1996 TOYOTA T100

Factory Service Manual

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HOW TO USE THIS MANUAL

IN02D–02

GENERAL INFORMATION

1. INDEX

An INDEX is provided on the first page of each section to guide you to the item to be repaired. To assist you in finding your way through the manual, the Section Title and major heading are given at the top of every page.

2. PRECAUTION

At the beginning of each section, a PRECAUTION is given that pertains to all repair operations contained in that section.

Read these precautions before starting any repair task.

3. TROUBLESHOOTING

TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause. The fundamentals of how to proceed with troubleshooting are described on page IN–16.

Be sure to read this before performing troubleshooting.

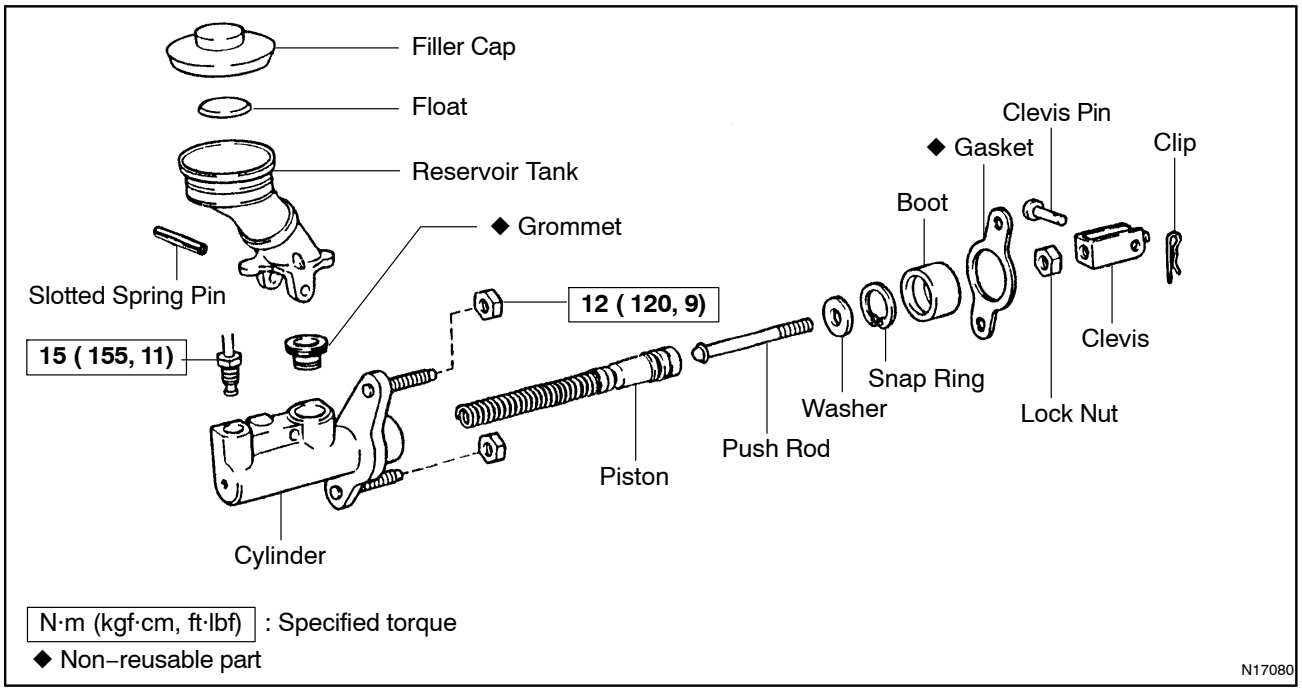
4. PREPARATION

Preparation lists the SST (Special Service Tools), recommended tools, equipment, lubricant and SSM (Special Service Materials) which should be prepared before beginning the operation and explains the purpose of each one.

5. REPAIR PROCEDURES

Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.

Example:

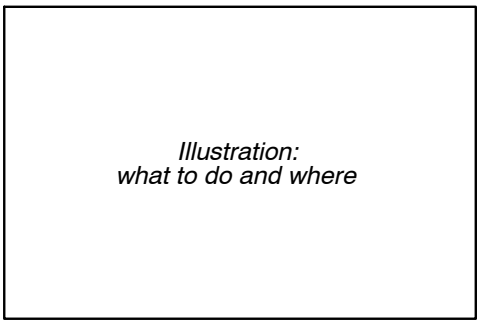


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The procedures are presented in a step–by–step format:

- The illustration shows what to do and where to do it.
- The task heading tells what to do.
- The detailed text tells how to perform the task and gives other information such as specifications and warnings.

Example:



Task heading : what to do

21. CHECK PISTON STROKE OF OVERDRIVE BRAKE

(a) Place SST and a dial indicator onto the overdrive brake piston as shown in the illustration.

SST 09350–30020 (09350–06120)

Set part No. *Component part No.*

Detailed text : how to do task

(b) Measure the stroke applying and releasing the compressed air (392 – 785 kPa, 4 – 8 kgf.cm^2 or 57 – 114 psi) as shown in the illustration.

Piston stroke: 1.40 — 1.70 mm (0.0551 — 0.0669 in.)

Specification

This format provides the experienced technician with a FAST TRACK to the information needed. The upper case task heading can be read at a glance when necessary, and the text below it provides detailed information. Important specifications and warnings always stand out in bold type.

6. REFERENCES

References have been kept to a minimum. However, when they are required you are given the page to refer to.

7. SPECIFICATIONS

Specifications are presented in bold type throughout the text where needed. You never have to leave the procedure to look up your specifications. They are also found in Service Specifications section for quick reference.

8. CAUTIONS, NOTICES, HINTS:

- CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- NOTICES are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- HINTS are separated from the text but do not appear in bold. They provide additional information to help you perform the repair efficiently.

9. SI UNIT

The UNITS given in this manual are primarily expressed according to the SI UNIT (International System of Unit), and alternately expressed in the metric system and in the English System.

Example:

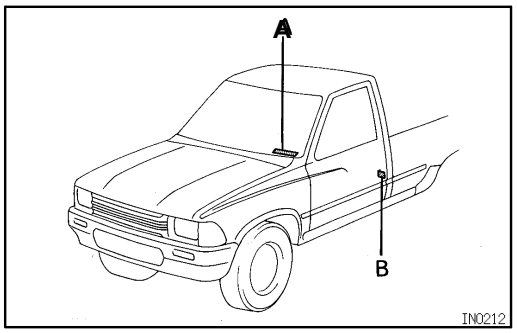
Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)

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IDENTIFICATION INFORMATION

IN02E–02

VEHICLE IDENTIFICATION AND ENGINE SERIAL NUMBER

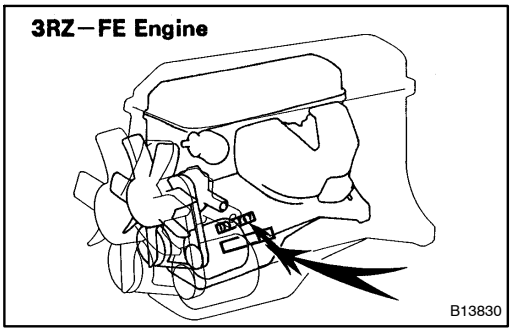


1. VEHICLE IDENTIFICATION NUMBER

The vehicle identification number is stamped on the vehicle identification number plate and certification label, as shown in the illustration.

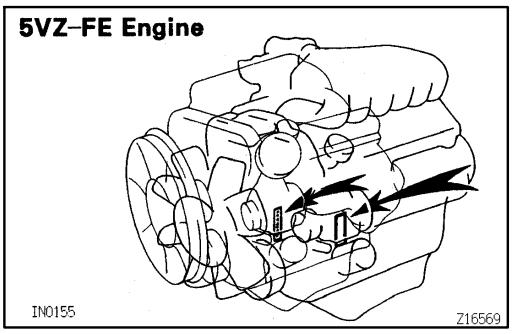
A: Vehicle Identification Number Plate

B: Certification Label

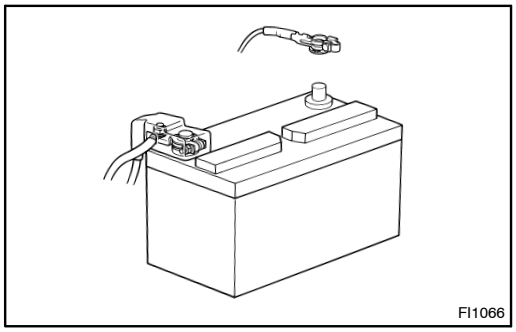


2. ENGINE SERIAL NUMBER

The engine serial number is stamped on the engine block as shown, in the illustration.



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REPAIR INSTRUCTIONS

IN0IL–01

GENERAL INFORMATION

BASIC REPAIR HINT

(a) Use fender, seat and floor covers to keep the vehicle clean and prevent damage.

(b) During disassembly, keep parts in the appropriate order to facilitate reassembly.

(c) Observe the following operations:

(1) Before performing electrical work, disconnect the negative (–) terminal cable from the battery.

(2) If it is necessary to disconnect the battery for inspection or repair, always disconnect the negative (–) terminal cable which is grounded to the vehicle body.

(3) To prevent damage to the battery terminal, loosen the cable nut and raise the cable straight up without twisting or prying it.

(4) Clean the battery terminals and cable ends with a clean shop rag. Do not scrape them with a file or other abrasive objects.

(5) Install the cable ends to the battery terminals with the nut loose, and tighten the nut after installation. Do not use a hammer to tap the cable ends onto the terminals.

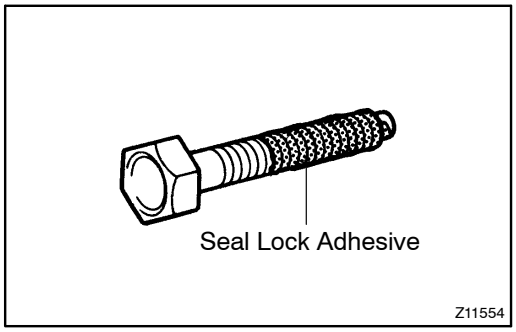
(6) Be sure the cover for the positive (+) terminal is properly in place.

(d) Check hose and wiring connectors to make sure that they are secure and correct.

(e) Non–reusable parts

(1) Always replace cotter pins, gaskets, O–rings and oil seals etc. with new ones.

(2) Non–reusable parts are indicated in the component illustrations by the "◆" symbol.



Z11554

(f) Precoated parts

Precoated parts are bolts and nuts, etc. that are coated with a seal lock adhesive at the factory.

(1) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.

(2) When reusing precoated parts, clean off the old adhesive and dry with compressed air. Then apply the specified seal lock adhesive to the bolt, nut or threads.

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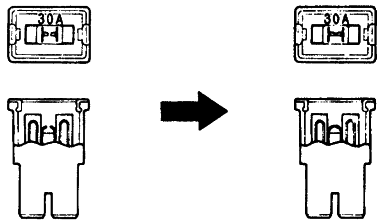
(3) Precoated parts are indicated in the component illustrations by the "★" symbol.

(g) When necessary, use a sealer on gaskets to prevent leaks.

(h) Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.

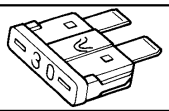
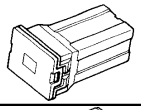
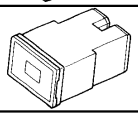
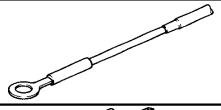
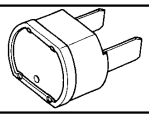
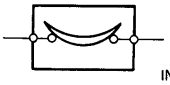
(i) Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found in the preparation part at the front of each section in this manual.

Medium Current Fuse and High Current Fuse Equal Amperage Rating



BE1367

(j) When replacing fuses, be sure the new fuse has the correct amperage rating. DO NOT exceed the rating or use one with a lower rating.

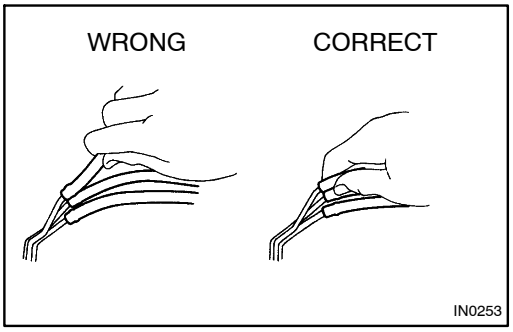
Illustration	Symbol	Part Name	Abbreviation
 BE5594	 IN0365	FUSE	FUSE
 BE5595	 IN0366	MEDIUM CURRENT FUSE	M–FUSE
 BE5596	 IN0367	HIGH CURRENT FUSE	H–FUSE
 BE5597	 IN0367	FUSIBLE LINK	FL
 BE5598	 IN0368	CIRCUIT BREAKER	CB

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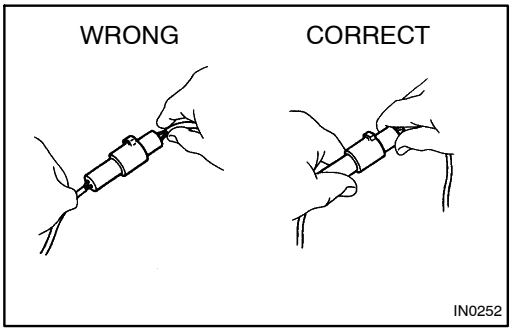
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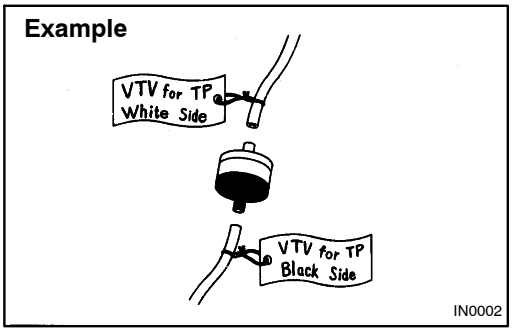
(k) Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations (See page IN–8).
  (1) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels at the opposite end in order to ensure safety.
  (2) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on a vehicle raised on a jack alone, even for a small job that can be finished quickly.

(l) Observe the following precautions to avoid damage to the following parts:
  (1) Do not open the cover or case of the ECU, ECM, PCM or TCM unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)



  (2) To disconnect vacuum hoses, pull off the end, not the middle of the hose.
  (3) To pull apart electrical connectors, pull on the connector itself, not the wires.
  (4) Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.
  (5) When steam cleaning an engine, protect the electronic components, air filter and emission–related components from water.
  (6) Never use an impact wrench to remove or install temperature switches or temperature sensors.
  (7) When checking continuity at the wire connector, insert the tester probe carefully to prevent terminals from bending.
  (8) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step–down adapter for adjustment. Once the hose has been stretched, it may leak.





(m) Tag hoses before disconnecting them:
  (1) When disconnecting vacuum hoses, use tags to identify how they should be reconnected to.
  (2) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.

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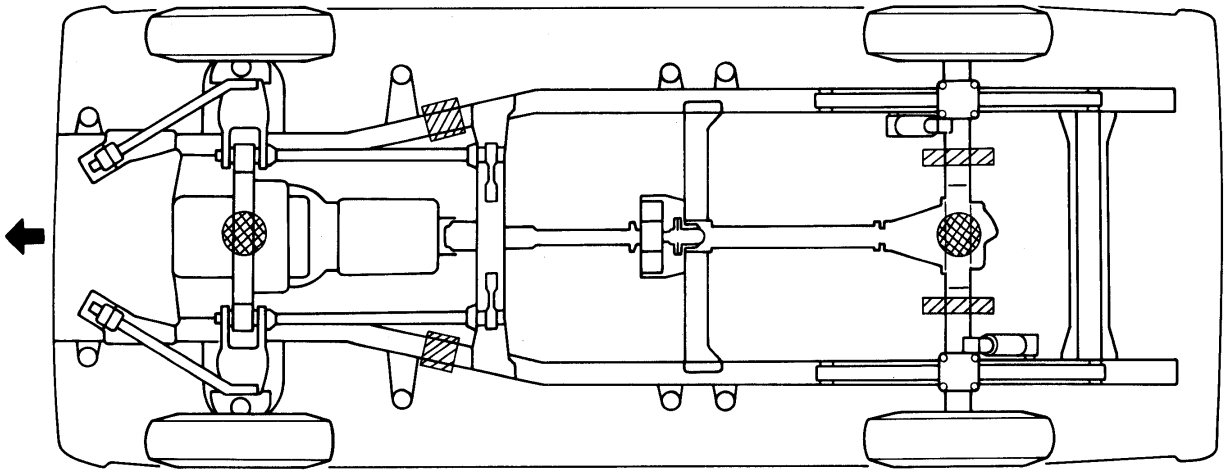
(n) Unless otherwise stated, all resistance is measured at an ambient temperature of 20°C (68°F). Because the resistance may be outside specifications if measured at high temperatures immediately after the vehicle has been running, measurement should be made when the engine has cooled down.

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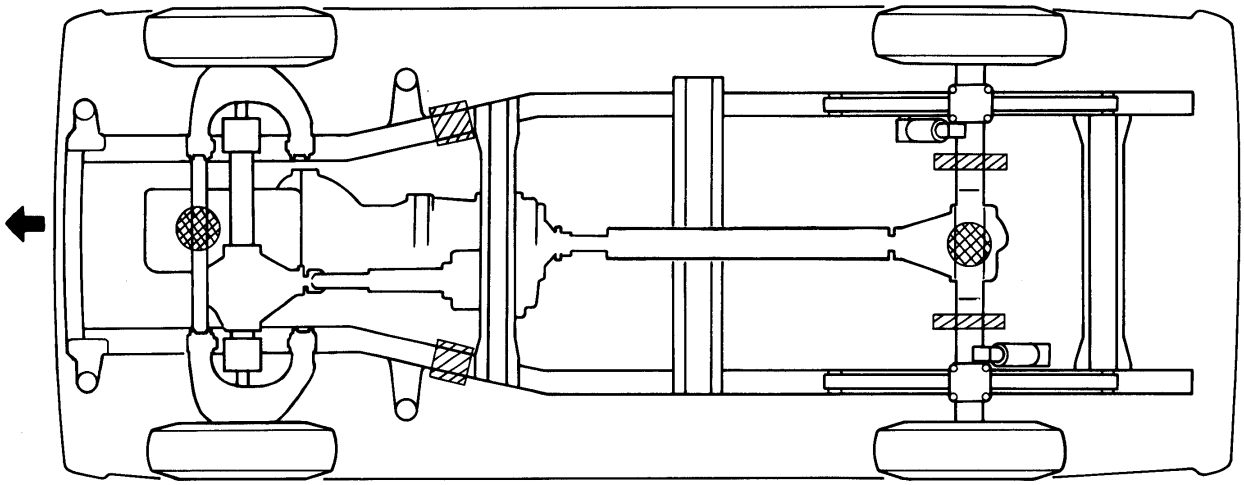
IN02G–02

VEHICLE LIFT AND SUPPORT LOCATIONS

[2WD]



[4WD]



JACK POSITION ..... 

Front ..... Center of crossmember

Rear ..... Under the rear differential

SUPPORT POSITION

Safety stand ..... 

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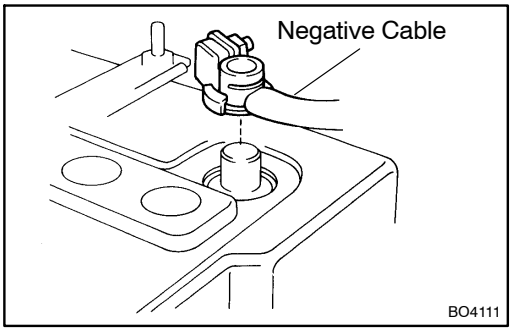
FOR ALL OF VEHICLES

PRECAUTION

IN02H–03

1. FOR VEHICLES EQUIPPED WITH SRS AIRBAG

(a) The TOYOTA T100 is equipped with an SRS (Supplemental Restraint System), such as the driver airbag.
Failure to carry out service operations in the correct sequence could cause the supplemental restraint system to unexpectedly deploy during servicing, possibly leading to a serious accident.
Further, if a mistake is made in servicing the supplemental restraint system, it is possible the SRS may fail to operate when required. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the following items carefully, then follow the correct procedure described in this manual.



(b) GENERAL NOTICE

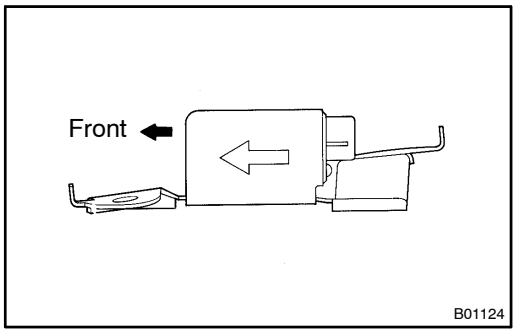
(1) Malfunction symptoms of the supplemental restraint system are difficult to confirm, so the diagnostic trouble codes become the most important source of information when troubleshooting. When troubleshooting the supplemental restraint system, always inspect the diagnostic trouble codes before disconnecting the battery (See page DI–365).

(2) Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.
(The supplemental restraint system is equipped with a back–up power source so that if work is started within 90 seconds of disconnecting the negative (–) terminal cable from the battery, the SRS may deploy.)
When the negative (–) terminal cable is disconnected from the battery, memory of the clock and audio systems will be cancelled. So before starting work, make a record of the contents memorized by the each memory system. Then when work is finished, reset the clock and audio systems as before.
To avoid erasing the memory of each memory system, never use a back–up power supply from outside the vehicle.

(3) Even in cases of a minor collision where the SRS does not deploy, the steering wheel pad should be inspected (See page RS–9).

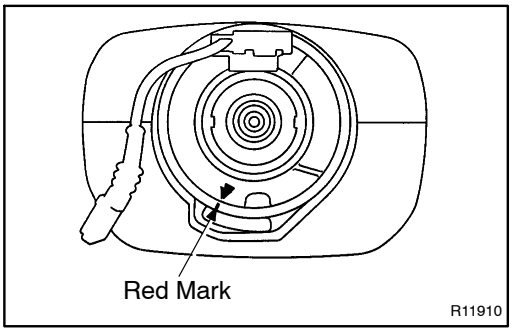
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(4) Never use SRS parts from another vehicle. When replacing parts, replace them with new parts.
(5) Before repairs, remove the center airbag sensor if shocks are likely to be applied to the sensor during repairs.
(6) Never disassemble and repair the center airbag sensor assembly, steering wheel pad in order to re-use it.
(7) If the center airbag sensor assembly, steering wheel pad have been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.
(8) Do not expose the center airbag sensor assembly, steering wheel pad directly to hot air or flames.
(9) Use a volt/ohmmeter with high impedance (10 kΩ/V minimum) for troubleshooting of the electrical circuit.
(10) Information labels are attached to the periphery of the SRS components. Follow the instructions on the notices.
(11) After work on the supplemental restraint system is completed, check the SRS warning light (See page DI–365).



(c) FRONT AIRBAG SENSOR
(1) Never reuse the front airbag sensors involved in a collision that activated the supplemental restraint system. (Replace both left and right airbag sensors.)
(2) Install the front airbag sensor with the arrow on the sensor facing toward the front of the vehicle.
The front airbag sensor set bolts have been anti–rust treated. When the sensor is removed, always replace the set bolts with new ones.
(3) The front airbag sensor is equipped with an electrical connection check mechanism. Be sure to lock this mechanism securely when connecting the connector.
(4) If connector is not securely locked, a malfunction code will be the diagnosis system (See page RS–2).

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(d) SPIRAL CABLE (in Combination Switch)
The steering wheel must be fitted correctly to the steering column with the spiral cable at the neutral position, otherwise cable disconnection and other troubles may result. Refer to SR–33 of this manual concerning correct steering wheel installation.

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(e) STEERING WHEEL PAD (with Airbag)

(1) When removing the steering wheel pad or handling a new steering wheel pad, it should be placed with the pad top surface facing up.
In this case, the twin–lock type connector lock lever should be in the locked state and care should be taken to place it so the connector will not be damaged. In addition do not store a steering wheel pad on top of another one. Storing the pad withits metallic surface facing upward may lead to a serious accident if the airbag inflates for some reason.

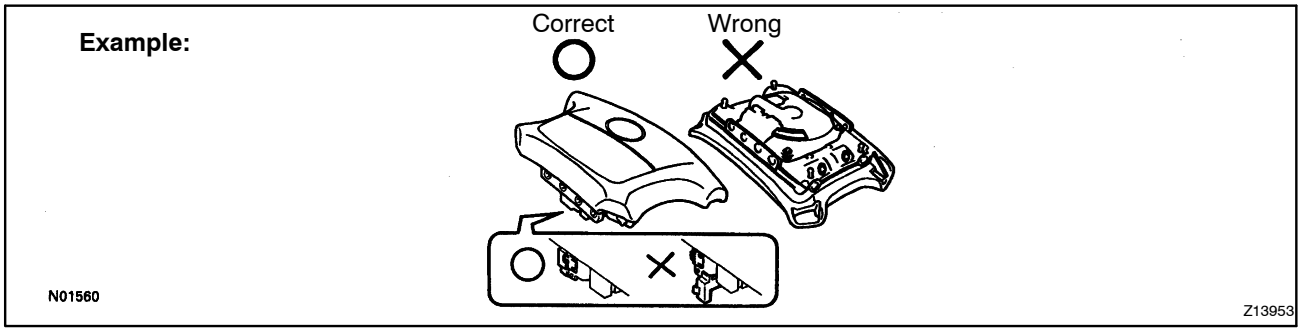
(2) Never measure the resistance of the airbag squib. (This may cause the airbag to deploy, which is very dangerous.)

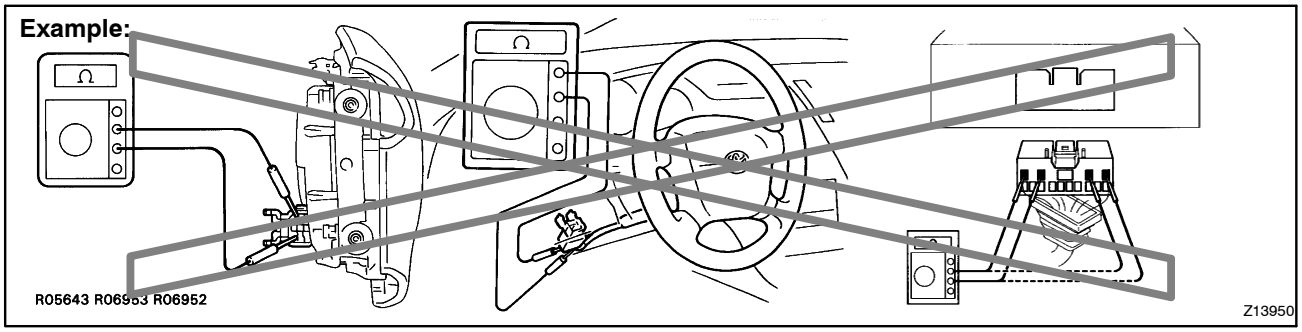
(3) Grease should not be applied to the steering wheel pad and the pad should not be cleaned with detergents of any kind.

(4) Store the steering wheel pad where the ambient temperature remains below 93˚C (200˚F), without high humidity and away from electrical noise.

(5) When using electric welding, first disconnect the airbag connector (yellow color and 2 pins) under the steering column near the combination switch connector before starting work.

(6) When disposing of a vehicle or the steering wheel pad alone, the airbag should be deployed using an SST before disposal (See page RS–11).
Carry out the operation in a safe place away from electrical noise.





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(f) CENTER AIRBAG SENSOR ASSEMBLY

(1) Never reuse the center airbag sensor assembly involved in a collision when the SRS has deployed.

(2) The connectors to the center airbag sensor assembly should be connected or disconnected with the sensor mounted on the floor. If the connectors are connected or disconnected while the center airbag sensor assembly is not mounted to the floor, it could cause undesired ignition of the supplemental restraint system.

(3) Work must be started after 90 seconds from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery, even if only loosening the set bolts of the center airbag sensor assembly.

(g) WIRE HARNESS AND CONNECTOR

The SRS wire harness is integrated with the cowl wire harness assembly and floor wire harness assembly. The wires for the SRS wire harness are encased in a yellow corrugated tube. All the connectors for the system are also a standard yellow color. If the SRS wire harness becomes disconnected or the connector becomes broken due to an accident, etc., repair or replace it.

2. FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

CAUTION:

If large amount of unburned gasoline flows into the converter, it may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.

(a) Use only unleaded gasoline.

(b) Avoid prolonged idling.
Avoid running the engine at idle speed for more than 20 minutes.

(c) Avoid spark jump test.

(1) Perform spark jump test only when absolutely necessary. Perform this test as rapidly as possible.

(2) While testing, never race the engine.

(d) Avoid prolonged engine compression measurement.
Engine compression tests must be done as rapidly as possible.

(e) Do not run engine when fuel tank is nearly empty.
This may cause the engine to misfire and create an extra load on the converter.

(f) Avoid coasting with ignition turned off and prolonged braking.

(g) Do not dispose of used catalyst along with parts contaminated with gasoline or oil.

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3. IF VEHICLE IS EQUIPPED WITH MOBILE COMMUNICATION SYSTEM

For vehicles with mobile communication systems such as two–way radios and cellular telephones, observe the following precautions.

(1) Install the antenna as far as possible away from the ECU and sensors of the vehicle's electronic system.
(2) Install the antenna feeder at least 20 cm (7.87 in.) away from the ECU and sensors of the vehicle's electronics systems. For details about ECU and sensors locations, refer to the section on the applicable component.
(3) Avoid winding the antenna feeder together with the other wiring as much as possible, and also avoid running the antenna feeder parallel with other wire harnesses.
(4) Confirm that the antenna and feeder are correctly adjusted.
(5) Do not install powerful mobile communications system.

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HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS

IN02I–02

GENERAL INFORMATION

A large number of ECU controlled systems are used in the TOYOTA T100. In general, the ECU controlled system is considered to be a very intricate system requiring a high level of technical knowledge and expert skill to troubleshoot. However, the fact is that if you proceed to inspect the circuits one by one, troubleshooting of these systems is not complex. If you have adequate understanding of the system and a basic knowledge of electricity, accurate diagnosis and necessary repair can be performed to locate and fix the problem. This manual is designed through emphasis of the above standpoint to help service technicians perform accurate and effective troubleshooting, and is compiled for the following major ECU controlled systems:

System	Page
1. 3RZ–FE Engine	DI–1
2. 5VZ–FE Engine	DI–127
3. Automatic Transmission	DI–263
4. Anti–Lock Brake system	DI–319
5. Supplemental Restraint System	DI–363
6. Cruise Control	DI–408

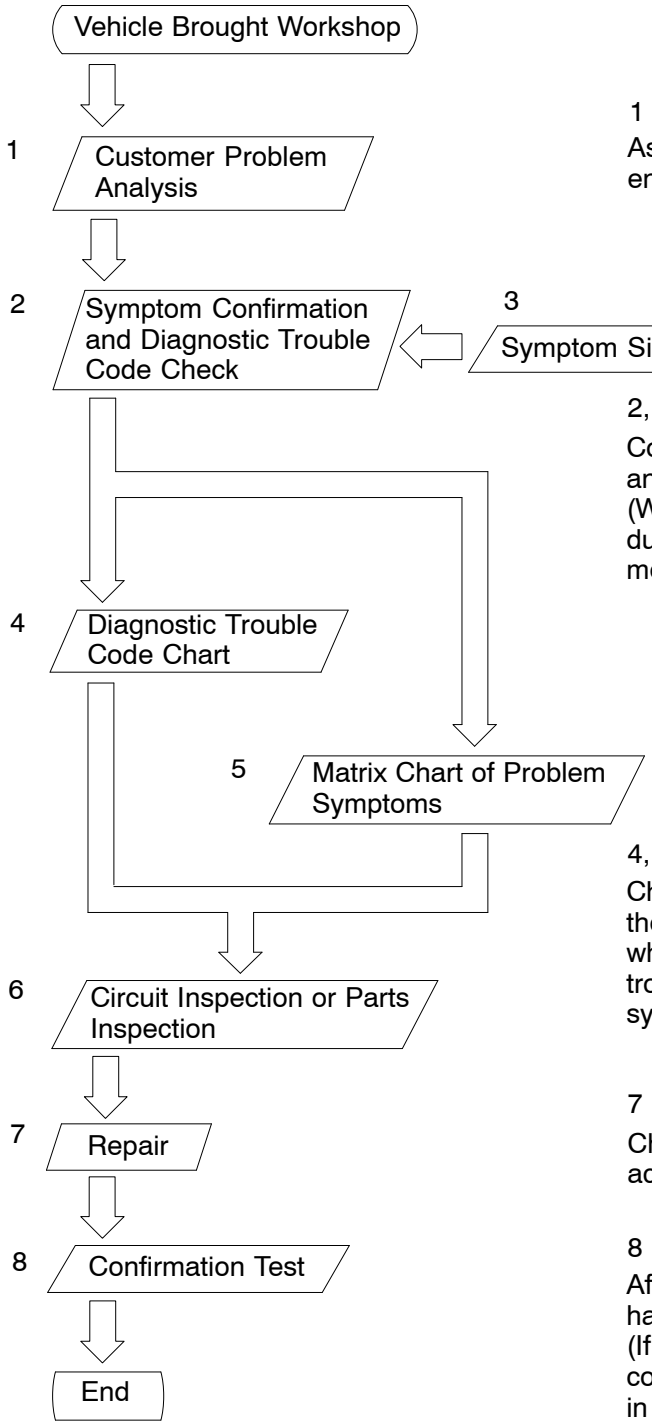
The troubleshooting procedure and how to make use of it are described on the above pages.

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IN02J–03

HOW TO PROCEED WITH TROUBLESHOOTING

Carry out troubleshooting in accordance with the procedure on the following page. Here, only the basic procedure is shown. Details are provided in each section, showing the most effective methods for each circuit. Confirm the troubleshooting procedures first for the relevant circuit before beginning troubleshooting of that circuit.



1
Ask the customer about the conditions and the environment when the problem occurred.

2, 3
Confirm the symptoms and the problem conditions, and check the diagnostic trouble codes.
(When the problem symptoms do not appear during confirmation, use the symptom simulation method described later on.)

4, 5, 6
Check the results obtained in Step 2, then confirm the inspection procedure for the system or the part which should be checked using the diagnostic trouble code chart or the matrix chart of problem symptoms.

7
Check and repair the affected system or part in accordance with the instructions in Step 6.

8
After completing repairs, confirm that the problem has been eliminated.
(If the problem is not reproduced, perform the confirmation test under the same conditions and in the same environment as when it occurred for the first time.)

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1. CUSTOMER PROBLEM ANALYSIS

In troubleshooting, the problem symptoms must be confirmed accurately and all preconceptions must be cleared away in order to give an accurate judgement. To ascertain just what the problem symptoms are, it is extremely important to ask the customer about the problem and the conditions at the time it occurred.
Important Point in the Problem Analysis:
The following 5 items are important points in the problem analysis. Past problems which are thought to be unrelated and the repair history, etc. may also help in some cases, so as much information as possible should be gathered and its relationship with the problem symptoms should be correctly ascertained for reference in troubleshooting. A customer problem analysis table is provided in the troubleshooting section for each system for your use.

Important Points in the Customer Problem Analysis

- What ––––– Vehicle model, system name
- When ––––– Date, time, occurrence frequency
- Where ––––– Road conditions
- Under what conditions? ––––– Running conditions, driving conditions, weather conditions
- How did it happen? ––––– Problem symptoms

(Sample) Engine control system check sheet.

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

Customer's Name		Model and Model Year	
Driver's Name		Frame No.	
Data Vehicle Brought in		Engine Model	
License No.		Odometer Reading	km miles

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Drive ability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

onstant ☐ Sometimes (times per day/month)

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2. SYMPTOM CONFIRMATION AND DIAGNOSTIC TROUBLE CODE CHECK

The diagnostic system in the TOYOTA T100 fulfills various functions. The first function is the Diagnostic Trouble Code Check in which a malfunction in the signal circuits to the ECU is stored in code in the ECU memory at the time of occurrence, to be output by the technician during troubleshooting. Another function is the Input Signal Check which checks if the signals from various switches are sent to the ECU correctly. By using these check functions, the problem areas can be narrowed down quickly and troubleshooting can be performed effectively. Diagnostic functions are incorporated in the following systems in the TOYOTA T100.

System	Diagnostic Trouble Code Check	Input Signal Check (Sensor Check)	Other Diagnosis Function
Engine (3RZ–FE, 5VZ–FE)	○ (with Test Mode)	○	
Automatic Transmission	○ (with Test Mode)	○	
Anti–Lock Brake system	○	○	
Supplemental Restraint System	○		
Cruise Control	○	○	Cancel Signal Check

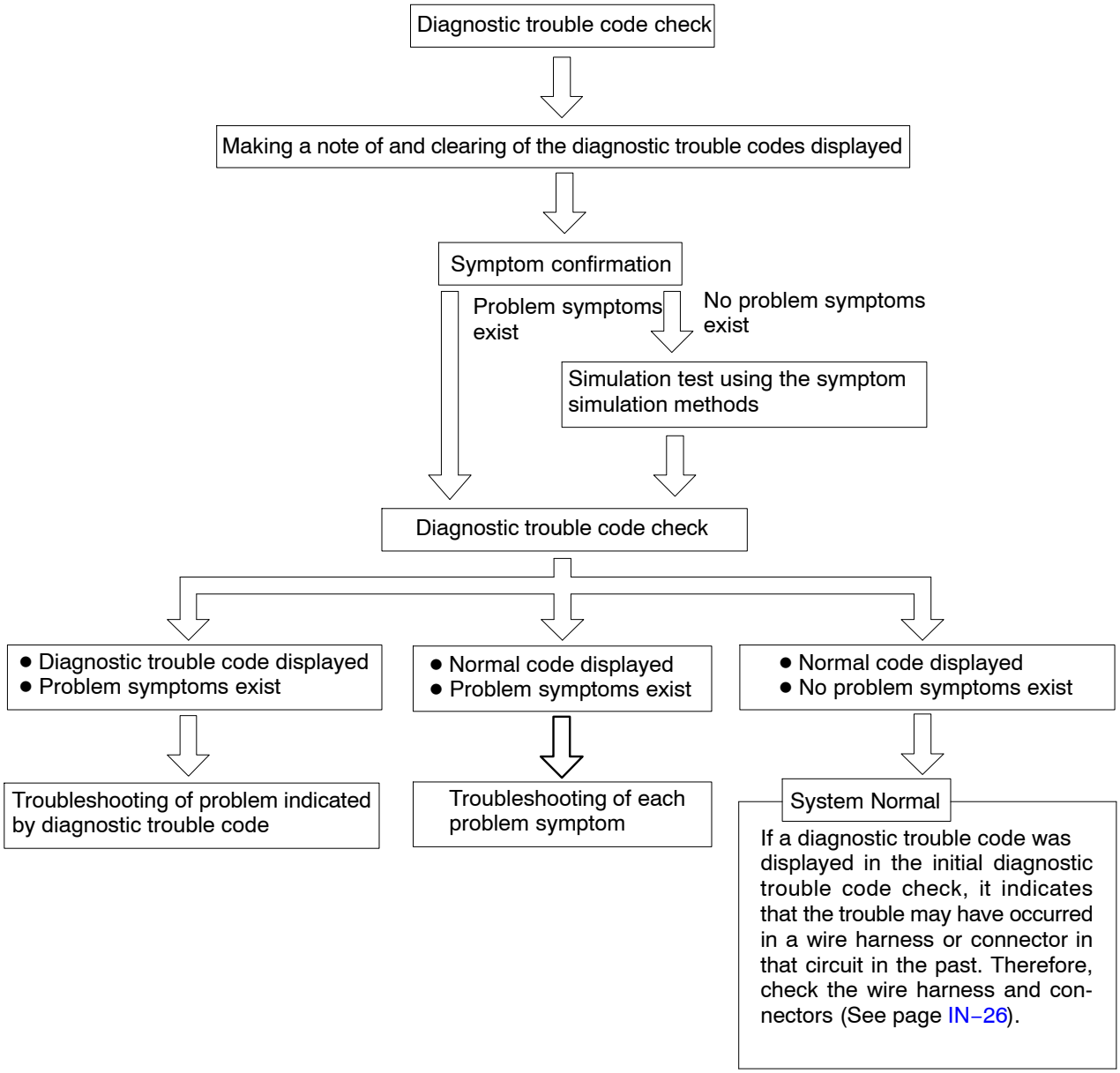
In diagnostic trouble code check, it is very important to determine whether the problem indicated by the diagnostic trouble code is still occurring or occurred in the past but returned to normal at present. In addition, it must be checked in the problem symptom check whether the malfunction indicated by the diagnostic trouble code is directly related to the problem symptom or not. For this reason, the diagnostic trouble codes should be checked before and after the symptom confirmation to determine the current conditions, as shown in the table below. If this is not done, it may, depending on the case, result in unnecessary troubleshooting for normally operating systems, thus making it more difficult to locate the problem, or in repairs not pertinent to the problem. Therefore, always follow the procedure in correct order and perform the diagnostic trouble code check.

DIAGNOSTIC TROUBLE CODE CHECK PROCEDURE

Diagnostic Trouble Code Check (Make a note of and then clear)	**Confirmation of Symptoms**	**Diagnostic Trouble Code Check**	**Problem Condition**
Diagnostic Trouble Code Display ⇨	Problem symptoms exist	Same diagnostic trouble code is displayed	Problem is still occurring in the diagnostic circuit.
		Normal code is displayed	The problem is still occurring in a place other than in the diagnostic circuit. (The diagnostic trouble code displayed first is either for a past problem or it is a secondary problem.)
	⇨ No problem symptoms exist		The problem occurred in the diagnostic circuit in the past.
Normal Code Display ⇨	Problem symptoms exist	Normal code is displayed	The problem is still occurring in a place other than in the diagnostic circuit.
	⇨ No problem symptoms exist	Normal code is displayed	The problem occurred in a place other than in the diagnostic circuit in the past.

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Taking into account the points on the previous page, a flow chart showing how to proceed with troubleshooting using the diagnostic trouble code check is shown below. This flow chart shows how to utilize the diagnostic trouble code check effectively, then by carefully checking the results, indicates how to proceed either to diagnostic trouble code troubleshooting or to troubleshooting of problem symptoms.



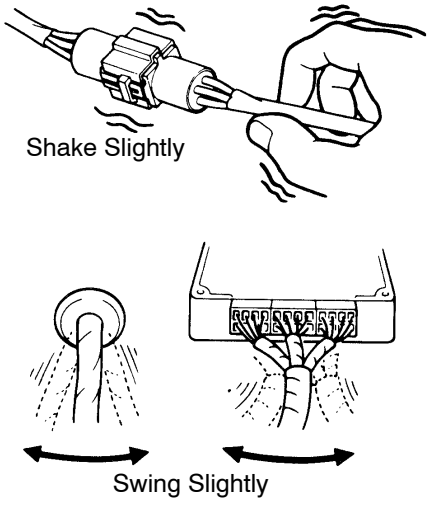
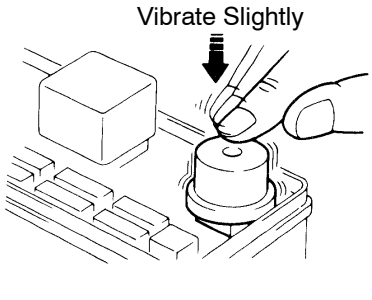
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3. SYMPTOM SIMULATION

The most difficult case in troubleshooting is when there are no problem symptoms occurring. In such cases, a thorough customer problem analysis must be carried out, then simulate the same or similar conditions and environment in which the problem occurred in the customer's vehicle. No matter how much experience a technician has, or how skilled he may be, if he proceeds to troubleshoot without confirming the problem symptoms he will tend to overlook something important in the repair operation and make a wrong guess somewhere, which will only lead to a standstill. For example, for a problem which only occurs when the engine is cold, or for a problem which occurs due to vibration caused by the road during driving, etc., the problem can never be determined so long as the symptoms are confirmed with the engine hot condition or the vehicle at a standstill. Since vibration, heat or water penetration (moisture) is likely cause for problem which is difficult to reproduce, the symptom simulation tests introduced here are effective measures in that the external causes are applied to the vehicle in a stopped condition.

Important Points in the Symptom Simulation Test:

In the symptom simulation test, the problem symptoms should of course be confirmed, but the problem area or parts must also be found out. To do this, narrow down the possible problem circuits according to the symptoms before starting this test and connect a tester beforehand. After that, carry out the symptom simulation test, judging whether the circuit being tested is defective or normal and also confirming the problem symptoms at the same time. Refer to the matrix chart of problem symptoms for each system to narrow down the possible causes of the symptom.

1	**VIBRATION METHOD: When vibration seems to be the major cause.**
CONNECTORS Slightly shake the connector vertically and horizontally. **WIRE HARNESS** Slightly shake the wire harness vertically and horizontally. The connector joint, fulcrum of the vibration, and body through portion are the major areas to be checked thoroughly.	
PARTS AND SENSOR Apply slight vibration with a finger to the part of the sensor considered to be the problem cause and check if the malfunction occurs. HINT: Applying strong vibration to relays may result in open relays.	

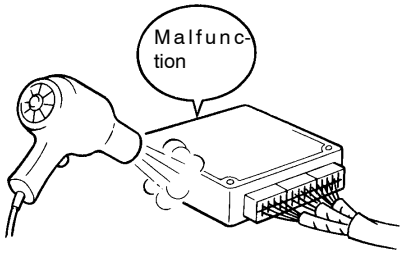
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2	**HEAT METHOD: When the problem seems to occur when the suspect area is heated.**

Heat the component that is the likely cause of the malfunction with a hair dryer or similar object. Check to see if the malfunction occurs.

NOTICE:
(1) Do not heat to more than 60 ˚C (140 ˚F). (Temperature is limited not to damage the components.)
(2) Do not apply heat directly to parts in the ECU.



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3	**WATER SPRINKLING METHOD: When the malfunction seems to occur on a rainy day or in a high–humidity condition.**

Sprinkle water onto the vehicle and check to see if the malfunction occurs.

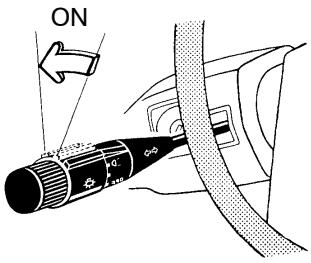
NOTICE:
(1) Never sprinkle water directly into the engine compartment, but indirectly change the temperature and humidity by applying water spray onto the radiator front surface.
(2) Never apply water directly onto the electronic components.

(Service hint)
If a vehicle is subject to water leakage, the leaked water may contaminate the ECU. When testing a vehicle with a water leakage problem, special caution must be taken.


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4	**OTHER: When a malfunction seems to occur when electrical load is excessive.**

Turn on all electrical loads including the heater blower, head lights, rear window defogger, etc. and check to see if the malfunction occurs.



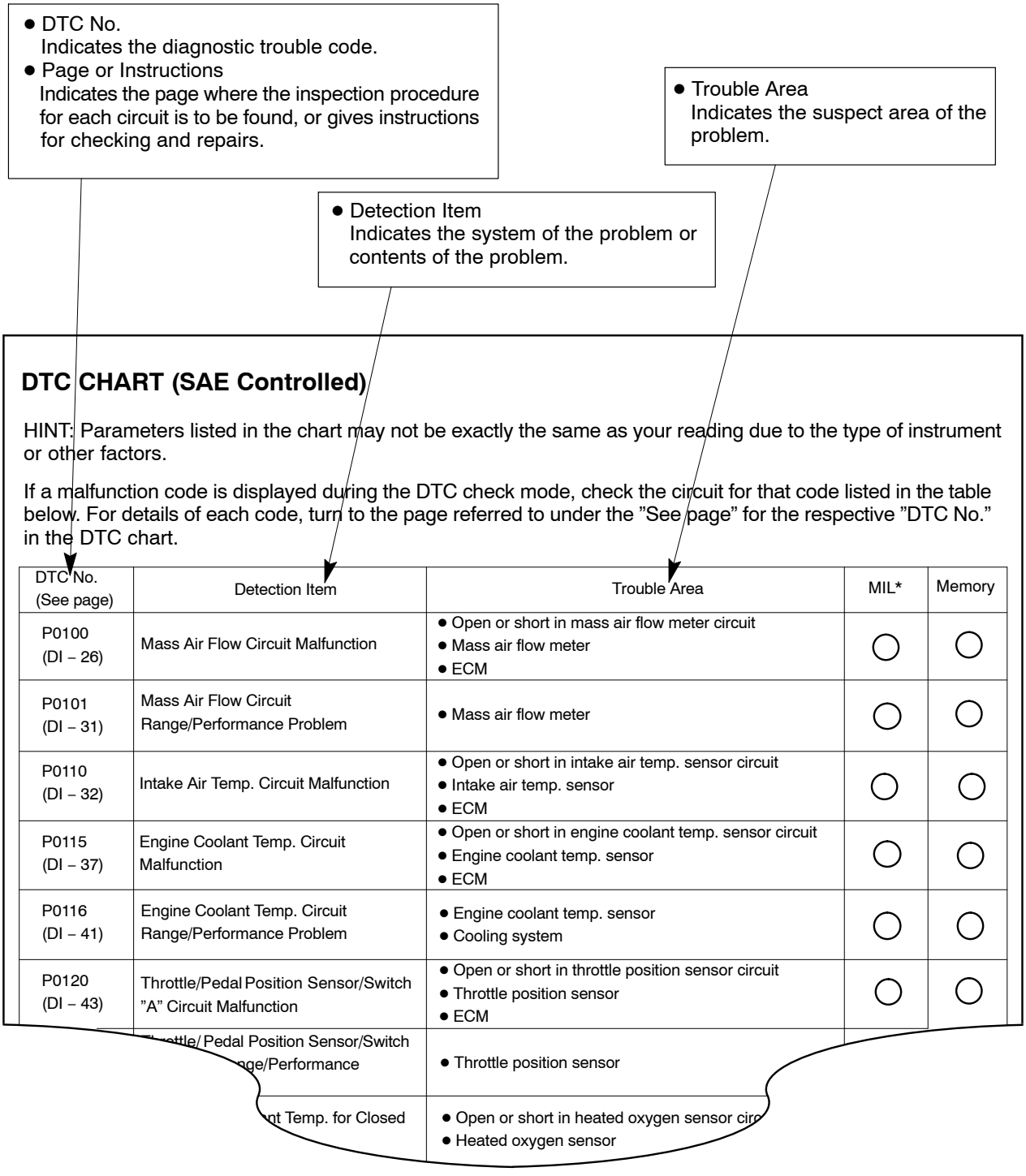
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4. DIAGNOSTIC TROUBLE CODE CHART

The inspection procedure is shown in the table below. This table permits efficient and accurate troubleshooting using the diagnostic trouble codes displayed in the diagnostic trouble code check. Proceed with troubleshooting in accordance with the inspection procedure given in the diagnostic chart corresponding to the diagnostic trouble codes displayed. The engine diagnostic trouble code chart is shown below as an example.



DTC CHART (SAE Controlled)

HINT: Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check mode, check the circuit for that code listed in the table below. For details of each code, turn to the page referred to under the "See page" for the respective "DTC No." in the DTC chart.

DTC No. (See page)	Detection Item	Trouble Area	MIL*	Memory
P0100 (DI – 26)	Mass Air Flow Circuit Malfunction	● Open or short in mass air flow meter circuit ● Mass air flow meter ● ECM	○	○
P0101 (DI – 31)	Mass Air Flow Circuit Range/Performance Problem	● Mass air flow meter	○	○
P0110 (DI – 32)	Intake Air Temp. Circuit Malfunction	● Open or short in intake air temp. sensor circuit ● Intake air temp. sensor ● ECM	○	○
P0115 (DI – 37)	Engine Coolant Temp. Circuit Malfunction	● Open or short in engine coolant temp. sensor circuit ● Engine coolant temp. sensor ● ECM	○	○
P0116 (DI – 41)	Engine Coolant Temp. Circuit Range/Performance Problem	● Engine coolant temp. sensor ● Cooling system	○	○
P0120 (DI – 43)	Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction	● Open or short in throttle position sensor circuit ● Throttle position sensor ● ECM	○	○
	ttle/ Pedal Position Sensor/Switch nge/Performance	● Throttle position sensor		
	nt Temp. for Closed	● Open or short in heated oxygen sensor circ ● Heated oxygen sensor		

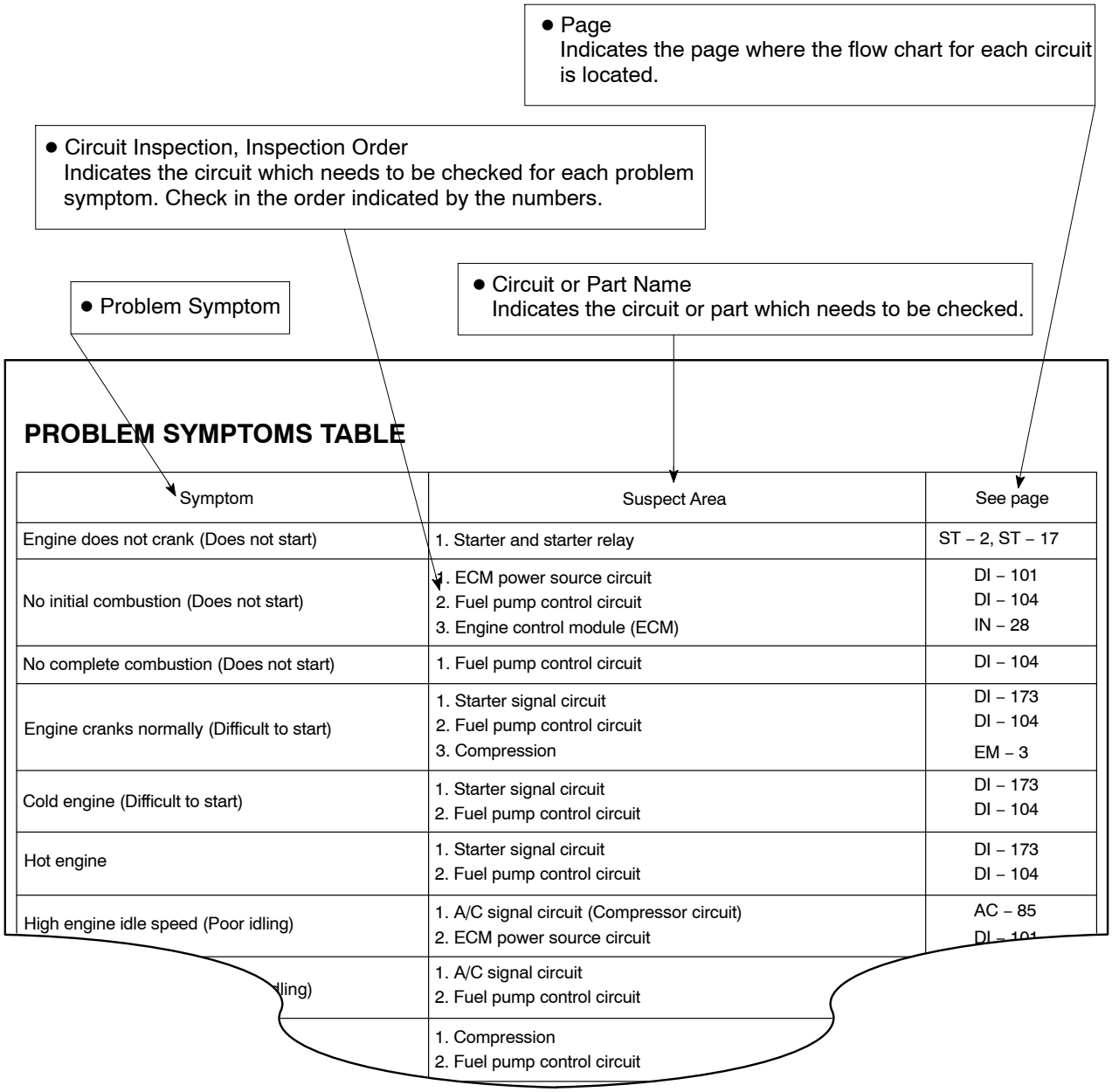
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5. PROBLEM SYMPTOMS TABLE

The suspect circuits or parts for each problem symptom are shown in the table below. Use this table to troubleshoot the problem when a "Normal" code is displayed in the diagnostic trouble code check but the problem is still occurring. Numbers in the table indicate the inspection order in which the circuits or parts should be checked.

HINT:

When the problem is not detected by the diagnostic system even though the problem symptom is present, it is considered that the problem is occurring outside the detection range of the diagnostic system, or that the problem is occurring in a system other than the diagnostic system.



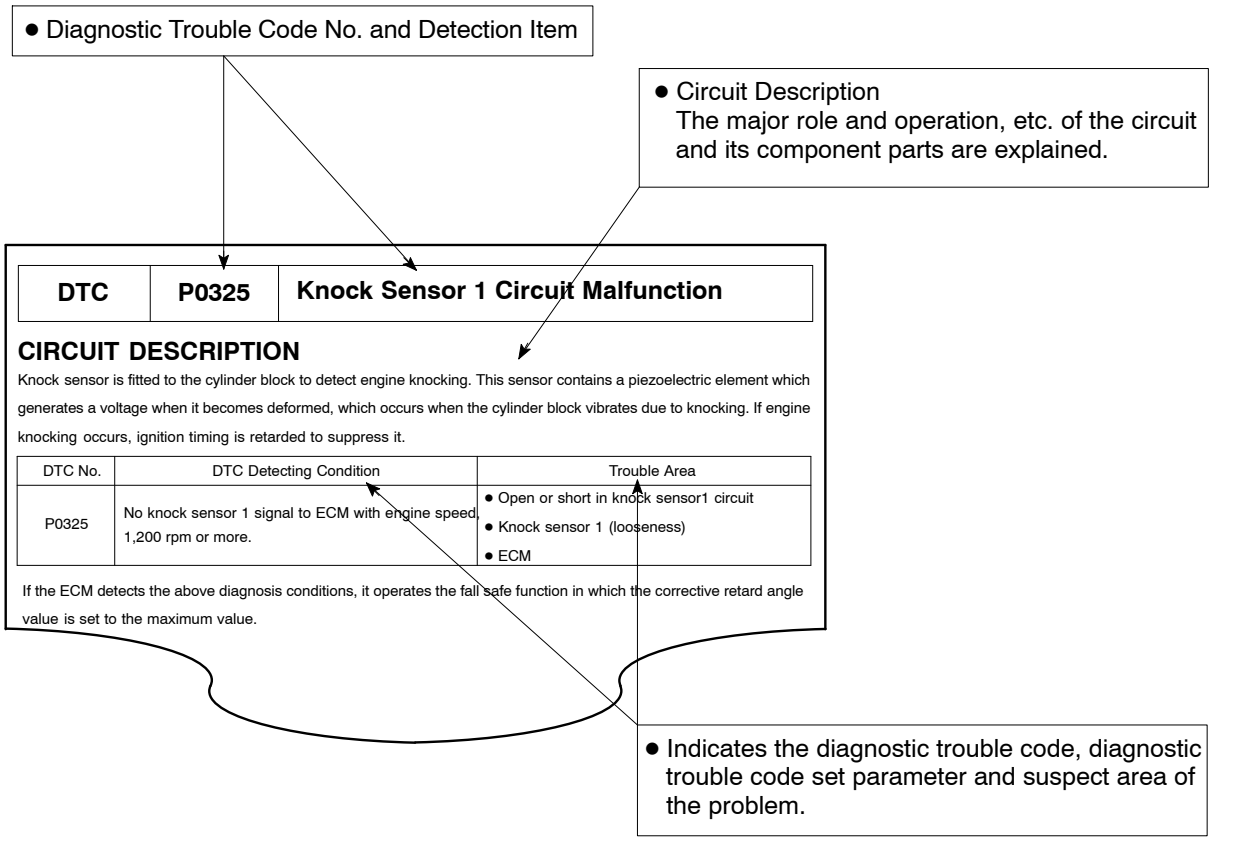
PROBLEM SYMPTOMS TABLE

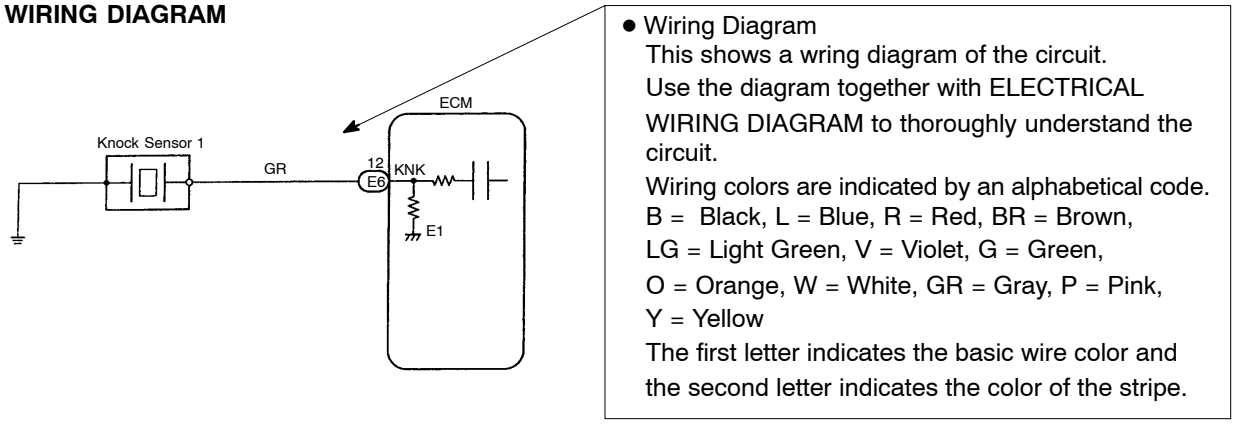
Symptom	Suspect Area	See page
Engine does not crank (Does not start)	1. Starter and starter relay	ST – 2, ST – 17
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. Engine control module (ECM)	DI – 101 DI – 104 IN – 28
No complete combustion (Does not start)	1. Fuel pump control circuit	DI – 104
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI – 173 DI – 104 EM – 3
Cold engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI – 173 DI – 104
Hot engine	1. Starter signal circuit 2. Fuel pump control circuit	DI – 173 DI – 104
High engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. ECM power source circuit	AC – 85 DI – 101
ling)	1. A/C signal circuit 2. Fuel pump control circuit	
	1. Compression 2. Fuel pump control circuit	

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6. CIRCUIT INSPECTION

How to read and use each page is shown below.





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● Indicates the position of the ignition switch during the check.

LOCK
Ignition Switch LOCK (OFF)

ON
Ignition Switch ON

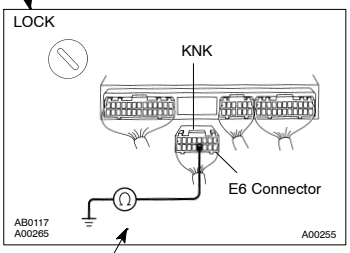
START
Ignition Switch START

ACC
Ignition Switch ACC

● Inspection Procedure
Use the inspection procedure to determine if the circuit is normal or abnormal, and, if it is abnormal, use it to determine whether the problem is located in the sensors, actuators, wire harness or ECU.

INSPECTION PROCEDURE

1	**Check continuity between terminal KNK of ECM connector and body ground.**



PREPARATION:
(a) Remove the glove compartment (See page SF – 37).
(b) Disconnect the E6 connector of ECM.

CHECK:
Measure resistance between terminal KNK of ECM connector and body ground.

OK:
Resistance: 1 MΩ or higher

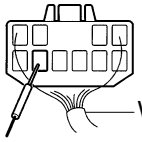
OK	**Go to step 3.**

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2	**Check knock sensor (See page SF – 34).**

OK	**Replace knock sensor.**

● Indicates the place to check the voltage or resistance.
● Indicates the connector position to checked, from the front or back side.

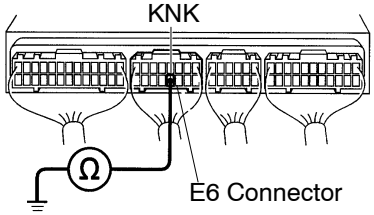


Check from the connector back side. (with harness)

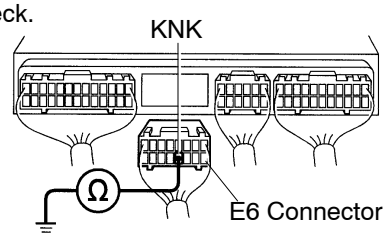


Check from the connector front side. (without harness)
In this case, care must be taken not to bend the terminals.

● Indicates the condition of the connector of ECU during the check.



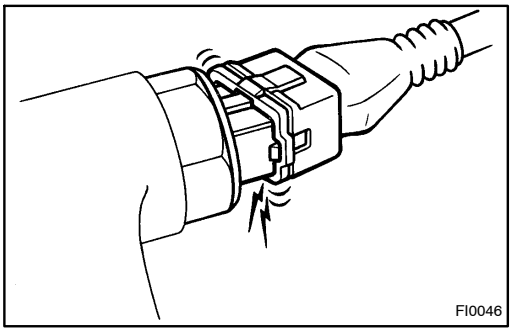
Connector being checked is connected.

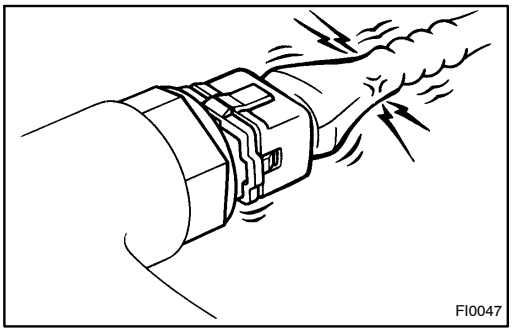


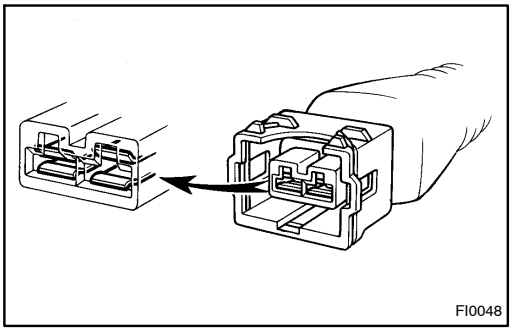
Connector being checked is disconnected.

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HOW TO USE THE DIAGNOSTIC CHART AND INSPECTION PROCEDURE

1. CONNECTOR CONNECTION AND TERMINAL INSPECTION

- For troubleshooting, diagnostic trouble code charts or problem symptom table are provided for each circuit with detailed inspection procedures on the following pages.
- When all the component parts, wire harnesses and connectors of each circuit except the ECU are found to be normal in troubleshooting, then it is determined that the problem is in the ECU. Accordingly, if diagnosis is performed without the problem symptoms occurring,refer to step 8 to replace the ECU, even if the problem is not in the ECU. So always confirm that the problem symptoms are occurring, or proceed with inspection while using the symptom simulation method.
- The instructions ”Check wire harness and connector” and ”Check and replace ECU” which appear in the inspection procedure, are common and applicable to all diagnostic trouble codes. Follow the procedure outlined below whenever these instructions appear.

OPEN CIRCUIT:

This could be due to and a disconnected wire harness, faulty contact in the connector, a connector terminal pulled out, etc.

HINT:

- It is rarely the case that a wire is broken in the middle of it. Most cases occur at the connector. In particular, carefully check the connectors of sensors and actuators.
- Faulty contact could be due to rusting of the connector terminals, to foreign materials entering terminals or a deformation of connector terminals between the male and female terminals of the connector. Simply disconnecting and reconnecting the connectors once changes the condition of the connection and may result in a return to normal operation. Therefore, in troubleshooting, if no abnormality is found in the wire harness and connector check, but the problem disappears after the check, then the cause is considered to be in the wire harness or connectors.

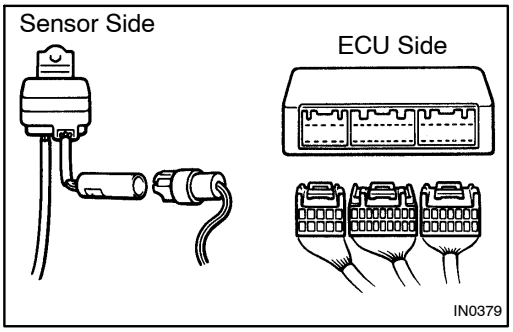
SHORT CIRCUIT:

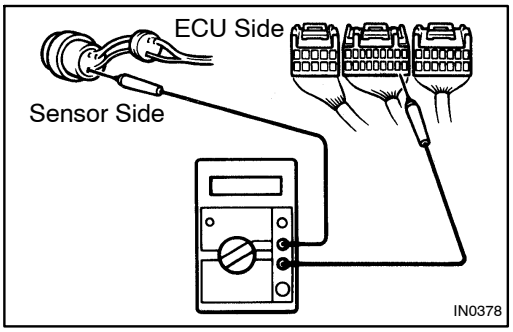
This could be due to a connect between the wire harness and the body ground or to a short occurred inside the switch etc.

HINT:

When there is a short circuit between the wire harness and body ground, check thoroughly whether the wire harness is caught in the body or is clamped properly.

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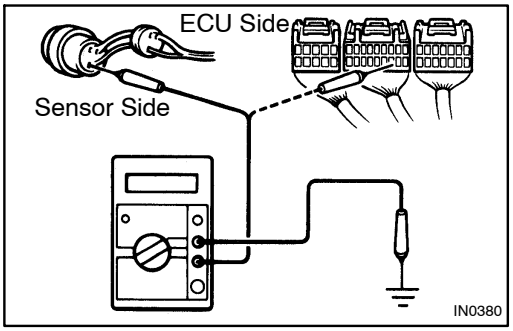
2. CONTINUITY CHECK (OPEN CIRCUIT CHECK)

(a) Disconnect the connectors at both ECU and sensor sides.

(b) Measure the resistance between the applicable terminals of the connectors.

HINT:

- Measure the resistance while lightly shaking the wire harness vertically and horizontally.
- When tester probes are inserted into a connector, insert the probes from the back. For waterproof connectors in which the probes cannot be inserted from the back, be careful not to bend the terminals when inserting the tester probes.



3. RESISTANCE CHECK (SHORT CIRCUIT CHECK)

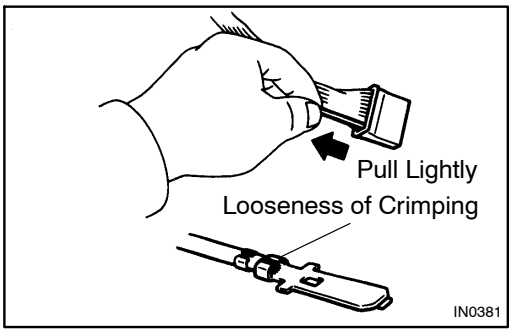
(a) Disconnect the connectors on both ends.

(b) Measure the resistance between the applicable terminals of the connectors and body ground. Be sure to carry out this check on the connectors on both ends.

Resistance: 1 MΩ or higher

HINT:

Measure the resistance while lightly shaking the wire harness vertically and horizontally.



4. VISUAL CHECK AND CONTACT PRESSURE CHECK

(a) Disconnect the connectors at both ends.

(b) Check for rust or foreign material, etc. in the terminals of the connectors.

(c) Check crimped portions for looseness or damage and check if the terminals are secured in lock portion.

HINT:

The terminals should not come out when pulled lightly.

(d) Prepare a test male terminal and insert it in the female terminal, then pull it out.

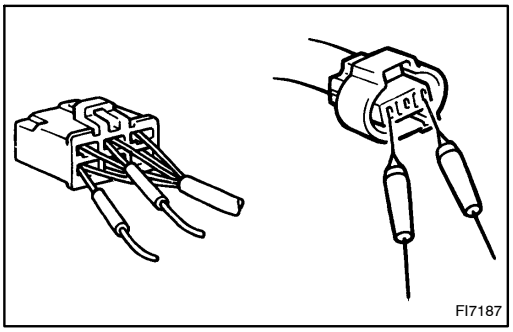
NOTICE:

When testing a gold–plated female terminal, always use a gold–plated male terminal.

HINT:

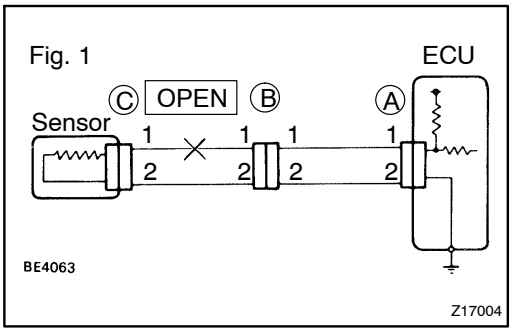
When the test terminal is pulled out more easily than others, there may be poor contact in that section.

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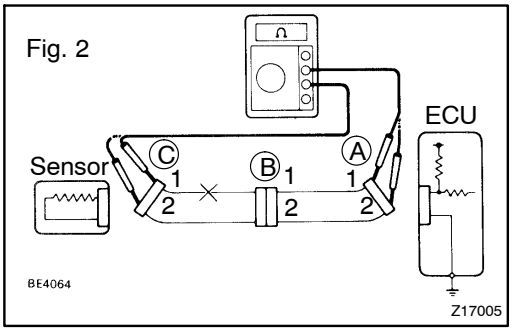
5. CONNECTOR HANDLING

When inserting tester probes into a connector, insert them from the rear of the connector. When necessary, use mini test leads. For water resistant connectors which cannot be accessed from behind, take good care not to deform the connector terminals.



6. CHECK OPEN CIRCUIT

For the open circuit in the wire harness in Fig.1, perform "(a) Continuity Check" or "(b) Voltage Check" to locate the section.



(a) Check the continuity.

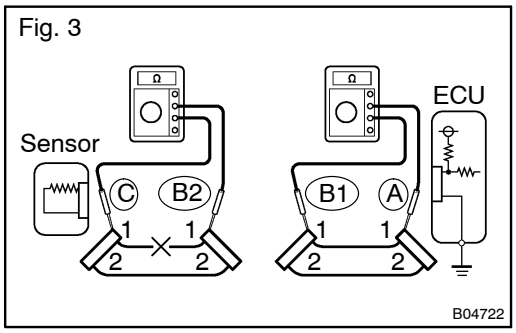
(1) Disconnect connectors "A" and "C" and measure the resistance between them.

In the case of Fig.2,

Between terminal 1 of connector "A" and terminal 1 of connector "C" → No continuity (open)

Between terminal 2 of connector "A" and terminal 2 of connector "C" → Continuity

Therefore, it is found out that there is an open circuit between terminal 1 of connector "A" and terminal 1 of connector "C".



(2) Disconnect connector "B" and measure the resistance between the connectors.

In the case of Fig.3,

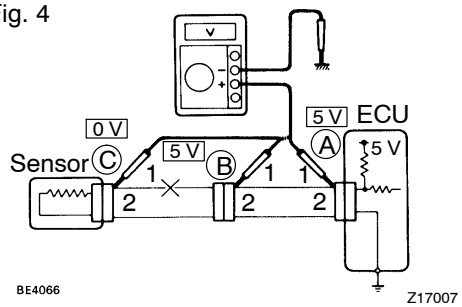
Between terminal 1 of connector "A" and terminal 1 of connector "B1" → Continuity

Between terminal 1 of connector "B2" and terminal 1 of connector "C" → No continuity (open)

Therefore, it is found out that there is an open circuit between terminal 1 of connector "B2" and terminal 1 of connector "C".

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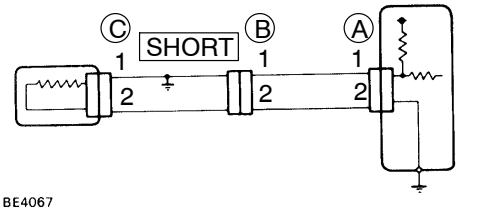
Fig. 4



(b) Check the voltage.
In a circuit in which voltage is applied (to the ECU connector terminal), an open circuit can be checked for by conducting a voltage check.
As shown in Fig.4, with each connector still connected, measure the voltage between body ground and terminal 1 of connector "A" at the ECU 5V output terminal, terminal 1 of connector "B", and terminal 1 of connector "C", in that order.

If the results are:
5V: Between Terminal 1 of connector "A" and Body Ground
5V: Between Terminal 1 of connector "B" and Body Ground
0V: Between Terminal 1 of connector "C" and Body Ground
Then it is found out that there is an open circuit in the wire harness between terminal 1 of "B" and terminal 1 of "C".

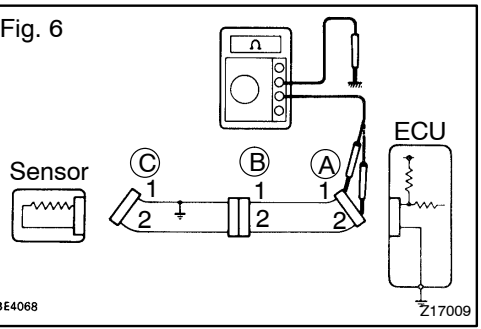
Fig. 5



7. CHECK SHORT CIRCUIT

If the wire harness is ground shorted as in Fig.5, locate the section by conducting a "continuity check with ground".

Fig. 6

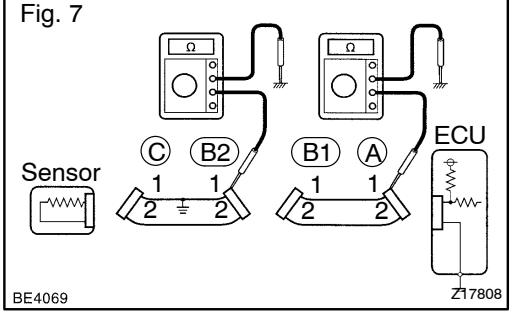


Check the continuity with ground.

(1) Disconnect connectors "A" and "C" and measure the resistance between terminal 1 and 2 of connector "A" and body ground.
In the case of Fig.6
Between terminal 1 of connector "A" and body ground → Continuity (short)
Between terminal 2 of connector "A" and body ground → No continuity
Therefore, it is found out that there is a short circuit between terminal 1 of connector "A" and terminal 1 of connector "C".

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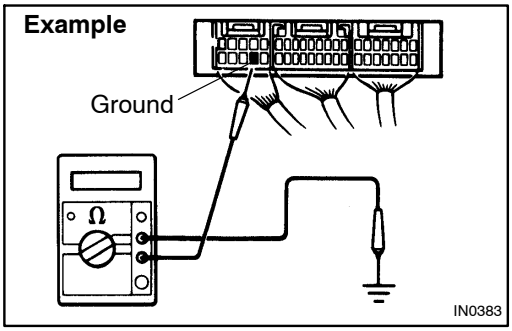
Fig. 7



(2) Disconnect connector ”B” and measure the resistance between terminal 1 of connector ”A” and body ground, and terminal 1 of connector ”B2” and body ground.
Between terminal 1 of connector ”A” and body ground → No continuity
Between terminal 1 of connector ”B2” and body ground → Continuity (short)
Therefore, it is found out that there is a short circuit between terminal 1 of connector ”B2” and terminal 1 of connector ”C”.

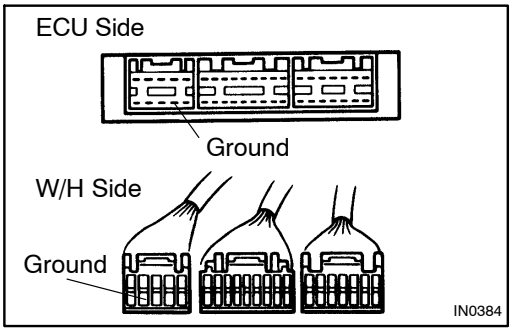
8. CHECK AND REPLACE ECU

First check the ECU ground circuit. If it is faulty, repair it. If it is normal, the ECU could be faulty, so replace the ECU with a normal functioning one and check that the symptoms appear.



(1) Measure the resistance between the ECU ground terminal and the body ground.

Resistance: 1 Ω or less



(2) Disconnect the ECU connector, check the ground terminals on the ECU side and the wire harness side for bend and check the contact pressure.

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TERMS

ABBREVIATIONS USED IN THIS MANUAL

IN02L–01

Abbreviations	Meaning
ABS	Anti–Lock Brake System
A.D.D.	Automatic Disconnecting Differential
A/T	Automatic Transmission
ATF	Automatic Transmission Fluid
BTDC	Before Top Dead Center
Calif.	California
CB	Circuit Breaker
Diff.Lock	Differential Locking System
DP	Dash Pot
ECU	Electronic Control Unit
E/G	Engine
ELR	Emergency Locking Retractor
ESA	Electronic Spark Advance
EX	Exhaust (Manifold, Valve)
FIPG	Formed in Place Gasket
FL	Fusible Link
FPU	Fuel Pressure Up
Fr	Front
IG	Ignition
IN	Intake (Manifold, Valve)
J/B	Junction Block
LH	Left–Hand
LLC	Long Life Coolant (Year Around Coolant)
LSPV	Load Sensing Proportioning Valve
Max.	Maximum
Min.	Minimum
MP	Multipurpose
M/T	Manual Transmission
O/D, OD	Overdrive
OHC	Over Head Camshaft
O/S	Oversize
PCV	Positive Crankcase Ventilation
PS	Power Steering
RH	Right–Hand
Rr	Rear
SRS	Supplemental Restraint System
SSM	Special Service Materials
SST	Special Service Tools
STD	Standard
SW	Switch
TDC	Top Dead Center
TEMP.	Temperature

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T/M	Transmission
U/S	Undersize
VCV	Vacuum Control Valve
VSV	Vacuum Switching Valve
VTV	Vacuum Transmitting Valve
w/	With
w/o	Without
2WD	Two Wheel Drive Vehicles (4x2)
4WD	Four Wheel Drive Vehicles (2x2)

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IN02M–01

GLOSSARY OF SAE AND TOYOTA TERMS

This glossary lists all SAE–J1930 terms and abbreviations used in this manual in compliance with SAE recommendations, as well as their Toyota equivalents.

SAE ABBREVIATIONS	SAE TERMS	TOYOTA TERMS ( )––ABBREVIATIONS
A/C	Air Conditioning	Air Conditioner
ACL	Air Cleaner	Air Cleaner
AIR	Secondary Air Injection	Air Injection (AI)
AP	Accelerator Pedal	–
B+	Battery Positive Voltage	+B, Battery Voltage
BARO	Barometric Pressure	–
CAC	Charge Air Cooler	Intercooler
CARB	Carburetor	Carburetor
CFI	Continuous Fuel Injection	–
CKP	Crankshaft Position	Crank Angle
CL	Closed Loop	Closed Loop
CMP	Camshaft Position	Cam Angle
CPP	Clutch Pedal Position	–
CTOX	Continuous Trap Oxidizer	–
CTP	Closed Throttle Position	–
DFI	Direct Fuel Injection (Diesel)	Direct Injection (DI)
DI	Distributor Ignition	–
DLC1 DLC2 DLC3	Data Link Connector 1 Data Link Connector 2 Data Link Connector 3	1: Check Connector 2: Total Diagnosis Comunication Link (TDCL) 3: OBD II Diagnostic Connector
DTC	Diagnostic Trouble Code	Diagnostic Code
DTM	Diagnostic Test Mode	–
ECL	Engine Control Level	–
ECM	Engine Control Module	Engine ECU (Electronic Control Unit)
ECT	Engine Coolant Temperature	Coolant Temperature, Water Temperature (THW)
EEPROM	Electrically Erasable Programmable Read Only Memory	Electrically Erasable Programmable Read Only Memory (EEPROM), Erasable Programmable Read Only Memory (EPROM)
EFE	Early Fuel Evaporation	Cold Mixture Heater (CMH), Heat Control Valve (HCV)
EGR	Exhaust Gas Recirculation	Exhaust Gas Recirculation (EGR)
EI	Electronic Ignition	Distributorless Ignition (DI)
EM	Engine Modification	Engine Modification (EM)
EPROM	Erasable Programmable Read Only Memory	Programmable Read Only Memory (PROM)
EVAP	Evaporative Emission	Evaporative Emission Control (EVAP)
FC	Fan Control	–
FEEPROM	Flash Electrically Erasable Programmable Read Only Memory	–
FEPROM	Flash Erasable Programmable Read Only Memory	–
FF	Flexible Fuel	–
FP	Fuel Pump	Fuel Pump
GEN	Generator	Alternator
GND	Ground	Ground (GND)

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HO2S	Heated Oxygen Sensor	Heated Oxygen Sensor (HO2S)
IAC	Idle Air Control	Idle Speed Control (ISC)
IAT	Intake Air Temperature	Intake or Inlet Air Temperature
ICM	Ignition Control Module	–
IFI	Indirect Fuel Injection	Indirect Injection
IFS	Inertia Fuel–Shutoff	–
ISC	Idle Speed Control	–
KS	Knock Sensor	Knock Sensor
MAF	Mass Air Flow	Air Flow Meter
MAP	Manifold Absolute Pressure	Manifold Pressure Intake Vacuum
MC	Mixture Control	Electric Bleed Air Control Valve (EBCV) Mixture Control Valve (MCV) Electric Air Control Valve (EACV)
MDP	Manifold Differential Pressure	–
MFI	Multiport Fuel Injection	Electronic Fuel Injection (EFI)
MIL	Malfunction Indicator Lamp	Check Engine Light
MST	Manifold Surface Temperature	–
MVZ	Manifold Vacuum Zone	–
NVRAM	Non–Volatile Random Access Memory	–
O2S	Oxygen Sensor	Oxygen Sensor, O_2 Sensor (O_2S)
OBD	On–Board Diagnostic	On–Board Diagnostic (OBD)
OC	Oxidation Catalytic Converter	Oxidation Catalyst Converter (OC), CCo
OP	Open Loop	Open Loop
PAIR	Pulsed Secondary Air Injection	Air Suction (AS)
PCM	Powertrain Control Module	–
PNP	Park/Neutral Position	–
PROM	Programmable Read Only Memory	–
PSP	Power Steering Pressure	–
PTOX	Periodic Trap Oxidizer	Diesel Particulate Filter (DPF) Diesel Particulate Trap (DPT)
RAM	Random Access Memory	Random Access Memory (RAM)
RM	Relay Module	–
ROM	Read Only Memory	Read Only Memory (ROM)
RPM	Engine Speed	Engine Speed
SC	Supercharger	Supercharger
SCB	Supercharger Bypass	–
SFI	Sequential Multiport Fuel Injection	Electronic Fuel Injection (EFI), Sequential Injection
SPL	Smoke Puff Limiter	–
SRI	Service Reminder Indicator	–
SRT	System Readiness Test	–
ST	Scan Tool	–
TB	Throttle Body	Throttle Body
TBI	Throttle Body Fuel Injection	Single Point Injection Central Fuel Injection (Ci)
TC	Turbocharger	Turbocharger
TCC	Torque Converter Clutch	Torque Converter

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TCM	Transmission Control Module	Transmission ECU (Electronic Control Unit)
TP	Throttle Position	Throttle Position
TR	Transmission Range	–
TVV	Thermal Vacuum Valve	Bimetallic Vacuum Switching Valve (BVSV) Thermostatic Vacuum Switching Valve (TVSV)
TWC	Three–Way Catalytic Converter	Three–Way Catalytic (TWC) CC_{RO}
TWC+OC	Three–Way + Oxidation Catalytic Converter	CC_R + CCo
VAF	Volume Air Flow	Air Flow Meter
VR	Voltage Regulator	Voltage Regulator
VSS	Vehicle Speed Sensor	Vehicle Speed Sensor (Read Switch Type)
WOT	Wide Open Throttle	Full Throttle
WU–OC	Warm Up Oxidation Catalytic Converter	–
WU–TWC	Warm Up Three–Way Catalytic Converter	Manifold Converter
3GR	Third Gear	–
4GR	Fourth Gear	–

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MA – MAINTENANCE

OUTSIDE VEHICLE	MA-1
INSIDE VEHICLE	MA-2
UNDER HOOD	MA-4
ENGINE	MA-5
BRAKE	MA-7
CHASSIS	MA-8

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OUTSIDE VEHICLE

GENERAL MAINTENANCE

MA001-28

The owners are responsible for these maintenance and inspection items.
They can be done by the owner or they can have them done at a service shop.
These items include those which should be checked on a daily basis, those which, in most cases, do not require (special) tools and those which are considered to be reasonable for the owner to do.
Items and procedures for general maintenance are as follows.

1. GENERAL NOTES

- Maintenance items may vary from country to country. Check the owner's manual supplement in which the maintenance schedule is shown.
- Every service item in the periodic maintenance schedule must be performed.
- Periodic maintenance service must be performed according to whichever interval in the periodic maintenance schedule occurs first, the odometer reading (miles) or the time interval (months).
- Maintenance service after the last period should be performed at the same interval as before unless otherwise noted.
- Failure to do even one item can cause the engine to run poorly and increase exhaust emissions.

2. TIRES

(a) Check the pressure with a gauge.
If necessary, adjust.
(b) Check for cuts, damage or excessive wear.

3. WHEEL NUTS

When checking the tires, check the nuts for looseness or for missing nuts.
If necessary, tighten them.

4. TIRE ROTATION

Check the owner's manual supplement in which the maintenance schedule is shown.

5. WINDSHIELD WIPER BLADES

Check for wear or cracks whenever they do not wipe clean.
If necessary, replace.

6. FLUID LEAKS

(a) Check underneath for leaking fuel, oil, water or other fluid.
(b) If you smell gasoline fumes or notice any leak, have the cause found and corrected.

7. DOORS AND ENGINE HOOD

(a) Check that all doors and the tailgate operate smoothly, and that all latches lock securely.
(b) Check that the engine hood secondary latch secures the hood from opening when the primary latch is released.

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INSIDE VEHICLE

GENERAL MAINTENANCE

MA002–05

These are maintenance and inspection items which are considered to be the owner's responsibility. They can be done by the owner or they can have them done at a service shop.
These items include those which should be checked on a daily basis, those which, in most cases, do not require (special) tools and those which are considered to be reasonable for the owner to do.
Items and procedures for general maintenance are as follows.

1. GENERAL NOTES

- Maintenance items may vary from country to country. Check the owner's manual supplement in which the maintenance schedule is shown.
- Every service item in the periodic maintenance schedule must be performed.
- Periodic maintenance service must be performed according to whichever interval in the periodic maintenance schedule occurs first, the odometer reading (miles) or the time interval (months).
- Maintenance service after the last period should be performed at the same interval as before unless otherwise noted.
- Failure to do even one item can cause the engine to run poorly and increase exhaust emissions.

2. LIGHTS

(a) Check that the headlights, stop lights, taillights, turn signal lights, and other lights are all working.
(b) Check the headlight aim.

3. WARNING LIGHTS AND BUZZERS

Check that all warning lights and buzzers function properly.

4. HORN

Check that it is working.

5. WINDSHIELD GLASS

Check for scratches, pits or abrasions.

6. WINDSHIELD WIPER AND WASHER

(a) Check operation of the wipers and washer.
(b) Check that the wipers do not streak.

7. WINDSHIELD DEFROSTER

Check that air comes out from the defroster outlet when operating the heater or air conditioner.

8. REAR VIEW MIRROR

Check that it is mounted securely.

9. SUN VISORS

Check that they move freely and are mounted securely.

10. STEERING WHEEL

Check that it has the specified freeplay. Be alert for changes in steering condition, such as hard steering, excessive freeplay or strange noises.

11. SEATS

(a) Check that the seat adjusters operate smoothly.
(b) Check that all latches lock securely in any position.
(c) Check that the head restraints move up and down smoothly and that the locks hold securely in any latch position.
(d) For fold–down seat backs, check that the latches lock securely.

12. SEAT BELTS

(a) Check that the seat belt system such as the buckles, retractors and anchors operate properly and smoothly.
(b) Check that the belt webbing is not cut, frayed, worn or damaged.

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13. ACCELERATOR PEDAL

Check the pedal for smooth operation and uneven pedal effort or catching.

14. CLUTCH PEDAL

(See page CL–2)

(a) Check the pedal for smooth operation.

(b) Check that the pedal has the proper freeplay.

15. BRAKE PEDAL

(See page BR–6)

(a) Check the pedal for smooth operation.

(b) Check that the pedal has the proper reserve distance and freeplay.

(c) Check the brake booster function.

16. BRAKES

At a safe place, check that the brakes do not pull to one side when applied.

17. PARKING BRAKE

(See page BR–8)

(a) Check that the lever has the proper travel.

(b) On a safe incline, check that the vehicle is held securely with only the parking brake applied.

18. AUTOMATIC TRANSMISSION ”PARK” MECHANISM

(a) Check the lock release button of the selector lever for proper and smooth operation.

(b) On a safe incline, check that the vehicle is held securely with the selector lever in ”P” position and all brakes released.

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UNDER HOOD

GENERAL MAINTENANCE

MA003–05

1. GENERAL NOTES

- Maintenance items may vary from country to country. Check the owner's manual supplement in which the maintenance schedule is shown.
- Every service item in the periodic maintenance schedule must be performed.
- Periodic maintenance service must be performed according to whichever interval in the periodic maintenance schedule occurs first, the odometer reading (miles) or the time interval (months).
- Maintenance service after the last period should be performed at the same interval as before unless otherwise noted.
- Failure to do even one item can cause the engine to run poorly and increase exhaust emissions.

2. WINDSHIELD WASHER FLUID

Check that there is sufficient fluid in the tank.

3. ENGINE COOLANT LEVEL

Check that the coolant level is between the FULL and LOW lines on the see–through reservoir.

4. RADIATOR AND HOSES

(a) Check that the front of the radiator is clean and not blocked with leaves, dirt or bugs.
(b) Check the hoses for cracks, kinks, rot or loose connections.

5. BATTERY ELECTROLYTE LEVEL

Check that the electrolyte level of all battery cells is between the upper and lower level lines on the case.

6. BRAKE AND CLUTCH FLUID LEVELS

Check that the brake and clutch fluid levels are near the upper level line on the see–through reservoirs.

7. ENGINE DRIVE BELTS

Check all drive belts for fraying, cracks, wear or oiliness.

8. ENGINE OIL LEVEL

Check the level on the dipstick with the engine turned off.

9. POWER STEERING FLUID LEVEL

(a) Check the level on the dipstick.
(b) The level should be in the HOT or COLD range depending on the fluid temperature.

10. AUTOMATIC TRANSMISSION FLUID LEVEL

(a) Park the vehicle on a level surface.
(b) With the engine idling and the parking brake applied, shift the selector into all positions from the P to L, and then shift into the P position.
(c) Pull out the dipstick and wipe off the fluid with a clean rag. Re–insert the dipstick and check that the fluid level is in the HOT range.
(d) Do this check with the fluid at normal driving temperature (70 – 80°C, 158 – 176°F).

HINT:

Wait until the engine cools down (approx. 30 min.) before checking the fluid level after extended driving at high speeds, in hot weather, in heavy traffic or pulling a trailer.

11. EXHAUST SYSTEM

(a) Visually inspect for cracks, holes or loose supports.
(b) If any change in the sound of the exhaust or smell of the exhaust fumes is noticed, have the cause located and corrected.

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ENGINE

INSPECTION

MA004–03

HINT:

Inspect these items when the engine is cold.

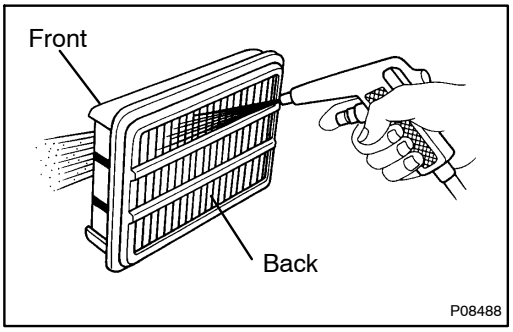
1. **(5VZ–FE ENGINE)**
   REPLACE TIMING BELT
   (See page EM–11)
2. **INSPECT DRIVE BELTS**
   GENERATOR:
   (3RZ–FE: See page CH–2)
   (5VZ–FE: See page CH–1)
   PS:
   (3RZ–FE: See page SR–3)
   (5VZ–FE: See page SR–3)
   A/C:
   (3RZ–FE: See page AC–14)
   (5VZ–FE: See page AC–14)
3. **REPLACE SPARK PLUGS**
   (3RZ–FE: See page IG–1)
   (5VZ–FE: See page IG–1)
4. **INSPECT AIR FILTER**

(a) Visually check that the air cleaner element is not excessively dirty, damaged or oily.

HINT:

Oiliness may indicate a stuck PCV valve.

If necessary, replace the air cleaner element.



(b) Clean the element with compressed air.
First blow from back side thoroughly, then blow off the front side of the element.

5. **REPLACE AIR FILTER**

Replace the used air cleaner element with a new one.

6. **REPLACE ENGINE OIL AND OIL FILTER**
   (3RZ–FE: See page LU–3)
   (5VZ–FE: See page LU–3)
7. **REPLACE ENGINE COOLANT**
   (3RZ–FE: See page CO–2)
   (5VZ–FE: See page CO–2)
8. **CALIFORNIA, MASSACHUSETTS, MAIN, VERMONT, RHODE ISLAND and NEW HAMPSHIRE:**
   INSPECT CHARCOAL CANISTER
   (3RZ–FE: See page EC–5)
   (5VZ–FE: See page EC–5)
9. **REPLACE GASKET IN FUEL TANK CAP**
   (3RZ–FE: See page EC–5)
   (5VZ–FE: See page EC–5)

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10. INSPECT FUEL LINES AND CONNECTIONS

Visually inspect the fuel lines for cracks, leakage loose connections, deformation or tank band looseness.

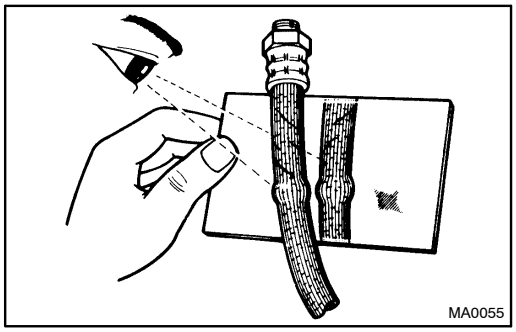
11. INSPECT EXHAUST PIPES AND MOUNTINGS

Visually inspect the pipes, hangers and connections for severe corrosion, leaks or damage.

12. ADJUST VALVE CLEARANCE

(3RZ–FE: See page EM–5)
(5VZ–FE: See page EM–4)

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BRAKE

MA014–01

INSPECTION

1. INSPECT BRAKE LINE PIPES AND HOSES

HINT:

Inspect in a well–lighted area. Inspect the entire circumference and length of the brake hoses using a mirror as required. Turn the front wheels fully right or left before inspecting the front brake.

(a) Check all brake lines and hoses for:
- Damage
- Wear
- Deformation
- Cracks
- Corrosion
- Leaks
- Bends
- Twists

(b) Check all clamps for tightness and connections for leakage.

(c) Check that the hoses and lines are clear of sharp edges, moving parts and the exhaust system.

(d) Check that the lines installed in grommets pass through the center of the grommets.

2. INSPECT FRONT BRAKE PADS AND DISCS

(2WD: See page BR–22)
(4WD: See page BR–25)

HINT:

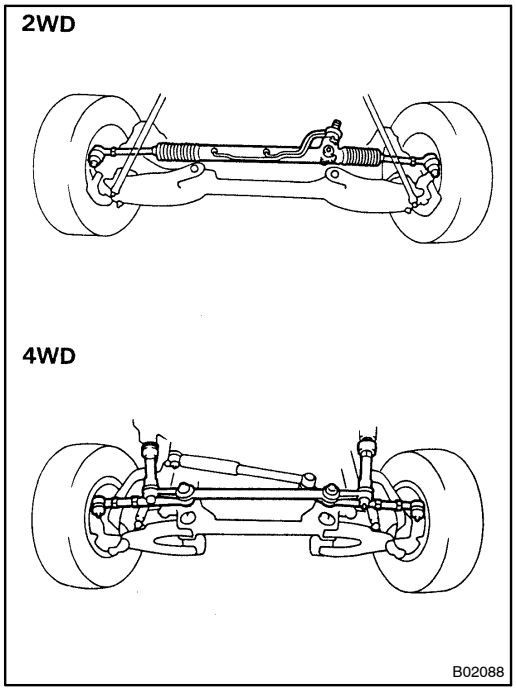
If a squealing or scraping noise occurs from the brake during driving, check the pad wear indicator.

If there are traces of the indicator contacting the disc rotor, the disc pad should be replaced.

3. INSPECT REAR BRAKE LININGS AND DRUMS

(2WD: See page BR–42)
(4WD: See page BR–48)

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CHASSIS

MA015–02

INSPECTION

1. INSPECT STEERING LINKAGE

(a) Check the steering wheel freeplay (See page SR–9).

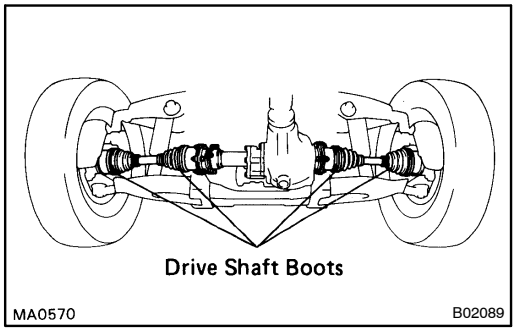
(b) Check the steering linkage for looseness or damage.
Check that:

- Tie rod ends and relay rod ends do not have excessive play.
- Dust seals are not damaged.
- 2WD:
  Boot clamps are not loose.

2. INSPECT SRS AIRBAG (See page RS–2)

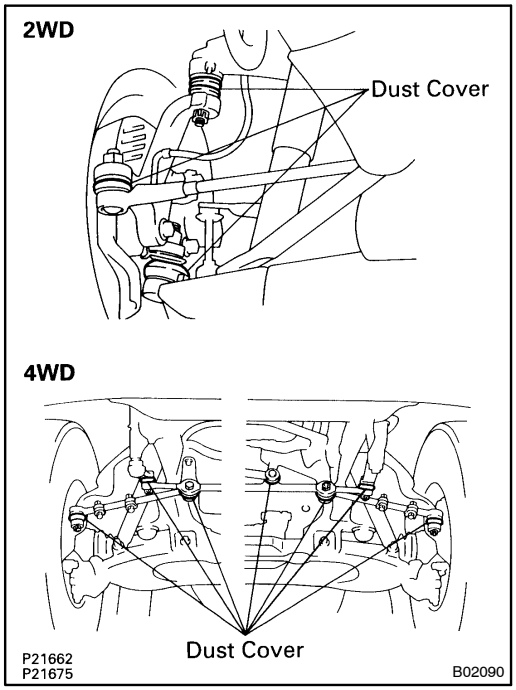
3. INSPECT STEERING GEAR HOUSING OIL

Check the steering gear housing for oil leaks.
If leakage is found, check for cause and repair.



4. 4WD:
INSPECT DRIVE SHAFT BOOTS

Inspect the drive shaft boots for clamp looseness, grease leakage or damage.

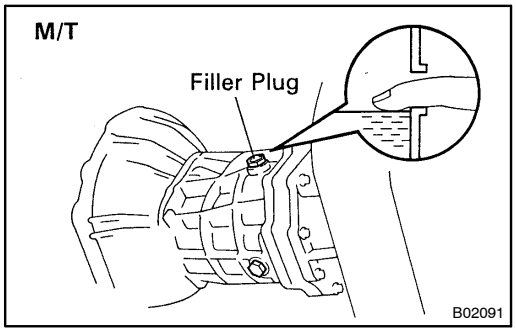


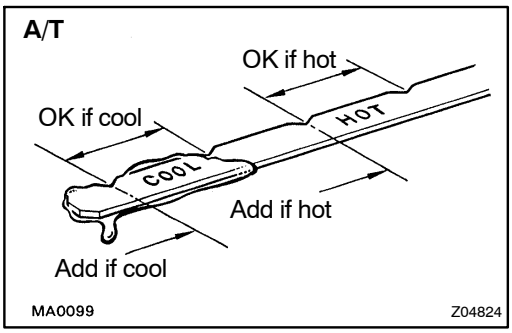
5. INSPECT BALL JOINTS AND DUST COVERS

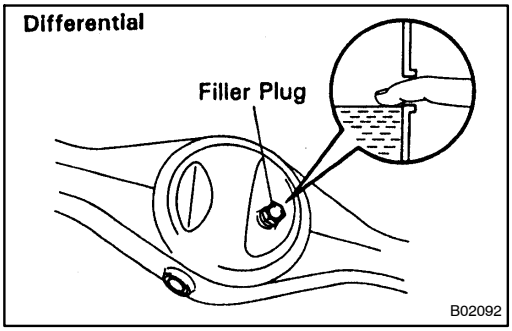
(a) Inspect the ball joints for excessive looseness.

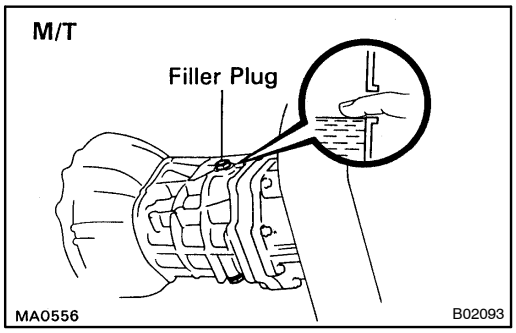
(b) Inspect the dust cover for damage.

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6. 2WD:
CHECK OIL LEVEL IN MANUAL TRANSMISSION, AUTOMATIC TRANSMISSION AND DIFFERENTIAL

(a) Manual transmission:
Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.
Transmission oil (M/T):
R150: See page MT–5
W59: See page MT–5

(b) Automatic transmission:
Check that the fluid level is in the "HOT" range at the normal operating temperature (70 – 80°C or 158 – 176°F) and add as necessary.

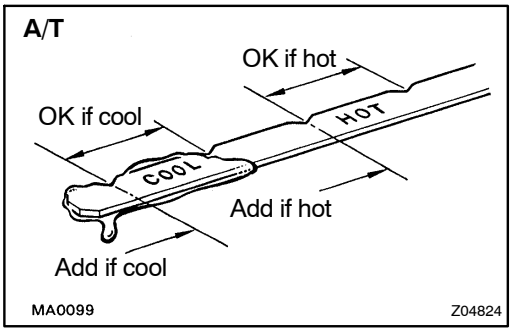
NOTICE:
Do not overfill.
Transmission fluid (A/T): See page DI–265

(c) Differential:
Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.
Differential oil: See page SA–154

7. 5VZ–FE (4WD):
CHECK OIL LEVEL IN MANUAL TRANSMISSION, AUTOMATIC TRANSMISSION, TRANSFER AND DIFFERENTIAL

(a) Manual transmission:
Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.
Transmission oil (M/T):
R150F: See page MT–10

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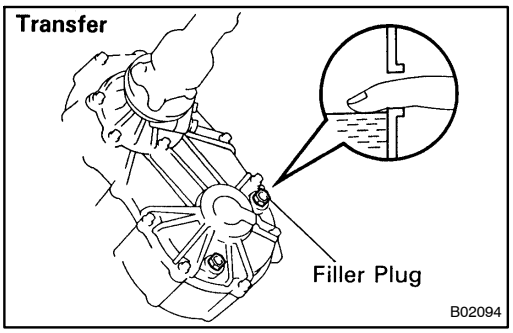


(b) Automatic transmission:
Check that the fluid level is in the "HOT" range at the normal operating temperature (70 – 80°C or 158 – 176°F) and add as necessary.

NOTICE:

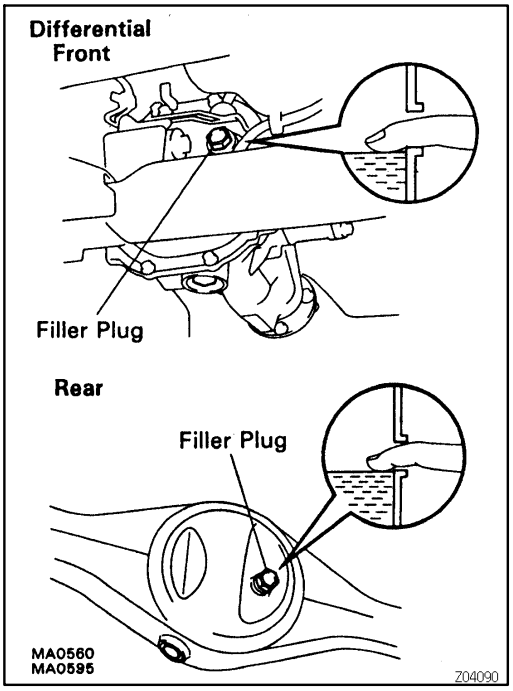
Do not overfill.

Transmission fluid (A/T): See page DI–265



(c) Transfer:
Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

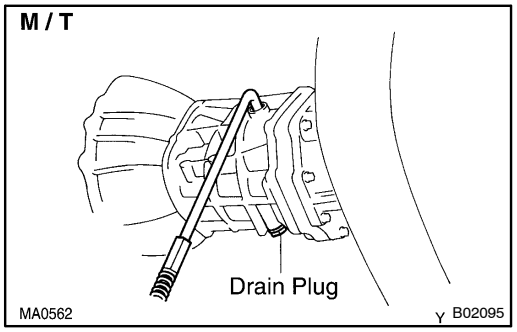
Transfer oil: See page TR–3



(d) Differential:
Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Front differential oil: See page SA–43

Rear differential oil: See page SA–154



8. REPLACE MANUAL TRANSMISSION, TRANSFER (5VZ–FE: 4WD) AND DIFFERENTIAL OIL

(a) Transfer:
Remove the transfer cover.

(b) Remove the drain plug and drain the oil.

(c) Reinstall drain plug securely.

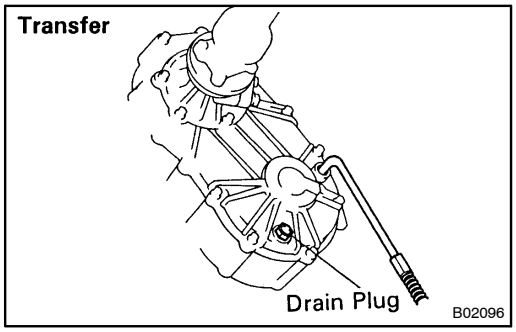
(d) Add new oil until it begins to run out of the filler hole.

(2WD) Transmission oil (M/T):

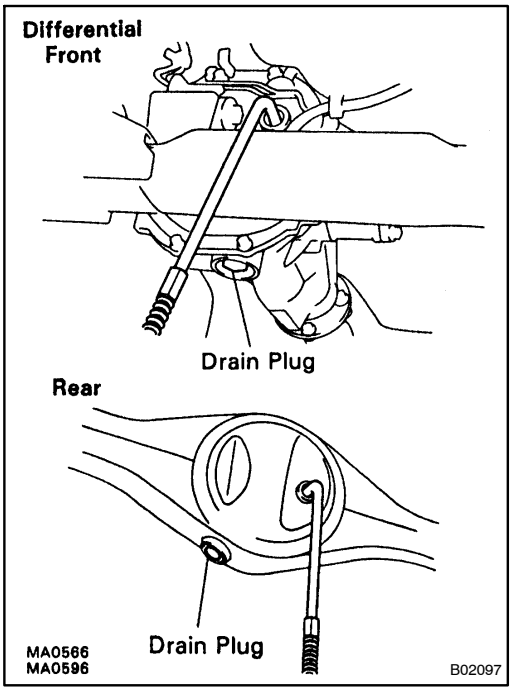
R150: See page MT–5

W59: See page MT–5

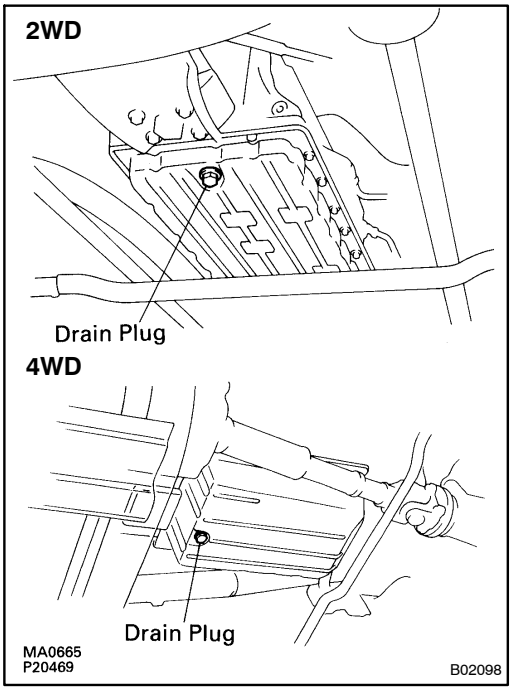
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(5VZ–FE: 4WD) Transmission oil (M/T):
R150F: See page MT–10
Transfer oil: See page TR–3



Front differential oil: See page SA–43
Rear differential oil: See page SA–154



9. REPLACE AUTOMATIC TRANSMISSION FLUID

(a) Remove the drain plug(s) and drain the fluid.

(b) Reinstall the drain plug(s) securely.

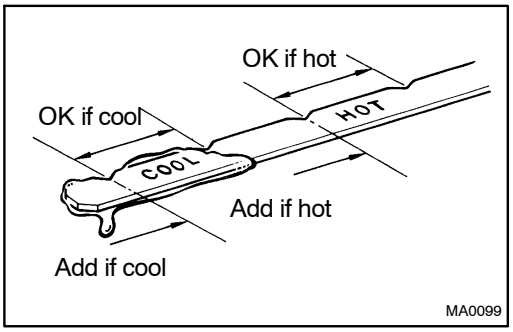
(c) With the engine OFF, add new fluid through the dipstick tube.

Transmission fluid (A/T): See page DI–265

(d) Start the engine and shift the selector into all positions from ”P” through ”L” and then shift into ”P”.

(e) With the engine idling, check the fluid level.
Add fluid up to the ”COOL” level on the dipstick.

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(f) Check that the fluid level is in the "HOT" range at the normal operating temperature (70 – 80°C or 158 – 176°F) and add as necessary.

NOTICE:

Do not overfill.

10. REPACK FRONT WHEEL BEARINGS AND THRUST BUSH

(a) Change the front wheel bearing grease.
(2WD: See page SA–19)
(4WD: See page SA–25)

(b) Repack the drive shaft thrust bush grease (See page SA–41).

11. 4WD:

LUBRICATE PROPELLER SHAFT

Lubricate propeller shaft, referring to the lubrication chart. Before pumping in grease, wipe off any mud and dust on the grease fitting.

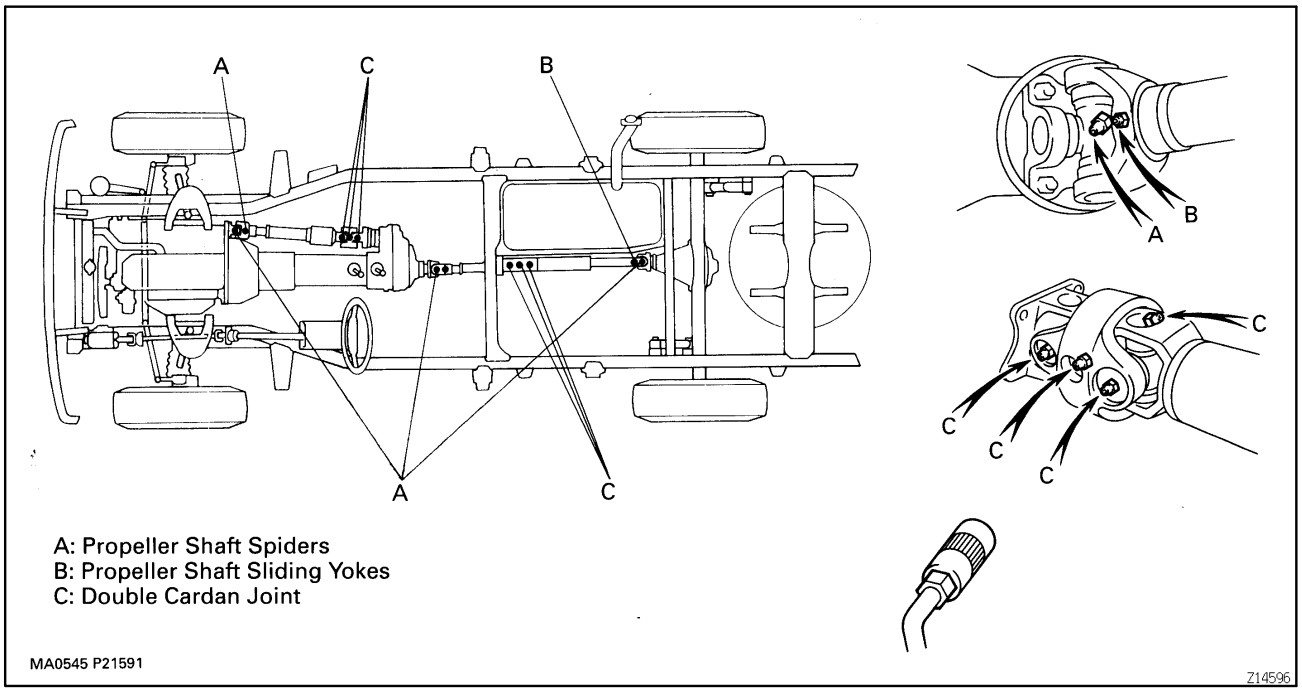
Grease grade:

Propeller shaft (Except Double–cardan joint)

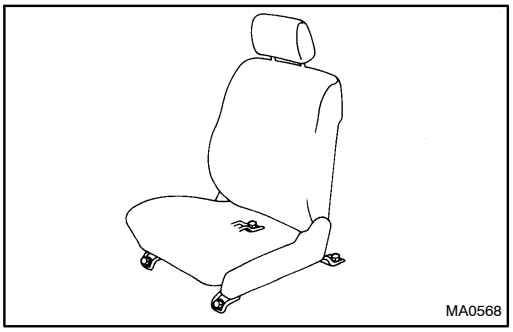
Lithium base chassis grease NLGI No.2

Double–cardan joint

Molybdenum disulphide lithium base chassis grease NLGI No.2



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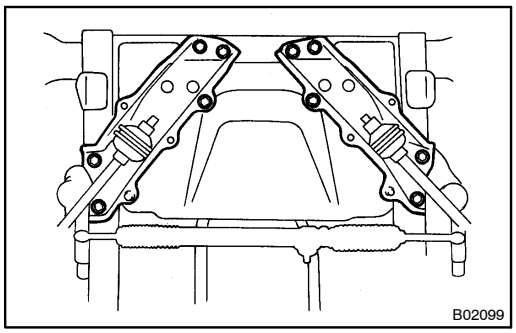

MA0568

12. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

(a) Tighten these parts:

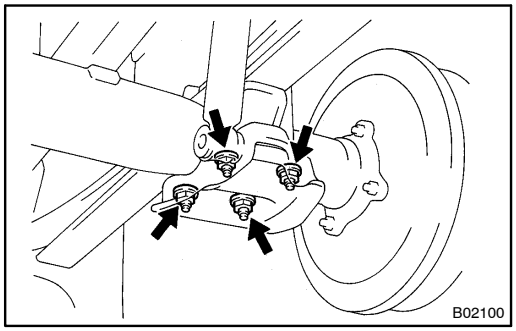
- Seat mounting bolts

Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)


B02099

- 2WD:
  Strut bar bracket–to–frame mounting bolts

Torque: 52 N·m (530 kgf·cm, 38 ft·lbf)


B02100

- Leaf spring U–bolt mounting nuts

Torque: 133 N·m (1,350 kgf·cm, 98 ft·lbf)

(b) Under Severe Conditions:

In addition to the above maintenance items, check for loose or missing bolts and nuts on the following.

- Steering system
- Drive train
- Suspension system
- Fuel tank mounts
- Engine mounts, etc.

13. FINAL INSPECTION

(a) Check operation of body parts:

- Hood:
  - Auxiliary catch operates properly
  - Hood locks securely when closed
- Doors:
  - Door locks operate properly
  - Doors close properly
- Seats:
  - Seat adjusts easily and locks securely in any positions
  - Seat backs lock securely at any angle
  - Fold–down seat backs lock securely

(b) Road test:

- Engine and chassis parts do not have abnormal noises.
- Vehicle does not wander or pull to one side.
- Brakes work properly and do not drag.

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(c) Be sure to deliver a clean vehicle and especially check:
- Steering wheel
- Shift lever knob
- All switch knobs
- Door handles
- Seats

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MAINTENANCE

EQUIPMENT

PP0G5–01

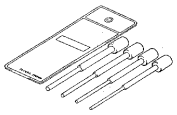
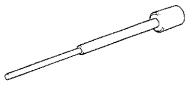
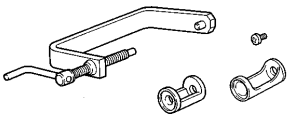
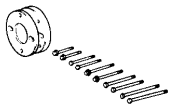
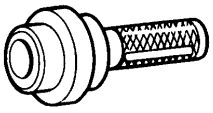
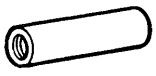
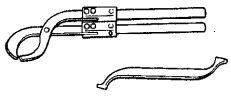
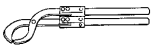
Mirror	Brake hose
Torque wrench	

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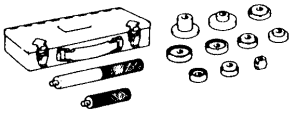
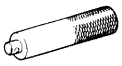
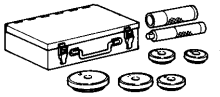
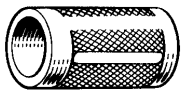
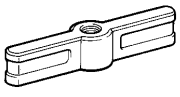
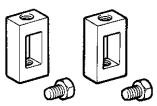
ENGINE MECHANICAL (3RZ–FE)

PP0G6–01

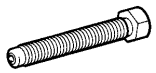
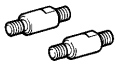
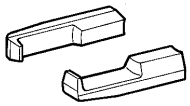
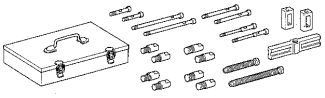
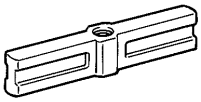
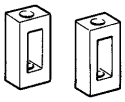
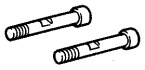
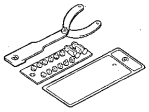
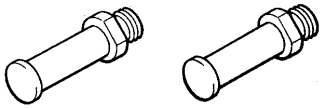
SST (Special Service Tools)

	09032–00100	Oil Pan Seal Cutter	
	09201–10000	Valve Guide Bushing Remover & Replacer Set	
	(09201–01060)	Valve Guide Bushing Remover & Replacer 6	
	09202–70020	Valve Spring Compressor	
	09207–76010	Rocker Arm Bushing	
	09213–54015	Crankshaft Pulley Holding Tool	
	09223–15030	Oil Seal & Bearing Replacer	Crankshaft rear oil seal
	09223–50010	Crankshaft Front oil Seal Replacer	
	09236–00101	Water Pump Overhaul Tool Set	
	(09236–15010)	Bearing Stay	Valve stem oil seal
	09248–55040	Valve Clearance Adjust Tool Set	
	(09248–05410)	Valve Lifter Press	

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	(09248–05420)	Valve Lifter Stopper	
	09325–20010	Transmission Oil Plug	
	09330–00021	Companion Flange Holding Tool	Crankshaft pulley
	09550–10012	Replacer Set ”B”	
	(09252–10010)	No. 1 Replacer Handle–	Valve guide busing
	09608–30012	Front Hub & Drive Pinion Bearing Tool Set–	
	(09951–07100)	Handle 100	Crankshaft rear oil seal
	09636–20010	Upper Ball Joint Dust Cover Replacer	Crankshaft timing gear
	09816–30010	Oil Pressure Switch Socket	Knock sensor
	09843–18020	Diagnosis Check Wire	
	09950–40010	Puller B Set	
	(09951–04010)	Hanger 150	
	(09952–04010)	Slide Arm	

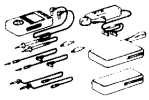
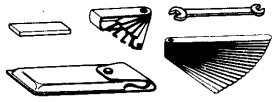
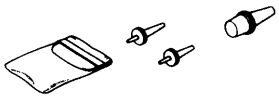
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	(09953–04010) Center Bolt 100	
	(09954–04010) Arm 25	
	(09955–04060) Claw No.6	
	09950–50010 Puller C Set	
	(09951–05010) Hanger 150	
	(09952–05010) Slide Arm	
	(09953–05010) Center Bolt 100	
	(09954–05020) Claw No.2	
	09960–10010 Variable Pin Wrench Set	
	(09962–01000) Variable Pin Wrench Arm Assy	
	(09963–00500) Pin 5	
	(09963–01000) Pin 10	

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PP0G7–02

RECOMMENDED TOOLS

	09082–00050	TOYOTA Electrical Tester Set.	
	09200–00010	Engine Adjust Kit .	
	09258–00030	Hose Plug Set .	Plug for the vacuum hose, fuel hose etc.

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PP0G8–01

EQUIPMENT

Caliper gauge	
CO/HC meter	
Compression gauge	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	
Dye penetrant	
Engine tune–up tester	
Heater	
Magnetic finger	
Micrometer	
Piston ring compressor	
Piston ring expander	
Plastigage	
Precision straight edge	
Soft brush	
Spring tester	Valve spring
Steel square	Valve spring
Thermometer	
Torque wrench	
V–block	
Valve seat cutter	
Vernier calipers	

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PP3M8–01

SSM (Special Service Materials)

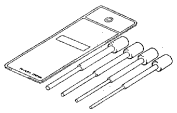
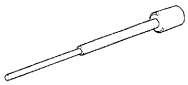
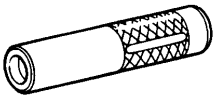
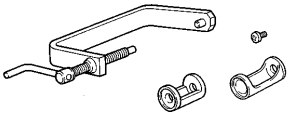
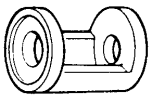
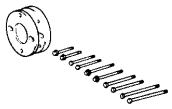
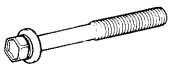
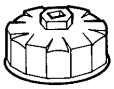
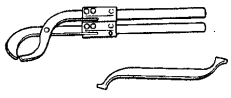
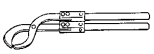
08826–00080	Seal Packing Black or equivalent (FIPG)	Over the space between the cylinder head and timing chain cover
08826–00080	Seal Packing Black or equivalent (FIPG)	Semi–circular plug Oil pan Rear oil seal retainer
08833–00070	Adhesive 1324, THREE BOND 1324 or equivalent	Spark plug tube

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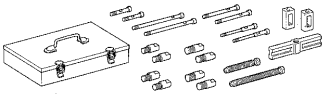
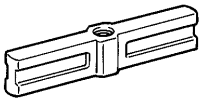
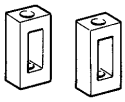
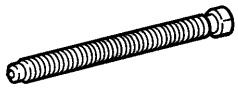
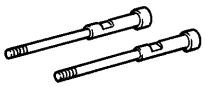
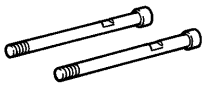
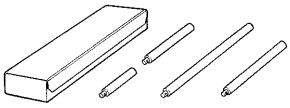
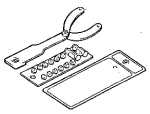
ENGINE MECHANICAL (5VZ–FE)

PP32X–01

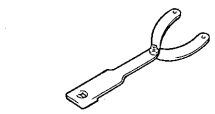
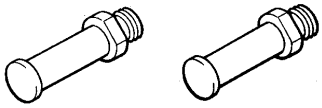
SST (Special Service Tools)

	09201–10000	Valve Guide Bushing Remover & Replacer Set	
	(09201–01060)	Valve Guide Bushing Remover & Replacer 6	
	09201–41020	Valve Stem Oil Seal Replacer	
	09202–70020	Valve Spring Compressor	
	(09202–00010)	Attachment	
	09213–54015	Crankshaft Pulley Holding Tool	
	(90119–08216)	Bolt	
	09222–30010	Connecting Rod Bushing Remover & Replacer	
	09223–15030	Oil Seal & Bearing Replacer	Crankshaft rear oil seal
	09228–07501	Oil Filter Wrench	
	09248–55040	Valve Clearance Adjust Tool Set	
	(09248–05410)	Valve Lifter Press	

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	(09248–05420)	Valve Lifter Stopper	
	09330–00021	Companion Flange Holding Tool	Crankshaft pulley
	09816–30010	Oil Pressure Switch Socket	Oil pressure switch
	09843–18020	Diagnosis Check Wire	
	09950–50010	Puller C Set	
	(09951–05010)	Hanger 150	Crankshaft pulley Crankshaft timing pulley
	(09952–05010)	Slide Arm	Crankshaft pulley Crankshaft timing pulley
	(09953–05020)	Center Bolt 150	Crankshaft pulley Crankshaft timing pulley
	(09954–05010)	Claw No.1	Crankshaft timing pulley
	(09954–05030)	Claw No.3	Crankshaft pulley
	09950–70010	Handle Set	
	(09951–07150)	Handle 150	Crankshaft rear oil seal Valve guide bushing
	09960–10010	Variable Pin Wrench Set	

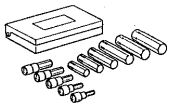
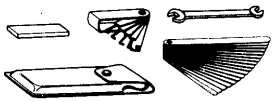
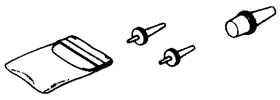
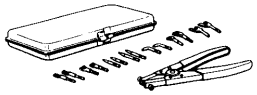
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	(09962–01000) Variable Pin Wrench Arm Assy	Camshaft timing pulley Camshaft sub–gear
	(09963–01000) Pin 10	Camshaft timing pulley
	(09963–00600) Pin 6	Camshaft sub–gear

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PP017–03

RECOMMENDED TOOLS

	09040–00010	Hexagon Wrench Set .	
	09090–04010	Engine Sling Device .	For suspending engine
	09200–00010	Engine Adjust Kit .	
	09258–00030	Hose Plug Set .	Plug for the vacuum hose, fuel hose etc.
	09904–00010	Expander Set .	

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PP018–03

EQUIPMENT

Caliper gauge	
CO/HC meter	
Compression gauge	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	
Dye penetrant	
Timing light	Ignition timing
OBDII scan tool	Engine speed
Heater	
Magnetic finger	
Micrometer	
Piston ring compressor	
Piston ring expander	
Plastigage	
Precision straight edge	
Soft brush	
Spring tester	Valve spring
Steel square	Valve spring
Thermometer	
Torque wrench	
Valve seat cutter	
Vernier calipers	

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PP3M9–01

SSM (Special Service Materials)

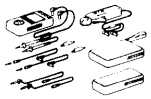
08826–00080	Seal Packing Black or equivalent (FIPG)	
08826–00100	Seal Packing 1282B, THREE BOND 1282B or equivalent (FIPG)	
08833–00070	Adhesive 1324, THREE BOND 1324 or equivalent	
08833–00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	

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EMISSION CONTROL (3RZ–FE)

RECOMMENDED TOOLS

PP0GA–02

	09082–00050 TOYOTA Electrical Tester Set.	

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PP0GB–01

EQUIPMENT

Tachometer	
Torque wrench	
Vacuum gauge	

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EMISSION CONTROL (5VZ–FE)

PP32Z–01

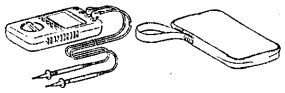
SST (Special Service Tools)

	09843–18020 Diagnosis Check Wire	

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PP014–04

RECOMMENDED TOOLS

	09082–00040 TOYOTA Electrical Tester.	

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PP018–04

EQUIPMENT

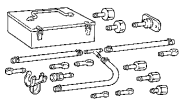
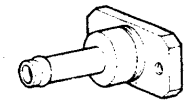
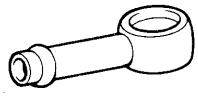
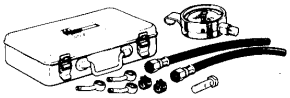
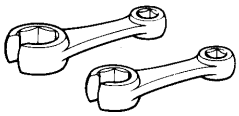
OBDII scan tool	Engine speed
Torque wrench	
Vacuum gauge	

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MFI (3RZ–FE)

SST (Special Service Tools)

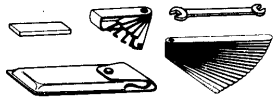
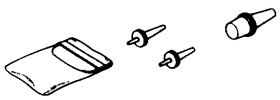
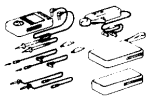
PP0GC–02

	09268–41046	Injection Measuring Tool Set	
	(09268–41091)	NO.7 Union	
	(90405–09015)	No.1 Union	
	09268–45012	EFI Fuel Pressure Gauge	
	09631–22020	Power Steering Hose Nut 14 x 17 mm Wrench Set	Fuel line flare nut
	09816–30010	Oil Pressure Switch Socket	Knock sensor
	09842–30070	Wiring ”F” EFI Inspection	
	09843–18020	Diagnosis Check Wire	

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PP0GD–02

RECOMMENDED TOOLS

	09200–00010	Engine Adjust Kit .	
	09258–00030	Hose Plug Set .	Plug for vacuum hose, fuel hose etc.
	09082–00050	TOYOTA Electrical Tester Set.	

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PP0GE–02

EQUIPMENT

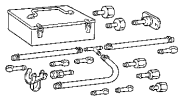
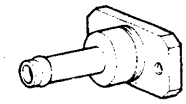
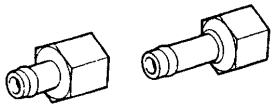
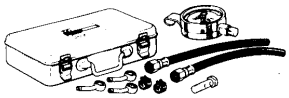
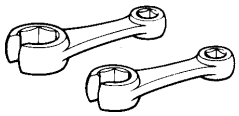
Carburetor cleaner	Throttle body
Graduated cylinder	Injector
Heater	
Soft brush	Throttle body
Sound scope	Injector
Tachometer	
Thermometer	
Torque wrench	

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SFI (5VZ–FE)

SST (Special Service Tools)

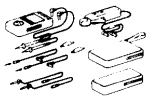
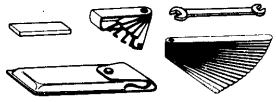
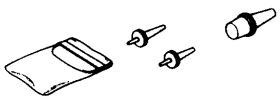
PP330–01

	09268–41046	Injection Measuring Tool Set	
	(09268–41091)	NO.7 Union	
	(09268–52011)	Injection Measuring Attachment	
	09268–45012	EFI Fuel Pressure Gauge	
	09631–22020	Power Steering Hose Nut 14 x 17 mm Wrench Set	Fuel line flare nut
	09816–30010	Oil Pressure Switch Socket	
	09842–30070	Wiring "F" EFI Inspection	
	09843–18020	Diagnosis Check Wire	

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PP01E–04

RECOMMENDED TOOLS

	09082–00050	TOYOTA Electrical Tester Set.	
	09200–00010	Engine Adjust Kit .	
	09258–00030	Hose Plug Set .	Plug for the vacuum hose, fuel hose etc.

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PP01F–02

EQUIPMENT

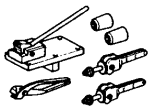
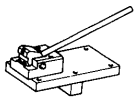
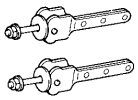
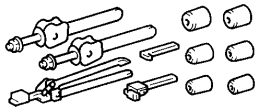
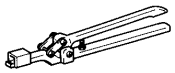
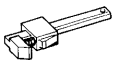
OBDII scan tool	Engine speed
Graduated cylinder	Injector
Carburetor cleaner	Throttle body
Sound scope	Injector
Torque wrench	
Soft brush	Throttle body

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COOLING (3RZ–FE)

SST (Special Service Tools)

PP3MA–01

	09230–00010 Radiator Service Tool Set	
	(09231–00010) Lock Plate Bender	
	(09231–00020) Lock Plate Bender	
	(09231–00030) Plug Handle	
	(09231–00040) No.1 Plug	
	(09231–00050) No.2 Plug	
	09230–01010 Radiator Service Tool Set	
	(09231–01010) Overhaul Handle	
	(09231–01020) Punch Assembly	
	(09231–01030) Claw	
	(09231–00060) No.3 Plug	

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PP0GF–02

EQUIPMENT

Heater	Thermostat
Radiator cap tester	
Thermometer	Thermostat
Torque wrench	

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PP0GG–01

COOLANT

Item	Capacity	Classification
Engine coolant (w/ Heater)	8.7 liters (9.2 US qts, 7.7 Imp. qts)	Ethylene–glycol base

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COOLING (5VZ–FE)

PP3MB–01

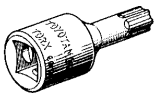
SST (Special Service Tools)

	09843–18020 Diagnosis Check Wire	

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PP3MC–01

RECOMMENDED TOOLS

	09042–00010 Torx Socket T30 .	

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PP01J–02

EQUIPMENT

Heater	
Radiator cap tester	
Thermometer	
Torque wrench	

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PP336–02

COOLANT

Item	Capacity	Classification
2WD		Ethylene–glycol base
M/T	10.0 liters (10.6 US qts, 8.8 Imp. qts)	
A/T	9.9 liters (10.5 US qts, 8.7 Imp. qts)	
4WD		
M/T	10.0 liters (10.6 US qts, 8.8 Imp. qts)	
A/T	10.2 liters (10.8 US qts, 9.0 Imp. qts)	

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PP337–01

SSM (Special Service Materials)

	08826–00100 Seal Packing 1282B, THREE BOND 1282B or equivalent (FIPG)	

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LUBRICATION (3RZ–FE)

PP0GH–01

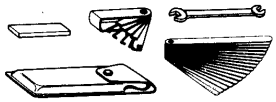
SST (Special Service Tools)

	09228–07501 Oil Filter Wrench	

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PP0GI–01

RECOMMENDED TOOLS

	09200–00010 Engine Adjust Kit .	

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PP0GJ–02

EQUIPMENT

Oil pressure gauge	
Precision straight edge	Oil pump
Torque wrench	

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PP0GK–01

LUBRICANT

Item	Capacity	Classification
Engine oil		API grade SH, Energy–Conserving II multigrade engine oil or ILSAC multigrade engine oil and recommended viscosity oil, with SAE 5W–30 being preferred engine oil
Dry fill	6.0 liters (6.3 US qts, 5.3 Imp. qts)	
Drain and refill		
w/ Oil filter change	5.3 liters (5.6 US qts, 4.7 Imp. qts)	
w/o Oil filter change	5.0 liters (5.3 US qts, 4.4 Imp. qts)	

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PP33E–01

SSM (Special Service Materials)

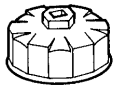
	08833–00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent

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LUBRICATION (5VZ–FE)

PP01R–01

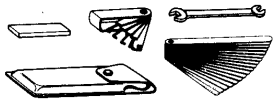
SST (Special Service Tools)

	09032–00100	Oil Pan Seal Cutter	
	09228–07501	Oil Filter Wrench	
	09309–37010	Transmission Bearing Replacer	Camshaft front oil seal
	09816–30010	Oil Pressure Switch Socket	

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PP01S–02

RECOMMENDED TOOLS

	09200–00010 Engine Adjust Kit .	

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PP01T–02

EQUIPMENT

Oil pressure gauge	
Precision straight edge	Oil pump
Torque wrench	

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PP01U–07

LUBRICANT

Item	Capacity	Classification
Engine oil		
2WD		
Dry fill	5.9 liters (6.2 US qts, 5.2 lmp. qts)	
Drain and refill	5.2 liters (5.5 US qts, 4.6 lmp. qts)	API grade SH, Energy–Conserving II multigrade
w/ Oil filter change	5.2 liters (5.5 US qts, 4.6 lmp. qts)	engine oil or ILSAC multigrade engine oil and
w/o Oil filter change	4.9 liters (5.2 US qts, 4.3 lmp. qts)	recommended viscosity oil, with SAE 5W–30
4WD		being preferred engine oil
Dry fill	5.5 liters (5.8 US qts, 4.8 lmp. qts)	
Drain and refill		
w/ Oil filter change	4.7 liters (5.0 US qts, 4.1 lmp. qts)	
w/o Oil filter change	4.4 liters (4.7 US qts, 3.9 lmp. qts)	

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PP33F–01

SSM (Special Service Materials)

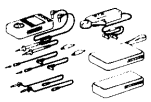
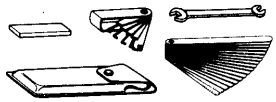
	08826–00080 Seal Packing Black or equivalent (FIPG)	
	08833–00080 Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	

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IGNITION (3RZ–FE)

RECOMMENDED TOOLS

PP0GM–02

	09082–00050	TOYOTA Electrical Tester Set.	
	09200–00010	Engine Adjust Kit .	

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PP0GN–03

EQUIPMENT

Spark plug cleaner	
Torque wrench	

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PP3MD–01

SSM (Special Service Materials)

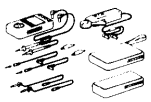
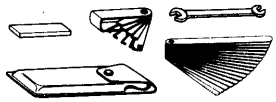
	08826–00080 Seal Packing Black or equivalent (FIPG)	

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IGNITION (5VZ–FE)

RECOMMENDED TOOLS

PP01Z–03

	09082–00050	TOYOTA Electrical Tester Set.	
	09200–00010	Engine Adjust Kit .	

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PP020–02

EQUIPMENT

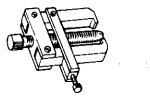
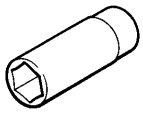
Spark plug cleaner	

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STARTING (3RZ–FE)

PP0GO–01

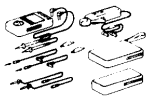
SST (Special Service Tools)

	09286–46011	Injection Pump Spline Shaft Puller	Armature bearing
	09810–38140	Starter Magnet Switch Nut Wrench 14	Terminal nut
	09820–00030	Alternator Rear Bearing Replacer	Armature rear bearing

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PP0GP–02

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set.	

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PP0GQ–01

EQUIPMENT

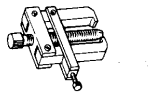
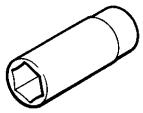
Dial indicator	Commutator
Magnetic finger	Steel ball
Press	Magnetic switch terminal kit
Pull scale	Brush spring
Sandpaper	Commutator
Torque wrench	
V–block	Commutator
Vernier calipers	Commutator, Brush

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STARTING (5VZ–FE)

PP3ME–01

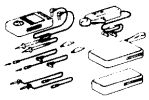
SST (Special Service Tools)

	09286–46011	Injection Pump Spline Shaft Puller	Armature bearing
	09810–38140	Starter Magnet Switch Nut Wrench 14	Terminal kit
	09820–00030	Alternator Rear Bearing Replacer	

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PP025–04

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set.	

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PP026–02

EQUIPMENT

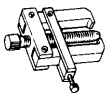
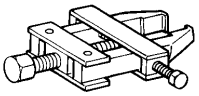
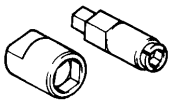
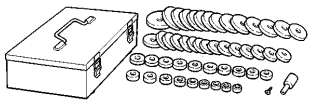
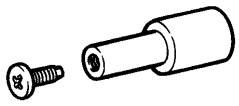
Dial indicator	Commutator
Magnetic finger	Steel ball
Press	Magnetic switch terminal kit
Pull scale	Brush spring
Sandpaper	Commutator
Torque wrench	
V–block	Commutator
Vernier calipers	Commutator, Brush

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CHARGING (3RZ–FE)

PP0GR–01

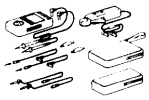
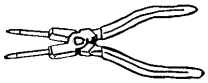
SST (Special Service Tools)

	09285–76010	Injection Pump Camshaft Bearing Cone Replacer	Rotor rear bearing cover
	09286–46011	Injection Pump Spline Shaft Puller	Rectifier end frame
	09820–00021	Alternator Rear Bearing Puller	
	09820–00030	Alternator Rear Bearing Replacer	
	09820–63010	Alternator Pulley Set Nut Wrench Set	
	09950–60010	Replacer Set	
	(09951–00260)	Replacer 26	Rotor front bearing
	(09951–00500)	Replacer 50	Rotor front bearing
	(09952–06010)	Adapter	Rotor front bearing

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PP3MF–01

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set.	
	09905–00013 Snap Ring Pliers .	

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PP0GT–02

EQUIPMENT

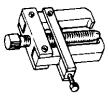
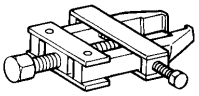
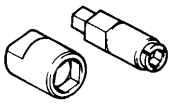
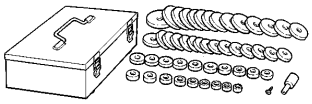
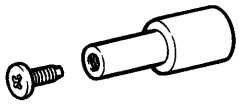
Ammeter (A)	
Belt tension gauge	
Torque wrench	
Vernier calipers	Rotor (Slip ring), Brush

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CHARGING (5VZ–FE)

PP33H–02

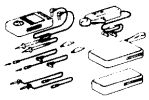
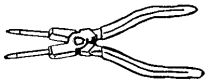
SST (Special Service Tools)

	09285–76010	Injection Pump Camshaft Bearing Cone Replacer	Rotor rear bearing cover
	09286–46011	Injection Pump Spline Shaft Puller	Rectifier end frame
	09820–00021	Alternator Rear Bearing Puller	
	09820–00030	Alternator Rear Bearing Replacer	
	09820–63010	Alternator Pulley Set Nut Wrench Set	
	09950–60010	Replacer Set	
	(09951–00260)	Replacer 26	Rotor front bearing
	(09952–06010)	Adapter	Rotor front bearing
	(09951–00500)	Replacer 50	Rotor front bearing

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PP3MG–01

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set.	
	09905–00013 Snap Ring Pliers .	

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PP02C–04

EQUIPMENT

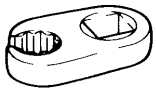
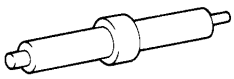
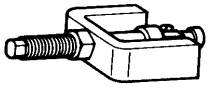
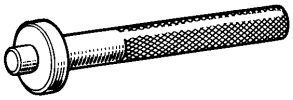
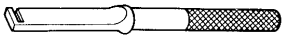
Ammeter (A)	
Belt tension gauge	
Torque wrench	
Vernier calipers	Rotor (Slip ring), Brush

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CLUTCH

SST (Special Service Tools)

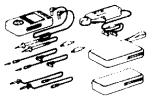
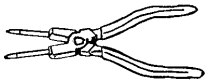
PP0EN–03

	09023–00100	Union Nut Wrench 10 mm	Clutch line
	09301–00110	Clutch Guide Tool	
	09303–35011	Input Shaft Front Bearing Puller	
	09304–30012	Input Shaft Front Bearing Replacer	
	09333–00013	Clutch Diaphragm Spring Aligner	

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PP0EO–03

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set.	
	09905–00013 Snap Ring Pliers .	

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PP0EP–01

EQUIPMENT

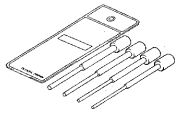
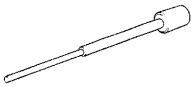
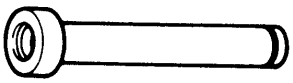
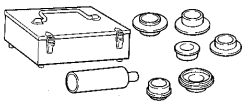
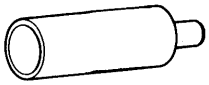
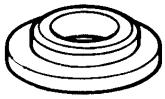
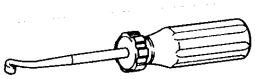
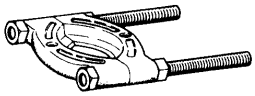
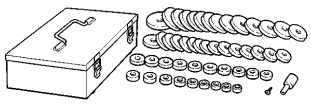
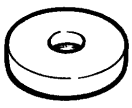
Caliper	
Dial indicator	
Torque wrench	

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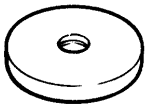
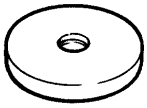
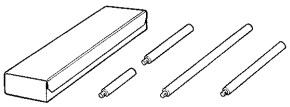
MANUAL TRANSMISSION (R150, R150F)

PP3LR–01

SST (Special Service Tools)

	09201–10000	Valve Guide Bushing Remover & Replacer Set	2WD: Speedometer driven gear oil seal
	(09201–01080)	Valve Guide Bushing Remover & Replacer 8	
	09309–35010	Transmission Rear Bearing Replacer	2WD: Output shaft rear bearing Output shaft center bearing
	09316–60011	Transmission & Transfer Bearing Replacer	
	(09316–00011)	Replacer Pipe	Output shaft rear bearing Gear spline piece No.5
	(09316–00031)	Replacer ”B”	5th gear
	(09316–00071)	Replacer ”F”	4WD: Output shaft rear bearing Output shaft center bearing
	09506–35010	Differential Drive Pinion Rear Bearing Replacer	Input shaft bearing
	09921–00010	Spring Tension Tool	2WD: Speedometer driven gear oil seal
	09950–00020	Bearing Remover	
	09950–60010	Replacer Set	
	(09951–00510)	Replacer 51	Front bearing retainer oil seal

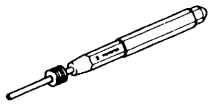
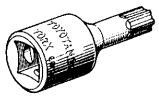
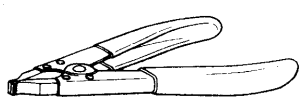
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	(09951–00570) Replacer 57	Extension housing oil seal Transfer adaptor oil seal
	(09951–00620) Replacer 62	Counter rear bearing
	09950–70010 Handle Set	
	(09951–07150) Handle 150	

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PP3LS–01

RECOMMENDED TOOLS

	09031–00030	Pin Punch .	
	09042–00020	Torx Socket T40 .	
	09905–00012	Snap Ring No.1 Expander .	

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PP0ES–01

EQUIPMENT

Dial indicator	
Micrometer	
Torque wrench	
Feeler gauge	
Magnetic finger	

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PP0ET–01

LUBRICANT

Item		Capacity	Classification
Manual transmission oil	2WD:	2.6 liters (2.7 US qts, 2.3 Imp. qts)	API GL–4 or GL–5
	4WD:	2.2 liters (2.3 US qts, 1.9 Imp. qts)	SAE 75W–90

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PP33I–01

SSM (Special Service Materials)

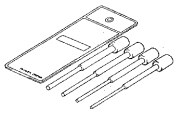
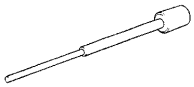
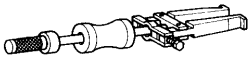
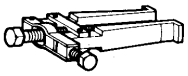
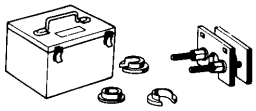
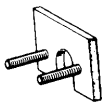
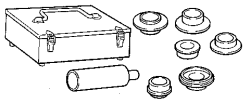
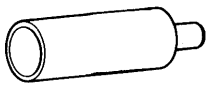
	08826–00090 Seal Packing 1281, THREE BOND 1281 or equivalent (FIPG)	
	08833–00080 Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	

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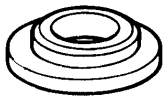
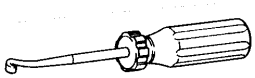
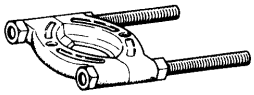
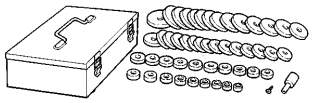
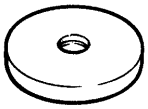
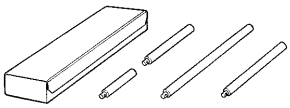
MANUAL TRANSMISSION (W59)

SST (Special Service Tools)

PP3LP–01

	09201–10000	Valve Guide Bushing Remover & Replacer Set	Speedometer driven gear oil seal
	(09201–01080)	Valve Guide Bushing Remover & Replacer 8	
	09308–00010	Oil Seal Puller	Output shaft rear bearing outer race
	09308–10010	Oil Seal Puller	Extension housing oil seal
	09312–20011	Transmission Gear Remover & Replacer	5th gear Output shaft rear bearing Reverse gear
	(09313–00010)	Reverse Gear Remover	
	(09313–00030)	Rear Bearing Replacer	
	(09313–00040)	Plate ”A”	
	(09313–00050)	Plate ”B”	
	09316–60011	Transmission & Transfer Bearing Replacer	No.3 clutch hub Counter gear center bearing outer race
	(09316–00011)	Replacer Pipe	
	(09316–00071)	Replacer ”F”	

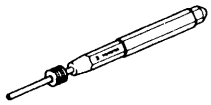
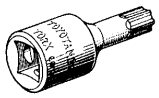
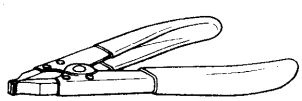
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	09506–35010	Differential Drive Pinion Rear Bearing Replacer	Input shaft bearing Output shaft center bearing
	09921–00010	Spring Tension Tool	Speedometer driven gear oil seal
	09950–00020	Bearing Remover	
	09950–60010	Replacer Set	
	(09951–00440)	Replacer 44	Front bearing retainer oil seal
	(09951–00510)	Replacer 51	Counter gear center bearing outer race
	(09951–00560)	Replacer 56	Output shaft rear bearing outer race Extension housing oil seal
	09950–70010	Handle Set	
	(09951–07150)	Handle 150	

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PP3LQ–01

RECOMMENDED TOOLS

	09031–00030	Pin Punch .	
	09042–00020	Torx Socket T40 .	
	09905–00012	Snap Ring No.1 Expander .	

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PP0BG–01

EQUIPMENT

Dial indicator	
Calipers	
Micrometer	
Torque wrench	
Feeler gauge	
Magnetic finger	

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PP0BH–01

LUBRICANT

Item	Capacity	Classification
Manual transmission oil	2.6 liters (2.7 US qts, 2.3 Imp. qts)	API GL–4 or GL–5 SAE 75W–90

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PP33J–01

SSM (Special Service Materials)

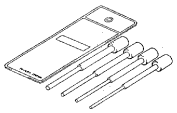
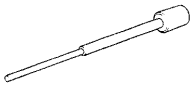
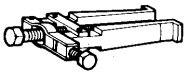
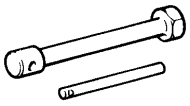
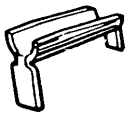
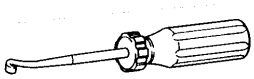
	08826–00090 Seal Packing 1281, THREE BOND 1281 or equivalent (FIPG)	
	08833–00080 Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	

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AUTOMATIC TRANSMISSION

SST (Special Service Tools)

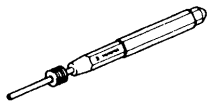
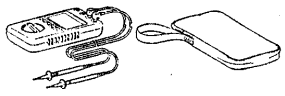
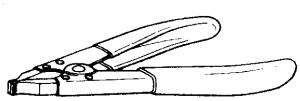
PP33K–01

	09032–00100	Oil Pan Seal Cutter	
	09201–10000	Valve Guide Bushing Remover & Replacer Set	Speedometer driven gear oil seal
	(09201–01080)	Valve Guide Bushing Remover & Replacer 8	
	09308–10010	Oil Seal Puller	
	09325–40010	Transmission Oil Plug	
	09350–30020	TOYOTA Automatic Transmission Tool Set	
	(09351–32010)	One–way Clutch Test Tool	
	(09351–32020)	Stator Stopper	
	09921–00010	Spring Tension Tool	Speedometer driven gear oil seal

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PP0FM–03

RECOMMENDED TOOLS

	09031–00030	Pin Punch .	
	09082–00040	TOYOTA Electrical Tester.	
	09905–00012	Snap Ring No.1 Expander .	

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PP0FN–02

EQUIPMENT

OBD II scan tool	
Ohmmeter	
Voltmeter	
Vernier calipers	Torque converter clutch
Dial indicator or dial indicator with magnetic base	Drive plate
Straight edge	Torque converter clutch
Torque wrench	

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PP0FO–06

LUBRICANT

Item	Capacity	Classification
Automatic transmission fluid		
(A340E)		
Dry fill	7.2 liters (7.6 US qts, 6.3 Imp.qts)	
Drain and refill	1.6 liters (1.7 US qts, 1.4 Imp.qts)	ATF DEXRON ®II
(A340E)		
Dry fill	7.6 liters (8.0 US qts, 6.7 Imp.qts)	
Drain and refill	2.0 liters (2.1 US qts, 1.8 Imp.qts)	

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PP33L–01

SSM (Special Service Materials)

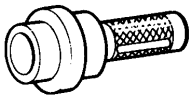
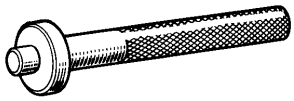
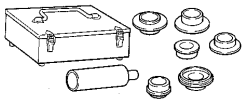
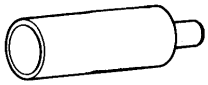
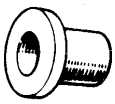
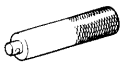
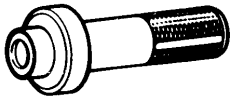
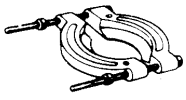
	08826–00090	Seal Packing 1281, THREE BOND 1281 or equivalent (FIPG)
	08833–00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent

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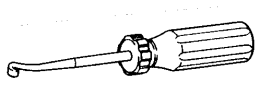
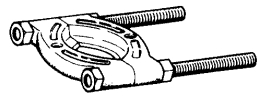
TRANSFER

SST (Special Service Tools)

PP3M7–01

	09223–15020	Oil Seal & Bearing Replacer	Planetary gear outer bearing
	09223–22010	Crankshaft Front Oil Seal Replacer	Front retainer oil seal
	09304–12012	Input Shaft Front Bearing Replacer	Shift fork shaft oil seal
	09316–60011	Transmission & Transfer Bearing Replacer	
	(09316–00011)	Replacer Pipe	High and low clutch hub Rear output shaft bearing Front case oil seal
	(09316–00071)	Replacer "F"	Rear output shaft bearing
	09330–00021	Companion Flange Holding Tool	Companion flange
	09515–30010	Rear Wheel Bearing Replacer	Planetary gear outer bearing
	(09252–10010)	No. 1 Replacer Handle	
	09550–00032	Replacer	
	09554–30011	Differential Oil Seal Replacer	Planetary gear outer bearing
	09555–55010	Differential Drive Pinion Bearing Replacer	Planetary gear outer bearing

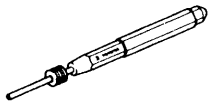
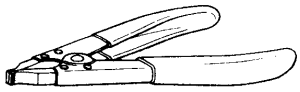
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	09921–00010	Spring Tension Tool	
	09950–00020	Bearing Remover	Driven sprocket rear beating Front drive clutch sleeve Rear output shaft bearing

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PP33M–01

RECOMMENDED TOOLS

	09031–00030	Pin Punch .	
	09905–00012	Snap Ring No.1 Expander .	

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PP0G2–01

EQUIPMENT

Calipers	
Dial indicator	
Micrometer	
Torque wrench	
Feeler gauge	

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PP0G3–01

LUBRICANT

Item	Capacity	Classification
Transfer oil	1.1 liters (1.2 US qts, 1.0 lmp.qts)	API GL–4 or GL–5 SAE 75W–90

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PP33N–01

SSM (Special Service Materials)

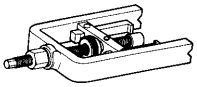
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	08833–00080 Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	

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PROPELLER SHAFT

SST (Special Service Tools)

PP3LO–01

	09325–40010	Transmission Oil Plug	Transmission to prevent oil leakage
	09330–00021	Companion Flange Holding Tool	Companion flange holding
	09332–25010	Universal Joint Bearing Remover & Replacer	Spider bearing removal and installation

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PP0EZ–01

EQUIPMENT

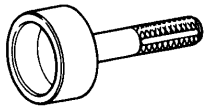
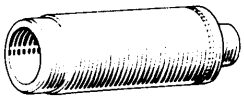
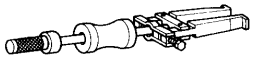
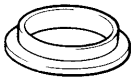
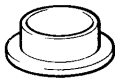
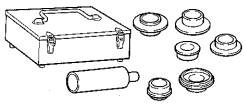
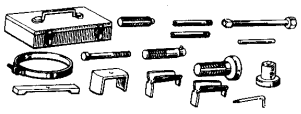
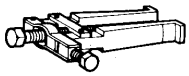
Dial indicator	
Torque wrench	

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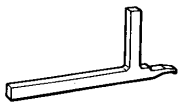
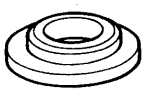
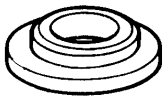
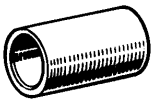
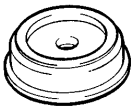
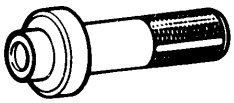
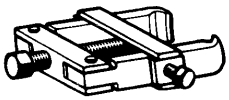
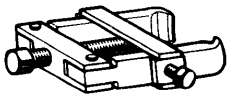
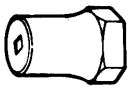
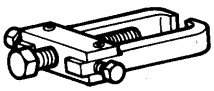
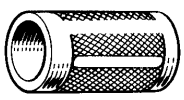
SUSPENSION AND AXLE

SST (Special Service Tools)

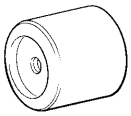
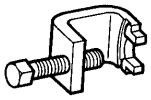
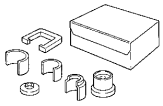
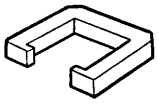
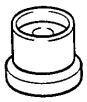
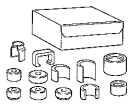
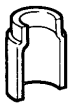
PP3K7–01

	09223–56010	Crankshaft Rear Oil Seal Replacer	Rear axle
	09226–10010	Crankshaft Front & Rear Bearing Replacer	Front differential
	09308–00010	Oil Seal Puller	Front axle (4WD) Front differential Rear axle Rear differential
	09316–12010	Transfer Bearing Replacer	Rear differential
	09316–20011	Transfer Bearing Replacer	Front differential
	09316–60011	Transmission & Transfer Bearing Replacer	Front deifferentian Rear axle
	(09316–00041)	Replacer ”C”	Front differential
	(09316–00051)	Replacer ”D”	Rear axle
	09330–00021	Companion Flange Holding Tool	Front differential Rear differential
	09350–20015	TOYOTA Automatic Transmission Tool Set	Front differential
	(09369–20040)	Piston Spring Compressor Set	
	09308–10010	Oil Seal Puller	Front differential Rear differential

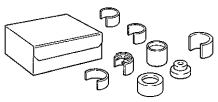
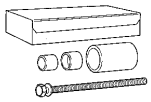
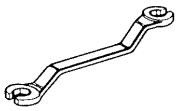
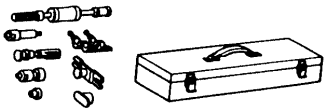
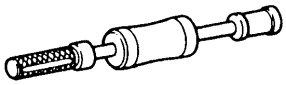
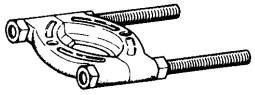
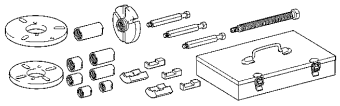
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	09504–22011	Differential Side Bearing Replacer	Front differential Rear differential
	09506–30012	Differential Drive Pinion Rear Bearing Cone Replacer	Front differential
	09506–35010	Differential Drive Pinion Rear Bearing Replacer	Rear differential
	09521–25011	Rear Axle Shaft Puller	Rear axle
	09523–36010	Rear Axle Hub Guide Tool	Rear differential
	(09558–10010)	Rear Axle Shaft Oil Seal Replacer–	
	09554–14010	Differential Oil Seal Replacer	Front differential
	09554–30011	Differential Oil Seal Replacer	Front differential
	09556–22010	Drive Pinion Front Bearing Remover	Front differential Rear differential
	09556–30010	Drive Pinion Front Bearing Remover	Front differential
	09607–60020	Front Wheel Adjusting Nut Wrench	Front axle (4WD)
	09628–62011	Ball Joint Puller	Front axle Front suspension (4WD)
	09636–20010	Upper Ball Joint Dust Cover Replacer	Front differential

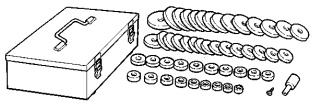
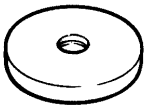
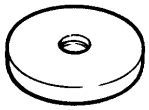
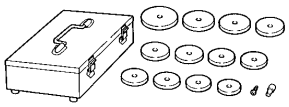
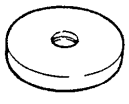
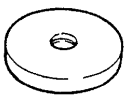
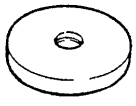
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	09649–17010	Steering Knuckle Tool	Rear differential
	09650–17011	Hub Bolt Remover	Rear axle
	09710–26011	Front Suspension Bushing Tool Set	Front suspension (4WD)
	(09710–05041)	Gate	
	(09710–05051)	Remover	
	(09710–05061)	Replacer	
	(09710–05081)	Rear Base	
	09710–30021	Suspension Bushing Tool Set	Front suspension (2WD)
	(09710–03031)	Bushing Remover	
	(09710–03041)	Bushing Remover Base	
	(09710–03051)	Bushing Replacer	
	(09710–03061)	Bushing Replacer Base	
	09710–30055	Suspension Arm Bushing Remover	Front differential

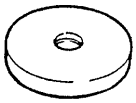
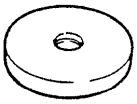
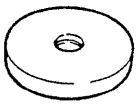
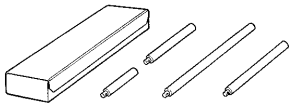
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	09726–27012	Front Suspension Arm Bushing Remover & Replacer	Front suspension (4WD)
	(09726–02041)	Replacer	
	(09726–02051)	Remover & Replacer	
	(09726–02061)	No.2 Base	
	09726–35011	Front Lower Arm Bushing Remover & Replacer	Front suspension (2WD)
	09751–36011	Brake Line Union Nut 10 x 12 mm Wrench	Rear axle
	09910–00015	Puller Set	Front differential
	(09911–00011)	Puller Clamp	
	(09912–00010)	Puller Slide Hammer	
	(09914–00011)	Rear Axle Shaft Puller Attachment	
	09950–00020	Bearing Remover	Front differential Rear differential
	09950–30010	Puller A Set	Front differential Rear differential
	09950–40010	Puller B Set	

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	09950–60010	Replacer Set	Front differential Rear differential Front axle Rear axle
	(09951–00360)	Replacer 36	Front axle (4WD)
	(09951–00370)	Replacer 37	Front differential
	(09951–00450)	Replacer 45	Rear differential
	(09951–00480)	Replacer 48	Front axle (2WD) Front differential Rear differential
	(09951–00500)	Replacer 50	Front axle (4WD)
	(09951–00530)	Replacer 53	Front suspension (4WD)
	(09951–00560)	Replacer 56	Rear axle
	(09951–00610)	Replacer 61	Rear axle
	09950–60020	Replacer Set No.2	Front axle (4WD) Front differential Rear differrential
	(09951–00710)	Replacer 71	Front axle (2WD) Front differential Rear differential
	(09951–00720)	Replacer 72	Front axle (4WD)
	(09951–00790)	Replacer 79	Front differential

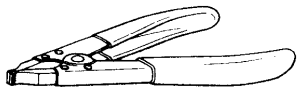
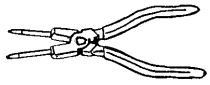
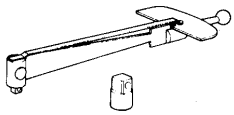
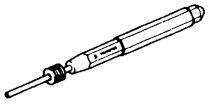
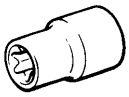
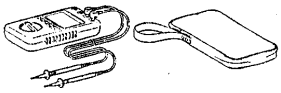
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	(09951–00810)	Replacer 81	Front axle (4WD)
	(09951–00890)	Replacer 89	Rear axle
	(09951–00910)	Replacer 91	Front axle (4WD) Rear differential
	09950–70010	Handle Set	Front axle Front differential Rear differential Rear axle
	(09951–07100)	Handle 100	Front axle (4WD)
	(09951–07150)	Handle 150	Front axle Front differential Rear axle Rear differential
	(09951–07200)	Handle 200	Front suspension(4WD)

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PP0F6–01

RECOMMENDED TOOLS

	09905–00012	Snap Ring No.1 Expander .	
	09905–00013	Snap Ring Pliers .	
	09025–00010	Torque Wrench (30 kgf–cm)	
	09031–00030	Pin Punch .	
	09044–00010	Torx Socket E14 .	
	09082–00040	TOYOTA Electrical Tester.	

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PP0F7–01

EQUIPMENT

Dial indicator	
Torque wrench	
Drill	
Spring tension gauge	
Micrometer	

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PP0F8–02

LUBRICANT

Item	Capacity	Classification
Drive shaft		
Outboard joint grease	176 – 186 g (6.21 – 6.56 oz.)	
Inboard joint grease	270 – 280 g (9.52 – 9.88 oz.)	
Front differential	1.86 liters (1.97 US qts, 1.64 Imp.qts)	Hypoid gear oil API GL–5 75W–90
Rear differential	2.35 liter (2.22 US qts, 2.67 Imp.qts)	Hypoid gear oil API GL–5 Above – 18 ˚C (0˚F) SAE 90 Below – 18 ˚C (0˚F) SAE 80W – 90 or 80W

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PP33P–01

SSM (Special Service Materials)

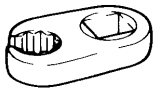
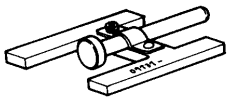
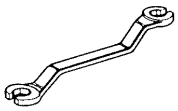
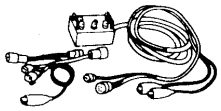
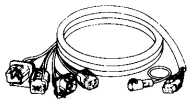
08826–00090	Seal Packing 1281, THREE BOND 1281 or equivalent (FIPG)	
08833–00070	Adhesive 1324, THREE BOND 1324 or equivalent	
08833–00100	THREE BOND 1360K or equivalent	

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BRAKE

SST (Special Service Tools)

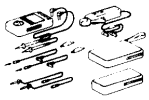
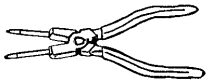
PP0FA–03

	09023–00100	Union Nut Wrench 10 mm	
	09703–30010	Brake Shoe Return Spring Tool	
	09709–29017	LSPV Gauge Set <mk2>	
	09718–00010	Shoe Hold Down Spring Driver	
	09737–00010	Brake Booster Push Rod Gauge	
	09751–36011	Brake Line Union Nut 10 x 12 mm Wrench	
	09843–18020	Diagnosis Check Wire	
	09990–00150	ABS Actuator Checker and Sub–harness	
	09990–00200	ABS Actuator Checker Sub–harness "C"	
	09990–00310	ABS Actuator Checker Sub–harness "J"	
	09990–00370	ABS Actuator Checker Sheet "L"	

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PP0FB–03

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set.	
	09905–00013 Snap Ring Pliers .	

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PP0FC–01

EQUIPMENT

Torque wrench	
Micrometor	Brake disc
Dial indicator	Brake disc
Vernier calipers	Brake drum

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PP0FD–01

LUBRICANT

Item	Capacity	Classification
Brake fluid	–	SAE J1703 or FMVSS No.116 DOT 3
Power steering fluid	–	ATF DEXRON® II

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PP33Q–01

SSM (Special Service Materials)

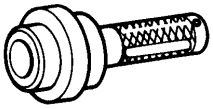
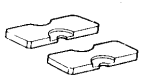
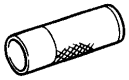
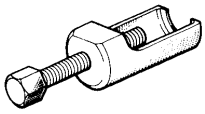
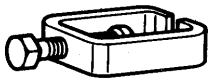
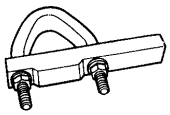
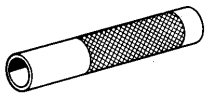
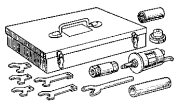
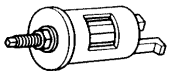
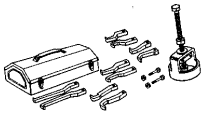
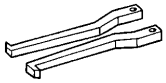
	08833–00070 Adhesive 1324, THREE BOND 1324 or equivalent	

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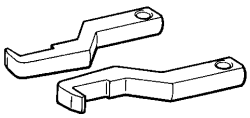
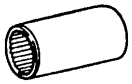
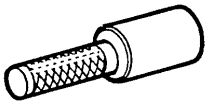
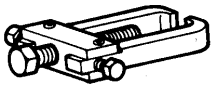
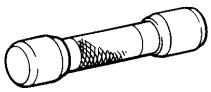
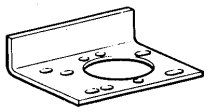
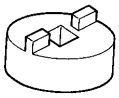
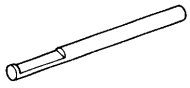
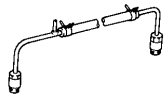
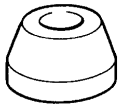
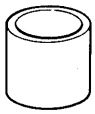
STEERING

SST (Special Service Tools)

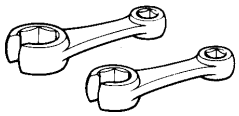
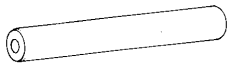
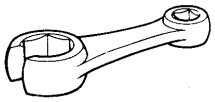
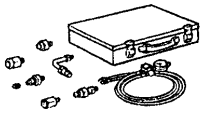
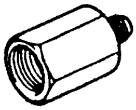
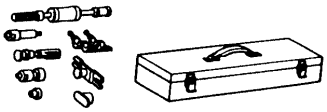
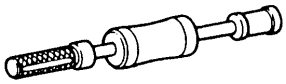
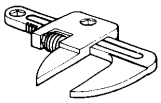
PP3K3–01

	09223–46011	Crankshaft Front Oil Seal Replacer	Idler arm
	09236–00101	Water Pump Overhaul Tool Set	
	(09237–00010)	Water Pump Bearing Remover & Replacer	PS gear (2WD)
	09608–04031	Front Hub Inner Bearing Cone Replacer	PS vane pump (3RZ–FE)
	09610–20012	Pitman Arm Puller	Steering linkage
	09611–22012	Tie Rod End Puller	Steering linkage
	09612–00012	Rack & Pinion Steering Rack Housing Stand	PS gear (2WD)
	09612–22011	Tilt Handle Bearing Replacer	PS gear (2WD)
	09612–24014	Steering Gear Housing Overhaul Tool Set	
	(09613–22011)	Steering Rack Shaft Bushing Puller	PS gear (2WD)
	09612–65014	Steering Worm Bearing Puller	
	(09612–01030)	Claw "C"	PS gear (4WD)

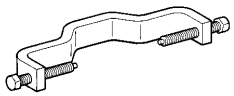
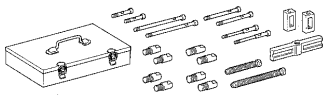
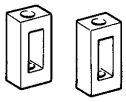
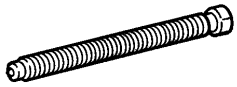
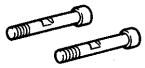
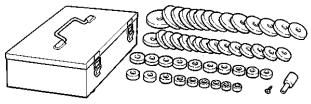
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	(09612–01060)	Claw "E"	PS gear (2WD)
	09616–00010	Steering Worm Bearing Adjusting Socket	PS gear (2WD, 4WD)
	09623–30011	Steering Worm Bearing & Oil Seal Replacer	PS gear (2WD)
	09628–62011	Ball Joint Puller	PS gear (4WD) Steering linkage
	09630–00014	Power Steering Gear Housing Overhaul Tool Set	
	(09631–00051)	No.3 Wrench	PS gear (4WD)
	(09631–00121)	Teflon Ring Former	PS gear (4WD)
	(09631–00142)	Overhaul Stand	PS gear (4WD)
	09631–10021	Rack Stopper Wrench	PS gear (2WD)
	09631–10030	Oil Seal Remover	PS vane pump (3RZ–FE)
	09631–12071	Steering Rack Oil Seal Test Tool	PS gear (2WD)
	09631–20070	Seal Ring Guide	PS gear (2WD)
	09631–20081	Seal Ring Tool	PS gear (2WD)

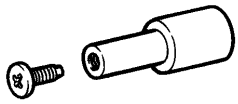
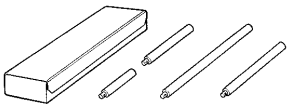
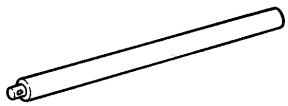
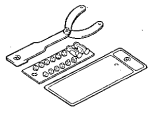
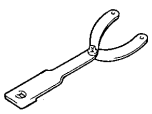
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	09631–22020	Power Steering Hose Nut 14 x 17 mm Wrench Set	PS gear (2WD, 4WD)
	09631–33010	Steering Rack Cover "I"	PS gear (2WD)
	09633–00020	Power Steering Hose Nut Wrench	PS gear (2WD)
	09640–10010	Power Steering Pressure Gauge Set	
	(09641–01010)	Gauge Assy	On–vehicle inspection
	(09641–01030)	Attachment B	On–vehicle inspection
	(09641–01060)	Attachment E	On–vehicle inspection
	09910–00015	Puller Set	
	(09911–00011)	Puller Clamp	Tilt steering column
	(09912–00010)	Puller Slide Hammer	Tilt steering column
	09922–10010	Variable Open Wrench	PS gear (2WD)
	09950–40010	Puller B Set	
	(09957–04010)	Attachment	Tilt steering column

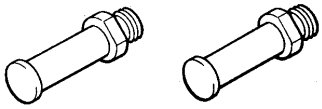
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	(09958–04010)	Holder	Tilt steering column
	09950–50010	Puller C Set	
	(09951–05010)	Hanger 150	Non–tilt steering column Tilt steering column
	(09952–05010)	Slide Arm	Non–tilt steering column Tilt steering column
	(09953–05020)	Center Bolt 150	Non–tilt steering column Tilt steering column
	(09954–05020)	Claw No.2	Non–tilt steering column Tilt steering column
	09950–60010	Replacer Set	
	(09951–00180)	Replacer 18	PS gear (2WD)
	(09951–00240)	Replacer 24	PS gear (2WD)
	(09951–00250)	Replacer 25	PS gear (2WD)
	(09951–00260)	Replacer 26	PS gear (2WD)
	(09951–00300)	Replacer 30	Idler arm
	(09951–00310)	Replacer 31	PS gear (2WD)

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	(09951–00320) Replacer 32	PS gear (2WD)
	(09951–00340) Replacer 34	PS gear (2WD, 4WD)
	(09951–00360) Replacer 36	PS gear (4WD)
	(09951–00410) Replacer 41	PS gear (2WD)
	(09951–00420) Replacer 42	PS gear (4WD)
	(09951–00430) Replacer 43	PS gear (2WD, 4WD)
	(09952–06010) Adapter	PS gear (2WD, 4WD)
	09950–70010 Handle Set	
	(09951–07150) Handle 150	PS gear (2WD)
	(09951–07200) Handle 200	PS gear (2WD, 4WD) Idler arm
	(09951–07360) Handle 360	PS gear (2WD)
	09960–10010 Variable Pin Wrench Set	
	(09962–01000) Variable Pin Wrench Arm Assy	PS vane pump (3RZ–FE, 5VZ–FE)

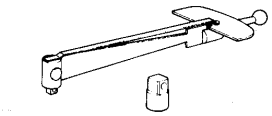
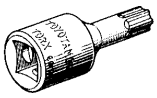
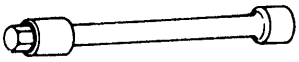
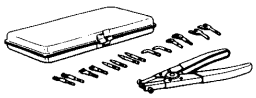
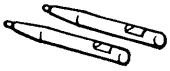
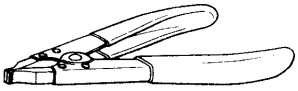
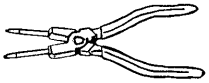
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	(09963–01000) Pin 10	PS vane pump (3RZ–FE, 5VZ–FE)

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PP0FV–01

RECOMMENDED TOOLS

	09025–00010	Torque Wrench (30 <kgfcm>) .	PS vane pump (3RZ–FE, 5VZ–FE) PS gear (2WD, 4WD) Idler arm
	09042–00010	Torx Socket T30 .	Non–tilt steering column Tilt steering column
	09043–38100	Hexagon 10 mm Wrench	PS gear (4WD)
	09904–00010	Expander Set .	
	(09904–00050)	No. 4 Claw	
	09905–00012	Snap Ring No.1 Expander .	
	09905–00013	Snap Ring Pliers .	

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PP0FW–01

EQUIPMENT

Belt tension gauge	On–vehicle inspection
Caliper gauge	PS vane pump (3RZ–FE, 5VZ–FE)
Calipers	PS vane pump (3RZ–FE, 5VZ–FE)
Dial indicator	PS gear (2WD, 4WD)
Feeler gauge	PS vane pump (3RZ–FE, 5VZ–FE)
Micrometer	PS vane pump (3RZ–FE, 5VZ–FE)
Torque wrench	

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PP0FX–01

LUBRICANT

Item	Capacity	Classification
Power steering fluid Total	0.8 liters (0.85 US qts, 0.70 Imp.qts)	ATF DEXRON®II or III

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PP33R–01

SSM (Special Service Materials)

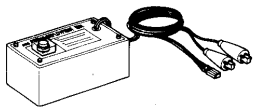
08833–00080	Adhesive 1344 THREE BOND 1344 LOCTITE 242 or equivalent	PS gear (2WD)
08826–00090	Seal Packing 1281, THREE BOND 1281 or equivalent (FIPG)	Idler arm

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SUPPLEMENTAL RESTRAINT SYSTEM

PP0FR–01

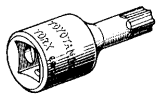
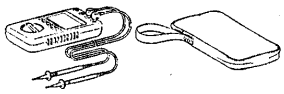
SST (Special Service Tools)

	09082–00700 SRS Airbag Deployment Tool	
	09843–18020 Diagnosis Check Wire	

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PP0FS–02

RECOMMENDED TOOLS

	09042–00020	Torx Socket T40 .	Center aribag sensor assembly
	09082–00040	TOYOTA Electrical Tester.	

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PP0FT–01

EQUIPMENT

Torque wrench	
Bolt: Length: 35mm (1.38 in.) Pitch: 1.0 mm (0.039 in.) Diam.: 6.0 mm (0.236 in.)	Airbag disposal
Tire Width: 185 mm (7.28 in.) Inner diam.: 360 mm (14.17 in.)	Airbag disposal
Tire with disc wheel Width: 185 mm (7.28 in.) Inner diam.: 360 mm (14.17 in.)	Airbag disposal
vinyl bag	Airbag disposal

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BODY ELECTRICAL

SST (Special Service Tools)

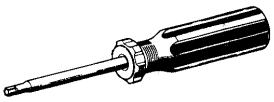
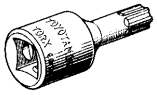
PP06F–09

	09843–18020 Diagnosis Check Wire	

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PP06G–08

RECOMMENDED TOOLS

	09082–00040	TOYOTA Electrical Tester.	
	09041–00030	Torx Driver T30 .	For removing and installing steering wheel pad
	09042–00010	Torx Socket T30 .	For removing and installing steering wheel pad

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PP06H–01

EQUIPMENT

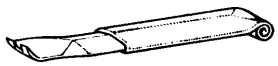
Voltmeter	
Ammeter	
Ohmmeter	
Test lead	
Syphon	Brake fluid level warning switch
Bulb (3W)	Fuel sender gauge
Bulb (3.4W)	Seat belt warning relay
Bulb (21W)	Turn signal flasher relay
Dry cell battery	Fuel sender gauge
Torque wrench	

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BODY

SST (Special Service Tools)

PP0FZ–02

	09806–30010 Windshield Moulding Remover	
	09812–00010 Door Hinge Set Bolt Wrench	

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PP0EW–01

LUBRICANT

Item	Capacity	Classification
MP grease	–	–

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PP33S–02

SSM (Special Service Materials)

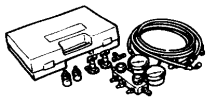
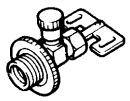
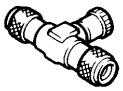
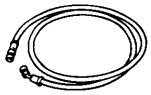
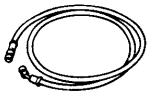
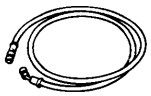
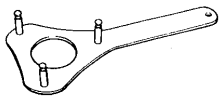
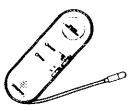
08833–00030	Three cement black or equivalent	Windshield Moulding Windshield Back Window Glass
08833–00070	Adhesive 1324, THREE BOND 1324 or equivalent	Front Door
08850–00070	Windshield glass adhesive set No.15 or equivalent	Windshield Back WindowGlass (0–15 °C or 32 – 59 °F)
08850–00080	Windshield glass adhesive set No.35 or equivalent	Windshield Back WindowGlass (35 – 45 °C or 59 – 95 °F)
08850–00090	Windshield glass adhesive set No.45 or equivalent	Windshield Back WindowGlass (35–45 °C or 95 – 95 °F)
08850–00801	Windshield Glass Adhesive Set or equivalent	Windshield

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AIR CONDITIONING

SST (Special Service Tools)

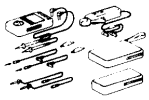
PP3LT–01

	07110–58060	Air Conditioner Service Tool Set	
	(07117–58060)	Refrigerant Drain Service Valve	
	(07117–58070)	T–Joint	
	(07117–58080)	Quick Disconnect Adapter	Discharge (diam. 16 mm)
	(07117–58090)	Quick Disconnect Adapter	Suction (diam. 13 mm)
	(07117–78050)	Refrigerant Charging Gauge	
	(07117–88060)	Refrigerant Charging Hose	Discharge (Red)
	(07117–88070)	Refrigerant Charging Hose	Suction (Blue)
	(07117–88080)	Refrigerant Charging Hose	Utility (Green)
	07112–66040	Magnetic Clutch Remover	
	07112–76060	Magnetic Clutch Stopper	
	07116–38360	Gas Leak Detector Assembly	

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PP3LU–01

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Tester Set.	

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PP0E4–02

EQUIPMENT

Voltmeter	
Ammeter	
Ohmmeter	
Test lead	
Thermometer	Thermistor
Torque wrench	
Dial indicator	Magnetic clutch
Plastic hammer	Magnetic clutch
Hexagon wrench	Expansion valve

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PP0E5–07

LUBRICANT

Item	Capacity	Classification
Compressor oil	–	ND–OIL 8 or equivalent
When replacing receiver	10 cc (0.34 fl.oz.)	
When replacing condenser	40 cc (1.4 fl. oz.)	
When replacing evaporator	40 cc (1.4 fl. oz.)	
When replacing compressor	140 cc (4.8 fl. oz.)	

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SS – SERVICE SPECIFICATIONS

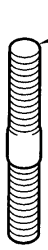
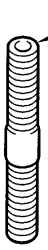
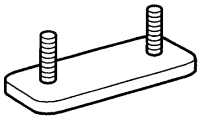
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STANDARD BOLT

HOW TO DETERMINE BOLT STRENGTH

SS00F–01

	Mark	Class		Mark	Class
Hexagon head bolt	 Bolt head No. 4– 5– 6– 7– 8– 9– 10– 11–	4T 5T 6T 7T 8T 9T 10T 11T	Hexagon flange bolt w/ washer hexagon bolt	 4 Protruding lines	9T
	 No mark	4T	Hexagon flange bolt w/ washer hexagon bolt	 5 Protruding lines	10T
Hexagon flange bolt w/ washer hexagon bolt	 No mark	4T	Hexagon flange bolt w/ washer hexagon bolt	 6 Protruding lines	11T
Hexagon head bolt	 2 Protruding lines	5T	Stud bolt	 No mark	4T
Hexagon flange bolt w/ washer hexagon bolt	 2 Protruding lines	6T		 Grooved	6T
Hexagon head bolt	 3 Protruding lines	7T	Welded bolt		4T
Hexagon head bolt	 4 Protruding lines	8T			

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SS00G–01

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N·m	kgf·cm	ft·lbf	N·m	kgf·cm	ft·lbf
4T	6	1	5	55	48 in.·lbf	6	60	52 in.·lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	–	–	–
5T	6	1	6.5	65	56 in.·lbf	7.5	75	65 in.·lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	–	–	–
6T	6	1	8	80	69 in.·lbf	9	90	78 in.·lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	–	–	–
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	–	–	–
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

V00079

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MAINTENANCE

TORQUE SPECIFICATION

SS091–01

Part tightened		N·m	kgf·cm	ft·lbf
Front seat mount bolts		37	375	27
Strut bar bracket x Frame	2WD	52	530	38
Leaf spring U–bolt mounting nuts		133	1350	98

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ENGINE MECHANICAL (3RZ–FE)

SERVICE DATA

SS092–01

Valve clearance (Cold)		Intake Exhaust	0.15 – 0.25 mm (0.006 – 0.010 in.) 0.25 – 0.35 mm (0.010 – 0.014 in.)
Ignition timing			3 – 7° BTDC @ idle
Idle speed			650 – 750 rpm
Compression pressure	at 250 rpm	STD Minimum	1,230 kPa (12.5 kgf/cm^2, 178 psi) or more 880 kPa (9.0 kgf/cm^2, 127 psi)
	Difference of pressure between each cylinder		98 kPa (1.0 kgf/cm^2, 14 psi) or less
Cylinder head	Warpage		
	Cylinder block side	Maximum	0.05 mm (0.0020 in.)
	Manifold side	Maximum	0.10 mm (0.0039 in.)
	Valve seat		
	Refacing angle	Intake Exhaust	30°, 45°, 60° 45°, 60°
	Contacting angle		45°
	Contacting width		1.0 – 1.4 mm (0.039 – 0.055 in.)
	Valve guide bushing bore diameter	STD O/S 0.05	11.000 – 11.027 mm (0.4331 – 0.4341 in.) 11.050 – 11.077 mm (0.4350 – 0.4361 in.)
	Cylinder head bolt outside diameter	STD Minimum	10.76 – 10.97 mm (0.4236 – 0.4319 in.) 10.40 mm (0.4094 in.)
Valve guide bushing	Inside diameter		6.010 – 6.030 mm (0.2366 – 0.2374 in.)
	Protrusion height		8.2 – 8.6 mm (0.323 – 0.339 in.)
	Replacing temperature (Cylinder head side)		80 – 100°C (176 –212°F)
Valve	Valve overall length	STD Intake Exhaust Minimum Intake Exhaust	103.45 mm (4.0728 in.) 103.60 mm (4.0787 in.) 102.95 mm (4.0531 in.) 103.10 mm (4.0590 in.)
	Valve face angle		44.5°
	Stem diameter	Intake Exhaust	5.970 – 5.985 mm (0.2350 – 0.2356 in.) 5.965 – 5.980 mm (0.2348 – 0.2354 in.)
	Stem oil clearance	STD Intake Exhaust Minimum Intake Exhaust	0.025 – 0.060 mm (0.0010 – 0.0024 in.) 0.030 – 0.065 mm (0.0012 – 0.0026 in.) 0.08 mm (0.0031 in.) 0.10 mm (0.0039 in.)
	Margin thickness	STD Minimum	1.0 mm (0.039 in.) 0.5 mm (0.020 in.)
Valve spring	Deviation	Maximum	2.0 mm (0.079 in.)
	Installed tension at 37.5 mm (1.406 in.)		177 – 204 N (18.0 – 20.0 kgf, 45.9 – 39.7 lbf)
Valve lifter	Lifter diameter		30.966 – 30.976 mm (1.1578 – 1.2195 in.)
	Lifter bore diameter		31.000 – 31.016 mm (1.2205 – 1.2211 in.)
	Oil clearance	STD Maximum	0.024 – 0.055 mm (0.0009 – 0.0022 in.) 0.07 mm (0.0028 in.)
Manifold	Warpage	Maximum Intake Exhaust	0.20 mm (0.0078 in.) 0.50 mm (0.0197 in.)
Air intake chamber	Warpage	Maximum	0.20 mm (0.0078 in.)

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Camshaft	Thrust clearance	STD	0.040 – 0.095 mm (0.0016 – 0.0037 in.)
		Maximum	0.12 mm (0.0047 in.)
	Journal oil clearance	STD	0.025 – 0.062 mm (0.0010 – 0.0024 in.)
		Maximum	0.08 mm (0.0031 in.)
	Journal diameter		26.959 – 26.975 mm (1.0614 – 1.0620 in.)
	Circle runout	Maximum	0.06 mm (0.0024 in.)
	Cam lobe height	Intake	45.31 – 45.41 mm (1.7839 – 1.7878 in.)
		Exhaust	45.06 – 45.16 mm (1.7740 – 1.7779 in.)
	Camshaft gear backlash	STD	0.020 – 0.200 mm (0.0008 – 0.0079 in.)
		Maximum	0.30 mm (0.0188 in.)
	Camshaft gear spring end free distance		22.5 – 22.9 mm (0.886 – 0.902 in.)
Spark plug tube	Protrusion		47.0 mm (1.850 in.)
Chain and timing gear	Chain length at 16 links	Maximum No.1	147.5 mm (5.807 in.)
		No.2	123.6 mm (4.866 in.)
	Crankshaft timing gear wear	Minimum	59.4 mm (2.339 in.)
	Camshaft timing gear wear	Minimum	113.8 mm (4.480 in.)
	Balance shaft drive gear wear	Minimum	75.9 mm (2.988 in.)
	No.2 crankshaft timing sprocket wear	Maximum	96.7 mm (3.807 in.)
Chain tensioner slipper and vibration damper	Wear	Maximum	1.0 mm (0.039 in.)
Cylinder block	Cylinder head surface warpage	Maximum	0.05 mm (0.0020 in.)
	Cylinder bore diameter	STD	94.990 – 95.003 mm (3.7398 – 3.7403 in.)
		Maximum	95.06 mm (3.7425 in.)
	Main bearing bolt outside diameter	STD	10.76 – 10.97 mm (0.4236 – 0.4319 in.)
		Minimum	10.40 mm (0.4094 in.)
	Cylinder block main journal bore diameter		
		STD Mark 1	64.004 – 64.010 mm (2.5198 – 2.5201 in.)
		Mark 2	64.011 – 64.016 mm (2.5201 – 2.5203 in.)
		Mark 3	64.017 – 64.022 mm (2.5203 – 2.5205 in.)
		U/S 0.25	64.000 – 64.024 mm (2.5197 – 2.5206 in.)
Piston and piston ring	Piston diameter	STD	94.933 – 94.943 mm (3.7375 – 3.7379 in.)
		O/S 0.50	95.433 – 95.443 mm (3.7572 – 3.7575 in.)
	Piston oil clearance		0.047 – 0.070 mm (0.0019 – 0.0028 in.)
	Piston ring groove clearance	No.1	0.020 – 0.070 mm (0.0008 – 0.0028 in.)
		No.2	0.030 – 0.070 mm (0.0012 – 0.0028 in.)
	Piston ring end gap	STD No.1	0.300 – 0.400 mm (0.0118 – 0.0157 in.)
		STD No.2 mark "T"	0.400 – 0.500 mm (0.0157 – 0.0194 in.)
		"N"	0.400 – 0.500 mm (0.0157 – 0.0194 in.)
		Maximum No.1	0.40 mm (0.0157 in.)
		No.2	0.50 mm (0.0196 in.)
	Piston pin installing temperature		80 – 90°C (176 – 194°F)

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Connecting rod	Thrust clearance	STD	0.160 – 0.312 mm (0.0063 – 0.0123 in.)
		Maximum	0.350 mm (0.0138 in.)
	Connecting rod bearing center wall thickness		
		STD Mark 4	1.482 – 1.485 mm (0.0583 – 0.0585 in.)
		Mark 5	1.485 – 1.488 mm (0.0585 – 0.0586 in.)
		Mark 6	1.488 – 1.491 mm (0.0586 – 0.0587 in.)
		U/S 0.25	1.601 – 1.607 mm (0.0630 – 0.0633 in.)
	Connecting rod big end inside diameter		
		STD Mark 4	56.000 – 56.006 mm (2.2047 – 2.2050 in.)
		Mark 5	56.006 – 56.012 mm (2.2050 – 2.2052 in.)
		Mark 6	56.012 – 56.018 mm (2.2052 – 2.2054 in.)
		U/S 0.25	56.000 – 56.018 mm (2.2047 – 2.2054 in.)
	Connecting rod oil clearance		
		STD	0.030 – 0.055 mm (0.0012 – 0.0022 in.)
		U/S 0.25	0.031 – 0.071 mm (0.0012 – 0.0026 in.)
		Maximum	0.10 mm (0.0039 in.)
	Rod out–of–alignment		
		Maximum per 100 mm (3.94 in.)	0.05 mm (0.0020 in.)
	Rod twist	Maximum per 100 mm (3.94 in.)	0.15 mm (0.0059 in.)
	Bushing inside diameter		24.008 – 24.017 mm (0.9452 – 0.9455 in.)
	Piston pin diameter		24.000 – 24.009 mm (0.9449 – 0.9452 in.)
	Piston pin oil clearance	STD	0.005 – 0.011 mm (0.0002 – 0.0004 in.)
		Maximum	0.015 mm (0.0006 in.)
	Connecting rod bolt outside diameter	STD	7.80 – 7.90 mm (0.3071 – 0.3110 in.)
		Minimum	7.60 mm (0.2992 in.)
Crankshaft	Thrust clearance	STD	0.020 – 0.0220 mm (0.0008 – 0.0087 in.)
		Maximum	0.30 mm (0.0118 in.)
	Thrust washer thickness		2.440 – 2.490 mm (0.0961 – 0.0980 in.)
	Main journal oil clearance	STD No.3	0.030 – 0.055 mm (0.0012 – 0.0022 in.)
		Others	0.024 – 0.049 mm (0.0009 – 0.0019 in.)
		U/S 0.25 No.3	0.030 – 0.070 mm (0.0012 – 0.0028 in.)
		Others	0.025 – 0.065 mm (0.0010 – 0.0026 in.)
		Maximum	0.10 mm (0.0039 in.)
	Main journal diameter	STD No.3	59.981 – 59.994 mm (2.2615 – 2.3620 in.)
		Others	59.987 – 60.000 mm (2.3617 – 2.3622 in.)
		U/S 0.25 No.3	59.740 – 59.750 mm (2.3520 – 2.3524 in.)
		Others	59.745 – 59.755 mm (2.3522 – 2.3526 in.)
	Main bearing center wall thickness		
		STD Mark 1	1.987 – 1.990 mm (0.0782 – 0.0783 in.)
		Mark 2	1.991 – 1.993 mm (0.0784 – 0.0785 in.)
		Mark 3	1.994 – 1.996 mm (0.0785 – 0.0786 in.)
		U/S 0.25	2.106 – 2.112 mm (0.0829 – 0.0831 in.)
	Crank pin diameter	STD	52.987 – 53.000 mm (2.0861 – 2.0866 in.)
		U/S 0.25	52.745 – 52.755 mm (2.0766 – 2.0770 in.)
	Circle runout	Maximum	0.03 mm (0.0012 in.)
	Main journal taper and out–of–round	Maximum	0.005 mm (0.0002 in.)
	Crank pin taper and out–of–round	Maximum	0.005 mm (0.0002 in.)
Balance shaft	Thrust clearance	STD	0.07 – 0.13 mm (0.0027 – 0.0051 in.)
		Maximum	0.2 mm (0.0079 in.)
	Bearing inside diameter	No.1	38.025 – 38.045 mm (1.4970 – 1.4978 in.)
		No.2	37.525 – 37.545 mm (1.4774 – 1.4781 in.)
	Journal diameter	No.1	37.969 – 37.985 mm (1.4948 – 1.4955 in.)
		No.2	37.449 – 37.465 mm (1.4744 – 1.4750 in.)
	Journal oil clearance	STD No.1	0.040 – 0.076 mm (0.0016 – 0.0031 in.)
		STD No.2	0.060 – 0.096 mm (0.0024 – 0.0038 in.)
		Maximum No.1	0.15 mm (0.0059 in.)
		No.2	0.15 mm (0.0059 in.)

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SS093–02

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Throttle body x Air intake chamber		20	200	14
Spark plug x Cylinder head		19	200	14
Cylinder head x Cylinder block	1st 2nd 3rd	39 Turn 90° Turn 90°	400	29
Cylinder head x Timing chain cover		21	210	15
Camshaft bearing cap x Cylinder head		15.5	160	12
Camshaft timing gear x Camshaft		73.5	750	54
Distributor gear x Camshaft		46	465	34
Chain tensioner x Cylinder head		21	210	15
Engine hanger x Cylinder head		42	420	30
Exhaust manifold x Cylinder head		49	500	36
Heat insulator x Exhaust manifold		5.5	55	48 in.·lbf
Front exhaust pipe x Exhaust manifold		62	630	46
No.1 support bracket x Transmission		39	400	29
No.1 support bracket clamp bolt		19	195	14
Front exhaust pipe x TWC		39	400	29
Intake manifold x Cylinder head		29	300	22
Delivery pipe x Intake manifold		21	210	15
Fuel inlet tube x Fuel filter		29	300	22
Fuel inlet tube x Delivery pipe		29	300	22
EGR valve x Air intake chamber, EGR pipe		19	195	14
EGR vacuum modulator x Air intake chamber		8.5	85	74 in.·lbf
EGR pipe x Exhaust manifold		20	200	15
EGR pipe x Cylinder head		18	185	14
Cylinder head rear cover x Cylinder head		13.5	135	10
Water outlet x Cylinder head		20	200	14
PS pump bracket x Cylinder head		20	200	14
PS pump bracket x PS pump		58	590	43
PS pump x PS pump pulley		43	440	32
PS pump idler pulley x Cylinder head		20	200	14
Balance shaft drive gear x Balance shaft		25	250	18
No.2 chain tensioner, No.3 vibration damper x Cylinder block		18	185	13
No.2 vibration damper x Cylinder block		27	270	20
No.1 vibration damper x Cylinder block		18	185	13
No.1 timing chain tensioner slipper x Cylinder block		27	270	20
Timing chain cover x Cylinder block	Bolt A Bolt B Bolt C Nut D	20 24.5 44 20	200 250 440 200	14 18 32 14
Timing chain cover mounting bolt		18	185	13
No.1 water bypass pipe mounting nut		20	200	14
Crankshaft pulley x Crankshaft		260	2,650	193
No.2 and No.3 crankshaft pulley x Crankshaft pulley		25	250	18

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Oil strainer x Cylinder block		18	185	13
Oil pan x Cylinder block		12.5	130	9
Crankshaft position sensor x Timing chain cover		8.5	85	74 in.·lbf
Generator bracket x Cylinder block		74.5	760	55
Generator bracket x Timing chain cover		18	185	13
Generator adjusting bar x Timing chain cover		63.5	650	47
A/C compressor bracket x Cylinder block		44	440	32
A/C compressor x A/C compressor bracket		25	250	18
Water pump pulley x Water pump		21	210	16
Connecting rod cap x Connecting rod	1st 2nd	45 Turn 90°	460	33
Main bearing cap x Cylinder block	1st 2nd	39 Turn 90°	400	29
No.1 balance shaft x Timing gear		36	365	26
No.2 balance shaft x Timing sprocket		36	365	26
Balance shaft x Cylinder block		18	185	13.4
Rear oil seal retainer x Cylinder block		13.5	135	9.7
RH, LH engine mounting bracket x Cylinder block		45	450	34
Oil dipstick guide x LH engine mounting bracket		20	200	14
Oil filter bracket union, Engine coolant drain plug x Cylinder block		25	250	18
Oil filter bracket x Cylinder block		28	290	21
Water bypass pipe x Cylinder block		20	200	14
Knock sensor x Cylinder block		37	380	27
Fuel filter x Cylinder block		20	200	14
Rear end plate x Cylinder block		18	185	13
Rear end plate x Water bypass pipe		20	200	14
Flywheel x Crankshaft	1st 2nd	26.5 Turn 90°	270	19
Front crossmember x Engine rear mounting bracket		25	260	19
Front exhaust pipe clamp x Exhaust manifold		62	630	46
Exhaust support bracket x Transmission		39	400	29
Front exhaust pipe clamp		19	195	14
Front exhaust pipe x TWC		39	400	29
Engine rear mounting bracket x Engine rear mounting insulator		18	183	13
Engine front mounting insulator x Frame		38	387	28
Clutch release cylinder bracket x Transmission		39	400	29
Clutch release cylinder x Transmission		13	130	9
Stabilizer bar bracket mounting bolt		30	306	22
Stabilizer bar x Lower suspension arm		13	130	9
Intake air connector x Cylinder head		18	185	13
Radiator x Body		18	185	13

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ENGINE MECHANICAL (5VZ–FE)

SERVICE DATA

SS00O–07

Compression pressure		at 250 rpm STD	1,200 kPa (12.2 kgf/cm^2, 174 psi)
		Minimum	1,000 kPa (10.2 kgf/cm^2, 145 psi)
	Difference of pressure between each cylinder		100 kPa (1.0 kgf/cm^2, 15 psi) or less
Valve clearance		at cold Intake	0.13 – 0.23 mm (0.006 – 0.009 in.)
		Exhaust	0.27 – 0.37 mm (0.011 – 0.014 in.)
	Adjusting shim for repair part	Mark 2.500	2.500 mm (0.0984 in.)
		Mark 2.550	2.550 mm (0.1004 in.)
		Mark 2.600	2.600 mm (0.1024 in.)
		Mark 2.650	2.650 mm (0.1043 in.)
		Mark 2.700	2.700 mm (0.1063 in.)
		Mark 2.750	2.750 mm (0.1083 in.)
		Mark 2.800	2.800 mm (0.1102 in.)
		Mark 2.850	2.850 mm (0.1122 in.)
		Mark 2.900	2.900 mm (0.1142 in.)
		Mark 2.950	2.950 mm (0.1161 in.)
		Mark 3.000	3.000 mm (0.1181 in.)
		Mark 3.050	3.050 mm (0.1201 in.)
		Mark 3.100	3.100 mm (0.1220 in.)
		Mark 3.150	3.150 mm (0.1240 in.)
		Mark 3.200	3.200 mm (0.1260 in.)
		Mark 3.250	3.250 mm (0.1280 in.)
		Mark 3.300	3.300 mm (0.1299 in.)
Ignition timing	w/ Terminals TE1 and E1 connected of DLC1		8 – 12° BTDC @ idle
Idle speed	–		700 ± 50 rpm
Intake manifold vacuum		at idle speed	60 kPa (450 mmHg, 17.7 in.Hg) or more
Timing belt tensioner	Protrusion from housing side		10.0 – 10.8 mm (0.394 – 0.425 in.)
Cylinder head	Warpage	Maximum	0.10 mm (0.039 in.)
	Valve seat		
	Refacing angle		30°, 45°, 60°
	Contacting angle		45°
	Contacting width		1.0 – 1.4 mm (0.039 – 0.055 in.)
	Valve guide bushing bore diameter	STD	10.985 – 11.027 mm (0.4325 – 0.4341 in.)
		O/S 0.05	11.050 – 11.077 mm (0.4350 – 0.4361 in.)
Valve guide bushing	Inside diameter		6.010 – 6.030 mm (0.2366 – 0.2374 in.)
	Outside diameter for repair part	STD	11.033 – 11.044 mm (0.4344 – 0.4348 in.)
		O/S 0.05	11.083 – 11.094 mm (0.4363 – 0.4368 in.)
Valve	Valve overall length	STD Intake	95.15 mm (3.7461 in.)
		Exhaust	94.90 mm (3.7362 in.)
		Minimum Intake	94.60 mm (3.7244 in.)
		Exhaust	94.40 mm (3.7165 in.)
	Valve face angle		44.5°
	Stem diameter	Intake	5.970 – 5.985 mm (0.2350 – 0.2356 in.)
		Exhaust	5.965 – 5.980 mm (0.2348 – 0.2354 in.)
	Stem oil clearance	STD Intake	0.025 – 0.060 mm (0.0010 – 0.0024 in.)
		Exhaust	0.030 – 0.065 mm (0.0012 – 0.0026 in.)
		Maximum Intake	0.08 mm (0.0031 in.)
		Exhaust	0.10 mm (0.0039 in.)
	Margin thickness	STD	1.0 mm (0.039 in.)
		Minimum	0.5 mm (0.020 in.)

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Valve spring	Deviation	Maximum	2.0 mm (0.079 in.)
	Free length		44.78 mm (1.7630 in.)
	Installed tension	at 33.3 mm (1.311 in.)	186 – 206 N (19.0 – 21.0 kgf, 41.9 – 46.3 lbf)
Valve lifter	Lifter diameter		30.966 – 30.976 mm (1.2191 – 2.2195 in.)
	Lifter bore diameter		31.000 – 31.018 mm (1.2205 – 1.2212 in.)
	Oil clearance	STD	0.024 – 0.052 mm (0.0009 – 0.0020 in.)
		Maximum	0.08 mm (0.0031 in.)
Camshaft	Thrust clearance	STD	0.033 – 0.080 mm (0.0013 – 0.0031 in.)
		Maximum	0.12 mm (0.0047 in.)
	Journal oil clearance	STD	0.035 – 0.072 mm (0.0014 – 0.0028 in.)
		Maximum	0.10 mm (0.0039 in.)
	Journal diameter		26.949 – 26.965 mm (1.0610 – 1.0616 in.)
	Circle runout	Maximum	0.06 mm (0.0024 in.)
	Cam lobe height	STD Intake	42.31 – 42.41 mm (1.6657 – 1.6697 in.)
		Exhaust	41.96 – 42.06 mm (1.6520 – 1.6559 in.)
		Minimum Intake	42.16 mm (1.6598 in.)
		Exhaust	41.81 mm (1.6461 in.)
	Camshaft gear backlash	STD	0.020 – 0.200 mm (0.0008 – 0.0079 in.)
		Maximum	0.30 mm (0.0188 in.)
	Camshaft gear spring end free distance		18.2 – 18.8 mm (0.712 – 0.740 in.)
Air intake chamber	Warpage	Maximum	0.10 mm (0.0039 in.)
Intake air connector	Warpage	Maximum	0.10 mm (0.0039 in.)
Intake manifold	Warpage	Maximum	0.10 mm (0.0039 in.)
Exhaust manifold	Warpage	Maximum	1.00 mm (0.0394 in.)
Cylinder block	Cylinder head surface warpage	Maximum	0.05 mm (0.0020 in.)
	Cylinder bore diameter	STD Mark 1	93.500 – 93.510 mm (3.6811 – 3.6815 in.)
		Mark 2	93.510 – 93.520 mm (3.6815 – 3.6819 in.)
		Mark 3	93.520 – 93.530 mm (3.6819 – 3.6823 in.)
		Maximum STD	93.730 mm (3.6902 in.)
		O/S 0.50	94.230 mm (3.7098 in.)
Piston and piston ring	Piston diameter	STD Mark 1	93.356 – 93.366 mm (3.6754 – 3.6758 in.)
		Mark 2	93.367 – 93.376 mm (3.6759 – 3.6762 in.)
		Mark 3	93.377 – 93.386 mm (3.6763 – 3.6766 in.)
		O/S 0.50	93.856 – 93.886 mm (3.6951 – 3.6963 in.)
	Piston oil clearance	STD	0.134 – 0.154 mm (0.0053 – 0.0060 in.)
		Maximum	0.174 mm (0.0069 in.)
	Piston ring groove clearance	No.1	0.040 – 0.080 mm (0.0016 – 0.0031 in.)
		No.2	0.030 – 0.070 mm (0.0012 – 0.0028 in.)
	Piston ring end gap	STD No.1	0.300 – 0.500 mm (0.0118 – 0.0197 in.)
		No.2	0.400 – 0.600 mm (0.0157 – 0.0236 in.)
		Oil	0.150 – 0.550 mm (0.0059 – 0.0217 in.)
		Maximum No.1	1.100 mm (0.0433 in.)
		No.2	1.200 mm (0.0472 in.)
		Oil	1.150 mm (0.0453 in.)

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Connecting rod	Thrust clearance	STD	0.150 – 0.330 mm (0.0059 – 0.0130 in.)
		Maximum	0.380 mm (0.0150 in.)
	Connecting rod bearing center wall thickness		
	Reference	Mark 1	1.484 – 1.488 mm (0.0584 – 0.0586 in.)
		Mark 2	1.488 – 1.492 mm (0.0586 – 0.0587 in.)
		Mark 3	1.492 – 1.496 mm (0.0587 – 0.0589 in.)
	Connecting rod oil clearance	STD	0.024 – 0.053 mm (0.0009 – 0.0021 in.)
		O/S 0.25	0.023 – 0.069 mm (0.0009 – 0.0027 in.)
		Maximum	0.08 mm (0.0031 in.)
	Rod bend	Maximum per 100 mm (3.94 in.)	0.05 mm (0.0020 in.)
	Rod twist	Maximum per 100 mm (3.94 in.)	0.15 mm (0.0059 in.)
	Bushing inside diameter		22.005 – 22.017 mm (0.8663 – 0.8668 in.)
	Piston pin diameter		21.997 – 22.009 mm (0.8660 – 0.8665 in.)
	Bushing oil clearance	STD	0.005 – 0.011 mm (0.0002 – 0.0004 in)
		Maximum	0.05 mm (0.0020 in.)
	Connecting rod bolt outer diameter	STD	7.860 – 8.000 mm (0.3094 – 0.3150 in.)
		Minimum	7.600 mm (0.2992 in.)
Crankshaft	Thrust clearance	STD	0.020 – 0.220 mm (0.0008 – 0.0087 in.)
		Maximum	0.300 mm (0.0118 in.)
	Thrust washer thickness		2.440 – 2.490 mm (0.0961 – 0.0980 in.)
	Main journal oil clearance	No.1 STD	0.020 – 0.038 mm (0.0008 – 0.0015 in.)
		U/S 0.25	0.019 – 0.059 mm (0.0007 – 0.0023 in.)
		Others STD	0.024 – 0.042 mm (0.0009 – 0.0017 in.)
		U/S 0.25	0.023 – 0.063 mm (0.0009 – 0.0025 in.)
		Maximum	0.08 mm (0.0031 in.)
	Main journal diameter	STD	63.985 – 64.000 mm (2.5191 – 2.5197 in.)
		U/S 0.25	63.745 – 63.755 mm (2.5096 – 2.5100 in.)
	Main bearing center wall thickness		
	Reference	No.1 Mark 1	1.991 – 1.994 mm (0.0784 – 0.0785 in.)
		Mark 2	1.994 – 1.997 mm (0.0785 – 0.0786 in.)
		Mark 3	1.997 – 2.000 mm (0.0786 – 0.0787 in.)
		Mark 4	2.000 – 2.003 mm (0.0787 – 0.0789 in.)
		Mark 5	2.003 – 2.006 mm (0.0789 – 0.0790 in.)
		Others Mark 1	1.989 – 1.992 mm (0.0783 – 0.0784 in.)
		Mark 2	1.992 – 1.995 mm (0.0784 – 0.0785 in.)
		Mark 3	1.995 – 1.998 mm (0.0785 – 0.0787 in.)
		Mark 4	1.998 – 2.001 mm (0.0787 – 0.0788 in.)
		Mark 5	2.001 – 2.004 mm (0.0788 – 0.0789 in.)
	Crank pin diameter	STD	54.987 – 55.000 mm (2.1648 – 2.1654 in.)
		U/S 0.25	54.745 – 54.755 mm (2.1553 – 2.1557 in.)
	Circle runout	Maximum	0.06 mm (0.0024 in.)
	Main journal taper and out–of–round	Maximum	0.02 mm (0.0008 in.)
	Crank pin taper and out–of–round	Maximum	0.02 mm (0.0008 in.)

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SS00P–11

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
No.1 idler pulley x Oil pump		35	350	26
No.2 idler pulley x No.2 idler pulley bracket		40	400	30
No.1 timing belt cover x Oil pump		9	90	80 in.·lbf
Crankshaft pulley x Crankshaft		250	2,500	184
Camshaft timing pulley x Camshaft		110	1,100	81
Timing belt tensioner x Oil pump		27	270	20
No.2 timing belt cover x No.3 timing belt cover		9	90	80 in.·lbf
Oil dipstick guide x Generator bracket		8	80	71 in.·lbf
Fluid coupling x Fan bracket		5.4	54	48 in.·lbf
Camshaft bearing cap x Cylinder head		16	160	12
Rear plate x Cylinder head		8	80	71 in.·lbf
Cylinder head x Cylinder block	12 pointed head 1st	34	350	25
	2nd	Turn 90°	Turn 90°	Turn 90°
	3rd	Turn 90°	Turn 90°	Turn 90°
	Recessed head	18	185	13
Cylinder head cover x Cylinder head		6	60	53 in.·lbf
Exhaust manifold x Cylinder head		40	400	30
Exhaust manifold heat insulator x Exhaust manifold		8	80	71 in.·lbf
Exhaust crossover pipe x Exhaust manifold		45	450	33
Generator bracket x LH cylinder head		18.5	185	14
PS pump bracket x RH cylinder head		44	440	32
Intake manifold x Cylinder head		18	180	13
Intake manifold stay x Intake manifold		18.5	185	13
Intake manifold stay x No. 2 idler pulley bracket		18.5	185	13
No.3 timing belt cover x Cylinder head		9	90	80 in.·lbf
Camshaft position sensor x RH cylinder head		8	80	71 in.·lbf
Intake air connector x Intake manifold		18.5	185	13
Air intake chamber x Intake air connector		18.5	185	13
Air intake chamber stay x LH cylinder head, Air intake chamber		40	400	30
EGR pipe x LH exhaust manifold		18.5	185	13
EGR pipe x EGR valve		18.5	185	13
EGR pipe x Cylinder head		8	80	71 in.·lbf
Engine hanger No.2 x RH cylinder head		40	400	30
Frame crossmember x Engine rear mounting bracket		58	590	43
Engine rear mounting bracket x Engine rear mounting insulator		18	185	13
Engine front mounting insulator x Frame		38	387	28
Connecting rod cap x Connecting rod	1st	25	250	18
	2nd	Turn 90°	Turn 90°	Turn 90°
Main bearing cap x Cylinder block	1st	61	625	45
	2nd	Turn 90°	Turn 90°	Turn 90°
Rear oil seal retainer x Cylinder block		8	80	71 in.·lbf
Oil cooler union x Cylinder block		30	300	22
Oil hole cover plate x Cylinder block		60	600	44
Engine coolant drain cock x Cylinder block		39	400	29

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Engine mounting bracket x Cylinder block	44	440	32
Oil filter union x Cylinder block	25	250	18
Oil pressure switch x Cylinder block	15	150	11
Generator adjusting bar x Cylinder block	42	420	31
Knock sensor x Cylinder block	39	400	29
No.2 idler pulley bracket x Cylinder block	38	380	28
Water bypass pipe x Cylinder block	8.5	85	75 in.·lbf
Rear end plate x Cylinder block	7.5	75	66 in.·lbf
Drive plate x Crankshaft	83	850	63
Flywheel x Crankshaft	85	850	63
Clutch release cylinder x Transmission	12	120	9
Stabilizer bar bracket mounting bolt	30	306	22
Stabilizer bar x Lower suspension arm	13	130	9
Front exhaust pipe x Exhaust crossover pipe	62	630	46
Front exhaust pipe x Center exhaust pipe	48	490	35
Front exhaust pipe support bracket x Front exhaust pipe	44	450	33
Front exhaust pipe support bracket x Transmission	44	450	33
Center exhaust pipe x Tailpipe	48	490	35
Center exhaust pipe support bracket x Body	29	300	21

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EMISSION CONTROL (3RZ–FE)

SERVICE DATA

SS094–01

VSV for EVAP	Resistance	at 20°C (68°F)	30 – 34 Ω
VSV for EGR	Resistance	at 20°C (68°F)	33 – 39 Ω

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SS095–01

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Charcoal canister x Charcoal canister bracket	31	310	23
EGR valve x Air intake chamber	19	195	14
EGR valve x EGR pipe	19	195	14
EGR pipe x Exhaust manifold	20	200	15
EGR pipe x Cylinder head	18	185	13
Heated oxygen sensor x Center exhaust pipe	20	200	14
Front exhaust pipe x Center pipe	48	490	35
Center pipe x Tail pipe	48	490	35

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EMISSION CONTROL (5VZ–FE)

TORQUE SPECIFICATION

SS00R–11

Part tightened	N·m	kgf·cm	ft·lbf
Charcoal canister x Charcoal canister bracket	18	180	13
EGR valve x Air intake chamber	18.5	185	14
EGR valve x EGR pipe	18.5	185	14
EGR pipe x LH exhaust manifold	18.5	185	14
EGR pipe stay x Cylinder head	8.0	80	71 in.·lbf
Heated oxygen sensor x Center exhaust pipe	20	200	14
Front exhaust pipe x Center exhaust pipe	48	490	35
Center exhaust pipe x Tailpipe	48	490	35

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MFI (3RZ–FE)

SERVICE DATA

SS096-02

Fuel pressure regulator	Fuel pressure	at no vacuum	265 – 304 kPa (2.7 – 3.1 kgf/cm^2, 38 – 44 psi)
Fuel pump	Resistance	at 20°C (68°F)	0.2 – 3.0 Ω
Injector	Resistance Injection volume Difference between each cylinder Fuel leakage	at 20°C (68°F)	12 – 16 Ω 69 – 88 cm^3 (4.2 – 5.3 cu in.) per 15 seconds 5 cm^3 (0.3 cu in.) or less One drop or less per minutes
Throttle body	Throttle valve fully closed angle Throttle opener setting speed		6° 1,200 – 1,400 rpm
TP sensor	Clearance between stop screw and lever	Terminals	Resistance
	0 mm (0 in.) 0.50 mm (0.020 in.) 0.75 mm (0.030 in.) Throttle valve fully open –	VTA – E2 IDL – E2 IDL – E2 VTA – E2 VC – E2	0.2 – 5.7 kΩ 2.3 kΩ or less Infinity 2.0 – 10.2 kΩ 2.5 – 5.9 kΩ
IAC valve	Resistance	+B – RSC or RSO	17.0 – 24.5 Ω (–10 – 50°C) 21.5 – 28.5 Ω (50 – 100°C)
VSV for EVAP	Resistance	at 20°C (68°F)	30 – 34 Ω
VSV for EGR	Resistance	at 20°C (68°F)	33 – 39 Ω
VSV for Vapor pressure sensor	Resistance	at 20°C (68°F)	37 – 44 Ω
Vapor pressure sensor	Power source voltage		4.5 – 5.5 V
ECT sensor	Resistance	at –20°C (–4°F) at 0°C (32°F) at 20°C (68°F) at 40°C (104°F) at 60°C (140°F) at 80°C (176°F)	10 – 20 kΩ 4 – 7 kΩ 2 – 3 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ 0.2 – 0.4 kΩ
MAF meter	Resistance (THA – E2)	at –20°C (–4°F) at 0°C (32°F) at 20°C (68°F) at 40°C (104°F) at 60°C (140°F) at 80°C (176°F)	10 – 20 kΩ 4 – 7 kΩ 2 – 3 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ 0.2 – 0.4 kΩ
EGR gas temp. sensor	Resistance	at 50°C (122°F) at 100°C (212°F) at 150°C (302°F)	64 – 97 kΩ 11 – 16 kΩ 2 – 4 kΩ
Heated oxygen sensor	Heater coil resistance Bank 1 sensor 1 Bank 1 sensor 2	 at 20°C (68°F) at 20°C (68°F)	 11 – 16 Ω 11 – 16 Ω
Fuel cut RPM	Fuel return rpm	M/T A/T	1,400 rpm 1,500 rpm

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SS097–02

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Fuel line (Union bolt type)	29	300	22
Fuel line (Flare nut type)	30	310	22
Fuel pump bracket assembly x Fuel tank	3.9	40	35 in.·lbf
Fuel filter x Cylinder block	20	200	15
Fuel pressure regulator x Delivery pipe	8.8	90	78 in.·lbf
Delivery pipe x Cylinder head	21	210	15
Fuel inlet tube x Fuel filter	29	300	22
Fuel inlet tube x Delivery pipe	29	300	22
Air intake chamber x Intake manifold	21	210	15
Throttle body x Air intake chamber	20	200	14
Fuel evaporation tube x Fuel tank	1.5	15	13 in.·lbf
Fuel tank filler pipe x Fuel tank	3.5	35	31 in.·lbf
Fuel inlet pipe x Body	5.4	55	47 in.·lbf
Fuel tank band x Body	39	400	29
MAF meter x Air cleaner cap	10	100	7
ECT sensor x Cylinder head	20	200	14
Knock sensor x Cylinder block	44	450	33

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SFI (5VZ–FE)

SERVICE DATA

SS00U–11

Fuel pressure regulator	Fuel pressure	at no vacuum	265 – 304 kPa (2.7 – 3.1 kgf/cm^2, 38 – 44 psi)
Fuel pump	Resistance	at 20 °C (68 °F)	0.2 – 3.0 Ω
Injector	Resistance Injection volume Difference between each cylinder Fuel leakage		Approx. 13.8 Ω 56 – 69 cm^3 (3.4 – 4.2 cu in.) per 15 sec. 6 cm^3 (0.31 cu in.) or less 1 drop or less per minute
MAF meter	Resistance (THA – E2)	at –20 °C (–4 °F) at 0 °C (32 °F) at 20 °C (68 °F) at 40 °C (104 °F) at 60 °C (140 °F) at 80 °C (176 °F)	10 – 20 kΩ 4 – 7 kΩ 2 – 3 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ 0.2 – 0.4 kΩ
Throttle body	Throttle valve fully closed angle DP setting speed (M/T) Throttle opener setting speed		10° 1,800 – 2,200 rpm 900 – 1,950 rpm
Throttle position sensor	Clearance between stop screw and lever 0 mm (0 in.) 0.32 mm (0.013 in.) 0.54 mm (0.021 in.) Throttle valve fully open	 VTA – E2 IDL – E2 IDL – E2 VTA – E2 VC – E2	 0.28 – 6.4 kΩ 0.5 kΩ or less Infinity 2.0 – 11.6 kΩ 2.7 – 7.7 kΩ
IAC valve	Resistance (+B – RSO or RSC)	at cold at hot	17.0 – 24.5 Ω 21.5 – 28.5 Ω
VSV for fuel pressure control	Resistance	at 20 °C (68 °F)	33 – 39 Ω
VSV for EGR (2WD 0.5 ton)	Resistance	at 20 °C (68 °F)	33 – 39 Ω
VSV for EVAP	Resistance	at 20 °C (68 °F)	29 – 33 Ω
A/C idle–up valve (w/ A/C)	Resistance	at 20 °C (68 °F)	30 – 34 Ω
ECT sensor	Resistance	at –20 °C (–4 °F) at 0 °C (32 °F) at 20 °C (68 °F) at 40 °C (104 °F) at 60 °C (140 °F) at 80 °C (176 °F)	10 – 20 kΩ 4 – 7 kΩ 2 – 3 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ 0.2 – 0.4 kΩ
EGR gas temperature sensor (2WD 0.5 ton)	Resistance	at 50 °C (122 °F) at 100 °C (212 °F) at 150 °C (302 °F)	64 – 97 kΩ 11 – 16 kΩ 2 – 4 kΩ
Heated oxygen sensor	Heater coil resistance M/T Bank 1 Sensor 1 Others	 at 20 °C (68 °F) at 20 °C (68 °F)	 5 – 7 Ω 11 – 16 Ω
Fuel cut rpm	Fuel return rpm	M/T A/T	1,000 rpm 1,200 rpm

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SS00V–11

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Fuel line (Union bolt type)	34.3	350	25
Fuel line (Flare nut type)	34.3	350	25
Fuel line (Flare nut type) using SST	28	285	21
No. 2 timing belt cover x No. 3 timing belt cover	9	90	80 in.·lbf
Fuel inlet pipe x Intake manifold	8	80	71 in.·lbf
Delivery pipe x Intake manifold	13	130	10
Fuel pump bracket assembly x Fuel tank	3.9	40	35 in.·lbf
Fuel tank band x Body	43	440	32
Fuel tank filler pipe x Fuel tank	3.9	40	35 in.·lbf
Fuel evaporation vent tube x Fuel tank	1.5	15	13 in.·lbf
Fuel pressure regulator x LH delivery pipe	8	80	71 in.·lbf
MAF meter x Air cleaner cap	6.9	72	61 in.·lbf
VSV assembly x Air intake connector	8	80	71 in.·lbf
A/C idle–up valve x Intake air connector	20	200	14
ECT sensor x Intake manifold	20	200	14
Knock sensor x Cylinder block	39	400	29
EGR gas temperature sensor x EGR valve	20	200	14
Heated oxygen sensor x Front exhaust pipe, Center exhaust pipe	20	200	14

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COOLING (3RZ–FE)

SS098–01

SERVICE DATA

Thermostat	Valve opening temperature Valve lift at 95°C (203°F)	80 – 84°C (176 – 183°F) 8 mm (0.31 in.) or more
Radiator cap	Relief valve opening pressure STD Minimum	74 – 103 kPa (0.75 – 1.05 kgf/cm^2, 10.7 – 14.9 psi) 59 kPa (0.6 kgf/cm^2, 8.5 psi)

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SS099–01

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Cylinder block x Drain plug		24	250	18
Fluid coupling x Fan		5.5	55	49 in.·lbf
Water pump x Cylinder block	expect bolt A	8.9	90	78 in.·lbf
	for bolt A	24.5	250	18
Water inlet x Water inlet housing		20	200	15
Radiator support x Radiator tank	M/T	13	130	9
	A/T	5.5	56	49 in.·lbf
Radiator mounting bolt		31	310	23

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COOLING (5VZ–FE)

SS00Y–03

SERVICE DATA

Thermostat	Valve opening pressure		80 – 84°C (176 – 183°F)
	Valve lift	at 95°C (203°F)	8.5 mm (0.335 in .) or more
Radiator cap	Relief valve opening pressure	STD	74 – 103 kPa (0.75 – 1.05 kgf/cm^2, 10.7 – 14.9 psi)
		Minimum	59 kPa (0.6 kgf/cm^2, 8.5 psi)

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SS00Z–06

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Fan x Fan pulley bracket	5.4	55	48 in.·lbf
Water pump x Cylinder block – Short bolt	20	200	14
Water inlet x Water pump	20	200	14
Radiator support x Body	12	120	8.7

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LUBRICATION (3RZ–FE)

SERVICE DATA

SS09A–01

Oil pressure	At idle speed (normal operating temperature)		29 kPa (0.3 kgf/cm^2, 4.3 psi) or more
	At 3,000 rpm (normal operating temperature)		245 – 490 kPa (2.5 – 5.0 kgf/cm^2, 36 – 71 psi)
Oil pump	Body clearance	STD	0.100 – 0.175 mm (0.0039 – 0.0069 in.)
		Maximum	0.30 mm (0.0118 in.)
	Tip clearance	STD	0.011 – 0.240mm (0.0043 – 0.0094 in.)
		Maximum	0.25 mm (0.0098 in.)
	Side clearance	STD	0.030 – 0.090 mm (0.0012 – 0.0035 in.)
		Maximum	0.15 mm (0.0059 in.)

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SS09B–02

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Oil pan x Drain plug	25	250	18

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LUBRICATION (5VZ–FE)

SERVICE DATA

SS012–01

Oil pressure	Normal operating temperature	at idle speed	29 kPa (0.3 kgf/cm^2, 4.3 psi) or more
		at 3,000 rpm	245 – 520 kPa (2.5 – 5.3 kgf/cm^2, 36 – 75 psi)
Oil pump	Body clearance	STD	0.10 – 0.18 mm (0.0039 – 0.0069 in.)
		Maximum	0.30 mm (0.0118 in.)
	Tip clearance	STD	0.11 – 0.24 mm (0.0043 – 0.0094 in.)
		Maximum	0.35 mm (0.0138 in.)
	Side clearance	STD	0.03 – 0.09 mm (0.0012 – 0.0035 in.)
		Maximum	0.15 mm (0.0059 in.)

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SS013–05

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Oil pressure switch x Cylinder block		15	150	11
Oil pump x Oil pump body cover		10	105	8
Oil pump x Cylinder block	Bolt A	20	200	14
	Bolt B	42	420	31
Oil pump x Relief valve		37	375	27
Oil strainer x Cylinder block		7.5	76	66 in.·lbf
Oil pan x Cylinder block		7.6	78	67 in.·lbf
Oil cooler x Cylinder block		59	600	43

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IGNITION (3RZ–FE)

SS09C–03

SERVICE DATA

Firing order	–		1 – 3 – 4 – 2
High–tension cord	Resistance	Maximum	25 kΩ per cord
Spark plug	Recommended spark plug	ND	K16R–U
	Recommended spark plug	NGK	BKR5EYA
	Correct electrode gap		0.8 mm (0.031 in.)
Ignition coil	Resistance		
	Primary coil	Cold	0.36 – 0.55 Ω
		Hot	0.45 – 0.65 Ω
	Secondary coil	Cold	9.0 – 15.4 kΩ
		Hot	11.4 – 18.1 kΩ
Distributor	Air gap		0.2 – 0.4 mm (0.008 – 0.016 in.)
	Signal generator (pick up coil) Resistance		
		at cold G+ – G–	185 – 275 Ω
		at hot G+ – G–	240 – 325 Ω
Crankshaft position sensor	Resistance	at cold NE+ – NE–	1,630 – 2,740 Ω
		at hot NE+ – NE–	2,065 – 3,225 Ω

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SS09D–03

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head	20	200	14
Distributor x Cylinder head	19	195	14
Crankshaft position sensor x Timing chain cover	8.5	85	74 in.·lbf
Generator bracket x Cylinder block	74.5	760	55
Generator bracket x Timing chain cover	18	180	13

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IGNITION (5VZ–FE)

SS016-04

SERVICE DATA

Firing order	–		1 – 2 – 3 – 4 – 5 – 6
Spark plug	Recommended spark plug	ND	K16TR11
		NGK	BKR5EKB–11
	Correct electrode gap for new plug		1.1 mm (0.043 in.)
Ignition coil	Primary coil resistance	Cold	0.67 – 1.05 Ω
		Hot	0.85 – 1.23 Ω
	Secondary coil resistance	Cold	9.3 –16.0 kΩ
		Hot	11.7 – 18.8 kΩ
Camshaft position sensor	Resistance	Cold	835 – 1,400 Ω
		Hot	1,060 – 1,645 Ω
Crankshaft position sensor	Resistance	Cold	1,630 – 2,740 Ω
		Hot	2,065 – 3,225 Ω

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SS017–01

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head	18	180	13
Ignition coil x Cylinder head	7.8	80	69 in.·lbf
Camshaft position sensor x Cylinder head	7.8	80	69 in.·lbf
Crankshaft position sensor x Oil pump	7.8	80	69 in.·lbf

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STARTING (3RZ–FE)

SERVICE DATA

SS09E–02

Starter (1.2 kW, 1.4 kW type)	Rated voltage and output power		12 V 1.2 kW, 1.4 kW
	No–load characteristics	Current	90 A or less at 11.5 V
		rpm	3,000 rpm or more
	Brush length	STD	15.5 mm (0.610 in.)
		Minimum	10.0 mm (0.394 in.)
	Spring installed load		
	1.2 kW type	STD	13.7 – 19.6 N (1.40 – 2.00 kgf, 3.1 – 4.4 lbf)
		Minimum	9.8 N (1.00 kgf, 2.2 lbf)
	1.4 kW type	STD	17.6 – 23.5 N (1.80 – 2.40 kgf, 4.0 – 5.3 lbf)
		Minimum	11.8 N (1.20 kgf, 2.6 lbf)
	Commutator		
	Diameter	STD	30.0 mm (1.18 in.)
		Minimum	29.0 mm (1.14 in.)
	Undercut depth	STD	0.6 mm (0.024 in.)
		Minimum	0.2 mm (0.008 in.)
	Circle runout	Maximum	0.05 mm (0.0020 in.)
	Magnetic switch		
	Contact plate for wear	Maximum	0.9 mm (0.035 in.)
Starter (1.8 kW, 2.0 kW type)	Rated voltage and output power		12 V 1.8 kW, 2.0 kW
	No–load characteristics	Current	100 A or less at 11.5 V
		rpm	2,500 rpm or more
	Brush length	STD	15.0 mm (0.591 in.)
		Minimum	9.0 mm (0.354 in.)
	Spring installed load	STD	21.5 – 27.5 N (2.20 – 2.80 kgf, 4.9 – 6.2 lbf)
		Minimum	12.7 N (1.30 kgf, 2.7 lbf)
	Commutator		
	Diameter	STD	35.0 mm (1.38 in.)
		Minimum	34.0 mm (1.34 in.)
	Undercut depth	STD	0.7 mm (0.028 in.)
		Minimum	0.2 mm (0.008 in.)
	Circle runout	Maximum	0.05 mm (0.0020 in.)
	Magnetic switch		
	Contact plate for wear	Maximum	0.9 mm (0.035 in.)

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SS09F–02

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Starter mounting bolt		39	400	29
Starter wire mounting nut		8.8	90	78 in.·lbf
Lead wire x Terminal C of starter		5.9	60	52 in.·lbf
Field frame x Starter housing	1.2 kW, 1.4 kW type	5.9	60	52 in.·lbf
	1.8 kW, 2.0 kW type	9.3	95	82 in.·lbf
Starter housing x Magnetic switch	1.2 kW, 1.4 kW type	5.9	60	52 in.·lbf
	1.8 kW, 2.0 kW type	9.3	95	82 in.·lbf
End cover x Field frame	1.2 kW, 1.4 kW type	1.5	15	13 in.·lbf
	1.8 kW, 2.0 kW type	3.8	39	34 in.·lbf
Terminal nut x Terminal 30 of starter		17	170	12
Terminal nut x Terminal C of starter		17	170	12
Magnetic switch end cover x Magnetic switch	1.2 kW, 1.4 kW type	2.5	25	22
	1.8 kW, 2.0 kW type	3.6	35	30

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STARTING (5VZ–FE)

SERVICE DATA

SS01A–11

Starter (1.4 kW type)	Rated voltage and output power		12 V 1.2 kW 1.4 kW
	No–load characteristics	Current	90 A or less at 11.5 V
		rpm	3,000 rpm or more
	Brush length	STD	15.5 mm (0.610 in.)
		Minimum	10.0 mm (0.394 in.)
	Spring installed load		
	1.2 kW type	STD	13.7 – 19.6 N (1.40 – 2.00 kgf, 3.1 – 4.4 lbf)
		Minimum	9.8 N (1.00 kgf, 2.2 lbf)
	1.4 kW type	STD	17.6 – 23.5 N (1.80 – 2.40 kgf, 4.0 – 5.3 lbf)
		Minimum	11.8 N (1.20 kgf, 2.6 lbf)
	Commutator		
	Diameter	STD	30 mm (1.180 in.)
		Minimum	29 mm (1.140 in.)
	Undercut depth	STD	0.6 mm (0.024 in.)
		Minimum	0.2 mm (0.008 in.)
	Circle runout	Maximum	0.05 mm (0.0020 in.)
	Magnetic switch		
	Contact plate for wear	Maximum	0.9 mm (0.035 in.)
Starter (1.8 kW type)	Rated voltage and output power		12 V 1.8 kW
	No–load characteristics	Current	100 A or less at 11.5 V
		rpm	2,500 rpm or more
	Brush length	STD	15.0 mm (0.591 in.)
		Minimum	9.0 mm (0.354 in.)
	Spring installed load	STD	21.5 – 27.5 N (2.20 – 2.80 kgf, 4.9 – 6.2 lbf)
		Minimum	12.7 N (1.30 kgf, 2.7 lbf)
	Commutator		
	Diameter	STD	35 mm (1.380 in.)
		Minimum	34 mm (1.340 in.)
	Undercut depth	STD	0.7 mm (0.028 in.)
		Minimum	0.2 mm (0.008 in.)
	Circle runout	Maximum	0.05 mm (0.0020 in.)
	Magnetic switch		
	Contact plate for wear	Maximum	0.9 mm (0.035 in.)

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SS01B–08

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Starter wire mounting nut		8.8	90	78 in.·lbf
Starter mounting bolt		39	400	29
Lead wire x Terminal C of starter		5.9	60	52 in.·lbf
Field frame, Magnetic switch x Starter housing	1.2 kW, 1.4 kW type	5.9	60	52 in.·lbf
	1.8 kW type	9.3	95	82 in.·lbf
End cover x Field frame	1.2 kW, 1.4 kW type	1.5	15	13 in.·lbf
	1.8 kW type	3.8	39	34 in.·lbf
Terminal nut x Terminal C of starter, Terminal 30 of starter		17	170	12
Magnetic switch end cover x Magnetic switch	1.2 kW, 1.4 kW type	2.5	25	22 in.·lbf
	1.8 kW type	3.6	35	30 in.·lbf

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CHARGING (3RZ–FE)

SS09G–02

SERVICE DATA

Battery	Standard voltage	at 20°C (68°F)	12.5 –12.9 V
Drive belt	Tension		
	New belt		175 ± 51 lbf
	Used belt		115 ± 20 lbf
Generator	Rated output		12 V – 60 A
	Rotor coil resistance		2.8 – 3.0 Ω
	Slip ring diameter	STD	14.2 mm – 14.4 mm (0.559 – 0.567 in.)
		Minimum	12.8 mm (0.504 in.)
	Brush exposed length	STD	10.5 mm (0.413 in.)
		Minimum	1.5 mm (0.059 in.)
Voltage regulator	Regulating voltage	at 25 °C (77 °F)	14.0 – 15.0 V
		at 115 °C (239 °F)	13.5 – 14.3 V

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SS09H–02

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Drive end frame x Rectifier end frame	4.5	46	40 in.·lbf
Generator pulley x Rotor	110	1,125	81
Rectifier holder x Coil lead on rectifier end frame	2.0	20	17 in.·lbf
Rear end cover x Rectifier holder	4.5	46	40 in.·lbf
Terminal insulator x Rectifier holder	4.1	41.5	36 in.·lbf
Pivot bolt (For generator) Generator x Generator bracket	59	600	43
Lock bolt (For generator) Generator x Adjusting bar	29	300	21
Bearing retainer x Drive end frame	2.6	27	23 in.·lbf
Voltage regulator and brush holder x Rectifier end frame	2.0	20	17 in.·lbf

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CHARGING (5VZ–FE)

SERVICE DATA

SS01A–12

Battery	Voltage	at 20 °C (68 °F)	12.7 – 12.9 V
Drive belt	Tension		
	New belt	3RZ–FE	175 ± 5 lbf
		5VZ–FE	160 ± 20 lbf
	used belt	3RZ–FE	115 ± 20 lbf
		5VZ–FE	100 ± 20 lbf
Generator	Rated output		12 V – 60 A
	Rotor coil resistance		2.8 – 3.0 Ω
	Slip ring diameter	STD	14.2 mm – 14.4 mm (0.559 – 0.567 in.)
		Minimum	12.8 mm (0.504 in.)
	Brush exposed length	STD	10.5 mm (0.413 in.)
		Minimum	1.5 mm (0.059 in.)
Voltage regulator	Regulating voltage	at 25 °C (77 °F)	14.0 – 15.0 V
		at 115 °C (239 °F)	13.5 – 14.3 V

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SS01B–09

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Bearing retainer x Drive end frame	2.6	27	23 in.·lbf
Rectifier end frame x Drive end frame	4.5	46	40 in.·lbf
Generator pulley x Rotor	110	1,125	81
Rectifier holder x Coil lead on rectifier end frame	2.0	20	17 in.·lbf
Voltage regulator and brush holder x Rectifier end frame	2.0	20	17 in.·lbf
Rear end cover x Rectifier holder	4.5	46	40 in.·lbf
Terminal insulator x Rectifier holder	4.1	41.5	36 in.·lbf
Generator x Generator bracket (3RZ–FE)	59	600	43
Generator x Adjusting bar (3RZ–FE)	29	300	21
Generator x Generator bracket (5VZ–FE)	51	520	38
Generator x Adjusting bar (5VZ–FE)	18.5	185	14

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CLUTCH

SERVICE DATA

SS07T–01

Pedal height from flower panel		154.6 – 164.6 mm (6.087 – 6.480 in.)
Pedal height from asphalt sheet	Extra Cab (4WD)	150.1 – 160.1 mm (5.909 – 6.303 in.)
Pedal height from asphalt sheet	Others	153.1 – 163.1 mm (6.027 – 6.421 in.)
Push rod play at pedal top		1.0 – 5.0 mm (0.039 – 0.197 in.)
Pedal freeplay		5.0 – 15.0 mm (0.197 – 0.591 in.)
Clutch release point from pedal full stroke end position		25 mm (0.98 in.) or more
Clutch start switch	ON–OFF Stroke	5.0 ± 0.5 mm (0.197 ± 0.020 in.)
Slotted spring pin protrusion		1.5 – 3.5 mm (0.059 – 0.138 in.)
Disc rivet head depth	Min.	0.3 mm (0.012 in.)
Disc runout	Max.	0.8 mm (0.031 in.)
Flywheel runout	Max.	0.1 mm (0.004 in.)
Diaphragm spring finger wear	Max. depth	0.6 mm (0.024 in.)
Diaphragm spring finger wear	Max. width	5.0 mm (0.197 in.)
Diaphragm spring tip non–alignment	Max.	0.5 mm (0.020 in.)

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SS07U–03

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Clutch line union		15	155	11
Master cylinder installation nut		13	130	9
Bleeder plug		11	110	8
Clutch cover x Flywheel		19	195	14
Release cylinder installation bolt		12	120	9
Release fork support	5VZ–FE	47	480	35
Release fork support	3RZ–FE	39	400	29

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MANUAL TRANSMISSION(R150, R150F)

SERVICE DATA

SS07V–01

Output shaft 1st gear journal diameter	Min.	38.860 mm (1.5299 in.)
Output shaft 2nd gear journal diameter	Min.	46.860 mm (1.8449 in.)
Output shaft 3rd gear journal diameter	Min.	37.860 mm (1.4905 in.)
Output shaft flange thickness	Min.	4.70 mm (0.1850 in.)
Output shaft runout	Max.	0.06 mm (0.0024 in.)
Gear thrust clearance 1st	STD	0.15–0.45 mm (0.0059–0.0177 in.)
	Max.	0.50 mm (0.0197 in.)
Gear thrust clearance 2nd	STD	0.10–0.25 mm (0.0039–0.0098 in.)
	Max.	0.30 mm (0.0118 in.)
Gear thrust clearance 3rd	STD	0.10–0.25 mm (0.0039–0.0098 in.)
	Max.	0.30 mm (0.0118 in.)
Gear radial clearance 1st	STD	0.020–0.073 mm (0.0008–0.0029 in.)
	Max.	0.160 mm (0.0063 in.)
Gear radial clearance 2nd	STD	0.015–0.068 mm (0.0006–0.0027 in.)
	Max.	0.160 mm (0.0063 in.)
Gear radial clearance 3rd	STD	0.015–0.068 mm (0.0006–0.0027 in.)
	Max.	0.160 mm (0.0063 in.)
Shift fork to hub sleeve clearance	Max.	1.0 mm (0.039 in.)
Synchronizer ring to gear clearance	Min.	0.8 mm (0.031 in.)
Input shaft snap ring thickness		
	Mark A	2.10–2.15 mm (0.0827–0.0846 in.)
	Mark B	2.15–2.20 mm (0.0846–0.0866 in.)
	Mark C	2.20–2.25 mm (0.0866–0.0886 in.)
	Mark D	2.25–2.30 mm (0.0886–0.0906 in.)
	Mark E	2.30–2.35 mm (0.0906–0.0925 in.)
	Mark F	2.35–2.40 mm (0.0925–0.0945 in.)
	Mark G	2.40–2.45 mm (0.0945–0.0965 in.)
Output shaft snap ring thickness		
Clutch hub No.1	Mark A	2.30–2.35 mm (0.0906–0.0925 in.)
	Mark B	2.35–2.40 mm (0.0925–0.0945 in.)
	Mark C	2.40–2.45 mm (0.0945–0.0965 in.)
	Mark D	2.45–2.50 mm (0.0965–0.0984 in.)
	Mark E	2.50–2.55 mm (0.0984–0.1004 in.)
	Mark F	2.55–2.60 mm (0.1004–0.1024 in.)
	Mark G	2.60–2.65 mm (0.1024–0.1043 in.)
Output shaft snap ring thickness		
Clutch hub No.2	Mark A	1.80–1.85 mm (0.0709–0.0728 in.)
	Mark B	1.85–1.90 mm (0.0728–0.0748 in.)
	Mark C	1.90–1.95 mm (0.0748–0.0768 in.)
	Mark D	1.95–2.00 mm (0.0768–0.0787 in.)
	Mark E	2.00–2.05 mm (0.0787–0.0807 in.)
	Mark F	2.05–2.10 mm (0.0807–0.0827 in.)
	Mark G	2.10–2.15 mm (0.0827–0.0846 in.)

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Output shaft snap ring thickness		
Rear	Mark A	2.65–2.70 mm (0.1043–0.1063 in.)
	Mark B	2.70–2.75 mm (0.1063–0.1083 in.)
	Mark C	2.75–2.80 mm (0.1083–0.1102 in.)
	Mark D	2.80–2.85 mm (0.1102–0.1122 in.)
	Mark E	2.85–2.90 mm (0.1122–0.1142 in.)
	Mark F	2.90–2.95 mm (0.1142–0.1161 in.)
	Mark G	2.95–3.00 mm (0.1161–0.1181 in.)
	Mark H	3.00–3.05 mm (0.1181–0.1201 in.)
	Mark J	3.05–3.10 mm (0.1201–0.1220 in.)
	Mark K	3.10–3.15 mm (0.1220–0.1240 in.)
	Mark L	3.15–3.20 mm (0.1240–0.1260 in.)
	Mark M	3.20–3.25 mm (0.1260–0.1280 in.)
	Mark N	3.25–3.30 mm (0.1280–0.1299 in.)
	Mark P	3.30–3.35 mm (0.1299–0.1319 in.)
	Mark Q	3.35–3.40 mm (0.1319–0.1339 in.)
	Mark R	3.40–3.45 mm (0.1339–0.1358 in.)
	Mark S	3.45–3.50 mm (0.1358–0.1378 in.)
Counter gear roller bearing journal diameter	Min.	27.860 mm (1.0968 in.)
Counter 5th gear thrust clearance	STD	0.10–0.35 mm (0.0039–0.0138 in.)
	Max.	0.40 mm (0.0157 in.)
Counter 5th radial clearance	STD	0.015–0.068 mm (0.0006–0.0027 in.)
	Max.	0.160 mm (0.0063 in.)
Reverse idler gear radial clearance	STD	0.040–0.082 mm (0.0016–0.0032 in.)
	Max.	0.130 mm (0.0051 in.)
Reverse idler gear to shift arm clearance	STD	0.05–0.35 mm (0.0020–0.0138 in.)
	Max.	0.50 mm (0.0197 in.)
Counter gear snap ring thickness		
Front	Mark A	2.00–2.05 mm (0.0787–0.0807 in.)
	Mark B	2.05–2.10 mm (0.0807–0.0827 in.)
	Mark C	2.10–2.15 mm (0.0827–0.0846 in.)
	Mark D	2.15–2.20 mm (0.0846–0.0866 in.)
	Mark E	2.20–2.25 mm (0.0866–0.0886 in.)
	Mark F	2.25–2.30 mm (0.0886–0.0906 in.)
Counter gear snap ring thickness		
Rear	Mark A	2.80–2.85 mm (0.1102–0.1122 in.)
	Mark B	2.85–2.90 mm (0.1122–0.1142 in.)
	Mark C	2.90–2.95 mm (0.1142–0.1161 in.)
	Mark D	2.95–3.00 mm (0.1161–0.1181 in.)
	Mark E	3.00–3.05 mm (0.1181–0.1201 in.)
	Mark F	3.05–3.10 mm (0.1201–0.1220 in.)
	Mark G	3.10–3.15 mm (0.1220–0.1240 in.)
Oil seal drive in depth		
Speedometer driven gear		25 mm (0.98 in.)
Front bearing retainer (from retainer end)		11.7 ± 0.5 mm (0.461 ± 0.020 in.)
Extension housing		0 ± 0.5 mm (0 ± 0.020 in.)
Transfer adaptor		45.6 ± 0.5 mm (1.795 ± 0.020 in.)

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SS07W–01

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Transmission x Engine	72	730	53
Stiffener plate x Engine (4WD)	37	380	27
Stiffener plate x Transmission (4WD)	37	380	27
Starter x Transmission	39	400	29
Engine rear mounting x Transmission	65	660	48
Rear end plate x Transmission (2WD)	18	185	13
Clutch release cylinder x Transmission	12	120	9
Front exhaust pipe x TWC	48	490	35
Front exhaust pipe support bracket	44	450	33
Front exhaust pipe x Exhaust manifold	62	630	46
Crossmember x Engine rear mounting (4WD)	18	180	13
Engine rear mounting bracket x Engine rear mounting (2WD)	18	180	13
Engine rear mounting bracket x Frame (2WD)	58	590	43
Crossmember x Frame (4WD)	95	970	70
Transmission x Transfer (4WD)	37	380	27
Reverse shift arm bracket set bolt	18	185	13
Rear bearing retainer x Intermediate plate	18	185	13
Shift fork x Shift fork shaft	20	200	14
Straight screw plug	19	190	14
Front bearing retainer x Transmission case	17	170	12
Transmission case x Transfer adaptor	37	380	27
Transmission case x Extension housing	37	380	27
Shift lever housing set bolt	38	390	28
Clutch housing x Transmission case	36	370	27
Oil receiver x Extension housing	11	115	8
Back–up light switch	44	450	32
Restrict pin	37	380	27
Control shift lever retainer x Transfer adaptor	18	185	13
Control shift lever retainer x Extension housing	18	185	13
Filler and drain plug	37	380	27
Speedometer driven gear (2WD)	11	115	8

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MANUAL TRANSMISSION (W59)

SERVICE DATA

SS05Z–03

Output shaft 2nd gear journal diameter	Min.	42.975 mm (1.6919 in.)
Output shaft 3rd gear journal diameter	Min.	31.969 mm (1.2586 in.)
Output shaft flange thickness	Min.	5.60 mm (0.2205 in.)
Output shaft runout	Max.	0.06 mm (0.0024 in.)
1st gear inner race flange thickness	Min.	4.78 mm (0.1881 in.)
1st gear inner race outer diameter	Min.	42.975 mm (1.6919 in.)
Counter gear bearing journal diameter	Min.	29.950 mm (1.1791 in.)
Counter 5th gear journal diameter	Min.	26.975 mm (1.0620 in.)
1st, 2nd and 3rd gear thrust clearance	STD	0.10 – 0.25 mm (0.0039 – 0.0098 in.)
	Max.	0.30 mm (0.0118 in.)
Counter 5th gear thrust clearance	STD	0.10 – 0.41 mm (0.0039 – 0.0161 in.)
	Max.	0.46 mm (0.0181 in.)
1st, 2nd and counter 5th gear radial clearance	STD	0.009 – 0.060 mm (0.0004 – 0.0024 in.)
	Max.	0.150 mm (0.0059 in.)
3rd gear radial clearance	STD	0.015 – 0.066 mm (0.0006 – 0.0026 in.)
	Max.	0.200 mm (0.0079 in.)
Reverse idler gear radial clearance	STD	0.041 – 0.074 mm (0.0016 – 0.0029 in.)
	Max.	0.194 mm (0.0076 in.)
Reverse idler gear to shift arm shoe clearance	STD	0.20 – 0.41 mm (0.0080 – 0.0161 in.)
	Max.	0.90 mm (0.0354 in.)
Shift fork to hub sleeve clearance	Max.	1.0 mm (0.039 in.)
Synchronizer ring to 1st and 4th gear clearance	Min.	0.5 mm (0.020 in.)
Synchronizer ring to 2nd and 3rd gear clearance	Min.	0.7 mm (0.028 in.)
Input shaft snap ring thickness		
	Mark 1	2.05 – 2.10 mm (0.0807 – 0.0827 in.)
	Mark 2	2.10 – 2.15 mm (0.0827 – 0.0846 in.)
	Mark 3	2.15 – 2.20 mm (0.0846 – 0.0866 in.)
	Mark 4	2.20 – 2.25 mm (0.0866 – 0.0886 in.)
	Mark 5	2.25 – 2.30 mm (0.0886 – 0.0906 in.)
	Mark 11	2.30 – 2.35 mm (0.0906 – 0.0925 in.)
	Mark 12	2.35 – 2.40 mm (0.0925 – 0.0945 in.)
Output shaft snap ring thickness		
No.2 clutch hub	Mark C–1	1.75 – 1.80 mm (0.0689 – 0.0709 in.)
	Mark D	1.80 – 1.85 mm (0.0709 – 0.0728 in.)
	Mark 11	1.86 – 1.91 mm (0.0732 – 0.0752 in.)
	Mark 12	1.92 – 1.97 mm (0.0756 – 0.0776 in.)
	Mark 13	1.98 – 2.03 mm (0.0780 – 0.0799 in.)
	Mark 14	2.04 – 2.09 mm (0.0803 – 0.0823 in.)
	Mark 15	2.10 – 2.15 mm (0.0827 – 0.0846 in.)
Output shaft snap ring thickness		
Rear bearing	Mark 8	2.31 – 2.36 mm (0.0909 – 0.0929 in.)
	Mark 9	2.37 – 2.42 mm (0.0933 – 0.0953 in.)
	Mark 10	2.43 – 2.48 mm (0.0957 – 0.0976 in.)
	Mark 11	2.49 – 2.54 mm (0.0980 – 0.1000 in.)
	Mark 12	2.55 – 2.60 mm (0.1004 – 0.1024 in.)
	Mark 13	2.61 – 2.66 mm (0.1028 – 0.1047 in.)
	Mark 14	2.68 – 2.73 mm (0.1055 – 0.1075 in.)
	Mark 15	2.74 – 2.79 mm (0.1079 – 0.1098 in.)

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Output shaft snap ring thickness		
Reverse gear	Mark 5	2.25 – 2.30 mm (0.0886 – 0.0906 in.)
	Mark 11	2.30 – 2.35 mm (0.0906 – 0.0925 in.)
	Mark 12	2.35 – 2.40 mm (0.0925 – 0.0945 in.)
	Mark 13	2.40 – 2.45 mm (0.0945 – 0.0965 in.)
	Mark 14	2.45 – 2.50 mm (0.0965 – 0.0984 in.)
	Mark 15	2.50 – 2.55 mm (0.0984 – 0.1004 in.)
	Mark 16	2.55 – 2.60 mm (0.1004 – 0.1024 in.)
	Mark 17	2.61 – 2.66 mm (0.1028 – 0.1047 in.)
	Mark 18	2.67 – 2.72 mm (0.1051 – 0.1071 in.)
	Mark 19	2.73 – 2.78 mm (0.1075 – 0.1094 in.)
	Mark 20	2.79 – 2.84 mm (0.1098 – 0.1118 in.)
	Mark 21	2.85 – 2.90 mm (0.1122 – 0.1142 in.)
	Mark 22	2.91 – 2.96 mm (0.1146 – 0.1165 in.)
	Mark 23	2.97 – 3.02 mm (0.1169 – 0.1189 in.)
Coutner gear snap ring thickness		
Front bearing	Mark A	2.05 – 2.10 mm (0.0807 – 0.0827 in.)
	Mark B	2.10 – 2.15 mm (0.0827 – 0.0846 in.)
	Mark C	2.15 – 2.20 mm (0.0846 – 0.0866 in.)
	Mark D	2.20 – 2.25 mm (0.0866 – 0.0886 in.)
	Mark E	2.25 – 2.30 mm (0.0886 – 0.0906 in.)
	Mark F	2.30 – 2.35 mm (0.0906 – 0.0925 in.)
	Mark G	2.35 – 2.40 mm (0.0925 – 0.0945 in.)
Counter gear snap ring thickness		
No.3 clutch hub	Mark 2	2.06 – 2.11 mm (0.0811 – 0.0831 in.)
	Mark 3	2.12 – 2.17 mm (0.0835 – 0.0854 in.)
	Mark 4	2.18 – 2.23 mm (0.0858 – 0.0878 in.)
	Mark 5	2.24 – 2.29 mm (0.0882 – 0.0902 in.)
Counter gear snap ring thickness		
Rear bearing	Mark 1	1.90 – 1.95 mm (0.0748 – 0.0768 in.)
	Mark 2	1.96 – 2.01 mm (0.0772 – 0.0791 in.)
	Mark 3	2.02 – 2.07 mm (0.0795 – 0.0815 in.)
	Mark 4	2.08 – 2.13 mm (0.0819 – 0.0839 in.)
	Mark 5	2.14 – 2.19 mm (0.0843 – 0.0862 in.)
	Mark 6	2.20 – 2.25 mm (0.0866 – 0.0886 in.)
	Mark 7	2.26 – 2.31 mm (0.0890 – 0.0909 in.)
Oil seal drive in depth		
Front bearing retainer (from retainer end)		12.2 ± 0.5 mm (0.480 ± 0.020 in.)
Extension housing		0 ± 0.5 mm (0 ± 0.020 in.)
Speedometer drive gear		25 mm (0.98 in.)

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SS060–03

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Transmission x Engine	72	730	53
Transmission x Starter	39	400	29
Rear end plate x Clutch housing	37	380	27
Shift fork set bolt	20	200	14
Straight screw plug	25	250	18
Reverse idler gear shaft stopper bolt	25	250	18
Oil separator x Intermediate plate	18	185	13
Front bearing retainer set bolt	25	250	18
Extension housing x Intermediate plate	37	380	27
Restrict pin	40	410	30
Shift lever housing x Shift and select lever shaft	39	400	29
Control shift lever retainer x Extension housing	18	185	13
Drain and filler plugs	37	380	27
Back–up light switch	40	410	30
Clutch housing x Transmission case	37	380	27
Rear bearing retainer x Intermediate plate	18	185	13
Speedometer driven gear	13	130	9

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AUTOMATIC TRANSMISSION

SERVICE DATA

SS089–02

Line pressure (Wheel locked)		
(3RZ–FE)		
	Engine idling	
	D position	363 – 422 kPa (3.7 – 4.2 kgf/cm^2, 53 – 61 psi)
	R position	490 – 588 kPa (5.0 – 6.0 kgf/cm^2, 71 – 85 psi)
	at stall (Throttle valve fully opened)	
	D position	932 – 1,177 kPa (9.5 – 12.0 kgf/cm^2, 135 – 171 psi)
	R position	1,294 – 1,638 kPa (13.2 – 16.7 kgf/cm^2, 188 – 238 psi)
(5VZ–FE)		
	Engine idling	
	D position	363 – 422 kPa (3.7 – 4.2 kgf/cm^2, 53 – 61 psi)
	R position	608 – 696 kPa (6.2 – 7.1 kgf/cm^2, 88 – 101 psi)
	at stall (Throttle valve fully opened)	
	D position	902 – 1,147 kPa (9.2 – 11.7 kgf/cm^2, 131 – 166 psi)
	R position	1,432 – 1,942 kPa (14.6 – 19.8 kgf/cm^2, 208 – 282 psi)
Engine stall revolution (D and R positions)	3RZ–FE	1,950 ± 150 rpm
	5VZ–FE	2,150 ± 150 rpm
Time lag	N → D position	Less than 1.2 seconds
	N → R position	Less than 1.5 seconds
Engine idle speed (A/C OFF and N position)		700 ± 50 rpm
Throttle cable adjustment (Throttle valve fully opened)		Between boot end face and inner cable stopper 0 – 1 mm (0 – 0.04 in.)
Drive plate runout	Max.	0.20 mm (0.0079 in.)
Torque converter runout	Max.	0.30 mm (0.0118 in.)
Torque converter installation distance	3R–FE	More than 31.75 mm (1.2500 in.)
	5VZ–FE	More than 17.95 mm (0.7067 in.)
Speedometer driven gear oil seal drive in depth	3RZ–FE	20 mm (0.79 in.)
	5VZ–FE	20 mm (0.79 in.)
Lock–up point		
(3RZ–FE / A340E)		
D position		
(Throttle valve opening 5%)	Lock–up ON	83 – 88 km/h (52 – 55 mph)
	Lock–up OFF	70 – 75 km/h (44 – 47 mph)
(5VZ–FE / A340E)		
D position		
(Throttle valve opening 5%)	Lock–up ON	79 – 84 km/h (49 – 52 mph)
	Lock–up OFF	72 – 77 km/h (45 – 48 mph)
(5VZ–FE / A340F)		
(Throttle valve opening 5%)	Lock–up ON	75 – 80 km/h (47 – 50 mph)
	Lock–up OFF	68 – 73 km/h (42 – 45 mph)

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Shift schedule		
(3RZ–FE / A340E)		
D position		
(Throttle valve fully opened)	1 → 2	55 – 60 km/h (34 – 37 mph)
	2 → 3	99 – 108 km/h (62 – 67 mph)
	3 → O/D	127 – 136 km/h (79 – 85 mph)
	O/D → 3	120 – 130 km/h (75 – 81 mph)
	3 → 2	92 – 98 km/h (57 – 61 mph)
	2 → 1	44 – 48 km/h (27 – 30 mph)
(Throttle valve fully closed)	3 → O/D	34 – 39 km/h (21 – 24 mph)
	O/D → 3	25 – 30 km/h (16 – 19 mph)
2 position		
(Throttle valve fully opened)	1 → 2	55 – 60 km/h (34 – 37 mph)
	3 → 2	110 – 120 km/h (68 – 75 mph)
	2 → 1	44 – 48 km/h (27 – 30 mph)
L position		
(Throttle valve fully opened)	2 → 1	53 – 58 km/h (33 – 36 mph)
(5VZ–FE / A340E)		
D position		
(Throttle valve fully opened)	1 → 2	57 – 62 km/h (35 – 39 mph)
	2 → 3	108 – 117 km/h (67 – 73 mph)
	3 → O/D	146 – 155 km/h (91 – 96 mph)
	O/D → 3	139 – 148 km/h (86 – 92 mph)
	3 → 2	99 – 108 km/h (62 – 67 mph)
	2 → 1	46 – 51 km/h (29 – 32 mph)
(Throttle valve fully closed)	3 → O/D	44 – 49 km/h (27 – 30 mph)
	O/D → 3	22 – 27 km/h (14 – 17 mph)
2 position		
(Throttle valve fully opened)	1 → 2	57 – 62 km/h (35 – 39 mph)
	3 → 2	115 – 124 km/h (71 – 77 mph)
	2 → 1	46 – 51 km/h (29 – 32 mph)
L position		
(Throttle valve fully opened)	2 → 1	52 – 58 km/h (32 – 36 mph)
(5VZ–FE / A340F)		
D position		
(Throttle valve fully opened)	1 → 2	55 – 59 km/h (35 – 39 mph)
	2 → 3	103 – 111 km/h (64 – 69 mph)
	3 → O/D	139 – 147 km/h (86 – 91 mph)
	O/D → 3	133 – 141 km/h (83 – 88 mph)
	3 → 2	95 – 103 km/h (59 – 64 mph)
	2 → 1	44 – 48 km/h (27 – 30 mph)
(Throttle valve fully closed)	3 → O/D	42 – 47 km/h (26 – 29 mph)
	O/D → 3	21 – 26 km/h (13 – 16 mph)
2 position		
(Throttle valve fully opened)	1 → 2	55 – 59 km/h (34 – 37 mph)
	3 → 2	110 – 118 km/h (68 – 73 mph)
	2 → 1	44 – 48 km/h (27 – 30 mph)
L position		
(Throttle valve fully opened)	2 → 1	53 – 58 km/h (33 – 36 mph)

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SS08A–03

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Valve body x Transmission case		10	100	7
Oil strainer x Valve body	(A340E)	5.4	55	48 in.·lbf
Oil strainer case x Valve body	(A340F)	10	100	7
Oil strainer x Valve body	(A340F)	6.9	70	61 in.·lbf
Oil pan		7.4	75	65 in.·lbf
Drain plug		20	205	15
Parking lock pawl bracket x Transmission case		7.4	75	65 in.·lbf
Extension housing x Transmission case	(A340E)	36	370	27
Extension housing x Rear mounting insulator		25	250	18
Rear support member x Rear mounting insulator	(A340F)	18	180	13
Rear support member x Body	(A340F)	95	970	70
Rear mounting insulator x Rear mounting bracket	(A340E)	18	180	13
Rear mounting bracket x Frame	(A340E)	58	590	42
Propeller shaft x Rear differential	(A340E)	74	750	54
Front propeller shaft x Front differential	(A340F)	74	750	54
Front propeller shaft x Transfer	(A340F)	74	750	54
Rear propeller shaft x Transfer	(A340F)	74	750	54
Rear propeller shaft x Rear differential	(A340F)	74	750	54
Center support bearing x Body		36	370	27
Drive plate x Crankshaft		83	850	61
Torque converter clutch x Drive plate		41	420	30
Stiffener plate x Engine	(A340F)	37	380	27
Stiffener plate x Transmission		37	380	27
Front exhaust pipe x Exhaust manifold		62	630	46
Front exhaust pipe x TWC		48	490	35
Rear support member x Dynamic damper		61	620	44
Oil cooler pipe		34	350	25
Transmission x Engine		71	730	53
Rear end plate x Transmission		37	380	27
Rear support member x Transfer under cover		29	300	21
Cross shaft x Frame		28	290	21
Cross shaft x Transmission		13	130	9
Cross shaft x No.1 gear shifting rod		13	130	9
Exhaust pipe clamp	(3RZ–FE)	19	195	14
Exhaust pipe support bracket x Transmission	(3RZ–FE)	71	730	53
Exhaust pipe support bracket x Transmission	(5VZ–FE)	44	450	33
Exhaust pipe support bracket x Exhaust pipe	(5VZ–FE)	44	450	33
Park/neutral position switch	(Nut)	3.9	40	35 in.·lbf
Park/neutral position switch	(Bolt)	13	130	9
No.2 vehicle speed sensor		5.4	55	48 in.·lbf
Speedometer driven gear sleeve x Locking plate		16	160	12
ATF temperature sensor x Transmission		15	150	11
Shift lever assembly x Steering column assembly		29	300	22

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Shift lever sub–assembly x Control shaft assembly	19	195	14
Casing cap x Control shaft support sub–assembly	50	510	37

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TRANSFER

SERVICE DATA

SS08Z–02

Oil pump body		
Body clearance	STD	0.10 – 0.16 mm (0.0039 – 0.0063 in.)
	Maximum	0.16 mm (0.0063 in.)
Tip clearance	STD	0.08 – 0.15 mm (0.0031 – 0.0059 in.)
	Maximum	0.16 mm (0.0063 in.)
Side clearance	STD	0.03 – 0.08 mm (0.0012 – 0.0031 in.)
	Maximum	0.08 mm (0.0031 in.)
Rear output shaft assembly		
Drive sprocket thrust clearance	STD	0.10 – 0.25 mm (0.0039 – 0.0098 in.)
	Maximum	0.25 mm (0.0098 in.)
Rear output shaft journal diameter		
(part A)	Minimum	27.98 mm (1.1016 in.)
(part B)	Minimum	36.99 mm (1.4563 in.)
Drive sprocket radial clearance	STD	0.010 – 0.055 mm (0.0004 – 0.0022 in.)
	Maximum	0.055 mm (0.0022 in.)
Front drive shift fork to hub sleeve clearance	Maximum	1.0 mm (0.039 in.)
High and low shift fork to hub sleeve clearance	Maximum	1.0 mm (0.039 in.)
Rear output shaft snap ring thickness	Mark	
	A	2.10 – 2.15 mm (0.0827 – 0.0846 in.)
	B	2.15 – 2.20 mm (0.0846 – 0.0866 in.)
	C	2.20 – 2.25 mm (0.0866 – 0.0886 in.)
	D	2.25 – 2.30 mm (0.0886 – 0.0906 in.)
	E	2.30 – 2.35 mm (0.0906 – 0.0925 in.)
	F	2.35 – 2.40 mm (0.0925 – 0.0945 in.)
	G	2.40 – 2.45 mm (0.0945 – 0.0965 in.)
	H	2.45 – 2.50 mm (0.0965 – 0.0984 in.)
	J	2.50 – 2.55 mm (0.0984 – 0.1004 in.)
	K	2.00 – 2.05 mm (0.0787 – 0.0807 in.)
	L	2.05 – 2.10 mm (0.0807 – 0.0827 in.)
Input shaft		
Input shaft journal outer diameter	Minimum	47.59 mm (1.8736 in.)
Input shaft bushing diameter	Maximum	39.14 mm (1.5409 in.)
Synchronizer ring to sprocket clearance	STD	1.15 – 1.85 mm (0.0453 – 0.0728 in.)
	Minimum	0.80 mm (0.0315 in.)
Input shaft snap ring thickness	Mark	
	A	2.10 – 2.15 mm (0.0827 – 0.0846 in.)
	B	2.15 – 2.20 mm (0.0846 – 0.0866 in.)
	C	2.20 – 2.25 mm (0.0866 – 0.0886 in.)
	D	2.25 – 2.30 mm (0.0886 – 0.0906 in.)
	E	2.30 – 2.35 mm (0.0906 – 0.0925 in.)
	F	2.35 – 2.40 mm (0.0925 – 0.0945 in.)
	G	2.40 – 2.45 mm (0.0945 – 0.0965 in.)
	H	2.45 – 2.50 mm (0.0965 – 0.0984 in.)
	J	2.50 – 2.55 mm (0.0984 – 0.1004 in.)
	K	2.55 – 2.60 mm (0.1004 – 0.1024 in.)
	L	2.60 – 2.65 mm (0.1024 – 0.1043 in.)
	M	2.65 – 2.70 mm (0.1043 – 0.1063 in.)
	N	2.70 – 2.75 mm (0.1063 – 0.1083 in.)
	P	2.75 – 2.80 mm (0.1083 – 0.1102 in.)
	Q	2.80 – 2.85 mm (0.1102 – 0.1122 in.)
	R	2.85 – 2.90 mm (0.1122 – 0.1142 in.)
	S	2.90 – 2.95 mm (0.1142 – 0.1161 in.)
	T	2.95 – 3.00 mm (0.1161 – 0.1181 in.)
	U	3.00 – 3.05 mm (0.1181 – 0.1201 in.)

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Planetary gear		
Pinion gear thrust clearance	STD	0.11 – 0.86 mm (0.0043 – 0.0339 in.)
	Maximum	0.86 mm (0.0339 in.)
Pinion gear radial clearance	STD	0.009 – 0.038 mm (0.0004 – 0.0015 in.)
	Maximum	0.038 mm (0.0015 in.)
Outer bearing snap ring thickness	Mark	
	1	1.45 – 1.50 mm (0.0571 – 0.0591 in.)
	2	1.50 – 1.55 mm (0.0591 – 0.0610 in.)
	3	1.55 – 1.60 mm (0.0610 – 0.0630 in.)
	4	1.60 – 1.65 mm (0.0630 – 0.0650 in.)
	5	1.65 – 1.70 mm (0.0650 – 0.0669 in.)
Inner bearing depth		5.0 – 5.6 mm (0.197 – 0.220 in.)
Oil seal		
Shift fork shaft oil seal depth		–0.5 – 0.5 mm (–0.020 – 0.020 in.)
Speedometer driven gear oil seal depth		25 mm (0.98 in.)

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SS090–02

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Transfer x Dynamic damper	37	380	27
Transfer adaptor x Transfer	37	380	27
Engine rear mounting	25	260	19
Indicator switch	37	380	27
L4 position switch	37	380	27
Transfer assembly x Transmission	37	380	27
Front retainer	11	115	8
Control retainer or upper cover	18	185	13
Companion flange lock nut	118	1,200	87
Extension housing	11	115	8
Front case x Rear case	37	380	27
Straight screw plug for shift fork shaft	19	190	14
Separator with oil strainer	18	185	13
Oil pump body x Front case	11	115	8
Straight screw plug for ring gear	19	190	14
Straight screw plug for oil pump body	29	300	21
Oil pump plate x Oil pump body	7.4	75	65 in.·lbf

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PROPELLER SHAFT

SERVICE DATA

SS07Y–01

Propeller shaft runout		Maximum runout		0.8 mm (0.031 in.)
Spider bearing axial play				0.05 mm (0.0020 in.)
Snap ring thickness	2WD (TMC–made) and 4WD	Mark	Color	
		1	–	2.100 – 2.150 mm (0.0827 – 0.0846 in.)
		2	–	2.150 – 2.200 mm (0.0846 – 0.0866 in.)
		3	–	2.200 – 2.250 mm (0.0866 – 0.0886 in.)
		–	Brown	2.250 – 2.300 mm (0.0886 – 0.0906 in.)
		–	Bule	2.300 – 2.350 mm (0.0906 – 0.0925 in.)
		6	–	2.350 – 2.400 mm (0.0925 – 0.0945 in.)
		7	–	2.400 – 2.450 mm (0.0945 – 0.0965 in.)
		8	–	2.450 – 2.500 mm (0.0965 – 0.0984 in.)
Snap ring thickness	2WD (DANA–made)		Color	
			Green	1.384 mm (0.0545 in.)
			Red	1.435 mm (0.0565 in.)
			Black	1.486 mm (0.0585 in.)
			Copper	1.511 mm (0.0895 in.)
			Silver	1.537 mm (0.0605 in.)
			Yellow	1.588 mm (0.0625 in.)
			Blue	1.638 mm (0.0645 in.)

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SS07Z–04

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Propeller shaft x Differential	2WD	74	750	54
Intermediate shaft x Propeller shaft	2WD	74	750	54
Front propeller shaft x Front differential	4WD	74	750	54
Front propeller shaft x Transfer	4WD	74	750	54
Rear propeller shaft x Rear differential	4WD	76	780	56
Rear propeller shaft x Transfer	4WD	76	780	56
Intermediate shaft x Propeller shaft	4WD	76	780	56
Center support bearing x Body		36	370	27
Intermediate shaft x Center support bearing x Joint flange				
	1st	181	1,850	134
	Loosen nut			
2WD (TMC–made) and 4WD	2nd	69	700	51
2WD (DANA–made)	2nd	81	830	60
Front propeller shaft No.2 dust cover set bolts		17	175	13
Front propeller shaft No.2 dust cover set nuts		13	135	10
Front propeller shaft dust cover bracket x Bracket		23	230	17
Front propeller shaft dust cover bracket x Transfer		36	370	27

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SUSPENSION AND AXLE

SERVICE DATA

SS082–02

Cold tire inflation pressure (2WD)	P215/75R15		Front	230 kPa (2.3 kgf/cm^2, 33 psi)
			Rear	240 kPa (2.4 kgf/cm^2, 35 psi)
	P235/75R15 (0.5 ton)		Front	180 kPa (1.8 kgf/cm^2, 26 psi)
			Rear	200 kPa (2.0 kgf/cm^2, 29 psi)
	P235/75R15 (1.0 ton)		Front	180 kPa (1.8 kgf/cm^2, 26 psi)
			Rear	280 kPa (2.8 kgf/cm^2, 41 psi)
Cold tire inflation pressure (4WD)	P235/75R15	STD cab	Front	180 kPa (1.8 kgf/cm^2, 26 psi)
	31x10.5R15LT	STD cab	Rear	200 kPa (2.0 kgf/cm^2, 29 psi)
	P235/75R15	Extra cab	Front	180 kPa (1.8 kgf/cm^2, 26 psi)
			Rear	240 kPa (2.4 kgf/cm^2, 35 psi)
	31x10.5R15LT	Extra cab	Front	200 kPa (2.0 kgf/cm^2, 29 psi)
			Rear	240 kPa (2.4 kgf/cm^2, 35 psi)
Wheel alignment (Standard loaded vehicle condition) (2WD)	Vehicle height	STD cab 0.5 ton	Front *1	74.0 mm (2.913 in.)
			Rear *2	122.0 mm (4.803 in.)
		STD cab 1.0 ton	Front *1	74.0 mm (2.913 in.)
			Rear *2	107.0 mm (4.213 in.)
		Extra cab	Front *1	74.0 mm (2.913 in.)
			Rear *2	115.5 mm (4.547 in.)
	Camber			0°00' ± 45' (0° ± 0.75°)
		Left–right error		45' (0.75°) or less
	Caster			4°00' ± 45' (4° ± 0.75°)
		Left–right error		45' (0.75°) or less
	Steering axis inclination			12°30' ± 45' (12.5° ± 0.75°)
		Left–right error		45' (0.75°) or less
	Toe–in (Total)	STD cab		0° ± 12' (0° ± 0.2°, 0 ± 2 mm, 0 ± 0.08 in.)
		Extra cab (P215/75R15)		–0°22' ± 12' (–0.36° ± 0.2°, –4.7 ± 2 mm, –0.18 ± 0.08 in.)
		Extra cab (P235/75R15)		–0°22' ± 12' (–0.36° ± 0.2°, –4.9 ± 2 mm, –0.19 ± 0.08 in.)
		Rack end length difference		3.0 mm (0.118 in.) or less
	Wheel angle			
	STD cab 0.5 ton	Inside wheel		40°42' ± 2° (40.7° ± 2°)
		Outside wheel		34°23' (34.38°)
	STD cab 1.0 ton	Inside wheel		39°55' ± 2° (39.92° ± 2°)
		Outside wheel		34°37' (34.62°)
	Extra cab	Inside wheel		40°10' ± 2° (40.17° ± 2°)
		Outside wheel		34°25' (34.42°)
		Left–right error		30' (0.5°) or less

*1: A – B

A: Ground clearance of spindle center.

B: Ground clearance of lower suspension arm bolt center.

*2: C – D

C: Ground clearance of rear axle shaft center.

D: Ground clearance of leaf spring front hanger pin center.

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Wheel alignment (Non–loaded vehicle condition) (2WD)	Vehicle height RCK10L–TRMRKA	P215/75R15	Front*1 Rear*2	45.4 mm (1.787 in.) 62.5 mm (2.460 in.)
	RCK10L–TRMRKA	P235/75R15	Front*1 Rear*2	45.4 mm (1.787 in.) 61.4 mm (2.417 in.)
	RCK10L–TRSRKA	P215/75R15	Front*1 Rear*2	45.4 mm (1.787 in.) 63.5 mm (2.500 in.)
	VCK11L–TRMDKA	P215/75R15	Front*1 Rear*2	48.0 mm (1.890 in.) 62.2 mm (2.449 in.)
	VCK11L–TRMDKA	P235/75R15	Front*1 Rear*2	48.0 mm (1.890 in.) 63.3 mm (2.492 in.)
	VCK11L–THMDKA	5VZ–FE Engine (1.0 ton)	Front*1 Rear*2	49.4 mm (1.945 in.) 32.3 mm (1.272 in.)
	VCK11L–TRSDKA	P215/75R15	Front*1 Rear*2	49.9 mm (1.965 in.) 63.5 mm (2.500 in.)
	VCK11L–TRSDKA	P235/75R15	Front*1 Rear*2	49.9 mm (1.965 in.) 64.6 mm (2.543 in.)
	VCK11L–THSDKA	5VZ–FE Engine (1.0 ton)	Front*1 Rear*2	49.9 mm (1.965 in.) 33.0 mm (1.299 in.)
	VCK11L–CRMDKA	P215/75R15	Front*1 Rear*2	38.8 mm (1.528 in.) 45.6 mm (1.795 in.)
	VCK11L–CRMSKA	P235/75R15	Front*1 Rear*2	38.8 mm (1.528 in.) 45.8 mm (1.803 in.)
	VCK11L–CRSDKA	P215/75R15	Front*1 Rear*2	38.8 mm (1.528 in.) 46.6 mm (1.835 in.)
	VCK11L–CRSDKA	P235/75R15	Front*1 Rear*2	38.8 mm (1.528 in.) 45.5 mm (1.791 in.)
	VCK11L–CRSSKA	P235/75R15	Front*1 Rear*2	38.8 mm (1.528 in.) 46.7 mm (1.839 in.)
	VCK11L–CRMDKA	P235/75R15	Front*1 Rear*2	38.8 mm (1.528 in.) 44.6 mm (1.756 in.)

*1: A – B

A: Ground clearance of spindle center.

B: Ground clearance of lower suspension arm bolt center.

*2: C – D

C: Ground clearance of rear axle shaft center.

D: Ground clearance of leaf spring front hanger pin center.

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Wheel alignment (Non–loaded vehicle condition) (2WD)	Camber		
		STD cab 3RZ–FE, 5VZ–FE engine (0.5 ton)	0°24' ± 45' (0.4° ± 0.75°)
		STD cab 5VZ–FE engine (1.0 ton)	0°22' ± 45' (0.37° ± 0.75°)
		Extra cab	0°28' ± 45' (0.47° ± 0.75°)
		Left–right error	45' (0.75°) or less
	Caster		
		STD cab 3RZ–FE, 5VZ–FE engine (0.5 ton)	2°28' ± 45' (2.47° ± 0.75°)
		STD cab 5VZ–FE engine 1.0 ton	1°38' ± 45' (1.63° ± 0.75°)
		Extra cab	2°04' ± 45' (2.06° ± 0.75°)
		Left–right error	45' (0.75°) or less
	Steering axis inclination	STD cab 0.5 ton	12°05' ± 45' (12.08° ± 0.75°)
		STD cab 1.0 ton	12°10' ± 45' (12.17° ± 0.75°)
		Extra cab	12°00' ± 45' (12° ± 0.75°)
		Left–right error	45' (0.75°) or less
	Toe–in (Total)		
		STD cab 3RZ–FE, 5VZ–FE engine (0.5 ton)	0°11' ± 12' (0.19° ± 0.2°, 2.4 ± 2 mm, 0.09 ± 0.08 in.)
		STD cab 5VZ–FE engine (1.0 ton)	0°33' ± 12' (0.55° ± 0.2°, 7.0 ± 2 mm, 0.28 ± 0.08 in.)
		Extra cab	0°20' ± 12' (0.33° ± 0.2°, 6.1 ± 2 mm, 0.24 ± 0.08 in.)
		Rack end length difference	3.0 mm (0.118 in.) or less
	Wheel angle		
	STD cab 3RZ–FE, 5VZ–FE engine (0.5 ton)		
		Inside wheel	40°42' ± 2° (40.7° ± 2°)
		Outside wheel	35°07' (35.12°)
	STD cab 5VZ–FE engine (1.0 ton)	Inside wheel	40°23' ± 2° (40.38° ± 2°)
		Outside wheel	35°31' (35.52°)
	Extra cab	Inside wheel	40°50' ± 2° (40.83° ± 2°)
		Outside wheel	35°41' (35.68°)
		Left–right error	30' (0.5°) or less

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Wheel alignment (Standard loaded vehicle condition) (4WD)	Vehicle height	STD cab	Front *1	58.0 mm (2.283 in.)
			Rear *2	23.0 mm (0.906 in.)
		Extra cab	Front *1	58.0 mm (2.283 in.)
			Rear *2	28.0 mm (1.102 in.)
	Camber		0°45' ± 45' (0.75° ± 0.75°)	
		Left–right error	45' (0.75°) or less	
	Caster	STD cab	1°30' ± 45' (1.5° ± 0.75°)	
		Extra cab	1°20' ± 45' (1.33° ± 0.75°)	
		Left–right error	45' (0.75°) or less	
	Steering axis inclination		11°50' ± 45' (11.83° ± 0.75°)	
		Left–right error	45' (0.75°) or less	
	Toe–in (Total)	STD cab	0°05' ± 12' (0.08° ± 0.2°, 1.0 ± 2 mm, 0.04 ± 0.08 in.)	
		Extra cab (P235/75R15)	–0°08' ± 12' (–0.14° ± 0.2°, –1.9 ± 2 mm, –0.07 ± 0.08 in.)	
		Extra cab (31x10.5R15)	–0°08' ± 12' (–0.14° ± 0.2°, –2.0 ± 2 mm, –0.08 ± 0.08 in.)	
		Rack end length difference	3.0 mm (0.118 in.) or less	
	Wheel angle			
	STD cab	Inside wheel	32°01' ± 2° (32.02° ± 2°)	
		Outside wheel	30°12' (30.2°)	
	Extra cab	Inside wheel	32°14' ± 2° (32.23° ± 2°)	
		Outside wheel	29°59' (29.99°)	
		Left–right error	30' (0.5°) or less	
Wheel alignment (Non–loaded vehicle condition) (4WD)	Vehicle height			
	VCK21L–TRMDKA	P235/75R15	Front*1	38.3 mm (1.508 in.)
			Rear*2	70.7 mm (2.783 in.)
	VCK21L–TRMDKA	31x10.5R15	Front*1	38.3 mm (1.508 in.)
			Rear*2	72.6 mm (2.858 in.)
	VCK21L–TRSDKA	P235/75R15	Front*1	40.0 mm (1.575 in.)
			Rear*2	69.5 mm (2.736 in.)
	VCK21L–TRSDKA	31x10.5R15	Front*1	40.0 mm (1.575 in.)
			Rear*2	71.4 mm (2.811 in.)
	VCK21L–CRM#KA	P235/75R15	Front*1	32.3 mm (1.272 in.)
			Rear*2	77.2 mm (3.039 in.)
	VCK21L–CRM#KA	31x10.5R15	Front*1	32.3 mm (1.272 in.)
			Rear*2	79.4 mm (3.126 in.)
	VCK21L–CRS#KA	P235/75R15	Front*1	32.3 mm (1.272 in.)
			Rear*2	76.2 mm (3.000 in.)
	VCK21L–CRS#KA	31x10.5R15	Front*1	32.3 mm (1.272 in.)
			Rear*2	78.3 mm (3.083 in.)

#: Any letter is applicable.
*1: A – B
A: Ground clearance of spindle center.
B: Ground clearance of lower suspension arm bolt center.
*2: C – D
C: Ground clearance of leaf spring front bushing center.
D: Ground clearance of rear axle shaft center.

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Wheel alignment (Non–loaded vehicle condition) (4WD)	Camber	STD cab	0°35' ± 45' (0.59° ± 0.75°)
		Extra cab	0°40' ± 45' (0.66° ± 0.75°)
		Left–right error	45' (0.75°) or less
	Caster	STD cab	0°59' ± 45' (0.98° ± 0.75°)
		Extra cab	1°10' ± 45' (1.17° ± 0.75°)
		Left–right error	45' (0.75°) or less
	Steering axis inclination		12°00' ± 45' (12° ± 0.75°)
		Left–right error	45' (0.75°) or less
	Toe–in (Total)	STD cab	0°12' ± 12' (0.2° ± 0.2°, 2.7 ± 2 mm, 0.11 ± 0.08 in.)
		Extra cab (P235/75R15)	0°08' ± 12' (0.14° ± 0.2°, 1.9 ± 2 mm, 0.07 ± 0.08 in.)
		Extra cab (31x10.5R15)	0°08' ± 12' (0.14° ± 0.2°, 2.0 ± 2 mm, 0.08 ± 0.08 in.)
	Wheel angle		
	STD cab	Inside wheel	32°45' ± 2° (32.75° ± 2°)
		Outside wheel <Reference>	30°31' (30.52°)
	Extra cab	Inside wheel	33°07' ± 2° (33.12° ± 2°)
		Outside wheel <Reference>	30°31' (30.52°)
Front axle (2WD)	Axle hub axial play	Maximum	0.05 mm (0.0020 in.)
	Axle hub preload (at starting)		Friction force plus 5.0 – 14.0 N (0.5 – 1.4 kgf, 1.1 – 3.1 in.)
Front axle (4WD)	Axle hub preload (at starting)		25 – 53 N (2.6 – 5.4 kgf, 5.7 – 11.9 lbf)
	Front drive shaft thrust clearance	Standard	0.1 – 0.5 mm (0.0039 – 0.0197 in.)
Front drive shaft (4WD)	Drive shaft length		481.2 – 491.2 mm (18.945 – 19.339 in.)
Front suspension (2WD)	Upper ball joint turning torque		2.0 – 3.9 N·m (20 – 40 kgf·cm, 17 – 34 in.·lbf)
	Lower ball joint turning torque		2.0 – 7.0 N·m (20 – 70 kgf·cm, 17 – 61 in.·lbf)
Front suspension (4WD)	Upper ball joint turning torque		0.5 – 2.4 N·m (5 – 25 kgf·cm, 4 – 22 in.·lbf)
	Lower ball joint turning torque		2.0 – 3.9 N·m (20 – 40 kgf·cm, 17 – 34 in.·lbf)
Rear axle	Shaft runout	Maximum	2.0 mm (0.079 in.)
	Flange runout	Maximum	0.1 mm (0.004 in.)
Front differential (4WD)	Companion flange vertical runout	Maximum	0.10 mm (0.0039 in.)
	Companion flange lateral runout	Maximum	0.10 mm (0.0039 in.)
	Drive pinion bearing preload (at starting)		
		New bearing	1.2 – 1.9 N·m (12 – 19 kgf·cm, 10.4 – 16.5 in.·lbf)
		Reused bearing	0.6 – 1.0 N·m (6 – 10 kgf·cm, 5.2 – 8.7 in.·lbf)
	Total preload (at starting)		In addition to drive pinion preload 0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.·lbf)
	Pinion gear to side gear backlash		0.05 – 0.20 mm (0.0020 – 0.0079 in.)
	Drive pinion to ring gear backlash		0.13 – 0.18 mm (0.0051 – 0.0070 in.)
	Ring gear runout	Maximum	0.07 mm (0.0028 in.)
	Rear oil seal drive in depth		1.5 mm (0.059 in.)
	Side gear shaft tube LH side oil seal drive in depth		2.5 mm (0.098 in.)
	A.D.D. sleeve fork to clutch sleeve clearance		0.35 mm (0.0138 in.)
	Differential bearing press in depth		2.0 mm (0.079 in.)

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Front differential (4WD)	Side gear thrust washer thickness	0.96 – 1.04 mm (0.0378 – 0.0409 in.)
		1.06 – 1.14 mm (0.0417 – 0.0449 in.)
		1.16 – 1.24 mm (0.0457 – 0.0488 in.)
		1.26 – 1.34 mm (0.0496 – 0.0528 in.)
	Side gear bearing adjusting washer thickness	2.57 – 2.59 mm (0.1012 – 0.1020 in.)
		2.60 – 2.62 mm (0.1024 – 0.1031 in.)
		2.63 – 2.65 mm (0.1035 – 0.1043 in.)
		2.66 – 2.68 mm (0.1047 – 0.1055 in.)
		2.69 – 2.71 mm (0.1059 – 0.1067 in.)
		2.72 – 2.74 mm (0.1071 – 0.1079 in.)
		2.75 – 2.77 mm (0.1083 – 0.1091 in.)
		2.78 – 2.80 mm (0.1094 – 0.1102 in.)
		2.81 – 2.83 mm (0.1106 – 0.1114 in.)
		2.84 – 2.86 mm (0.1118 – 0.1126 in.)
		2.87 – 2.89 mm (0.1130 – 0.1138 in.)
		2.90 – 2.92 mm (0.1142 – 0.1150 in.)
		2.93 – 2.95 mm (0.1154 – 0.1161 in.)
		2.96 – 2.98 mm (0.1165 – 0.1173 in.)
		2.99 – 3.01 mm (0.1177 – 0.1185 in.)
		3.02 – 3.04 mm (0.1189 – 0.1197 in.)
		3.05 – 3.07 mm (0.1201 – 0.1209 in.)
		3.08 – 3.10 mm (0.1213 – 0.1220 in.)
		3.11 – 3.13 mm (0.1224 – 0.1232 in.)
		3.14 – 3.16 mm (0.1236 – 0.1244 in.)
		3.17 – 3.19 mm (0.1248 – 0.1256 in.)
		3.20 – 3.22 mm (0.1260 – 0.1268 in.)
		3.23 – 3.25 mm (0.1272 – 0.1280 in.)
	Drive pinion bearing washer thickness	2.27 mm (0.0894 in.)
		2.30 mm (0.0906 in.)
		2.33 mm (0.0917 in.)
		2.36 mm (0.0929 in.)
		2.39 mm (0.0941 in.)
		2.42 mm (0.0953 in.)
		2.45 mm (0.0965 in.)
		2.48 mm (0.0976 in.)
		2.51 mm (0.0988 in.)
		2.54 mm (0.1000 in.)
		2.57 mm (0.1012 in.)
		2.60 mm (0.1024 in.)
		2.63 mm (0.1035 in.)
		2.66 mm (0.1047 in.)
		2.69 mm (0.1059 in.)

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Rear differential	Companion flange vertical runout	Maximum	0.09 mm (0.0035 in.)
	Companion flange lateral runout	Maximum	0.09 mm (0.0035 in.)
	Drive pinion bearing preload (at starting)		
		New bearing	1.0 – 1.6 N·m (10 – 16 kgf·cm, 8.7 – 13.9 in.·lbf)
		Reused bearing	0.5 – 0.8 N·m (5 – 8 kgf·cm, 4.3 – 6.9 in.·lbf)
	Total preload (at starting)		In addition to drive pinion preload 0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.·lbf)
	Pinion gear to side gear backlash		0.05 – 0.20 mm (0.0020 – 0.0079 in.)
	Drive pinion to ring gear backlash	2WD	0.08 – 0.13 mm (0.0031 – 0.0051 in.)
		4WD	0.13 – 0.18 mm (0.0051 – 0.0071 in.)
	Ring gear runout	Maximum	0.05 mm (0.0020 in.)
	Differential case runout	Maximum	0.04 mm (0.0016 in.)
	Differential side gear thrust washer thickness		1.50 mm (0.0590 in.)
			1.55 mm (0.0610 in.)
			1.60 mm (0.0630 in.)
			1.65 mm (0.0650 in.)
			1.70 mm (0.0669 in.)
			1.75 mm (0.0689 in.)
			1.80 mm (0.0709 in.)
			1.85 mm (0.0728 in.)
			1.90 mm (0.0748 in.)
	Side bearing adjusting washer thickness		58 2.58 mm (0.1015 in.)
			60 2.60 mm (0.1024 in.)
			62 2.62 mm (0.1031 in.)
			64 2.64 mm (0.1039 in.)
			66 2.66 mm (0.1047 in.)
			68 2.68 mm (0.1055 in.)
			70 2.70 mm (0.1063 in.)
			72 2.72 mm (0.1071 in.)
			74 2.74 mm (0.1079 in.)
			76 2.76 mm (0.1087 in.)
			78 2.78 mm (0.1094 in.)
			80 2.80 mm (0.1102 in.)
			82 2.82 mm (0.1110 in.)
			84 2.84 mm (0.1118 in.)
			86 2.86 mm (0.1126 in.)
			88 2.88 mm (0.1134 in.)
			90 2.90 mm (0.1142 in.)
			92 2.92 mm (0.1150 in.)
			94 2.94 mm (0.1157 in.)
			96 2.96 mm (0.1165 in.)
			98 2.98 mm (0.1173 in.)
			00 3.00 mm (0.1181 in.)
			02 3.02 mm (0.1189 in.)
			04 3.04 mm (0.1197 in.)
			06 3.06 mm (0.1205 in.)
			08 3.08 mm (0.1213 in.)

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Rear differential	Side bearing adjusting washer thickness	10	3.10 mm (0.1220 in.)
		12	3.12 mm (0.1228 in.)
		14	3.14 mm (0.1236 in.)
		16	3.16 mm (0.1244 in.)
		18	3.18 mm (0.1252 in.)
		20	3.20 mm (0.1260 in.)
		22	3.22 mm (0.1268 in.)
		24	3.24 mm (0.1276 in.)
		26	3.26 mm (0.1283 in.)
		28	3.28 mm (0.1291 in.)
		30	3.30 mm (0.1299 in.)
		32	3.32 mm (0.1307 in.)
		34	3.34 mm (0.1315 in.)
		36	3.36 mm (0.1323 in.)
		38	3.38 mm (0.1331 in.)
		40	3.40 mm (0.1339 in.)
		42	3.42 mm (0.1346 in.)
		44	3.44 mm (0.1354 in.)
		46	3.46 mm (0.1362 in.)
		48	3.48 mm (0.1370 in.)
	Drive pinion bearing adjusting washer thickness	87	1.87 mm (0.0736 in.)
		88	1.88 mm (0.0740 in.)
		89	1.89 mm (0.0744 in.)
		90	1.90 mm (0.0748 in.)
		91	1.91 mm (0.0752 in.)
		92	1.92 mm (0.0756 in.)
		93	1.93 mm (0.0760 in.)
		94	1.94 mm (0.0764 in.)
		95	1.95 mm (0.0768 in.)
		96	1.96 mm (0.0772 in.)
		97	1.97 mm (0.0776 in.)
		98	1.98 mm (0.0780 in.)
		99	1.99 mm (0.0783 in.)
		00	2.00 mm (0.0787 in.)
		01	2.01 mm (0.0791 in.)
		02	2.02 mm (0.0795 in.)
		03	2.03 mm (0.0799 in.)
		04	2.04 mm (0.0803 in.)
		05	2.05 mm (0.0807 in.)
		06	2.06 mm (0.0811 in.)
		07	2.07 mm (0.0815 in.)
		08	2.08 mm (0.0819 in.)
		09	2.09 mm (0.0823 in.)
		10	2.10 mm (0.0827 in.)
		11	2.11 mm (0.0831 in.)

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Rear differential	Drive pinion bearing adjusting washer thickness	12	2.12 mm (0.0835 in.)
		13	2.13 mm (0.0839 in.)
		14	2.14 mm (0.0843 in.)
		15	2.15 mm (0.0846 in.)
		16	2.16 mm (0.0850 in.)
		17	2.17 mm (0.0854 in.)
		18	2.18 mm (0.0858 in.)
		19	2.19 mm (0.0862 in.)
		20	2.20 mm (0.0866 in.)
		21	2.21 mm (0.0870 in.)
		22	2.22 mm (0.0874 in.)
		23	2.23 mm (0.0878 in.)
		24	2.24 mm (0.0882 in.)
		25	2.25 mm (0.0886 in.)
		26	2.26 mm (0.0890 in.)
		27	2.27 mm (0.0894 in.)
		28	2.28 mm (0.0898 in.)

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SS083–02

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Front (2WD)			
Tie rod end lock nut	56	570	41
Steering knuckle x Upper ball joint	108	1,100	80
Steering knuckle x Lower ball joint	142	1,450	105
Steering knuckle x Brake caliper	108	1,100	80
Steering knuckle x Steering knuckle arm	183	1,870	135
Dust cover x Steering knuckle	19	195	14
Disc x Axle hub	64	650	47
Upper suspension arm x Upper ball joint	31	320	23
Lower suspension arm x Lower ball joint	75	760	55
Torque arm x Lower suspension arm	49	500	36
Shock absorber x Frame	25	250	18
Lower suspension arm x Shock absorber	18	185	13
Lower suspension arm x Stabilizer bar	13	130	9
Lower suspension arm shaft nut	206	2,100	152
Upper suspension arm shaft x Frame	96	980	71
Upper suspension arm shaft x Upper suspension arm	126	1,280	93
Lower ball joint x Strut bar	75	760	55
Strut bar x Frame	123	1,250	90
Stabilizer bar link set nut	13	130	9
Stabilizer bar bracket x Frame	30	306	22
Hub nut	103	1,050	76
ABS speed sensor x Steering knuckle	8.0	82	71 in.·lbf
ABS Speed sensor wire harness x Upper suspension arm	5.0	51	44 in.·lbf
Front (4WD)			
Knuckle stopper bolt lock nut	47	480	35
Tie rod clamp bolt	22	225	16
Steering knuckle x Upper ball joint	142	1,450	105
Steering knuckle x Lower ball joint	58	590	43
Steering knuckle x Brake caliper	123	1,250	90
Flange x Axle hub	31	315	23
Flange x Front drive shaft	18	185	13
Axle hub bearing lock nut	47	480	35
Oil seal x Dust cover	18	185	13
Upper suspension arm x Upper ball joint	33	340	25
Lower suspension arm x Lower ball joint	142	1,450	105
Steering knuckle arm x Steering knuckle	183	1,870	135
Upper suspension arm x Torque arm	87	890	64
Upper suspension arm shaft lock nut	226	2,300	166
Shock absorber x Frame	25	250	18
Lower suspension arm x Shock absorber	137	1,400	101
Lower suspension arm x Stabilizer bar	25	260	19
Stabilizer bar bracket x Frame	29	300	22

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Part tightened	N·m	kgf·cm	ft·lbf
Front drive shaft x Side gear shaft	83	845	61
Lower suspension arm x Frame	196	2,000	145
Upper suspension arm shaft x Frame	178	1,810	131
Hub nut	103	1,050	76
ABS speed sensor x Steering knuckle	8.0	82	71 in.·lbf
ABS speed sensor wire harness	5.0	51	44 in.·lbf
Companion flange x Front differential assembly	108	1,100	80
Drain plug	49	500	36
Filler plug	39	400	29
Crossmember x Frame	126	1,280	93
Front mounting bolt	147	1,500	108
Rear mounting bolt	167	1,700	123
Actuator x Clutch case cover	21	210	15
Screw plug x Clutch case cover	20	200	14
A.D.D. indicator switch x Clutch case cover	40	410	30
Carrier cover x Oil deflector	7.4	75	65 in.·lbf
Ring gear x Differential case	97	985	71
Differential carrier x Bearing cap	78	800	58
Clutch case x Tube	78	800	58
Clutch case x Differential carrier	78	800	500
Differential x Front propeller shaft	74	750	54
Clutch case cover x Clutch case	21	210	15
Differential carrier cover x Differential carrier	47	475	34
Tube x Bearing retainer	12	120	9
Rear			
Ring gear x Differential case	125	1,270	92
Bearing cap x Differential carrier	113	1,150	83
Differential carrier x Axle housing	73	740	54
Rear axle housing x Rear brake assembly	69	700	51
Rear shock absorber x Spring seat	26	260	19
Rear shock absorber x Frame	26	260	19
U–bolt x Spring seat	132	1,350	97
Shackle pin x Leaf spring	91	930	67
Differential x Propeller shaft	76	780	56
Hanger pin x Leaf spring	91	930	67
Hanger pin lock bolt	26	260	19
Leaf spring center bolt	44	450	33
Hub nut	103	1,050	76
Spring bumper seat set bolt	29	300	22
ABS speed sensor x Rear axle housing	8.0	82	71 in.·lbf
Brake line	15	155	11
Parking brake set bolt	25	260	19
Drain plug	49	500	36
Filler plug	39	400	29

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BRAKE

SERVICE DATA

SS084–01

Brake pedal height (from asphalt sheet)	Extra cab 4WD	146.7–156.7 mm (5.776–6.169 in.)
	Except extra cab 4WD	149.7–159.7 mm (5.894–6.287 in.)
Brake pedal freeplay		3–6 mm (0.12–0.24 in.)
Brake pedal reserve distance at 490 N (50 kgf, 110.2 lbf)		
	2WD 1 ton (STD cab)	More than 78 mm (3.07 in.)
	2WD 0.5 ton / 4WD (STD cab)	More than 73 mm (2.87 in.)
	4WD (Extra cab)	More than 70 mm (2.76 in.)
Brake booster push rod to piston clearance (w/ SST)		0 mm (0 in.)
Front brake pad thickness	2WD 1.0 ton STD	9.5 mm (0.374 in.)
	2WD 0.5 ton STD	11.0 mm (0.433 in.)
	4WD STD	9.5 mm (0.374 in.)
	Minimum	1.0 mm (0.039 in.)
Disc thickness	STD	25.0 mm (0.984 in.)
	Minimum	23.0 mm (0.906 in.)
Disc runout	Maximum	0.07 mm (0.0028 in.)
Rear brake drum inside diameter	STD	295.0 mm (11.614 in.)
Rear brake drum inside diameter	Maximum	297.0 mm (11.693 in.)
Rear brake shoe lining thickness	STD	6.0 mm (0.236 in.)
Rear brake shoe lining thickness	Minimum	1.0 mm (0.039 in.)
Rear brake drum to shoe clearance		0.6 mm (0.024 in.)
Parking brake lever travel at 196 N (20 kgf, 44 lbf)		11 – 17 clicks

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SS085–01

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Master cylinder x Piston stopper bolt		10	100	7
Master cylinder x Reservoir		1.7	17.5	15.2 in.·lbf
Master cylinder x Brake booster		13	130	9
Brake line union nut		15	155	11
Brake booster clevis lock nut		25	260	19
Brake booster x Pedal bracket		13	130	9
Front disc brake caliper installation bolt	2WD 1.0 ton	39	400	29
	2WD 0.5 ton	36	370	27
	4WD	123	1,250	90
Bleeder plug		11	110	8
Front disc brake torque plate x Steering knuckle	2WD	108	1,100	80
Front disc x Front axle hub		64	650	47
Front disc brake caliper x Flexible hose		15	155	11
Rear drum brake wheel cylinder x Backing plate		10	100	7
Parking brake bellcrank bracket x Backing plate		13	130	9
LSP & BV installation nut		13	130	9
LSP & BV x Load Sensing Spring Assembly		18	185	13
Load Sensing Spring Assembly x Shackle No.1		18	185	13
Shackle No.1 x Shackle No.2		25	250	18
Shackle No.2 x Shackle Bracket		13	130	9
LSP & BV x Frame		29	300	11
ABS actuator x ABS actuator bracket		5.4	55	48 in.·lbf
ABS actuator bracket x Body		19	195	14
Speed sensor installation bolt		8.0	82	71 in.·lbf
Front speed sensor wire harness clamp		5.0	51	44 in.·lbf
Rear speed sensor wire harness clamp		13	130	9

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STEERING

SERVICE DATA

SS08W–01

ON–VEHICLE INSPECTION		
Steering wheel freeplay	Maximum	30 mm (1.18 in.)
3RZ–FE:		
Drive belt tension	New belt	135–185 lbf
Drive belt tension	Used belt	80–120 lbf
Oil level rise	Maximum	Below 5 mm (0.20 in.)
5VZ–FE:		
Drive belt tension	New belt	135–180 lbf
Drive belt tension	Used belt	85–120 lbf
Oil level rise	Maximum	Below 5 mm (0.20 in.)
3RZ–FE and 5VZ–FE (2WD):		
Oil pressure at idle speed with valve closed	Minimum	7,845 kPa (80 kgf/cm^2, 1,138 psi)
5VZ–FE (4WD):		
Oil pressure at idle speed with valve closed	Minimum	8,336 kPa (85 kgf/cm^2, 1,209 psi)
Steering effort at idle speed	Maximum	8.3 N·m (85 kgf·cm, 73 in.·lbf)
TILT STEERING COLUMN		
Pawl stopper		
	1 or A	12.68 – 12.74 mm (0.4992 – 0.5016 in.)
	2 or B	12.61 – 12.67 mm (0.4965 – 0.4988 in.)
	3 or C	12.54 – 12.60 mm (0.4937 – 0.4961 in.)
	4 or D	12.47 – 12.53 mm (0.4909 – 0.4933 in.)
	5 or E	12.40 – 12.46 mm (0.4882 – 0.4906 in.)
	6 or F	12.33 – 12.39 mm (0.4854 – 0.4878 in.)
	7 or G	12.26 – 12.32 mm (0.4827 – 0.4850 in.)
PS VANE PUMP		
3RZ–FE and 5VZ–FE:		
Pump shaft and front housing bushing oil clearance	STD	0.03–0.05 mm (0.0012–0.0020 in.)
Pump shaft and front housing bushing oil clearance	Maximum	0.07 mm (0.0028 in.)
Vane plate height	Minimum	8.6 mm (0.339 in.)
Vane plate thickness	Minimum	1.397 mm (0.0550 in.)
Vane plate length	Minimum	14.991 mm (0.5902 in.)
Vane plate and pump rotor groove clearance	Maximum	0.035 mm (0.0014 in.)
Vane plate length	Pump rotor and cam ring mark	
	None	14.999–15.001 mm (0.59051–0.59059 in.)
	1	14.997–14.999 mm (0.59043–0.59051 in.)
	2	14.995–14.997 mm (0.59035–0.59043 in.)
	3	14.993–14.995 mm (0.59027–0.59035 in.)
	4	14.991–14.993 mm (0.59020–0.59027 in.)
Flow control valve spring length	Minimum	32.3 mm (1.272 in.)
Pump rotating torque	Maximum	0.25 N·m (2.5 kgf·cm, 2.2 in.·lbf) or less
PS GEAR		
2WD:		
Steering rack runout	Maximum	0.3 mm (0.0118 in.)

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Total preload		0.5–1.4 N·m (5–14 kgf·cm, 4.3–12.2 in.·lbf)
4WD:		
Worm gear valve body ball clearance		0.15 mm (0.059 in.)
Cross shaft adjusting screw thrust clearance	STD	0.03–0.05 mm (0.0012–0.0020 in.)
Cross shaft adjusting screw thrust clearance	Maximum	0.05 mm (0.0020 in.)
Worm gear preload		0.3–0.5 N·m (3–5.5 kgf·cm, 2.6–4.8 in.·lbf)
Total preload		0.5–0.9 N·m (5–9.5 kgf·cm, 4.3–8.3 in.·lbf)
STEERING LINKAGE		
Tie rod length	Approximately	329.2 mm (12.961 in.)
Idler arm rotating torque		0.5–2.9 N·m (5–30 kgf·cm, 5–26 in.·lbf)

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SS08X–01

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
STEERING COLUMN				
NON–TILT STEERING COLUMN:				
Steering wheel set nut		35	360	26
Steering wheel pad set screw (Torx screw)		9.0	90	78 in.·lbf
Steering column assembly set bolt and nut		25	260	19
Control shaft lever x Control shaft assembly	AT	35	360	26
Intermediate shaft x Control valve assembly	2WD	35	360	26
Intermediate shaft x Worm gear valve assembly	4WD	35	360	26
Sliding w/shaft york sub–assembly x Intermediate shaft		35	360	26
Main shaft assembly x Sliding w/shaft york sub–assembly		35	360	26
TILT STEERING COLUMN:				
Steering wheel set nut		35	360	26
Steering wheel pad set screw (Torx screw)		9.0	90	78 in.·lbf
Steering column assembly set bolt and nut		25	260	19
Control shaft lever x Control shaft assembly	AT	35	360	26
Intermediate shaft x Control valve assembly	2WD	35	360	26
Intermediate shaft x Worm gear valve assembly	4WD	35	360	26
Sliding w/shaft york sub–assembly x Intermediate shaft		35	360	26
Sliding york sub–assembly x Sliding w/shaft york sub–assembly		35	360	26
Main shaft assembly x Sliding york sub–assembly		35	360	26
Turn signal bracket set bolt		7.8	80	69 in.·lbf
Tilt lever assembly set bolt		2	20	17 in.·lbf
Tilt sub lever side pawl set bolt x nut		5.9	60	52 in.·lbf
Tilt lever retainer set nut		15	150	11
Compression spring set bolt		7.8	80	69 in.·lbf
PS VANE PUMP				
3RZ–FE and 5VZ–FE:				
Union bolt x Pressure feed tube		47	475	34
Pressure port union x Pump housing		83	850	61
Bracket x Pump assembly	5VZ–FE	43	440	32
Rear housing set bolt		24	240	17
Oil reservoir set bolt	Front	13	130	9
	Rear	24	240	17
Vane pump pulley set nut		43	440	32
Vane pump assembly set bolt	3RZ–FE	39	400	29
Vane pump assembly with bracket set bolt and nut	5VZ–FE	39	400	29
PS GEAR				
2WD:				
Control valve housing x Rack housing		18	185	13
Self–locking nut		25	250	18
Rack housing cap		69	700	51
Rack guide spring cap lock nut		51 (60)	521 (700)	38 (51)
Rack x Rack end		61 (83)	618 (850)	45 (62)

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Tie rod end lock nut	56	570	41
Turn pressure tube union nut	10 (13)	102 (130)	7 (9)
PS gear assembly set bolt and nut	88	900	65
Mount bracket x Suspension crossmember	88	900	65
Control valve shaft x Intermediate shaft	35	360	26
Pressure feed tube x Control valve housing	19 (25)	195 (250)	14 (18)
Return tube x Control valve housing	19 (25)	195 (250)	14 (18)
Tie rod end x Steering knuckle	90	920	67
4WD:			
Pressure feed tube x PS gear assembly	36 (44)	365 (450)	26 (33)
Return tube x PS gear assembly	36 (44)	365 (450)	26 (33)
PS gear assembly x Body	142	1450	105
Pitman arm x Cross shaft	177	1800	130
Cross shaft adjusting screw set nut	46	470	34
Side cover x Gear housing	61	620	45
Plunger guide nut	20	205	15
Worm gear valve body assembly x Gear housing	61	620	45
Worm gear valve body assembly x Intermediate shaft	35	360	26
STEERING LINKAGE			
Pitman arm x Cross shaft	177	1800	130
Pitman arm x Relay rod	90	920	67
Tie rod clamp bolt	22	225	16
Tie rod assembly x Relay rod	90	920	67
Tie rod assembly x Knuckle arm	90	920	67
Idler arm assembly x Frame	142	1450	105
Relay rod x Idler arm assembly	59	600	43
Steering damper set bolt and nut	25	260	19
Relay rod x Steering damper	59	600	43
IDLER ARM			
Idler arm x Idler arm bracket	78	800	58

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SUPPLEMENTAL RESTRAINT SYSTEM

SERVICE DATA

SS08E–01

FRONT AIRBAG SENSOR	
⊕S – ⊕A	Less then 1 Ω
⊕S – ⊖S	1 MΩ or Higher
⊖S – ⊖A	755 – 885 Ω

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SS08D–01

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Steering wheel	34	350	25
Steering wheel pad	8.8	90	78 in.·lbf
Airbag sensor assembly	21	210	15
Front airbag sensor	29	300	22

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BODY ELECTRICAL

SERVICE DATA

SS03A–03

DAYTIME RUNNING LIGHT MAIN RELAY (Wire Harness Side)	
2 – Ground (Ignition Switch LOCK or ACC)	No voltage
2 – Ground (Ignition Switch ON or START)	Battery positive voltage
6 – Ground (Constant)	Battery positive voltage
11 – Ground (Engine Stop)	No voltage
11 – Ground (Engine Running)	Battery positive voltage
DAYTIME RUNNING LIGHT MAIN RELAY (Connector connected)	
17 – Ground (Headlight dimmer switch LOW beam)	No voltage
17 – Ground (Headlight dimmer switch HIGH beam or Flash)	Battery positive voltage
TURN SIGNAL FLASHER	
Flashes/ Minute	60 – 120
SPEEDOMETER (Using a speedmeter tester)	
Standard indication (mph)	Allowable range (mph)
20	18 – 24
40	38 – 44
60	58 – 66
80	78 – 88
100	98 – 110
120	118 – 132
Standard indication (km/h)	Allowable range (km/h)
20	17 – 24
40	38 – 46
60	57.5 – 67
80	77 – 88
100	96 – 109
120	115 – 130
140	134 – 151.5
160	153 – 173
TACHOMETER (On–Vehicle) / DC 13.5 V 20 ˚C at (68 ˚F)	
Standard indication	Allowable range
700	610 – 750
3,000	2,850 – 3,150
5,000	4,850 – 5,150
7,000	6,790 – 7,210
VOLT GAUGE	Resistance (Ω)
A – B	Approx. 347.0 Ω
FUEL RECEIVER GAUGE (w/ Tachometer)	Resistance (Ω)
A – B	Approx. 137.0 Ω
A – C	Approx. 123.0 Ω
B – C	Approx. 260.0 Ω
FUEL RECEIVER GAUGE (w/o Tachometer)	Resistance (Ω)
A – B	Approx. 150.0 Ω
A – C	Approx. 80.0 Ω

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B – C	Approx. 55.0 Ω
FUEL SENDER GAUGE	
Float position mm (in.)	Resistance (Ω)
F: Approx. 95 mm	Approx. 3.0 Ω
1/2: Approx. 188.0 mm	Approx. 32.5 Ω
E: Approx. 283.0 mm	Approx. 110.0 Ω
ENGINE COOLANT TEMPERATURE RECEIVER GAUGE (w/ Tachometer)	Resistance (Ω)
A – B	Approx. 150.0 Ω
A – C	Approx. 54.0 Ω
B – C	Approx. 138.0 Ω
ENGINE COOLANT TEMPERATURE RECEIVER GAUGE (w/ o Tachometer)	
A – B	Approx. 25.0 Ω
OIL PRESSURE RECEIVER GAUGE	
A – B	Approx. 25.0 Ω
DOOR LOCK CONTROL RELAY (Wire Harness Side)	
2 – Ground (Constant)	Battery positive voltage
8 – Ground (Ignition Switch LOCK or ACC)	No voltage
8 – Ground (Ignition Switch ON)	Battery positive voltage
13 – Ground (Key unlock warning switch OFF (Ignition key removed))	No voltage
13 – Ground (Key unlock warning switch ON (Ignition key set))	Battery positive voltage
CRUISE CONTROL ECU (wire harness side)	
24 – 26 (constant)	Approx. 2.0 kΩ
25 – 26 (Actuator arm turned)	Resistance change even
10 – Ground (Brake pedal position: Released)	Approx. 38.0 Ω
10 – Ground (Brake pedal position: Depressed)	No continuity
CRUISE CONTROL SWITCH	
18 – Ground (Control switch position: OFF)	No continuity
18 – Ground (Control switch position: RESUME/ACCEL)	Approx. 68.0 Ω
18 – Ground (Control switch position: SET/COAST)	Approx. 198.0 Ω
18 – Ground (Control switch position: CANCEL)	Approx. 418.0 Ω
14 – Ground (Ignition switch position: LOCK or ACC)	No voltage
14 – Ground (Ignition switch position: ON)	Battery positive voltage
15 – Ground (Constant)	Battery positive voltage
1 – Ground (Constant)	Battery positive voltage
16 – Ground (Brake pedal position: Released)	No voltage
16 – Ground (Brake pedal position: Depressed)	Battery positive voltage
20 – Ground (With ignition switch ON, Speedsensor shaft turned)	Valtage changes repeatedly
CRUISE CONTROL ACTUATOR	
1 – 3	Approx. 2.0 kΩ
2 – 3 (The arm is moving from the closed to open position)	Approx. 0.5 to 1.8 kΩ
ANTENNA MOTOR CONTROL RELAY (Wire harness side)	
3 – Ground (Constant)	Battery positive voltage
5 – Ground (Ignition Switch position: LOCK)	No voltage
5 – Ground (Ignition switch position: ACC)	Battery positive voltage
7 – Ground (Ignition switch position: LOCK)	No voltage

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7 – Ground (Ignition switch position: ACC or ON) (Radio switch and cassette OFF)	No voltage
7 – Ground (Ignition switch position: ACC or ON) (Radio switch and cassette ON)	Battery positive voltage
8 – Ground (Ignition switch position: LOCK)	No voltage
8 – Ground (Ignition switch position: ACC or ON) (Radio switch ON and cassette ON)	No voltage
8 – Ground (Ignition switch position: ACC or ON) (Radio switch ON and cassette OFF)	Battery positive voltage
4 – Ground (Ignition switch position: LOCK or ACC)	No voltage
4 – Ground (Ignition switch position: ON)	Battery positive voltage

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BODY

TORQUE SPECIFICATION

SS08Y–02

Part tightened	N·m	kgf·cm	ft·lbf
FRONT BUMPER	–	–	–
Front bumper arm x Body	61	620	45
Bumper side support x Bumper arm	13	130	9
HOOD	–	–	–
Hood hinge x Hood	14	145	10
Hood lock x Body	19	195	14
FRONT DOOR	–	–	–
Door hinge x Body	25	260	19
Door hinge x Door panel	25	260	19
Door lock x Door panel	5.9	60	52 in.·lbf
Window regulator x Door panel	5.4	55	48 in.·lbf
FRONT WIPER AND WASHER	–	–	–
Wiper arm x Wiper link	20	204	15
TAIL GATE	–	–	–
Tail gate lock striker x Body	12	120	9
Tail gate lock x Tail gate	12	120	9
Tail gate hinge x Tail gate	18	185	13
FRONT SEAT (Bench Type)	–	–	–
Seat track x Body	37	375	27
Seat track x Seatback	18	185	13
Outer track x Seat cushion frame	18	185	13
Inner track x Seat cushion frame	18	185	13
FRONT SEAT (Split Bench Type)	–	–	–
Seat track x Body	37	375	27
Seat adjuster x Seatback	18	185	13
Outer track x Seat cushion frame	18	185	13
Inner track x Seat cushion frame	18	185	13
Seat adjuster x Seat cushion frame	18	185	13
Inner track x Seat back frame	12.5	130	9.5
REAR SEAT	–	–	–
Back panel trim x Body	9.8	100	7
Seat cushion x Body	9.8	100	7
SEAT BELT	–	–	–
Front Seat Belt	–	–	–
Adjustable anchor x Body	43	440	32
Shoulder anchor x Adjustable anchor	43	440	32
ELR x Body	43	440	32
Lap outer anchor x Body	43	440	32
Inner belt x Body	43	440	32
Rear Seat Belt	–	–	–
Shoulder anchor x Body	43	440	32
ELR x Body	43	440	32

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Part tightened	N·m	kgf·cm	ft·lbf
Lap outer anchor x Body	43	440	32
Inner belt x Body	43	440	32

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AIR CONDITIONING

SERVICE DATA

SS08B–03

Refrigerant charge volume	650 ± 50 g (22.92 ± 1.76 oz.)
Drive belt tension	–
New belt	160 ± 25 lbf
Used belt	100 ± 20 lbf
Idle–up speed	–
3RZ – FE	900 rpm
5VZ – FE	850 rpm
Magnetic clutch clearance	0.5 ± 0.15 mm (0.020 ± 0.0059 in.)

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SS08C–03

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Compressor x Compressor Bracket	25	250	18
Compressor bracket x Engine	47	475	34
Idle pulley lock nut	39	400	29
Compressor x Discharge hose	10	100	7
Compressor x Suction hose	10	100	7
Cooling unit x Suction tube	32	330	24
Cooling unit x Liquid tube	14	140	10
Expansion valve x Evaporator	22	225	16
Expansion valve x Liquid tube	14	140	10
Receiver x Liquied tube	5.4	55	48 in.·lbf
Condenser x Liquid tube	10	100	7
Condenser x Discharge hose	10	100	7
Pressure switch x Liquied tube	10	100	7
Pressure plate x Compressor	13.2	135	9

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DI – DIAGNOSTICS

ENGINE (3RZ-FE)	DI-1
ENGINE (5VZ-FE)	DI-127
AUTOMATIC TRANSMISSION	DI-263
ANTI-LOCK BRAKE SYSTEM	DI-319
SUPPLEMENTAL RESTRAINT SYSTEM	DI-363
CRUISE CONTROL SYSTEM	DI-408

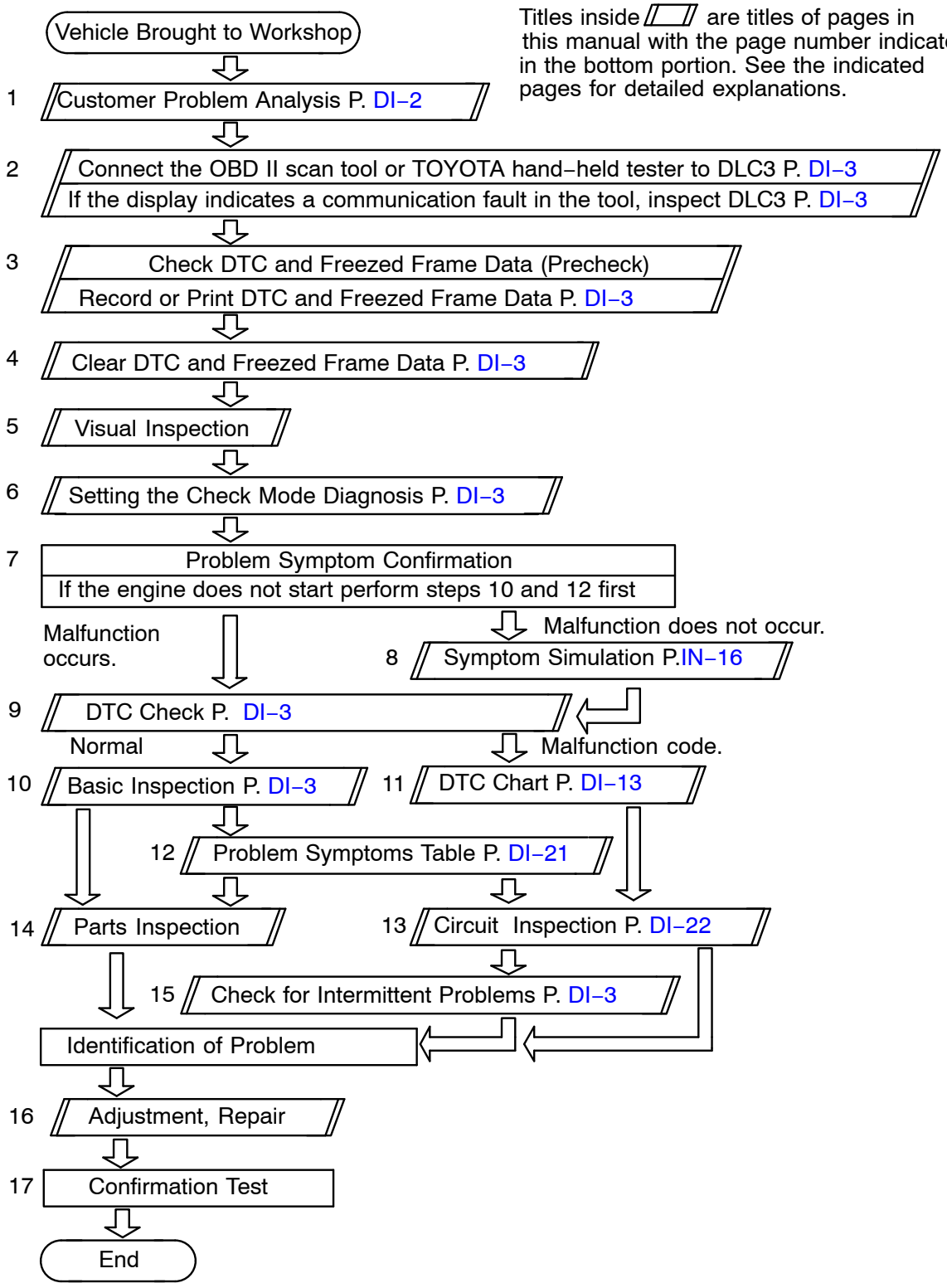
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ENGINE (3RZ–FE)

DI0T5–02

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.



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DI0T6–01

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name _____

Customer's Name		Model and Model Year	
Driver's Name		Frame No.	
Data Vehicle Brought in		Engine Model	
License No.		Odometer Reading	km miles

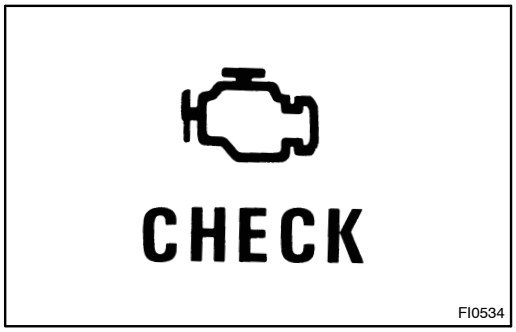
Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Datas Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temp.	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx. ____°F/____°C)
	Place	☐ Highway ☐ Suburbs ☐ Inner city ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After warming up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

Condition of MIL		☐ Remains on	☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal Mode (Precheck)	☐ Normal	☐ Malfunction code(s) (code) ☐ Freezed frame data ( )
	Check Mode	☐ Normal	☐ Malfunction code(s) (code) ☐ Freezed frame data ( )

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DI0T7–03



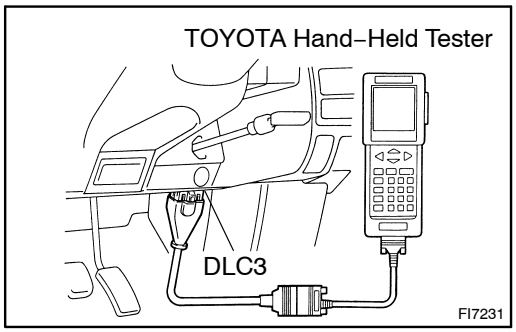
PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you connect to the vehicle the OBD II scan tool complying with SAE J1978 or TOYOTA hand–held tester, and read off various data output from the vehicle's ECM.
- OBD II regulations require that the vehicle's on–board computer lights up the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components which affect vehicle emissions. In addition to the MIL lighting up when a malfunction is detected, the applicable Diagnostic Trouble Code (DTC) prescribed by SAE J2012 are recorded in the ECM memory (See page DI–13).

If the malfunction does not reoccur in 3 trips, the MIL goes off but the DTCs remain recorded in the ECM memory.



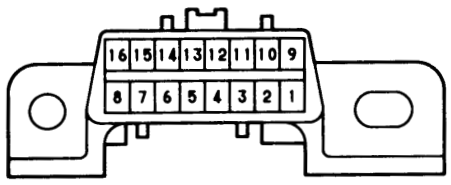
- To check the DTCs, connect the OBD II scan tool or TOYOTA hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle. The OBD II scan tool or TOYOTA hand–held tester also enables you to erase the DTCs and check freezed frame data and vaious forms of engine data (For operating instructions, see the OBD II scan tool's instruction book.).
- DTCs include SAE controlled codes and manufacturer controlled codes. SAE controlled codes must be set as prescribed by the SAE, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page DI–13).
- The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and ensure thorough malfunction detection. By switching the ECM to check mode when troubleshooting, the technician can cause the MIL to light up for a malfunction that is only detected once or momentarily (TOYOTA hand–held tester only) (See step 2).
- *2 trip detection logic: When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the 2nd drive test, this 2nd detection causes the MIL to light up.

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- The 2 trip repeats the same mode a 2nd time (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip.).
- Freeze frame data:
  Freeze frame data records the engine condition when a misfire (DTCs P0300 – P0304) or fuel trim malfunction (DTCs P0171, P0172) or other malfunction (first malfunction only), is detected.
- Because freeze frame data records the engine conditions (fuel system, calculator load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

Priorities for troubleshooting:
If troubleshooting priorities for multiple DTCs are given in the applicable DTC chart, these should be followed.
If no instructions are given troubleshoot DTCs according to the following priorities.

(1) DTCs other than fuel trim malfunction (DTCs P0171, P0172), EGR (DTCs P0401, P0402), and misfire (DTC P0300 – P0304).



DLC3

(2) Fuel trim malfunction (DTCs P0171, P0172), and EGR (DTCs P0401, P0402).
(3) Misfire (DTCs P0300 ~ P0304).

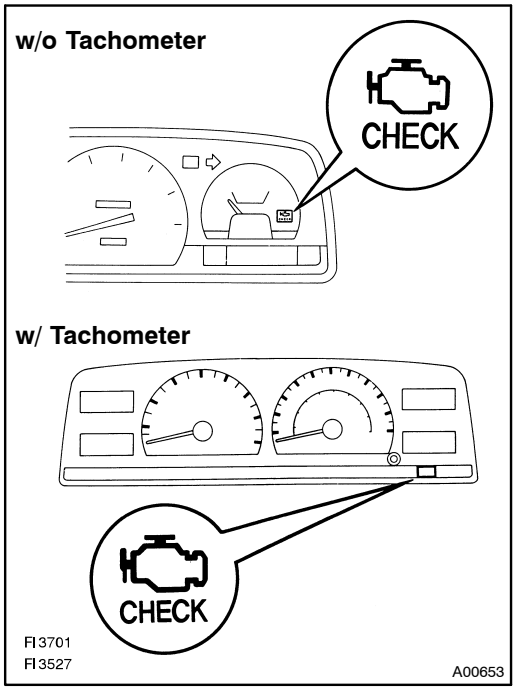
(b) Check the DLC3.
The vehicle's ECM uses V.P.W. (Variable Pulse Width) for communication to comply with SAE J1850. The terminal arrangement of DLC3 complies with SAE J1962 and matches the V.P.W. format.

Terminal No.	Connection / Voltage or Resistance	Condition
2	Bus ⊕ Line / Pulse generation	During transmission
4	Chassis Ground ↔ Body Ground / 1 Ω or less	Always
5	Signal Ground ↔ Body Ground / 1 Ω or less	Always
16	Battery Positive ↔ Body Ground / 9 – 14 V	Always

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HINT:
If your display shows ”UNABLE TO CONNECT TO VEHICLE” when you have connected the cable of the OBD II scan tool or TOYOTA hand–held tester to DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool’s instruction manual.



2. INSPECT DIAGNOSIS (Normal Mode)

(a) Check the MIL.

(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the MIL does not light up, troubleshoot the combination meter.

(2) When the engine started, the MIL should go off. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

(b) Check the DTC.

NOTICE:
TOYOTA hand–held tester only: When the diagnosis system is switched from normal mode to check mode, it erases all DTCs and freezed frame data recorded in normal mode. So before switching modes, always check the DTCs and freezed frame data, and note them down.

(1) Prepare the OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester.

(2) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3 at the lower of the instrument panel.

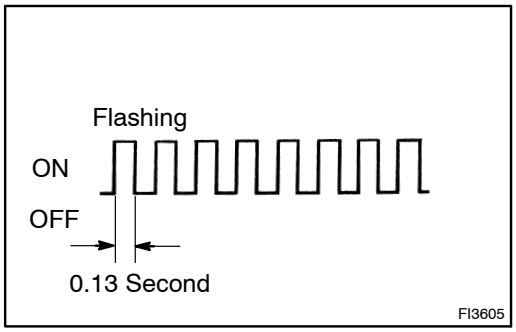
(3) Turn the ignition switch ON and turn the OBD II scan tool or TOYOTA hand–held tester switch ON.

(4) Use the OBD II scan tool or TOYOTA hand–held tester to check the DTCs and freezed frame data, note them down. (For operating instructions, see the OBD II scan tool’s instruction book.)

(5) See page DI–13 to confirm the details of the DTCs.

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NOTICE:
When simulating symptoms with an OBD II scan tool (excluding TOYOTA hand–held tester) to check the DTCs, use normal mode. For code on the DTC chart subject to ”2 trip detection logic”, turn the ignition switch OFF after the symptom is simulated the 1st time. Then repeat the simulation process again. When the problem has been simulated twice, the MIL lights up and the DTCs are recorded in the ECM.



3. INSPECT DIAGNOSIS (Check Mode)

HINT:
TOYOTA hand–held tester only:
Compared to the normal mode, the check mode has an increased sensitivity to detect malfunctions.
Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.

(a) Check the DTC.
  (1) Initial conditions
    - Battery positive voltage 11 V or more
    - Throttle valve fully closed
    - Transmission in ”P” or ”N” position
    - Air conditioning switched OFF
  (2) Turn the ignition switch OFF.
  (3) Prepare the TOYOTA hand–held tester.
  (4) Connect the TOYOTA hand–held tester to DLC3 at the lower of the instrument panel.
  (5) Turn the ignition switch ON and switch the TOYOTA hand–held tester ON.
  (6) Switch the TOYOTA hand–held tester normal mode to check mode (Check that the MIL flashes.).
  (7) Start the engine (The MIL goes out after the engine start.).
  (8) Simulate the conditions of the malfunction described by the customer.

NOTICE:
Leave the ignition switch ON until you have checked the DTCs, etc.

  (9) After simulating the malfunction conditions, use the TOYOTA hand–held tester diagnosis selector to check the DTCs and freezed frame data, etc.

HINT:
Take care not to turn the ignition switch OFF. Turning the ignition switch OFF switches the diagnosis system from check mode to normal mode. so all DTCs, etc. are erased.

  (10) After checking the DTC, inspect the applicable circuit.

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(b) Clear the DTC.
The following actions will erase the DTCs and freezed frame data.
(1) Operating the OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester to erase the codes. (See the OBD II scan tool's instruction book for operating instructions.)
(2) Disconnecting the battery terminals or EFI fuse.

NOTICE:
If the TOYOTA hand–held tester switches the ECM from normal mode to check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during check mode, the DTCs and freezed frame data will be erased.

4. FAIL–SAFE CHART

If any of the following codes is recorded, the ECM enters fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0100	Ignition timing fixed at 5° BTDC Injection time fixed Starting – – – – – – – – 11.6 msec. CTP switch ON – – – – 3.2 msec. CTP switch OFF – – – – 6.0 msec.	Returned to normal condition
P0110	Intake air temp. is fixed at 20°C (68°F)	Returned to normal condition
P0115	Engine coolant temp. is fixed at 80°(176°F)	Returned to normal condition
P0120	VTA is fixed at 0°	Following condition must be repeated at least 2 times consecutively When closed throttle position switch is ON: 0.1 V ≦ VTA ≦ 0.95 V
P0135 P0141	Heater circuit in which an abnormality is detected is turned off	Ignition switch OFF
P0325	Max. timing retardation	Ignition switch OFF
P0336	Fuel cut	Returned to normal condition
P1300	Fuel cut	Returned to normal condition

5. CHECK FOR INTERMITTENT PROBLEMS

HINT:
TOYOTA HAND–HELD TESTER only:
By putting the vehicle's ECM in check mode, 1 trip detection logic is possible instead of 2 trip detection logic and sensitivity to detect open circuits is increased. This makes it easier to detect intermittent problems.

(a) Clear the DTC (See step 3).
(b) Set the check mode (See step 3).
(c) Perform a simulation test (See page IN–16).
(d) Check the connector and terminal (See page IN–26).
(e) Handle the connector (See page IN–26).

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6. BASIC INSPECTION

When the malfunction code is not confirmed in the DTC check, troubleshooting should be performed in the order for all possible circuits to be considered as the causes of the problems. In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, use of this check is essential in engine troubleshooting.

1	**Is battery positive voltage 11 V or more when engine is stopped?**

NO → **Charge or replace battery.**

YES

2	**Is engine cranked?**

NO → **Proceed to page ST–15 and continue to trouble-shoot.**

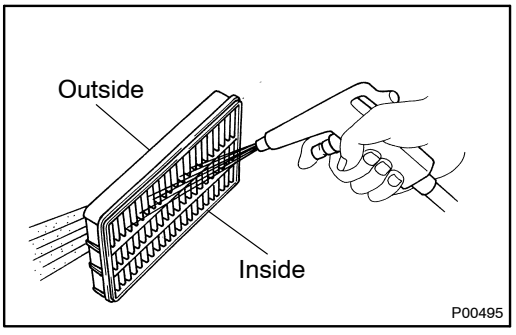
YES

3	**Does engine start?**

NO → **Go to step 7.**

YES

4	**Check air filter.**



PREPARATION:
Remove the air filter.
CHECK:
Visual check that the air filter is not dirty or excessive oily.
HINT:
If necessary, clean the filter with compressed air. First blow from inside thoroughly, then blow from outside of the filter.

NG → **Repair or replace.**

OK

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5	Check idle speed.

PREPARATION:

(a) Warm up the engine to normal operating temperature.
(b) Switch off all the accessories.
(c) Switch off the air conditioning.
(d) Shift the transmission into ”N” position.
(e) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3 on the vehicle.

CHECK:

Use CURRENT DATA to check the idle speed.

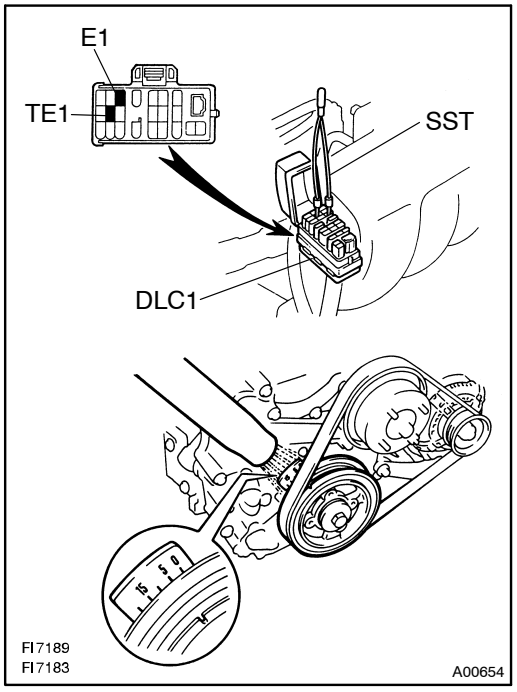
OK:

Idle speed: 750 ± 50 rpm

NG → **Proceed to problem symptoms table on page DI–21.**

OK

6	Check ignition timing.



PREPARATION:

(a) Warm up the engine to normal operating temperature.
(b) Shift the transmission into ”N” position.
(c) Keep the engine speed at idle.
(d) Using SST, connect terminals TE1 and E1 of the DLC1.
SST 09843–18020
(e) Using a timing light, connect the tester to the No.1 high–tension cord.

CHECK:

Check the ignition timing.

OK:

Ignition timing: Approx. 5° BTDC at idle

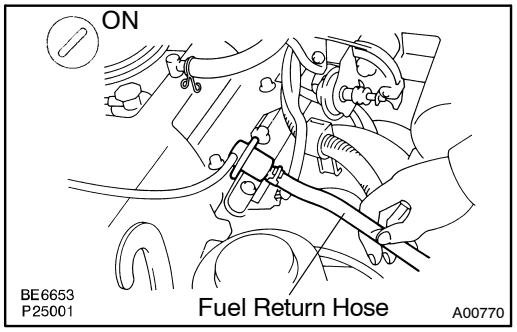
NG → **Proceed to IGNITION and continue to trouble-shoot.**

OK

Proceed to problem symptoms table on page DI–21.

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7	Check fuel pressure.



PREPARATION:

(a) Be sure that enough fuel is in the tank.
(b) Connect the TOYOTA hand–held tester to the DLC3.
(c) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
(d) Use ”ACTIVE TEST” mode to operate the fuel pump.

CHECK:

Check for fuel pressure in the fuel return hose when it is pinched off.

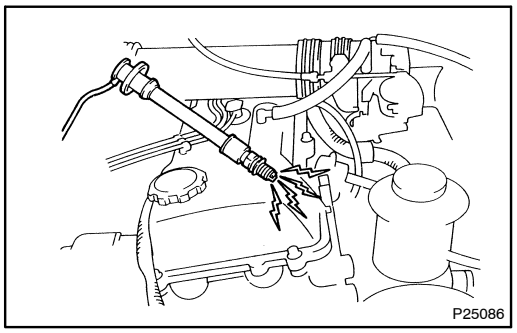
HINT:

At this time, you will hear a fuel flowing noise.

NG → **Proceed to page MF–1 and continue to trouble-shoot.**

OK

8	Check for spark.



PREPARATION:

(a) Disconnect the high–tension cord from the spark plug.
(b) Remove the spark plug.
(c) Install the spark plug to the high–tension cord.
(d) Disconnect the injector connector.
(e) Ground the spark plug.

CHECK:

Check if the spark occurs while engine is being cranked.

NOTICE:

To prevent excess fuel being injected from the injectors during this test, don’t crank the engine for more than 5 ~ 10 seconds at a time.

NG → **Proceed to page IG–1 and continue to trouble-shoot.**

OK

Proceed to problem symptoms table on page DI–21.

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7. ENGINE OPERATING CONDITION

NOTICE:

The values given below for "Normal Condition" are representative values, so a vehicle may still be normal even if its value varies from those listed here. So do not decide whether a part is faulty or not solely according to the "Normal Condition" here.

(a) CARB mandated signals.

TOYOTA hand–held tester display	Measurement Item	Normal Condition*
FUEL SYS #1	Fuel System Bank 1 OPEN: Air–fuel ratio feedback stopped CLOSED: Air–fuel ratio feedback operating	Idling after warming up: CLOSED
CALC LOAD	Calculator Load: Current intake air volume as a proportion of max. intake air volume	Idling: 15.4 – 22.1 % Racing without load (2,500 rpm): 14.7 – 21.5 %
COOLANT TEMP.	Engine Coolant Temp. Sensor Value	After warming up: 80 ~ 95°C (176 ~ 203°F)
SHORT FT #1	Short–term Fuel Trim Bank 1	0 ± 20 %
LONG FT #1	Long–term Fuel Trim Bank 1	0 ± 20 %
ENGINE SPD	Engine Speed	Idling: 650 – 750 rpm
VEHICLE SPD	Vehicle Speed	Vehicle Stopped: 0 km/h (0 mph)
IGN ADVANCE	Ignition Advance: Ignition Timing of Cylinder No.1	Idling: BTDC 7 – 13°
INTAKE AIR	Intake Air Temp. Sensor Value	Equivalent to Ambient Temp.
MAF	Air Flow Rate Through Mass Air Flow Meter	Idling: 2.7 – 3.9 gm/sec. Racing without load (2,500 rpm): 9.2 – 13.3 gm/sec.
THROTTLE POS	Voltage Output of Throttle Position Sensor Calculated as a percentage: 0 V → 0 %, 5 V → 100 %	Throttle Fully Closed: 7 – 11 % Throttle Fully Open: 65 – 75 %
O2S B1, S1	Voltage Output of Oxygen Sensor Bank 1, Sensor 1	Idling: 0.1 – 0.9 V
O2FT B1, S1	Oxygen Sensor Fuel Trim Bank 1, Sensor 1 (Same as SHORT FT #1)	0 ± 20 %
O2S B1, S2	Voltage Output of Oxygen Sensor Bank 1, Sensor 2	Driving (50 km/h, 31 mph): 0.1 – 0.9 V

*: If no conditions are specifically stated for "Idling", it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

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(b) TOYOTA Enhanced Signals.

TOYOTA hand–held tester display	Measurement Item	Normal Condition*
MISFIRE RPM	Engine RPM for first misfire range	Misfire 0: 0 rpm
MISFIRE LOAD	Engine load for first misfire range	Misfire 0: 0 g/r
INJECTOR	Fuel injection time for cylinder No.1	Idling: 2.5 – 4.3 ms
IAC DUTY RATIO	Intake Air Control Valve Duty Ratio Opening ratio rotary solenoid type IAC valve	Idling: 24.8 – 50.0 %
STARTER SIG	Starter Signal	Cranking: ON
CTP SW	Closed Throttle Position Switch Signal	Throttle Fully Closed: ON
A/C SIG	A/C Switch Signal	A/C ON: ON
STOP LIGHT SW	Stop Light Switch Signal	Stop light switch ON: ON
FC IDL	Fuel Cut Idle: Fuel cut when throttle valve fully closed, during deceleration	Fuel cut operating: ON
FC TAU	Fuel Cut TAU: Fuel cut during very light load	Fuel cut operating: ON
CYL #1, CYL #2, CYL #3, CYL #4	Abnormal revolution variation for each cylinder	0 %
IGNITION	Total number of ignition for every 1,000 revolutions	0 – 2,000
EGRT GAS	EGR Gas Temp. Sensor Value	EGR not operating: Temp. between intake air temp. and engine coolant temp.
EGR SYSTEM	EGR System Operating Condition	Idling: OFF
A/C CUT SIG	A/C Cut Signal	A/C S/W OFF: ON
FUEL PUMP	Fuel Pump Signal	Idling: ON
EVAP (PURGE) VSV	EVAP VSV Signal	Idling: OFF
TOTAL FT B1	Total Fuel Trim Bank 1: Average value for fuel trim system of bank 1	Idling: 0.8 – 1.2 V
O2 LR B1, S1	Oxygen Sensor Lean Rich Bank 1, Sensor 1 Response time for oxygen sensor output to switch from lean to rich	Idling after warming up: 0 – 1,000 msec.
O2 RL B1, S1	Oxygen Sensor Rich Lean Bank 1, Sensor 1 Response time for oxygen sensor output to switch from rich to lean	Idling after warming up: 0 – 1,000 msec.

*: If no conditions are specifically stated for ”Idling”, it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

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DI0T8–03

DIAGNOSTIC TROUBLE CODE CHART

SAE CONTROLLED

HINT:

Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in check mode, check the circuit for that code listed in the table below. For details of each code, turn to the page referred to under the "See Page " for the respective "DTC No." in the DTC chart.

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0100 (DI–22)	Mass Air Flow Circuit Malfunction	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0101 (DI–26)	Mass Air Flow Circuit Range/Performance Problem	• Mass air flow meter	○	○
P0110 (DI–27)	Intake Air Temp. Circuit Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • ECM	○	○
P0115 (DI–33)	Engine Coolant Temp. Circuit Malfunction	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	○	○
P0116 (DI–38)	Engine Coolant Temp. Circuit Range/Performance Problem	• Engine coolant temp. sensor • Cooling system	○	○
P0120 (DI–39)	Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	○	○
P0121 (DI–43)	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem	• Throttle position sensor	○	○
P0125 (DI–44)	Insufficient Coolant Temp. for Closed Loop Fuel Control	• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1)	○	○
P0130 (DI–47)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	• Heated oxygen sensor • Fuel trim malfunction	○	○
P0133 (DI–50)	Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Heated oxygen sensor	○	○
P0135 (DI–51)	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM	○	○
P0136 (DI–53)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Heated oxygen sensor	○	○
P0141 (DI–51)	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	• Same as DTC No. P0135	○	○

*: ○ · · · MIL lights up

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0171 (DI–55)	System too Lean (Fuel Trim)	• Air intake (hose loose) • Fuel line pressure • Injector blockage • Heated oxygen sensor (bank 1 sensor 1) malfunction • Mass air flow meter • Engine coolant temp. sensor	○	○
P0172 (DI–55)	System too Rich (Fuel Trim)	• Fuel line pressure • Injector leak, blockage • Heated oxygen sensor (bank 1 sensor 1) malfunction • Mass air flow meter • Engine coolant temp. sensor	○	○
P0300 (DI–58)	Random/Multiple Cylinder Misfire Detected	• Ignition system • Injector • Fuel line pressure • EGR • Compression pressure • Valve clearance not to specification • Valve timing • Mass air flow meter • Engine coolant temp. sensor	○	○
P0301 P0302 P0303 P0304 (DI–58)	Misfire Detected – Cylinder 1 – Cylinder 2 – Cylinder 3 – Cylinder 4			
P0325 (DI–63)	Knock Sensor 1 Circuit Malfunction	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM	○	○
P0335 (DI–66)	Crankshaft Position Sensor ”A” Circuit Malfunction	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • ECM	○	○
P0336 (DI–69)	Crankshaft Position Sensor ”A” Circuit Range/Performance	• Valve timing • Distributor installation • ECM	○	○
P0340 (DI–70)	Camshaft Position Sensor Circuit Malfunction	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Distoributor • Starter • ECM	○	○
P0401 (DI–72)	Exhaust Gas Recirculation Flow Insufficient Detected	• EGR valve stuck closed • Short in VSV circuit for EGR • Open in EGR gas temp. sensor circuit • EGR hose disconnected • ECM	○	○
P0402 (DI–82)	Exhaust Gas Recirculation Flow Excessive Detected	• EGR valve stuck open • VSV for EGR open malfunction • Open in VSV circuit for EGR • Short in EGR gas temp. sensor circuit • ECM	○	○
P0420 (DI–86)	Catalyst System Efficiency Below Threshold	• Three–way catalytic convertor • Open or short in heated oxygen sensor circuit • Heated oxygen sensor	○	○

*: ○ · · · MIL lights up

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0441 (DI–88)	Evaporative Emission Control System Incorrect Purge Flow	• Open or short in VSV circuit for EVAP • VSV for EVAP • ECM • Vacuum hose damaged, blocked or disconnected • Charcoal canister	○	○
P0500 (DI–92)	Vehicle Speed Sensor Malfunction	• Open or short in No.1 vehicle speed sensor circuit • No.1 vehicle speed sensor • ECM • Speedometer cable	○	○
P0505 (DI–94)	Idle Control System Malfunction	• IAC valve is stuck or closed • Open or short in IAC valve circuit • Air intake (hose loose)	○	○
P0510 (DI–97)	Closed Throttle Position Switch Malfunction	• Open in closed throttle position switch circuit • Closed throttle position switch • ECM	○	○

*: ○ · · · MIL lights up

MANUFACTURER CONTROLLED

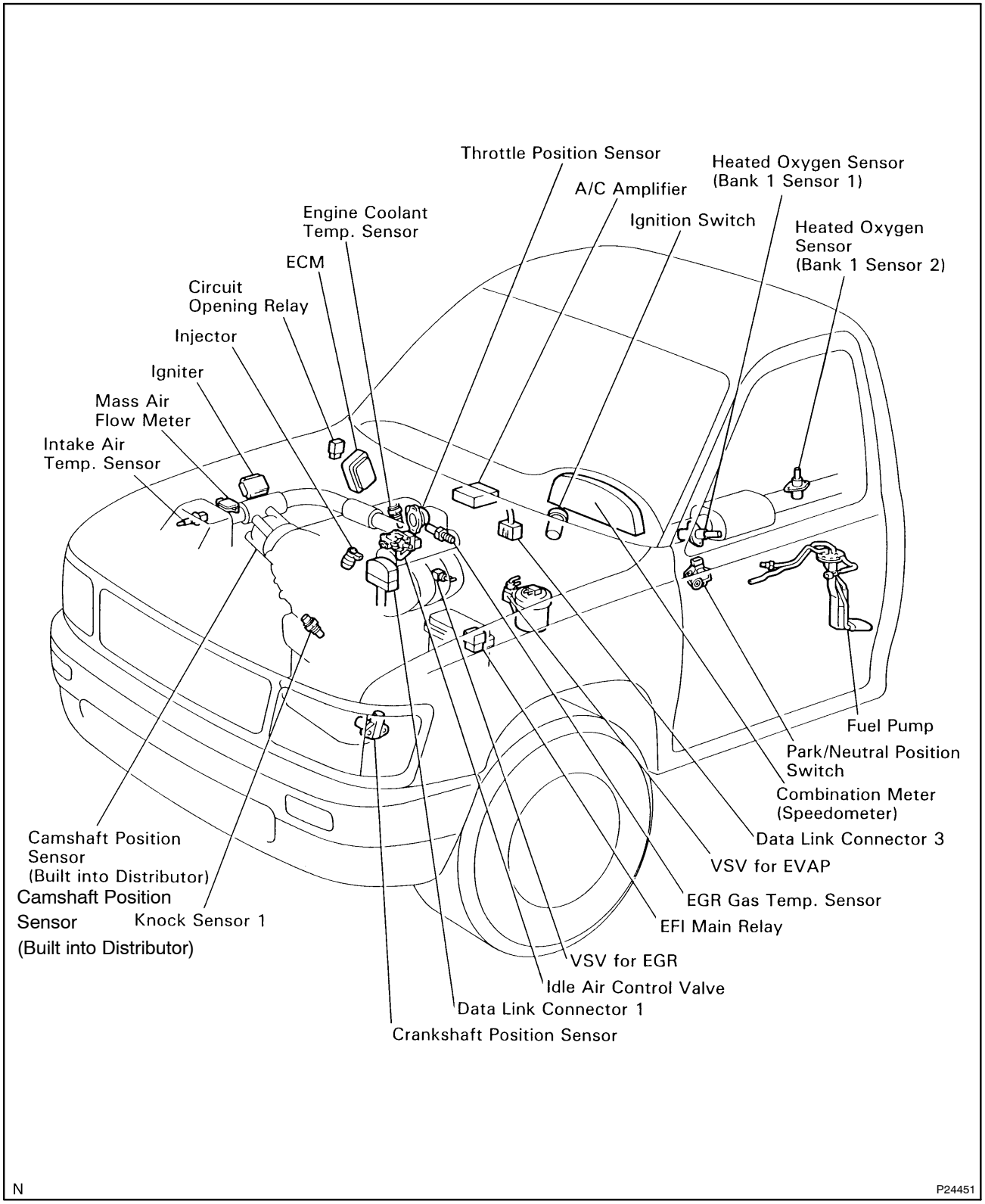
DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P1300 (DI–103)	Igniter Circuit Malfunction	• Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM	○	○
P1335 (DI–109)	Crankshaft Position Sensor Circuit Malfunction (during engine running)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • ECM	–	○
P1500 (DI–110)	Starter Signal Malfunction	• Open or short in starter signal • Open or short in ignition switch or starter relay circuit • ECM	–	○
P1600 (DI–112)	ECM BATT Malfunction	• Open in back up power source circuit • ECM	○	○
P1780 (DI–114)	Park/Neutral Position Switch Malfunction	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM	○	○

*: – · · · MIL does not light up, ○ · · · MIL lights up

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DI0T9–02

PARTS LOCATION



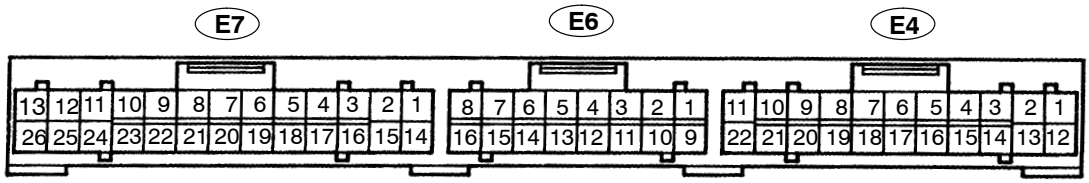
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DI0TA–03

TERMINALS OF ECM

For M/T

ECM Terminals



P19559

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E4–1) – E1 (E7–14)	B–G ↔ BR	Always	9 – 14
+B (E4–12) – E1 (E7–14)	W–R ↔ BR	IG switch ON	9 – 14
VCC (E6–1) – E2 (E6–9)	G–Y ↔ BR–B	IG switch ON	4.5 – 5.5
IDL (E6–12) – E2 (E6–9)	Y–L↔BR–B	IG switch ON, Apply vacuum to throttle opener Throttle valve fully closed	0 – 3.0
		IG switch ON, Throttle valve fully open	9 – 14
VTA (E6–11) – E2 (E6–9)	Y ↔ BR–B	IG switch ON, Apply vacuum to throttle opener Throttle valve fully closed	0.3 – 0.8
		IG switch ON, Throttle valve fully open	3.2 – 4.9
VG (E6–2) – E3 (E6–16)	Y–R ↔ BR	Idling, N position, A/C switch OFF	1.1 – 1.5
THA (E6–7) – E2 (E6–9)	Y–G ↔ BR–B	Idling, Intake air temp. 20°C (68°F)	0.5 – 3.4
THW (E6–4) – E2 (E6–9)	G–Y ↔ BR–B	Idling, Engine coolant temp. 80°C (176°F)	0.2 – 1.0
STA (E4–11) – E1 (E7–14)	B–W ↔ BR	Cranking	6.0 or more
#10 (E7–12) – E01 (E7–13)	W–R ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–58)
#20 (E7–11) – E01 (E7–13)	W ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–58)
IGT (E7–20) – E1 (E7–14)	B–L ↔ BR	Idling	Pulse generation (See page DI–103)
IGF (E7–3) – E1 (E7–14)	B–Y ↔ BR	IG switch ON, Disconnect igniter connector	Below 2.0
		Idling	Pulse generation (See page DI–103)
G (E7–5) – G– (E7–18)	B ↔ G	Idling	Pulse generation (See page DI–66)
NE (E7–4) – NE– (E7–17)	W ↔ B	Idling	Pulse generation (See page DI–66)
FC (E4–14) – E1 (E7–14)	G–Y ↔ BR	IG switch ON	9 – 14
EGR (E7–6) – E1 (E7–14)	P ↔ BR	IG switch ON	9 – 14
EVP (E7–23) – E1 (E7–14)	W–G ↔ BR	IG switch ON	9 – 14
RSC (E7–9) – E1 (E7–14)	V–Y ↔ BR	IG switch ON, Disconnect E7 of ECM connector	9 – 14
RSO (E7–10) – E1 (E7–14)	V–R ↔ BR	IG switch ON, Disconnect E7 of ECM connector	9 – 14
OX1 (E6–6) – E1 (E7–14)	B ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warming up	Pulse generation

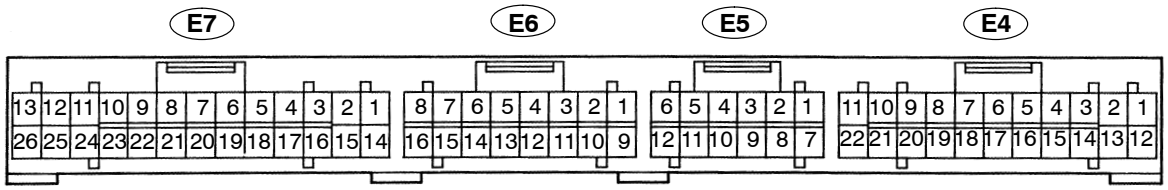
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HT1 (E7–2) – E03 (E7–25)	P–G ↔ BR	Idling	Below 3.0
		IG switch ON	9 – 14
HT2 (E7–15) – E03 (E7–25)	R–G ↔ BR	Idling	Below 3.0
		IG switch ON	9 – 14
KNK (E6–13) – E1 (E7–14)	B ↔ BR	Idling	Pulse generation (See page DI–63)
SP1 (E4–9) – E1 (E7–14)	G ↔ BR	IG switch ON, Rotate driving wheel slowly	Pulse generation (See page DI–92)
TE1 (E6–15) – E1 (E7–14)	V–W ↔ BR	IG switch ON	9 – 14
W (E4–5) – E1 (E7–14)	V ↔ BR	Idling	9 – 14
		IG switch ON	Below 3.0
ACT (E4–8) – E1 (E7–14)	L–B ↔ BR	A/C switch OFF at idling	9 – 14
		A/C switch ON at idling	Below 2.0
AC1 (E4–10) – E1 (E7–14)	B–R ↔ BR	A/C switch ON at idling	Below 2.0
		A/C switch OFF idling	9 – 14

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For A/T

ECM Terminals



FI6526

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E4–2) – E1 (E7–24)	B–G ↔ BR	Always	9 – 14
+B (E4–12) – E1 (E7–24)	W–R ↔ BR	IG switch ON	9 – 14
VCC (E6–1) – E2 (E6–9)	G–Y ↔ BR–B	IG switch ON	4.5 – 5.5
IDL (E6–11) – E2 (E6–9)	Y–L ↔ BR–B	IG switch ON, Apply vacuum to throttle opener Throttle valve fully closed	0 – 3.0
		IG switch ON, Throttle valve fully open	9 – 14
VTA (E6–10) – E2 (E6–9)	Y ↔ BR–B	IG switch ON, Apply vacuum to throttle opener Throttle valve fully closed	0.3 – 0.8
		IG switch ON, Throttle valve fully open	3.2 – 4.9
VG (E6–2) – E3 (E6–3)	Y–R ↔ BR	Idling, A/C switch OFF	1.0 – 1.5
THA (E6–12) – E2 (E6–9)	Y–G ↔ BR–B	Idling, Intake air temp. 20˚C (68˚F)	0.5 – 3.4
THW (E6–4) – E2 (E6–9)	G–Y ↔ BR–B	Idling, Engine coolant temp. 80˚C (176˚F)	0.2 – 1.0
STA (E4–11) – E1 (E7–24)	B–W ↔ BR	Cranking	6.0 or more
#10 (E7–12) – E01 (E7–13)	W–R ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–58)
#20 (E7–11) – E01 (E7–13)	W ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–58)
IGT (E7–23) – E1 (E7–24)	B–L ↔ BR	Idling	Pulse generation (See page DI–103)
IGF (E7–17) – E1 (E7–24)	B–Y ↔ BR	IG switch ON, Disconnect igniter connector	Below 2.0
		Idling	Pulse generation (See page DI–103)
G (E5–11) – G– (E5–5)	B ↔ G	Idling	Pulse generation (See page DI–66)
NE (E5–12) – NE– (E5–6)	W ↔ B	Idling	Pulse generation (See page DI–66)
FC (E7–14) – E1 (E7–24)	G–Y ↔ BR	IG switch ON	9 – 14
EGR (E7–22) – E1 (E7–24)	P ↔ BR	IG switch ON	9 – 14
PRG (E5–1) – E1 (E7–24)	W–G ↔ BR	IG switch ON	9 – 14
RSC (E7–6) – E1 (E7–24)	V–Y ↔ BR	IG switch ON, Disconnect E7 of ECM connector	9 – 14
RSO (E7–7) – E1 (E7–24)	V–R ↔ BR	IG switch ON, Disconnect E7 of ECM connector	9 – 14
OX1 (E6–5) – E1 (E7–24)	B ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warming up	Pulse generation

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FPU (E7–4) – E1 (E7–24)	G ↔ BR	IG switch ON	9 – 14
		Restarting at high engine coolant temp.	0 – 3
HT1 (E7–3) – E03 (E7–25)	P–G ↔ BR	Idling	Below 3.0
		IG switch ON	9 – 14
HT2 (E7–16) – E03 (E7–25)	R–G ↔ BR	Idling	Below 3.0
		IG switch ON	9 – 14
KNK (E6–6) – E1 (E7–24)	B ↔ BR	Idling	Pulse generation (See page DI–63)
NSW (E4–22) – E1 (E7–24)	B–Y ↔ BR	IG switch ON, Other shift position in "P", "N" position	9 – 14
		IG switch ON, Shift position in "P", "N" position	0 – 3.0
SP1 (E4–8) – E1 (E7–24)	G ↔ BR	IG switch ON Rotate driving wheel slowly	Pulse generation (See page DI–92)
TE1 (E6–7) – E1 (E7–14)	V–W ↔ BR	IG switch ON	9 – 14
W (E4–4) – E1 (E7–24)	V ↔ BR	Idling	9 – 14
		IG switch ON	Below 3.0
ACT (E4–6) – E1 (E7–24)	L–B ↔ BR	A/C switch OFF at idling	9 – 14
		A/C switch ON at idling	Below 2.0
AC1 (E4–7) – E1 (E7–24)	B–R ↔ BR	A/C switch ON at idling	Below 2.0
		A/C switch OFF idling	9 – 14

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DI0TB–03

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	1. Starter and starter relay	ST–15
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit	DI–115 DI–118
No complete combustion (Does not start)	1. Fuel pump control circuit	DI–118
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI–110 DI–118 EM–3
Cold engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI–110 DI–118
Hot engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI–110 DI–118
High engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. ECM power source circuit	AC–79 DI–115
Low engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. Fuel pump control circuit	AC–79 DI–118
Rough idling (Poor idling)	1. Compression 2. Fuel pump control circuit	EM–3 DI–118
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel pump control circuit	DI–115 DI–118
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. A/T faulty	DI–118 DI–282
Surging (Poor driveability)	1. Fuel pump control circuit	DI–118
Soon after starting (Engine stall)	1. Fuel pump control circuit	DI–118
During A/C operation (Engine stall)	1. A/C signal circuit (Compressor circuit) 2. Engine control module (ECM)	AC–79 IN–26

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DI0TC–03

CIRCUIT INSPECTION

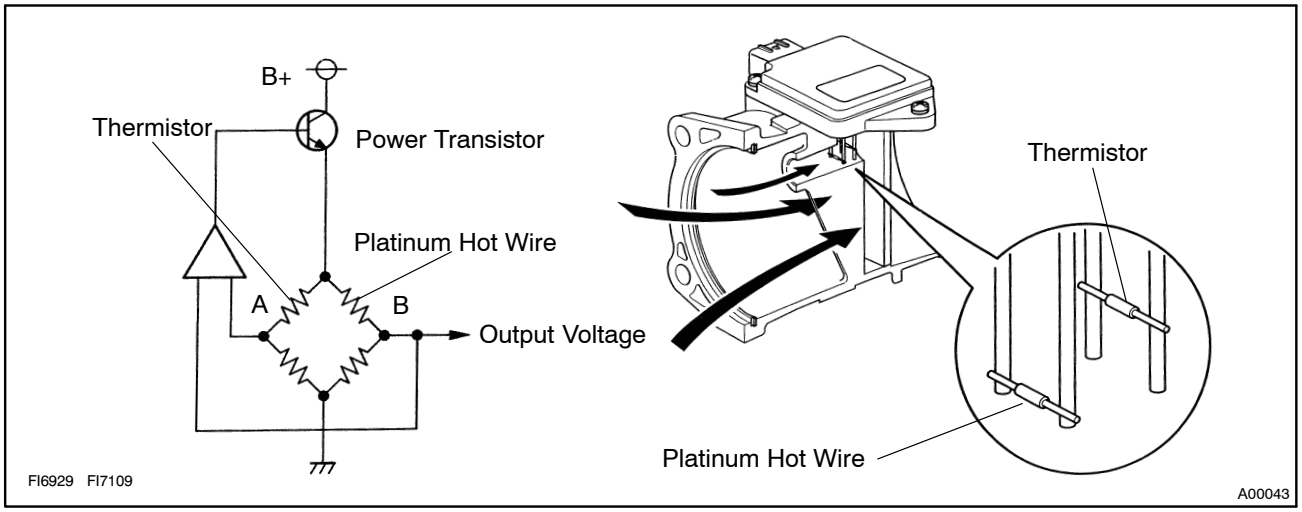
DTC	P0100	Mass Air Flow Circuit Malfunction

CIRCUIT DESCRIPTION

The mass air flow meter uses a platinum hot wire. The hot wire air flow meter consists of a platinum hot wire, thermistor and a control circuit installed in a plastic housing. The hot wire air flow meter works on the principle that the hot wire and thermistor located in the intake air bypass of the housing detect any changes in the intake air temp.

The hot wire is maintained at the set temp. by controlling the current flow through the hot wire. This current flow is ten measured as the output voltage of the air flow meter.

The circuit is constructed so that the platinum hot wire and thermistor provide a bridge circuit, with the power transistor controlled so that the potential of ”A” and ”B” remains equal to maintain the set temp.



DTC No.	DTC Detecting Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or less (2 trip detection logic)	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM

If the ECM detects DTC ”P0100” it operates the fail safe function, keeping the ignition timing and injection volume constant and making it possible to drive the vehicle.

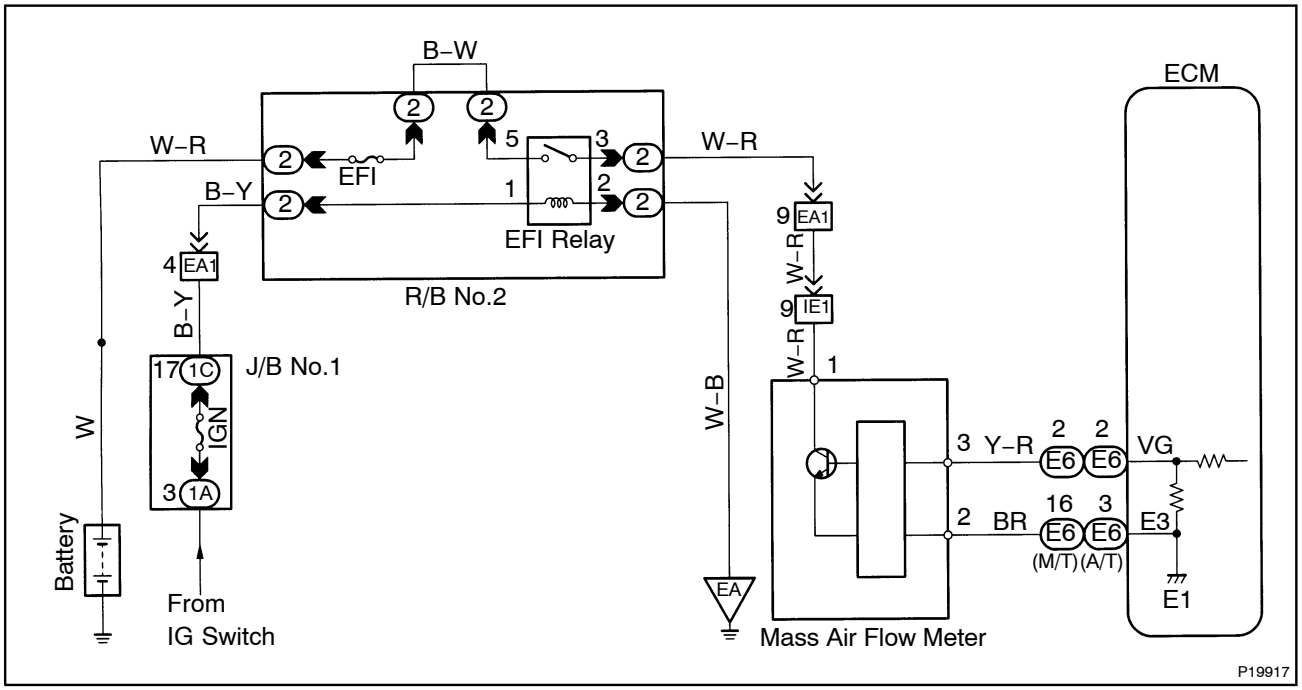
HINT:

After confirming DTC P0100 use the OBD II scan tool or TOYOTA hand–held tester to confirm the mass air flow ratio from ”CURRENT DATA”.

Mass Air Flow Value (gm/sec.)	Malfunction
0.5	• Mass air flow meter power source circuit open • VG circuit open or short
202.2 or more	• E3 circuit open

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WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Connect OBD II scan tool or TOYOTA hand–held tester and read value of mass air flow rate.**

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON.

(c) Start the engine.

CHECK:

Read mass air flow rate on the OBD II scan tool or TOYOTA hand–held tester.

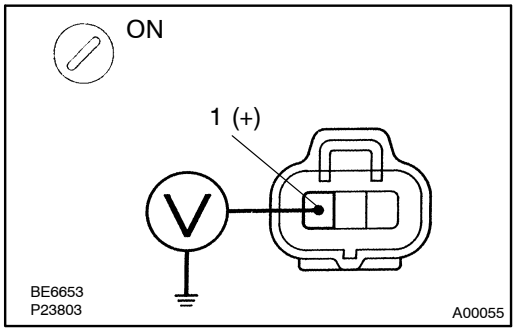
RESULT:

	Type I	Type II
Mass air flow rate (gm/sec.)	0.5 gm/sec.	202.2 gm/sec. or more

Type I	**Go to step 2.**
Type II	**Go to step 5.**

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2	Check voltage of mass air flow meter power source.



PREPARATION:
(a) Disconnect the mass air flow meter connector.
(b) Turn the ignition switch ON.

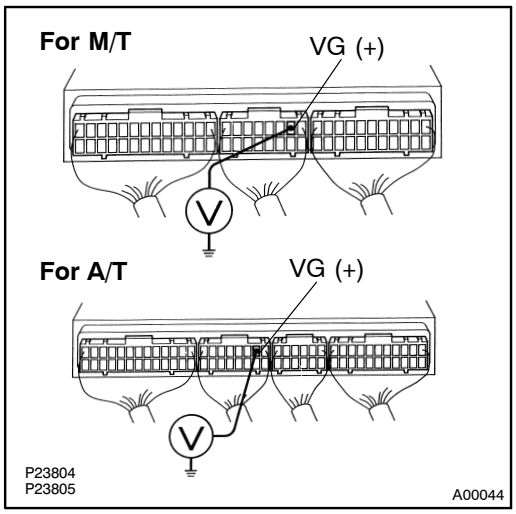
CHECK:
Measure voltage between terminal 1 of mass air flow meter connector and body ground.

OK:
Voltage: 9 – 14 V

NG	Check for open in harness and connector between EFI main relay (Marking : EFI) and mass air flow meter (See page IN–26).

OK

3	Check voltage between terminals VG of ECM connector and body ground.



PREPARATION:
(a) Remove the right cowl side trim (See page MF–50).
(b) Start the engine.

CHECK:
Measure voltage between terminal VG of ECM connector and body ground while engine is idling.

OK:
Voltage:
1.0 – 1.5 V (A/C switch OFF)

OK	Check and replace ECM (See page IN–26).

NG

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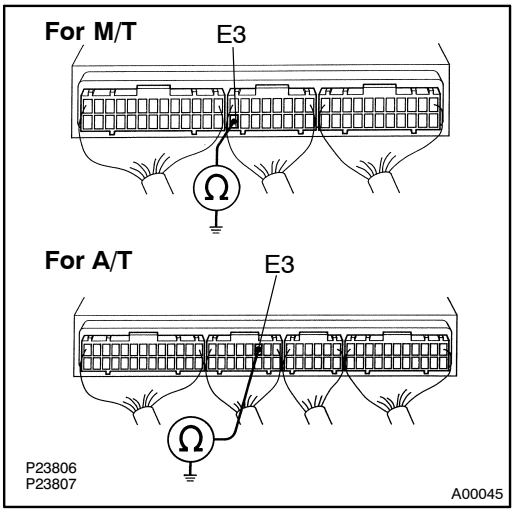
4	**Check for open and short in harness and connector between mass air flow meter and ECM (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

Replace mass air flow meter.

5	**Check continuity between terminal E3 of ECM connector and body ground.**



PREPARATION:
Remove the right cowl side trim (See page MF–50).
CHECK:
Check continuity between terminal E3 of ECM connector and body ground.
OK:

Continuity (1 Ω or less)

NG → **Check and replace ECM (See page IN–26).**

OK

6	**Check for open in harness and connector between mass air flow meter and ECM (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

Replace mass air flow meter.

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DI0TD–02

DTC	P0101	Mass Air Flow Circuit Range/Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page DI–22.

DTC No.	DTC Detecting Condition	Trouble Area
P0101	Conditions (a), (b) and (c) continue with engine speed 900 rpm or less: (2 trip detection logic) (a) Closed throttle position switch: ON (b) Mass air flow meter output > 2.2 V (c) THW ≧ 70°C (158°F)	• Mass air flow meter
	Conditions (a) and (b) continue with engine speed 1,850 rpm or more: (a) VTA ≧ 0.75 V (b) Mass air flow meter output < 1.0 V	

WIRING DIAGRAM

Refer to DTC P0110 (Intake Air Temp Circuit Malfunction) on page DI–27 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

1	Are there any other codes (besides DTC P0101) being output?

YES → Go to relevant DTC chart.

NO →

Replace mass air flow meter.

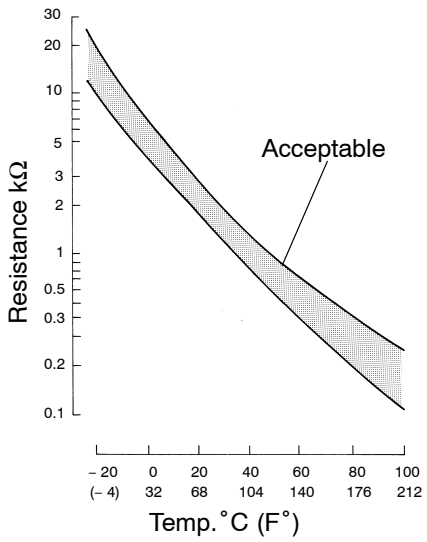
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DIOTE–03

DTC	P0110	Intake Air Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

(fig.1)



The intake air temp. sensor is built into the air cleaner cap and sensors the intake air temp.

A thermistor built in the sensor changes the resistance value according to the intake air temp. The lower the intake air temp., the greater the thermistor resistance value, and the higher the intake air temp., the lower the thermistor resistance value (See fig.1).

The intake air temp. sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temp. sensor from the terminal THA via a resistor R. That is, the resistor R and the intake air temp. sensor are connected in series. When the resistance value of the intake air temp. sensor changes in accordance with changes in the intake air temp., the potential at terminal THA also changes. Based on this signal, the ECM increases the fuel injection volume to improve driveability during cold engine operation.

If the ECM detects the DTC ”P0110”, it operates the fail safe function in which the intake air temp. is assumed to be 20˚C (68˚F).

DTC No.	DTC Detecting Condition	Trouble Area
P0110	Open or short in intake air temp. sensor circuit	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • ECM

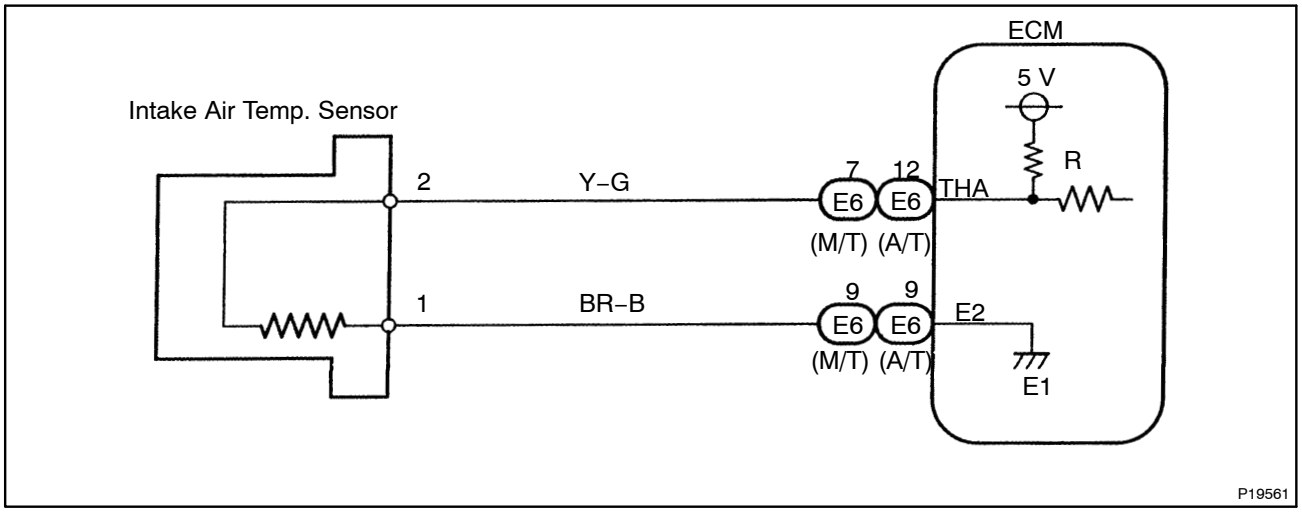
HINT:

After confirming DTC P110 use the OBD II scan tool or TOYOTA nand–held tester to confirm the intake air temp. from ”CURRENT DATA”.

Temp. Displayed	Malfunction
– 40˚C (– 40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

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WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

If DTCs P0110, P0115 and P0120 are output simultaneously, E2 (Sensor Ground) may be open.

1	**Connect OBD II scan tool or TOYOTA hand–held tester and read value of intake air temp.**

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to DLC3.

(b) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

Same as actual intake air temp.

HINT:

- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates – 40°C (– 40°F).
- If there is short circuit, OBD II scan tool or TOYOTA hand—held tester indicates 140°C (284°F) or more.

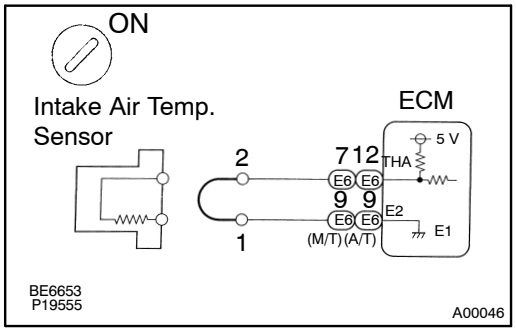
NG → **– 40°C (– 40°F) ... Go to step 2.**
140°C (284°F) or more ... Go to step 4.

OK

Check for intermittent problems (See page DI–3).

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2	Check for open in harness or ECM.



PREPARATION:

(a) Disconnect the intake air temp. sensor connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

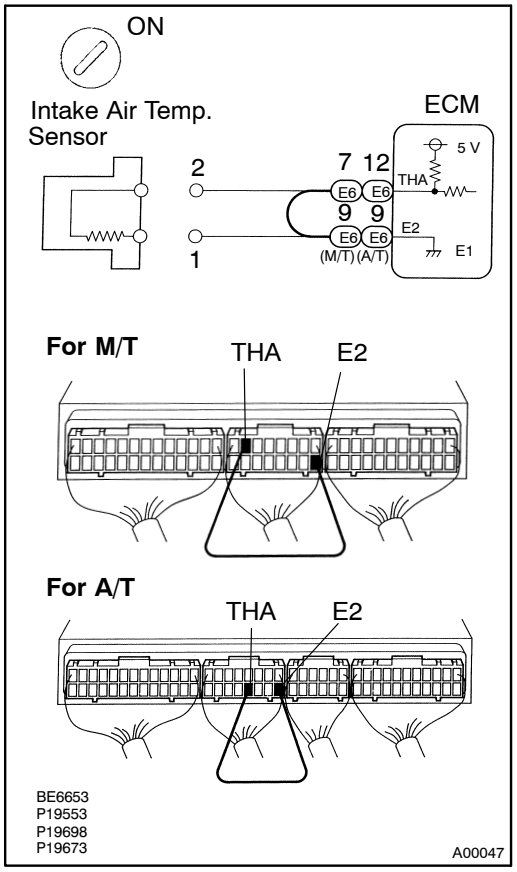
Temp. value: 140°C (284°F) or more

OK	Confirm good connection at sensor. If OK, replace intake air temp. sensor.

NG

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3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).

(b) Connect between terminals THA and E2 of the ECM connector.

HINT:

The intake air temp. sensor connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector (See page DI–3).

(c) Turn the ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

Temp. value: 140°C (284°F) or more

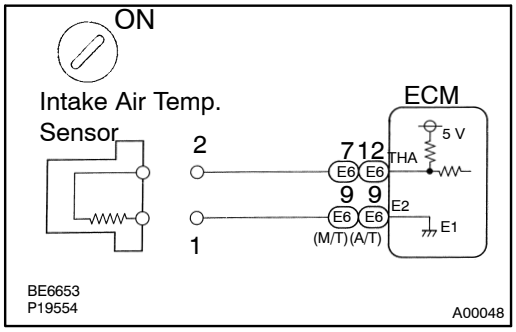
OK → **Open in harness between terminals E2 or THA, repair or replace harness.**

NG

**Confirm good connection at ECM.
If OK, replace ECM.**

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4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the intake air temp. sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

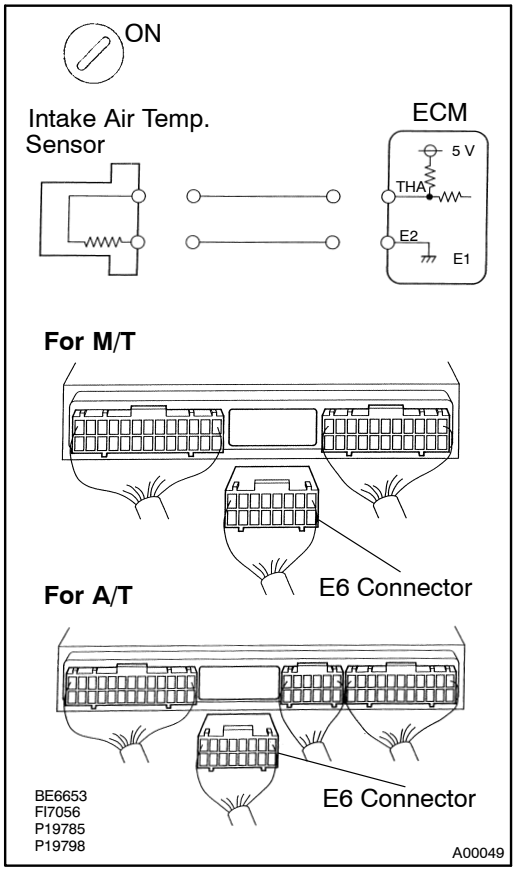
Temp. value: – 40°C (– 40°F)

OK	Replace intake air temp. sensor.

NG

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5	Check for short in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).

(b) Disconnect the E6 connector of the ECM.

HINT:

The intake air temp. sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

Temp. value: – 40°C (– 40°F)

OK → **Repair or replace harness or connector.**

NG → **Check and replace ECM (See page IN–26).**

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DI0TF–03

DTC	P0115	Engine Coolant Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

A thermistor built into the engine coolant temp. sensor changes the resistance value according to the engine coolant temp.

The structure of the sensor and connection to the ECM is the same as in the intake air temp. circuit malfunction shown on page DI–27.

If the ECM detects the DTC P0115, it operates the fail safe function in which the engine coolant temp. is assumed to be 80˚C (176˚F).

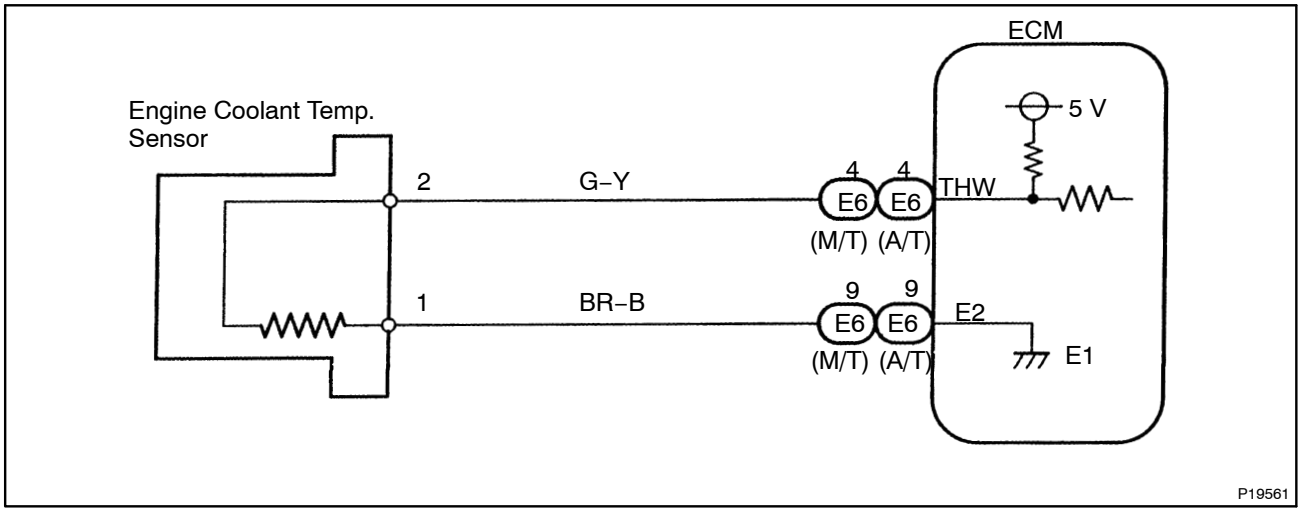
DTC No.	Detection Item	Trouble Area
P0115	Open or short in engine coolant temp. sensor circuit	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM

HINT:

After confirming DTC P0115 use the OBD II scan tool or TOYOTA hand–held tester to confirm the engine coolant temp. from ”CURRENT DATA”.

Temp. Displayed	Malfunction
– 40˚C (– 40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:
If DTCs P0110, P0115 and P0120 are output simultaneously, E2 (Sensor Ground) may be open.

1	**Connect OBD II scan tool or TOYOTA hand–held tester and read value of engine coolant temp.**

PREPARATION:
(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:
Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:
Same as actual engine coolant temp.

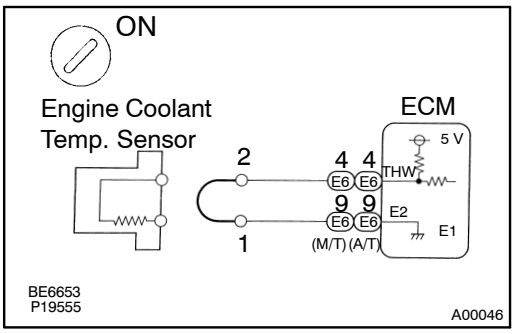
HINT:
- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates – 40°C (– 40°F).
- If there is open circuit, OBD II scan tool or TOYOTA hand—held tester indicates 140°C (284°F) or more.

NG → **– 40°C (– 40°F) ... Go to step 2.**
140°C (284°F) or more ... Go to step 4.

OK

Check for intermittent problems (See page DI–3).

2	**Check for open in harness or ECM.**



PREPARATION:
(a) Disconnect the engine coolant temp. sensor connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.

CHECK:
Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

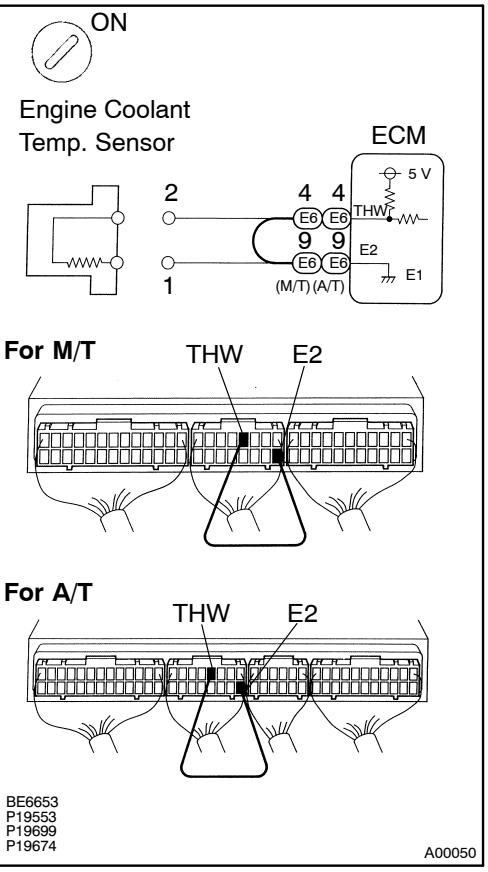
OK:
Temp. value: 140°C (284°F) or more

OK → **Confirm good connection at sensor.**
If OK, replace engine coolant temp. sensor.

NG

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3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).

(b) Connect between terminals THW and E2 of the ECM connector.

HINT:

The engine coolant temp. sensor connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector (See page DI–3).

(c) Turn the ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

Temp. value: 140°C (284°F) or more

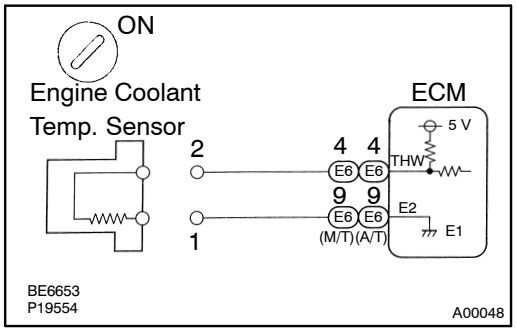
OK → **Open in harness between terminals E2 or THW, repair or replace harness.**

NG

Confirm good connection at ECM.
If OK, replace ECM.

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4	Check for open in harness or ECM.



PREPARATION:

(a) Disconnect the engine coolant temp. sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

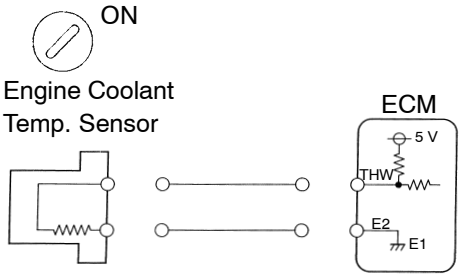
Temp. value: – 40°C (– 40°F)

OK	Replace engine coolant temp. sensor.

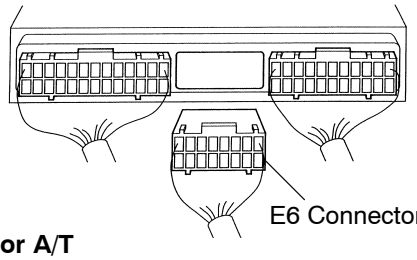
NG

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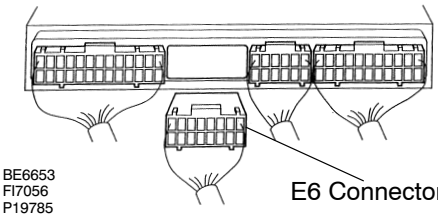
5	Check for short in harness or ECM.



For M/T



For A/T



BE6653
FI7056
P19785
P19798

A00049

PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).

(b) Disconnect the E6 connector of the ECM.

HINT:

The engine coolant temp. sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

Temp. value: – 40°C (– 40°F)

OK → **Repair or replace harness or connector.**

NG

Check and replace ECM (See page IN–26).

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DI0TG–03

DTC	P0116	Engine Coolant Temp. Circuit Range/ Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page DI–33.

DTC No.	DTC Detecting Condition	Trouble Area
P0116	When engine starts, water temp. is – 7°C (20°F) or less And, 20 min. or more after engine starts, engine coolant temp. sensor value is 20°C (68°F) or less (2 trip detection logic)	• Engine coolant temp. sensor • Cooling system
	When engine starts, water temp. is between – 7°C (19.4°F) and 10°C (50°F) And, 5 min. or more after engine starts, engine coolant temp. sensor value is 20°C (68°F) or less (2 trip detection logic)	
	When engine starts, water temp. is 10°C (50°F) or more And, 2 min. or more after engine starts, engine coolant temp. sensor value is 20°C (68°F) or less (2 trip detection logic)	

INSPECTION PROCEDURE

HINT:

If DTCs P0115 and P0116 are output simultaneously, engine coolant temp. sensor circuit may be open. Perform troubleshooting of DTC P0115 first.

1	Are there any other codes (besides DTC P0116) being output?

YES → Go to relevant DTC chart.

NO

2	Check thermostat (See page CO–9).

NG → Replace thermostat.

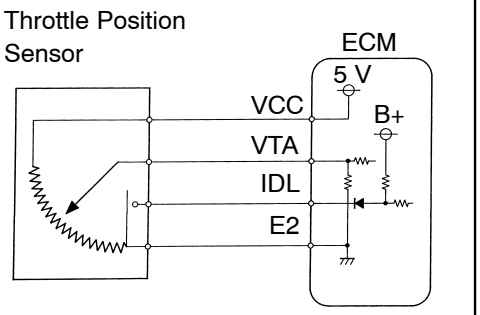
OK

Replace engine coolant temp. sensor (See page MF–45).

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DTC	P0120	Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction

CIRCUIT DESCRIPTION



The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, the IDL contacts in the throttle position sensor are on, so the voltage at terminal IDL of the ECM becomes 0 V. At this time, a voltage of approximately 0.3 – 0.8 V is applied to terminal VTA of the ECM. When the throttle valve is opened, the IDL contacts go off and thus the power source voltage of approximately 12 V in the ECM is applied to terminal IDL of the ECM. The voltage applied to terminal VTA of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 3.2 – 4.9 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from these signals input from terminals VTA and IDL, and uses them as one of the conditions for deciding the air–fuel ratio correction, power increase correction and fuel–cut control etc.

DTC No.	DTC Detecting Condition	Trouble Area
P0120	Condition (a) or (b) continues: (a) VTA < 0.1 V, and closed throttle position switch is OFF (b) VTA > 4.9 V	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM

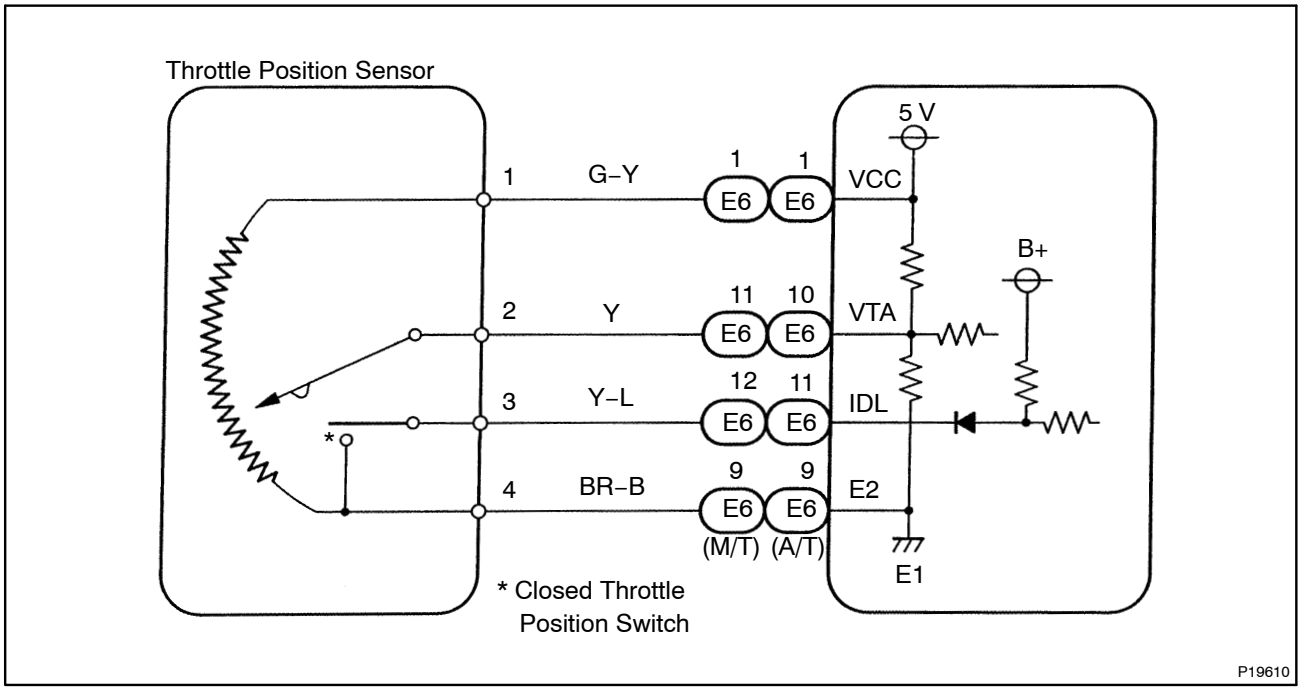
HINT:

- If there is open circuit in IDL line, DTC P0120 does not indicate.
- After confirming DTC P0120 use the OBD II scan tool or TOYOTA hand–held tester to confirm the throttle valve opening percentage and closed throttle position switch condition.

Throttle valve opening position expressed as percentage		Trouble Area
Throttle valve fully closed	Throttle valve fully open	
0 %	0 %	VCC line open VTA line open or short
100 %	100 %	E2 line open

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WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

If DTCs P0110, P0115 and P0120 are output simultaneously, E2 (Sensor Ground) may be open.

1	**Connect OBD II scan tool or TOYOTA hand–held tester and read the throttle valve opening percentage.**

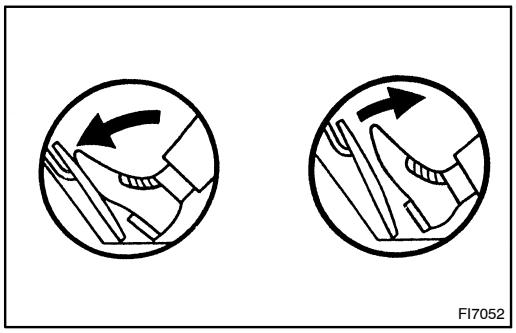
PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to DLC3.

(b) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

Read the throttle valve opening percentage.



OK:

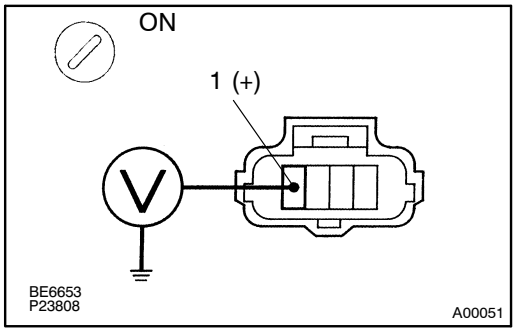
Throttle valve	Throttle valve opening position expressed as percentage
Fully open	Approx. 75 %
Fully closed	Approx. 10 %

OK	**Check for intermittent problems (See page DI–3).**

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NG

2	Check voltage between terminal 1 of wire harness side connector and body ground.



PREPARATION:

(a) Disconnect the throttle position sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals 1 of wire harness side connector and body ground.

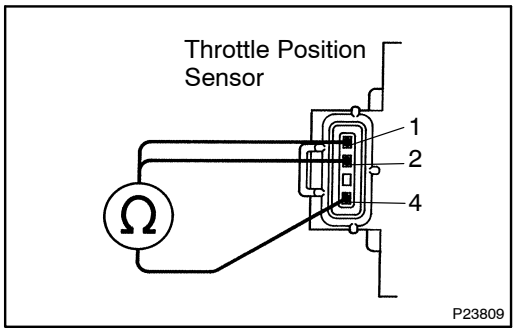
OK:

Voltage: 4.5 – 5.5 V

NG	Go to step 5.

OK

3	Check throttle position sensor.



PREPARATION:

Disconnect the throttle position sensor connector.

CHECK:

Measure voltage between terminals 1, 2 and 4 of throttle position sensor.

OK:

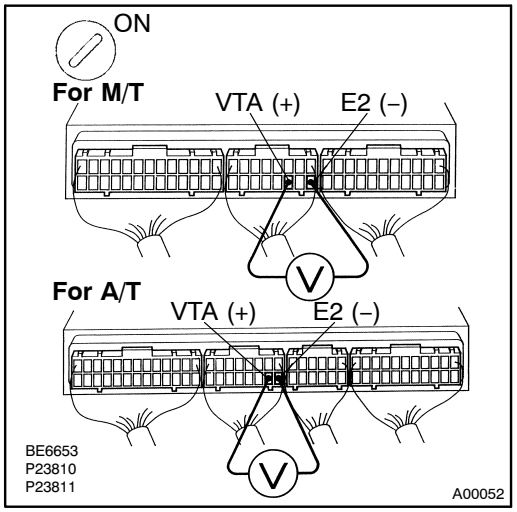
Terminals	Throttle valve	Resistance
1 – 4	—	2.5 – 5.9 kΩ
2 – 4	Fully closed	0.2 – 5.7 kΩ
2 – 4	Fully open	2.0 – 10.2 kΩ

NG	Replace throttle position sensor.

OK

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4	Check voltage between terminals VTA and E2 of ECM connector.



PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals VTA and E2 of ECM connector.

OK:

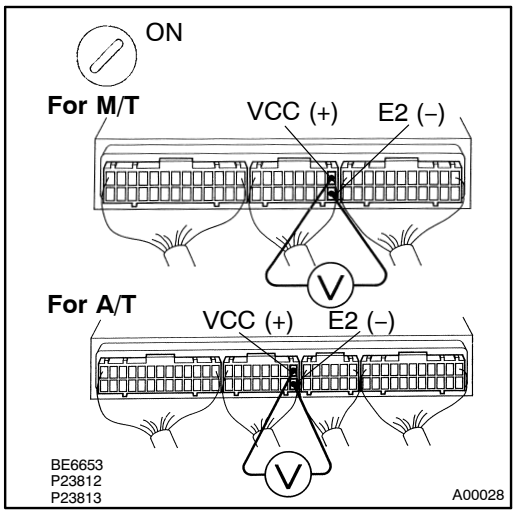
Throttle valve	Voltage
Fully closed	0.3 – 0.8 V
Fully open	2.7 – 5.2 V

NG → **Check for open and short in harness and connector between ECM and throttle position sensor (VTA line) (See page IN–26).**

OK →

Check and replace ECM (See page IN–26).

5	Check voltage between terminals VCC and E2 of ECM connector.



PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals VCC and E2 of ECM connector.

OK:

Voltage: 4.5 – 5.5 V

NG → **Check and replace ECM (See page IN–26).**

OK →

Check for open in harness and connector between ECM and sensor (VCC line) (See page IN–26).

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DI0TI–01

DTC	P0121	Throttle/Pedal Position Sensor/Switch ”A” Circuit Range/Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page DI–39.

DTC No.	Detection Item	Trouble Area
P0121	After vehicle speed has been exceeded 30 km/h (19 mph) even once, output value of throttle position sensor is out of applicable range while vehicle speed between 30 km/h (19 mph and 0 km/h (0 mph)	• Throttle position sensor

INSPECTION PROCEDURE

1	Are there any other codes (besides DTC P0121) being output?

YES → Go to relevant DTC chart.

NO →

Replace throttle position sensor.

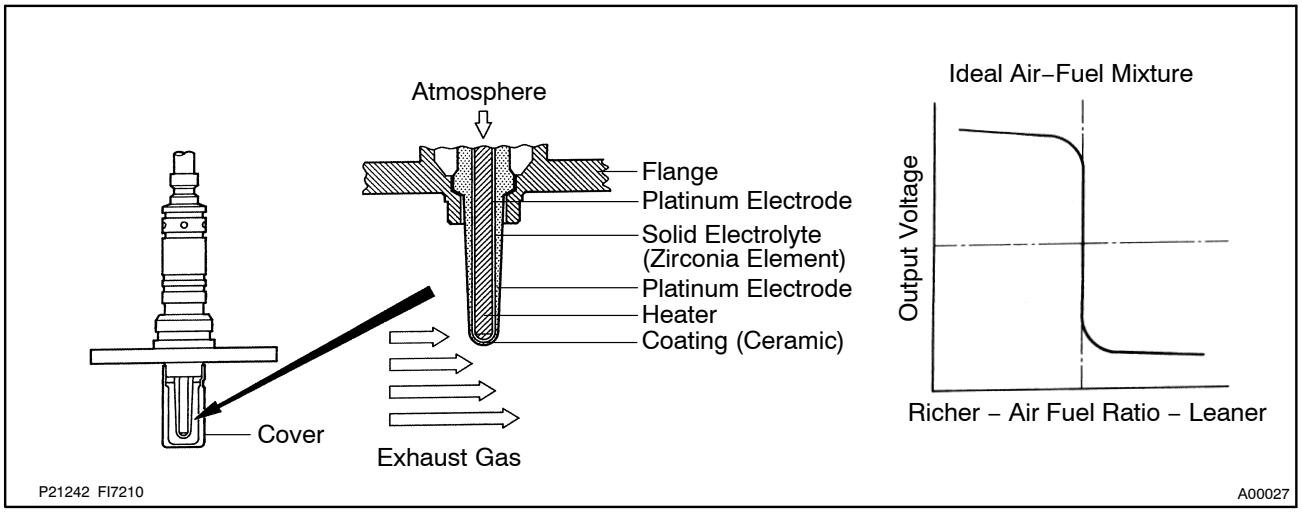
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DI0TJ–02

DTC	P0125	Insufficient Coolant Temp. for Closed Loop Fuel Control

CIRCUIT DESCRIPTION

To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used, but for the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.
The oxygen sensor has the characteristic where by its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This is used to detect the oxygen concentration in the exhaust gas and provide feedback to the computer for control of the air–fuel ratio.
When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the oxygen sensor informs the ECM of the LEAN condition (small electromotive force: 0 V).
When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio the oxygen concentration in the exhaust gas is reduced and the oxygen sensor informs the ECM of the RICH condition (large electromotive force: 1 V). The ECM judges by the electromotive force from the oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the oxygen sensor causes output of abnormal electromotive force, the ECM is unable to perform accurate air–fuel ratio control.
The heated oxygen sensors include a heater which heats the zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temp. of the exhaust gas is low) current flows to the heater to heat the sensor for accurate oxygen concentration detection.

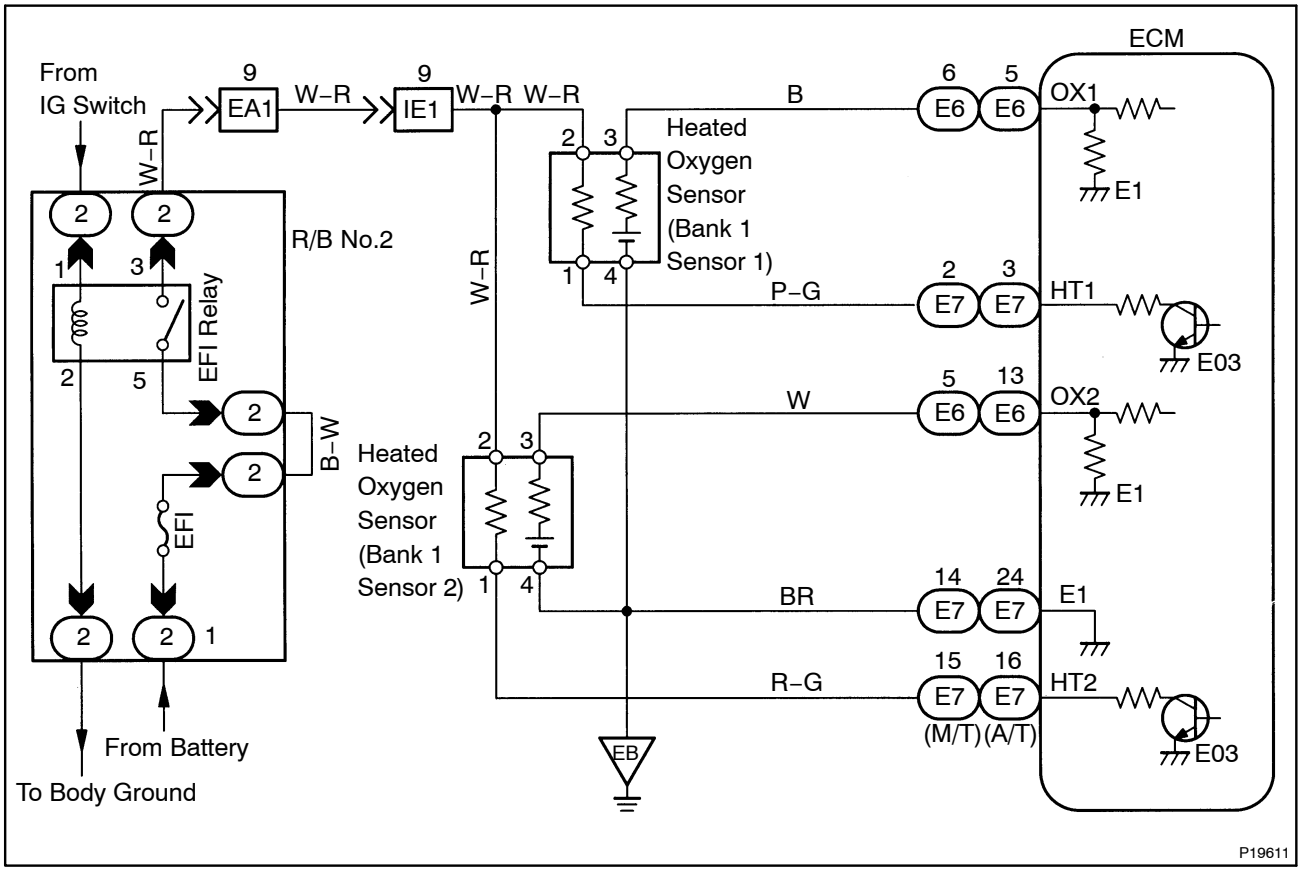


DTC No.	DTC Detecting Condition	Trouble Area
P0125	After engine is warmed up, heated oxygen sensor output does not indicate RICH even once when conditions (a), (b), (c) and (d) continue for at least 1.5 min.: (a) Engine speed: 1,500 rpm or more (b) Vehicle speed: 40 ~ 100 km/h (25 ~ 62 mph) (c) Closed throttle position switch: OFF (d) 140 sec. or more after starting engine	• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1)

HINT:
After confirming DTC P0125 use the OBD II scan tool or TOYOTA hand–held tester to confirm voltage output of heated oxygen sensor from "CURRENT DATA".
If voltage output of heated oxygen sensor is 0 V, heated oxygen sensor circuit may be open or short.

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WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Connect OBD II scan tool or TOYOTA hand–held tester and read value for voltage output of heated oxygen sensor (Bank 1 sensor 1).**

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(b) Warm up the engine to normal operating temp.

CHECK:

Read voltage output of heated oxygen sensor (bank 1 sensor 1) when engine is suddenly raced.

HINT:

Perform quick racing to 4,000 rpm 3 times using the accelerator pedal.

OK:

Heated oxygen sensor (bank 1 sensor 1) output a RICH signal (0.45 V or more) at least once

OK → **Check and replace ECM (See page IN–26).**

NG

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2	Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1 sensor 1) (See page IN–26).

NG → Repair or replace harness or connector.

OK →

Replace heated oxygen sensor (bank 1 sensor 1).

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DTC	P0130	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–44.

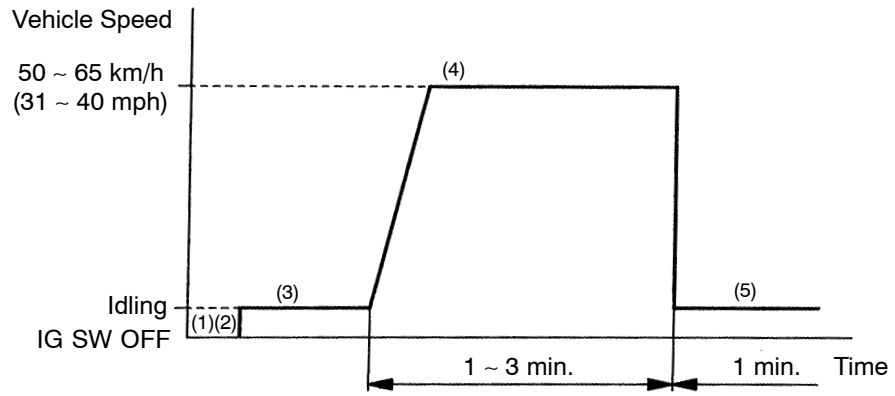
DTC No.	Detection ItemDTC Detecting Condition	Trouble AreaTrouble Area
P0130	Voltage output of heated oxygen sensor remains at 0.4 V or more or 0.55 V or less, during idling after engine is warmed up (2 trip detection logic)	• Heated oxygen sensor • Fuel trim malfunction

HINT:
Sensor 1 refers to the sensor closer to the engine body.
The heated oxygen sensor's output voltage and the short–term fuel trim value can be read using the OBD II scan tool or TOYOTA hand–held tester.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–44.

CONFIRMATION DRIVING PATTERN



(1) Connect the TOYOTA hand–held tester to the DLC3.
(2) Switch the TOYOTA hand–held tester from normal mode to check mode (See page DI–13).
(3) Start the engine and warm it up with all the accessory switches OFF.
(4) Drive the vehicle at 50 – 65 km/h (31 – 40 mph) for 1 – 3 min. to warm up the heated oxygen sensor.
(5) Let the engine idle for 1 min.
HINT:
If a malfunction exists, the MIL will light up during step (5).
NOTICE:
If the conditions in this test are not strictly followed, detection of the malfunction will not be possible. If you do not have a TOYOTA hand–held tester, turn the ignition switch OFF after performing steps (3) to (5), then perform steps (3) to (5) again.

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INSPECTION PROCEDURE

1	**Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

2	**Check for heated oxygen sensor data.**

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(b) Warm up the engine to normal operating temp.

CHECK:

Read heated oxygen sensor output voltage and short–term fuel trim.

HINT:

Read the values for the same bank.

RESULT:

Pattern	Heated oxygen sensor output voltage	Short–term fuel trim
1	Lean condition (Changes at 0.55 V or less)	Changes at about + 20 %
2	Rich condition (Changes at 0.4 V or more)	Changes at about – 20 %
3	Except 1 and 2	

1, 2 → **Check fuel trim system (See page DI–55).**

3

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3	**Check output voltage of heated oxygen sensor during idling.**

PREPARATION:

Warm up the heated oxygen sensor with the engine at 2,500 rpm for approx. 90 sec.

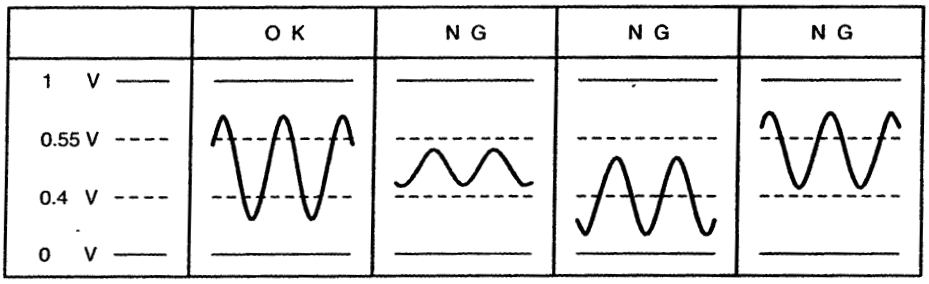
CHECK:

Use the OBD II scan tool or TOYOTA hand–held tester read the output voltage of the heated oxygen sensor during idling.

OK:

Heated oxygen sensor output voltage:

Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the following table)



P18349

OK → **Perform confirmation driving pattern.**

NG

Replace heated oxygen sensor.

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DI0TL–01

DTC	P0133	Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–44.

DTC No.	DTC Detecting Condition	Trouble Area
P0133	Response time for heated oxygen sensor's voltage output to change from rich to lean, or from lean to rich, is 1 sec. or more during idling after engine is warmed up (2 trip detection logic)	• Heated oxygen sensor

HINT:
Sensor 1 refers to the sensor closer to the engine body.

INSPECTION PROCEDURE

1	**Are there any other codes (besides DTC P0133) being output?**

YES → **Go to relevant DTC chart.**

NO

Replace heated oxygen sensor.

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DTC	P0135	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)

DTC	P0141	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–44.

DTC No.	DTC Detecting Condition	Trouble Area
P0135 P0141	When heater operates, heater current exceeds 2 A (2 trip detection logic)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM
	Heater current of 0.2 A or less when heater operates (2 trip detection logic)	

HINT:

- Sensor 1 refers to the sensor closer to the engine body.
- Sensor 2 refers to the sensor farther away from the engine body.

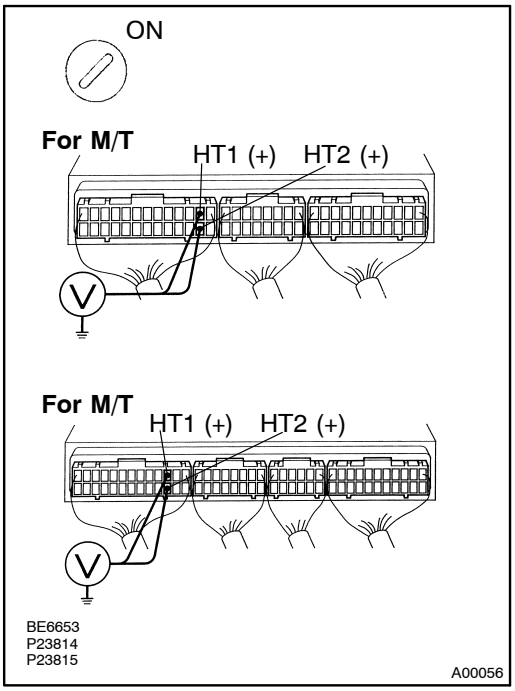
WIRING DIAGRAM

Refer to DTC P0125 on page DI–44.

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INSPECTION PROCEDURE

1	**Check voltage between terminals HT1, HT2 of ECM connector and body ground.**



PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals HT1, HT2 of ECM connector and body ground.

HINT:

- Connect terminal HT1 to bank 1 sensor 1.
- Connect terminal HT2 to bank 1 sensor 2.

OK:

Voltage: 9 – 14 V

OK → **Check and replace ECM (See page IN–26).**

NG

2	**Check resistance of heated oxygen sensor heater.**

NG → **Replace heated oxygen sensor.**

OK

Check and repair harness or connector between EFI main relay, heated oxygen sensor and ECM.

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DTC	P0136	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–44.

DTC No.	DTC Detecting Condition	Trouble Area
P0136	Voltage output of heated oxygen sensor (bank 1 Sensor 2) remains at 0.4 V or more or 0.5 V or less when vehicle is driven at 50 km/h (31 mph) or more after engine is warmed up (2 trip detection logic)	• Heated oxygen sensor

HINT:
Sensor 2 refers to the sensor farther away from the engine body.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–44.

INSPECTION PROCEDURE

1	**Are there any other codes (besides DTC P0136) being output?**

YES → **Go to relevant DTC chart.**

NO

2	**Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

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3	**Check output voltage of heated oxygen sensor (bank 1 sensor 2).**

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(b) Warm up the engine to normal operating temp.

CHECK:

Read voltage output of the heated oxygen sensor (bank 1 sensor 2) when the engine suddenly raced.

HINT:

Perform quick racing to 4,000 rpm 3 min. using the accelerator pedal.

OK:

Heated oxygen sensor output voltage: Alternates from 0.4 V or less to 0.5 V or more

OK → **Check that each connector is properly connected.**

NG → **Replace heated oxygen sensor.**

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DI0TO–03

DTC	P0171	System too Lean (Fuel Trim)

DTC	P0172	System too Rich (Fuel Trim)

CIRCUIT DESCRIPTION

Fuel trim refers to the feedback compensation value compared against the basic injection time. Fuel trim includes short–term fuel trim and long–term fuel trim.

Short–term fuel trim is the short–term fuel compensation used to maintain the air–fuel ratio at its ideal theoretical value. The signal from the heated oxygen sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the ideal theoretical value, triggering a reduction in fuel volume if the air–fuel ratio is rich, and an increase in fuel volume if it is lean.

Long–term fuel trim is overall fuel compensation carried out long–term to compensate for continual deviation of the short–term fuel trim from the central value due to individual engine differences, wear over time and changes in the usage environment.

If both the short–term fuel trim and long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the MIL lights up.

DTC No.	DTC Detecting Condition	Trouble Area
P0171	When air fuel ratio feedback is stable after engine warming up, fuel trim is considerably in error on RICH side (2 trip detection logic)	• Air intake (hose loose) • Fuel line pressure • Injector blockage • Heated oxygen sensor (bank 1 sensor 1) malfunction • Mass air flow meter • Engine coolant temp. sensor
P0172	When air fuel ratio feedback is stable after engine warming up, fuel trim is considerably in error on LEAN side (2 trip detection logic)	• Fuel line pressure • Injector leak, blockage • Heated oxygen sensor (bank 1 sensor 1) malfunction • Mass air flow meter • Engine coolant temp. sensor

HINT:

- When the DTC P0171 is recorded, the actual air–fuel ratio is on the LEAN side. When DTC P0172 is recorded, the actual air–fuel ratio is on the RICH side.
- If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC P0171 is recorded. The MIL then comes on.
- If the total of the short–term fuel trim value and long–term fuel trim value is within ± 25 %, the system is functioning normally.

INSPECTION PROCEDURE

1	Check air induction system (See page MF–1).

NG → Repair or replace.

OK

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2	**Check for heated oxygen sensor (bank 1 sensor 1) data.**

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(b) Warm up the engine to normal operating temp.

CHECK:

Read heated oxygen sensor output voltage and short–term fuel trim.

RESULT:

Pattern	Heated oxygen sensor output voltage	Short–term fuel trim
1	Lean condition (Changes at 0.55 V or less)	Changes at about + 20 %
2	Rich condition (Changes at 0.4 V or more)	Changes at about – 20 %
3	Except 1 and 2	

3 → **Check for heated oxygen sensor (bank 1 sensor 1) (See page MF–49).**

1, 2 ↓

3	**Check fuel pressure (See page MF–5).**

NG → **Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page MF–10).**

OK ↓

4	**Check injector injection (See page MF–16).**

NG → **Replace injector.**

OK ↓

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5	Check mass air flow meter and engine coolant temp. sensor (See page DI–22,DI–33).

NG → Repair or replace.

OK

6	Check for spark and ignition (See page IG–1).

NG → Repair or replace.

OK

Check and replace ECM (See page IN–26).

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DI0TP–03

DTC	P0300	Random/Multiple Cylinder Misfire Detected

DTC	P0301	Cylinder 1 Misfire Detected

DTC	P0302	Cylinder 2 Misfire Detected

DTC	P0303	Cylinder 3 Misfire Detected

DTC	P0304	Cylinder 4 Misfire Detected

CIRCUIT DESCRIPTION

Misfire: The ECM uses the crankshaft position sensor and camshaft position sensor to monitor changes in the crankshaft rotation for each cylinder.

The ECM counts the number of times the engine speed change rate indicates that misfire has occurred. And when the misfire rate equals or exceeds the count indicating that the engine condition has deteriorated, the MIL lights up.

If the misfire rate is high enough and the driving conditions will cause catalyst overheating, the MIL blinks when misfiring occurs.

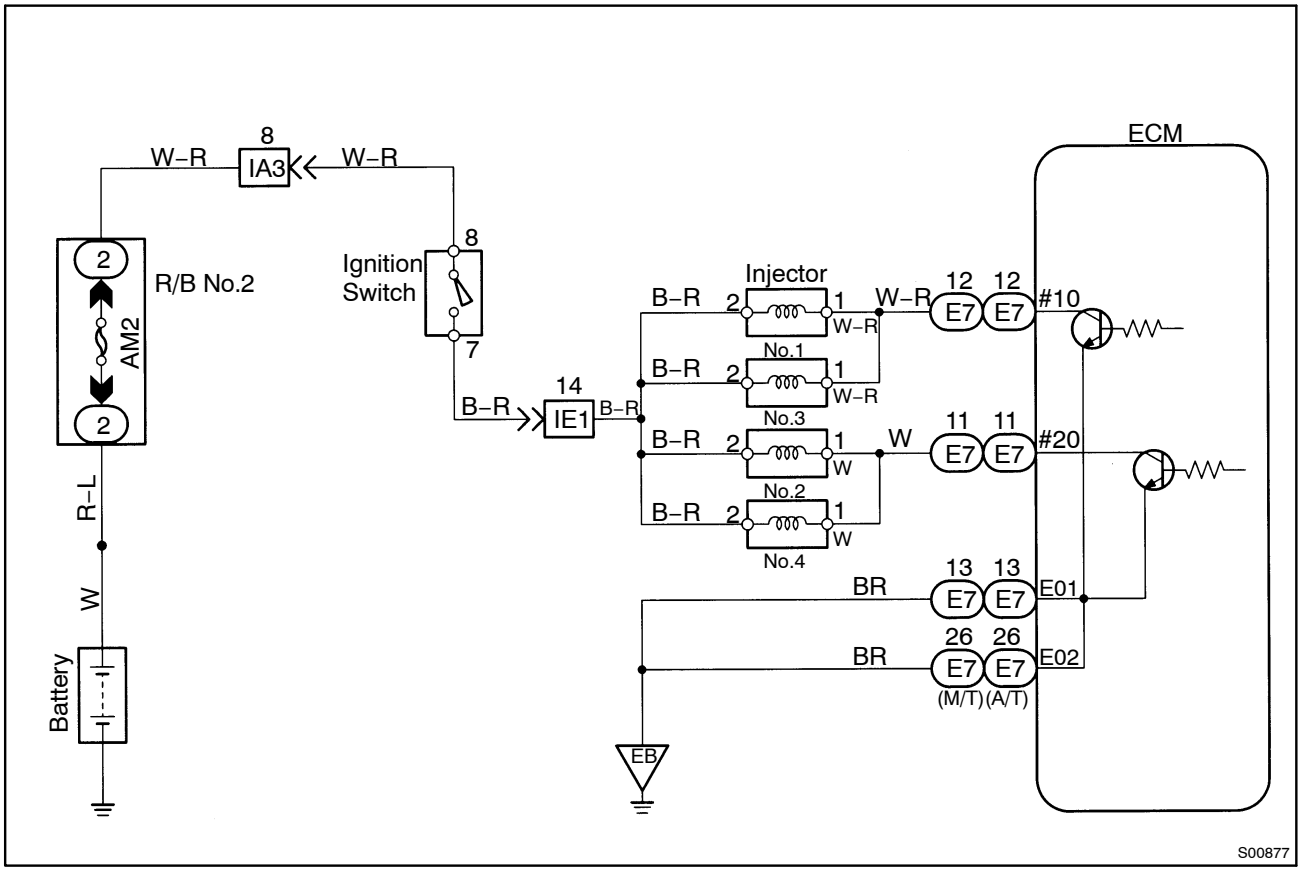
DTC No.	DTC Detecting Condition	Trouble Area
P0300	Misfiring of random cylinders is detected during any particular 200 or 1,000 revolutions	• Ignition system • Injector • Fuel line pressure • EGR • Compression pressure • Valve clearance not to specification • Valve timing • Mass air flow meter • Engine coolant temp. sensor
P0301 P0302 P0303 P0304	For any particular 200 revolutions for engine, misfiring is detected which can cause catalyst overheating (This causes MIL to blink)	
	For any particular 1,000 revolutions for engine, misfiring is detected which causes a deterioration in emissions (2 trip detection logic)	

HINT:

When the 2 more codes for a misfiring cylinder are recorded repeatedly but no random misfire code is recorded, it indicates that the misfires were detected and recorded at different times.

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WIRING DIAGRAM



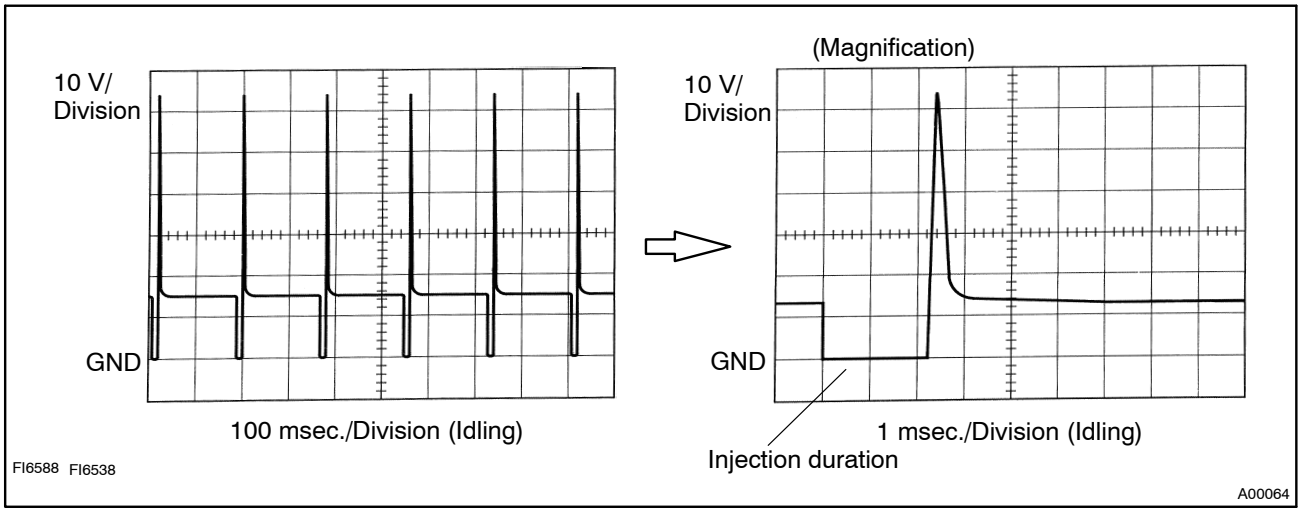
Reference: INSPECTION USING OSCILLOSCOPE

INJECTOR SIGNAL WAVEFORM

With the engine idling, measure between terminals #10, #20 and E01 of ECM.

HINT:

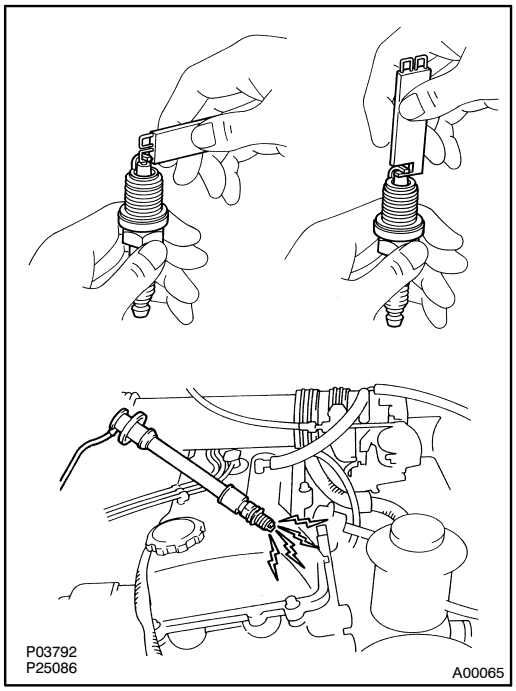
The correct waveform is as shown.



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INSPECTION PROCEDURE

1	**Check spark plug and spark of misfiring cylinder.**



PREPARATION:

(a) Disconnect the high–tension cord.
(b) Remove the spark plug.

CHECK:

(a) Check the carbon deposits electrode.
(b) Check the electrode gap.

OK:

(1) No large carbon deposit present. Not wet with gasoline or oil.
(2) Electrode gap: 0.8 mm (0.031 in.)

PREPARATION:

(a) Install the spark plug to the high–tension code.
(b) Disconnect the injector connector.
(c) Ground the spark plug.

CHECK:

Check if the spark occurs while the engine is being craked.

NOTICE:

To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5 – 10 seconds at a time.

OK:

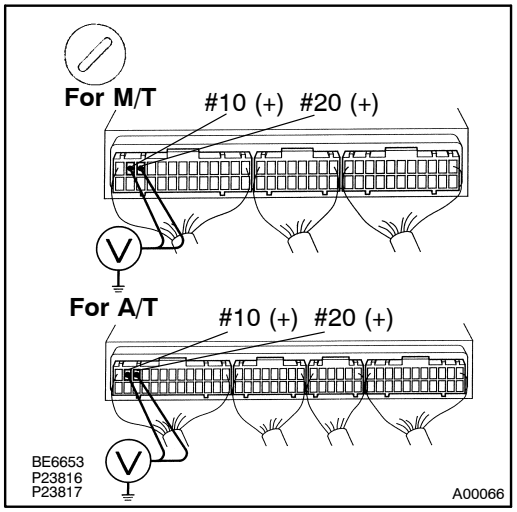
Spark jumps across electrode gap.

NG → **Replace or check ignition system (See page IG–1).**

OK

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2	Check voltage of ECM terminal for injector of failed cylinder.



PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between applicable terminal of ECM connector and body ground.

OK:

Voltage: 9 – 14 V

OK → **Go to step 4.**

NG

3	Check resistance of injector of misfiring cylinder (See page MF–16).

NG → **Replace injector.**

OK

Check for open and short in harness and connector between injector and ECM (See page IN–26).

4	Check fuel pressure (See page MF–5).

NG → **Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page MF–10).**

OK

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5	Check injector injection (See page MF–16).

NG → Replace injector.

OK

6	Check EGR system (See page EC–7).

NG → Repair EGR system.

OK

7	Check mass air flow meter and engine coolant temp. sensor (See page DI–22, DI–33).

NG → Repair or replace.

OK

Check compression pressure, valve clearance and valve timing.

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DI0TQ–03

DTC	P0325	Knock Sensor 1 Circuit Malfunction

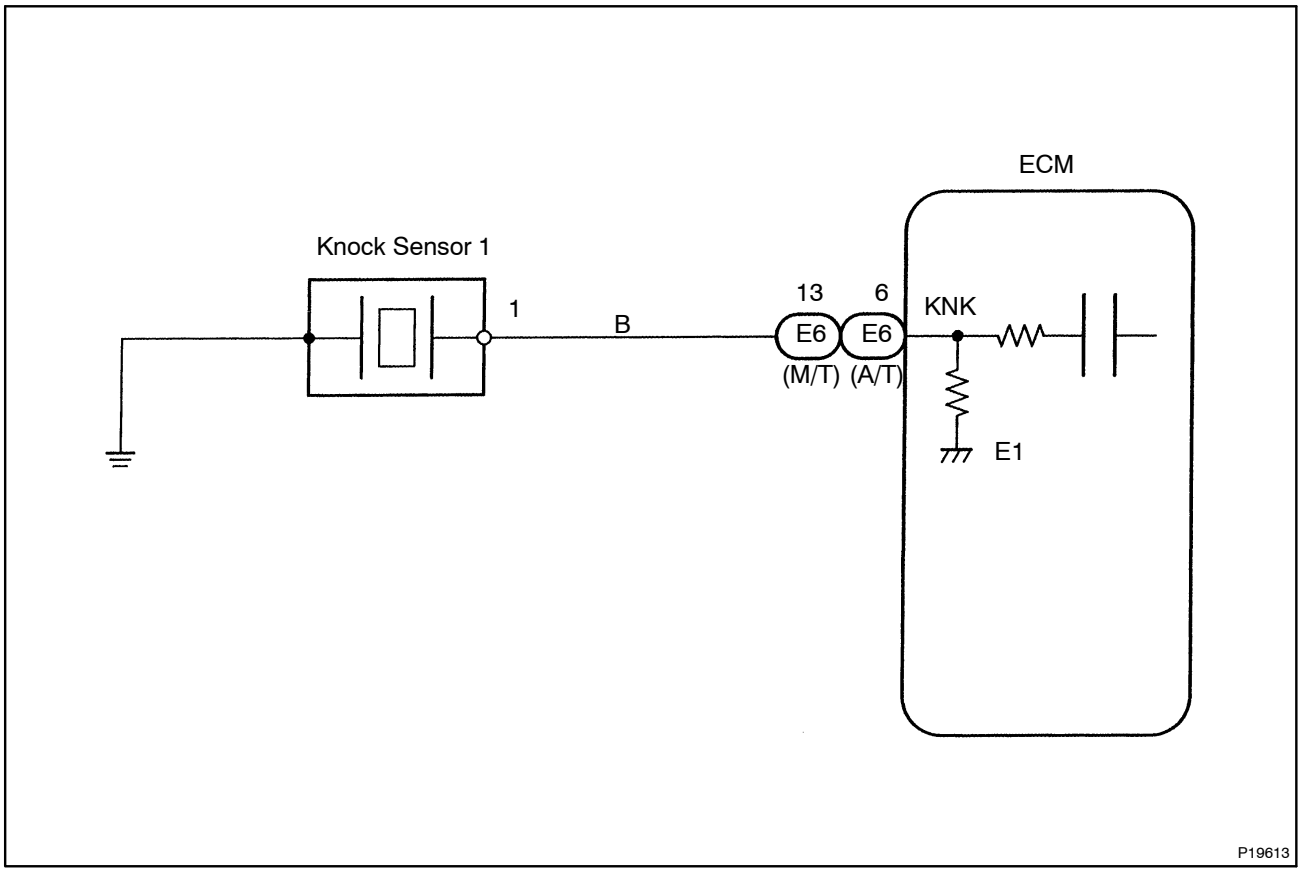
CIRCUIT DESCRIPTION

Knock sensor is fitted to the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

DTC No.	DTC Detecting Condition	Trouble Area
P0325	No knock sensor 1 signal to ECM with engine speed 1,200 rpm or more	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM

If the ECM detects the above diagnosis conditions, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.

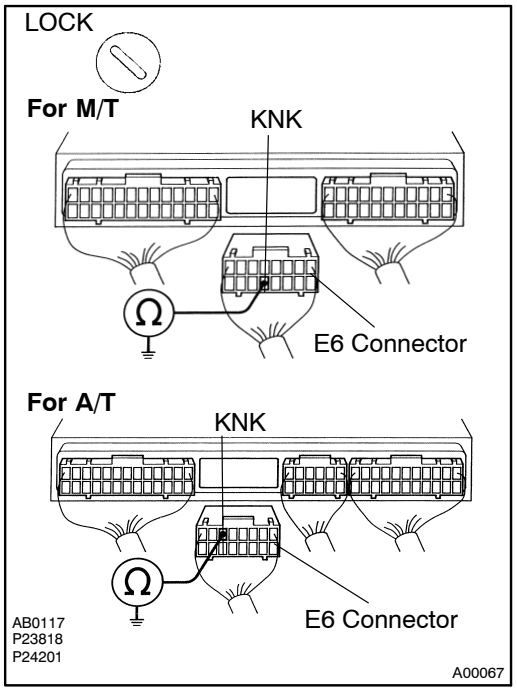
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check continuity between terminal KNK of ECM connector and body ground.**



PREPARATION:

(a) Remove the right cowl side trim (See page MF–51).

(b) Disconnect the E6 connector of ECM.

CHECK:

Measure resistance between terminal KNK of ECM connector and body ground.

OK:

Resistance: 1 MΩ or higher

OK → **Go to step 3.**

NG

2	**Check knock sensor (See page MF–47).**

NG → **Replace knock sensor.**

OK

3	**Check for open and short in harness and connector between ECM and knock sensor (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

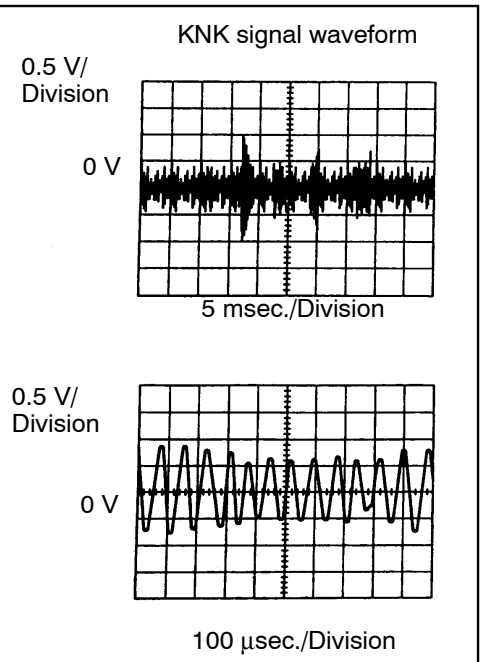
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4	Does malfunction disappear when a good knock sensor is installed?

YES → Replace knock sensor.

NO

Check and replace ECM (See page IN–26).



Reference: INSPECTION USING OSCILLOSCOPE

- With the engine racing (4,000 rpm), measure between terminal KNK of ECM and body ground.

HINT:
The correct waveform is as shown.

- Spread the time on the horizontal axis, and confirm that period of the wave is 151 µsec (Normal mode vibration frequency of knock sensor: 6.6 kHz).

HINT:
If normal mode vibration frequency is not 6.6 kHz the sensor is malfunctioning.

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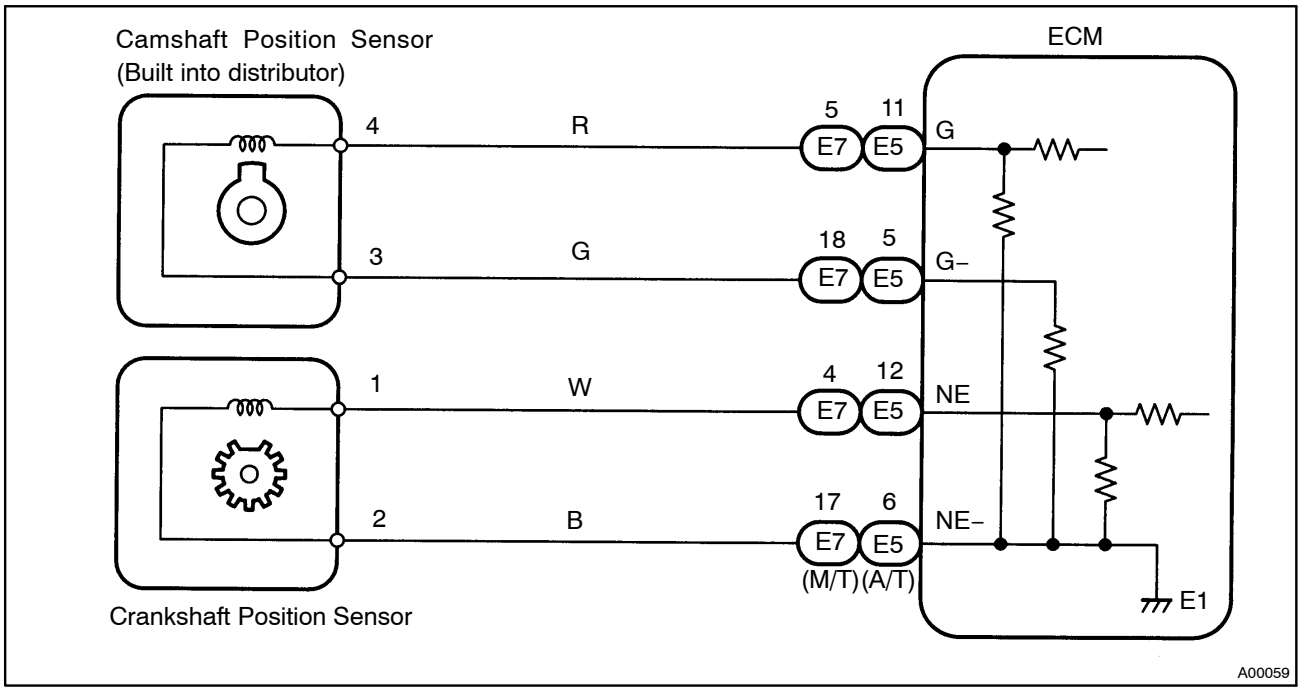
DTC	P0335	Crankshaft Position Sensor ”A” Circuit Malfunction

CIRCUIT DESCRIPTION

Crankshaft position sensor (NE signal) consist of a signal plate and pickup coil.
The NE signal plate has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals of every engine revolution. The ECM detects the standard crankshaft angle based on the G signals, and the actual crankshaft angle the engine speed by the NE signals.

DTC No.	DTC Detecting Condition	Trouble Area
P0335	No crankshaft position sensor signal to ECM during cranking (2 trip detection logic)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • ECM
	No crankshaft position sensor signal to ECM with engine speed 600 rpm or more (2 trip detection logic)	

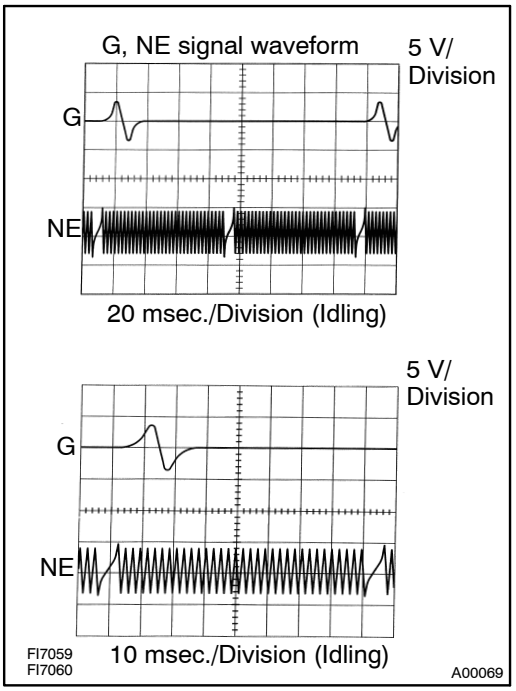
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check resistance of crankshaft position sensor (See page IG–14).**



Reference: INSPECTION USING OSCILLOSCOPE
During cranking or idling, check between terminals G and G–, NE and NE– of ECM
HINT:
The correct waveforms are as shown.

NG → **Replace crankshaft position sensor.**

OK

2	**Check for open and short in harness and connector between ECM and crankshaft position sensor (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

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3	Inspect sensor installation and teeth of signal plate.

NG → Tighten the sensor. Replace signal plate.

OK →

Check and replace ECM (See page IN–26).

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DTC	P0336	Crankshaft Position Sensor ”A” Circuit Range/Performance

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page DI–66.

If the ECM records the DTC P0336, it operates the fail safe function, stopping the fuel injection.

DTC No.	DTC Detecting Condition	Trouble Area
P0336	Deviation on crankshaft position sensor signal and camshaft position sensor signal	• Valve timing • Distributor installation • ECM

INSPECTION PROCEDURE

1	**Check valve timing (See page EM–38).**

NG → **Adjust valve timing.**

OK

2	**Check distributor installation (See page EM–5).**

NG → **Reinstall distributor.**

OK

Check and replace ECM (See page IN–26).

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DI0TT–03

DTC	P0340	Camshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

Camshaft position sensor (G signal) consist of signal plate and pickup coil. The G signal plate has one tooth on its outer circumference and is built into the distributor.
When the camshafts rotate, the protrusion on the signal plate and the air gap on the pickup coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pickup coil.
The NE signal plate has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals for every engine revolution. The ECM detects the standard crankshaft angle based on the G signals and the actual crankshaft angle and the engine speed by the NE signals.

DTC No.	DTC Detecting Condition	Trouble Area
P0340	No camshaft position sensor signal to ECM during cranking (2 trip detection logic)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Distributor • Starter • ECM
	No camshaft position sensor signal to ECM during engine running	

WIRING DIAGRAM

Refer to DTC P0335 on page DI–66.

INSPECTION PROCEDURE

1	**Check resistance of camshaft position sensor (See page EM–3).**

Reference: INSPECTION USING OSCILLOSCOPE

Refer to DTC P0335 on page DI–66.

NG → **Replace distributor housing.**

OK ↓

2	**Check for open and short in harness and connector between ECM and distributor (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK ↓

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3	Check air gap (See page EM–1).

NG → Replace distributor housing.

OK →

Check and replace ECM (See page IN–26).

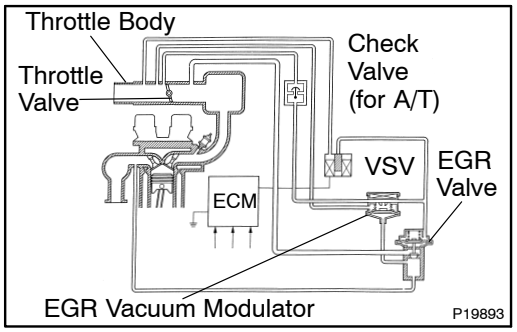
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DI0TU–03

DTC	P0401	Exhaust Gas Recirculation Flow Insufficient Detected

CIRCUIT DESCRIPTION

The EGR system recirculates exhaust gas, which is controlled to the proper quantity to suit the driving conditions, into the intake air mixture to slow down combustion, reduce the combustion temp. and reduce NOx emissions. The amount of EGR is regulated by the EGR vacuum modulator according to the engine load.

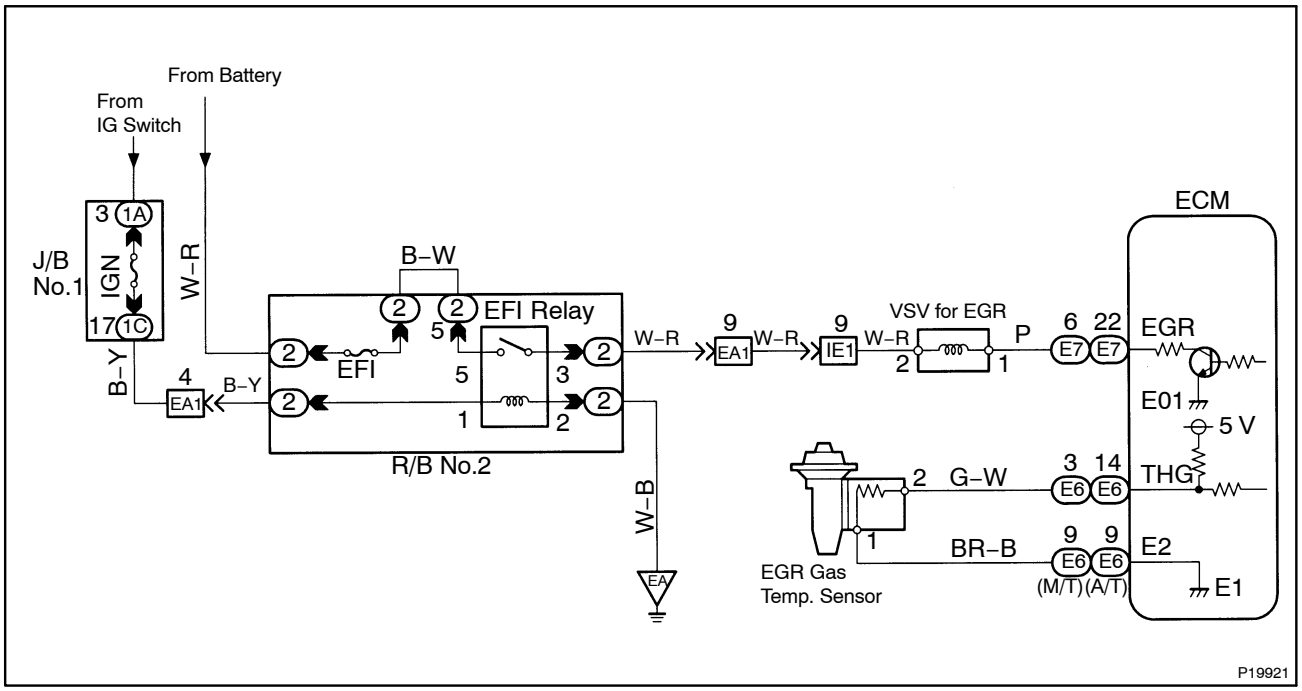


If even one of the following conditions is fulfilled, the VSV is turned ON by a signal from the ECM.
This results in atmospheric air acting on the EGR valve, closing the EGR valve and shutting off the exhaust gas (EGR cut–off).
Under the following conditions, EGR is cut to maintain driveability:

- Before the engine is warmed up
- During deceleration (throttle valve closed)
- Light engine load (amount of intake air very small)
- Engine racing

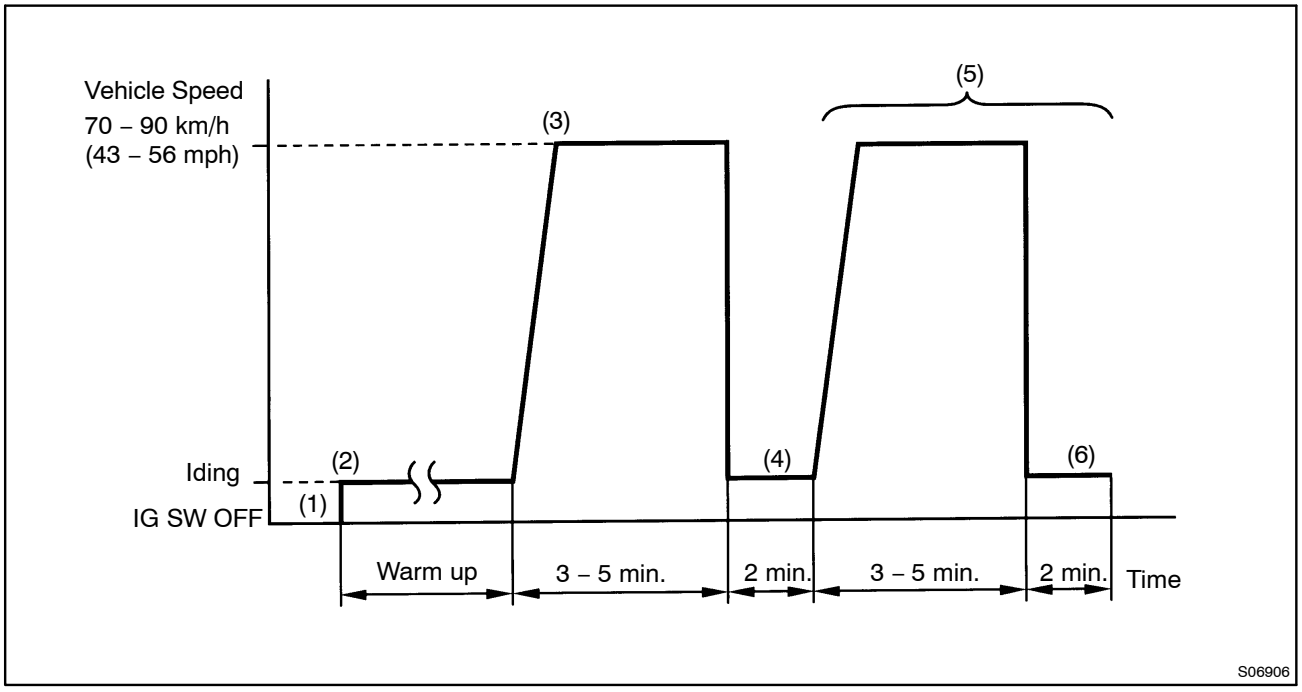
DTC No.	DTC Detecting Condition	Trouble Area
P0401	After engine is warmed up and run at 80 km/h (50 mph) for 3 to 5 min., EGR gas temp. sensor value does not exceed 35°C (95°F) above ambient air temp. (2 trip detection logic)	• EGR valve stuck closed • Short in VSV circuit for EGR • Open in EGR gas temp. sensor circuit • EGR hose disconnected • ECM

WIRING DIAGRAM



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SYSTEM CHECK DRIVING PATTERN



(1) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.
(2) Start and warm up the engine with all the accessories switched OFF.
(3) Run the vehicle at 70 – 90 km/h (43 – 56 mph) for 3 min. or more.
(4) Idle the engine for about 2 min.
(5) Do steps (3) and (4) again.
(6) Check the ”READINESS TESTS” mode on the OBD II scan tool or TOYOTA hand–held tester.
If ”COMPL” is displayed and the MIL does not light up, the system is normal.
If ”INCMPL” is displayed and the MIL does not light up, run the vehicle step (5) from somes times and check it.
HINT:
”INCMPL” is displayed when either condition (a) or (b) exists.
(a) The system check is incomplete.
(b) There is a malfunction in the system.
If there is a malfunction in the system, the MIL will light up after steps (2) to (5) above are done.

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INSPECTION PROCEDURE
TOYOTA hand–held tester:

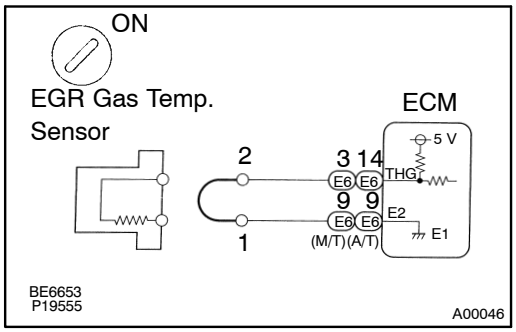
1	**Connect TOYOTA hand–held tester and read value of EGR gas temp. value.**

PREPARATION:
(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
CHECK:
Read EGR gas temp. on the TOYOTA hand–held tester.
OK:
EGR gas temp.: 10˚C (50˚F) or more
HINT:
If there is an open circuit, the TOYOTA hand–held tester indicates 3.1˚C (37.6˚F).

OK → **Go to step 4.**

NG

2	**Check for open in harness or ECM.**



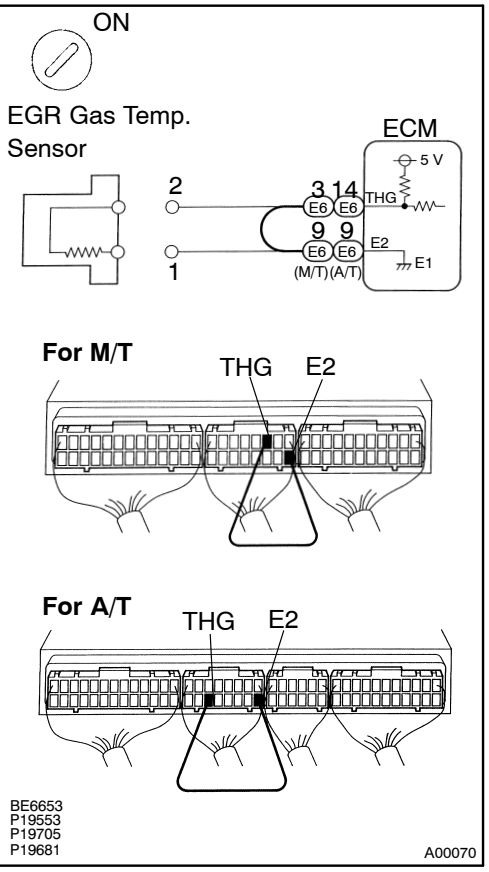
PREPARATION:
(a) Disconnect the EGR gas temp. sensor connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.
CHECK:
Read EGR gas temp. on the TOYOTA hand–held tester.
OK:
EGR gas temp.: 159.3˚C (318.7˚F)

OK → **Confirm good connection at sensor.**
If OK, replace EGR gas temp. sensor.

NG

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3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).

(b) Connect between terminals THG and E2 of the ECM connector.

HINT:

The EGR gas temp. sensor connector is disconnected. Before checking, do a visual check and contact pressure check for the ECM connector (See page IN–26).

CHECK:

Read EGR gas temp. on the TOYOTA hand–held tester.

OK:

EGR gas temp.: 159.3°C (318.7°F)

OK	Open in harness between terminals E2 or THG. Repair or replace harness.

NG

Confirm connection at ECM.
If OK, replace ECM.

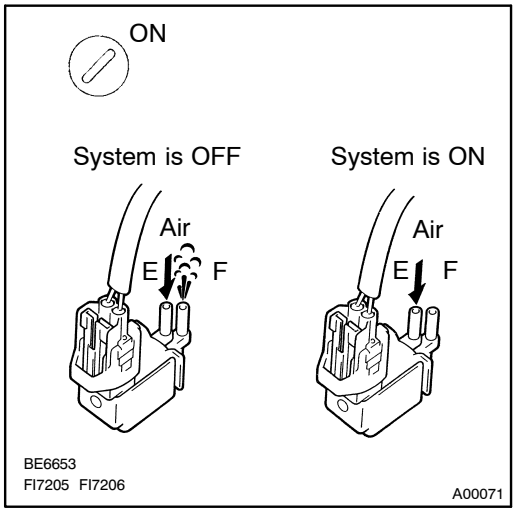
4	Check connection of vacuum hose and EGR hose (See page EC–2).

NG	Repair or replace.

OK

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5	Check VSV for EGR.



PREPARATION:
Select the "ACTIVE TEST" mode on the TOYOTA hand–held tester.

CHECK:
Check operation of VSV when it is operated by the TOYOTA hand–held tester.

OK:

EGR system is OFF:
Air flows from port E to port F.
EGR system is ON:
Air does not flow from port E to port F.

OK → **Go to step 7.**

NG

6	Check operation of VSV for EGR (See page MF–44).

NG → **Replace VSV for EGR.**

OK

Check for short in harness and connector between VSV and ECM (See page IN–26).

7	Check EGR vacuum modulator (See page MF–44).

NG → **Repair or replace.**

OK

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8	**Check EGR valve (See page MF–44).**

NG → **Repair or replace.**

OK

9	**Check value of EGR gas temp. sensor.**

PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
(c) Select the ”ACTIVE TEST” mode on the TOYOTA hand–held tester (EGR system ON).
(d) Race the engine at 4,000 rpm for 3 min.

CHECK:

Measure EGR gas temp. while racing engine at 4,000 rpm.

OK:

EGR gas temp. after 3 min.: 140˚C (284˚F) or more

NG → **Replace EGR gas temp. sensor.**

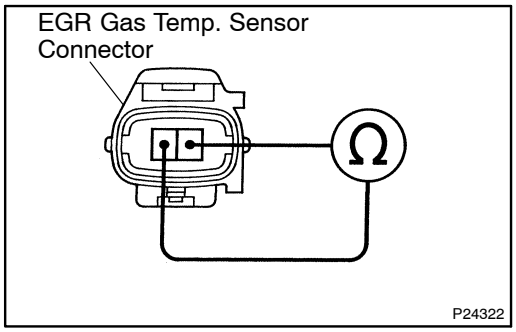
OK

Check and replace ECM (See page IN–26).

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OBD II scan tool (excluding TOYOTA hand–held tester):

1	**Check resistance of EGR gas temp. sensor.**



PREPARATION:
Disconnect the EGR gas temp. sensor connector.
CHECK:
Measure resistance between terminals of EGR gas temp. sensor connector.
OK:

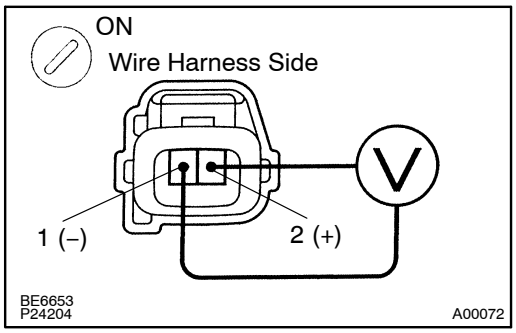
Resistance: 600 kΩ or less

HINT:
If there is open circuit, ohmmeter indicates 720 kΩ or more.

NG	**Check and replace EGR gas temp. sensor (See page MF–48).**

OK

2	**Check for open in harness or ECM.**



PREPARATION:
(a) Disconnect the EGR gas temp. sensor connector.
(b) Turn the ignition switch ON.
CHECK:
Measure voltage between terminals of EGR gas temp. sensor wire harness side connector.
OK:

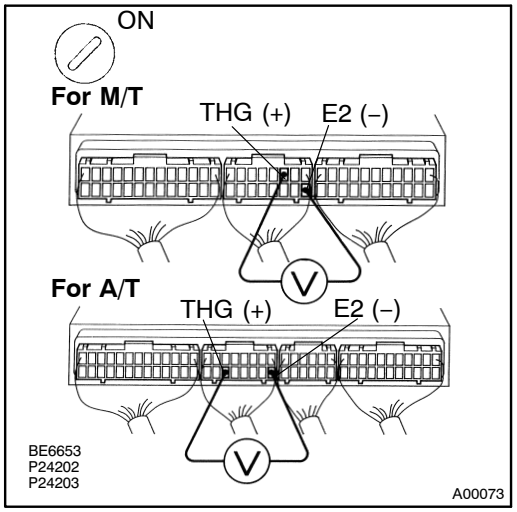
Voltage: 4.5 – 5.5 V

OK	**Go to step 4.**

NG

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3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals of THG and E2 of ECM connector.

HINT:

The EGR gas temp. sensor connector is disconnected.

OK:

Voltage: 4.5 – 5.5 V

OK	Open in harness between terminals E2 or THG. Repair or replace harness.

NG

Confirm connection at ECM.
If OK, replace ECM.

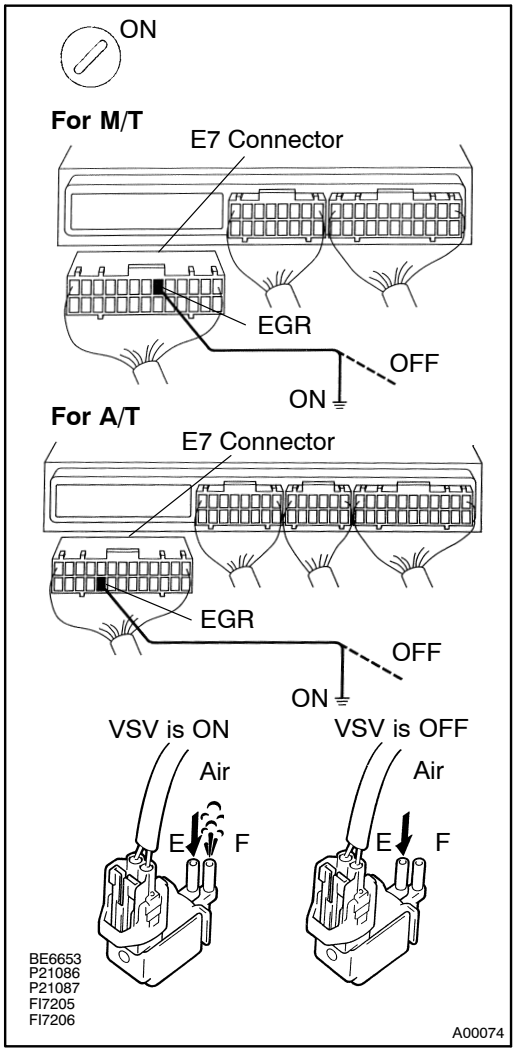
4	Check connection of vacuum hose and EGR hose (See page EC–2).

NG	Repair or replace.

OK

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5	Check VSV for EGR.



PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).
(b) Disconnect the E7 connector of ECM.
(c) Turn the ignition switch ON.

CHECK:

Check VSV function:

(1) Connect between terminal EGR of ECM and body ground (ON).
(2) Disconnect between terminal EGR of ECM and body ground (OFF).

OK:

(1) VSV is ON:
Air flows from port E to port F.
(2) VSV is OFF:
Air does not flow from port E to port F.

OK	Go to step 7.

NG

6	Check operation for VSV for EGR (See page MF–44).

NG	Replace VSV for EGR.

OK

Check for open in harness and connector between R/B NO.2 and ECM (See page IN–26).

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7	**Check EGR vacuum modulator (See page EC–7).**

NG → **Repair or replace.**

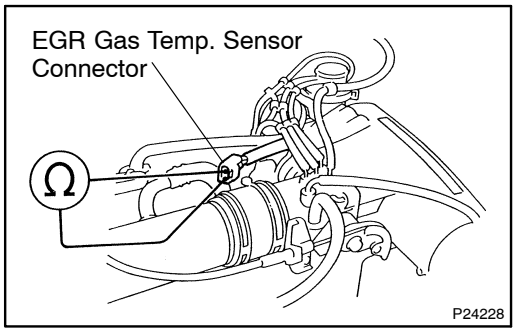
OK

8	**Check EGR valve (See page EC–7).**

NG → **Repair or replace.**

OK

9	**Check resistance of EGR gas temp. sensor.**



PREPARATION:

(a) Disconnect the EGR gas temp. sensor connector.
(b) Start the engine and warm it up.
(c) Disconnect the VSV connector for EGR.
(d) Race the engine at 4,000 rpm or 3 min.

CHECK:

Measure resistance of the EGR gas temp. sensor while racing the engine at 4,000 rpm.

OK:

Resistance of EGR gas temp. sensor after 3 min.: 4.3 kΩ or less

HINT:

Resistance: 188.6 – 439.0 kΩ at 20°C (68°F)

NG → **Replace EGR gas temp. sensor.**

OK

Check and replace ECM (See page IN–26).

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DTC	P0402	Exhaust Gas Recirculation Flow Excessive Detected

CIRCUIT DESCRIPTION

Refer to DTC P0401 on page DI–72.

DTC No.	DTC Detecting Condition	Trouble Area
P0402	EGR gas temp. sensor value is high during EGR cut–off when engine is cold and vacuum is applied to port E (2 trip detection logic)	• EGR valve stuck open • VSV for EGR open malfunction • Open in VSV circuit for EGR • Short in EGR gas temp. sensor circuit • ECM
	EGR valve is always open (2 trip detection logic)	

WIRING DIAGRAM

Refer to DTC P0401 on page DI–72.

SYSTEM CHECK DRIVING PATTERN

Refer to DTC P0401 on page DI–72.

INSPECTION PROCEDURE

TOYOTA hand–held tester:

1	**Connect TOYOTA hand–held tester and read EGR gas temp. value.**

PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.

CHECK:

Read EGR gas temp. on the TOYOTA hand–held tester.

OK:

EGR gas temp.: 150°C (302°F) or less (Not immediately after driving)

HINT:

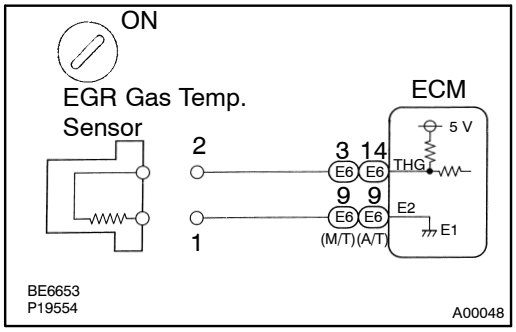
If there is a short circuit, the TOYOTA hand–held tester indicates 159.3°C (318.7°F).

OK	**Go to step 4.**

NG

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2	Check for short in harness and ECM.

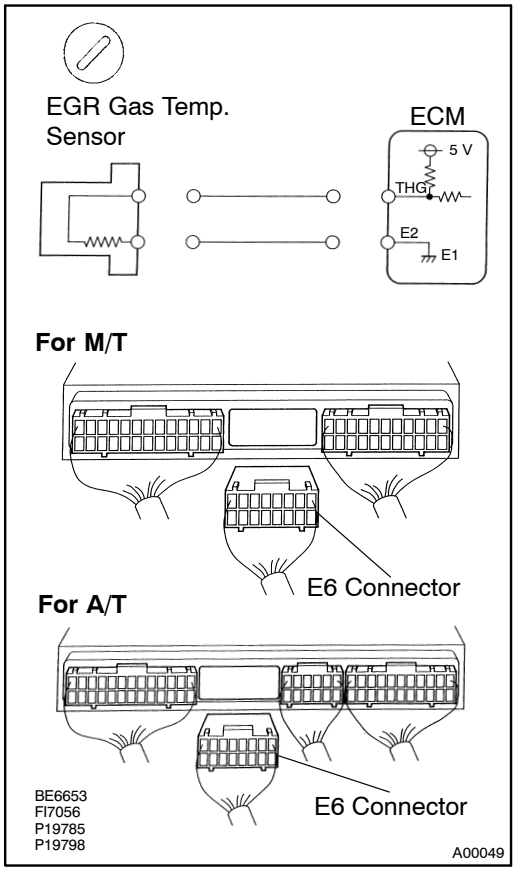


PREPARATION:
Disconnect the EGR gas temp. sensor connector.
CHECK:
Read EGR gas temp. on the TOYOTA hand–held tester.
OK:
EGR gas temp.: 3.1°C (37.6°F)

OK	Replace EGR gas temp. sensor.

NG

3	Check for short in harness or ECM.



PREPARATION:
(a) Remove the glove compartment (See page MF–50).
(b) Disconnect the E6 connector of the ECM.
HINT:
The EGR gas temp. sensor is disconnected.
CHECK:
Read EGR gas temp. on the TOYOTA hand–held tester.
OK:
EGR gas temp.: 3.1°C (37.6°F)

OK	Repair or replace harness or connector.

NG

Check and replace ECM (See page IN–26).

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4	**Check VSV for EGR (See page MF–44).**

OK → **Check EGR valve (See page EC–7).**

NG

5	**Check operation of VSV for EGR (See page EC–7).**

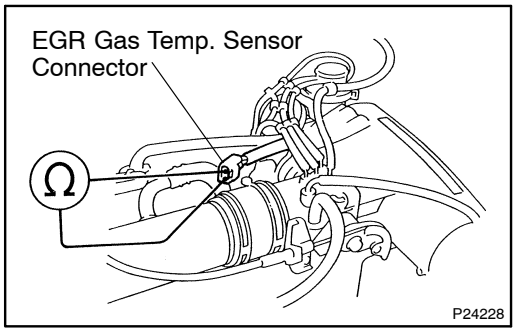
NG → **Replace VSV for EGR.**

OK

Check for open in harness and connector between R/B No.2 and ECM (See page IN–26).

OBD II scan tool (excluding TOYOTA hand–held tester):

1	**Check resistance of EGR gas temp. sensor.**



PREPARATION:
Disconnect the EGR gas temp. sensor connector.
CHECK:
Measure resistance between terminals of EGR gas temp. sensor connector.
OK:

Resistance: 2.5 kΩ or more
(Not immediately after driving)

HINT:
If there is short circuit, ohmmeter indicates 200 Ω or less.

NG → **Replace EGR gas temp. sensor.**

OK

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2	Check for short in harness and connector between EGR gas temp. sensor and ECM (See page IN–26).

NG → Repair or replace harness or connector.

OK ↓

3	Check VSV for EGR (See page MF–44).

OK → Check EGR valve (See page EC–7).

NG ↓

4	Check operation of VSV for EGR (See page MF–44).

NG → Replace VSV for EGR.

OK ↓

5	Check for open in harness and connector between R/B N0.2 and ECM (See page IN–26).

NG → Repair or replace harness or connector.

OK ↓

Check and replace ECM (See page IN–26).

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DI0TW–02

DTC	P0420	Catalyst System Efficiency Below Threshold

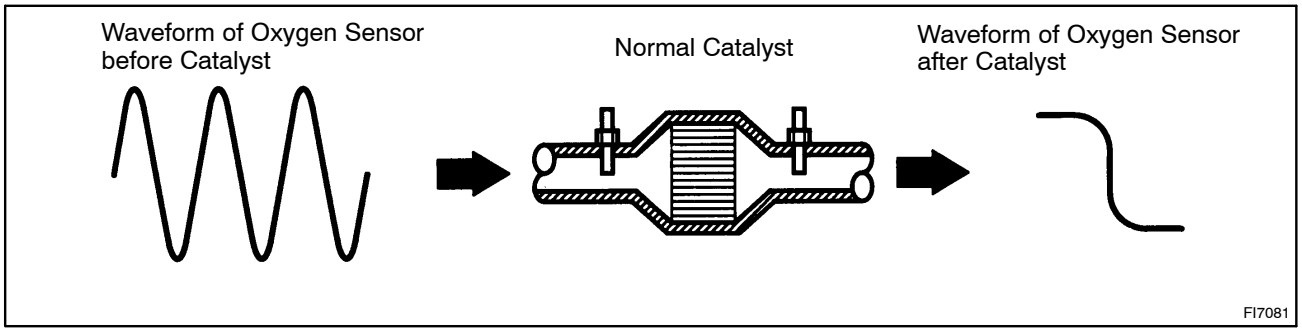
CIRCUIT DESCRIPTION

The ECM compares the waveform of the oxygen sensor located before the catalyst with the waveform of the oxygen sensor located after the catalyst to determine whether or not catalyst performance has deteriorated.

Air–fuel ratio feedback compensation keeps the waveform of the oxygen sensor before the catalyst repeatedly changing back and forth from rich to lean.

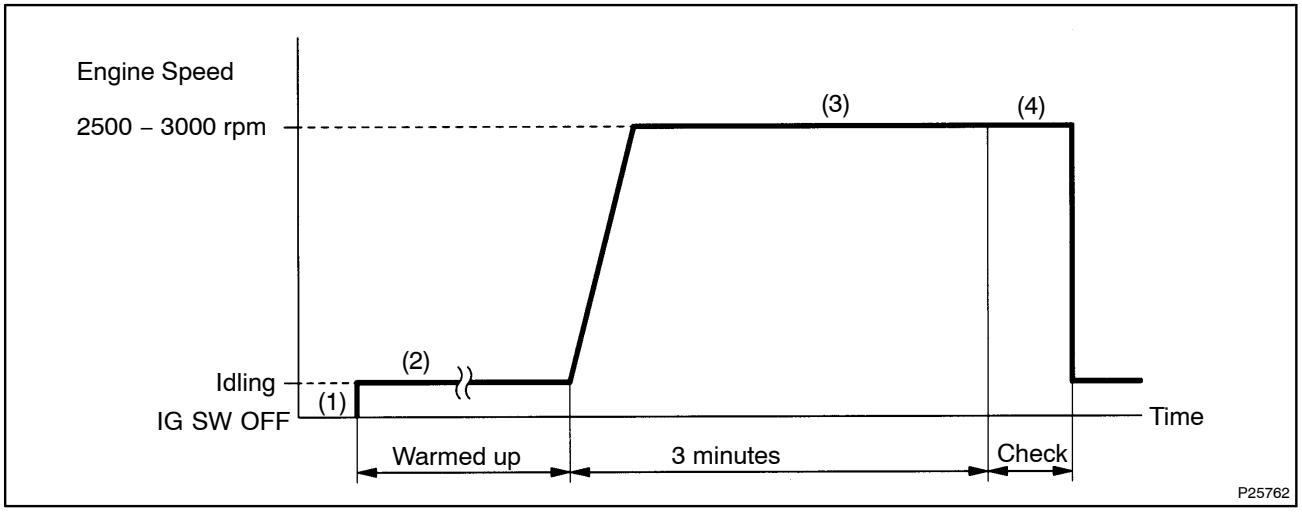
If the catalyst is functioning normally, the waveform of the oxygen sensor after the catalyst switches back and forth between rich and lean much more slowly than the waveform of the oxygen sensor before the catalyst.

But when both waveforms change at a similar rate, it indicates that catalyst performance has deteriorated.



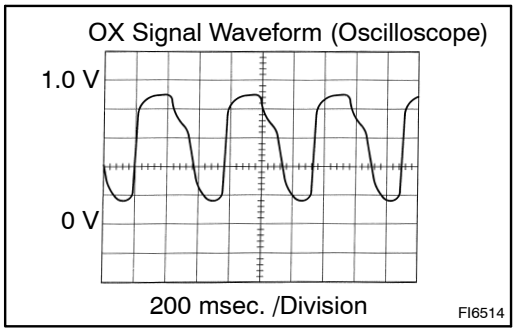
DTC No.	DTC Detecting Condition	Trouble Area
P0420	After engine and catalyst are warmed up, and while vehicle is driven within set vehicle and engine speed range, waveforms of heated oxygen sensors (bank 1 sensor 1, 2) have same amplitude (2 trip detection logic)	• TWC (Three–way catalytic converter) • Heated oxygen sensor (bank 1 sensor 1, 2)

CONFIRMATION ENGINE RACING PATTERN



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(1) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.
(2) Start engine and warm it up with all accessories switched OFF until the water temperature is stable.
(3) Race the engine at 2500 – 3000 rpm for about 3 min.
(4) After confirming that the waveform of the heated oxygen sensor, bank 1 sensor 1 (OX1), oscillate around 0.5 V during feedback to the ECM, check the waveform of the heated oxygen sensor bank 1 sensor 2 (OX2).



HINT:
If there is a malfunction in the system, the waveform of the heated oxygen sensor bank 1 sensor 2 (OX2) is almost the same as that of the heated oxygen sensor bank 1 sensor 1 (OX1) on the left.
There are some cases where, even though a malfunction exists, the MIL may either light up or not light up.

INSPECTION PROCEDURE

1	**Are there any other codes (besides DTC P0420) being output?**

YES → **Go to relevant DTC chart.**

NO

2	**Check heated oxygen sensor (bank 1 sensor 1) (See page DI–47).**

NG → **Repair or replace.**

OK

3	**Check heated oxygen sensor (bank 1 sensor 2) (See page DI–53).**

NG → **Repair or replace.**

OK

Replace TWC (three–way catalytic converter) (See page EM–104).

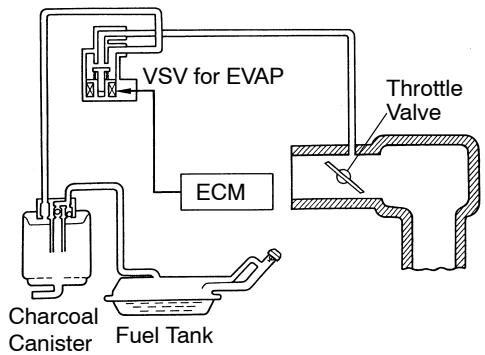
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DI0TX–03

DTC	P0441	Evaporative Emission Control System Incorrect Purge Flow

CIRCUIT DESCRIPTION

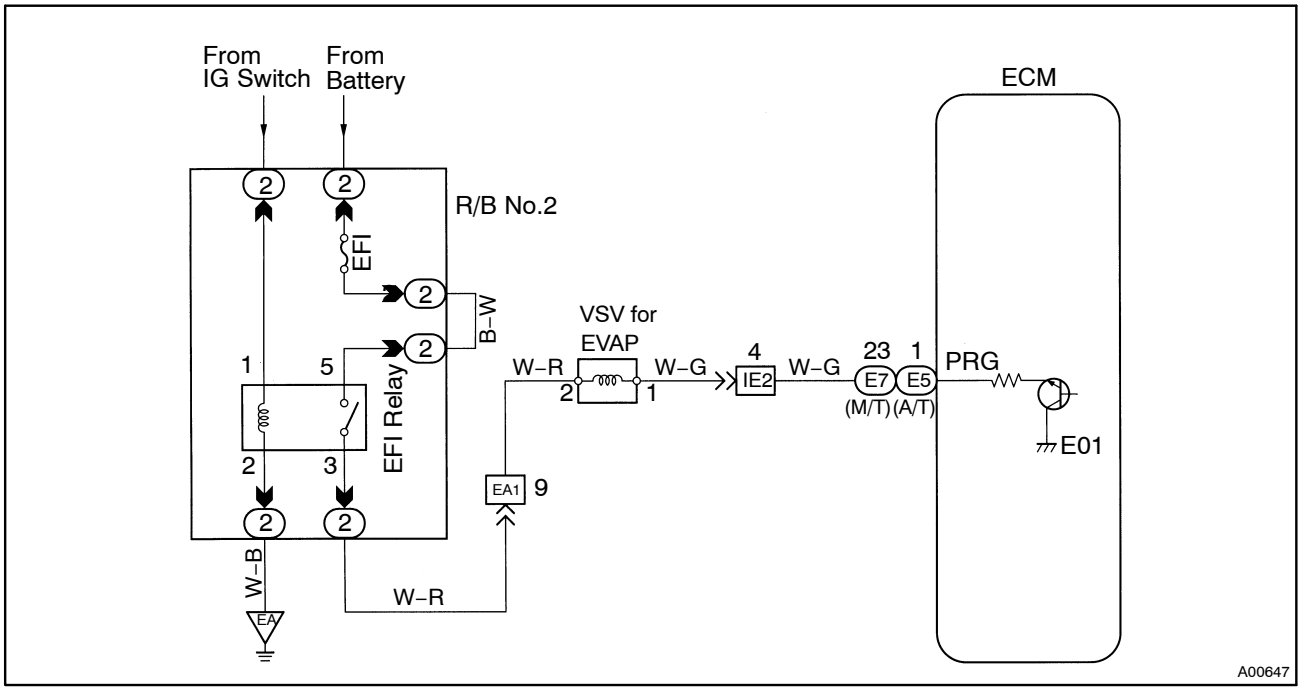
Fig 1



To reduce HC emissions, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders.
The ECM changes the duty signal to the VSV for EVAP so that the intake quantity of HC emissions is appropriate for the driving conditions (engine load, engine speed, vehicle speed, etc.) after the engine is warmed up.

DTC No.	DTC Detecting Condition	Trouble Area
P0441	Proper response to computer command does not occur (2 trip detection logic)	• Open or short in VSV circuit for EVAP • VSV for EVAP • ECM • Vacuum hose cracks, hole, blocked, damaged or disconnected • Charcoal canister

WIRING DIAGRAM

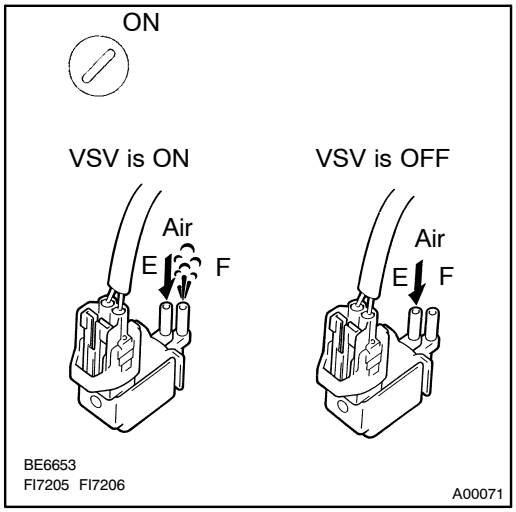


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INSPECTION PROCEDURE

TOYOTA hand–held tester:

1	**Connect TOYOTA hand–held tester and check operation of VSV for EVAP.**



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.
(c) Select the "ACTIVE TEST" mode on the TOYOTA hand–held tester.

CHECK:

Check operation of VSV when it is operated by the TOYOTA hand–held tester.

OK:

(1) VSV is ON:
Air flows from port E to port F.
(2) VSV is OFF:
Air does not flow from port E to port F.

OK	**Go to step 4.**

NG

2	**Check operation of VSV for EVAP (See page MF–44).**

NG	**Replace VSV for EVAP.**

OK

3	**Check for open and short in harness and connector between EFI main relay (Marking: EFI) and ECM (See page IN–26).**

NG	**Repair or replace harness or connector.**

OK

Check and replace ECM (See page IN–26).

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4	**Check connection of vacuum hose (See Fig 1 in circuit description).**

NG → **Repair or replace.**

OK

Check and repair charcoal canister (See page EC–5).

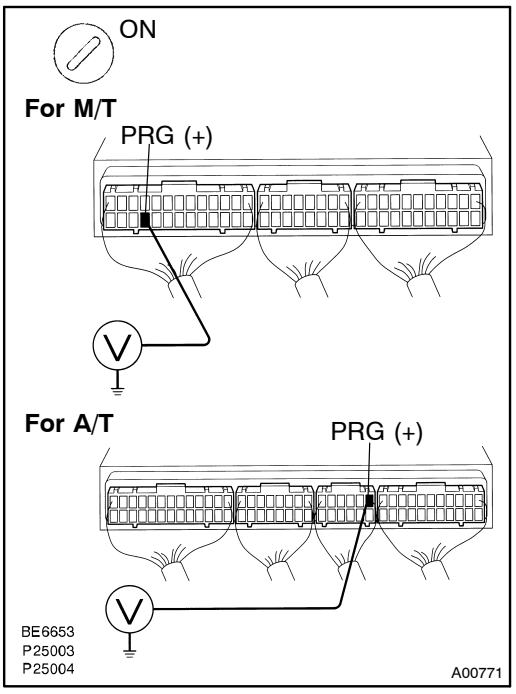
OBD II scan tool (excluding TOYOTA hand–held tester):

1	**Check operation of VSV for EVAP (See page MF–43).**

NG → **Replace VSV for EVAP.**

OK

2	**Check voltage between terminal PRG of ECM connector and body ground.**



PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).

(b) Turn the ignition switch ON.

CHECK:

Measuve voltage between terminal PRG of ECM connector and body ground.

OK:

Voltage: 9 – 14 V

NG → **Check and repair harness or connector.**

OK

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3	Check connection of vacuum hose (See Fig 1 in circuit description).

NG → Repair or replace.

OK

4	Check charcoal canister (See page EC–5).

NG → Repair or replace.

OK

Check and replace ECM (See page IN–26).

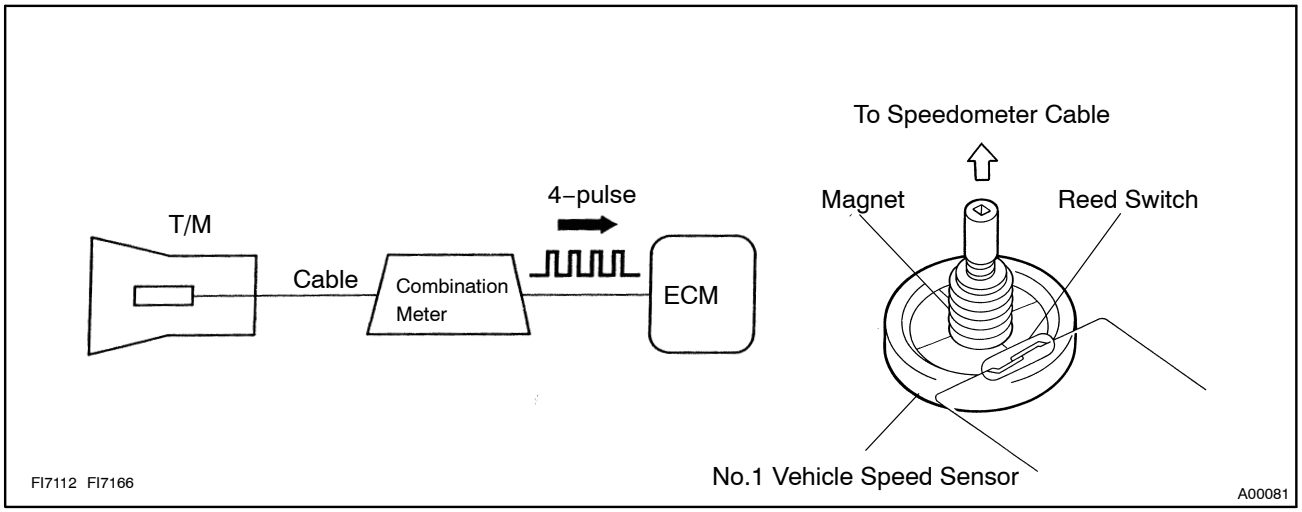
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DI0TY–05

DTC	P0500	Vehicle Speed Sensor Malfunction

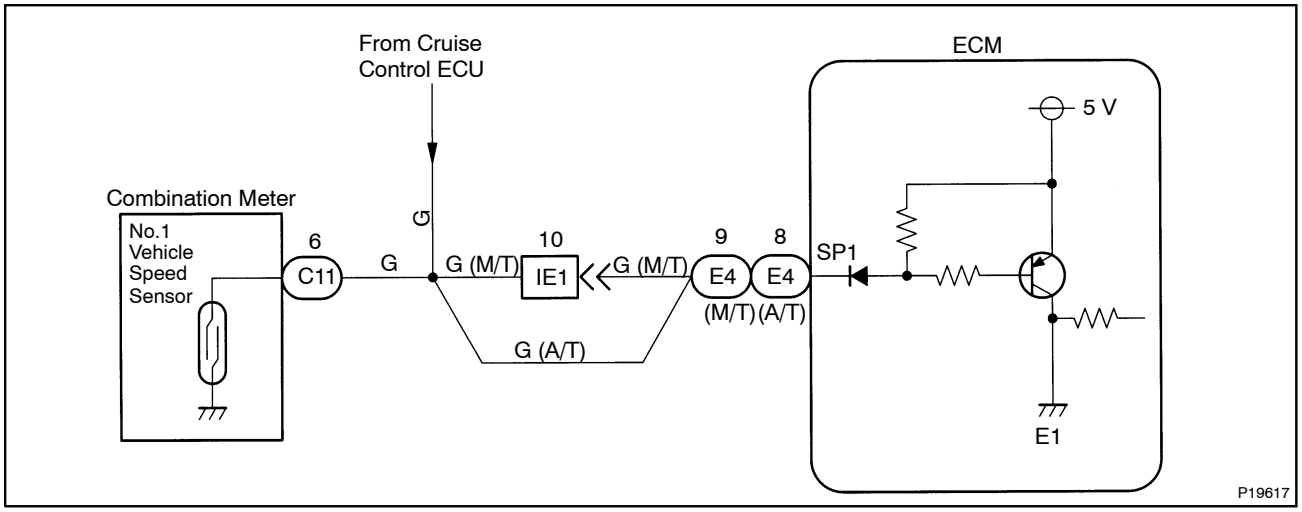
CIRCUIT DESCRIPTION

This No.1 vehicle speed sensor is mounted in the combination meter. It contains a magnet which is rotated by the speed meter cable.
Turning the reed switch ON and OFF 4 times for every revolution of the speedmeter.
It is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pluse signals.



DTC No.	DTC Detecting Condition	Trouble Area
P0500	No vehicle speed sensor signal to ECM under conditions (a) (2 trip detection logic) (a) Vehicle is being driven	• Open or short in No.1 vehicle speed sensor circuit • No.1 vehicle speed sensor • ECM • Speedometer cable

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	Check operation of speedometer.

CHECK:

Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.

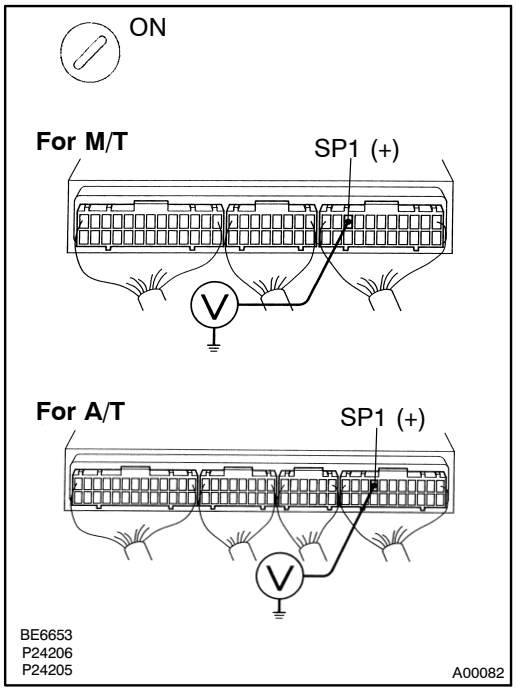
HINT:

The vehicle speed sensor is operating normally if the speedometer display is normal.

NG → Check speedometer (See page BE–38).

OK

2	Check voltage between terminal SP1 of ECM connector and body ground.



PREPARATION:

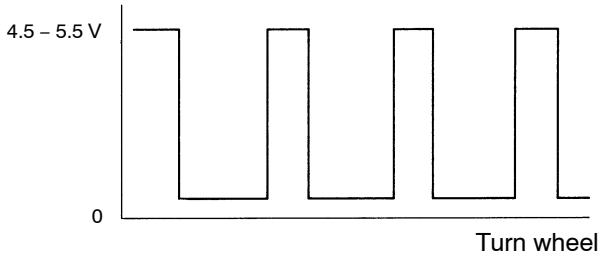
(a) Remove the right cowl side trim (See page MF–50).
(b) Disconnect the cruise control ECU connector.
(c) Shift the shift lever to neutral.
(d) Jack up the rear wheels on one side.
(e) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal SP1 of ECM connector and body ground when the wheel is turned slowly.

OK:

Voltage is generated intermittently.



NG → Check and repair harness and connector between combination meter and ECM.

OK

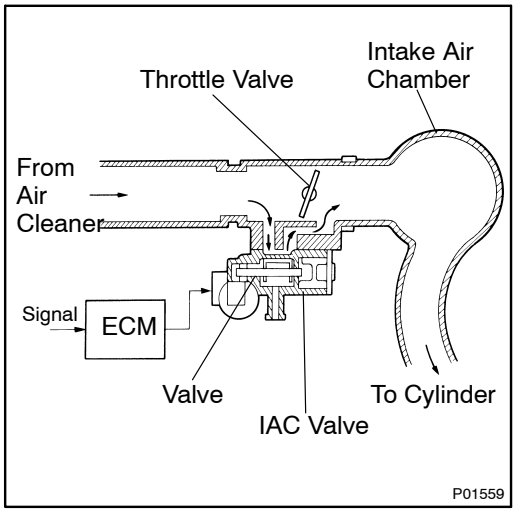
Check and replace ECM (See page IN–26).

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DI0TZ–03

DTC	P0505	Idle Control System Malfunction

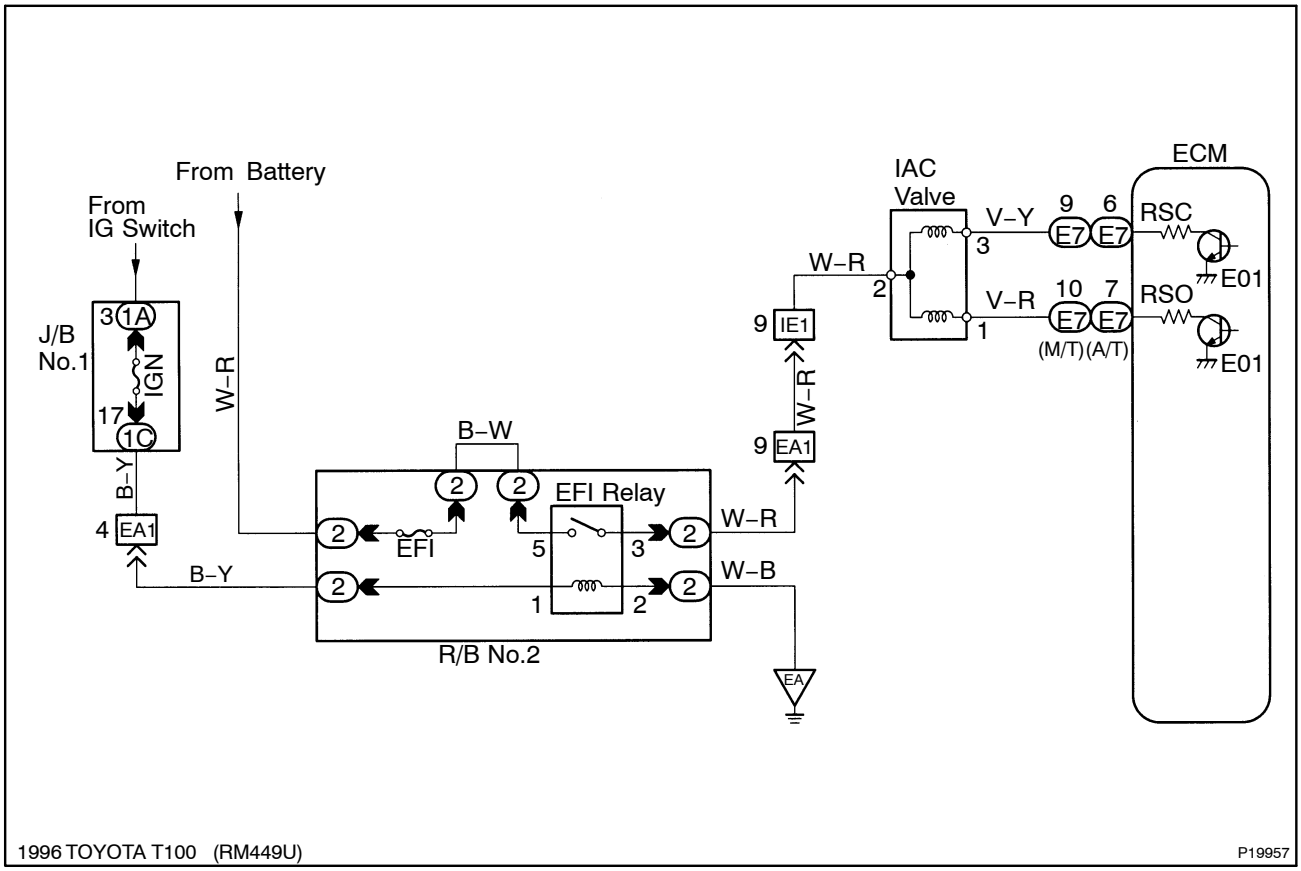
CIRCUIT DESCRIPTION



The rotary solenoid type IAC valve is located in front of the intake air chamber and intake air bypassing the throttle valve is directed to the IAC valve through a passage.
In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed.
The ECM operates only the IAC valve to perform idle–up and provide feedback for the target idling speed.

DTC No.	DTC Detecting Condition	Trouble Area
P0505	Idle speed continues to vary greatly from target speed (2 trip detection logic)	• IAC valve is stuck or closed • Open or short in IAC valve circuit • Air intake (hose loose)

WIRING DIAGRAM



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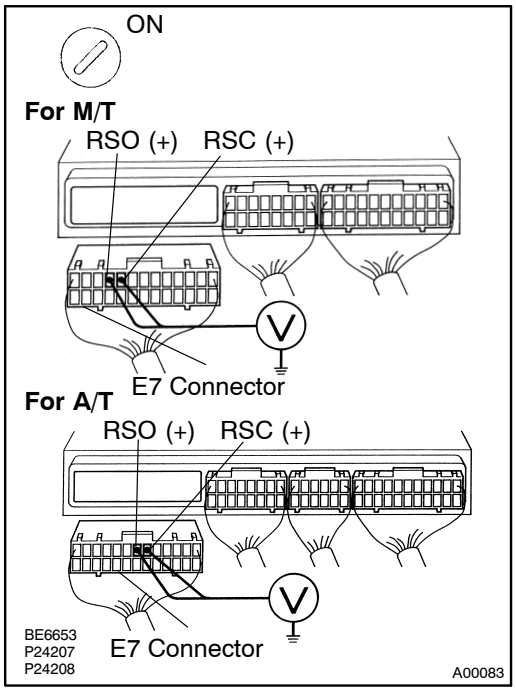
INSPECTION PROCEDURE

1	**Check air induction system (See page MF–1).**

NG → **Repair or replace.**

OK

2	**Check voltage between terminals RSO and RSC of ECM connector and body ground.**



PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).
(b) Disconnect the E7 connector of the ECM.
(c) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals RSO and RSC of ECM connector and body ground.

OK:

Voltage: 9 – 14 V

OK → **Go to step 4.**

NG

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3	Check IAC valve (See page MF–31).

NG → Replace IAC valve.

OK →

Check for open and short in harness and connector between R/B No.2 and IAC valve, IAC valve and ECM (See page IN–26).

4	Check operation of IAC valve (See page MF–31).

NG → Repair or replace IAC valve.

OK →

Check and replace ECM (See page IN–26).

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DI0U0–03

DTC	P0510	Closed Throttle Position Switch Malfunction

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page DI–39.

DTC No.	DTC Detecting Condition	Trouble Area
P0510	Closed throttle position switch does not turn ON even once when vehicle is driven (2 trip detection logic)	• Open in closed throttle position switch circuit • Closed throttle position switch • ECM

HINT:
After confirming DTC P0510 use the TOYOTA hand–held tester to confirm the closed throttle position switch signal from ”CURRENT DATA”.

Throttle Valve	Closed Throttle Position Switch Signal	Malfunction
Fully closed	OFF	Open circuit
Fully open	ON	Short circuit

WIRING DIAGRAM

Refer to DTC P0120 on page DI–39.

INSPECTION PROCEDURE

HINT:
If DTC P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open.

TOYOTA hand–held tester:

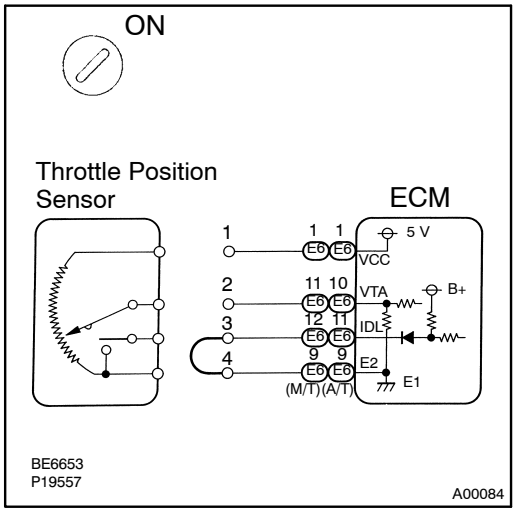
1	**Connect TOYOTA hand–held tester and read CTP switch signal.**

PREPARATION:
(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
CHECK:
Read CTP switch signal on the TOYOTA hand–held tester.
RESULT:

Throttle Valve	Closed Throttle Position Switch Signal	Malfunction
Fully closed	OFF	Open circuit: Go to step 2
Fully open	ON	Short circuit: Go to step 4

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2	Check for open in harness or ECM.



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Disconnect the throttle position sensor connector.
(c) Connect the sensor wire harness terminals between terminals 3 and 4.
(d) Turn the ignition switch ON.

CHECK:

Read CTP switch signal on the TOYOTA hand–held tester.

OK:

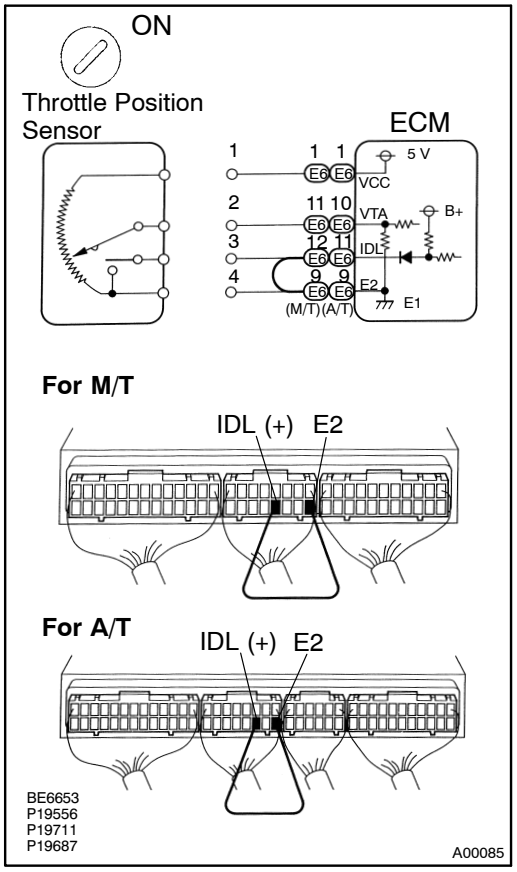
CTP switch signal: ON

OK → **Confirm good connection at sensor. If OK, replace throttle position sensor.**

NG

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3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).

(b) Connect between terminals IDL and E2 of the ECM connector.

HINT:

Throttle position sensor connector is disconnected.

Before checking, do a visual check and contact pressure check for the connector (See page IN–26).

(c) Turn the ignition switch ON.

CHECK:

Read CTP switch signal on the TOYOTA hand–held tester.

OK:

CTP switch signal: ON

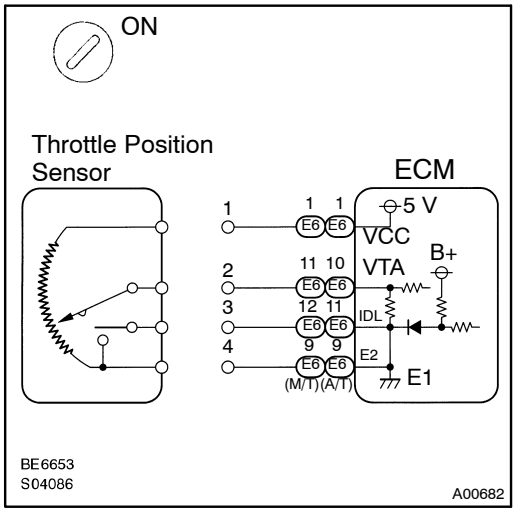
OK → **Open in harness between ECM and throttle position sensor, repair or replace harness.**

NG

Confirm connection at ECM.
If OK, replace ECM.

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4	Check for short in harness or ECM.



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Disconnect the throttle position sensor connector.
(c) Turn the ignition switch ON.

CHECK:

Read CTP switch signal on the TOYOTA hand–held tester.

OK:

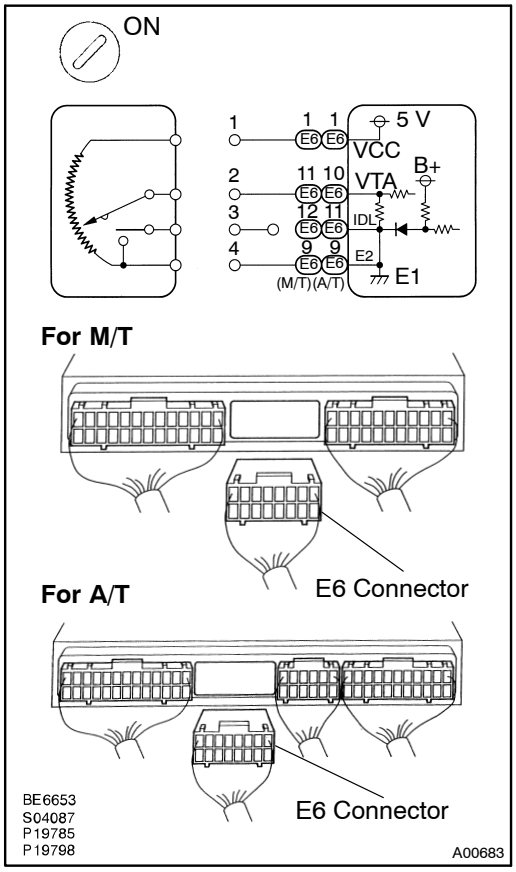
CTP switch signal: OFF

OK	Confirm good connection at sensor. If OK, replace throttle position sensor.

NG

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5	Check for short in harness or ECM.



PREPARATION:

(a) Remove right cowl side trim (See page MF–50).
(b) Disconnect the E6 connector of the ECM.
(c) Turn the ignition switch ON.

HINT:

Throttle position sensor connector is disconnected.

CHECK:

Read CTP switch signal on TOYOTA hand–held tester.

OK:

CTP switch signal: OFF

OK → **Short in harness between ECM and throttle position sensor, repair or replace harness.**

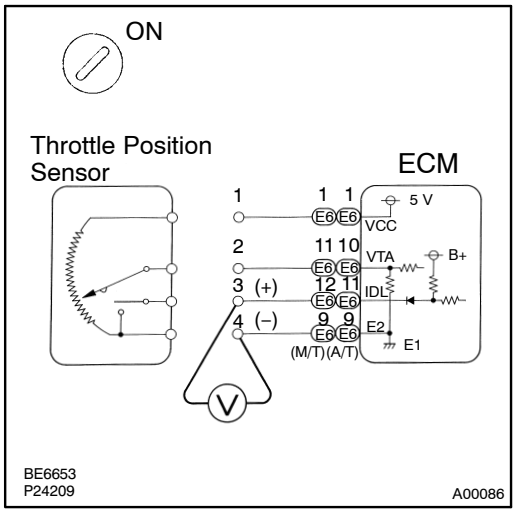
NG

**Confirm connection at ECM.
If OK, replace ECM.**

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OBD II scan tool (excluding TOYOTA hand–held tester):

1	**Check for open in harness or ECM.**



PREPARATION:

(a) Disconnect the throttle position sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals 3 and 4 of throttle position sensor connector.

OK:

Voltage: 9 – 14 V

OK	**Confirm good connection at sensor. If OK, replace throttle position sensor.**

NG

2	**Check for open in harness and connector between throttle position sensor and ECM (See page IN–26).**

NG	**Open in harness between ECM and throttle position sensor.**

OK

Confirm connection at ECM. If OK, replace ECM.

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DI0U1–03

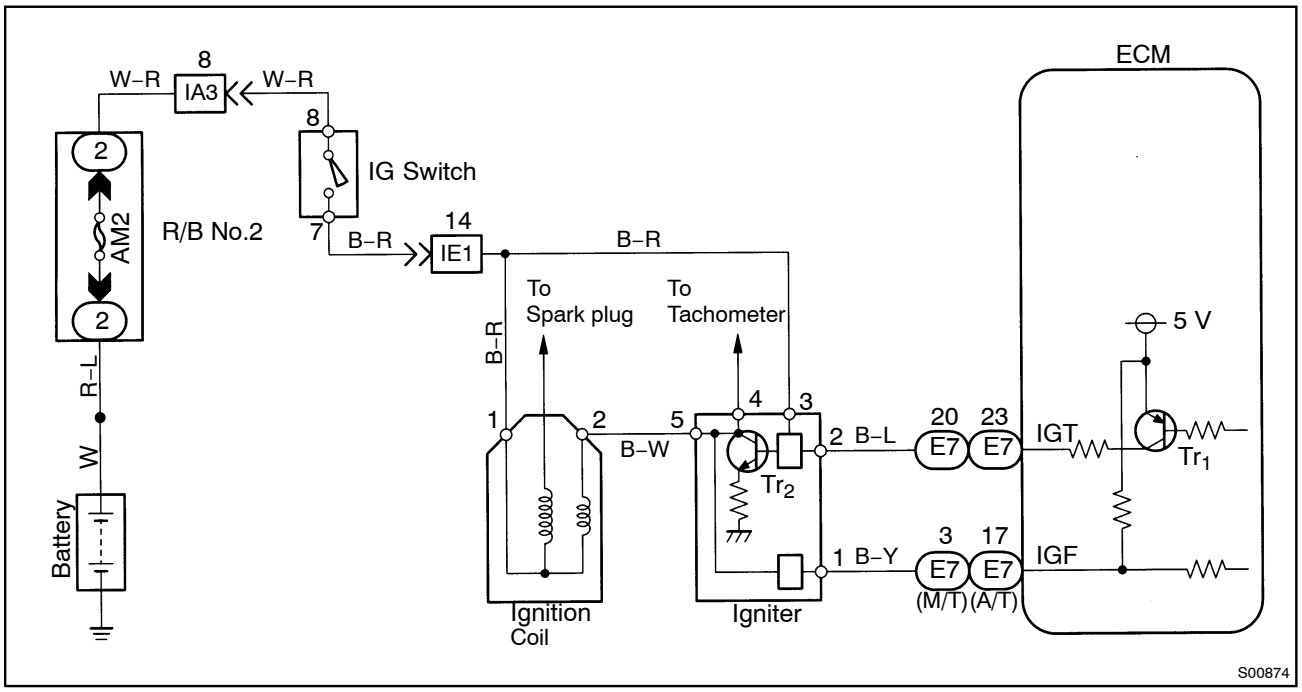
DTC	P1300	Ignition Circuit Malfunction

CIRCUIT DESCRIPTION

The ECM determines the ignition timing, turns on Tr_1 at a predetermined angle (˚CA) before the desired ignition timing and outputs an ignition signal (IGT) "1" to the igniter.
Since the width of the IGT signal is constant, the dwell angle control circuit in the igniter determines the time the control circuit starts primary current flow to the ignition coil based on the engine rpm and ignition timing one revolution ago, that is, the time the Tr_2 turns on.
When it reaches the ignition timing, the ECM turns Tr_1 off and outputs the IGT signal "0".
This turns Tr_2 off, interrupting the primary current flow and generating a high voltage in the secondary coil which causes the spark plug to spark. Also, by the counter electromotive force generated when the primary current is interrupted, the igniter sends an ignition confirmation signal (IGF) to the ECM. The ECM stops fuel injection as a fail safe function when the IGF signal is not input to the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P1300	No IGF signal to ECM for 4 consecutive IGT signal during engine running	• Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	Check spark plug and spark (See page IG–1).

NG → Go to step 4.

OK

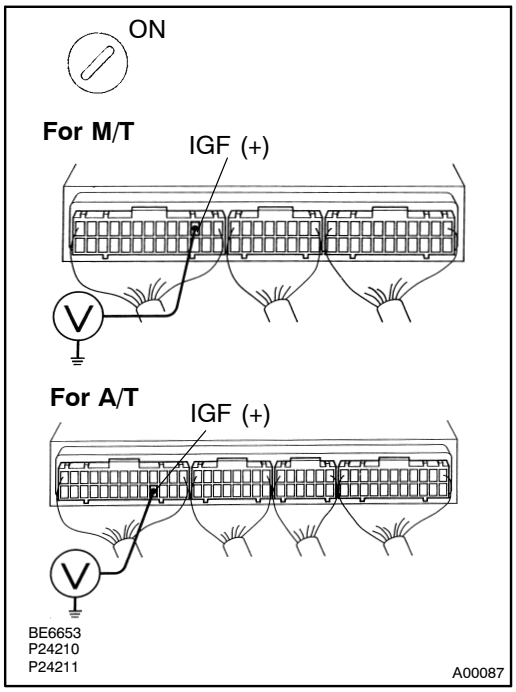
2	Check for open and short in harness and connector in IGF signal circuit between ECM and igniter (See page IN–26).

NG → Repair or replace harness or connector.

OK

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3	Disconnect igniter connector and check voltage between terminal IGF of ECM connector and body ground.



PREPARATION:

(a) Disconnect the igniter connector.
(b) Remove the right cowl side trim (See page MF–50).
(c) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal IGF of ECM connector and body ground.

OK:

Voltage: 4.5 – 5.5 V

OK → **Replace igniter.**

NG

Check and replace ECM (See page IN–26).

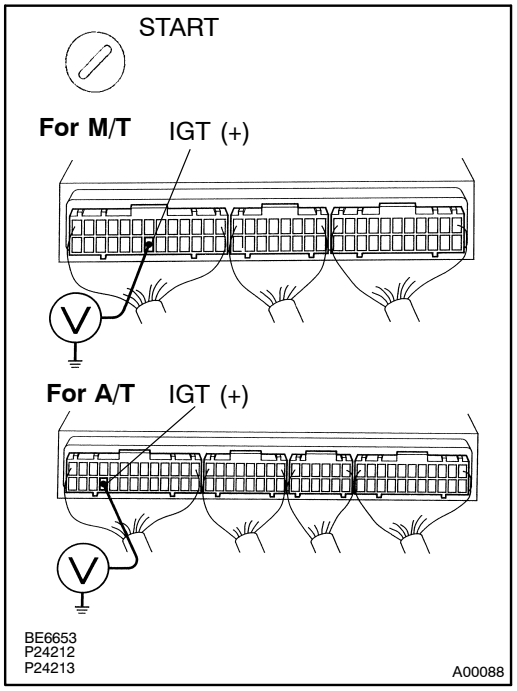
4	Check for open and short in harness and connector in IGT signal circuit between ECM and igniter (See page IN–26).

NG → **Repair or replace harness or connector.**

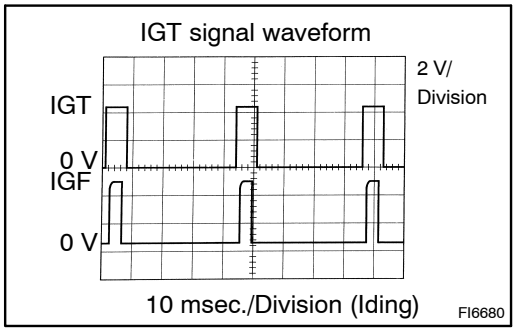
OK

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5	Check voltage between terminals IGT of ECM connector and body ground.



PREPARATION:
Remove the right cowl side trim (See page MF–50).
CHECK:
Measure voltage between terminals IGT of ECM connector and body ground when engine is cranked.
OK:
Voltage: More than 0.1 V and less than 4.5 V



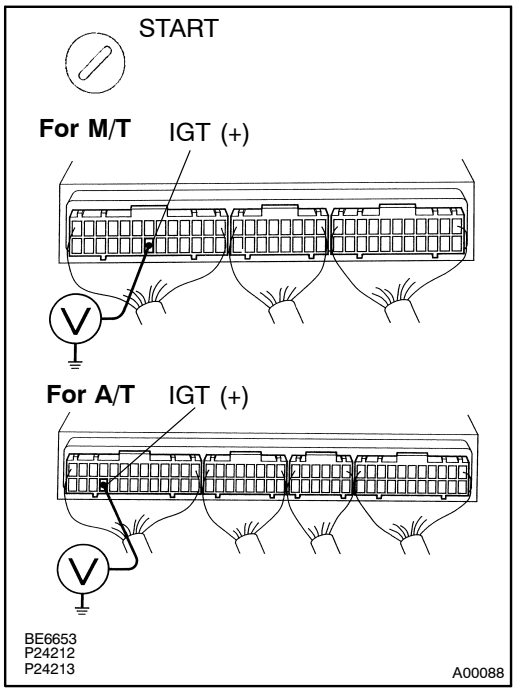
Reference: INSPECTION USING OSCILLOSCOPE
During cranking or idling, check waveform between terminals IGT and E1 of ECM.
HINT:
The correct waveforms are as shown.

NG → **Check and replace ECM (See page IN–26).**

OK

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6	Disconnect igniter connector and check voltage between terminals IGT of ECM connector and body ground.



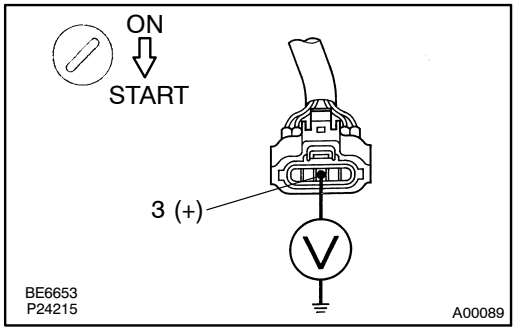
PREPARATION:
Disconnect the igniter connector.
CHECK:
Measure voltage between terminals IGT of ECM connector and body ground when engine is cranked.
OK:

Voltage: More than 0.1 V and less than 4.5 V

NG → **Check and replace ECM (See page IN–26).**

OK

7	Check voltage between terminal 3 of igniter connector and body ground.



PREPARATION:
Disconnect the igniter connector.
CHECK:
When the ignition switch is turned to ”ON” and ”STA” position, measure voltage between terminal 3 of igniter connector and body ground.
OK:

Voltage: 9 – 14 V

NG → **Check and repair igniter power source circuit.**

OK

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8	Check for open and short in harness and connector between ignition switch and ignition coil, ignition coil and igniter (See page IN–26).

NG → Repair or replace harness or connector.

OK

9	Check ignition coil (See page IG–1).

NG → Replace ignition coil.

OK

Replace igniter.

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DI0U2-01

DTC	P1335	Crankshaft Position Sensor Circuit Malfunction (during engine running)

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page DI–66.

DTC No.	DTC Detecting Condition	Trouble Area
P1335	No crankshaft position sensor signal to ECM with engine speed 1,000 rpm or more	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • ECM

WIRING DIAGRAM

Refer to DTC P0335 on page DI–66.

INSPECTION PROCEDURE

Refer to DTC P0335 on page DI–66.

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DI984–01

DTC	P1500	Starter Signal Circuit Malfunction

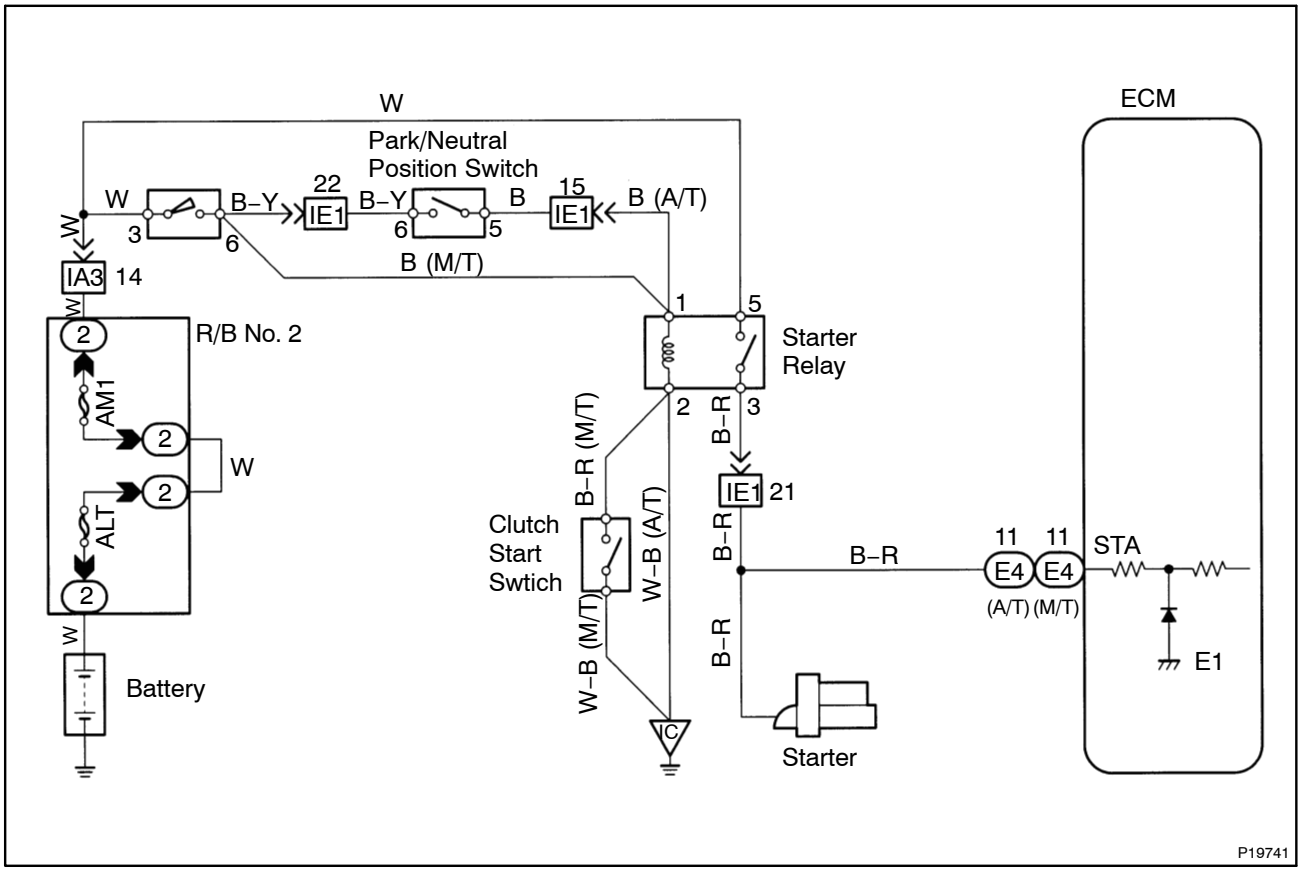
CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow is slow, so fuel vaporazation is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

DTC No.	DTC Detecting Condition	Trouble Area
P1500	No starter signal to ECM	• Open or short in starter signal circuit • Open or short in ignition swtich or starter relay circuit • ECM

HINT:
In this circuit, diagnosis can only be made in the check mode.

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

This inspection procedure is based on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the matrix chart of problem symptoms on page DI–21.

1	**Connect the TOYOTA hand–held tester and check STA signal.**

PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.

(b) Turn ignition switch ON and TOYOTA hand–held tester main switch ON.

CHECK:

Read STA signal on the TOYOTA hand–held tester while starter operates.

OK:

Ignition switch position	ON	START
STA signal	OFF	ON

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–21)**

NG

2	**Check for open in harness and connector between ECM and starter relay (See page IN–26).**

NG → **Repair or replace harness and sconnector.**

OK

Check and replace ECM (See page IN–26).

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DI0U4–03

DTC	P1600	ECM BATT Malfunction

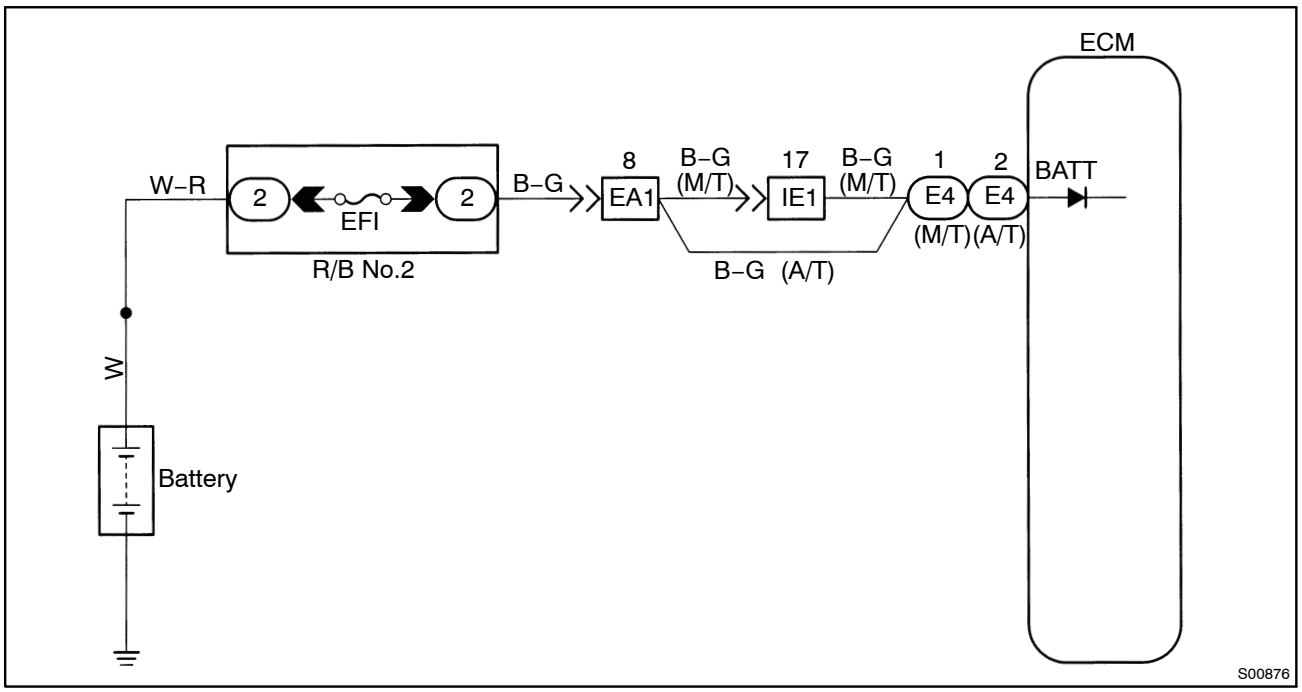
CIRCUIT DESCRIPTION

Battery positive voltage is supplied to terminal BATT of the ECM even when the ignition switch is OFF for use by the DTC memory and air–fuel ratio adaptive control value memory, etc.

DTC No.	DTC Detecting Condition	Trouble Area
P1600	Open in back up power source circuit	• Open in back up power source circuit • ECM

HINT:
If DTC P1600 appear, the ECM does not store another DTC.

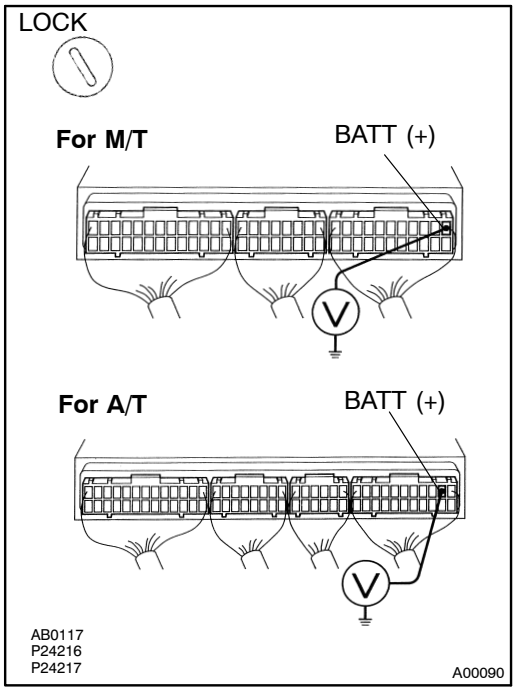
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check voltage between terminal BATT of ECM connector and body ground.**

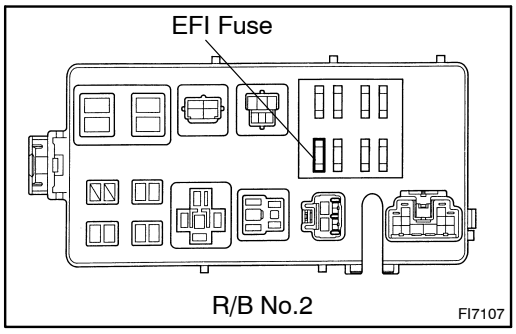


PREPARATION:
Remove the right cowl side trim (See page MF–50).
CHECK:
Measure voltage between terminal BATT of ECM connector and body ground.
OK:
Voltage: 9 – 14 V

OK → **Check and replace ECM (See page IN–26).**

NG

2	**Check EFI fuse.**



PREPARATION:
Remove the EFI fuse from the R/B No2.
CHECK:
Check continuity of EFI fuse.
OK:
Continuity

NG → **Check for short in all the harness and components connected to EFI fuse.**

OK

Check and repair harness or connector between battery, EFI fuse and ECM.

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DI0U5–02

DTC	P1780	Park/Neutral Position Switch Malfunction (A/T Only)

CIRCUIT DESCRIPTION

The park/neutral position switch goes on when the shift lever is in the N or P shift position. When it goes on terminal NSW of the ECM is grounded to body ground via the starter relay, thus the terminal NSW voltage becomes 0 V. When the shift lever is in the D, 2, L, or R position, the park/neutral position switch goes off, so the voltage of ECM. Terminal NSW becomes battery positive voltage, the voltage of the ECM internal power source. If the shift lever is moved from the N position to the D position, this signal is used for air–fuel ratio correction and for idle speed control (estimated control), etc.

DTC No.	DTC Detecting Condition	Trouble Area
P1780	2 or more switches are ON simultaneously for "N", "2" and "L" position (2 trip detection logic)	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM
	When driving under conditions (a) and (b) for 30 sec. or more the park/neutral position switch is ON (N position): (2 trip detection logic) (a) Vehicle speed: 70 km/h (44 mph) or more (b) Engine speed: 1,500 – 2,500 rpm	

HINT:
After confirming DTC P1780 use the TOYOTA hand–held tester to confirm the PNP switch signal from "CURRENT DATA".

WIRING DIAGRAM

Refer to DTC P1780 on page DI–114.

INSPECTION PROCEDURE

Refer to DTC P1780 on DI–114.

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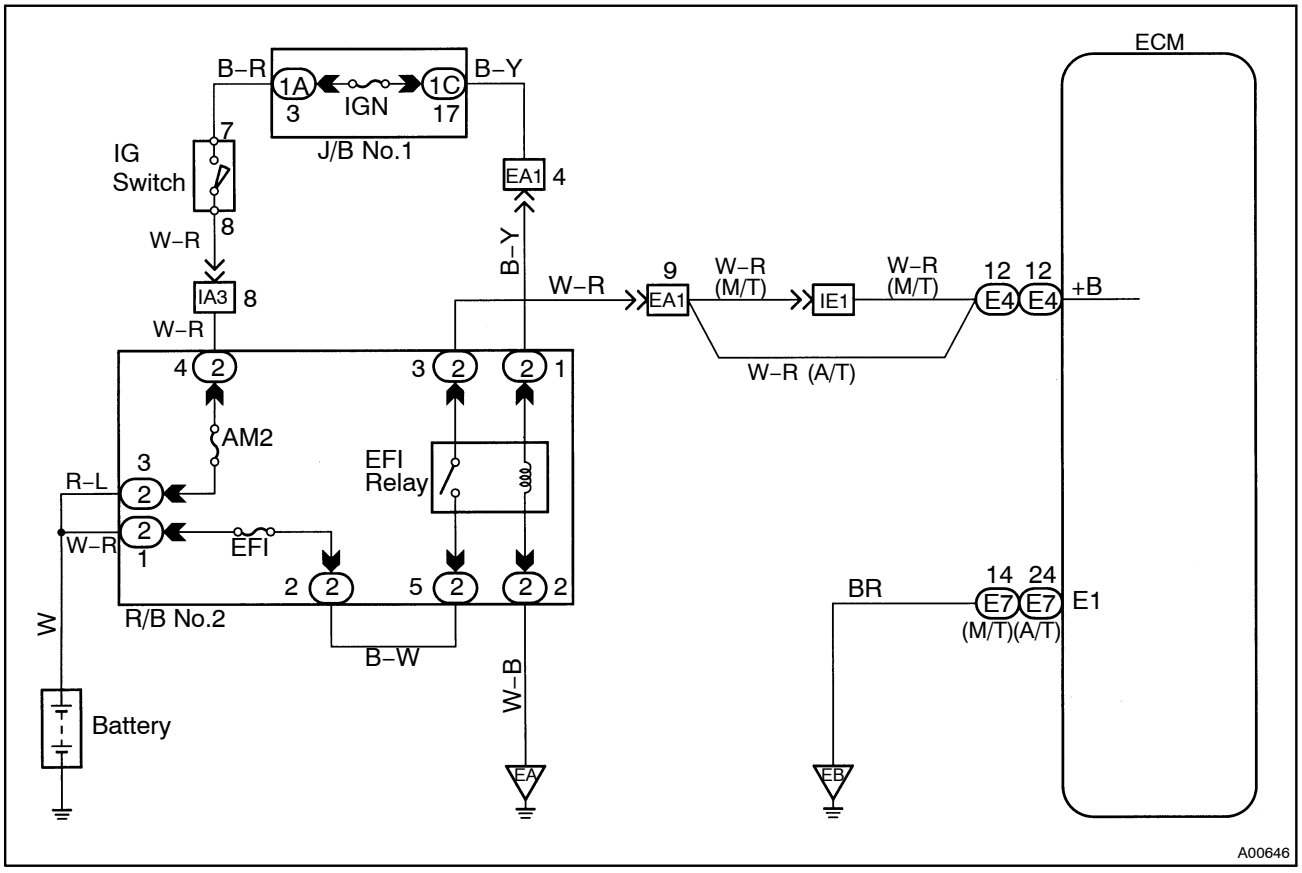
DI0U7–03

ECM Power Source Circuit

CIRCUIT DESCRIPTION

When the ignition switch is turned ON, battery positive voltage is applied to the coil, closing the contacts of the EFI main relay (Making: EFI) and supplying power to terminal +B of the ECM.

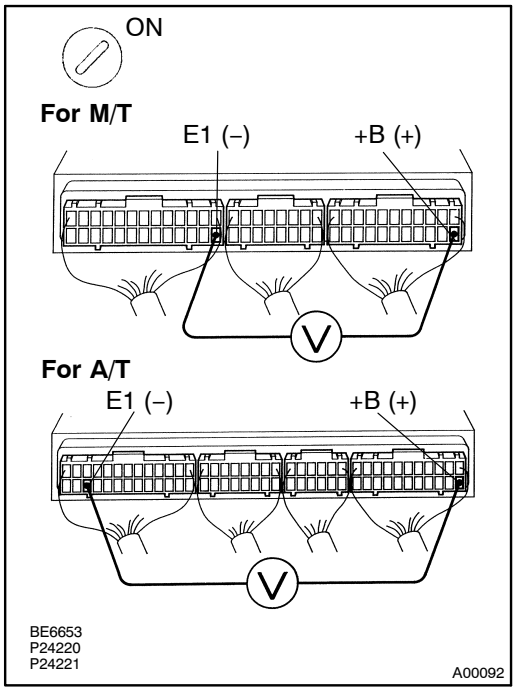
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check voltage between terminals + B and E1 of ECM connector.**



PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals + B and E1 of ECM connector.

OK:

Voltage: 9 – 14 V

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–21).**

NG

2	**Check for open in harness and connector between terminal E1 of ECM and body ground (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

3	**Check EFI main relay (Marking: EFI) (See page MF–40).**

NG → **Replace EFI main relay.**

OK

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4	**Check EFI fuse (See page DI–114, step 2).**

NG → **Check for short in all harness and components connected to EFI fuse.**

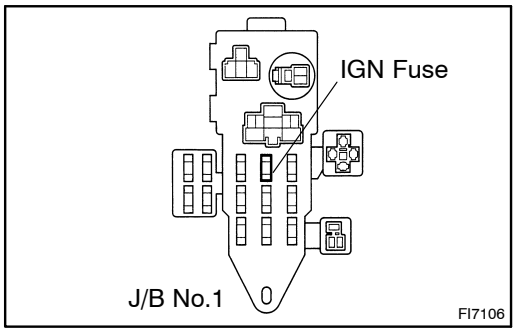
OK

5	**Check for open in harness and connector between EFI main relay (Marking: EFI) and battery, EFI main relay (Marking: EFI) and ECM (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

6	**Check IGN fuse.**



PREPARATION:
Remove the IGN fuse from the J/B No.1.
CHECK:
Check continuity of IGN fuse.
OK:
Continuity

NG → **Check for short in all the harness and components connected to IGN fuse.**

OK

7	**Check ignition switch (See page BE–12).**

NG → **Replace ignition switch.**

OK

Check for open in harness and connector between IG switch and EFI main relay, EFI main relay and body ground (See page IN–26).

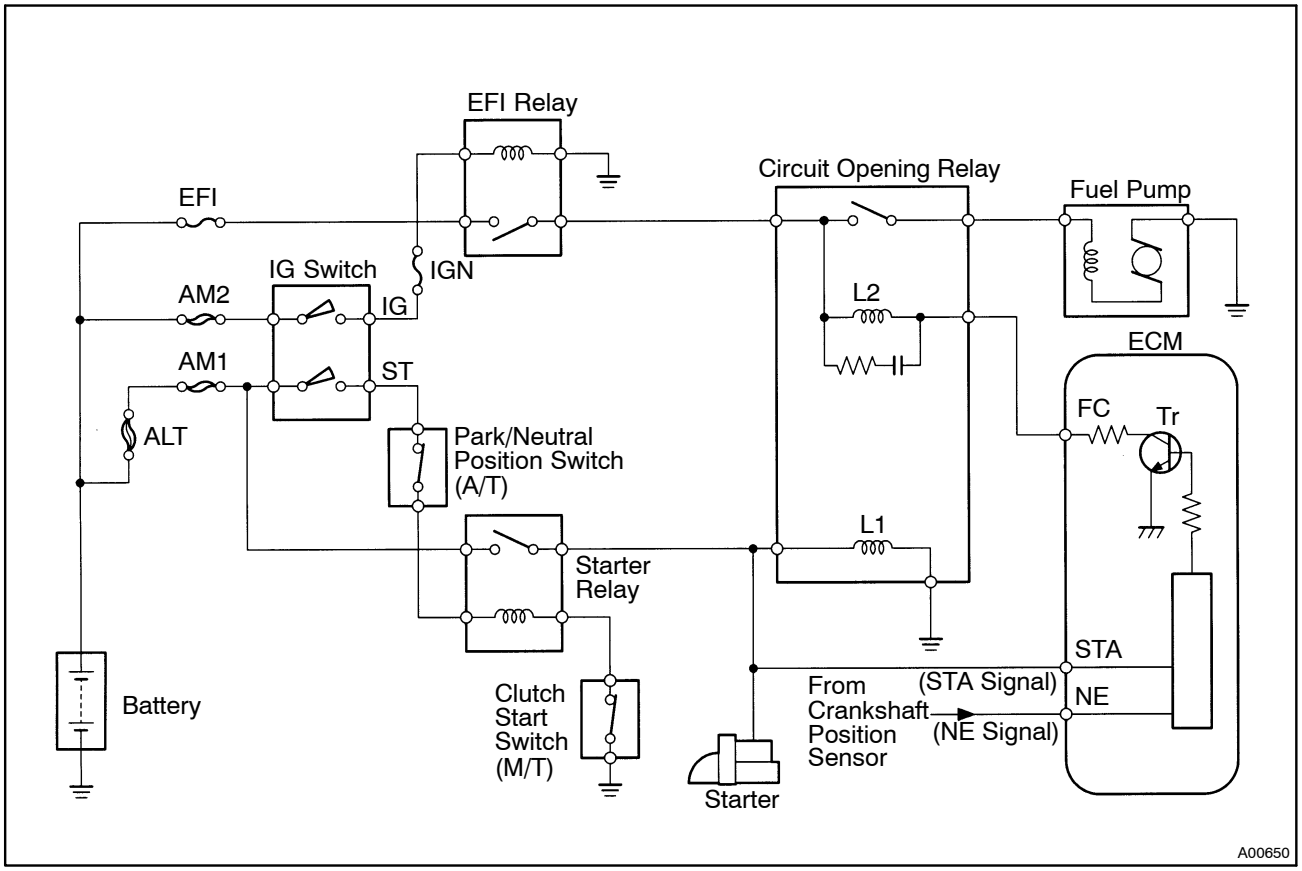
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DI0U8–03

Fuel Pump Control Circuit

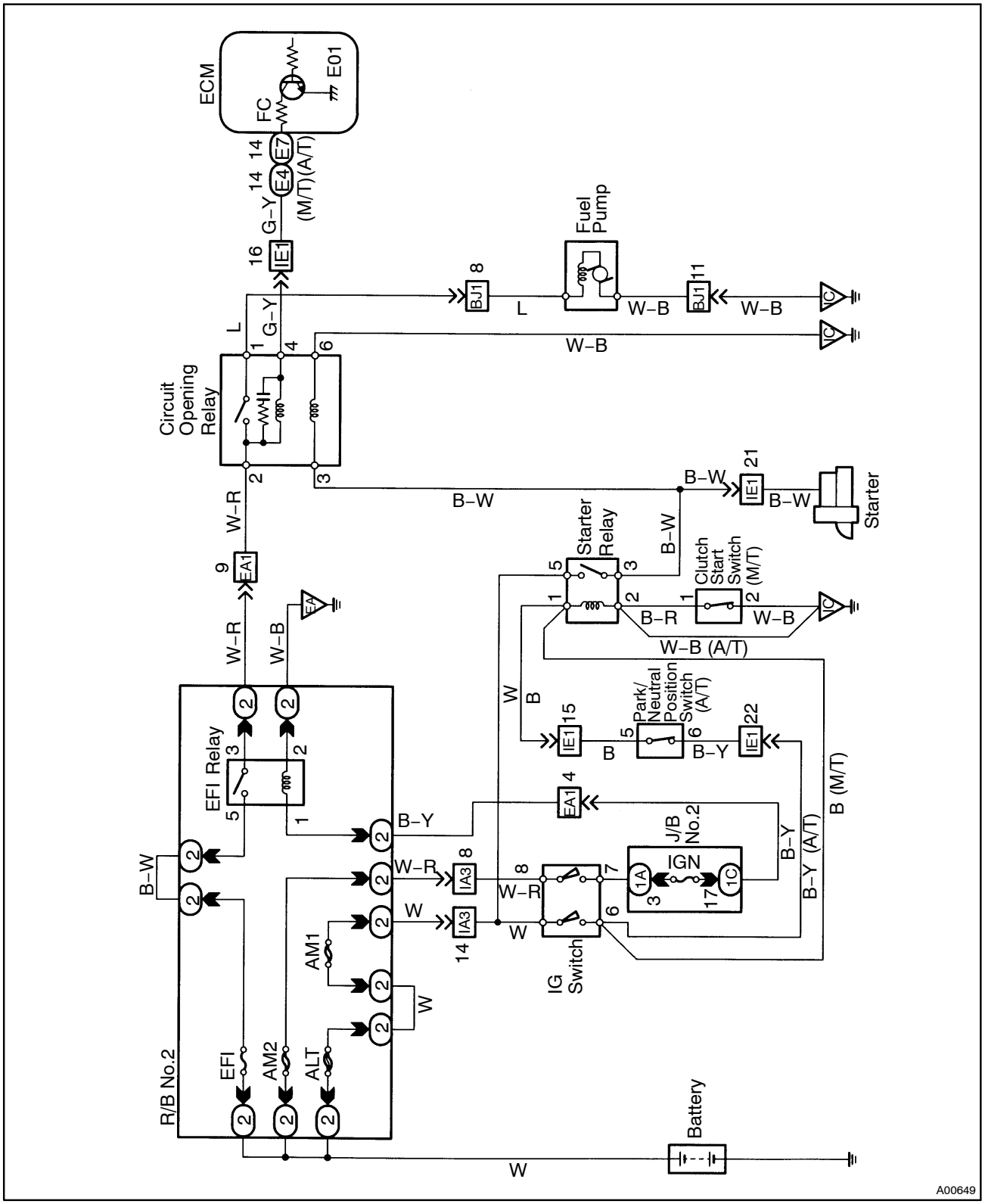
CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows from terminal ST of the ignition switch to the starter relay coil, the starter relay switches on and current flows to coil L1 of the circuit opening relay. Thus the circuit opening relay switches on, power is supplied to the fuel pump and the fuel pump operates. When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to coil L2 of the circuit opening relay, the relay witches on and the fuel pump operates.
While the NE signal is generated (engine running), the ECM keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.



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WIRING DIAGRAM

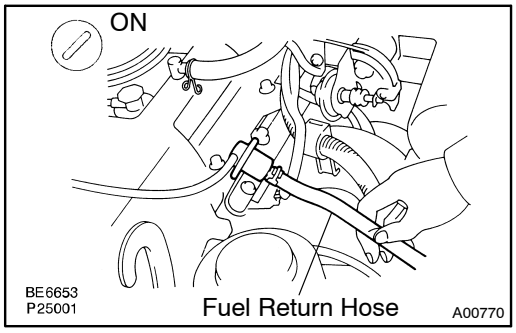


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INSPECTION PROCEDURE

TOYOTA hand–held tester:

1	**Connect TOYOTA hand–held tester and check operation of fuel pump.**



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
(c) Use ”ACTIVE TEST” mode to operate the fuel pump.

CHECK:

Check for fuel pressure in the fuel return hose when it is pinched off.

OK:

There is pressure in the fuel return hose.

HINT:

At this time, you will hear a fuel flowing noise.

OK	**Go to step 7.**

NG

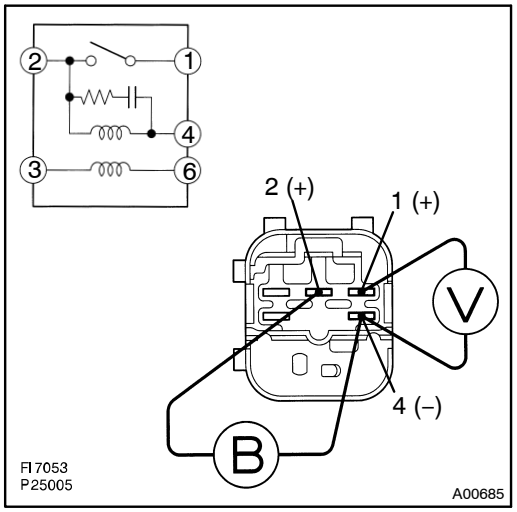
2	**Check for ECM power source circuit (See page DI–115).**

NG	**Repair or replace.**

OK

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3	Check circuit opening relay.



PREPARATION:

Remove the circuit opening relay (See page MF–42).

CHECK:

(a) Apply battery voltage between terminals 2 and 4.

(b) Measure voltage between terminals 1 and 4.

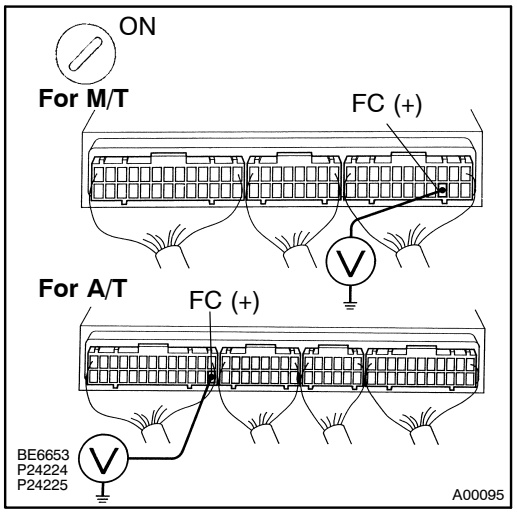
OK:

Terminals 1 and 4	Same as battery

NG → **Replace circuit opening relay.**

OK ↓

4	Check voltage between terminal FC of ECM connector and body ground.



PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal FC of ECM connector and body ground.

OK:

Voltage: 9 – 14 V

NG → **Check for open in harness and connector between EFI main relay and circuit opening relay, circuit opening relay and ECM.**

OK ↓

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5	**Check fuel pump (See page MF–5).**

NG → **Repair or replace fuel pump.**

OK

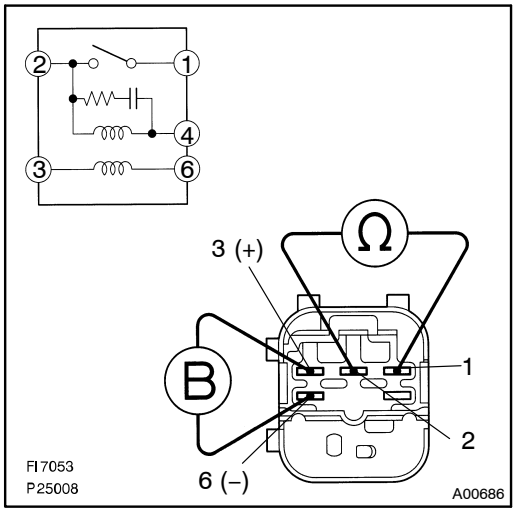
6	**Check for open in harness and connector between circuit opening relay and fuel pump, fuel pump and body ground (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM.

7	**Check circuit opening relay.**



PREPARATION:

Remove the circuit opening relay (See page MF–42).

CHECK:

(a) Apply battery voltage between terminals 3 and 6.

(b) Check continuity between terminal 1 and 2.

OK:

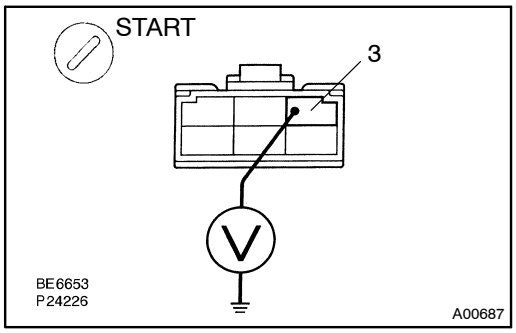
Terminals 1 and 2	Continuity

NG → **Replace circuit opening relay.**

OK

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8	**Check voltage between terminal 3 of circuit opening relay connector and body ground.**



CHECK:

Measure voltage between terminal 3 of circuit opening relay connector and body ground when engine is cranked.

OK:

Voltage: 9 – 14 V

NG → **Check for starter signal circuit (See page DI–110).**

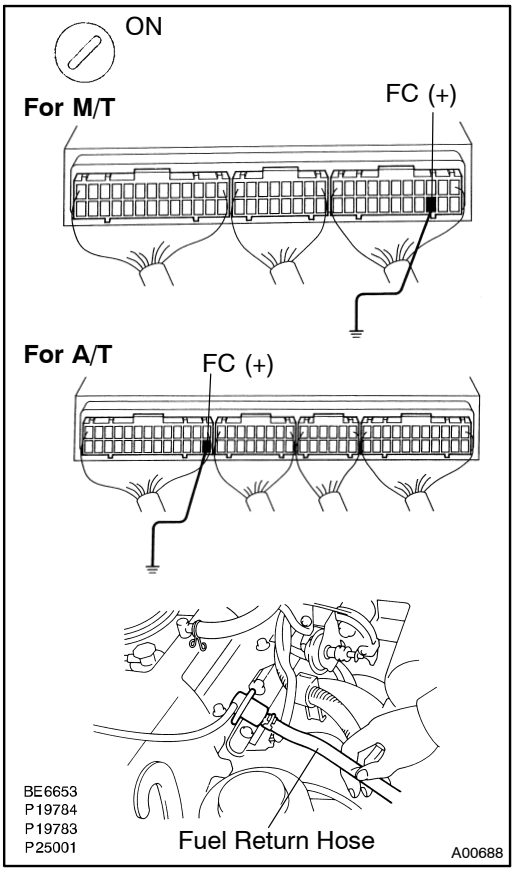
OK

Check for open in harness and connector between terminal 6 of circuit opening relay connector and body ground (See page IN–26).

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OBD II scan tool (excluding TOYOTA hand–held tester):

1	**Check operation of fuel pump.**



PREPARATION:

(a) Remove the right cowl side trim (See page MF–50).

(b) Turn the ignition switch ON.

CHECK:

(a) Connect between terminal FC of ECM connector and body ground.

(b) Check for fuel pressure in the fuel return hose when it is pinched off.

OK:

There is pressure in the fuel return hose.

HINT:

At this time, you will hear a fuel return flowing noise.

OK	**Go to step 7.**

NG

2	**Check for ECM power source circuit (See page DI–115).**

NG	**Repair or replace.**

OK

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3	Check circuit opening relay (See page MF–42).

NG → Replace circuit opening relay.

OK

4	Check voltage between terminal FC of ECM connector and body ground (See page MF–42).

NG → Check for open in harness and connector between EFI main relay and circuit opening relay, circuit opening relay and ECM.

OK

5	Check fuel pump (See page IG–1).

NG → Repair or replace fuel pump.

OK

6	Check for open in harness and connector between circuit opening relay and fuel pump, fuel pump and body ground (See page IN–26).

NG → Repair or replace harness or connector.

OK

Check and replace ECM.

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7	Check circuit opening relay (See page MF–42).

NG → Replace circuit opening relay.

OK

8	Check voltage between terminal 3 of circuit opening relay connector and body ground (See page MF–42).

NG → Check for starter signal circuit (See page DI–110).

OK

Check for open in harness and connector between terminal 6 of circuit opening relay connector and body ground (See page IN–26).

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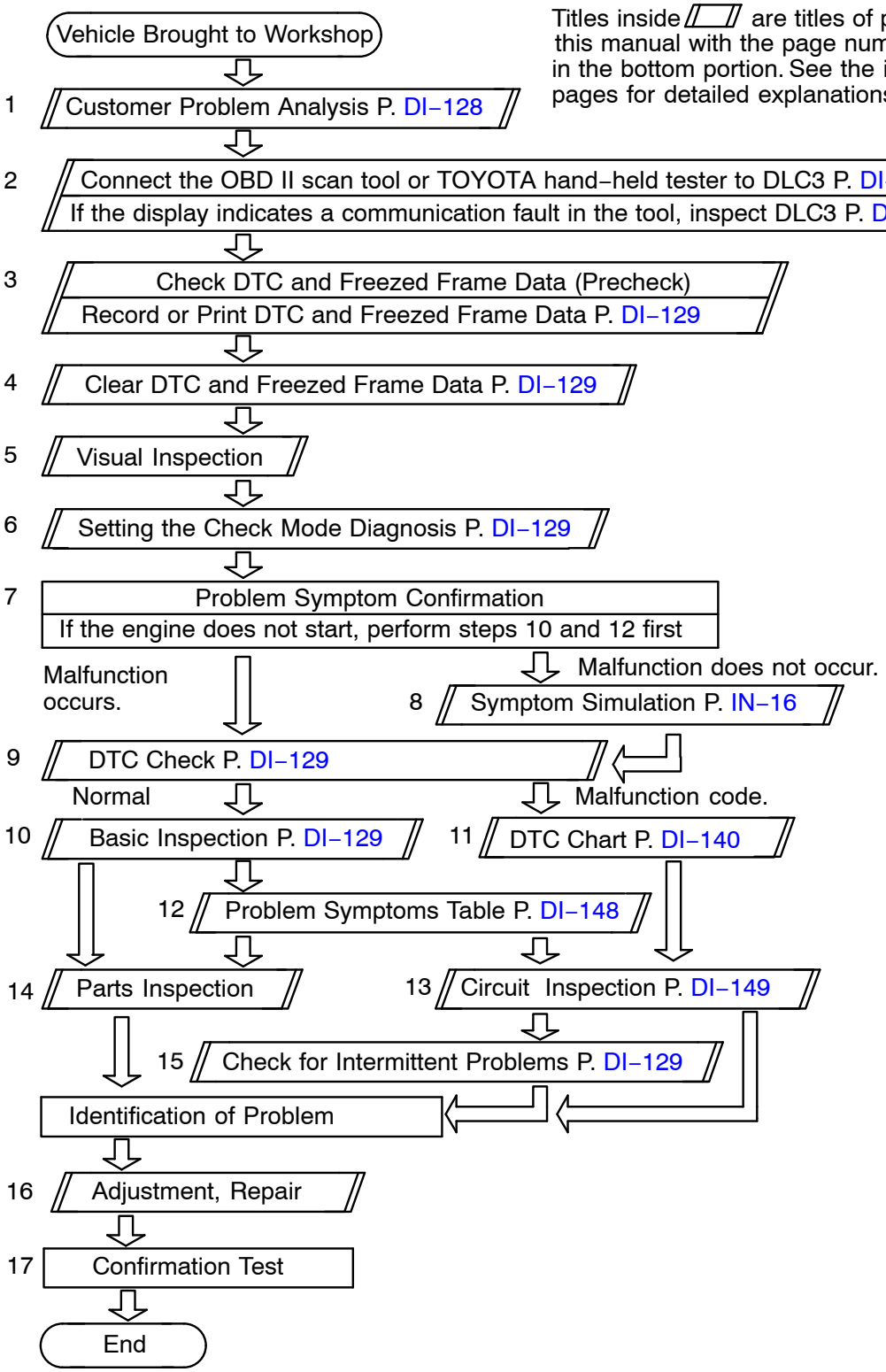
ENGINE (5VZ–FE)

DI0U9–01

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.

Titles inside ▱ are titles of pages in this manual with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.



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DI0UA–01

CUSTOMER PROBLEM ANALYSIS CHECK

ENGINE CONTROL SYSTEM Check Sheet

Inspector's Name

Customer's Name		Model and Model Year	
Driver's Name		Frame No.	
Date Vehicle Brought in		Engine Model	
License No.		Odometer Reading	km miles

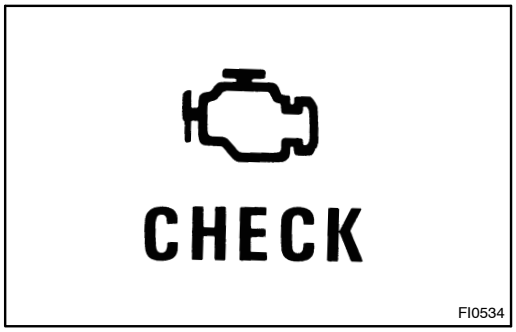
Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal ☐ High (rpm) ☐ Low (rpm) ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after–fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Dates Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other _____
Condition When Problem Occurs	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other _____
	Outdoor Temp.	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx. ____˚F/____˚C)
	Place	☐ Highway ☐ Suburbs ☐ Inner city ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other _____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After warming up ☐ Any temp. ☐ Other _____
	Engine Operation	☐ Starting ☐ Just after starting (min.) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other _____

Condition of MIL		☐ Remains on	☐ Sometimes lights up ☐ Does not light up
DTC Inspection	Normal Mode (Precheck)	☐ Normal	☐ Malfunction code(s) (code) ☐ Freezed frame data ( )
	Check Mode	☐ Normal	☐ Malfunction code(s) (code) ☐ Freezed frame data ( )

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DI0UB–02



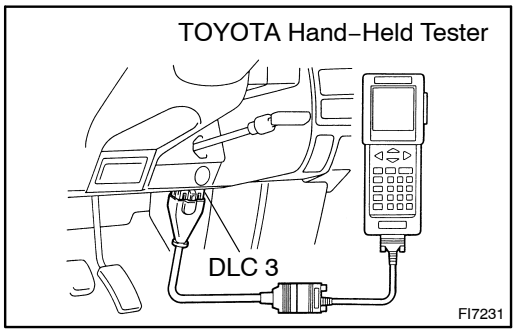
PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you connect to the vehicle the OBD II scan tool complying with SAE J1978 or TOYOTA hand–held tester, and read off various data output from the vehicle's ECM.
- OBD II regulations require that the vehicle's on–board computer lights up the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components which affect vehicle emissions. In addition to the MIL lighting up when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory (See page DI–140).

If the malfunction does not reoccur in 3 trips, the MIL goes off but the DTCs remain recorded in the ECM memory.



- To check the DTCs, connect the OBD II scan tool or TOYOTA hand–held tester to the Data Link Connector 3 (DLC3) on the vehicle. The OBD II scan tool or TOYOTA hand–held tester also enables you to erase the DTCs and check freezed frame data and various forms of engine data (For operating instructions, see the OBD II scan tool's instruction book.).
- DTCs include SAE controlled codes and manufacturer controlled codes. SAE controlled codes must be set as prescribed by the SAE, while manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page DI–140).

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- The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTCs use 2 trip detection logic* to prevent erroneous detection, and ensure thorough malfunction detection. By switching the ECM to check mode when troubleshooting, the technician can cause the MIL to light up for a malfunction that is only detected once or momentarily (TOYOTA hand–held tester only).
- *2 trip detection logic: When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the 2nd drive test, this 2nd detection causes the MIL to light up.
- The 2 trip repeats the same mode a 2nd time. (However, the ignition switch must be turned OFF between the 1st trip and 2nd trip.)
- Freeze frame data:
  Freeze frame data records the engine condition when a misfire (DTCs P0300 – P0306) or fuel trim malfunction (DTCs P0171, P0172) or other malfunction (first malfunction only), is detected.
- Because freeze frame data records the engine conditions (fuel system, calculator load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air–fuel ratio lean or rich, etc. at the time of the malfunction.

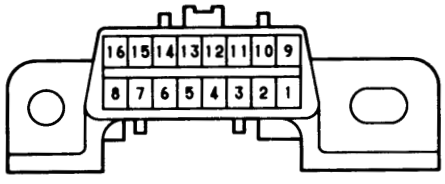
Priorities for troubleshooting:
If troubleshooting priorities for multiple DTCs are given in the applicable DTC chart, these should be followed.
If no instructions are given troubleshoot DTCs according to the following priorities.

(1) DTCs other than fuel trim malfunction (DTCs P0171, P0172), EGR (DTCs P0401, P0402) and misfire (DTCs P0300 – P0306).

(2) Fuel trim malfunction (DTCs P0171, P0172) and EGR (DTCs P0401, P0402).

(3) Misfire (DTCs P0300 – P0306).

(b) Check the DLC3
The vehicle's ECM uses V.P.W. (Variable Pulse Width) for communication to comply with SAE J1850. The terminal arrangement of DLC3 complies with SAE J1962 and matches the V.P.W. format.



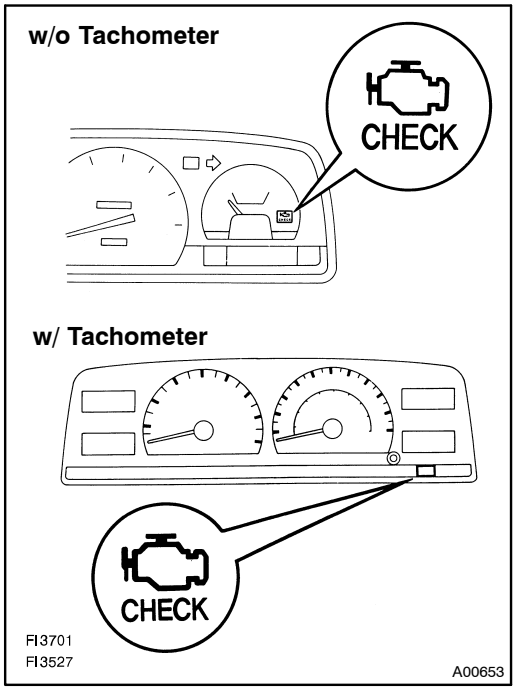
DLC3

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Terminal No.	Connection / Voltage or Resistance	Condition
2	Bus ⊕ Line / Pulse generation	During transmission
4	Chassis Ground ↔ Body Ground / 1 Ω or less	Always
5	Signal Ground ↔ Body Ground / 1 Ω or less	Always
16	Battery Positive ↔ Body Ground / 9 – 14 V	Always

HINT:
If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the OBD II scan tool or TOYOTA hand–held tester to DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.



2. INSPECT DIAGNOSIS (Normal Mode)

(a) Check the MIL

(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:
If the MIL does not light up, troubleshoot the combination meter (See page BE–36).

(2) When the engine started, the MIL should go off. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

(b) Check the DTC.

NOTICE:
TOYOTA hand–held tester only: When the diagnosis system is switched from normal mode to check mode, it erases all DTCs and freezed frame data recorded in normal mode. So before switching modes, always check the DTCs and freezed frame data, and note them down.

(1) Prepare the OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester.

(2) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3 at the lower of the instrument panel.

(3) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester switch ON.

(4) Use the OBD II scan tool or TOYOTA hand–held tester to check the DTCs and freezed frame data, note them down. (For operating instructions, see the OBD II scan tool's instruction book.)

(5) See page DI–129 to confirm the details of the DTCs.

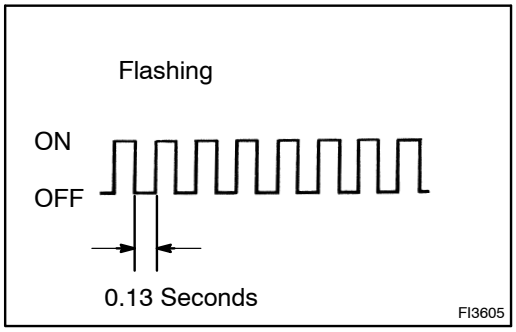
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NOTICE:
When simulating symptoms with an OBD II scan tool (excluding TOYOTA hand–held tester) to check the DTCs, use normal mode. For code on the DTC chart subject to "2 trip detection logic", turn the ignition switch OFF after the symptom is simulated the 1st time. Then repeat the simulation process again. When the problem has been simulated twice, the MIL lights up and the DTCs are recorded in the ECM.

3. INSPECT DIAGNOSIS (Check Mode)

HINT:
TOYOTA hand–held tester only:
Compared to the normal mode, the check mode has an increased sensitivity to detect malfunctions.
Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.

(a) Check the DTC.
  (1) Initial conditions
    - Battery positive voltage 11 V or more
    - Throttle valve fully closed
    - Transmission in "P" or "N" position
    - Air conditioning switched OFF
  (2) Turn the ignition switch OFF.
  (3) Prepare the TOYOTA hand–held tester.
  (4) Connect the TOYOTA hand–held tester to DLC3 at the lower of the instrument panel.
  (5) Turn the ignition switch ON and push the TOYOTA hand–held tester switch ON.
  (6) Switch the TOYOTA hand–held tester normal mode to check mode (Check that the MIL flashes.).
  (7) Start the engine. (The MIL goes out after the engine start.)
  (8) Simulate the conditions of the malfunction described by the customer.



NOTICE:
Leave the ignition switch ON until you have checked the DTCs, etc.

  (9) After simulating the malfunction conditions, use the TOYOTA hand–held tester diagnosis selector to check the DTCs and freezed frame data, etc.

HINT:
Take care not to turn the ignition switch OFF. Turning the ignition switch OFF switches the diagnosis system from check mode to normal mode. so all DTCs, etc. are erased.

  (10) After checking the DTC, inspect the applicable circuit.

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(b) Clear the DTC.
The following actions will erase the DTCs and freezed frame data.
(1) Operating the OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester to erase the codes (See the OBD II scan tool's instruction book for operating instructions.).
(2) Disconnecting the battery terminals or EFI fuse.

NOTICE:
If the TOYOTA hand–held tester switches the ECM from normal mode to check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during check mode, the DTCs and freezed frame data will be erased.

4. FAIL–SAFE CHART

If any of the following codes is recorded, the ECM enters fail–safe mode.

DTC No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
P0100	Ignition timing fixed at 10° BTDC	Returned to normal condition
P0110	Intake air temp. is fixed at 20°C (68°F)	Returned to normal condition
P0115	Engine coolant temp. is fixed at 80°(176°F)	Returned to normal condition
P0120	VTA is fixed at 0°	Following condition must be repeated at least 2 times consecutively 0.1 V ≦ VTA ≦ 0.95 V
P0135 P0141	Heater circuit in which an abnormality is detected is turned off	Ignition switch OFF
P0325 P0330	Max. timing retardation	Ignition switch OFF
P1300	Fuel cut	IGF signal is detected for 6 consective ignitions

5. CHECK FOR INTERMITTENT PROBLEMS

HINT:
TOYOTA HAND–HELD TESTER only:
By putting the vehicle's ECM in check mode, 1 trip detection logic is possible instead of 2 trip detection logic and sensitivity to detect open circuits is increased. This makes it easier to detect intermittent problems.
(a) Clear the DTCs (See step 3).
(b) Set the check mode (See step 3).
(c) Perform a simulation test (See page IN–16).
(d) Check the connector and terminal (See page IN–26).
(e) Handle the connector (See page IN–26).

6. BASIC INSPECTION

When the malfunction code is not confirmed in the DTC check, troubleshooting should be performed in the order for all possible circuits to be considered as the causes of the problems. In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, use of this check is essential in engine troubleshooting.

1	**Is battery positive voltage 11 V or more when engine is stopped?**

NO → **Charge or replace battery.**

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YES

2	Is engine cranked?

NO → Proceed to page ST–6 and continue to trouble-shoot.

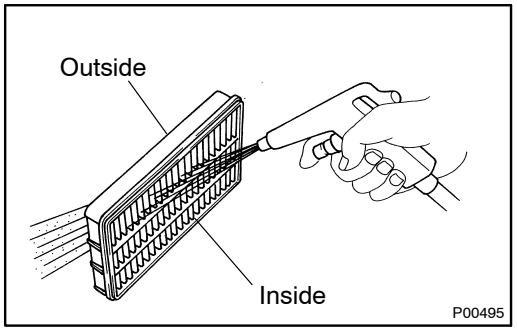
YES

3	Does engine start?

NO → Go to step 7.

YES

4	Check air filter.



PREPARATION:
Remove the air filter.
CHECK:
Visual check that the air filter is not dirty or excessive oily.
HINT:
If necessary, clean the filter with compressed air. First blow from inside thoroughly, then blow from outside of the filter.

NG → Repair or replace.

OK

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5	Check idle speed.

PREPARATION:

(a) Warm up the engine to normal operating temperature.
(b) Switch off all the accessories.
(c) Switch off air conditioning.
(d) Shift the transmission into ”N” position.
(e) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3 on the vehicle.

CHECK:

Use ”CURRENT DATA” to check the idle speed.

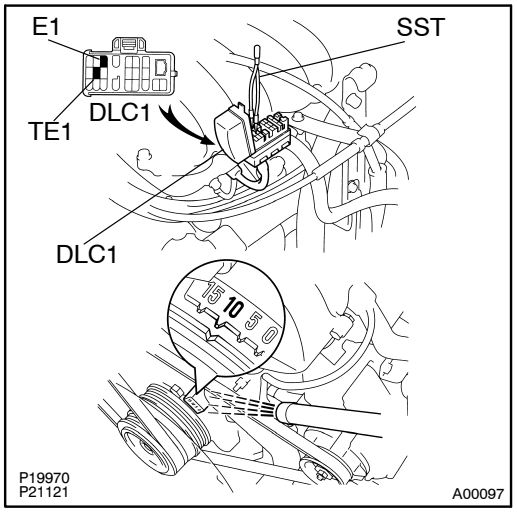
OK:

Idle speed: 650 – 750 rpm

NG → **Proceed to problem symptoms table on page DI–148.**

OK

6	Check ignition timing.



PREPARATION:

(a) Warm up the engine to normal operating temperature.
(b) Shift the transmission into ”N” position.
(c) Keep the engine speed at idle.
(d) Using SST, connect terminals TE1 and E1 of the DLC1.
SST 09843–18020
(e) Using a timing light, connect the tester to the No.1 high–tension cord.

CHECK:

Check the ignition timing.

OK:

Ignition timing: 8 – 12° BTDC at idle

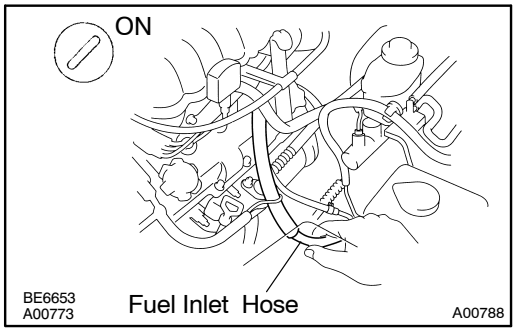
NG → **Proceed to page Ignition system and continue to troubleshoot.**

OK

Proceed to problem symptoms table on page DI–148.

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7	Check fuel pressure.



PREPARATION:

(a) Be sure that enough fuel is in the tank.
(b) Connect the TOYOTA hand–held tester to the DLC3.
(c) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
(d) Use ”ACTIVE TEST” mode to operate the fuel pump.
(e) Please refer to the TOYOTA hand–held tester operator’s manual for further details.
(f) If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page SF–5).

CHECK:

Check for fuel pressure in the fuel inlet hose when it is pinched off.

HINT:

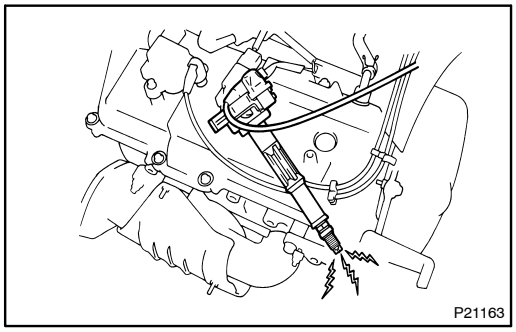
At this time, you will hear a fuel flowing noise.

NG → **Proceed to page SF–5 and continue to trouble-shoot.**

OK

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8	Check for spark.



PREPARATION:

(a) Remove the ignition coil or disconnect the high–tension cord from the spark plug.
(b) Remove the spark plug.
(c) Install the spark plug to the ignition coil or high–tension cord.
(d) Disconnect the injector connector.
(e) Hold the end about 12.5 mm (0.61 in.) from the ground.

CHECK:

Check if the spark occurs while engine is being cranked.

NOTICE:

To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5 – 10 seconds at a time.

NG → **Proceed to page IG–1 and continue to troubleshoot.**

OK

Proceed to problem symptoms table on page DI–148.

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7. ENGINE OPERATING CONDITION

NOTICE:

The values given below for "Normal Condition" are representative values, so a vehicle may still be normal even if its value varies from those listed here. So do not decide whether a part is faulty or not solely according to the "Normal Condition" here.

(a) CARB mandated signals.

TOYOTA hand–held tester display	Measurement Item	Normal Condition*
FUEL SYS #1	Fuel System Bank 1 OPEN: Air–fuel ratio feedback stopped CLOSED: Air–fuel ratio feedback operating	Idling after warming up: CLOSED
CALC LOAD	Calculator Load: Current intake air volume as a proportion of max. intake air volume	Idling: 14.9 – 21.3 % Racing without load (2,500rpm): 16.5 ~ 23.5%
COOLANT TEMP.	Engine Coolant Temp. Sensor Value	After warming up: 80 – 95°C (176 – 203°F)
SHORT FT #1	Short–term Fuel Trim Bank 1	0 ± 20 %
LONG FT #1	Long–term Fuel Trim Bank 1	0 ± 20 %
ENGINE SPD	Engine Speed	Idling: 650 – 750 rpm
VEHICLE SPD	Vehicle Speed	Vehicle stopped: 0 km/h (0 mph)
IGN ADVANCE	Ignition Advance: Ignition Timing of Cylinder No.1	Idling: BTDC 12.5 – 22.0°
INTAKE AIR	Intake Air Temp. Sensor Value	Equivalent to Ambient Temp.
MAF	Air Flow Rate Through Mass Air Flow Meter	Idling: 3.2 – 4.6 gm/sec. Racing without load (2,500 rpm): 12.9 – 18.3 gm/sec.
THROTTLE POS	Voltage Output of Throttle Position Sensor Calculated as a percentage: 0 V → 0 %, 5 V → 100 %	Throttle valve fully closed: 7 – 11 % Throttle valve fully open: 65 – 75 %
O2S B1, S1	Voltage Output of Oxygen Sensor Bank 1, Sensor 1	Idling: 0.1 – 0.9 V
O2FT B1, S1	Oxygen Sensor Fuel Trim Bank 1, Sensor 1 (Same as SHORT FT #1)	0 ± 20 %
O2S B1, S2	Voltage Output of Oxygen Sensor Bank 1, Sensor 2	Driving 50 km/h (31 mph): 0.1 – 0.9 V

*: If no conditions are specifically stated for "Idling", it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

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(b) TOYOTA Enhanced Signals.

TOYOTA hand–held tester display	Measurement Item	Normal Condition*1
MISFIRE RPM	Engine RPM for first misfire range	Misfire 0: 0 rpm
MISFIRE LOAD	Engine load for first misfire range	Misfire 0: 0 g/r
INJECTOR	Fuel injection time for cylinder No.1	Idling: 1.82 – 3.15 ms
IAC DUTY RATIO	Intake Air Control Valve Duty Ratio Opening ratio rotary solenoid type IAC valve	Idling: 22 – 46 %
STARTER SIG	Starter Signal	Cranking: ON
A/C SIG	A/C Switch Signal	A/C ON: ON
PNP SW	Park/Neutral Position Switch Signal	P or N position: ON
STOP LIGHT SW	Stop Light Switch Signal	Stop light switch ON: ON
FC IDL	Fuel Cut Idle: Fuel cut when throttle valve fully closed, during deceleration	Fuel cut operating: ON
FC TAU	Fuel Cut TAU: Fuel cut during very light load	Fuel cut operating: ON
CYL #1 – CYL #6	Abnormal revolution variation for each cylinder	0 %
IGNITION	Total number of ignition for every 1,000 revolutions	0 – 3,000
EGRT GAS*2	EGR Gas Temp. Sensor Value	EGR not operating: Temp. between intake air temp. and engine coolant temp.
EGR SYSTEM*2	EGR System Operating Condition	Idling: OFF
A/C CUT SIG	A/C Cut Signal	A/C S/W OFF: ON
FUEL PUMP	Fuel Pump Signal	Idling: ON
EVAP (PURGE) VSV	EVAP VSV Signal	VSV operating: ON
VAPOR PRESS VSV	Vapor Pressure VSV Signal	VSV operating: ON
TOTAL FT B1	Total Fuel Trim Bank 1: Average value for fuel trim system of bank 1	Idling: 0.8 – 1.2 V
O2 LR B1, S1	Oxygen Sensor Lean Rich Bank 1, Sensor 1 Response time for oxygen sensor output to switch from lean to rich	Idling after warming up: 0 – 1,000 msec.
O2 RL B1, S1	Oxygen Sensor Rich Lean Bank 1, Sensor 1 Response time for oxygen sensor output to switch from rich to lean	Idling after warming up: 0 – 1,000 msec.

*1: If no conditions are specifically stated for ”Idling”, it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

*2: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

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DI0UC–02

DIAGNOSTIC TROUBLE CODE CHART

SAE CONTROLLED

HINT:

Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in check mode, check the circuit for that code listed in the table below. For details of each code, turn to the page referred to under the "See Page " for the respective "DTC No." in the DTC chart.

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0100 (DI–149)	Mass Air Flow Circuit Malfunction	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0101 (DI–153)	Mass Air Flow Circuit Range/Performance Problem	• Mass air flow meter	○	○
P0110 (DI–154)	Intake Air Temp. Circuit Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • ECM	○	○
P0115 (DI–158)	Engine Coolant Temp. Circuit Malfunction	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	○	○
P0116 (DI–162)	Engine Coolant Temp. Circuit Range/Performance Problem	• Engine coolant temp. sensor • Cooling system	○	○
P0120 (DI–163)	Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	○	○
P0121 (DI–168)	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem	• Throttle position sensor	○	○
P0125 (DI–169)	Insufficient Coolant Temp. for Closed Loop Fuel Control	• Open or short in heated oxygen sensor (bank 1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1)	○	○
P0130 (DI–172)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	• Heated oxygen sensor • Fuel trim malfunction	○	○
P0133 (DI–175)	Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Heated oxygen sensor	○	○
P0135 (DI–176)	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor • ECM	○	○
P0136 (DI–178)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Heated oxygen sensor	○	○
P0141 (DI–176)	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	• Same as DTC No. P0135	○	○

*: ○ · · · MIL lights up

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DTC No. (See Page)	Detection Item	Trouble Area	MIL	Memory
P0171 (DI–180)	System too Lean (Fuel Trim)	• Air intake (hose loose) • Fuel line pressure • Injector blockage • Heated oxygen sensor (bank 1 sensor 1) malfunction • Mass air flow meter • Engine coolant temp. sensor	○*1	○
P0172 (DI–180)	System too Rich (Fuel Trim)	• Fuel line pressure • Injector leak, blockage • Heated oxygen sensor (bank 1 sensor 1) malfunction • Mass air flow meter • Engine coolant temp. sensor	○*1	○
P0300 (DI–183)	Random/Multiple Cylinder Misfire Detected	• Ignition system • Injector • Fuel line pressure • EGR*3 • Compression pressure • Valve clearance not to specification • Valve timing • Mass air flow meter • Engine coolant temp. sensor	○*2	○
P0301 P0302 P0303 P0304 P0305 P0306 (DI–183)	Misfire Detected – Cylinder 1 – Cylinder 2 – Cylinder 3 – Cylinder 4 – Cylinder 5 – Cylinder 6		○*2	○
P0325 (DI–188)	Knock Sensor 1 Circuit Malfunction	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM	○*1	○
P0330 (DI–188)	Knock Sensor 2 Circuit Malfunction	• Open or short in knock sensor 2 circuit • Knock sensor 2 (looseness) • ECM	○*1	○
P0335 (DI–191)	Crankshaft Position Sensor ”A” Circuit Malfunction	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • ECM	○*1	○
P0340 (DI–194)	Camshaft Position Sensor Circuit Malfunction	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Starter • ECM	○*1	○
P0401*3 (DI–196)	Exhaust Gas Recirculation Flow Insufficient Detected	• EGR valve stuck closed • Short in VSV circuit for EGR • Open in EGR gas temp. sensor circuit • EGR hose disconnected • ECM	○*1	○
P0402*3 (DI–206)	Exhaust Gas Recirculation Flow Excessive Detected	• EGR valve stuck open • EGR VSV open malfunction • Open in VSV circuit for EGR • Short in EGR gas temp. sensor circuit • ECM	○*1	○
P0420 (DI–210)	Catalyst System Efficiency Below Threshold	• Three–way catalytic converter • Open or short in heated oxygen sensor (bank 1 sensor 1, 2) circuit • Heated oxygen sensor (bank 1 sensor 1, 2)	○*1	○

*1: MIL lights up

*2: MIL lights up or blinking

*3: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

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DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0441 (DI–212)	Evaporative Emission Control System Incorrect Purge Flow	• Open or short in VSV circuit for EVAP • VSV for EVAP • Open or short in vapor pressure sensor circuit • Vapor pressure sensor • Open or short in VSV circuit for vapor pressure sensor • VSV for vapor pressure sensor • Vacuum hose cracked, holed, blocked, damaged or disconnected • Charcoal canister cracked, holed or damaged	○	○
P0500 (DI–226)	Vehicle Speed Sensor Malfunction	• Open or short in No.1 vehicle speed sensor circuit • No.1 vehicle speed sensor • ECM • Speedometer cable	○	○
P0505 (DI–228)	Idle Control System Malfunction	• IAC valve is stuck or closed • Open or short in IAC valve circuit • Open or short in A/C signal circuit • Air intake (hose loose)	○	○
P0510 (DI–231)	Closed Throttle Position Switch Malfunction	• Open in closed throttle position switch circuit • Closed throttle position switch • ECM	○	○

*: ○ · · · MIL lights up

MANUFACTURER CONTROLLED

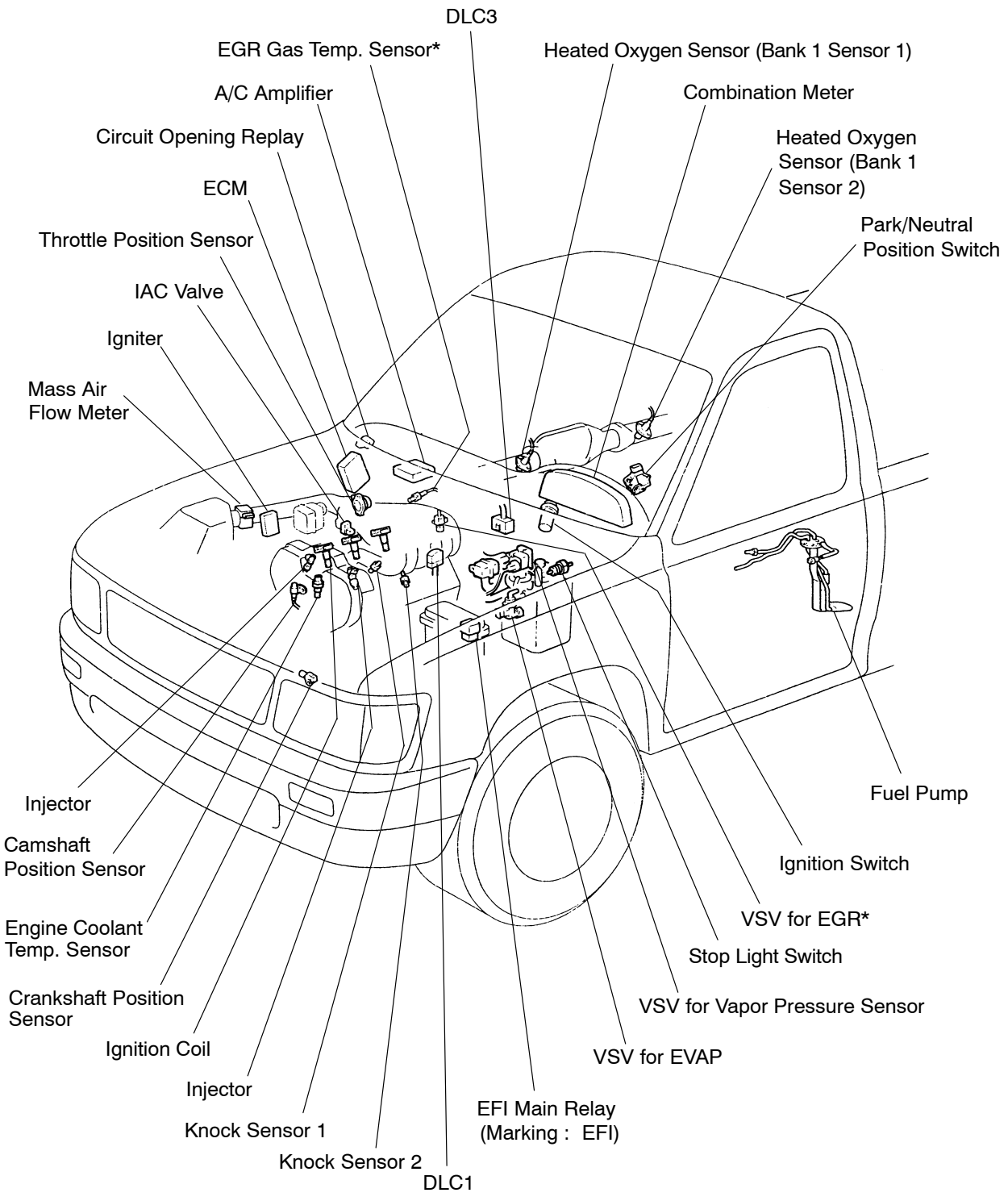
DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P1300 (DI–235)	Igniter Circuit Malfunction	• Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM	○	○
P1335 (DI–241)	Crankshaft Position Sensor Circuit Malfunction (during engine running)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • ECM	–	○
P1500 (DI–242)	Starter Signal Circuit Malfunction	• Open or short in starter signal circuit • Open or short in ignition switch or starter relay circuit • ECM	–	○
P1600 (DI–244)	ECM BATT Malfunction	• Open in back up power source circuit • ECM	○	○
P1605 (DI–246)	Knock Control CPU Malfunction	• ECM	○	○
P1780 (DI–247)	Park/Neutral Position Switch Malfunction	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM	○	○

*: – · · · MIL does not light up, ○ · · · MIL lights up

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DI0UD–01

PARTS LOCATION



*: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

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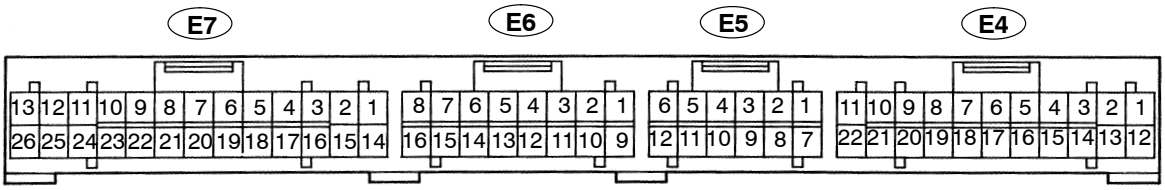
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DI0UE–02

TERMINALS OF ECM

For M/T

ECM Terminals



FI6526

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E4–2) – E1 (E7–24)	B–G ↔ BR	Always	9 – 14
+B (E4–12) – E1 (E7–24)	W–R ↔ BR	IG switch ON	9 – 14
VCC (E6–1) – E2 (E6–9)	G–B ↔ BR–B	IG switch ON	4.5 – 5.5
VG (E6–2) – E3 (E6–8)	GR–R ↔ BR–W	Idling, N position, A/C switch OFF	1.1 – 1.5
THA (E6–12) – E2 (E6–9)	Y–G ↔ BR–B	Idling, Intake air temp. 20°C (68°F)	0.5 – 3.4
THW (E6–4) – E2 (E6–9)	G–Y ↔ BR–B	Idling, Engine coolant temp. 80°C (176°F)	0.2 – 1.0
IDL (E6–11) – E2 (E6–9)	Y–L ↔ BR–B	IG switch ON and apply vacuum to the throttle opener/Throttle valve fully closed	0 – 3
		IG switch ON Throttle valve fully open	9 – 14
VTA (E6–10) – E2 (E6–9)	Y–B ↔ BR–B	IG switch ON Throttle valve fully closed	0.3 – 0.8
		IG switch ON Throttle valve fully open	3.2 – 4.9
STA (E4–11) – E1 (E7–24)	B–W ↔ BR	Cranking	6.0 or more
#10 (E7–12) – E01 (E7–13)	W–R ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–183)
#20 (E7–11) – E01 (E7–13)	W ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–183)
#30 (E7–25) – E01 (E7–13)	W–G ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–183)
#40 (E7–10) – E01 (E7–13)	Y–K ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–183)
#50 (E7–9) – E01 (E7–13)	W–L ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–183)
#60 (E7–8) – E01 (E7–13)	Y–B ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–183)
IGT1 (E7–23) – E1 (E7–24)	B–L ↔ BR	Idling	Pulse generation (See page DI–235)

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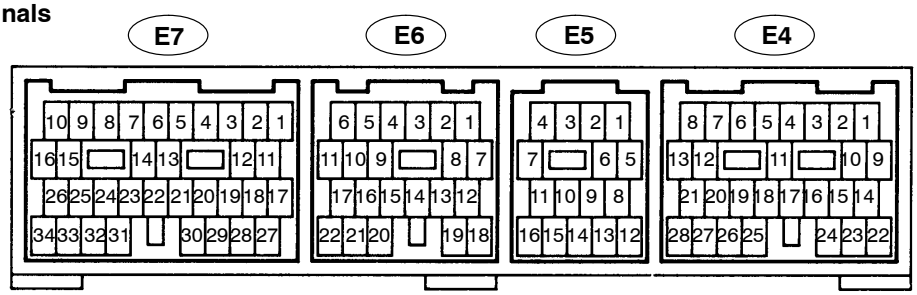
Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
IGT2 (E7– 22) – E1 (E7–24)	BR–B ↔ BR	Idling	Pulse generation (See page DI–235)
IGT3 (E7–31) – E1 (E7–24)	B–W ↔ BR	Idling	Pulse generation (See page DI–235)
IGF (E7–17) – E1 (E7–24)	B–Y ↔ BR	IG switch ON, Disconnect igniter connector	4.5 – 5.5
		Idling	Pulse generation (See page DI–235)
G (E5–11) – G– (E5–5)	B ↔ W	Idling	Pulse generation (See page DI–191)
NE (E5–12) – NE– (E5–6)	G ↔ L	Idling	Pulse generation (See page DI–191)
FPU (E7–19) – E1 (E7–24)	R–B ↔ BR	IG switch ON	9 – 14
		Idling	0 – 3.0
EGR* (E7–18) – E1 (E7–24)	R–W ↔ BR	IG switch ON	9 – 14
THG* (E6–14) –E2(E6–9)	P ↔ BR–B	IG switch ON	4.5 – 5.5
EVP1 (E7–5) – E1 (E7–24)	W–G ↔ BR	IG switch ON	9 – 14
RSC (E7–6) – E1 (E7–24)	B–R ↔ BR	IG switch ON, Disconnect E7 of ECM connector	9 – 14
RSO (E7–7) – E1 (E7–24)	BR–R ↔ BR	IG switch ON, Disconnect E7 of ECM connector	9 – 14
ACV (E7–2) – E1 (7–24)	B–R ↔ BR	Idling, A/C switch ON	0 – 3
		Idling, A/C switch OFF	9 – 14
FC (E7–14) – E1 (E7–24)	G–Y ↔ BR	IG switch ON	9 – 14
		Idling	0 – 3
OX1 (E6–5) – E1 (E7–24)	W ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warming up	Pulse generation (See page DI–172)
OX2 (E6–13) – E1 (E7–24)	R ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warming up	Pulse generation (See page DI–172)
HT1 (E5–3) – E03 (E5–7)	P–G ↔ BR	Idling	Below 3.0
		IG switch ON	9 – 14
HT2 (E5–9) – E03 (E5–7)	R–G ↔ BR	Idling	Below 3.0
		IG switch ON	9 – 14
KNK1 (E6–6) – E1 (E7–24)	B ↔ BR	Idling	Pulse generation (See page DI–188)
KNK2 (E6–3) – E1 (E7–24)	GR ↔ BR	Idling	Pulse generation (See page DI–188)
SP1 (E4–8) – E1 (E7–24)	G ↔ BR	IG switch ON Rotate driving wheel slowly	Pulse generation (See page DI–226)
TE1 (E6–7) – E1 (E7–24)	V–W ↔ BR	IG switch ON	9 – 14
W (E4–4) – E1 (E7–24)	V ↔ BR	Idling	9 – 14
		IG switch ON	Below 3.0
ACT (E4–6) – E1 (E7–24)	L–B ↔ BR	A/C switch OFF at Idling	Below 2.0
		A/C switch ON at idling	5 or more
AC1 (E4–7) – E1 (E7–24)	B–R ↔ BR	A/C switch ON at idling	Below 2.0
		A/C switch OFF at Idling	9 – 14
SDL (E4–19) – E1 (E7–24)	W ↔ BR	During transmission	Pulse generation

*: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

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For A/T

ECM Terminals



FI6810

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
BATT (E4–14) – E1 (E5–16)	B–G ↔ BR	Always	9 – 14
+B (E4–22) – E1 (E5–16)	W–R ↔ BR	IG switch ON	9 – 14
VCC (E6–1) – E2 (E6–22)	G–B ↔ BR–B	IG switch ON	4.5 – 5.5
VG (E6–8) – E3 (E6–18)	GR–R ↔ BR–W	Idling, P or N position, A/C switch OFF	1.1 – 1.5
THA (E6–14) – E2 (E6–22)	Y–G ↔ BR–B	Idling, Intake air temp. 20°C (68°F)	0.5 – 3.4
THW (E6–20) – E2 (E6–22)	G–Y ↔ BR–B	Idling, Engine coolant temp. 80°C (176°F)	0.2 – 1.0
STA (E7–13) – E1 (E5–16)	B–W ↔ BR	Cranking	6.0 or more
#10 (E7–10) – E01 (E7–34)	W–R ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–183)
#20 (E7–9) – E01 (E7–34)	W ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–183)
#30 (E7–8) – E01 (E7–34)	W–G ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–183)
#40 (E7–7) – E01 (E7–34)	Y–R ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–183)
#50 (E7–6) – E01 (E7–34)	W–L ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–183)
#60 (E7–5) – E01 (E7–34)	Y–B ↔ BR	IG switch ON	9 – 14
		Idling	Pulse generation (See page DI–183)
IGT1 (E7–24) – E1 (E5–16)	B–L ↔ BR	Idling	Pulse generation (See page DI–235)
IGT2 (E7–25) – E1 (E5–16)	BR–B ↔ BR	Idling	Pulse generation (See page DI–235)
IGT3 (E7–26) – E1 (E5–16)	B–W ↔ BR	Idling	Pulse generation (See page DI–235)
IGF (E7–12) – E1 (E5–16)	B–Y ↔ BR	IG switch ON, Disconnect igniter connector	4.5 – 5.5
		Idling	Pulse generation (See page DI–235)
IDL (E7–32) – E2 (E6–22)	Y–L ↔ BR–B	IG switch ON and apply vacuum to the throttle opener/THrottle valve fully closed	0 – 3
		IG switch ON Throttle valve fully open	9 – 14

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Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
VTA (E6–7) – E2 (E6–22)	Y–B ↔ BR–B	IG switch ON Throttle valve fully closed	0.3 – 0.8
		IG switch ON Throttle valve fully open	3.2 – 4.9
G (E6–10) – G– (E6–11)	B ↔ W	Idling	Pulse generation (See page DI–191)
NE (E6–5) – NE– (E6–6)	G ↔ L	Idling	Pulse generation (See page DI–191)
FPU (E5–9) – E1 (E5–16)	R–B ↔ BR	IG switch ON	9 – 14
		Idling	0 – 3.0
EGR* (E5–8) – E1 (E5–16)	R–W ↔ BR	IG switch ON	9 – 14
EVP1 (E5–15) – E1 (E5–16)	W–G ↔ BR	IG switch ON	9 – 14
THG* (E6–21) – E2 (E6–22)	P ↔ BR–B	IG switch ON	4.5 – 5.5
RSC (E7–22) – E1 (E5–16)	B–R ↔ BR	IG switch ON, Disconnect E7 of ECM connector	9 – 14
RSO (E7–23) – E1 (E5–16)	BR–R ↔ BR	IG switch ON, Disconnect E7 of ECM connector	9 – 14
OX1 (E6–13) – E1 (E5–16)	W ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warming up	Pulse generation (See page DI–172)
OX2 (E6–19) – E1 (E5–16)	R ↔ BR	Maintain engine speed at 2,500 rpm for 2 min. after warming up	Pulse generation (See page DI–172)
HT1 (E7–15) – E03 (E7–1)	P–G ↔ W–B	Idling	Below 3.0
		IG switch ON	9 – 14
HT2 (E7–16) – E03 (E7–1)	R–G ↔ W–B	Idling	Below 3.0
		IG switch ON	9 – 14
KNK1 (E6–17) – E1 (E5–16)	B ↔ BR	Idling	Pulse generation (See page DI–188)
KNK2 (E6–16) – E1 (E5–16)	GR ↔ BR	Idling	Pulse generation (See page DI–188)
NSW (E7–14) – E1 (E5–16)	B–O ↔ BR	IG switch ON, Other shift position in ”P”, ”N” position	9 – 14
		IG switch ON, Shift position in ”P”, ”N” position	0 – 3.0
SP1 (E4–12) – E1 (E5–16)	G ↔ BR	IG switch ON Rotate driving wheel slowly	Pulse generation (See page DI–226)
TE1 (E5–5) – E1 (E5–16)	V–W ↔ BR	IG switch ON	9 – 14
W (E5–3) – E1 (E5–16)	V ↔ BR	Idling	9 – 14
		IG switch ON	Below 3.0
ACV (E5–10) – E1 (E5–16)	B–R ↔ BR	Idling, A/C switch ON	0 – 3
		Idling, A/C switch OFF	9 – 14
ACT (E4–5) – E1 (E5–16)	L–B ↔ BR	A/C switch OFF at idling	Below 2.0
		A/C switch ON at idling	5 or more
AC1 (E4–20) – E1 (E5–16)	B–R ↔ BR	A/C switch ON at idling	Below 2.0
		A/C switch OFF at idling	9 – 14
SDL (E4–18) – E1 (E5–16)	W ↔ BR	During transmission	Pulse generation
OD1 (E4–7) – E1 (E5–16)	Y–R ↔ BR	IG switch ON	9 – 14
THG* (E6–12) – E2 (E6–22)	P ↔ BR–B	IG switch ON	3.9 – 5.0
FC (E5–4) – E1 (E5–16)	G–Y ↔ BR	IG switch ON	9 – 14
		Idling	0 – 3.0

*: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

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DI0UF–01

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
Engine does not crank (Does not start)	1. Starter and starter relay	ST–6 ST–14
No initial combustion (Does not start)	1. ECM power source circuit 2. Fuel pump control circuit 3. Engine control module (ECM)	DI–251 DI–255 IN–26
No complete combustion (Does not start)	1. Fuel pump control circuit	DI–255
Engine cranks normally (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit 3. Compression	DI–248 DI–255 EM–2
Cold engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI–248 DI–255
Hot engine (Difficult to start)	1. Starter signal circuit 2. Fuel pump control circuit	DI–248 DI–255
High engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. ECM power source circuit	AC–79 DI–251
Low engine idle speed (Poor idling)	1. A/C signal circuit (Compressor circuit) 2. Fuel pump control circuit	AC–79 DI–255
Rough idling (Poor idling)	1. Compression 2. Fuel pump control circuit	EM–2 DI–255
Hunting (Poor idling)	1. ECM power source circuit 2. Fuel pump control circuit	DI–251 DI–255
Hesitation/Poor acceleration (Poor driveability)	1. Fuel pump control circuit 2. A/T faulty	DI–255 DI–282
Surging (Poor driveability)	1. Fuel pump control circuit	DI–255
Soon after starting (Engine stall)	1. Fuel pump control circuit	DI–255
During A/C operation (Engine stall)	1. A/C signal circuit (Compressor circuit) 2. Engine control module (ECM)	AC–79 IN–26

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DI0UG–01

CIRCUIT INSPECTION

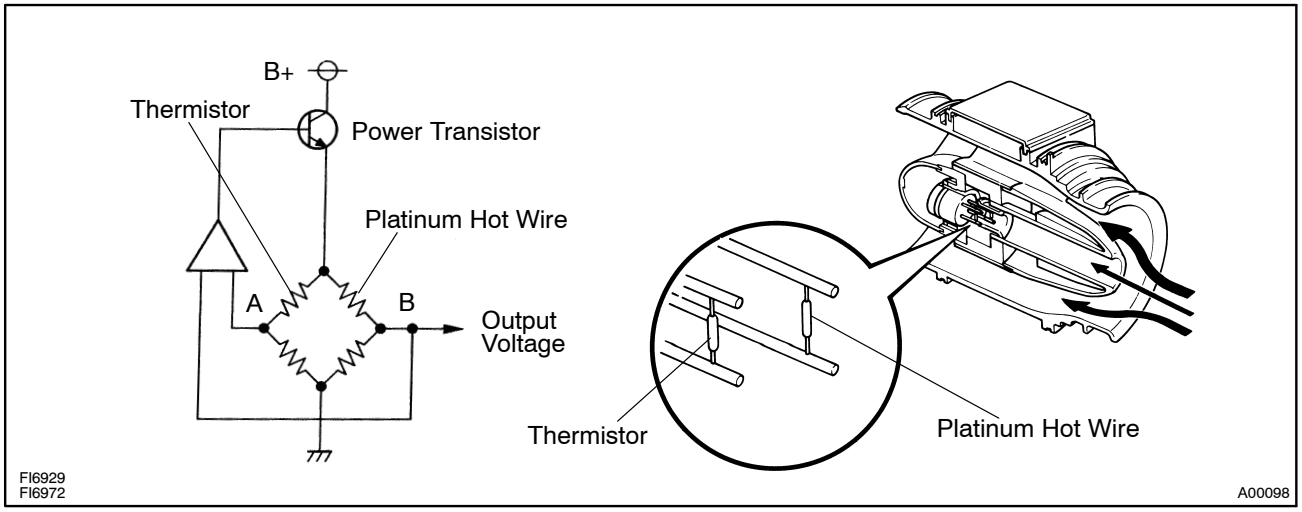
DTC	P0100	Mass Air Flow Circuit Malfunction

CIRCUIT DESCRIPTION

The mass air flow meter uses a platinum hot wire. the hot wire air flow meter consists of a platinum hot wire, thermistor and a control circuit installed in a plastic housing. the hot wire air flow meter works on the principle that the hot wire and thermistor located in the intake air bypass of the housing detect any changes in the intake air temp.

The hot wire is maintained at the set temp. by controlling the current flow through the hot wire. This current flow is ten measured as the output voltage of the air flow meter.

The circuit is constructed so that the platinum hot wire and thermistor provide a bridge circuit, with the power transistor controlled so that the potential of A and B remains equal to maintain the set temp.



DTC No.	Detection ItemDTC	Trouble Area
P0100	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or less	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM
P0100	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or more (2 trip detection logic)	

If the ECM detects DTC ”P0100” it operates the fail sefe function, keeping the ignition timing and injection volume constant and making it possible to drive the vehicle.

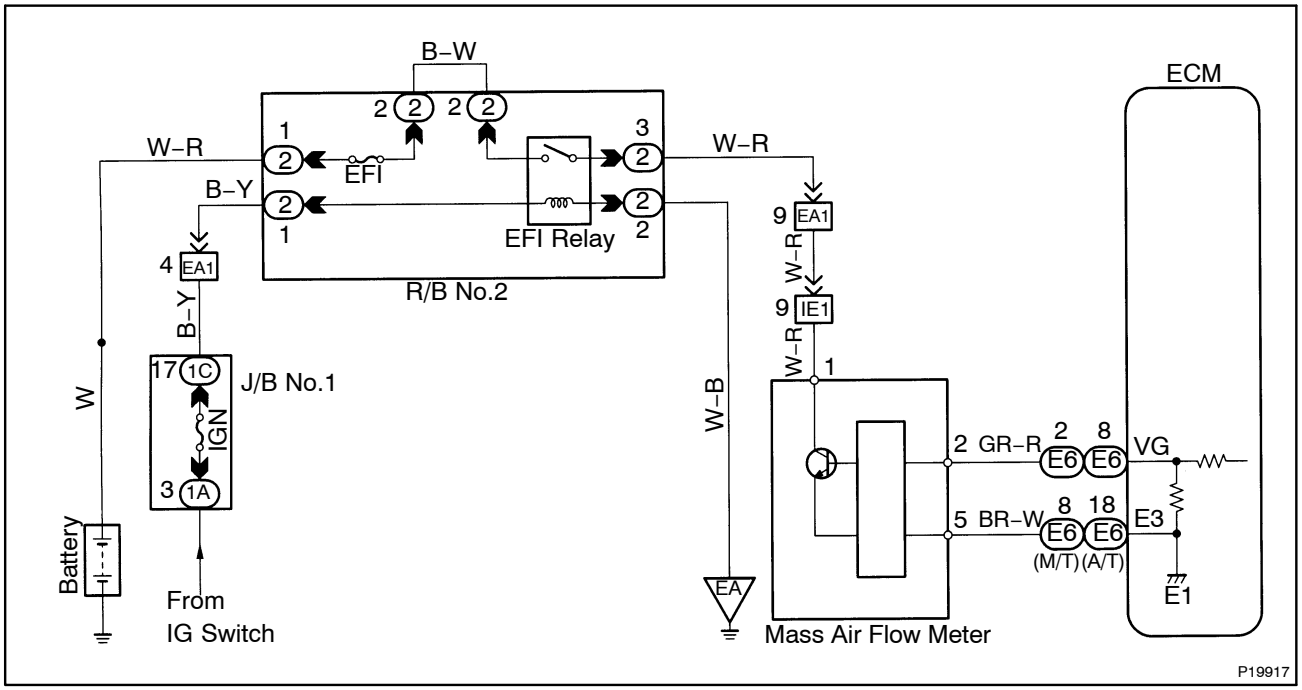
HINT:

After confirming DTC P0100 use the OBD II scan tool or TOYOTA hand–held tester to confirm the mass air flow ratio from ”CURRENT DATA”.

Mass Air Flow Value (gm/sec.)	Malfunction
Approx. 0	• Mass air flow meter power source circuit open • VG circuit open or short
11.0 – 25.1 (idling after warming up)	• E3 circuit open

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WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Connect OBD II scan tool or TOYOTA hand–held tester and read value of mass air flow rate.**

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON.

(c) Start the engine.

CHECK:

Read mass air flow rate on the OBD II scan tool or TOYOTA hand–held tester.

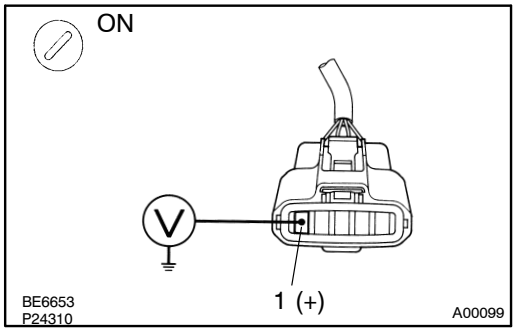
RESULT:

	Type I	Type II
Mass air flow rata (gm/sec.)	Approx. 0	11.0 – 25.1 (idling after warming up)

Type I	**Go to step 2.**
Type II	**Go to step 5.**

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2	Check voltage of mass air flow meter power source.



PREPARATION:

(a) Disconnect the mass air flow meter connector.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal 1 of mass air flow meter connector and body ground.

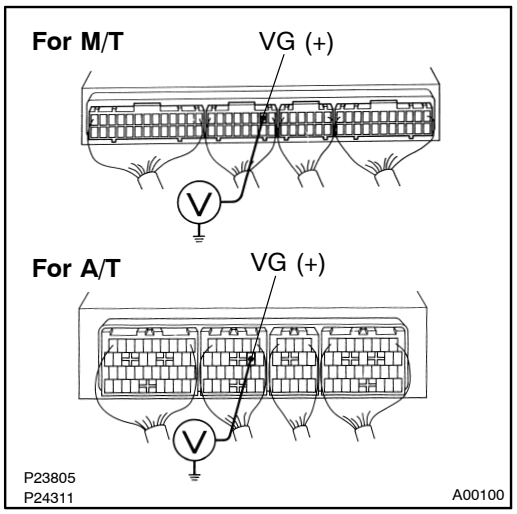
OK:

Voltage: 9 – 14 V

NG → **Check for open in harness and connector between EFI main relay and mass air flow meter (See page IN–26).**

OK

3	Check voltage between terminals VG of ECM connector and body ground.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–61).

(b) Start the engine.

CHECK:

Measure voltage between terminal VG of ECM connector and body ground while engine is idling.

OK:

Voltage:

1.1 – 1.5 V (P or N position and A/C switch OFF)

OK → **Check and replace ECM (See page IN–26).**

NG

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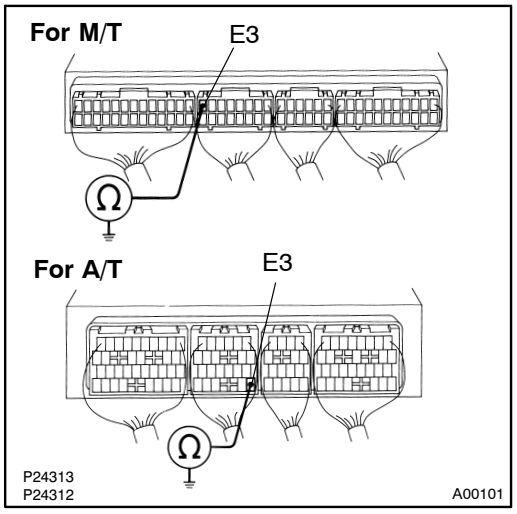
4	**Check for open and short in harness and connector between mass air flow meter and ECM (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

Replace mass air flow meter.

5	**Check continuity between terminal E3 of ECM and body ground.**



PREPARATION:
Remove the right cowl side trim (See page SF–61).
CHECK:
Check continuity between terminal E3 of ECM connector and body ground.
OK:
Continuity (1 Ω or less)

NG → **Check and replace ECM (See page IN–26).**

OK

6	**Check for open in harness and connector between mass air flow meter and ECM (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

Replace mass air flow meter.

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DI0UH–01

DTC	P0101	Mass Air Flow Circuit Range/Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0100 on page DI–149.

DTC No.	DTC Detecting Condition	Trouble Area
P0101	After engine is warmed up, conditions (a) and (b) continue with engine speed 900 rpm or less: (2 trip detection logic) (a) Throttle valve fully closed (b) Mass air flow meter output > 2.2 V	• Mass air flow meter
	Conditions (a) and (b) continue with engine speed 1,500 rpm or more: (2 trip detection logic) (a) VTA ≧ 0.63 V (b) Mass air flow meter output < 1.06 V	

INSPECTION PROCEDURE

1	Are there any other codes (besides DTC P0101) being output?

NO → Replace mass air flow meter.

YES

Go to relevant DTC chart.

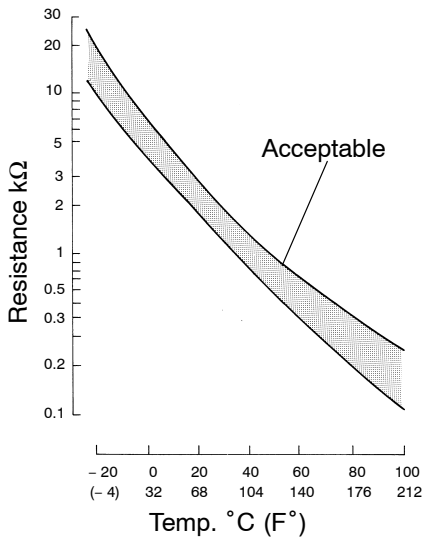
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DI0UI–01

DTC	P0110	Intake Air Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

(fig. 1)



The intake air temp. sensor is built into the mass air flow meter and senses the intake air temp.
A thermistor built in the sensor changes the resistance value according to the intake air temp.
The lower the intake air temp., the greater the thermistor resistance value, and the higher the intake air temp., the lower the thermistor resistance value (See fig. 1).
The intake air temp. sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temp. sensor from the terminal THA via resistor R.
That is, the resistor R and the intake air temp. sensor are connected in series. When the resistance value of the intake air temp. sensor changes in accordance with changes in the intake air temp., the potential at terminal THA also changes. Based on this signal, the ECM increases the fuel injection volume to improve driveability during cold engine operation.
If the ECM detects the DTC "P0110", it operates the fail safe function in which the intake air temp. is assumed to be 20°C (68°F).

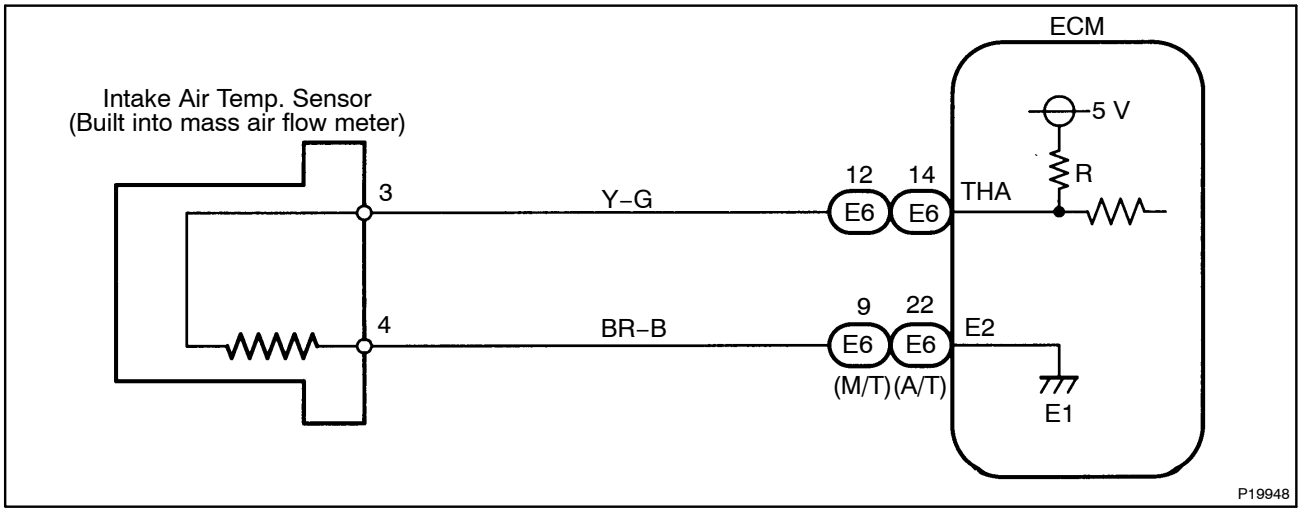
DTC No.	DTC Detecting Condition	Trouble Area
P0110	Open or short in intake air temp. sensor circuit	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • ECM

HINT:
After confirming DTC P0110 use the OBD II scan tool or TOYOTA hand–held tester to confirm the intake air temp. from "CURRENT DATA".

Temp. Displayed	Malfunction
– 40°C (– 40°F)	Open circuit
140°C (284°F) or more	Short circuit

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WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

If DTCs P0110, P0115 and P0120 are output simultaneously, E2 (Sensor Ground) may be open.

1	**Connect OBD II scan tool or TOYOTA hand–held tester and read value of intake air temp.**

PREPARATION:

(a) Connector the OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

Same as actual intake air temp.

HINT:

- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates – 40°C (– 40°F).
- If there is short circuit, OBD II scan tool or TOYOTA hand–held tester indicates 140°C (284°F) or more.

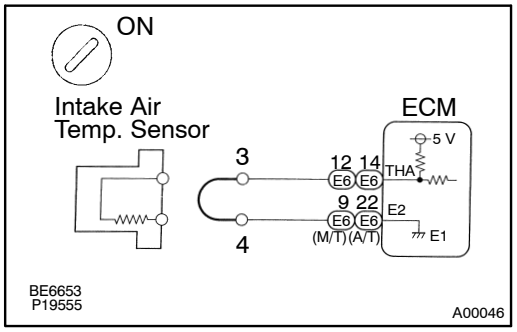
NG → **– 40°C (– 40°F) ... Go to step 2.**
140°C (284°F) or more ... Go to step 4.

OK

Check for intermittent problems
(See page DI–129).

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2	Check for open in harness or ECM.



PREPARATION:

(a) Disconnect the mass air flow meter connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

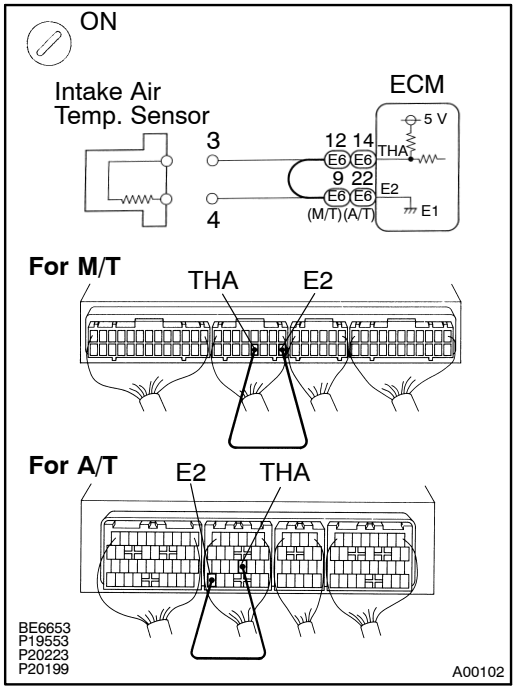
OK:

Temp. value: 140°C (284°F) or more

OK	Confirm good connection at sensor. If OK, replace mass air flow meter.

NG

3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–61).
(b) Connect between terminals THA and E2 of the ECM connector.

HINT:

The mass air flow meter connector is disconnected.
Before checking, do a visual and contact pressure check for the ECM connector (See page IN–26).

(c) Turn the ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

Temp. value: 140°C (284°F) or more

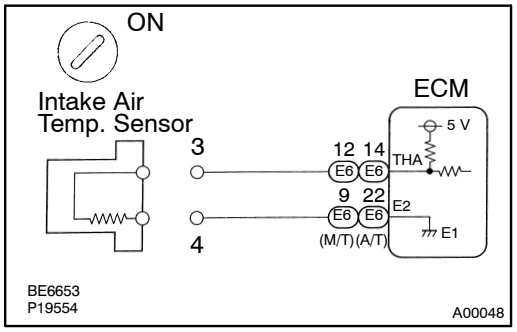
OK	Open in harness between terminals E2 or THA, repair or replace harness.

NG

**Confirm good connection at ECM.
If OK, check and replace ECM.**

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4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the mass air flow meter connector.

(b) Turn the ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

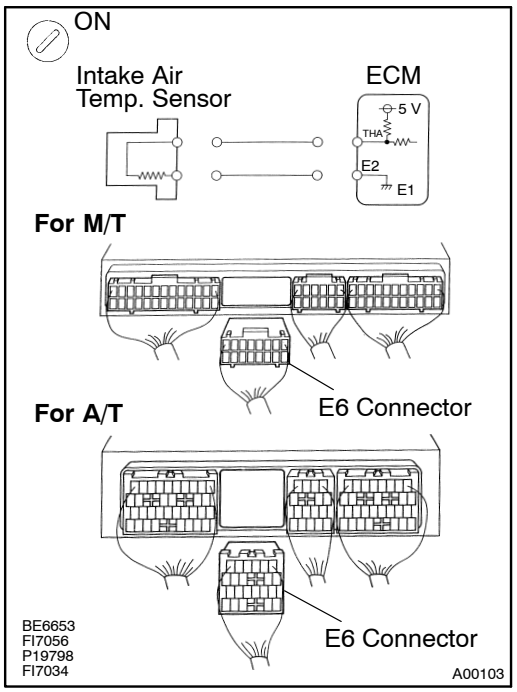
OK:

Temp. value: – 40°C (– 40°F)

OK → **Replace mass air flow meter.**

NG

5	Check for short in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–61).

(b) Disconnect the E6 connector of the ECM.

HINT:

The mass air flow meter connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

Temp. value: – 40°C (– 40°F)

OK → **Repair or replace harness or connector.**

NG

Check and replace ECM (See page IN–26).

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DI0UJ–01

DTC	P0115	Engine Coolant Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

A thermistor built into the engine coolant temp. sensor changes the resistance value according to the engine coolant temp.

The structure of the sensor and connection to the ECM is the same as in the intake air temp. circuit malfunction shown on page DI–154.

If the ECM detects the DTC P0115, it operates the fail safe function in which the engine coolant temp. is assumed to be 80˚C (176˚F).

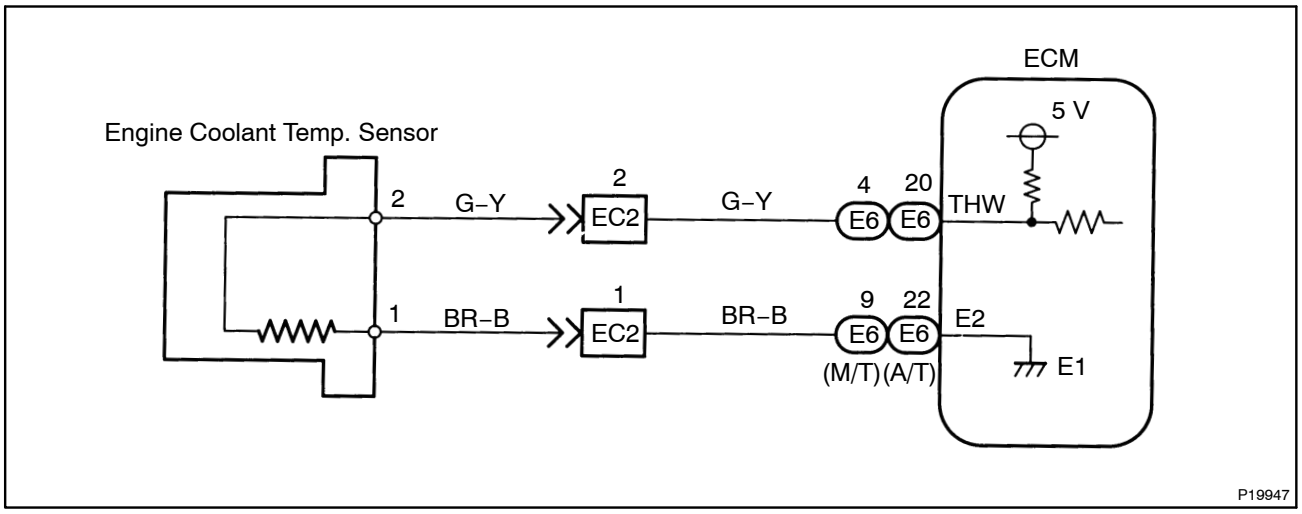
DTC No.	Detection Item	Trouble Area
P0115	Open or short in engine coolant temp. sensor circuit	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM

HINT:

After confirming DTC P0115 use the OBD II scan tool or TOYOTA hand–held tester to confirm the engine coolant temp. from ”CURRENT DATA”.

Temp. Displayed	Malfunction
– 40˚C (– 40˚F)	Open circuit
140˚C (284˚F) or more	Short circuit

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:
If DTCs P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open.

1	**Connect OBD II scan tool or TOYOTA hand–held tester and read value of engine coolant temp.**

PREPARATION:
(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:
Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:
Same as actual engine coolant temp.

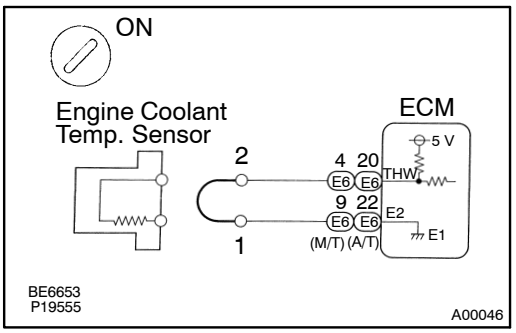
HINT:
- If there is open circuit, OBD II scan tool or TOYOTA hand–held tester indicates – 40°C (– 40°F).
- If there is open circuit, OBD II scan tool or TOYOTA hand—held tester indicates 140°C (284°F) or more.

NG → **– 40°C (– 40°F) ... Go to step 2.**
140°C (284°F) or more ... Go to step 4.

OK

Check for intermittent problems
(See page DI–129).

2	**Check for open in harness or ECM.**



PREPARATION:
(a) Disconnect the engine coolant temp. sensor connector.
(b) Connect the sensor wire harness terminals together.
(c) Turn the ignition switch ON.

CHECK:
Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

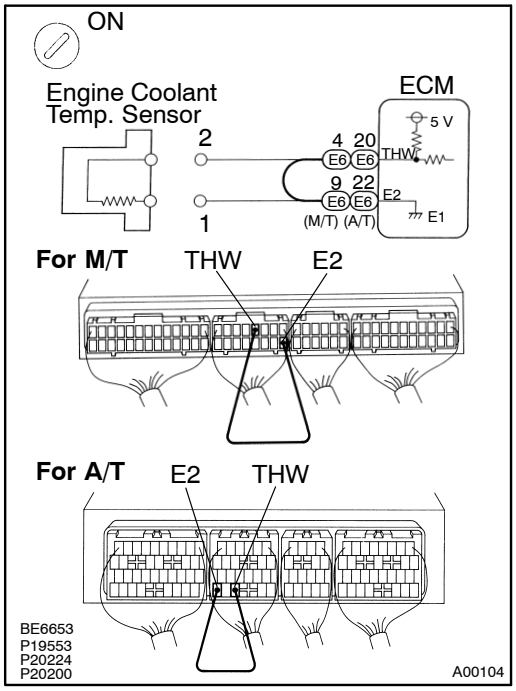
OK:
Temp. value: 140°C (284°F) or more

OK → **Confirm good connection at sensor.**
If OK, replace engine coolant temp. sensor.

NG

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3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–61).

(b) Connect between terminals THW and E2 of the ECM connector.

HINT:

The engine coolant temp. sensor connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector (See page IN–26).

(c) Turn the ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

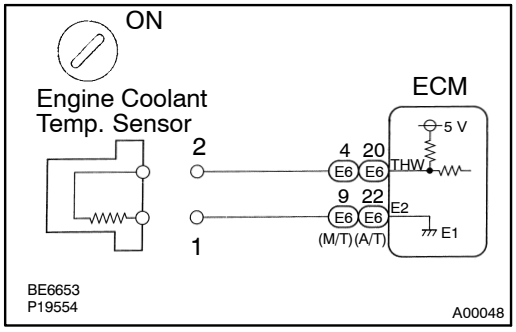
Temp. value: 140°C (284°F) or more

OK	Open in harness between terminals E2 or THW, repair or replace harness.

NG

Confirm good connection at ECM.
If OK, check and replace ECM.

4	Check for short in harness and ECM.



PREPARATION:

(a) Disconnect the engine coolant temp. sensor connector.

(b) Turn the ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

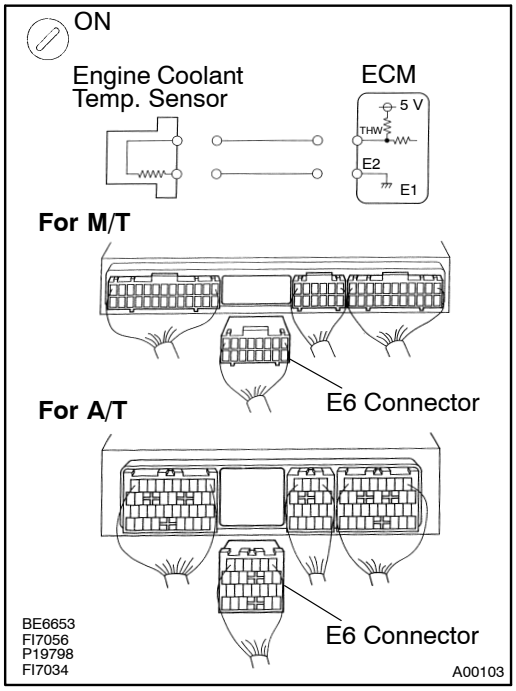
Temp. value: – 40°C (– 40°F)

OK	Replace engine coolant temp. sensor.

NG

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5	Check for short in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–61).

(b) Disconnect the E6 connector of the ECM.

HINT:

The engine coolant temp. sensor connector is disconnected.

(c) Turn the ignition switch ON.

CHECK:

Read temp. value on the OBD II scan tool or TOYOTA hand–held tester.

OK:

Temp. value: – 40°C (– 40°F)

OK → **Repair or replace harness or connector.**

NG

Check and replace ECM (See page IN–26).

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DI0UK-01

DTC	P0116	Engine Coolant Temp. Circuit Range/ Performance problem

CIRCUIT DESCRIPTION

Refer to DTC P0115 on page DI–158.

DTC No.	DTC Detecting Condition	Trouble Area
P0116	If THW ⍰ – 7°C (19.4°F) at engine start, 20 min. or more after starting engine, engine coolant temp. sensor value is 35°C (95°F) or less (2 trip detection logic)	• Engine coolant temp. sensor • Cooling system
	If THW ⍰ – 7°C (19.4°F) at engine start, 5 min. or more after starting engine, engine coolant temp. sensor value is 35°C (95°F) or less (2 trip detection logic)	

INSPECTION PROCEDURE

HINT:

If DTCs P0115 and P0116 are output simultaneously, engine coolant temp. sensor circuit may be open.Perform troubleshooting of DTC P0115 first.

1	Are there any other codes (besides DTC P0116) being output?

YES → Go to relevant DTC chart.

NO

2	Check thermostat (See page CO–9).

NG → Replace thermostat.

OK

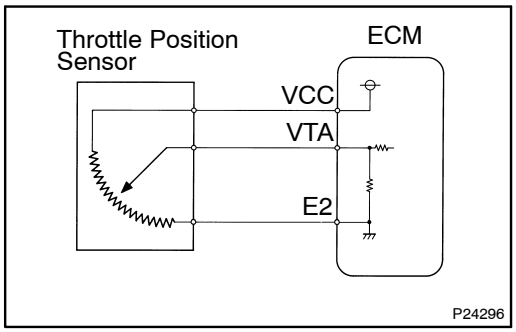
Replace engine coolant temp. sensor.

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DI0UL–01

DTC	P0120	Throttle/Pedal position Sensor/Switch "A" Circuit Malfunction

CIRCUIT DESCRIPTION



The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, a voltage of approximately 0.7 V is applied to terminal VTA of the ECM. The voltage applied to the terminals VTA of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 2.7 ~ 5.2 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from these signals input from terminals VTA and uses them as one of the conditions for deciding the air–fuel ratio correction, power increase correction and fuel–cut control etc.

DTC No.	DTC Detecting Condition	Trouble Area
P0120	Condition (a) or (b) continues: (a) VTA ⍁ 0.1 V (b) VTA ⍁ 4.9 V	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM

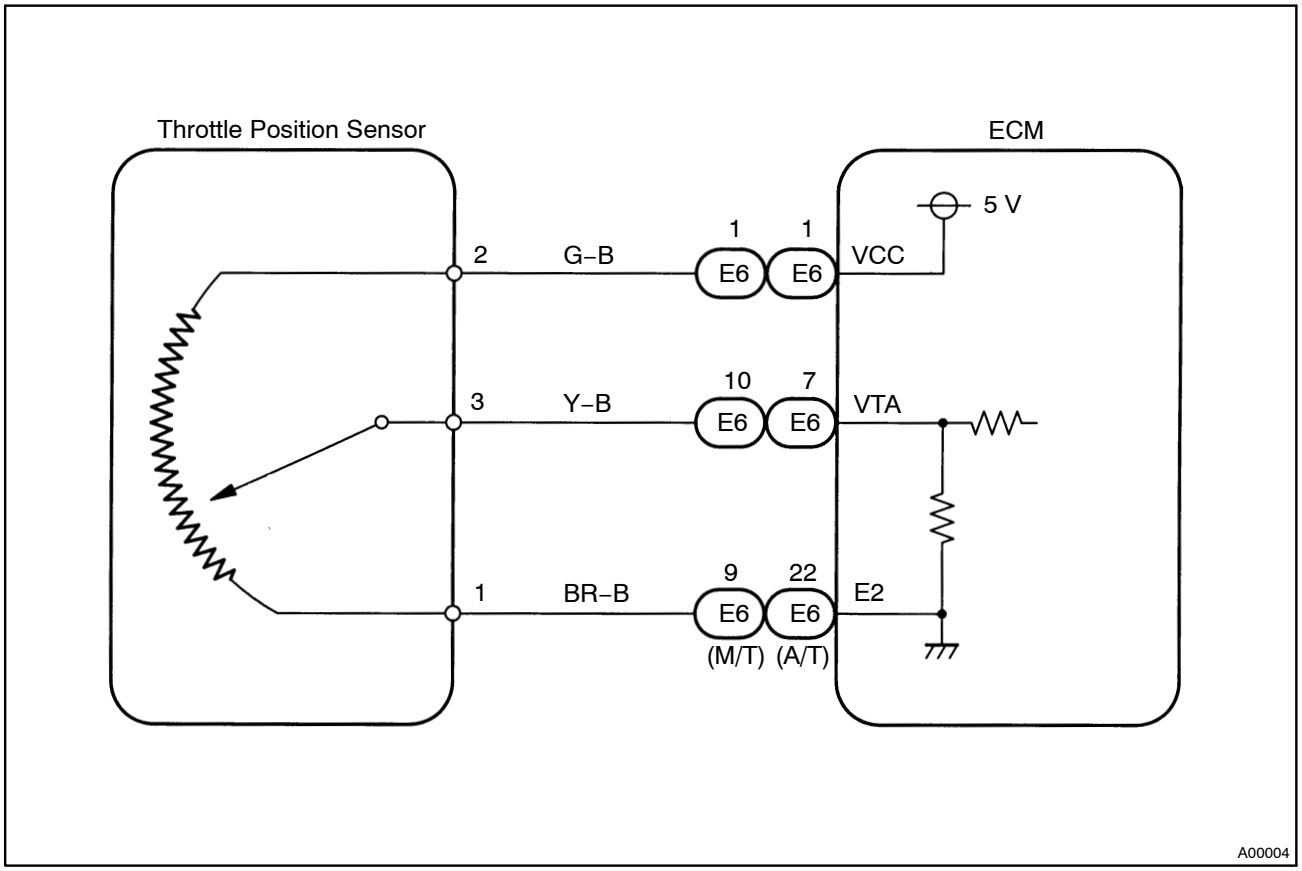
HINT:

After confirming DTC P0120 use the OBD II scan tool or TOYOTA hand–held tester to confirm the throttle valve opening percentage and closed throttle position switch condition.

Throttle valve opening position expressed as percentage		Trouble Area
Throttle valve fully closed	Throttle valve fully open	Trouble Area
0 %	0 %	VCC line open VTA line open or short
Approx. 99 %	Approx. 100 %	E2 line open

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WIRING DIAGRAM



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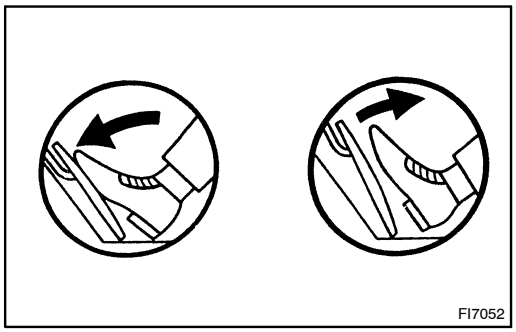
INSPECTION PROCEDURE

HINT:
If DTCs P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open. If DTCs P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open.

1	**Connect OBD II scan tool or TOYOTA hand–held tester and read the throttle valve opening percentage.**

PREPARATION:
(a) Connect the OBD II scan tool or TOYOTA hand–held tester to DLC3.
(b) Turn the ignition switch ON and push the OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:
Read the throttle valve opening percentage.



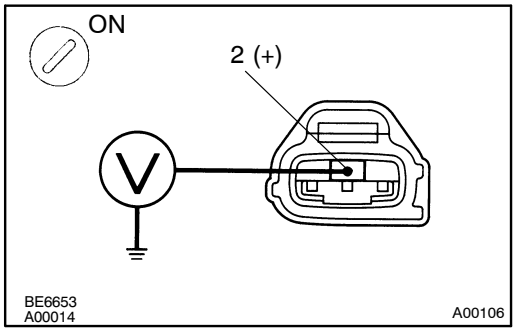
OK:

Throttle valve	Throttle valve opening position expressed as percentage
Fully open	Approx. 75 %
Fully closed	Approx. 10 %

OK → **Check for intermittent problems (See page DI–129).**

NG

2	**Check voltage between terminal 2 of wire harness side connector and body ground.**



PREPARATION:
(a) Disconnect the throttle position sensor connector.
(b) Turn the ignition switch ON.

CHECK:
Measure voltage between terminals 2 of wire harness side connector and body ground.

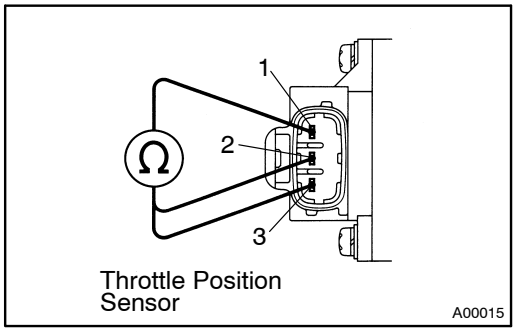
OK:
Voltage: 4.5 – 5.5 V

NG → **Go to step 5.**

OK

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3	Check throttle position sensor.



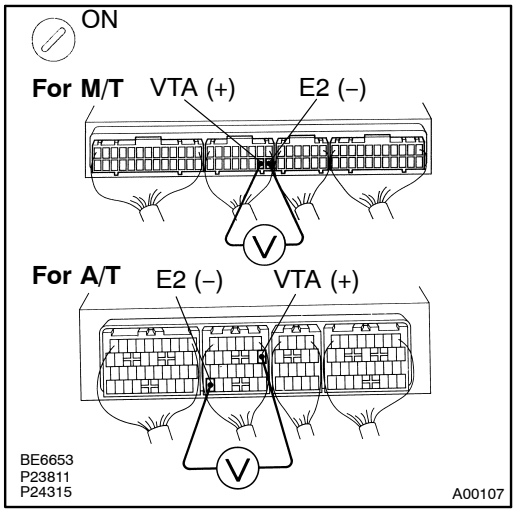
PREPARATION:
Disconnect the throttle position sensor connector.
CHECK:
Measure voltage between terminals 1, 2 and 3 of throttle position sensor.
OK:

Terminals	Throttle valve	Resistance
1 – 2	—	2.5 – 5.9 kΩ
1 – 3	Fully closed	0.2 – 5.7 kΩ
	Fully open	2.0 – 10.2 kΩ

NG → **Replace throttle position sensor.**

OK

4	Check voltage between terminals VTA and E2 of ECM.



PREPARATION:
(a) Remove the right cowl side trim (See page SF–61).
(b) Turn the ignition switch ON.
CHECK:
Measure voltage between terminals VTA and E2 of ECM connector.
OK:

Throttle valve	Voltage
Fully closed	1.0 V
Fully open	2.72 ~ 5.2 V

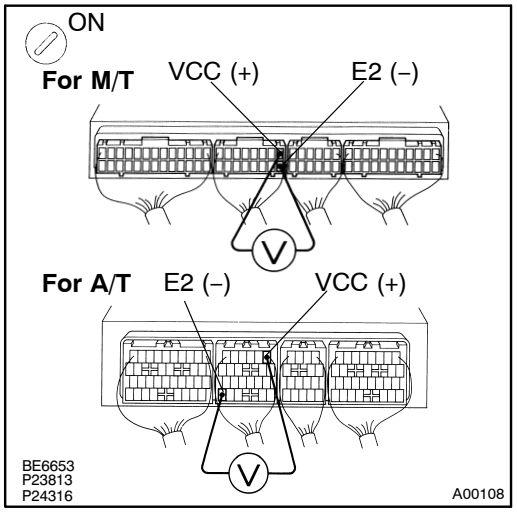
NG → **Check for open and short in harness and connector between ECM and throttle position sensor (VTA line) (See page IN–26).**

OK

Check and replace ECM (See page IN–26).

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5	Check voltage between terminals VCC and E2 of ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–61).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals VCC and E2 of ECM connector.

OK:

Voltage: 4.5 – 5.5 V

NG → **Check and replace ECM (See page IN–26).**

OK →

Check for open in harness and connector between ECM and sensor (VCC line) (See page IN–26).

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DI0UM–01

DTC	P0121	Throttle/Pedal Position Sensor/Switch ”A” Circuit Range/Performance Problem

CIRCUIT DESCRIPTION

Refer to DTC P0120 on page DI–163.

DTC No.	DTC Detecting Condition	Trouble Area
P0121	After vehicle speed has been exceeded 30 km/h (19 mph) even once, output value of throttle position sensor is out of the applicable range while vehicle speed between 30 km/h (19 mph) and 0 km/h (0 mph)	• Throttle position sensor

INSPECTION PROCEDURE

1	Are there any other codes (besides DTC P0121) being output?

YES → Go to relevant DTC chart.

NO

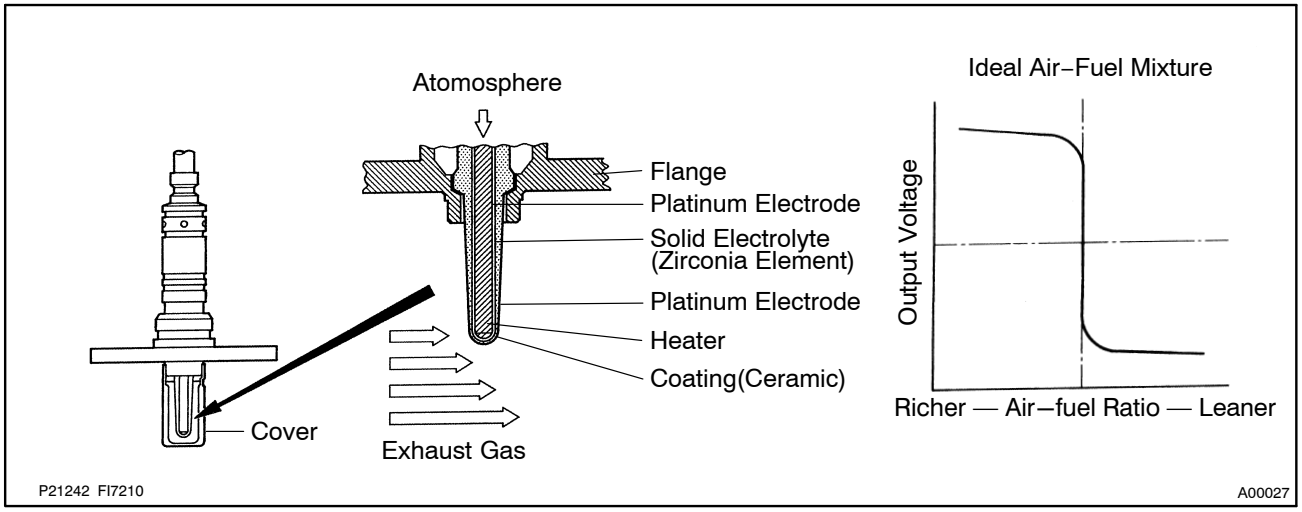
Replace throttle position sensor.

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DTC	P0125	Insufficient Coolant Temp. for Closed Loop Fuel Control

CIRCUIT DESCRIPTION

To obtain a high purification rate for the CO, HC and NOx components of the exhaust gas, a three–way catalytic converter is used, but for the most efficient use of the three–way catalytic converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.
The oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This characteristic is used to detect the oxygen concentration in the exhaust gas and provide feedback to the computer for control of the air–fuel ratio.
When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the oxygen sensor informs the ECM of the LEAN condition (small electromotive force: 0 V).
When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio the oxygen concentration in the exhaust gas is reduced and the oxygen sensor informs the ECM of the RICH condition (large electromotive force: 1 V). The ECM judges by the electromotive force from the oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the oxygen sensor causes output of abnormal electromotive force, the ECM is unable to perform accurate air–fuel ratio control.
The heated oxygen sensors include a heater which heats the Zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temp. of the exhaust gas is low) current flows to the heater to heat the sensor for accurate oxygen concentration detection.

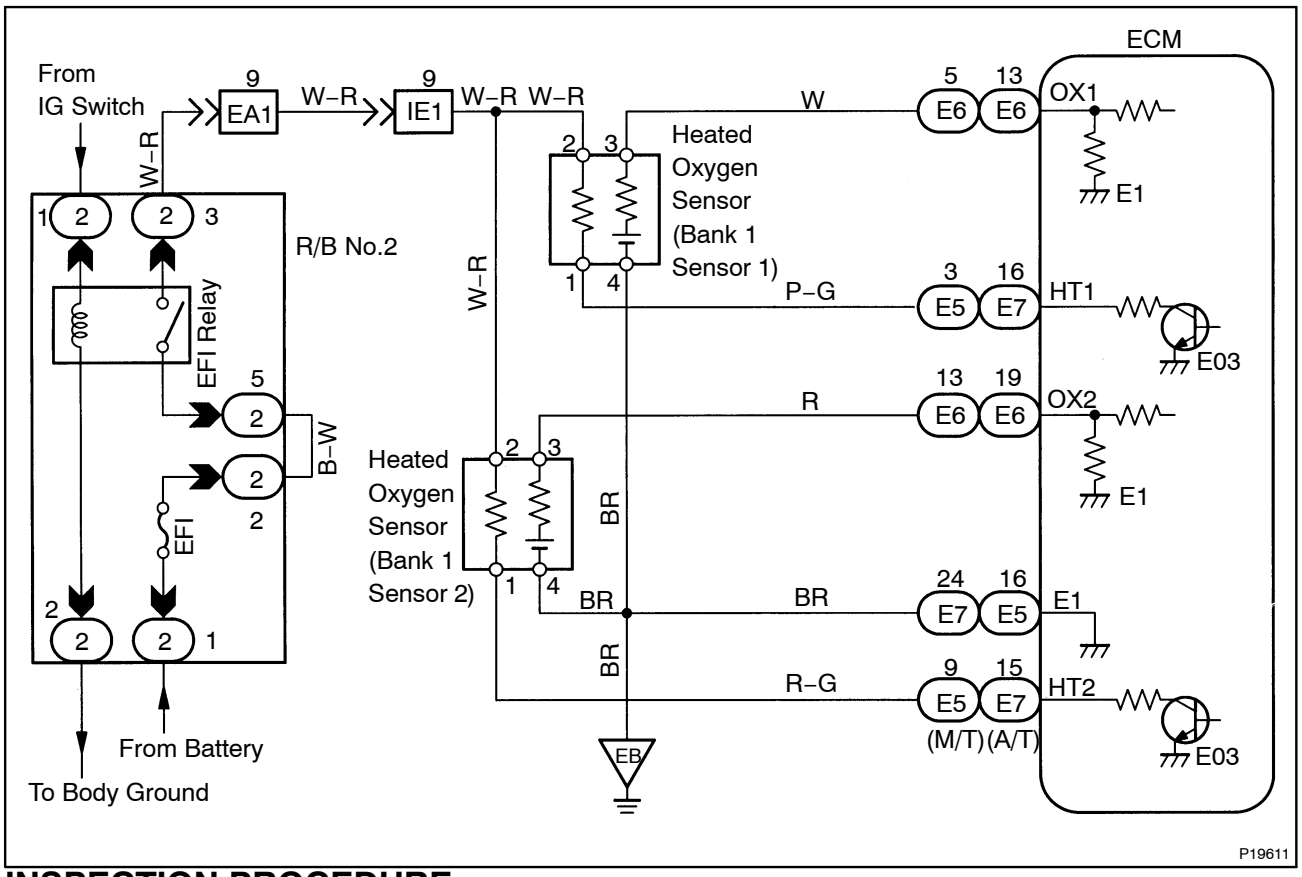


DTC No.	DTC Detecting Condition	Trouble Area
P0125	After engine is warmed up, heated oxygen sensor output does not indicate RICH even once when conditions (a), (b), (c) and (d) continue for at least 1.5 min.: (a) Engine speed: 1,500 rpm or more (b) Vehicle speed: 40 – 100 km/h (25 – 62 mph) (c) Throttle valve does not fully closed (d) 140 sec. or more after starting engine	• Open or short in heated oxygen sensor (bank1 sensor 1) circuit • Heated oxygen sensor (bank 1 sensor 1)

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HINT:
After confirming DTC P0125 use the OBD II scan tool or TOYOTA hand–held tester to confirm voltage output of heated oxygen sensor from "CURRENT DATA".
If voltage output of heated oxygen sensor is 0 V, heated oxygen sensor circuit may be open or short.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Connect OBD II scan tool or TOYOTA hand–held tester and read value for voltage output of heated oxygen sensor (bank 1 sensor 1).**

PREPARATION:
(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.
(b) Warm up the engine to normal operating temp.

CHECK:
Read voltage output of heated oxygen sensor (bank 1 sensor 1) when engine is suddenly raced.
HINT:
Perform quick racing to 4,000 rpm 3 times using the accelerator pedal.

OK:

Heated oxygen sensor (bank 1 sensor 1) output a RICH signal (0.45 V or more) at least once

OK	**Check and replace ECM (See page IN–26).**

NG

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2	**Check for open and short in harness and connector between ECM and heated oxygen sensor (bank 1 sensor 1) (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

Replace heated oxygen sensor (bank 1 sensor 1).

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DI0UO–01

DTC	P0130	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–169.

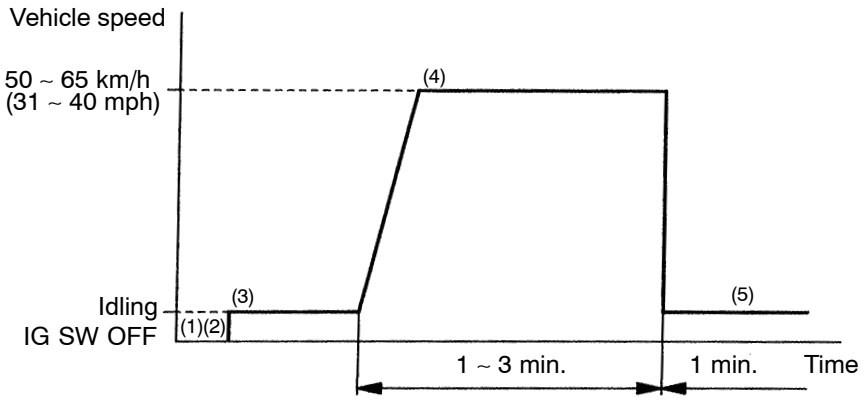
DTC No.	DTC Detecting Condition	Trouble Area
P0130	Voltage output of heated oxygen sensor remains at 0.35 V or more, or 0.55 V or less, during idling after engine is warmed up (2 trip detection logic)	• Heated oxygen sensor • Fuel trim malfunction

HINT:
Sensor 1 refers to the sensor closer to the engine body.
The heated oxygen sensor's output voltage and the short–term fuel trim value can be read using the OBD II scan tool or TOYOTA hand–held tester.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–169.

CONFIRMATION DRIVING PATTERN



FI7130

(1) Connect the TOYOTA hand–held tester to the DLC3.
(2) Switch the TOYOTA hand–held tester from normal mode to check mode (See page DI–129).
(3) Start the engine and warm it up with all the accessory switches OFF.
(4) Drive the vehicle at 50 – 65 km/h (31 – 40 mph) for 1 – 3 min. to warm up the heated oxygen sensor.
(5) Let the engine idle for 1 min.
HINT:
If a malfunction exists, the MIL will light up during step (5).
NOTICE:
If the conditions in this test are not strictly followed, detection of the malfunction will not be possible. If you do not have a TOYOTA hand–held tester, turn the ignition switch OFF after performing steps (3) to (5), then perform steps (3) to (5) again.

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INSPECTION PROCEDURE

1	**Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

2	**Check for heated oxygen sensor data.**

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(b) Warm up the engine to normal operating temp.

CHECK:

Read heated oxygen sensor output voltage and short–term fuel trim.

RESULT:

Pattern	Heated oxygen sensor output voltage	Short–term fuel trim
1	Lean condition (Changes at 0.55 V or less)	Changes at about + 20 %
2	Rich condition (Changes at 0.35 V or more)	Changes at about – 20 %
3	Except 1 and 2	Except 1 and 2

1, 2 → **Check fuel trim system (See page DI–183).**

3

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3	**Check output voltage of heated oxygen sensor during idling.**

PREPARATION:

Warm up the heated oxygen sensor with the engine at 2,500 rpm for approx. 90 sec.

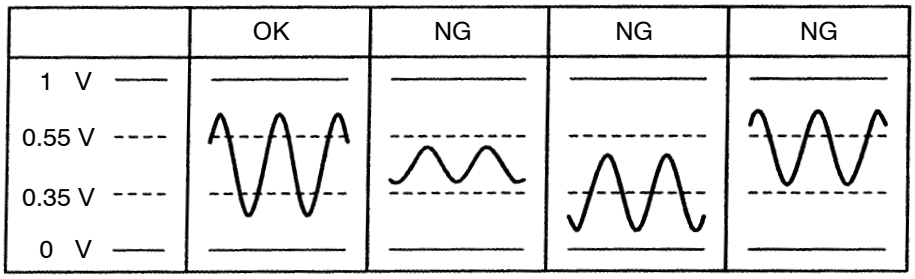
CHECK:

Use the OBD II scan tool or TOYOTA hand–held tester read the output voltage of the heated oxygen sensor during idling.

OK:

Heated oxygen sensor output voltage:

Alternates repeatedly between less than 0.35 V and more than 0.55 V (See the following table)



OK → **Perform confirmation driving pattern.**

NG

Replace heated oxygen sensor.

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DTC	P0133	Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–169.

DTC No.	DTC Detecting Condition	Trouble Area
P0133	Response time for heated oxygen sensor's voltage output to change from rich to lean, or from lean to rich, is 1 sec. or more during idling after engine is warmed up (2 trip detection logic)	• Heated oxygen sensor

HINT:
Sensor 1 refers to the sensor closer to the engine body.

INSPECTION PROCEDURE

1	Are there any other codes (besides DTC P0133) being output?

YES → Go to relevant DTC chart.

NO →

Replace heated oxygen sensor.

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DI0UQ–01

DTC	P0135	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)

DTC	P0141	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–169.

DTC No.	DTC Detecting Condition	Trouble Area
P0135 P0141	When heater operates, heater current exceeds 2.35 A (2 trip detection logic)	• Open or short in heater circuit of heated oxygen sensor Heated oxygen sensor heater ECM
	Heater current of 0.2 A or less when heater operates (2 trip detection logic)	

HINT:

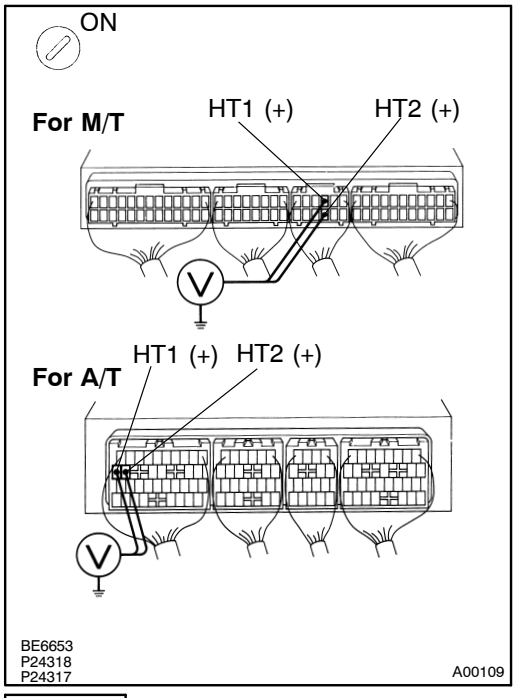
- Sensor 1 refers to the sensor closer to the engine body.
- Sensor 2 refers to the sensor farther away from the engine body.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–169.

INSPECTION PROCEDURE

1	Check voltage between terminals HT1, HT2 of ECM connector and body ground.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–61).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals HT1, HT2 of ECM connector and body ground.

HINT:

- Connect terminal HT1 to bank 1 sensor 1.
- Connect terminal HT2 to bank 1 sensor 2.

OK:

Voltage: 9 – 14 V

OK	Check and replace ECM (See page IN–26).

NG

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2	Check resistance of heated oxygen sensor heater (See page SF–60).

NG → Replace heated oxygen sensor.

OK →

Check and repair harness or connector between EFI main relay, heated oxygen sensor and ECM (See page IN–26).

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DI0UR–01

DTC	P0136	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)

CIRCUIT DESCRIPTION

Refer to DTC P0125 on page DI–169.

DTC No.	DTC Detecting Condition	Trouble Area
P0136	Voltage output of heated oxygen sensor (bank 1 sensor 2) remains at 0.4 V or more or 0.5 V or less when vehicle is driven at 50 km/h (31 mph) or more after the engine is warmed up. (2 trip detection logic).	• Heated oxygen sensor

HINT:
Sensor 2 refers to the sensor farther away from the engine body.

WIRING DIAGRAM

Refer to DTC P0125 on page DI–169.

INSPECTION PROCEDURE

1	**Are there any other codes (besides DTC P0136) being output?**

YES → **Go to relevant DTC chart.**

NO

2	**Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

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3	**Check output voltage of heated oxygen sensor.**

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(b) Warm up the engine to normal operating temp.

CHECK:

Read voltage output of the heated oxygen sensor (bank 1 sensor 2) when the engine suddenly raced.

HINT:

Perform quick racing to 4,000 rpm 3 min. using the accelerator pedal.

OK:

Heated oxygen sensor output voltage: Alternates from 0.4 V or less to 0.5 V or more

OK → **Check that each connector is properly connected.**

NG → **Replace heated oxygen sensor.**

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DI0US–01

DTC	P0171	System too Lean (Fuel Trim)

DTC	P0172	System too Rich (Fuel Trim)

CIRCUIT DESCRIPTION

Fuel trim refers to the feedback compensation value compared against the basic injection time. Fuel trim includes short–term fuel trim and long–term fuel trim.

Short–term fuel trim is the short–term fuel compensation used to maintain the air–fuel ratio at its ideal theoretical value. The signal from the heated oxygen sensor indicates whether the air–fuel ratio is RICH or LEAN compared to the ideal theoretical value, triggering a reduction in fuel volume if the air–fuel ratio is rich, and an increase in fuel volume if it is lean.

Long–term fuel trim is overall fuel compensation carried out long–term to compensate for continual deviation of the short–term fuel trim from the central value due to individual engine differences, wear over time and changes in the usage environment.

If both the short–term fuel trim and long–term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the MIL lights up.

DTC No.	DTC Detecting Condition	Trouble Area
P0171	When air fuel ratio feedback is stable after engine warming up, fuel trim is considerably in error on RICH side (2 trip detection logic)	• Air intake (hose loose) • Fuel line pressure • Injector blockage • Heated oxygen sensor (bank 1 sensor 1) malfunction • Mass air flow meter • Engine coolant temp. sensor
P0172	When air fuel ratio feedback is stable after engine warming up, fuel trim is considerably in error on LEAN side (2 trip detection logic)	• Fuel line pressure • Injector leak, blockage • Heated oxygen sensor (bank 1 sensor 1) malfunction • Mass air flow meter • Engine coolant temp. sensor

HINT:

- When DTC P0171 is recorded, the actual air–fuel ratio is on the LEAN side. When DTC P0172 is recorded, the actual air–fuel ratio is on the RICH side.
- If the vehicle runs out of fuel, the air–fuel ratio is LEAN and DTC P0171 is recorded. The MIL then comes on.
- If the total of the short–term fuel trim value and long–term fuel trim value is within ± 25 %, the system is functioning normally.

INSPECTION PROCEDURE

1	Check air induction system (See page SF–5).

NG → Repair or replace.

OK

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2	**Check for heated oxygen sensor (bank 1 sensor 1) data.**

PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(b) Warm up the engine to normal operating temp.

CHECK:

Read heated oxygen sensor (bank 1 sensor 1) output voltage and short–term fuel trim.

RESULT:

Pattern	Heated oxygen sensor output voltage	Short–term fuel trim
1	Lean condition (Changes at 0.55 V or less)	Changes at about + 20 %
2	Rich condition (Changes at 0.35 V or more)	Changes at about – 20 %
3	Except 1 and 2	Except 1 and 2

3 → **Check for heated oxygen sensor (bank 1 sensor 1) (See page DI–172).**

1, 2 ↓

3	**Check fuel pressure (See page SF–5).**

NG → **Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page SF–5).**

OK ↓

4	**Check injector injection (See page SF–21).**

NG → **Replace injector.**

OK ↓

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5	**Check mass air flow meter and engine coolant temp. sensor (See page SF–29, SF–52).**

NG → **Repair or replace.**

OK

6	**Check for spark and ignition (See page IG–1).**

NG → **Repair or replace.**

OK

Check and replace ECM (See page IN–26).

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DIOUT–01

DTC	P0300	Random/Multiple Cylinder Misfire Detected

DTC	P0301	Cylinder 1 Misfire Detected

DTC	P0302	Cylinder 2 Misfire Detected

DTC	P0303	Cylinder 3 Misfire Detected

DTC	P0304	Cylinder 4 Misfire Detected

DTC	P0305	Cylinder 5 Misfire Detected

DTC	P0306	Cylinder 6 Misfire Detected

CIRCUIT DESCRIPTION

Misfire: The ECM uses the crankshaft position sensor and camshaft position sensor to monitor changes in the crankshaft rotation for each cylinder.

The ECM counts the number of times the engine speed change rate indicates that misfire has occurred.When the misfire rate equals or exceeds the count indicating that the engine condition has deteriorated, the MIL lights up.

If the misfire rate is high enough and the driving conditions will cause catalyst overheating, the MIL blinks when misfiring occurs.

DTC No.	DTC Detecting Condition	Trouble Area
P0300	Misfiring of random cylinders is detected during any particular 200 or 1,000 revolutions	• Ignition system • Injector • Fuel line pressure • EGR* • Compression pressure • Valve clearance not to specification • Valve timing • Mass air flow meter • Engine coolant temp. sensor
P0301 P0302 P0303 P0304 P0305 P0306	For any particular 200 revolutions for engine, misfiring is detected which can cause catalyst overheating (This causes MIL to blink)	
	For any particular 1,000 revolutions of engine, misfiring is detected which causes a deterioration in emission (2 trip detection logic)	

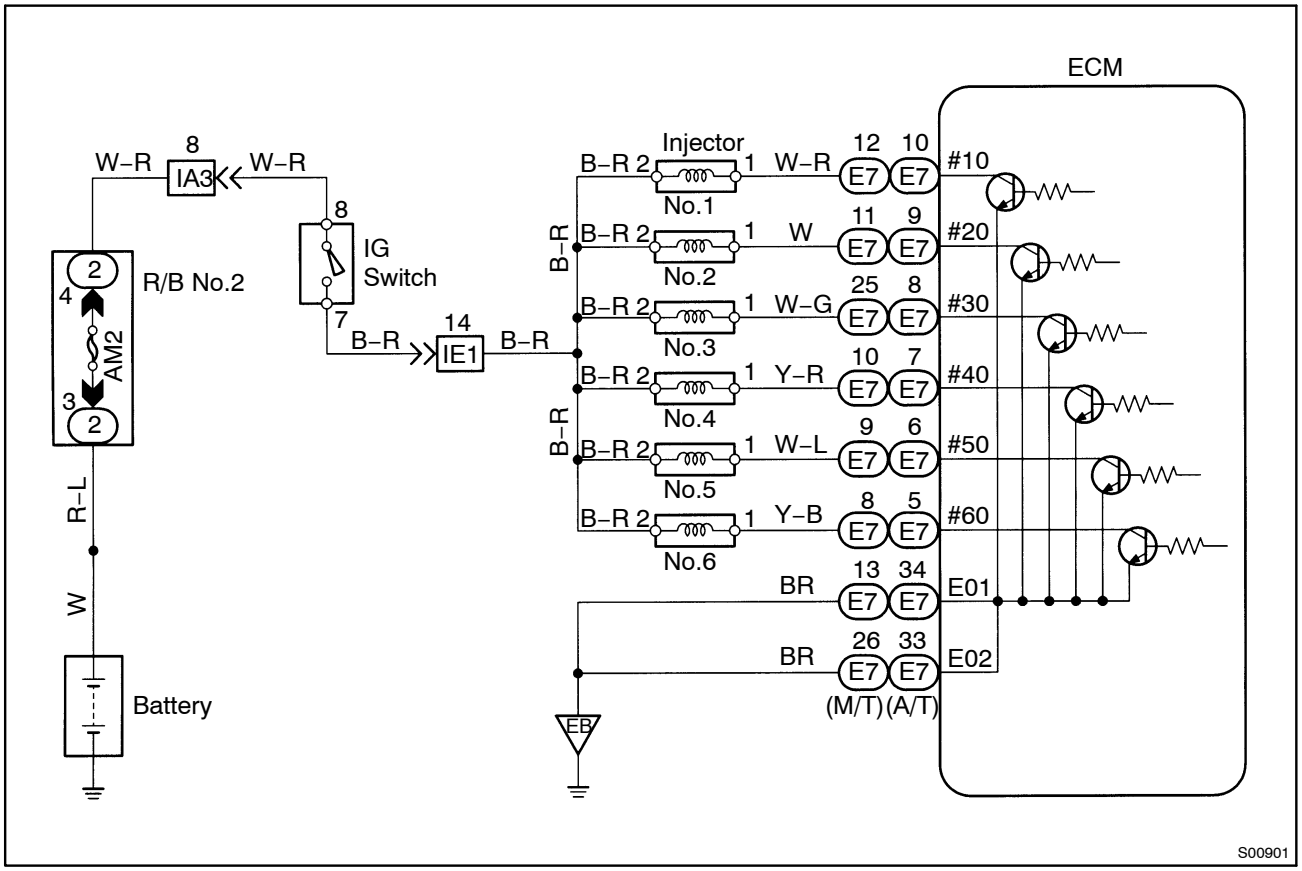
*: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

HINT:

When the 2 or more codes for a misfiring cylinder are recorded repeatedly but no Random Misfire code is recorded, it indicates that the misfires were detected and recorded at different times.

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WIRING DIAGRAM



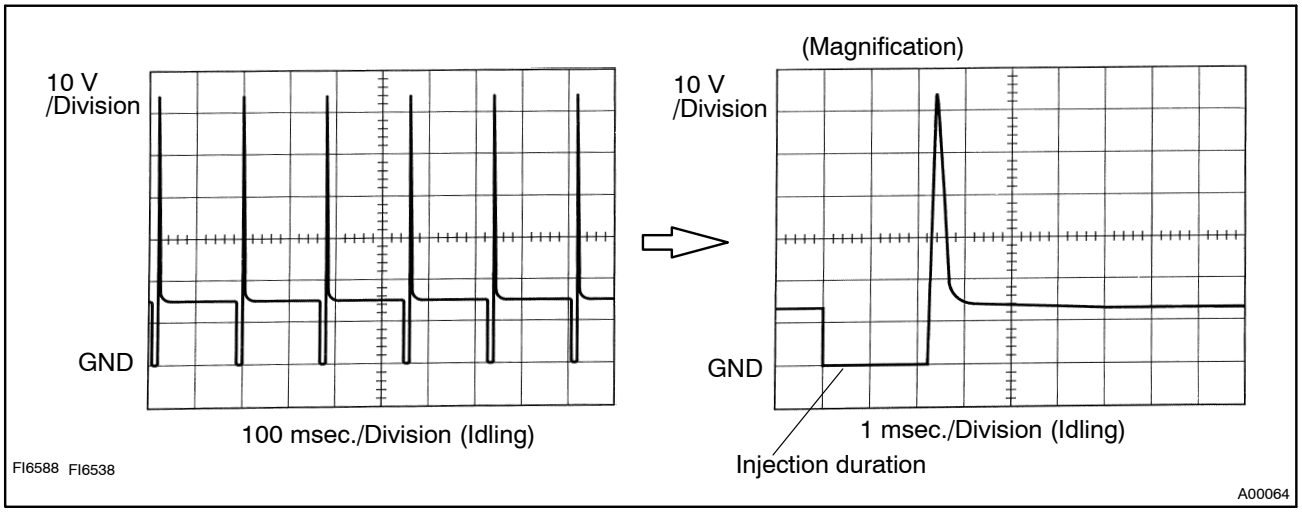
Reference INSPECTION USING OSCILLOSCOPE

INJECTOR SIGNAL WAVEFORM

With the engine idling, measure between terminals #10 – #60 and E01 of ECM.

HINT:

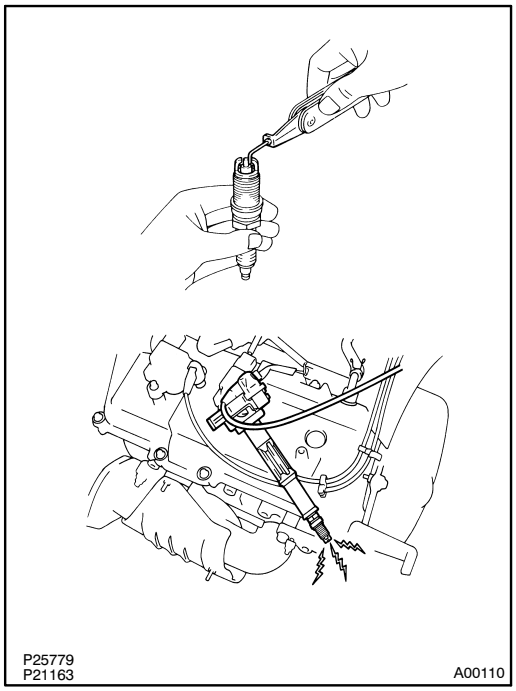
The correct waveform is as shown.



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INSPECTION PROCEDURE

1	**Check spark plug and spark of misfiring cylinder.**



PREPARATION:

(a) Remove the ignition coil and high–tension cord.
(b) Remove the spark plug.

CHECK:

(a) Check the spark plug type.
(b) Check for carbon deposits on electrode.
(c) Check the electrode gap.

OK:

(1) Twin ground electrodes type.
Recommended spark plug:
ND K16TR11
NGK BKR5EKB–11
(2) No large carbon deposit present. Not wet with gosoline or oil.
(3) Electrode gap: 1.0 – 1.1 mm (0.039 – 0.043 in.)

PREPARATION:

(a) Install the spark plug to the ignition coil or high–tension cord.
(b) Disconnect the injector connector.
(c) Ground the spark plug.

CHECK:

Check if the spark occurs while the engine is being cranked.

NOTICE:

To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5 – 10 sec. at a time.

OK:

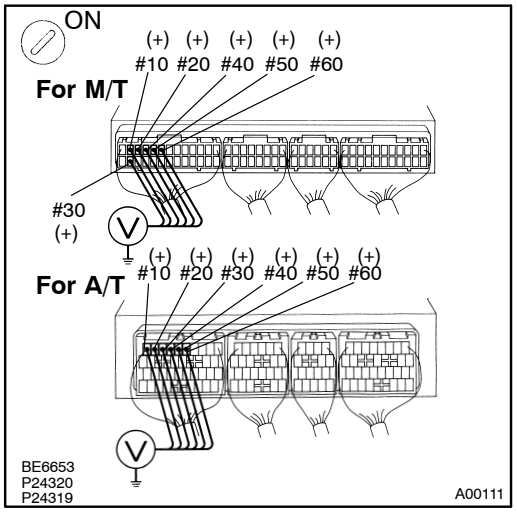
Spark jumps across electrode gap.

NG → **Replace or check ignition system (See page IG–1).**

OK

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2	Check voltage of ECM terminal for injector of failed cylinder.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–61).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between applicable terminal of ECM connector and body ground.

OK:

Voltage: 9 – 14 V

OK	Go to step 4.

NG

3	Check resistance of injector of misfiring cylinder (See page SF–21).

NG	Replace injector.

OK

Check for open and short in harness and connector between injector and ECM (See page IN–26).

4	Check fuel pressure (See page SF–5).

NG	Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page SF–5).

OK

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5	**Check injector injection (See page SF–21).**

NG → **Replace injector.**

OK

6	**Check EGR system (See page EC–9).***

NG → **Repair EGR system.***

OK

*: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

7	**Check mass air flow meter and engine coolant temp. sensor (See page SF–29 and SF–52).**

NG → **Repair or replace.**

OK

Check the compression pressure (See page EM–2), valve clearance (See page EM–4) and valve timing (See page EM–17).

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DI0UU–01

DTC	P0325	Knock Sensor 1 Circuit Malfunction

DTC	P0330	Knock Sensor 2 Circuit Malfunction

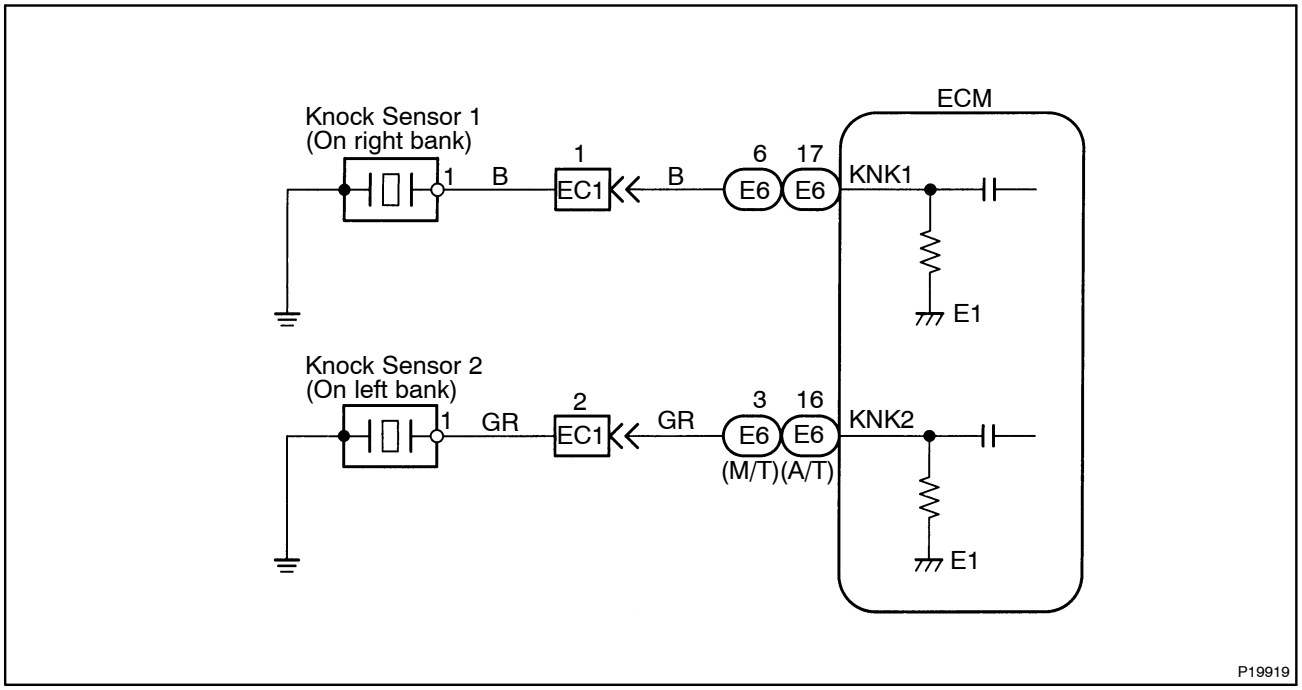
CIRCUIT DESCRIPTION

Knock sensors are fitted one to the right bank and left bank of the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

DTC No.	DTC Detecting Condition	Trouble Area
P0325	No knock sensor 1 signal to ECM with engine speed between 1,760 rpm and 5,600 rpm	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM
P0330	No knock sensor 2 signal to ECM with engine speed between 1,760 rpm and 5,600 rpm	• Open or short in knock sensor 2 circuit • Knock sensor 2 (looseness) • ECM

If the ECM detects the above diagnosis conditions, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.

WIRING DIAGRAM

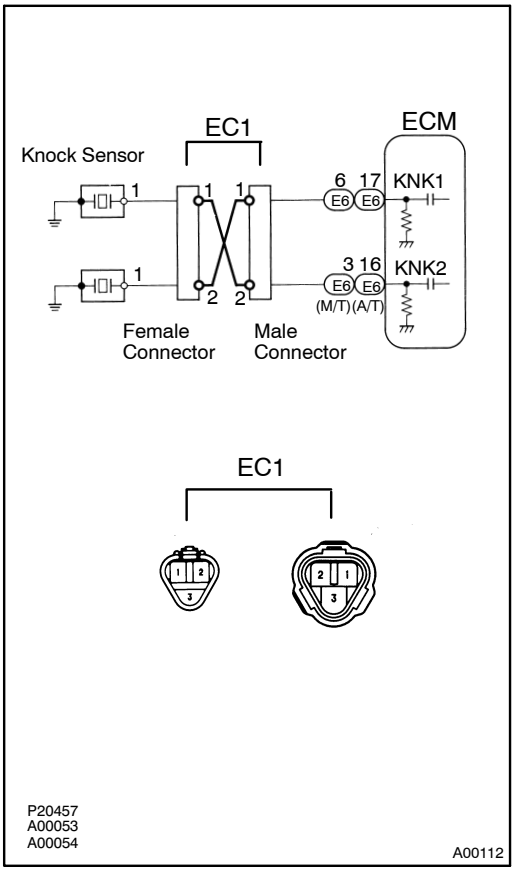


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INSPECTION PROCEDURE

HINT:
DTC P0325 is for the right bank knock sensor circuit. DTC P0330 is for the left bank knock sensor circuit.

1	**Connect OBD II scan tool or TOYOTA hand–held tester and check knock sensor circuit.**



PREPARATION:

(a) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.
(b) Disconnect the wire to wire connector EC1.
(c) Connect the terminals of the disconnected EC1 male connector and EC1 female as follows.

Male connector ↔ Female connector
Terminal 1 ↔ Terminal 2
Terminal 2 ↔ Terminal 1

(d) Turn the ignition switch ON and push the OBDII scan tool or TOYOTA hand–held tester main switch ON.
(e) After the engine is warmed up, perform quick racing to 4,000 rpm 3 times.

CHECK:

Check the DTC.

RESULT:

Type I	DTC same as when vehicle brought in P0325 → P0325 or P0330 → P0330
Type II	DTC different to when vehicle brought in P0325 → P0330 or P0330 → P0325

Type II → **Go to step 3.**

Type I

2	**Check for open and short in harness and connector between EC1 connector and ECM (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page IN–26).

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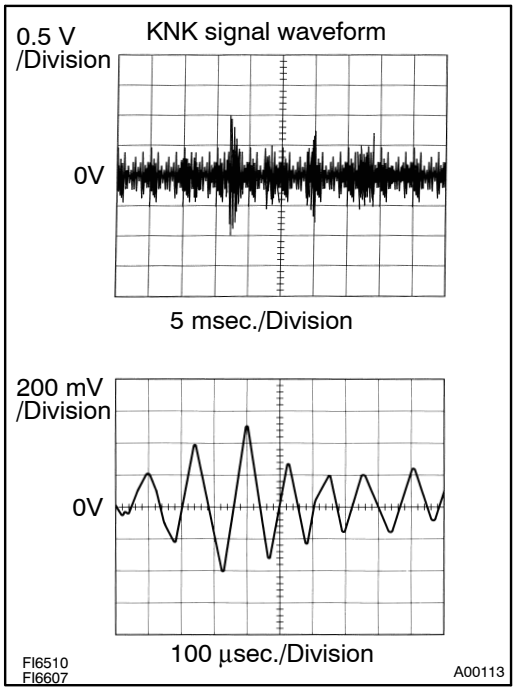
3	**Check for open and short in harness and connector between EC1 connector and knock sensor (See page IN–26).**

HINT:
- If DTC P0325 has changed to P0330, check the knock sensor circuit on the right bank side.
- If DTC P0330 has changed to P0325, check the knock sensor circuit on the left bank side.

NG → **Repair or replace harness or connector.**

OK

Replace knock sensor.



Reference INSPECTION USING OSCILLOSCOPE

- With the engine racing (4,000 rpm), measure between terminal KNK1, KNK2 of ECM and body ground.

HINT:
The correct waveform is as shown.

- Spread the time on the horizontal axis, and confirm that period of the wave is 141 µsec (Normal mode vibration frequency of knock sensor: 7.1 kHz).

HINT:
If normal mode vibration frequency is not 7.1 kHz, the sensor is malfunctioning.

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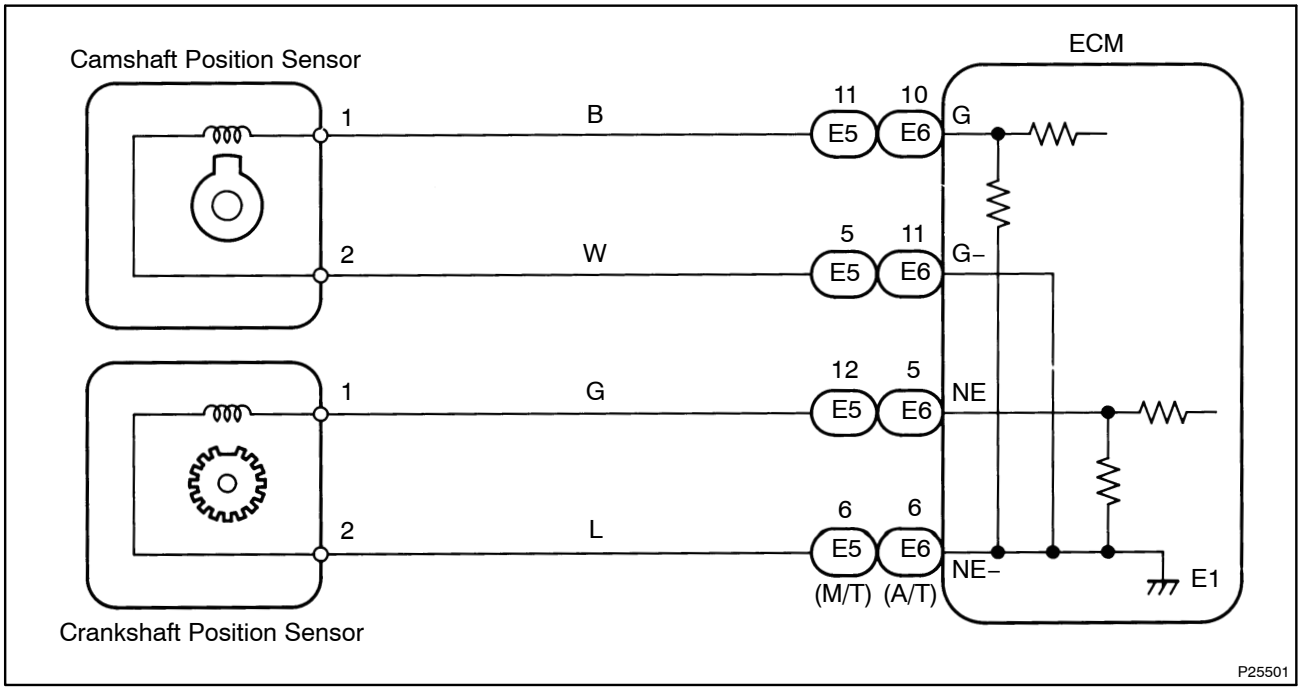
DTC	P0335	Crankshaft Position Sensor ”A” Circuit Malfunction

CIRCUIT DESCRIPTION

The crankshaft position sensor, which detects the engine speed and crankshaft angle signal (NE signal), has been installed on the oil pump body.
The NE signal plate has 34 teeth. The NE signal sensor generates 34 signals of every engine revolution. The ECM detects the standard crankshaft angle based on the G signals, and the actual crankshaft angle and the engine speed by the NE signals.

DTC No.	DTC Detecting Condition	Trouble Area
P0335	No crankshaft position sensor signal to ECM during cranking (2 trip detection logic)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • ECM
	No crankshaft position sensor signal to ECM with engine speed 600 rpm or more (2 trip detection logic)	

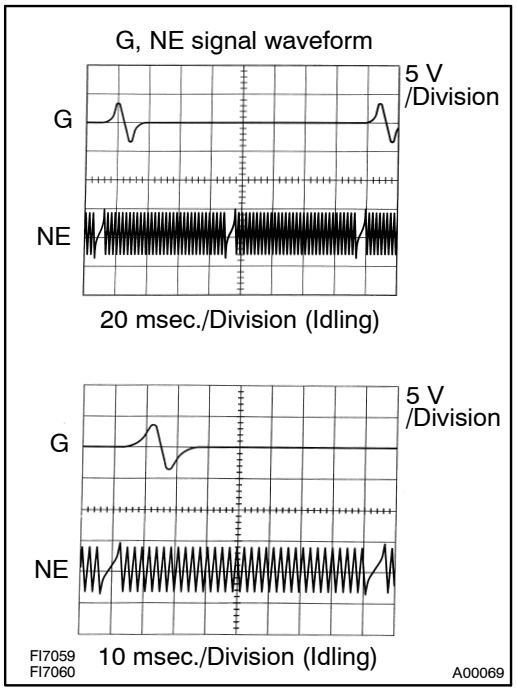
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check resistance of crankshaft position sensor (See page IG–13).**



Reference INSPECTION USING OSCILLOSCOPE

During cranking or idling, check between terminals G and G–, NE and NE– of ECM

HINT:

The correct waveforms are as shown.

NG → **Replace crankshaft position sensor.**

OK

2	**Check for open and short in harness and connector between ECM and crankshaft position sensor (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

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3	Inspect sensor installation and teeth of signal plate.

NG → Tighten the sensor. Replace signal plate.

OK →

Check and replace ECM (See page IN–26).

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DI0UW–02

DTC	P0340	Camshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

The camshaft position sensor which detects the crankshaft angle signal (G signal), has been installed on the front of right bank cylinder head. The timing rotor has been integrated with the right bank camshaft timing pulley. When the camshafts rotate, the protrusion on the timing rotor and the air gap on the pickup coil change, causing fluctuations, in the magnetic field and generating an electromotive force in the pickup coil. The NE signal plate has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals for every engine revolution. The ECM detects the standard crankshaft angle based on the G signals and the actual crankshaft angle and the engine speed by the NE signals.

DTC No.	DTC Detecting Condition	Trouble Area
P0340	No camshaft position sensor signal to ECM during cranking (2 trip detection logic)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Starter • ECM
	No camshaft position sensor signal to ECM with engine speed 600 rpm or more	

WIRING DIAGRAM

Refer to DTC P0335 on page DI–191.

INSPECTION PROCEDURE

1	**Check resistance of camshaft position sensor (See page IG–1).**

Reference INSPECTION USING OSCILLOSCOPE

Refer to DTC P0335 on page DI–191.

NG → **Replace camshaft position sensor.**

OK ↓

2	**Check for open and short in harness and connector between ECM and camshaft position sensor (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK ↓

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3	**Inspect sensor installation.**

NG → **Tighten the sensor.**

OK

Check and replace ECM (See page IN–26).

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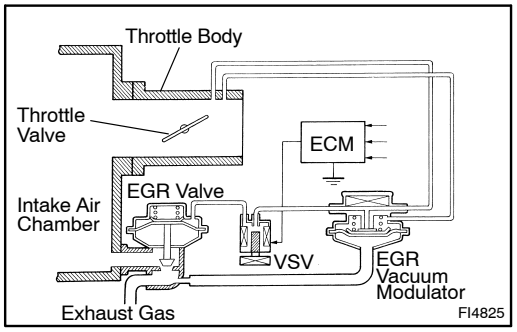
DI0UX–01

DTC	P0401	Exhaust Gas Recirculation Flow Insufficient Detected*

*: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

CIRCUIT DESCRIPTION

The EGR system recirculates exhaust gas which is controlled to the proper quantity to suit the driving conditions, into the intake air mixture to slow down combustion, reduce the combustion temp. and reduce NOx emissions. The amount of EGR is regulated by the EGR vacuum modulator according to the engine load.

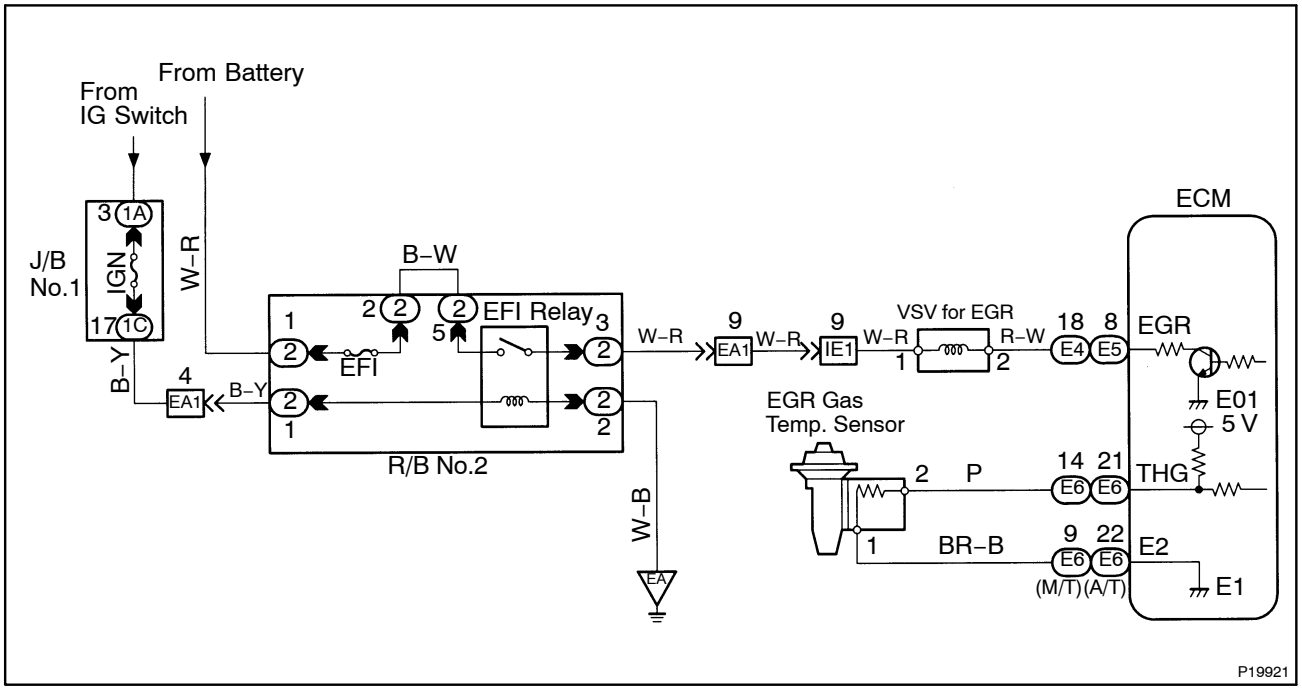


If even one of the following conditions is fulfilled, the VSV is turned ON by a signal from the ECM.
This results in atmospheric air acting on the EGR valve, closing the EGR valve and shutting off the exhaust gas (EGR cut–off).
Under the following conditions, EGR is cut to maintain driveability:

- Before the engine is warmed up
- During deceleration (throttle valve closed)
- Light engine load (amount of intake air very small)
- Engine racing

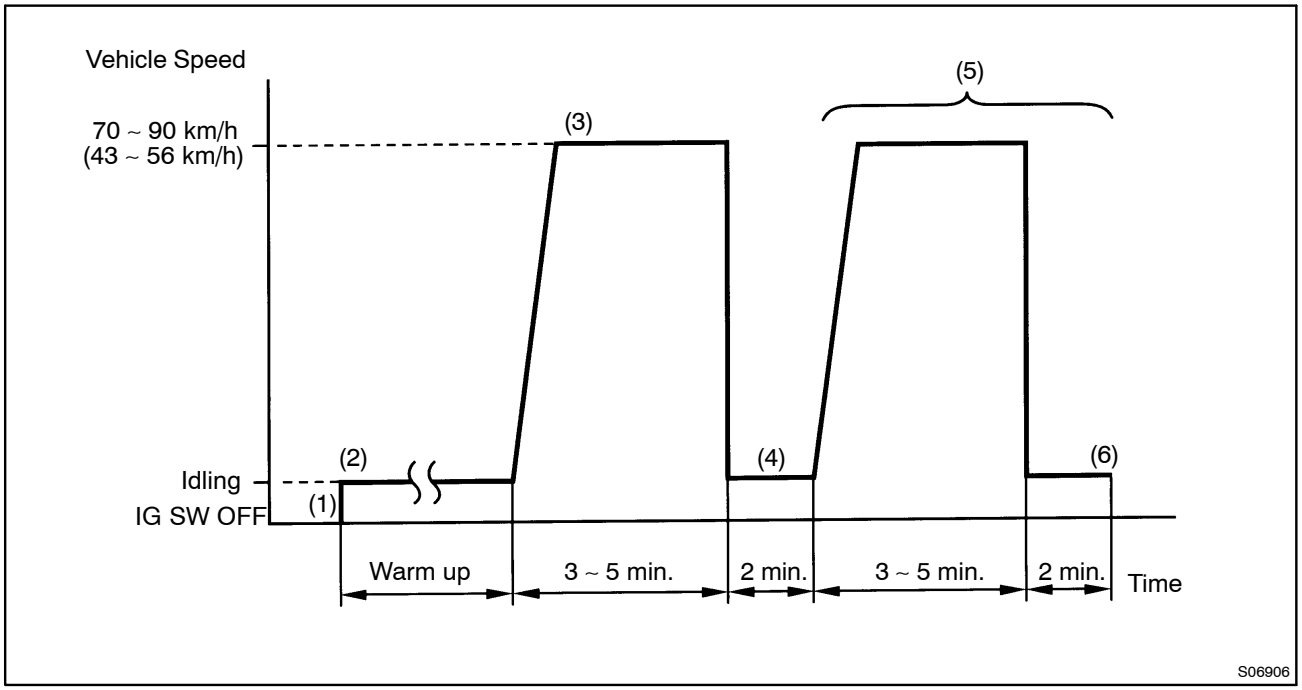
DTC No.	DTC Detecting Condition	Trouble Area
P0401	After engine is warmed up and run at 80 km/h (50 mph) for 3 to 5 min., EGR gas temp. sensor valve does not exceed 60°C (140°F) above ambient air temp. (2 trip detection logic)	• EGR valve stuck closed • Short in VSV circuit for EGR • Open in EGR gas temp. sensor circuit • EGR hose disconnected • ECM

WIRING DIAGRAM



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SYSTEM CHECK DRIVING PATTERN



(1) Connect the OBD II scan tool or TOYOTA hand–held tester to the DLC3.
(2) Start and warm up the engine with all the accessories switched OFF.
(3) Run the vehicle at 70 – 90 km/h (43 – 56 mph) for 3 min. or more.
(4) Idle the engine for about 2 min.
(5) Do steps (3) and (4) again.
(6) Check the ”READINESS TESTS” mode on the OBD II scan tool or TOYOTA hand–held tester.
If ”COMPL” is displayed and the MIL does not light up, the system is normal.
If ”INCMPL” is displayed and the MIL does not light up, run the vehicle step (5) from some time and check it.
HINT:
”INCMPL” is displayed when either condition (a) or (b) exists:
(a) The system check is incomplete.
(b) There is a malfunction in the system.
If there is a malfunction in the system, the MIL will light up after steps (2) to (5) above are done.

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INSPECTION PROCEDURE

TOYOTA hand–held tester:

1	**Connect TOYOTA hand–held tester and read value of EGR gas temp. value.**

PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.

CHECK:

Read EGR gas temp. on the TOYOTA hand–held tester.

OK:

EGR gas temp.: 10˚C (50˚F) or more

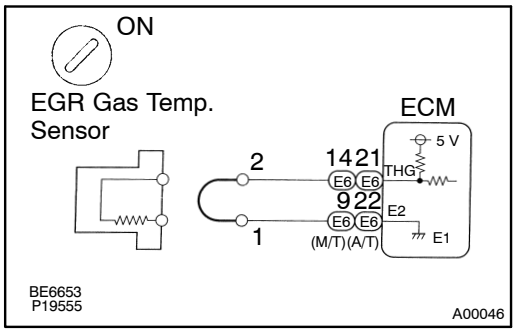
HINT:

If there is an open circuit, the TOYOTA hand–held tester indicates 3.1˚C (37.6˚F).

OK → **Go to step 4.**

NG

2	**Check for open in harness or ECM.**



PREPARATION:

(a) Disconnect the EGR gas temp. sensor connector.

(b) Connect the sensor wire harness terminals together.

(c) Turn the ignition switch ON.

CHECK:

Read EGR gas temp. on the TOYOTA hand–held tester.

OK:

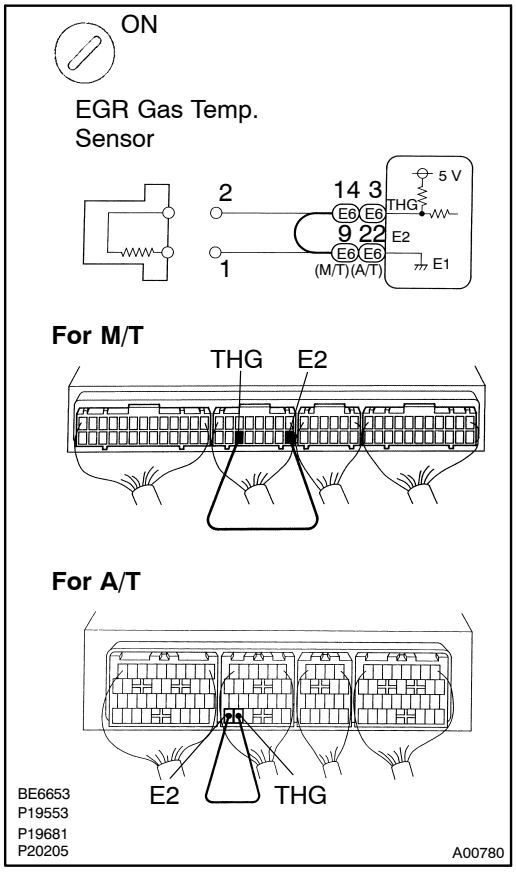
EGR gas temp.: 159˚C (318.2˚F)

OK → **Confirm good connection at sensor. If OK, replace EGR gas temp. sensor.**

NG

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3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–61).

(b) Connect between terminals THG and E2 of the ECM connector.

HINT:

The EGR gas temp. sensor connector is disconnected.

Before checking, do a visual check and contact pressure check for the ECM connector (See page IN–26).

CHECK:

Read EGR gas temp. on the TOYOTA hand–held tester.

OK:

EGR gas temp.: 159°C (318.2°F)

NG

Confirm connection at ECM.
If OK, replace ECM.

OK

Open in harness between terminals E2 or THG.
Repair or replace harness.

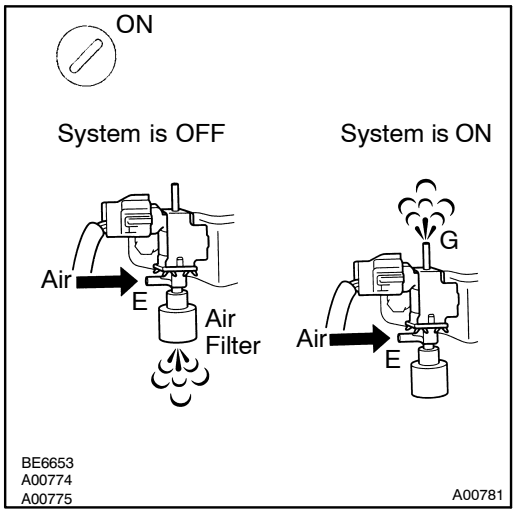
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4	**Check connection of vacuum hose and EGR hose (See page EC–9).**

NG → **Repair or replace.**

OK

5	**Check VSV for EGR.**



PREPARATION:
Select the "ACTIVE TEST" mode on the TOYOTA hand–held tester.

CHECK:
Check operation of VSV when it is operated by the TOYOTA hand–held tester.

OK:

EGR system is OFF:
Air flows from port E to the air filter.
EGR system is ON:
Air flows from port E to port G.

OK → **Go to step 7.**

NG

6	**Check operation of VSV for EGR (See page EC–9).**

NG → **Replace VSV for EGR.**

OK

Check for open in harness and connector between VSV and ECM (See page IN–26).

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7	**Check EGR vacuum modulator (See page EC–9).**

NG → **Repair or replace.**

OK

8	**Check EGR valve (See page EC–9).**

NG → **Repair or replace.**

OK

9	**Check value of EGR gas temp. sensor.**

PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
(c) Select the "ACTIVE TEST" mode on the TOYOTA hand–held tester (EGR system ON).
(d) Race the engine at 4,000 rpm for 3 min.

CHECK:

Measure EGR gas temp. while racing engine at 4,000 rpm.

OK:

EGR gas temp. after 3 min.: 140°C (284°F) or more

NG → **Replace EGR gas temp. sensor.**

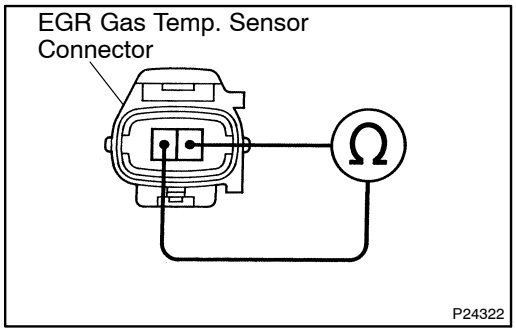
OK

Check and replace ECM (See page IN–26).

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OBD II scan tool (excluding TOYOTA hand–held tester):

1	**Check resistance of EGR gas temp. sensor.**

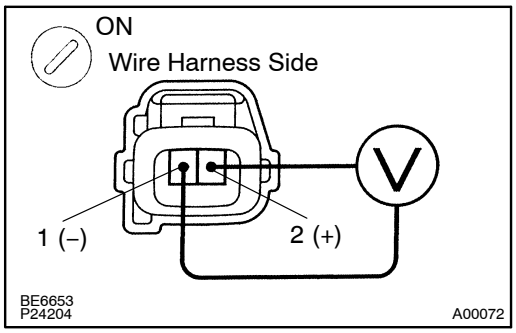


PREPARATION:
Disconnect the EGR gas temp. sensor connector.
CHECK:
Measure resistance between terminals of EGR gas temp. sensor connector.
OK:
Resistance: 600 kΩ or less
HINT:
If there is open circuit, ohmmeter indicates 720 kΩ or more.

NG	**Check and replace EGR gas temp. sensor (See page SF–59).**

OK

2	**Check for open in harness or ECM.**



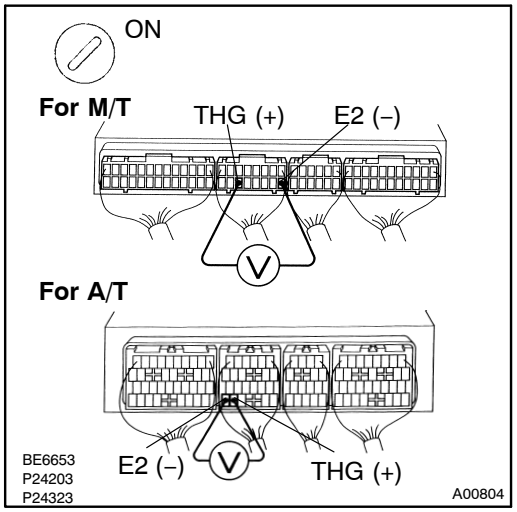
PREPARATION:
(a) Disconnect the EGR gas temp. sensor connector.
(b) Turn the ignition switch ON.
CHECK:
Measure voltage between terminals of EGR gas temp. sensor wire harness side connector.
OK:
4.5 – 5.5 V

OK	**Go to step 4.**

NG

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3	Check for open in harness or ECM.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–61).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals of THG and E2 of ECM connector.

HINT:

The EGR gas temp. sensor connector is disconnected.

OK:

4.5 – 5.5 V

OK	Open in harness between terminals E2 or THG. Repair or replace harness.

NG

Confirm connection at ECM.
If OK, replace ECM.

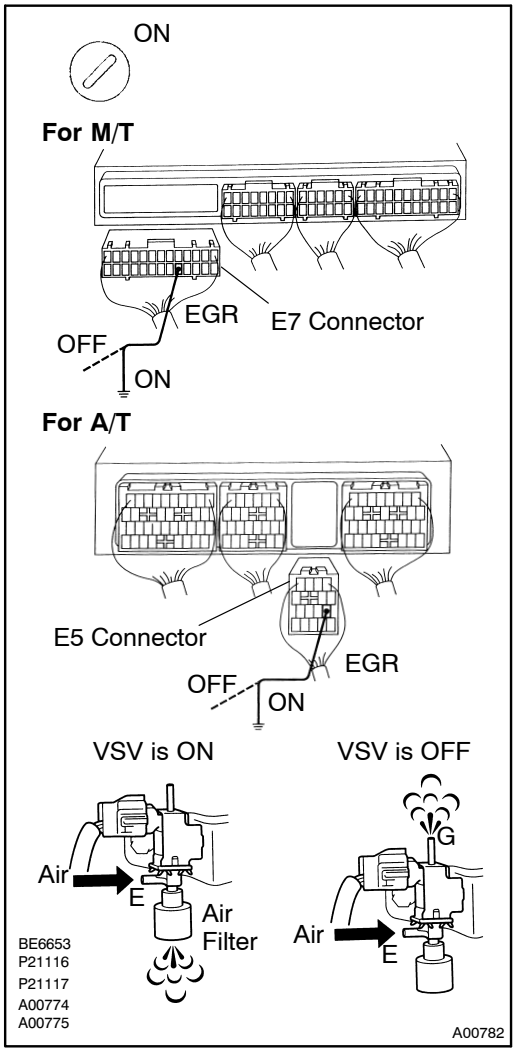
4	Check connection of vacuum hose and EGR hose (See page EC–2).

NG	Repair or replace.

OK

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5	Check VSV for EGR.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–61).
(b) Disconnect the E7 or E5 connector of the ECM.
(c) Turn the ignition switch ON.

CHECK:

Check VSV function:

(1) Connect between terminal EGR of ECM connector and body ground (ON).
(2) Disconnect between terminal EGR of ECM connector and body ground (OFF).

OK:

(1) VSV is ON:
Air flows from port E to the air filter.
(2) VSV is OFF:
Air flows from port E to port G.

OK	Go to step 7.

NG

6	Check operation for VSV for EGR (See page SF–49).

NG	Replace VSV for EGR.

OK

Check for open in harness and connector between R/B No.2 and ECM (See page EC–1).

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7	**Check EGR vacuum modulator (See page EC–9).**

NG → **Repair or replace.**

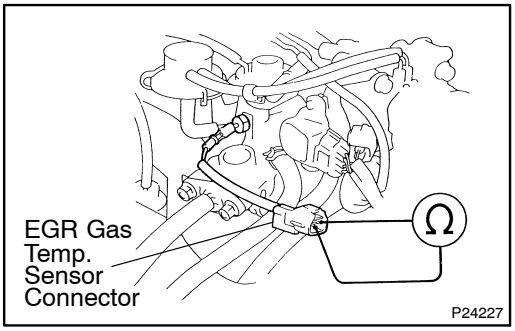
OK

8	**Check EGR valve (See page EC–9).**

NG → **Repair or replace.**

OK

9	**Check resistance of EGR gas temp. sensor.**



PREPARATION:

(a) Disconnect the EGR gas temp. sensor connector.
(b) Start the engine and warm it up.
(c) Disconnect the VSV connector for EGR.
(d) Race the engine at 4,000 rpm or 3 min.

CHECK:

Measure resistance of the EGR gas temp. sensor while racing the engine at 4,000 rpm.

OK:

Resistance of EGR gas temp. sensor after 3 min.: 4.3 kΩ or less

HINT:

Resistance: 188.6 ~ 439.0 kΩ at 20°C (68°F)

NG → **Replace EGR gas temp. sensor.**

OK

Check and replace ECM (See page IN–26).

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DI0UY–01

DTC	P0402	Exhaust Gas Recirculation Flow Excessive Detected*

*: Only for 2WD models with a load capacity of 0.5 ton and regular cab.

CIRCUIT DESCRIPTION

Refer to DTC P0401 on page DI–196.

DTC No.	Detection ItemDTC Detecting Condition	Trouble AreaTrouble Area
P0402	EGR gas temp. sensor value is high during EGR cut–off when engine is cold (Race engine at about 4,000 rpm without load so that vacuum is applied to port E) (2 trip detection logic)	• EGR valve stuck open • VSV for EGR open malfunction • Open in VSV circuit for EGR • Short in EGR gas temp. sensor circuit • ECM
P0402	EGR valve is always open (2 trip detection logic)	

WIRING DIAGRAM

Refer to DTC P0401 on page DI–196.

SYSTEM CHECK DRIVING PATTERN

Refer to DTC P0401 on page DI–196.

INSPECTION PROCEDURE

TOYOTA hand–held tester:

1	**Connect TOYOTA hand–held tester and read EGR gas temp. value.**

PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.

CHECK:

Read EGR gas temp. on the TOYOTA hand–held tester.

OK:

EGR gas temp.: 159°C (318.2°F) or less (Not immediately after driving)

HINT:

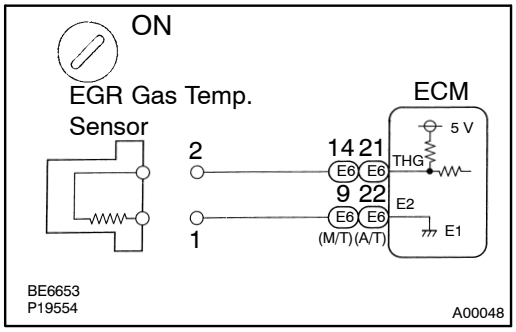
If there is a short circuit, the TOYOTA hand–held tester indicates 159.3°C (318.7°F).

OK → **Go to step 4.**

NG

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2	Check for short in harness and ECM.

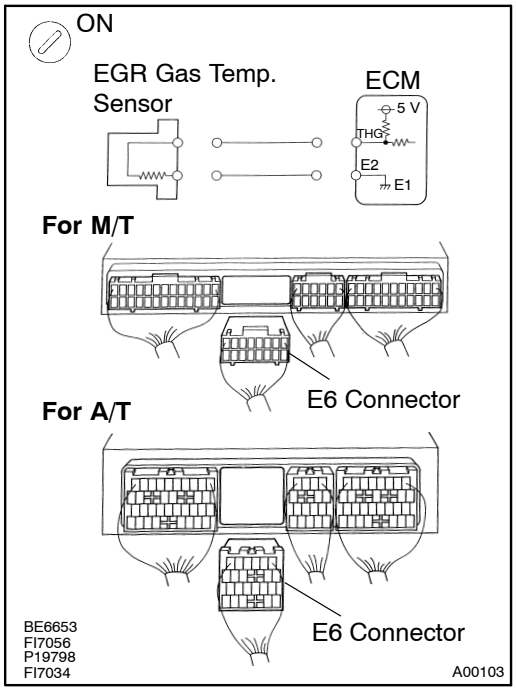


PREPARATION:
Disconnect the EGR gas temp. sensor connector.
CHECK:
Read EGR gas temp. on the TOYOTA hand–held tester.
OK:
EGR gas temp.: 3.1°C (37.6°F)

OK	Replace EGR gas temp. sensor.

NG

3	Check for short in harness or ECM.



PREPARATION:
(a) Remove the right cowl side trim (See page SF–61).
(b) Disconnect the E6 connector of ECM.
HINT:
The EGR gas temp. sensor is disconnected.
CHECK:
Read EGR gas temp. on the TOYOTA hand–held tester.
OK:
EGR gas temp.: 3.1°C (37.6°F)

OK	Repair or replace harness or connector.

NG

Check and replace ECM (See page IN–26).

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4	Check VSV for EGR (See page DI–196, step 5).

OK → Check EGR valve (See page EC–9).

NG

5	Check operation of VSV for EGR (See page SF–49).

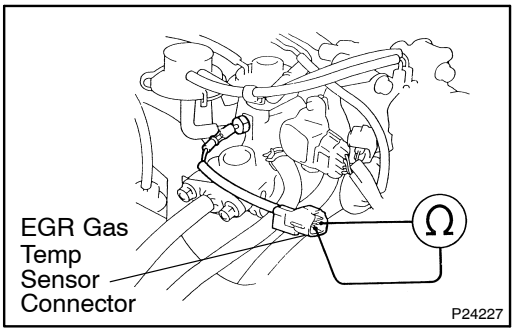
NG → Replace VSV for EGR.

OK

Check for short in harness and connector between VSV and ECM (See page IN–26).

OBD II scan tool (excluding TOYOTA hand–held tester):

1	Check resistance of EGR gas temp. sensor.



PREPARATION:
Disconnect the EGR gas temp. sensor connector.
CHECK:
Measure resistance between terminals of EGR gas temp. sensor connector.
OK:
Resistance: 2.5 kΩ or more
(Not immediately after driving)
HINT:
If there is short circuit, ohmmeter indicates 200 Ω or less.

NG → Replace EGR gas temp. sensor.

OK

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2	Check for short in harness and connector between EGR gas temp. sensor and ECM (See page IN–26).

NG → Repair or replace harness or connector.

OK ↓

3	Check VSV for EGR (See page DI–196, step 5).

OK → Check EGR valve (See page EC–9).

NG ↓

4	Check operation of VSV for EGR (See page SF–49).

NG → Replace VSV for EGR.

OK ↓

5	Check for short in harness and connector between VSV and ECM (See page IN–26).

NG → Repair or replace harness or connector.

OK ↓

Check and replace ECM (See page IN–26).

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DI0UZ–01

DTC	P0420	Catalyst System Efficiency Below Threshold

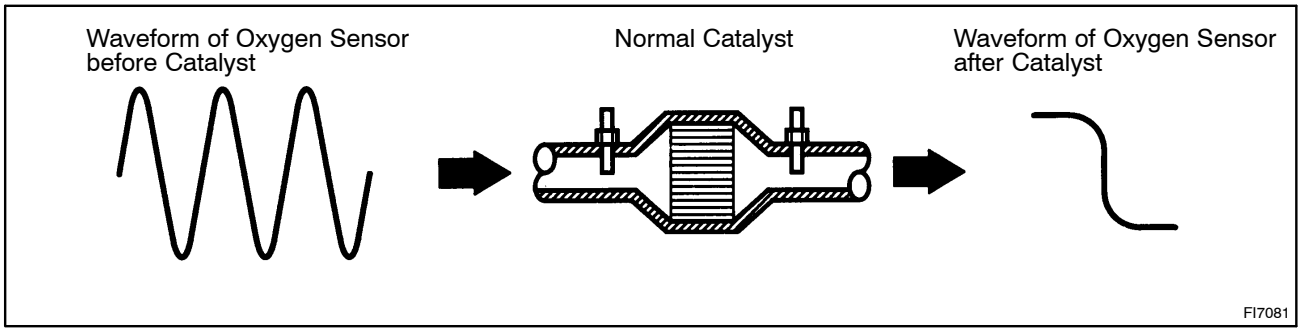
CIRCUIT DESCRIPTION

The ECM compares the waveform of the oxygen sensor located before the catalyst with the waveform of the oxygen sensor located after the catalyst to determine whether or not catalyst performance has deteriorated.

Air–fuel ratio feedback compensation keeps the waveform of the oxygen sensor before the catalyst repeatedly changing back and forth from rich to lean.

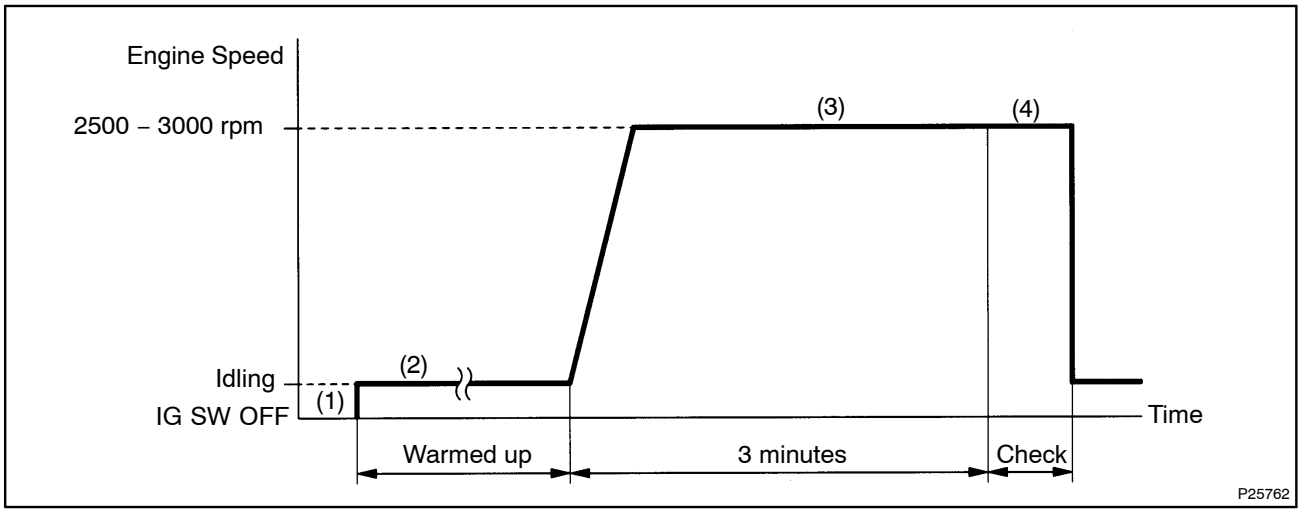
If the catalyst is functioning normally, the waveform of the oxygen sensor after the catalyst switches back and forth between rich and lean much more slowly than the waveform of the oxygen sensor before the catalyst.

But when both waveforms change at a similar rate, it indicates that catalyst performance has deteriorated.



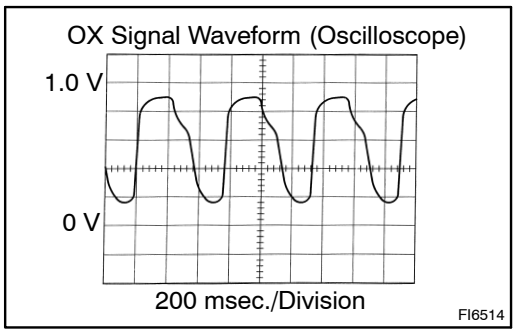
DTC No.	DTC Detecting Condition	Trouble Area
P0420	After engine and catalyst are warmed up, and while vehicle is driven within set vehicle and engine speed range, waveforms of heated oxygen sensors (bank 1 sensor 1, 2) have same amplitude (2 trip detection logic)	• Three–way catalytic converter • Open or short in heated oxygen sensor (bank 1 sensor 1, 2) circuit • Heated oxygen sensor (bank 1 sensor 1, 2)

CONFIRMATION ENGINE RACING PATTERN



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(1) Connect the TOYOTA hand–held tester to the DLC3, or connect the probe of the oscilloscope between terminals OX1, OX2 and E1 of ECM.
(2) Start engine and warm it up with all accessories switched OFF until water temp. is stable.
(3) Race the engine at 2500 – 3000 rpm for about 3 min.
(4) After confirming that the waveform of the heated oxygen sensor, bank 1 sensor 1 (OX1), oscillate around 0.5 V during feedback to the ECM, check the waveform of the heated oxygen sensor bank 1 sensor 2 (OX2).



HINT:
If there is a malfunction in the system, the waveform of the heated oxygen sensor bank 1 sensor 2 (OX2) is almost the same as that of the heated oxygen sensor bank 1 sensor 1 (OX1) on the left.
There are some cases where, even though a malfunction exists, the MIL may either light up or not light up.

INSPECTION PROCEDURE

1	**Are there any other codes (besides DTC P0420) being output?**

YES → **Go to relevant DTC chart.**

NO

2	**Check heated oxygen sensor (bank 1 sensor 1) (See page DI–172).**

NG → **Repair or replace.**

OK

3	**Check heated oxygen sensor (bank 1 sensor 2) (See page DI–178).**

NG → **Repair or replace.**

OK

Replace center exhaust pipe (TWC: catalyst) (See page EM–108).

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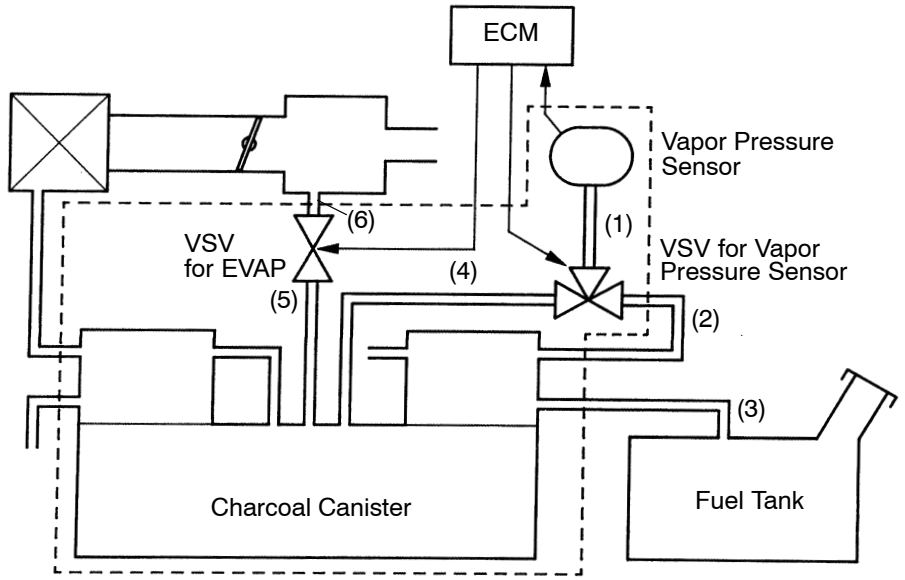
DI9AE–01

DTC	P0441	Evaporative Emission Control System Incorrect Purge Flow

CIRCUIT DESCRIPTION

The vapor pressure sensor and VSV for vapor pressure sensor are used to detect abnormalities in the evaporative emission control system.
The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.
DTCs P0441 and P0446 are recorded by the ECM when evaporative emissions leak from the components within the dotted line in fig. 1 below, or when there is a malfunction in either the VSV for EVAP, the VSV for vapor pressure sensor, or in the vapor pressure sensor itself.

fig. 1

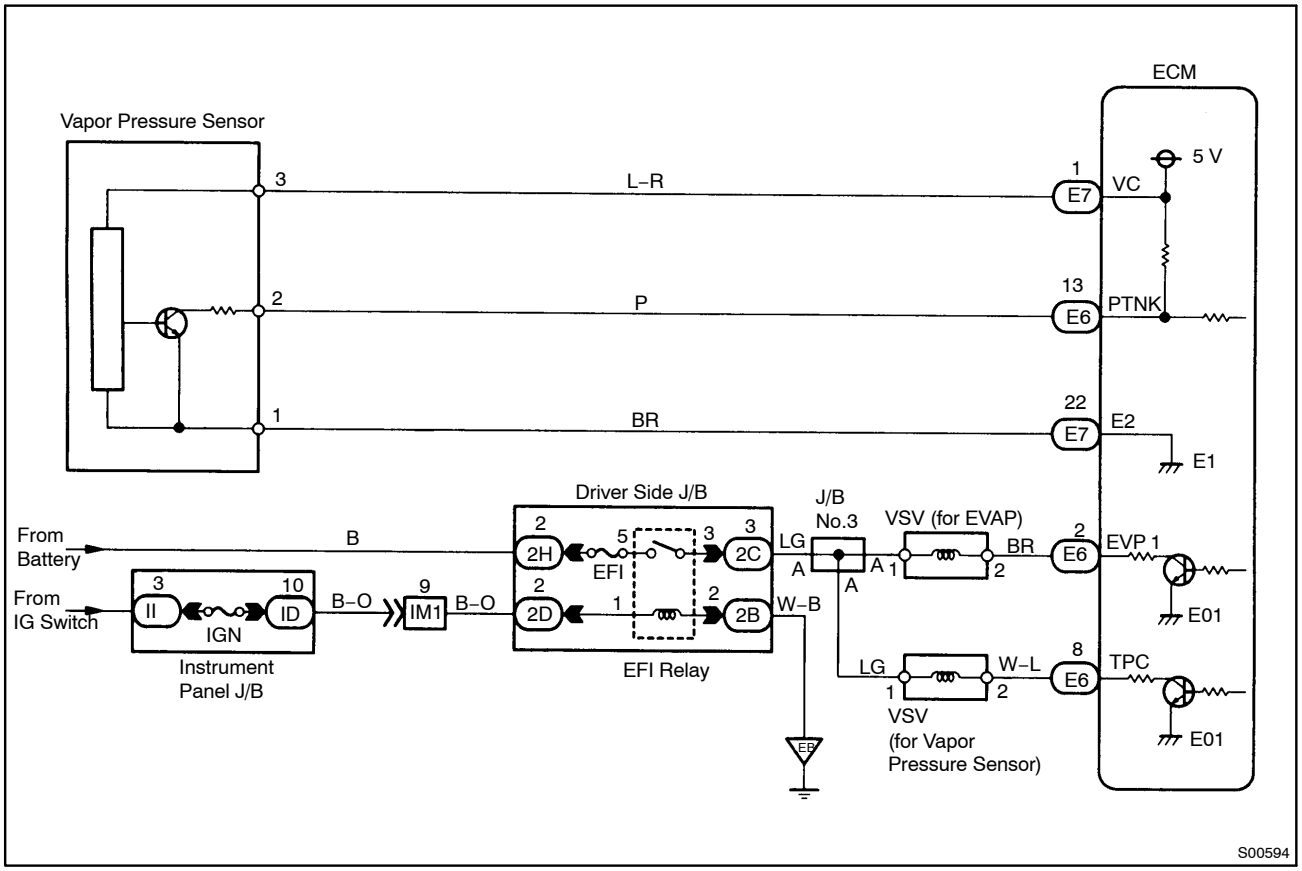


S00044

DTC No.	DTC Detecting Condition	Trouble Area
P0441	Pressure in charcoal canister does not drop during purge control (2 trip detection logic)	• Open or short in VSV circuit for EVAP • Open or short in VSV circuit for vapor pressure sensor • Open or short in vapor pressure sensor circuit • VSV for EVAP • VSV for vapor pressure sensor • Vapor pressure sensor • Vacuum hose cracks, holed blocked, damaged or disconnected ((1), (4), (5) and (6) in fig. 1) • Charcoal canister cracks, holed or damaged
	During purge cut–off, pressure in charcoal canister is very low compared with atmospheric pressure (2 trip detection logic)	

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WIRING DIAGRAM



INSPECTION PROCEDURE

TOYOTA hand–held tester:

1	**Check VSV connector for EVAP, VSV connector for vapor pressure sensor and vapor pressure sensor connector for looseness and disconnection.**

NG → **Repair or connect VSV or sensor connector.**

OK

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2	**Check vacuum hose between throttle body and VSV for EVAP, VSV for EVAP and charcoal canister, charcoal canister and VSV for vapor pressure sensor, VSV for vapor pressure sensor and vapor pressure sensor.**

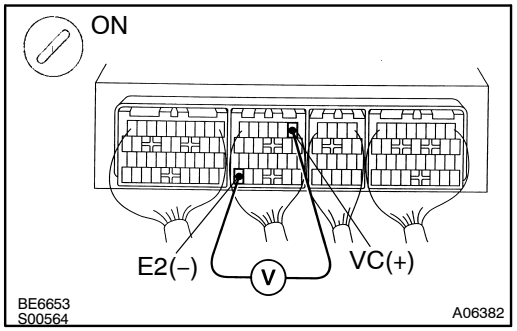
CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole, damage and blockage.

NG → **Repair or replace.**

OK

3	**Check voltage between terminals VCC and E2 of ECM connector.**



PREPARATION:

(a) Remove the glove compartment (See page SF–61).
(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals VC and E2 of ECM connector.

OK:

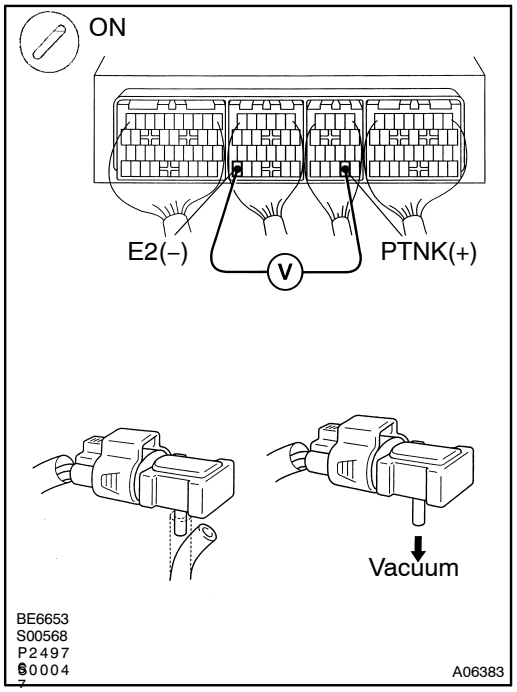
Voltage: 4.5 – 5.5 V

NG → **Check and replace ECM (See page IN–26).**

OK

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4	**Check voltage between terminals PTNK and E2 of ECM connector.**



PREPARATION:

(a) Remove the glove compartment (See page SF–61).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals PTNK and E2 of ECM connector.

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum to the vapor pressure sensor.

NOTICE:

The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in. Hg).

OK:

(1) Voltage: 2.9 – 3.7 V

(2) Voltage: 0.5 V or less

OK	**Go to step 6.**

NG

5	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–26).**

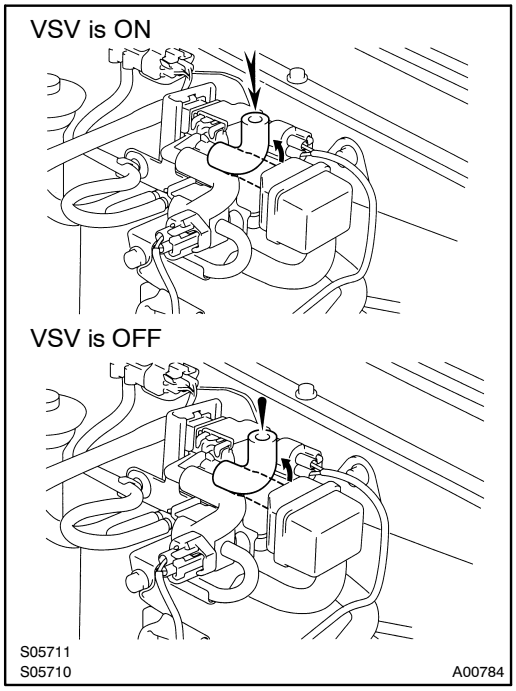
NG	**Repair or replace harness or connector.**

OK

Replace vapor pressure sensor.

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6	Check the purge flow.



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Select the "ACTIVE TEST" mode on the TOYOTA hand–held tester.
(c) Disconnect the VSV vacuum hose for EVAP from the charcoal canister.
(d) Start the engine.

CHECK:

When the VSV for the EVAP is operated by the TOYOTA hand–held tester, check whether the disconnected hose applies suction to your finger.

OK:

VSV is ON:
Disconnected hose applies suction to your finger.
VSV is OFF:
Disconnected hose applies no suction to your finger.

OK	Go to step 10.

NG

7	Check vacuum hose between throttle body and VSV for EVAP, VSV for EVAP and charcoal canister.

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole, damage and blockage.

NG	Repair or replace.

OK

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8	Check operation of VSV for EVAP (See page SF–50).

NG → Replace VSV.

OK

9	Check for open and short in harness and connector between EFI main relay (Marking: EFI), VSV for EVAP and ECM (See page IN–26).

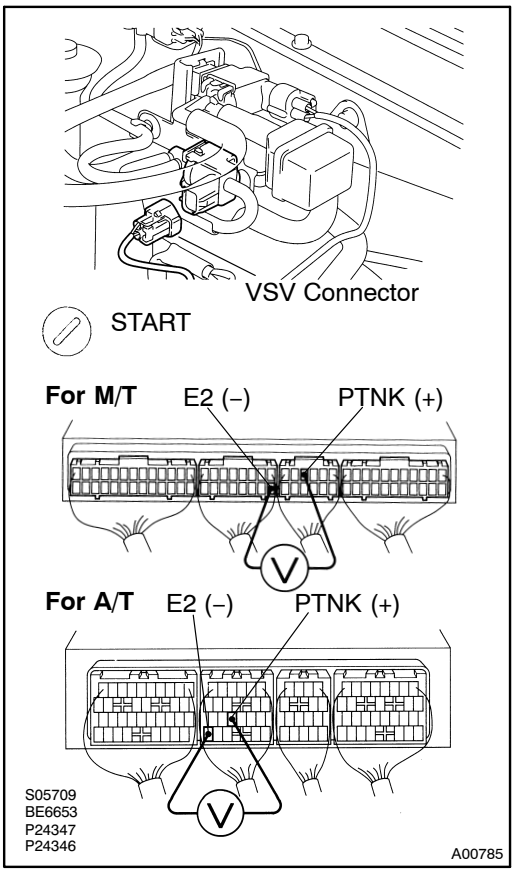
NG → Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–26).

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10	**Connect TOYOTA hand–held tester, when VSV connector for vapor pressure sensor is disconnected and VSV for EVAP is ON, measure voltage between terminals PTNK and E2 of ECM connector.**



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Disconnect the VSV connector for the vapor pressure sensor.
(c) Select the "ACTIVE TEST" mode on the TOYOTA hand–held tester.
(d) Start the engine.

CHECK:

Measure voltage between terminals PTNK and E2 of ECM connector, when VSV for EVAP is ON, using the TOYOTA hand–held tester.

OK:

Voltage: 2.0 V or less

OK	**Go to step 13.**

NG

11	**Check vacuum hose between charcoal canister and VSV for vapor pressure sensor, vapor pressure sensor and VSV for vapor pressure sensor.**

CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole, damage and blockage.

NG	**Repair or replace.**

OK

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12	Check operation of VSV for vapor pressure sensor (See page SF–50).

NG → Replace VSV.

OK

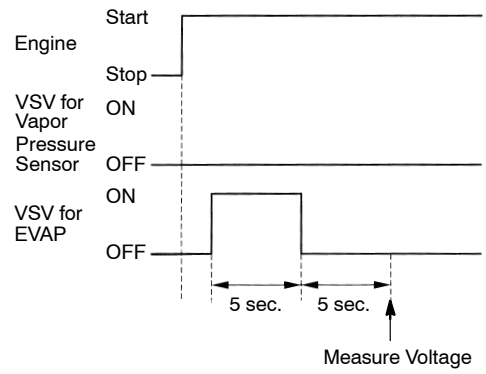
13	Check for open and short in harness and connector between EFI main relay (Marking: EFI), VSV for vapor pressure sensor and ECM (See page IN–26).

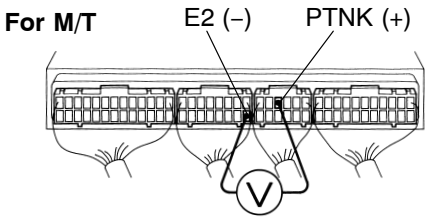
NG → Repair or replace harness or connector.

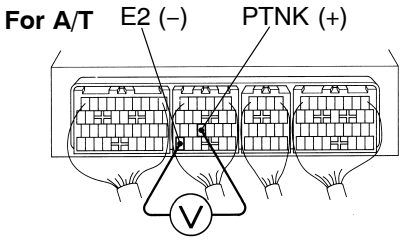
OK

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14	Check charcoal canister.







S00049
P24347
P24346

A00117

PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Remove the fuel tank cap.
(c) Disconnect the VSV connector for the vapor pressure sensor.
(d) Select the "ACTIVE TEST" mode on the TOYOTA hand–held tester.
(e) Start the engine.
(f) The VSV for the EVAP is ON by the TOYOTA hand–held tester and remains on for 5 sec.

CHECK:

Measure voltage between terminals PTNK and E2 of ECM connector 5 sec. after switching VSV for EVAP from ON to OFF.

OK:

Voltage: 2.5 V or less

NG → **Replace charcoal canister.**

OK

Check and replace ECM (See page IN–26).

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OBD II scan tool (excluding TOYOTA hand–held tester):

1	**Check VSV connector for EVAP, VSV connector for vapor pressure sensor and vapor pressure sensor connector for looseness and disconnection.**

NG → **Repair or connect VSV or sensor connectors.**

OK

2	**Check vacuum hoses between throttle body and VSV for EVAP, VSV for EVAP and charcoal canister, charcoal canister and VSV for vapor pressure sensor, VSV for vapor pressure sensor and vapor pressure sensor.**

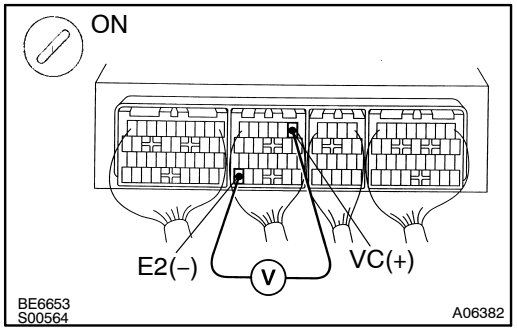
CHECK:

(a) Check that the vacuum hose is connected correctly.
(b) Check the vacuum hose for looseness and disconnection.
(c) Check the vacuum hose for cracks, hole, damage and blockage.

NG → **Repair or replace.**

OK

3	**Check voltage between terminals VCC and E2 of ECM connector.**



PREPARATION:

(a) Remove the glove compartment (See page SF–61).
(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals VC and E2 of ECM connector.

OK:

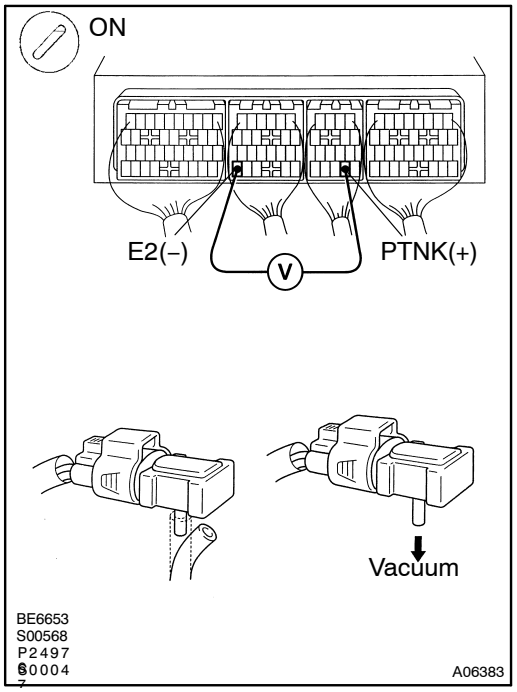
Voltage: 4.5 – 5.5 V

NG → **Check and replace ECM (See page IN–26).**

OK

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4	**Check voltage between terminals PTNK and E2 of ECM connector.**



PREPARATION:

(a) Remove the glove compartment (See page SF–61).

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals PTNK and E2 of ECM connector.

(1) Disconnect the vacuum hose from the vapor pressure sensor.

(2) Using the MITYVAC (Hand–Held Vacuum Pump), apply a vacuum to the vapor pressure sensor.

NOTICE:

The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in. Hg).

OK:

(1) Voltage: 2.9 – 3.7 V

(2) Voltage: 0.5 V or less

OK	**Go to step 6.**

NG

5	**Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN–26).**

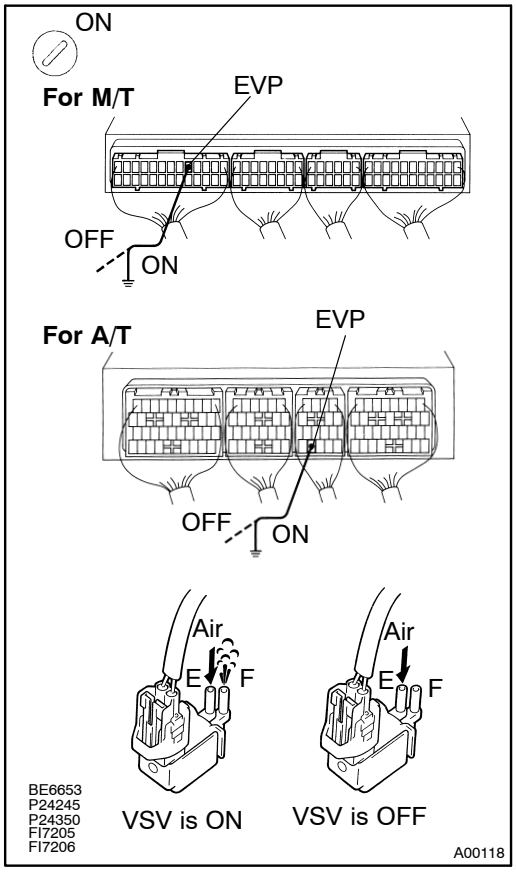
NG	**Repair or replace harness or connector.**

OK

Replace vapor pressure sensor.

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6	Check VSV for EVAP.



BE6653
P24245
P24350
FI7205
FI7206

PREPARATION:

(a) Remove the right cowl side trim (See page SF–61).

(b) Turn the ignition switch ON.

CHECK:

Check VSV function.

(1) Connect between terminal EVP of ECM and body ground.

(2) Disconnect between terminal EVP of ECM and body ground.

OK:

(1) VSV is ON:
Air flows from port E to port F.
(2) VSV is OFF:
Air does not flow from port E to port F.

OK	Go to step 9.

NG

7	Check operation of VSV for EVAP (See page SF–50).

NG	Replace VSV.

OK

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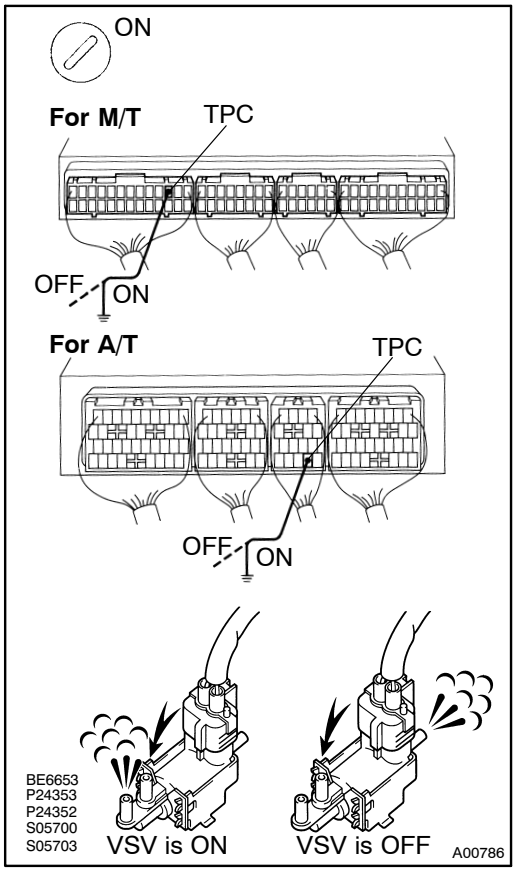
8	**Check for open and short in harness and connector between EFI main relay (Marking: EFI), VSV for EVAP and ECM (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page IN–26).

9	**Check VSV for vapor pressure sensor.**



PREPARATION:

(a) Remove the right cowl side trim (See page SF–61).

(b) Turn the ignition switch ON.

CHECK:

Check VSV function.

(1) Connect between terminal TPC of ECM and body ground (ON).

(2) Disconnect between terminal TPC of ECM and body ground (OFF).

OK:

(1) VSV is ON:
Air flows from port E to port F.
(2) VSV is OFF:
Air flows from port E to port G.

OK → **Check and replace charcoal canister (See page EC–1).**

NG

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10	Check operation of VSV for vapor pressure sensor.

NG → Replace VSV.

OK

11	Check for open and short in harness and connector between EFI main relay (Marking: EFI), VSV for vapor pressure sensor and ECM (See page IN–26).

NG → Repair or replace harness or connector.

OK

Check and replace ECM (See page IN–26).

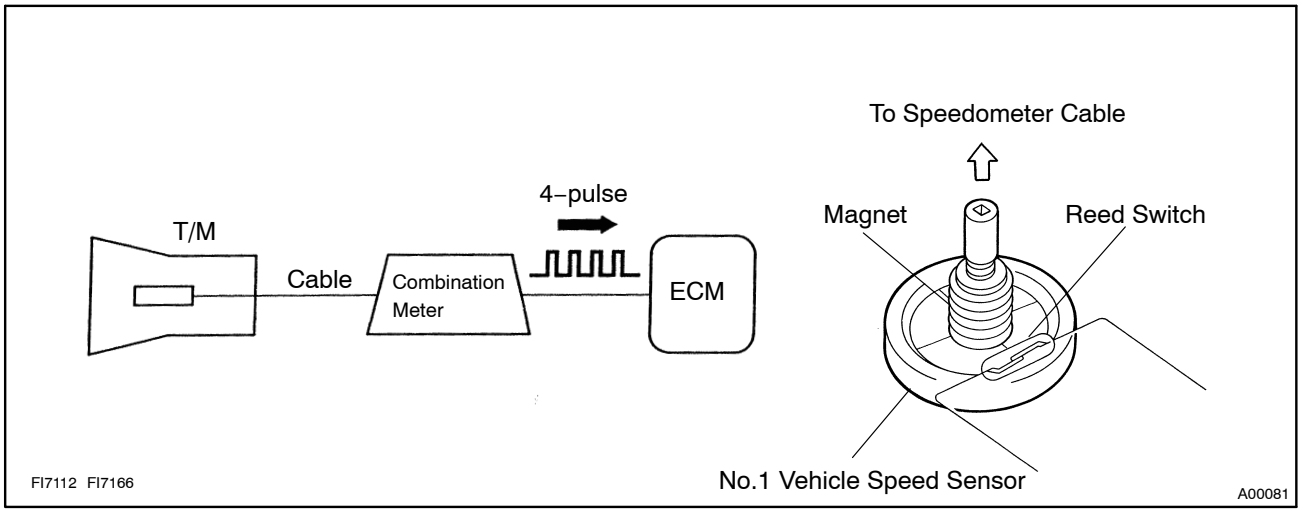
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DI0V3–01

DTC	P0500	Vehicle Speed Sensor Malfunction

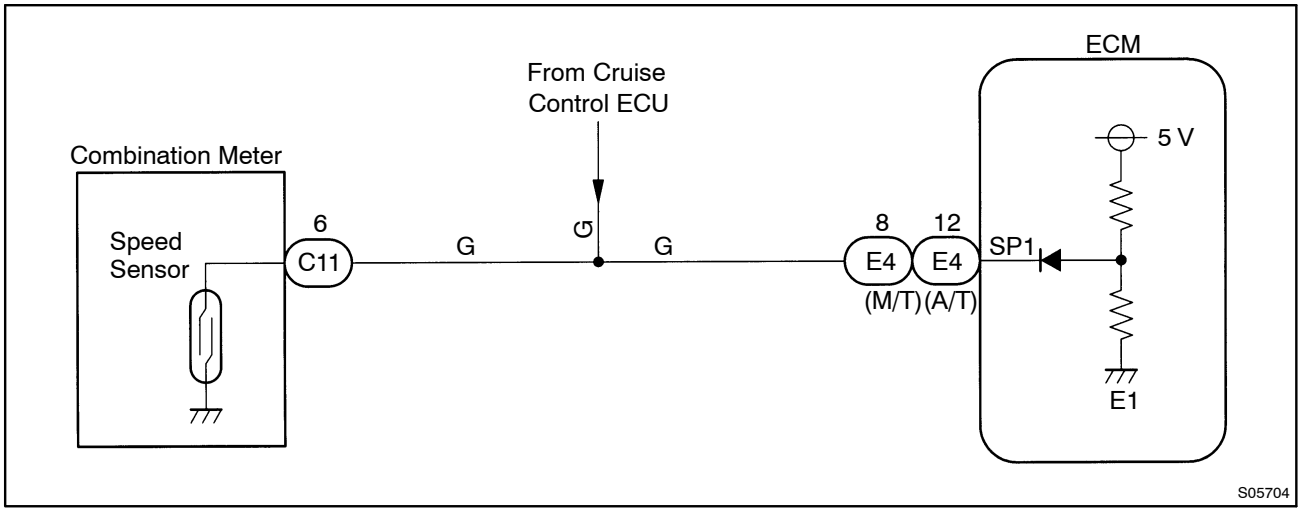
CIRCUIT DESCRIPTION

This sensor is mounted in the combination meter. It contains a magnet which is rotated by the speed meter cable.
Turning the reed switch ON and OFF 4 times for every revolution of the speedmeter.
It is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.



DTC No.	DTC Detecting Condition	Trouble Area
P0500	No speed sensor signal to ECM under conditions (a) (2 trip detection logic) (a) Vehicle is being driven	• Open or short in No.1 vehicle speed sensor circuit • No.1 vehicle speed sensor • ECM • Speedometer cable

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check operation of speedometer.**

CHECK:

Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.

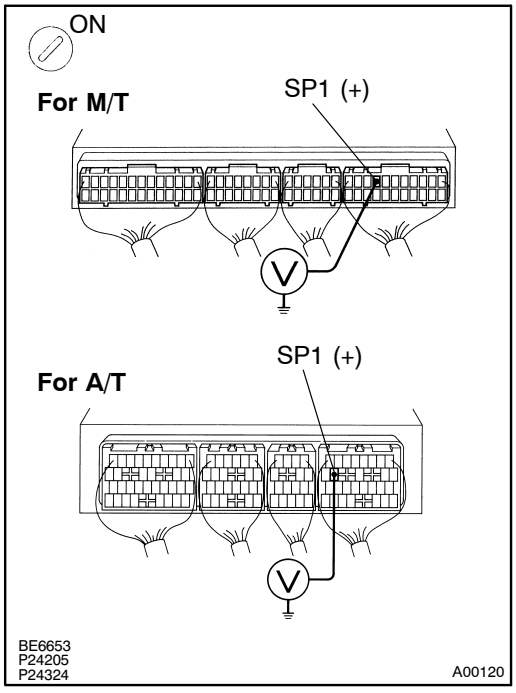
HINT:

The vehicle speed is operating normally if the speedometer display is normal.

NG → **Check speedometer and cable (See page BE–38).**

OK

2	**Check voltage between terminal SP1 of ECM connector and body ground.**



PREPARATION:

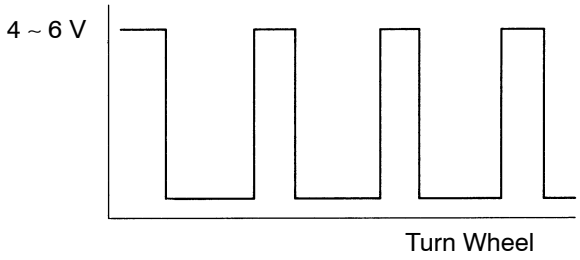
(a) Remove the right cowl side trim (See page SF–61).
(b) Disconnect the cruise control ECU connector.
(c) Shift the shift lever to neutral.
(d) Jack up the rear wheel on one side.
(e) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal SP1 of ECM connector and body ground when the wheel is turned slowly.

OK:

Voltage is generated intermittently.



NG → **Check and repair harness and connector between combination meter and ECM.**

OK

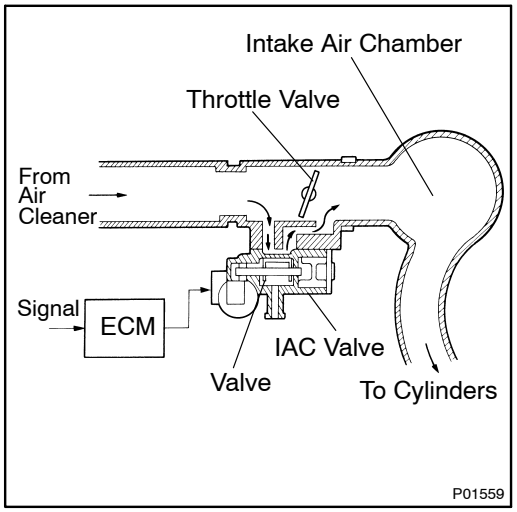
Check and replace ECM (See page IN–26).

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DI0V4–01

DTC	P0505	Idle Control System Malfunction

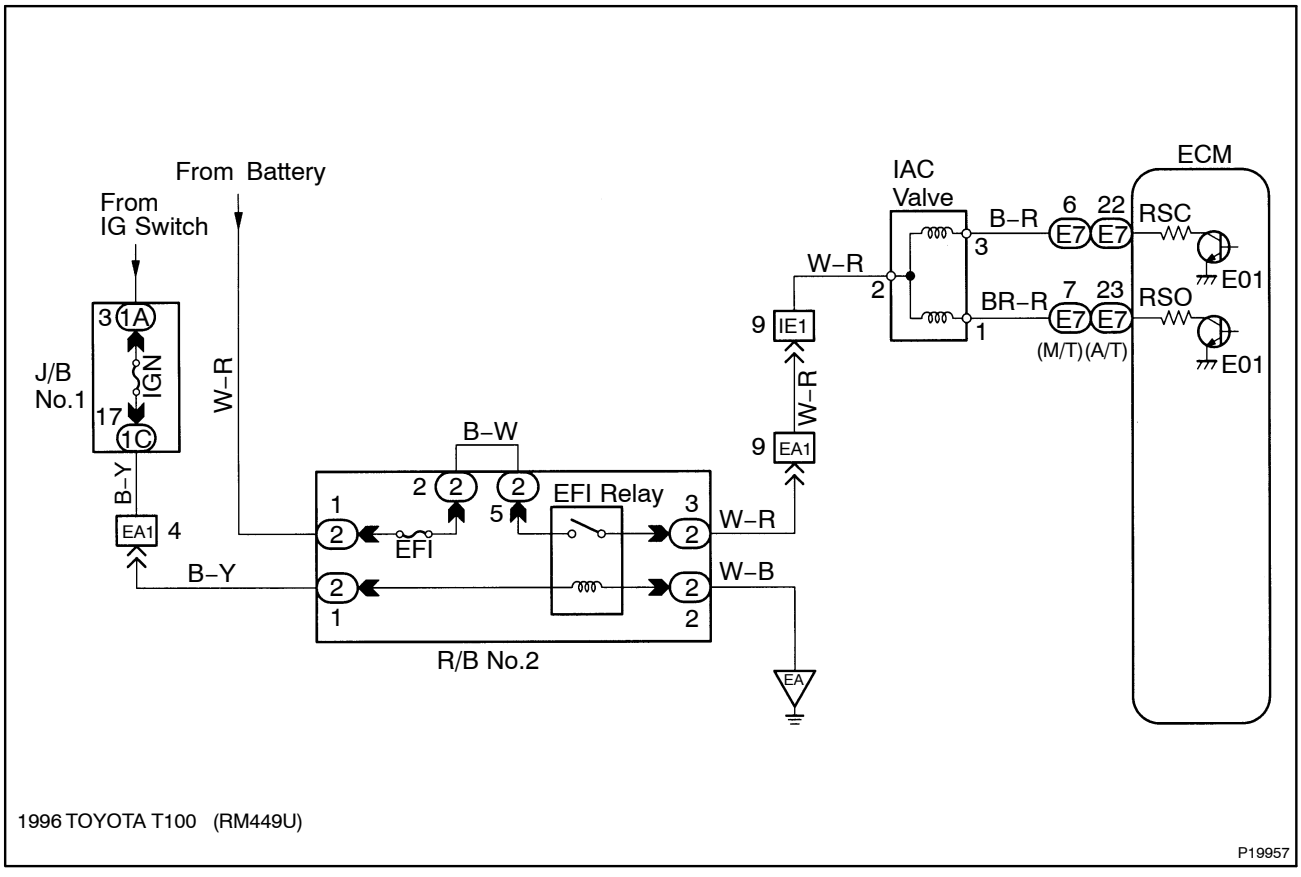
CIRCUIT DESCRIPTION



The rotary solenoid type IAC valve is located in front of the intake air chamber and intake air bypassing the throttle valve is directed to the IAC valve through a passage.
In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed.
The ECM operates only the IAC valve to perform idle–up and provide feedback for the target idling speed and a VSV for idle–up control is also added (for air conditioning).

DTC No.	DTC Detecting Condition	Trouble Area
P0505	Idle speed continues to vary greatly from target speed (2 trip detection logic)	• IAC valve is stuck or closed • Open or short in IAC valve circuit • Open or short in A/C signal circuit • Air intake (hose loose)

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check air induction system (See page SF–1).**

NG → **Repair or replace.**

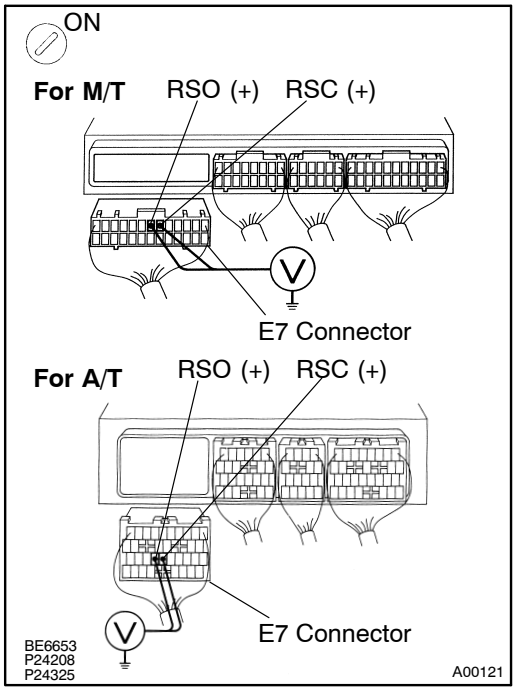
OK

2	**Check A/C signal circuit (See page AC–79).**

NG → **Repair or replace.**

OK

3	**Check voltage terminals RSO and RSC of ECM connector and body ground.**



PREPARATION:

(a) Remove the right cowl side trim (See page SF–61).
(b) Disconnect the E7 connector of ECM.
(c) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals RSO and RSC of the ECM connector and body ground.

OK:

Voltage: 9 – 14 V

OK → **Go to step 5.**

NG

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4	Check IAC valve (See page SF–39).

NG → Replace IAC valve.

OK

Check for open and short in harness and connector between R/B No.2 and IAC valve, IAC valve and ECM (See page IN–26).

5	Check operation of the IAC valve (See page SF–43).

NG → Repair or replace IAC valve.

OK

Check and replace ECM (See page IN–26).

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DI9AF–01

DTC	P0510	Closed Throttle Position Switch Malfunction

CIRCUIT DESCRIPTION

Refer to Throttle/ Pedal Position Sensor/ Switch ”A” Circuit Malfunction on page DI–163.

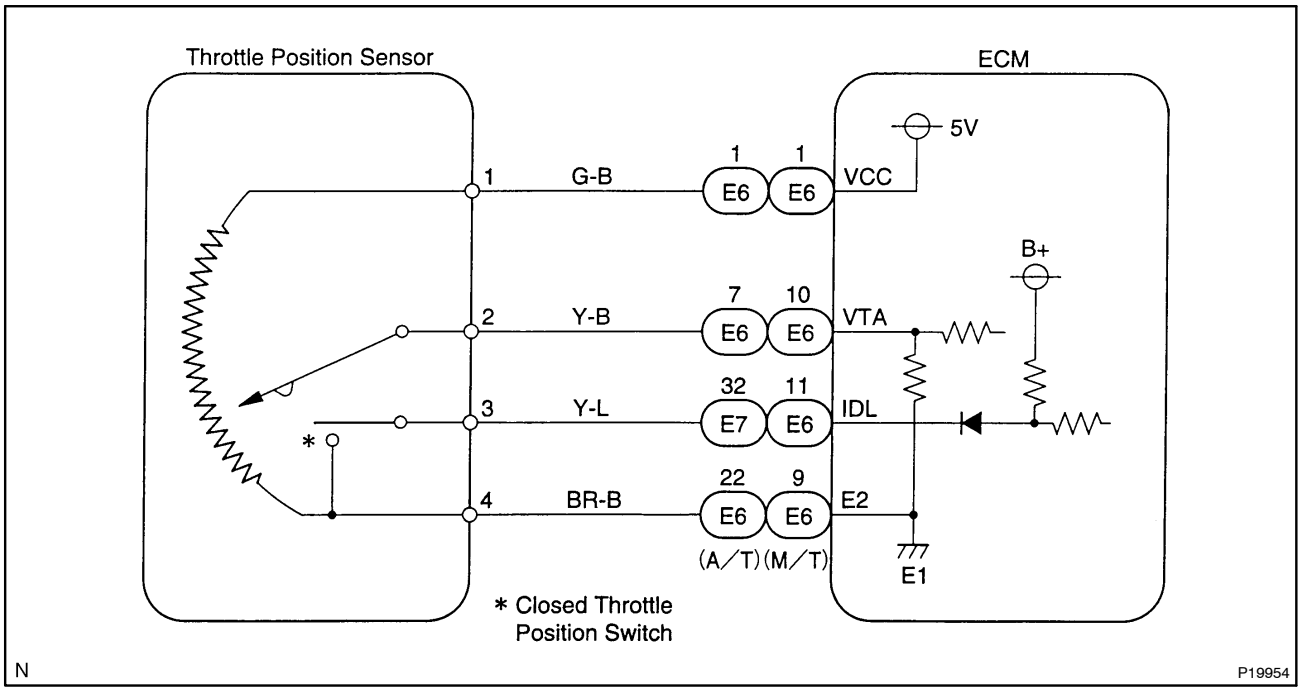
DTC No.	DTC Detecting Condition	Trouble Area
P0510	The closed throttle position switch does not turn ON even once when the vehicle is driven (2 trip detection logic)	• Open in closed throttle position switch circuit • Closed throttle position switch • ECM

HINT:

After confirming DTC P0510 use the TOYOTA hand–held tester to confirm the closed throttle position switch signal from ”CURRENT DATA”.

Throttle Valve	Closed throttle position Switch Signal	Malfunction
Fully Closed	OFF	Open Circuit
Fully Open	ON	Short Circuit

WIRING DIAGRAM



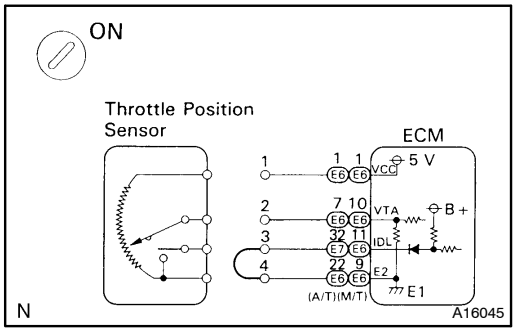
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INSPECTION PROCEDURE

HINT:
If DTC ”P0110” (intake air temp. circuit malfunction), ”P0115” (engine coolant temp. circuit malfunction) and ”P0120” (throttle/pedal position sensor/ switch ”A” circuit malfunction) are output simultaneously, E2 (sensor ground) may be open.

TOYOTA hand–held tester:

1	**Check for open in harness or ECM.**



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Disconnect the throttle position sensor connector.
(c) Connect sensor wire harness terminals between terminals 3 and 4.
(d) Turn ignition switch ON.

CHECK:

Read CTP switch signal on the TOYOTA hand–held tester.

OK:

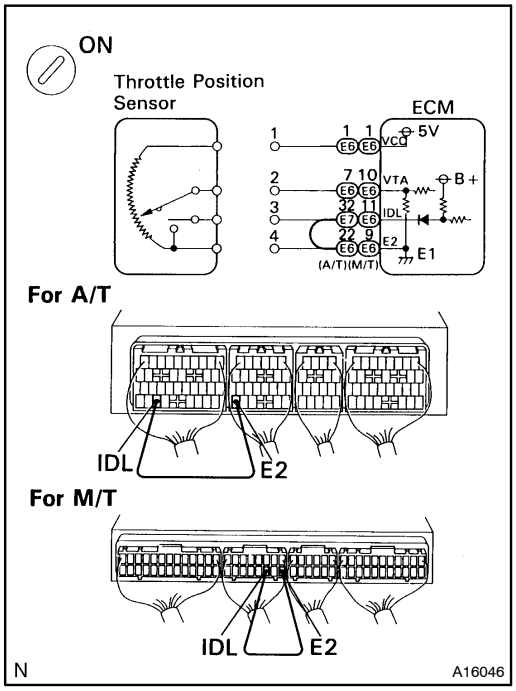
CTP switch signal: ON

OK	**Confirm good connection at sensor. If OK, replace throttle position sensor.**

NG

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2	Check for open in harness or ECM.



PREPARATION:

(a) Remove right cowl side trim.

(b) Connect between terminals IDL and E2 of ECM connectors.

HINT:

Throttle position sensor connector is disconnected. Before checking, do a visual check and contact pressure check for the connector.

(c) Turn ignition switch ON.

CHECK:

Read CTP switch signal on the TOYOTA hand–held tester.

OK:

CTP switch signal: ON

OK → **Open in harness between ECM and throttle position sensor, repair or replace harness.**

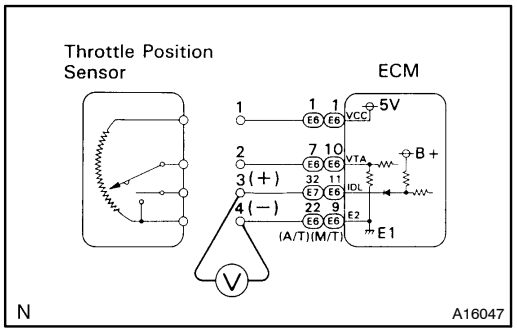
NG

Confirm connection at ECM. If OK, replace ECM.

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OBDII scan tool (excluding TOYOTA hand–held tester):

1	**Check for open in harness or ECM**



PREPARATION:

(a) Disconnect the throttle position sensor connector.

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals 3 and 4 of throttle position sensor connector.

OK:

Voltage: 9 – 14 V

OK	**Confirm good connection at sensor. If OK, replace throttle position sensor.**

NG

2	**Check for open in harness and connector between throttle position sensor and ECM (See page IN–26).**

NG	**Open in harness between ECM and throttle position sensor.**

OK

Confirm connection at ECM. If OK, replace ECM.

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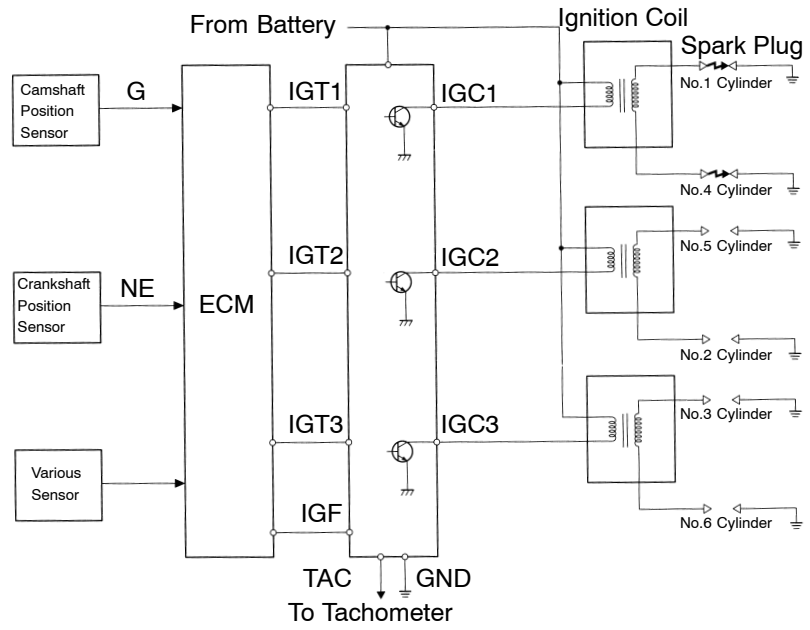
DI0V5–01

DTC	P1300	Igniter Circuit Malfunction

CIRCUIT DESCRIPTION

A DIS (Direct Ignition System) has been adopted. The DIS improves the ignition timing accuracy, reduces high–voltage loss, and enhances the overall reliability of the ignition system by eliminating the distributor. The DIS is a 2–cylinder simultaneous ignition system which ignites 2 cylinders simultaneously with one ignition coil. In the 2–cylinder simultaneous ignition system, each of the 2 spark plugs is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the spark plugs. The sparks of the 2 spark plugs pass simultaneously from the center electrode to the ground electrode.

The ECM determines ignition timing end outputs the ignition signals (IGT) for each cylinder. Based on IGT signals, the igniter controls the primary ignition signals (IGC) for all ignition coils. At the same time, the igniter also sends an ignition confirmation signal (IGF) as a fail–safe measure to the ECM.

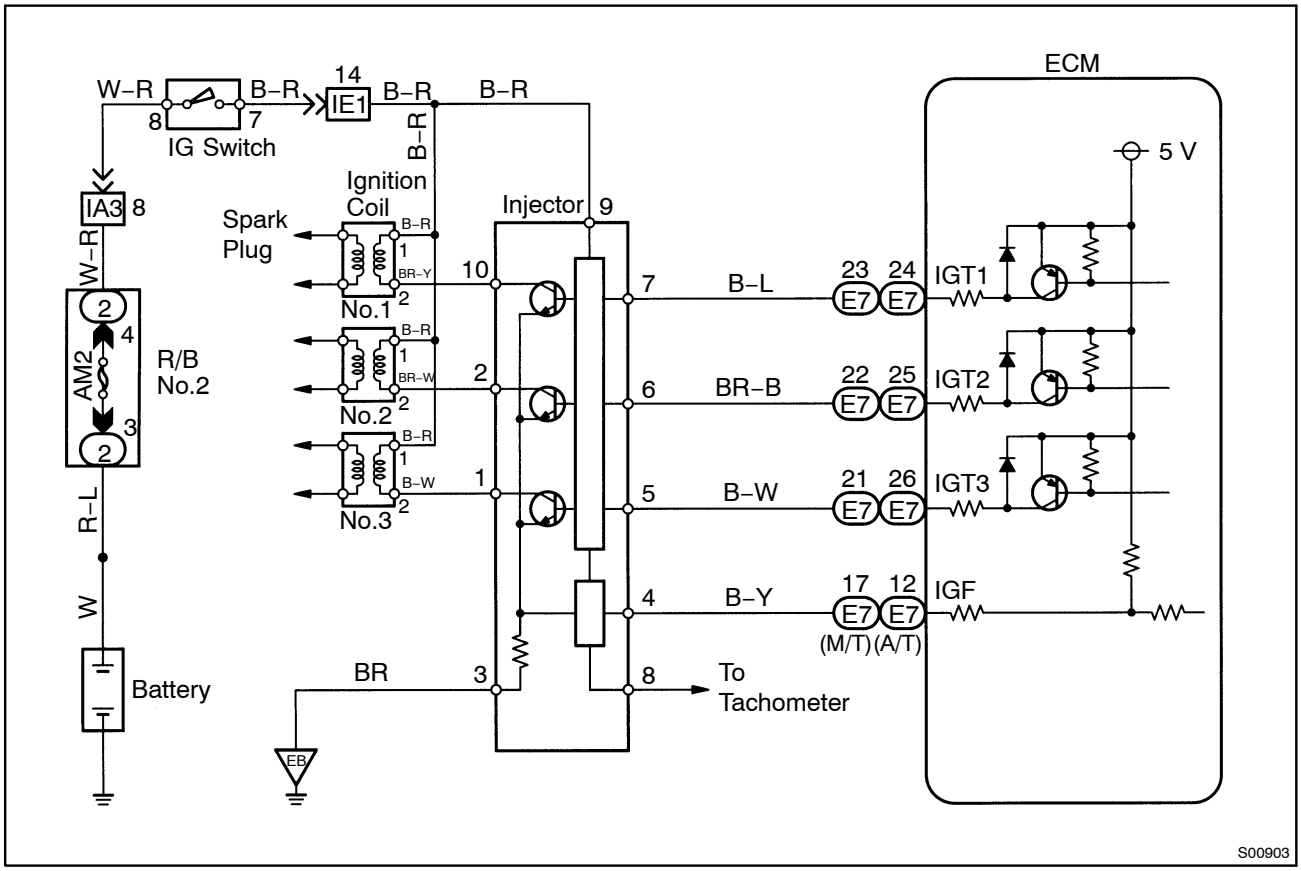


S00251

DTC No.	DTC Detecting Condition	Trouble Area
P1300	No IGF signal to ECM for 6 consecutively IGT signals during engine running	• Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM

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WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check spark plug (See page IG–1).**

NG → **Go to step 4.**

OK

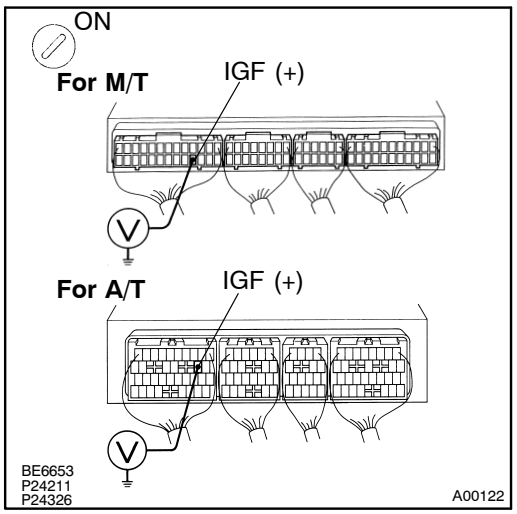
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2	**Check for open and short in harness and connector in IGF signal circuit between ECM and igniter (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

3	**Disconnect igniter connector and check voltage between terminal IGF of ECM connector and body ground.**



PREPARATION:

(a) Disconnect the igniter connector.
(b) Remove the right cowl side trim (See page SF–61).
(c) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal IGF of ECM connector and body ground.

OK:

Voltage: 4.5 – 5.5 V

OK → **Replace igniter.**

NG

Check and replace ECM (See page IN–26).

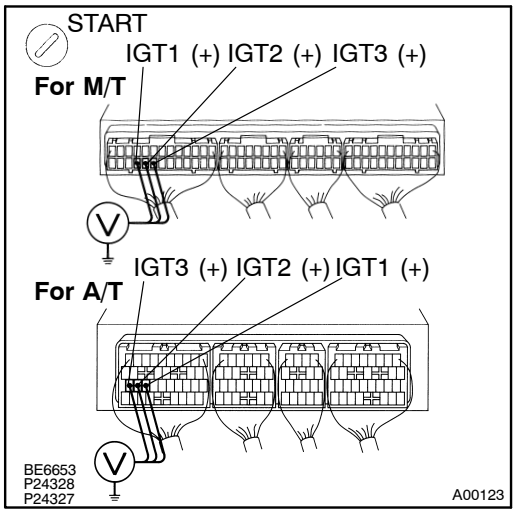
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4	**Check for open and short in harness and connector in IGT1 – 3 signal circuit between ECM and igniter (See page IN–26).**

NG → **Repair or replace harness or connector.**

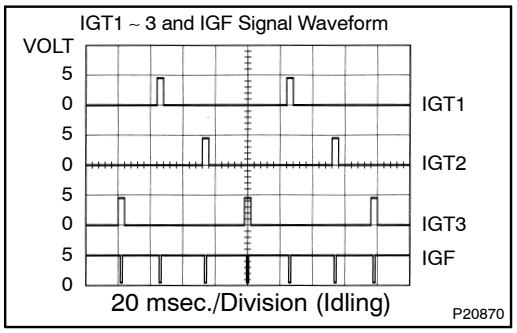
OK

5	**Check voltage between terminals IGT1 – 3 of ECM connector and body ground.**



PREPARATION:
Remove the right cowl side trim (See page SF–61).
CHECK:
Measure voltage between terminal IGT1 – 3 of ECM connector and body ground when engine is cranked.
OK:

Voltage: More than 0.1 V and less than 4.5 V



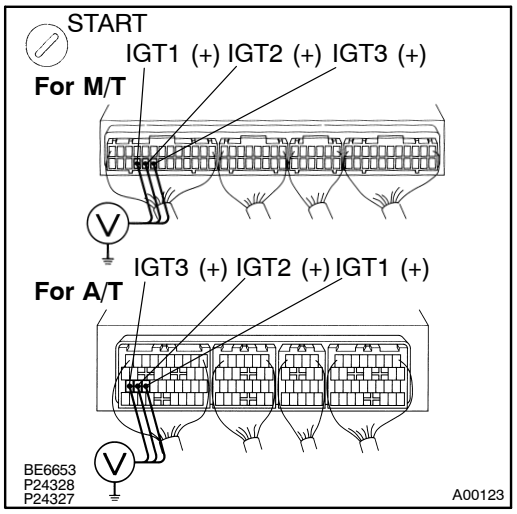
Reference INSPECTION USING OSCILLOSCOPE
During idling, check waveform between terminals IGT1 – 3, IGF and E1 of ECM.
HINT:
The correct waveforms are as shown.

NG → **Check and replace ECM (See page IN–26).**

OK

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6	Disconnect igniter connector and check voltage between terminals IGT1 – 3 of ECM connector and body ground.



PREPARATION:

(a) Disconnect the igniter connector.

(b) Remove the right cowl side trim (See page SF–61).

CHECK:

Measure voltage between terminals IGT1 ~ 3 of ECM connector and body ground when engine is cranked.

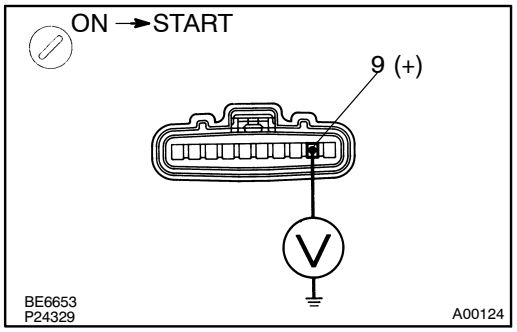
OK:

Voltage: More than 0.1 V and less than 5.0 V

NG → **Check and replace ECM (See page IN–26).**

OK

7	Check voltage between terminal 9 of igniter connector and body ground.



PREPARATION:

Disconnect the igniter connector.

CHECK:

Measure voltage between terminal 9 of igniter connector and body ground, when ignition switch is turned to "ON" and "START" position.

OK:

Voltage: 9 – 14 V

NG → **Check and repair igniter power source circuit.**

OK

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8	Check for open and short in harness and connector between ignition switch and ignition coil, ignition coil and igniter (See page IN–26).

NG → Repair or replace harness or connector.

OK

9	Check ignition coil (See page IG–1).

NG → Replace ignition coil.

OK

Replace igniter.

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DI0V6-01

DTC	P1335	Crankshaft Position Sensor Circuit Malfunction (during engine running)

CIRCUIT DESCRIPTION

Refer to DTC P0335 on page DI–191.

DTC No.	DTC Detecting Condition	Trouble Area
P1335	No crankshaft position sensor signal to ECM with engine speed 1,000 rpm or more	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • ECM

WIRING DIAGRAM

Refer to DTC P0335 on page DI–191.

INSPECTION PROCEDURE

Refer to DTC P0335 on page DI–191.

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DI9AG–01

DTC	P1500	Starter Signal Circuit Malfunction

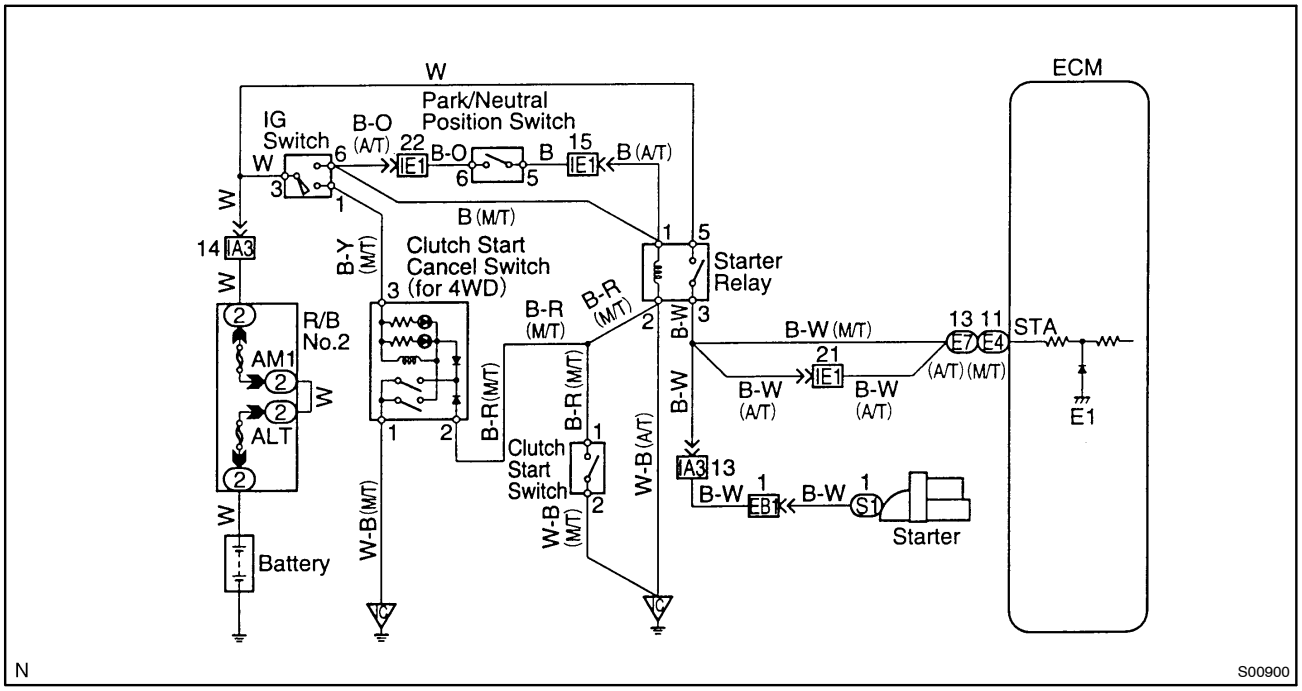
CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow is slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery positive voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

DTC No.	DTC Detecting Condition	Trouble Area
P1500	No starter signal to ECM	• Open or short in starter signal circuit • Open or short in ignition switch or starter relay circuit • ECM

HINT:
In this circuit, diagnosis can only be made in the check mode.

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

This diagnostic chart is based on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the matrix chart of problem symptoms on page DI–148.

1	**Connect the TOYOTA hand–held tester and check STA signal.**

PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.

(b) Turn ignition switch ON and push TOYOTA hand–held tester main switch ON.

CHECK:

Read STA signal on the TOYOTA hand–held tester while starter operates.

OK:

Ignition Switch Position	ON	START
STA Signal	OFF	ON

OK → **Proceed to next circuit inspection shown on matrix chart (See page DI–148).**

NG

2	**Check for open in harness and connector between ECM and starter relay (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page IN–26).

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DI0V8–01

DTC	P1600	ECM BATT Malfunction

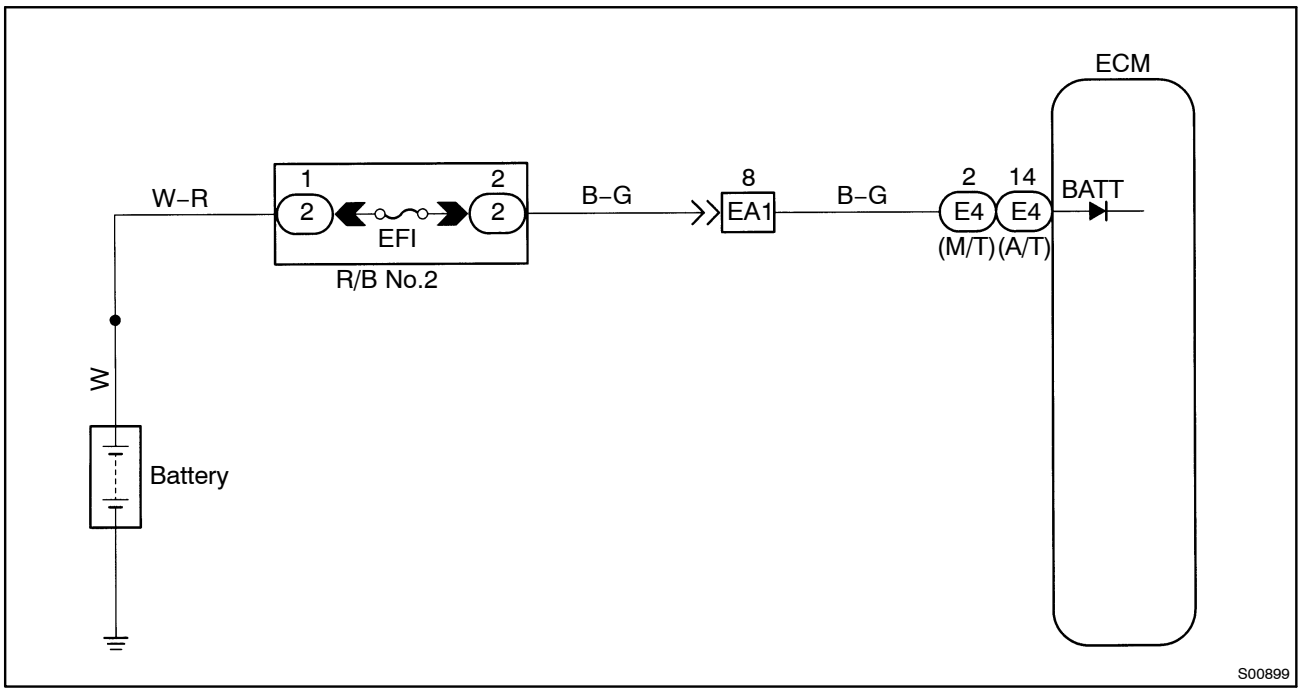
CIRCUIT DESCRIPTION

Battery positive voltage is supplied to terminal BATT of the ECM even when the ignition switch is OFF for use by the DTC memory and air–fuel ratio adaptive control value memory, etc.

DTC No.	DTC Detecting Condition	Trouble Area
P1600	Open in back up power source circuit	• Open in back up power source circuit • ECM

HINT:
If DTC P1600 appear, the ECM does not store another DTC.

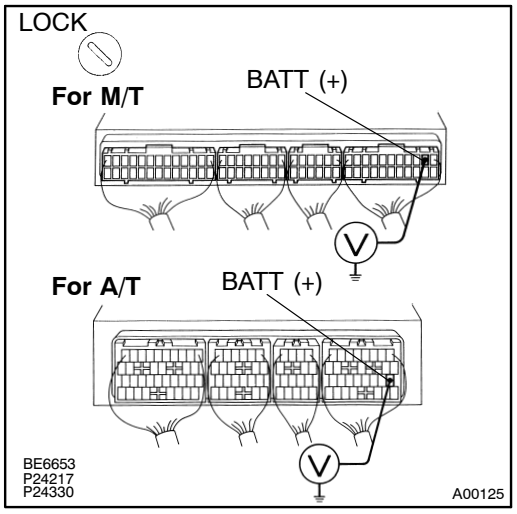
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	Check voltage between terminal BATT of ECM connector and body ground.

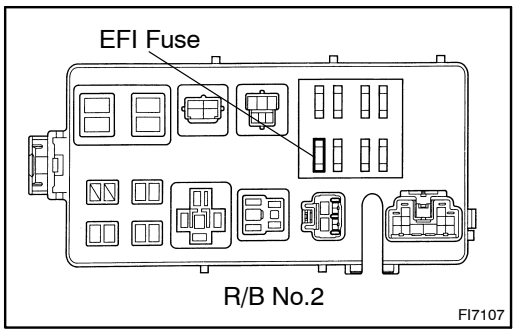


PREPARATION:
Remove the right cowl side trim (See page SF–61).
CHECK:
Measure voltage between terminal BATT of ECM connector and body ground.
OK:
Voltage: 9 – 14 V

OK	Check and replace ECM (See page IN–26).

NG

2	Check EFI fuse.



PREPARATION:
Remove the EFI fuse from the R/B No.2.
CHECK:
Check continuity of EFI fuse.
OK:
Continuity

NG	Check for short in all harness and components connected to EFI fuse.

OK

Check and repair harness or connector between battery, EFI fuse and ECM.

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DI9AH–01

DTC	P1605	Knock Control CPU Malfunction

CIRCUIT DESCRIPTION

Refer to Knock Sensor 1, 2 Circuit Malfunction on page DI–188.

DTC No.	DTC Detecting Condition	Trouble Area
P1605	Engine control computer malfunction (for knock control)	• ECM

WIRING DIAGRAM

Refer to page DI–188 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

1	**Are there any other codes (besides DTC P1605) being output?**

YES → **Go to relevant DTC chart.**

NO

Check and replace ECM (See page IN–26).

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DI0V9–01

DTC	P1780	Park/Neutral Position Switch Malfunction

CIRCUIT DESCRIPTION

The park/neutral position switch goes on when the shift lever is in the N or P shift position. When it goes on terminal NSW of the ECM is grounded to body ground via the starter relay, thus the terminal NSW voltage becomes 0 V. When the shift lever is in the D, 2, L, or R position, the park/neutral position switch goes off, so the voltage of ECM. Terminal NSW becomes battery voltage, the voltage of the ECM internal power source. If the shift lever is moved from the N position to the D position, this signal is used for air–fuel ratio correction and for idle speed control (estimated control), etc.

DTC No.	DTC Detecting Condition	Trouble Area
P1780	2 or more switches are ON simultaneously for "R", "N", "2" and "L" and position (2 trip detection logic)	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM
	When driving under conditions (a) and (b) for 30 sec. or more park/neutral position switch is ON (N position): (2 trip detection logic) (a) Vehicle speed: 70 km/h (44 mph) or more (b) Engine speed: 1,500 ~ 2,500 rpm	

HINT:
After confirming DTC P1780 use the TOYOTA hand–held tester to confirm the PNP switch signal from "CURRENT DATA".

WIRING DIAGRAM

Refer to DTC P1780 on page DI–247.

INSPECTION PROCEDURE

Refer to DTC P1780 on page DI–247.

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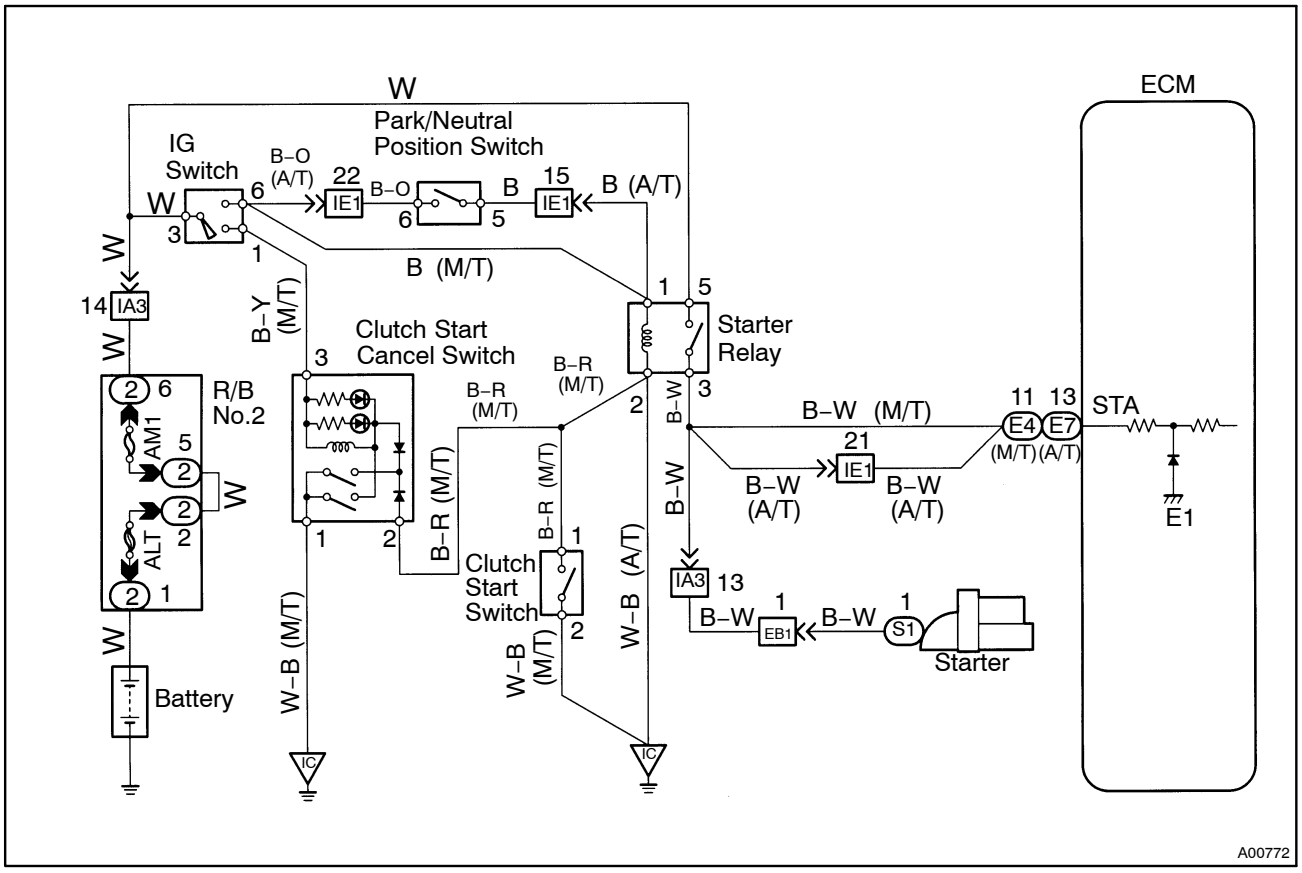
DI0VA–01

Starter Signal Circuit

CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow is slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery positive voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

WIRING DIAGRAM



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INSPECTION PROCEDURE

HINT:

This diagnostic chart is based on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the problem symptoms table on page DI–148.

TOYOTA hand–held tester:

1	**Connect TOYOTA hand–held tester and check STA signal.**

PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.

CHECK:

Read STA signal on the TOYOTA hand–held tester while starter operates.

OK:

Ignition Switch Position	ON	START
STA signal	OFF	ON

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–148).**

NG

2	**Check for open in harness and connector between ECM and starter relay (Marking: ST) (See page IN–26).**

NG → **Repair or replace harness or connector.**

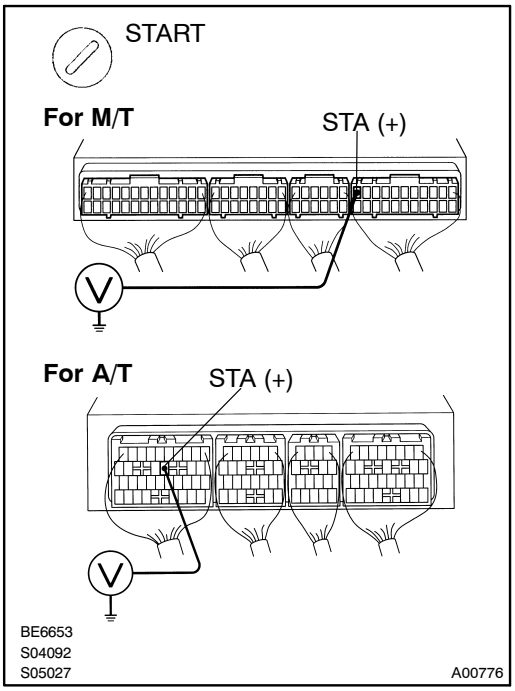
OK

Check and replace ECM (See page IN–26).

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OBD II scan tool (excluding TOYOTA hand–held tester):

1	**Check voltage between terminal STA of ECM connector and body ground.**



PREPARATION:
Remove the right cowl side trim (See page SF–61).
CHECK:
Measure voltage between terminal STA of ECM connector and body ground, during engine cranking.
OK:
Voltage: 6 V or more

OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–148).**

NG

2	**Check for open in harness and connector between ECM and starter relay (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page IN–26).

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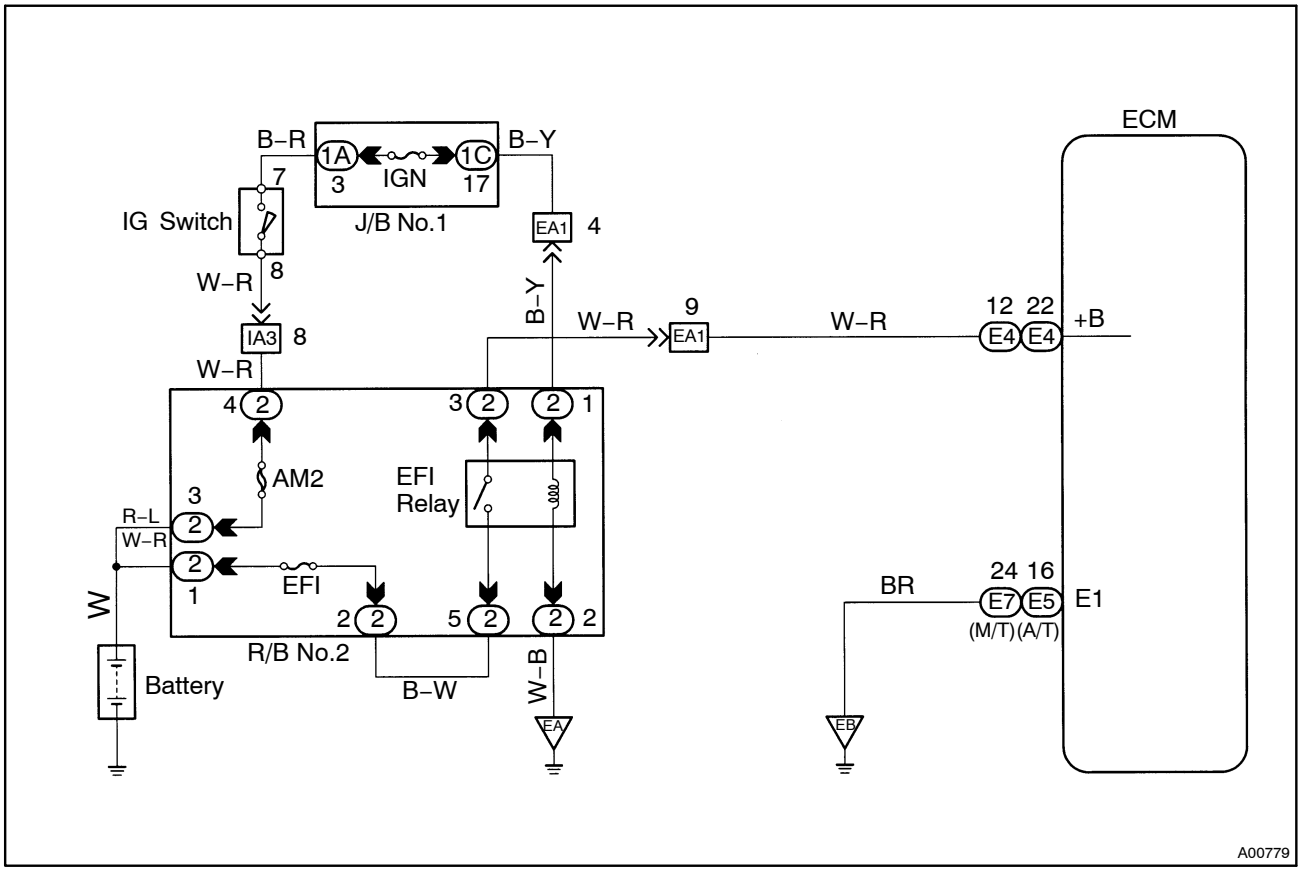
DI0VB–01

ECM Power Source Circuit

CIRCUIT DESCRIPTION

When the ignition switch is turned ON, battery positive voltage is applied to the coil, closing the contacts of the EFI main relay (Marking: EFI) and supplying power to terminal +B of the ECM.

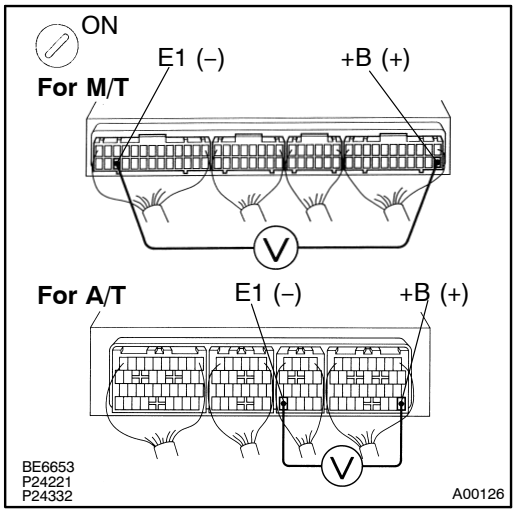
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check voltage between terminals + B and E1 of ECM connector.**



PREPARATION:

(a) Remove the right cowl side trim (See page SF–61).

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals + B and E1 of ECM connector.

OK:

Voltage: 9 – 14 V

OK	**Proceed to next circuit inspection shown on problem symptoms table (See page DI–148).**

NG

2	**Check for open in harness and connector between terminal E1 of ECM and body ground (See page IN–26).**

NG	**Repair or replace harness or connector.**

OK

3	**Check EFI main relay (Marking: EFI) (See page SF–45).**

NG	**Replace EFI main relay.**

OK

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4	**Check EFI fuse (See page DI–244, step 2).**

NG → **Check for short in all harness and components connected to EFI fuse.**

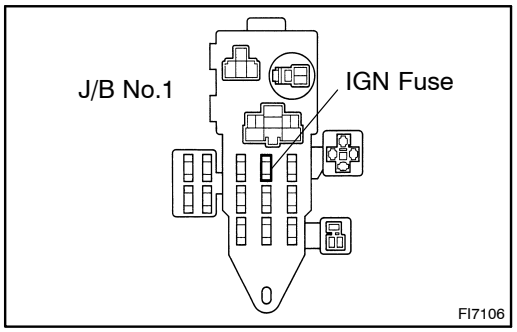
OK

5	**Check for open harness and connector between EFI main relay (Marking: EFI) and battery, EFI main relay (Marking: EFI) and ECM (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

6	**Check IGN fuse.**



PREPARATION:
Remove the IGN fuse from the J/B No.1.
CHECK:
Check continuity of IGN fuse.
OK:
Continuity

NG → **Check for short in all harness and components connected to IGN fuse.**

OK

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7	Check ignition switch (See page BE–12).

NG → Replace ignition switch.

OK →

Check for open in harness and connector between IG switch and EFI main relay, EFI main relay and body ground (See page IN–26).

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DI0VC–01

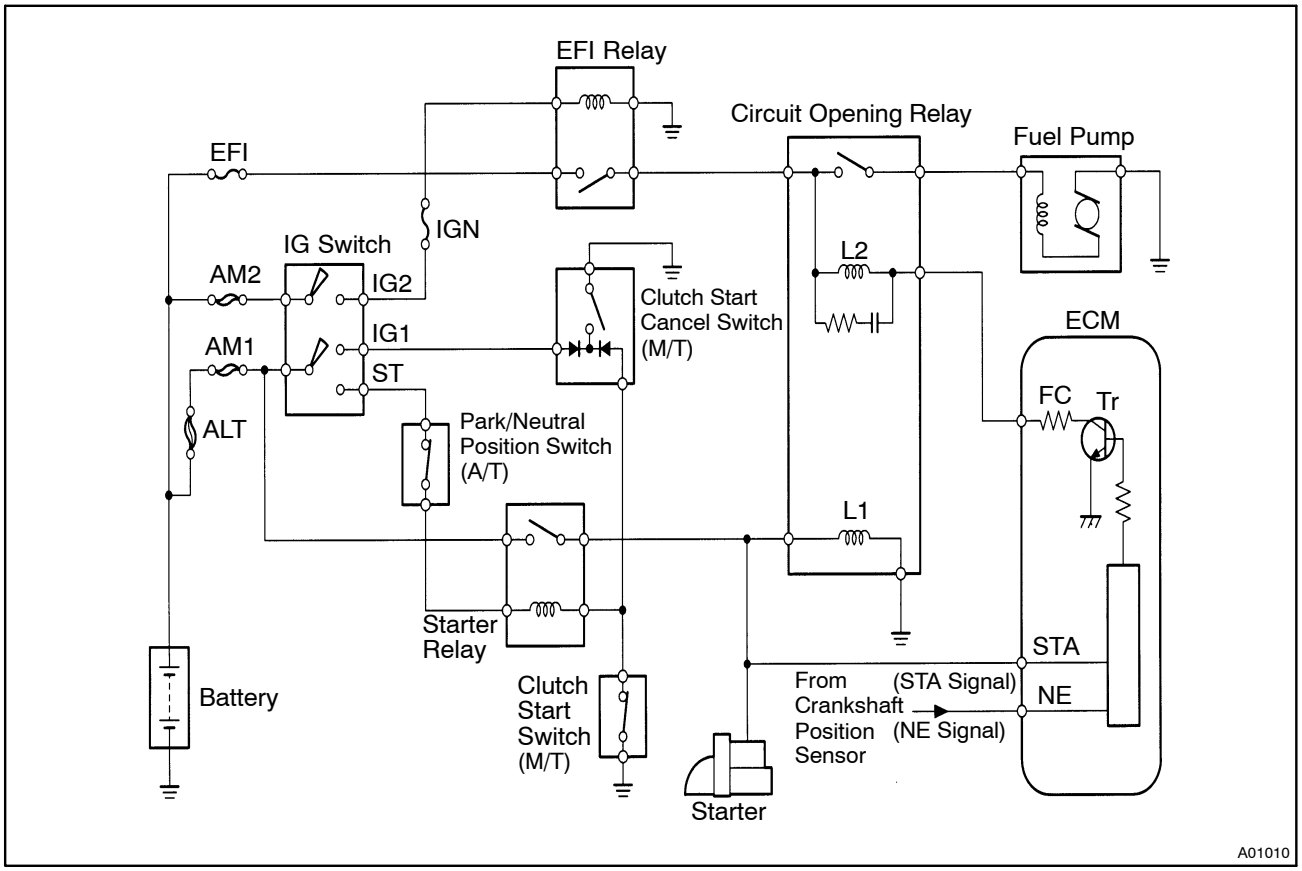
Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

The fuel pump is switched on (low voltage at terminal FC) when STA is on or while the NE signal is input to the ECM.

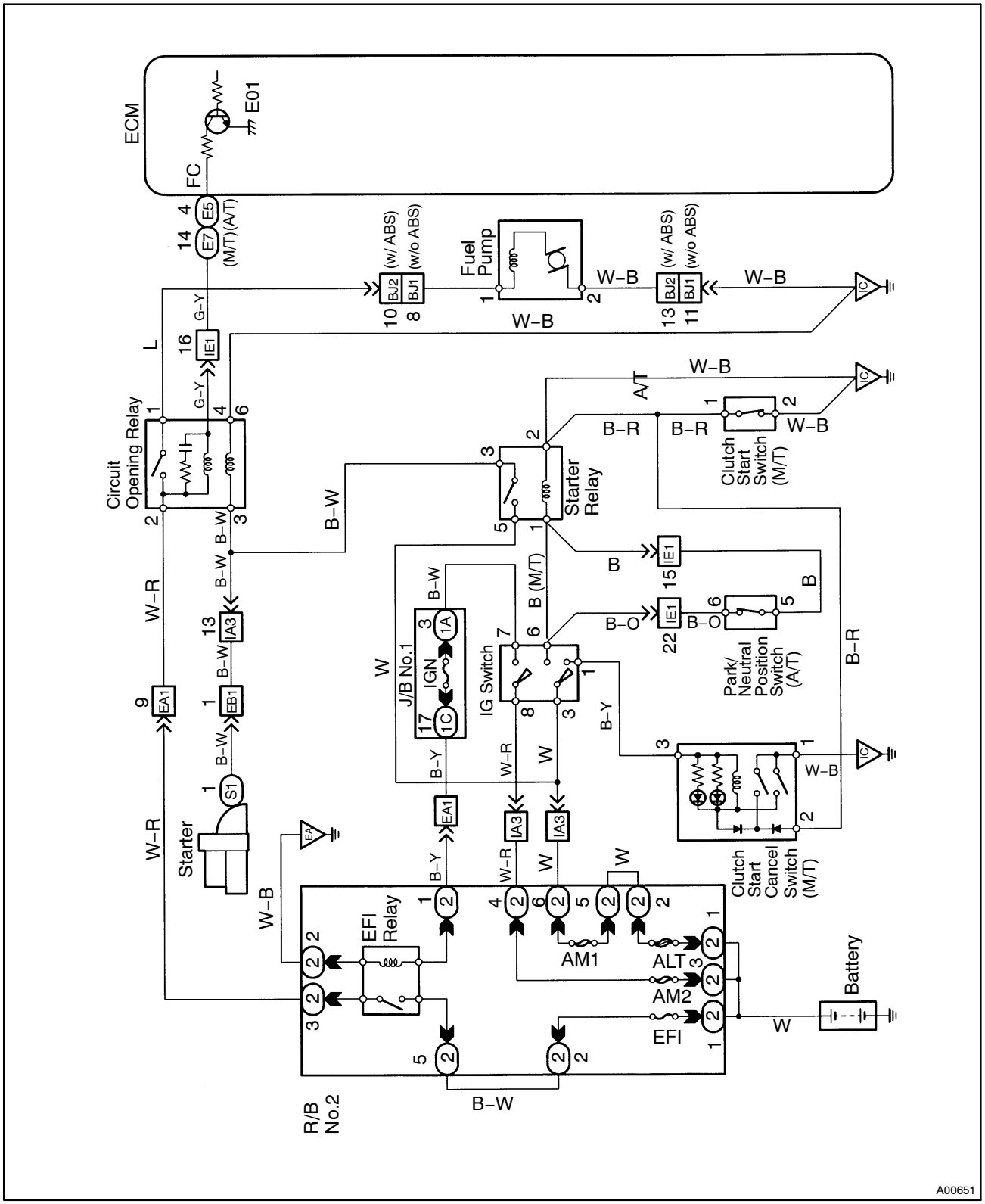
In the diagram below, when the engine is cranked, current flows from terminal ST of the ignition switch to the starter relay coil, the starter relay switches on and current flows to coil L1 of the circuit opening relay. Thus the circuit opening relay switches on, power is supplied to the fuel pump and the fuel pump operates. When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to coil L2 of the circuit opening relay, the relay switches on and the fuel pump operates.

While the NE signal is generated (engine running), the ECM keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.



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WIRING DIAGRAM

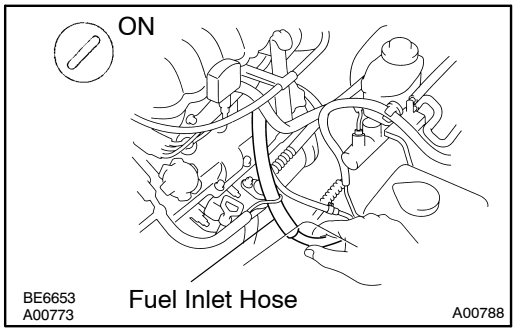


A00651

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INSPECTION PROCEDURE
TOYOTA hand–held tester:

1	**Connect TOYOTA hand–held tester and check operation of fuel pump.**



PREPARATION:

(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.
(c) Use ”ACTIVE TEST” mode to operate the fuel pump.

CHECK:

Check for fuel pressure in the fuel inlet hose when it is pinched off.

OK:

There is pressure in the fuel inlet hose.

HINT:

At this time, you will hear a fuel flowing noise.

OK	**Go to step 7.**

NG

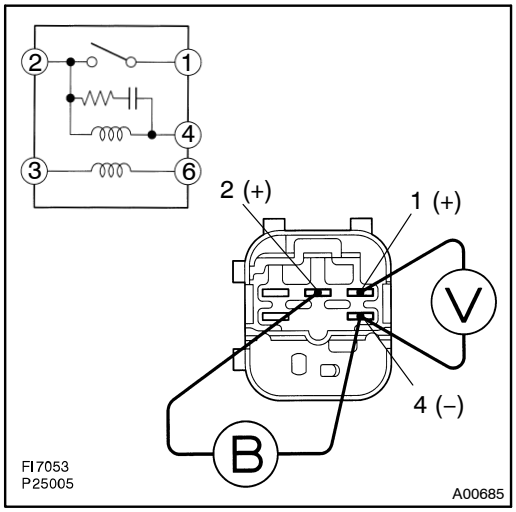
2	**Check for ECM power source circuit (See page DI–244).**

NG	**Repair or replace.**

OK

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3	Check circuit opening relay.



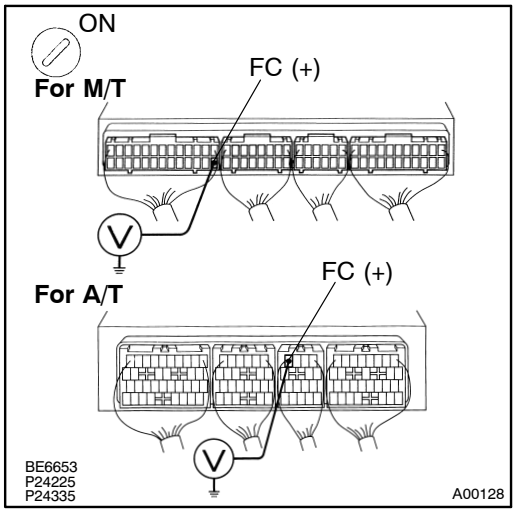
PREPARATION:
Remove the circuit opening relay (See page SF–46).
CHECK:
(a) Apply battery voltage between terminals 2 and 4.
(b) Measure voltage between terminals 1 and 4.
OK:

Voltage: Same as battery

NG → **Replace circuit opening relay.**

OK

4	Check voltage between terminal FC of ECM connector and body ground.



PREPARATION:
(a) Remove the right cowl side trim (See page SF–61).
(b) Turn the ignition switch ON.
CHECK:
Measure voltage between terminal FC of ECM connector and body ground.
OK:

Voltage: 9 – 14 V

NG → **Check for open in harness and connector between EFI main relay and circuit opening relay, and ECM (See page IN–26).**

OK

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5	**Check fuel pump (See page SF–5).**

NG → **Repair or replace fuel pump.**

OK

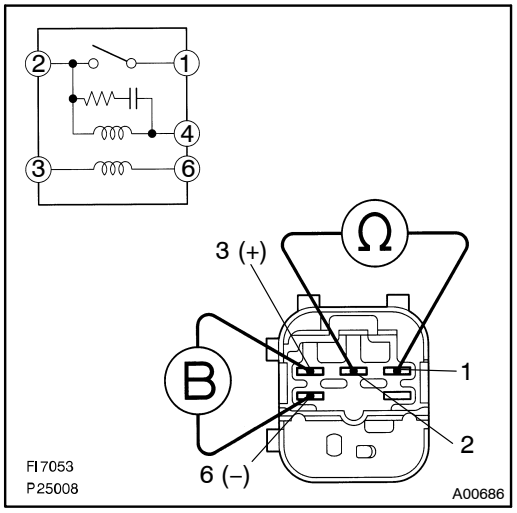
6	**Check for open in harness and connector between circuit opening relay and fuel pump, fuel pump and body ground (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM (See page IN–26).

7	**Check circuit opening relay.**



PREPARATION:

Remove the circuit opening relay (See page SF–46).

CHECK:

(a) Apply battery voltage between terminals 3 and 6.

(b) Check continuity between terminal 1 and 2.

OK:

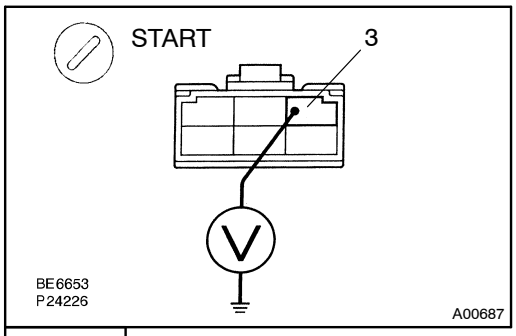
Continuity

NG → **Replace circuit opening relay.**

OK

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8	Check voltage between terminal 3 of circuit opening relay connector and body ground.



CHECK:

Measure voltage between terminal 3 of circuit opening relay connector and body ground when engine is cranked.

OK:

Voltage: 9 – 14 V

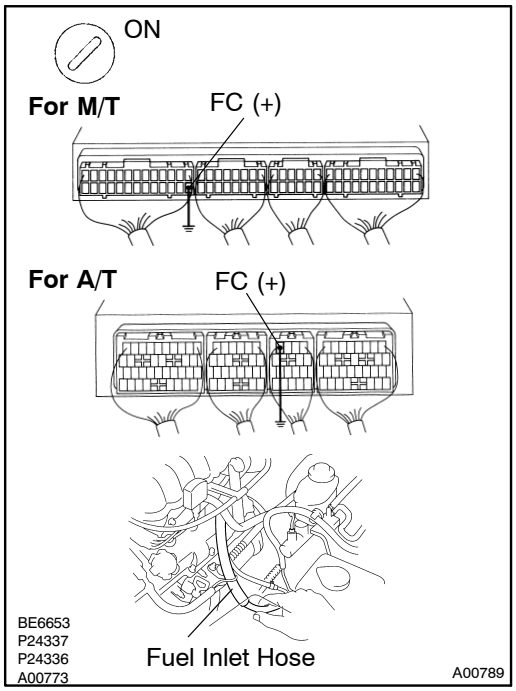
NG → **Check for starter signal circuit (See page DI–248).**

OK →

Check for open in harness and connector between terminal 6 of circuit opening relay connector and body ground (See page IN–26).

OBD II scan tool (excluding TOYOTA hand–held tester):

1	Check operation of fuel pump.



PREPARATION:

(a) Remove the right cowl side trim (See page SF–61).

(b) Turn the ignition switch ON.

CHECK:

(a) Connect between terminal FC of ECM connector and body ground.

(b) Check for fuel pressure in the inlet hose when it is pinched off.

OK:

There is pressure in the fuel inlet hose.

HINT:

At this time, you will hear a fuel flowing noise.

OK → **Go to step 7.**

NG →

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2	Check for ECM power source circuit (See page DI–251).

NG → Repair or replace.

OK

3	Check circuit opening relay (See page DI–255, step 3).

NG → Replace circuit opening relay.

OK

4	Check voltage between terminal FC of ECM connector and body ground (See page DI–255, step 4).

NG → Check for open in harness and connector between EFI main relay and circuit opening relay and ECM (See page IN–26).

OK

5	Check fuel pump (See page SF–5).

NG → Repair or replace fuel pump.

OK

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6	Check for open in harness and connector between circuit opening relay and fuel pump, fuel pump and body ground (See page IN–26).

NG → Repair or replace harness or connector.

OK →

Check and replace ECM (See page IN–26).

7	Check circuit opening relay (See page DI–255, step 7).

NG → Replace circuit opening relay.

OK →

8	Check voltage between terminal 3 of circuit opening relay connector and body ground (See page DI–255, step 8).

NG → Check for starter signal circuit (See page DI–248).

OK →

Check for open in harness and connector between terminal 6 of circuit opening relay connector and body ground (See page IN–26).

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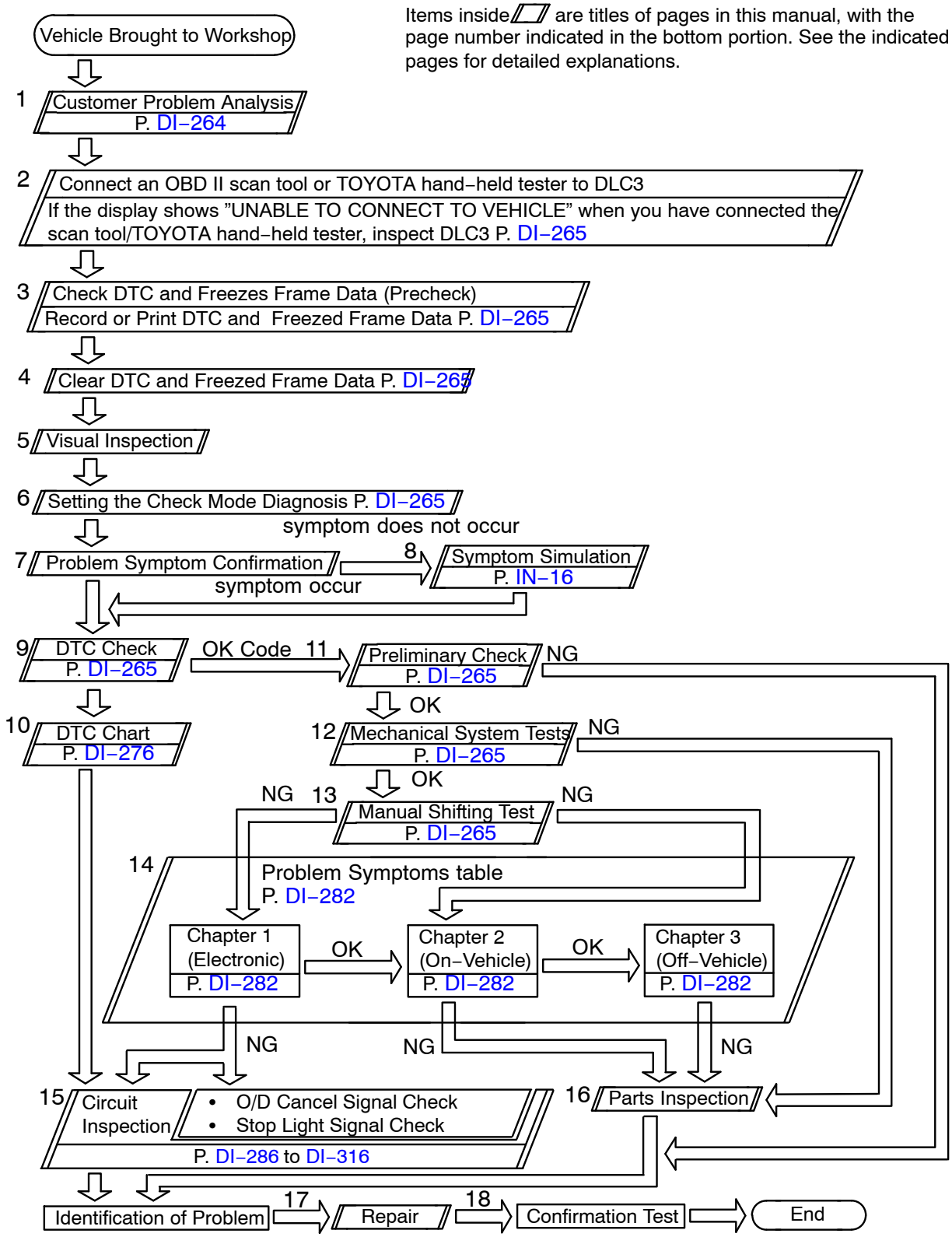
AUTOMATIC TRANSMISSION

DI0VD–02

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.

Items inside ▱ are titles of pages in this manual, with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.



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DI0VE–01

CUSTOMER PROBLEM ANALYSIS CHECK

Transmission Control System Check Sheet	Inspector's Name :

Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	Odometer Reading	km miles

Date Problem Occurred	/ /
How Often Does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)

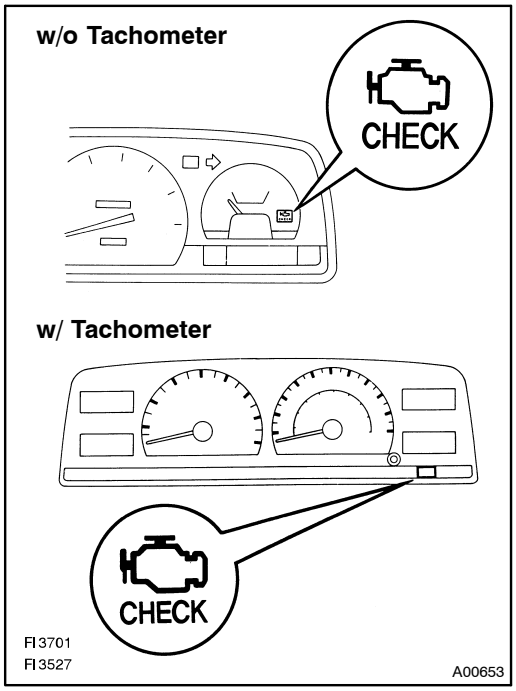
Symptoms	☐ Vehicle does not move (☐ Any position ☐ Particular position)
	☐ No up–shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → O/D)
	☐ No down–shift (☐ O/D → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st)
	☐ Lock–up malfunction
	☐ Shift point too high or too low
	☐ Harsh engagement (☐ N → D ☐ Lock–up ☐ Any drive position)
	☐ Slip or shudder
	☐ No kick–down
	☐ Others ( )

Check Item	Malfunction Indicator Lamp	☐ Normal ☐ Remains ON

DTC Check	1st Time	☐ Normal code	☐ Malfunction code (Code)
	2nd Time	☐ Normal code	☐ Malfunction code (Code)

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DI0VF–02



PRE–CHECK

1. DIAGNOSIS SYSTEM

(a) Description

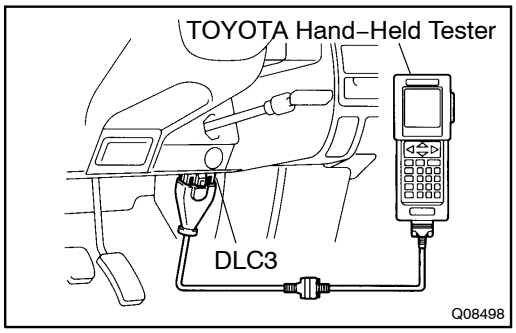
- When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you connect to the vehicle an OBD II scan tool complying with SAE J1978 or TOYOTA hand–held tester, and read off various data output from the vehicle's ECM.

  OBD II regulations require that the vehicle's on–board computer lights up the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components which affect vehicle emissions. In addition to the MIL lighting up when a malfunction is detected, the applicable DTCs prescribed by SAE J2012 are recorded in the ECM memory.

  (3RZ–FE: See page DI–13)

  (5VZ–FE: See page DI–140)

If the malfunction only occurs in 3 trips, the MIL goes off but the DTCs remain recorded in the ECM memory.



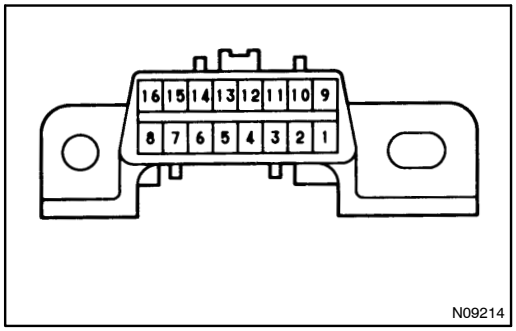
- To check the DTCs, connect an OBD II scan tool or TOYOTA hand–held tester to DLC3 on the vehicle. The OBD II scan tool or TOYOTA hand–held tester also enables you to erase the DTCs and check freeze frame data and various forms of engine data (For instruction book).

  DTCs include SAE controlled codes and Manufacturer controlled codes.

  SAE controlled codes must be set as prescribed by the SAE, while Manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits (See DTC chart on page DI–276).

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- The diagnosis system operates in normal mode during normal vehicle use, and also has a check mode for technicians to simulate malfunction symptoms and perform troubleshooting. Most DTCs use 2 trip detection logic(*) to prevent erroneous detection. By switching the ECM to check mode when troubleshooting, the technician can cause the MIL to light up and for a malfunction that is only detected once or momentarily (TOYOTA hand–held tester) (See page DI–265).
- *2 trip detection logic:
  When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the 2nd test drive, this 2nd detection causes the MIL to light up.



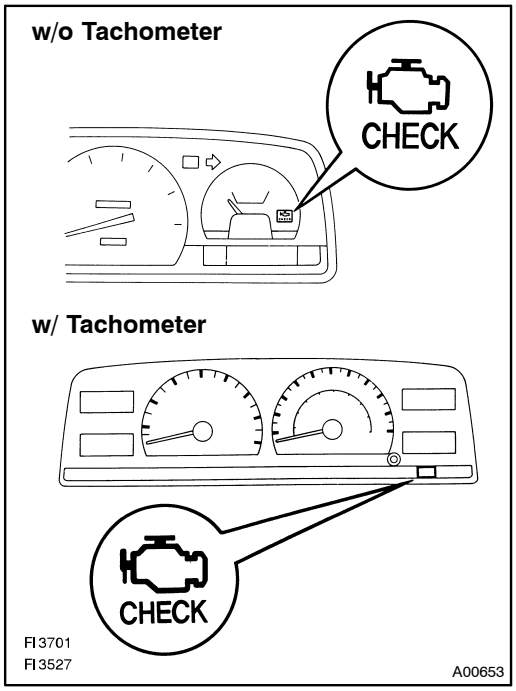
(b) Inspect the DLC3.
The vehicle's ECM uses the V.P.W. (Variable Pulse Width) for communication to comply with SAE J1850. The terminal arrangement of DLC3 complies with SAE J1962 and matches the V.P.W. format.

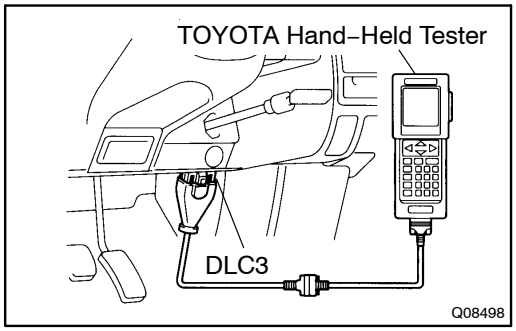
Terminal No.	Connection / Voltage or Resistance	Condition
2	Bus ⊕ Line / Pulse generation	During communication
4	Chassis Ground ↔ Body / 1 Ω or less	Always
5	Signal Ground ↔ Body / 1 Ω or less	Always
16	Battery Positive ↔ Body / 9 – 14 V	Always

HINT:
If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of OBD II scan tool or TOYOTA hand–held tester to DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

- If communication is normal when the tool is connected to another vehicle, inspect DLC3 on the original vehicle.
- If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.

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2. INSPECT DIAGNOSIS (NORMAL MODE)

(a) Check the MIL.

(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:

If the MIL does not light up, troubleshoot the combination meter (See page BE–38).

(2) When the engine is started, the MIL should go off. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

(b) Check the DTC.

NOTICE:

TOYOTA hand–held tester only: When the diagnostic system is switched from normal mode to check mode, it erases all DTCs and freezed frame data recorded in normal mode. So before switching modes, always check the DTCs and freezed frame data, and note them down.

(1) Prepare an OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester.

(2) Connect the OBD II scan tool or TOYOTA hand–held tester to DLC3 at the lower of the instrument panel.

(3) Turn the ignition switch ON and turn the OBD II scan tool or TOYOTA hand–held tester switch ON.

(4) Use the OBD II scan tool or TOYOTA hand–held tester to check the DTCs and freezed frame data and note them down (For operating instructions, see the OBD II scan tool's instruction book).

(5) See page DI–276 to confirm the details of the DTCs.

NOTICE:

When simulating symptoms with an OBD II scan tool (excluding TOYOTA hand–held tester) to check the DTCs, use normal mode. For codes on the DTCs chart subject to "2 trip detection logic", turn the ignition switch off after the symptoms have been simulated the 1st time. Then repeat the simulation process again. When the program has been simulated twice, the MIL lights up and the DTCs are recorded in the ECM.

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3. INSPECT DIAGNOSIS (CHECK MODE)

HINT:

TOYOTA hand–held tester only: Compared to the normal mode, the check mode has high sensing ability to detect malfunctions. Furthermore, the same diagnostic items which are detected in Normal mode can also be detected in Check mode.

(a) Check the DTC.

(1) Check the initial conditions.
- Battery positive voltage 11 V or more
- Throttle valve fully closed
- Transmission in P position
- Air conditioning switched off

(2) Turn the ignition switch OFF.

(3) Prepare a TOYOTA hand–held tester.

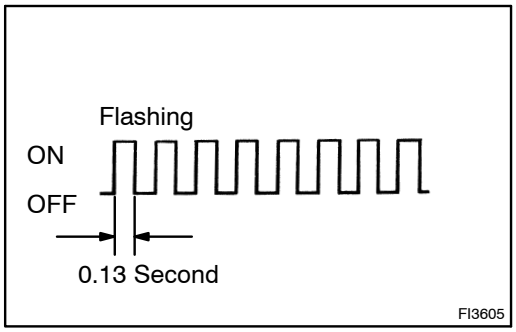
(4) Connect the TOYOTA hand–held tester to DLC3 at the lower of the instrument panel.

(5) Turn the ignition switch ON and switch the TOYOTA hand–held tester ON.

(6) Switch the TOYOTA hand–held tester from Normal mode to Check mode (Check that the MIL flashes).

(7) Start the engine (MIL goes out after the engine starts).

(8) Simulate the conditions of the malfunction described by the customer.



NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

(9) After simulating the malfunction conditions, use the TOYOTA hand–held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Take care not to turn the ignition switch OFF, as turning it off switches the diagnosis system from Check mode to Normal mode, so all DTCs, etc. are erased.

(10) After checking the DTC, inspect the applicable circuit.

(b) Clear the DTC.

The following actions will erase the DTC and freezed frame data. Operating an OBD II scan tool (complying with SAE J1978) or TOYOTA hand–held tester to erase the codes (See the OBD II scan tool's instruction book for operating instructions.).

NOTICE:

If the TOYOTA hand–held tester switches the ECM from normal mode to check mode or vice–versa, or if the ignition switch is turned from ON to ACC or OFF during check mode, the DTCs and freezed frame data will be erased.

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4. ROAD TEST

NOTICE:

Perform the test at normal operating ATF temperature 50 – 80°C (122 – 176°F).

(a) D position test

Shift into the D position and fully depress the accelerator pedal and and check the following points:

(1) Check up–shift operation.

1 → 2, 2 → 3 and 3 → O/D up–shift takes place, at the shift point shown in the automatic shift schedule (See page SS–49).

HINT:

There is no O/D up–shift or lock–up when the coolant temperature is below 60°C (140°F).

Evaluation:

Problem	Possible cause
If there is no 1→ 2 up–shift	• Shift solenoid valve No.2 is stuck • 1–2 shift valve is stuck
If there is no 2 → 3 up–shift	• Shift solenoid valve No.1 is stuck • 2–3 shift valve is stuck
If there is no 3 → O/D up–shift	• 3–4 shift valve is stuck
If the shift point is defective	• Throttle valve, 1–2 shift valve, 2–3 shift valve, etc. are defective
If the lock up is defective	• Shift solenoid valve SL is stuck • Lock–up relay valve is stuck

(2) Check for shift shock and slip.

Check for shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up–shifts.

Evaluation:

Problem	Possible cause
If the shock is excessive	• Line pressure is too high • Accumulator is defective • Check ball is defective

(3) Check for abnormal noises and vibration.

Run at the D position lock–up or O/D gear and check for abnormal noises and vibration.

HINT:

The check for the cause of abnormal noises and vibration must be done very thoroughly as it could also be due to loss of balance in the differential torque converter clutch, etc.

(4) Check kick–down operation.

While running in the D position, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick–downs conform to those indicated on the automatic shift schedule (See page SS–49).

(5) Check abnormal shock and slip at kick–down.

(6) Check the lock–up mechanism.

- Drive in D position, O/D gear, at a steady speed (lock–up ON).
- Lightly depress the accelerator pedal and check that there is lock–up.

If there is a big jump in engine speed, there is no lock–up.

(b) 2 position test

Shift into the 2 position and fully depress the accelerator pedal and check the following points:

(1) Check up–shift operation.

Check to see that the 1 → 2 up–shift takes place and that the shift point conforms to the automatic shift schedule (See page SS–49).

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HINT:
There is no O/D up–shift and lock–up in the 2 position.

(2) Check engine braking.
While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.

Evaluation:

Problem	Possible cause
If there is no engine braking effect	• 2nd coast brake defective

(3) Check for abnormal noises during acceleration and deceleration, and for shock at up–shift and down–shift.

(c) L position test
Shift into the 2 position and fully depress the accelerator pedal and check the following points:

(1) Check no up–shift.
While running in the L position, check that there is no up–shift to 2nd gear.

(2) Check engine braking.
While running in the L position, release the accelerator pedal and check the engine braking effect.

Evaluation:

Problem	Possible cause
If there is no engine braking effect	• 1st and reverse brake is defective

(3) Check for abnormal noises during acceleration and deceleration.

(d) R position test
Shift into the R position and fully depress the accelerator pedal and check for slipping.

CAUTION:
Before conducting this test ensure that the test area is free from personnel and obstruction.

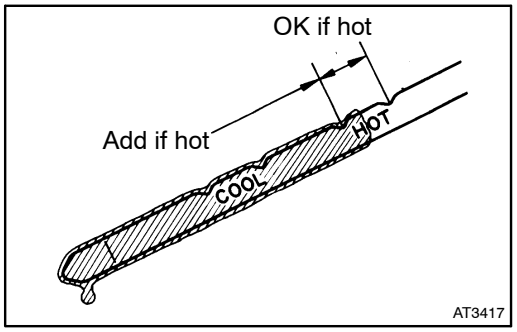
(e) P position test
Stop the vehicle on a grade (more than 5°) and after shifting into the P position, release the parking brake. Then, check to see that the parking lock pawl holds the vehicle in place.

5. BASIC INSPECTION

(a) Check the fluid level.

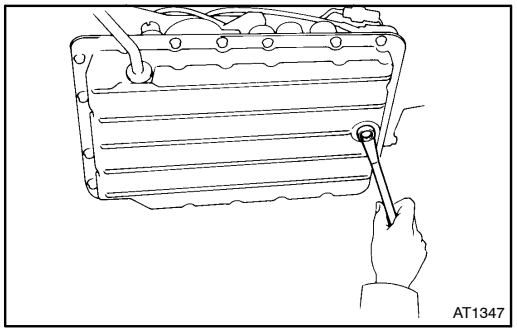
HINT:

- Drive the vehicle so that the engine and transmission are at normal operating temperature.
  Fluid temp.: 70 – 80°C (158 – 176°F)
- Only use the COOL range on the dipstick as a rough reference when the fluid is replaced or the engine does not run.



(1) Park the vehicle on a level surface and set the parking brake.
(2) With the engine idling and the brake pedal depressed, shift the shift lever into all positions from P to L position and return to P position.
(3) Pull out the dipstick and wipe it clean.
(4) Push it back fully into the pipe.
(5) Pull it out and check that the fluid level is in the HOT range.

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If the level is at the low side, add new fluid.

Fluid type: ATF DEXRON®II

NOTICE:

Do not overfill.

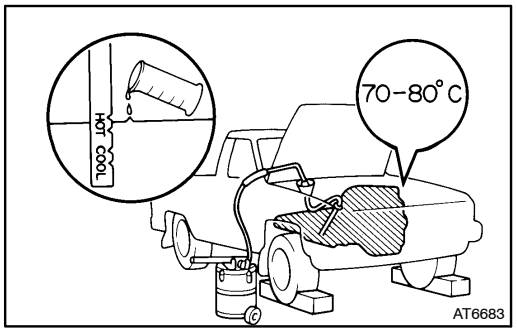
(b) Check the fluid condition.

If the fluid smells burnt or is black, replace it.

(c) Replace the ATF.

(1) Remove the drain plug and drain the fluid.

(2) Reinstall the drain plug securely.



(3) With the engine OFF, add new fluid through the oil filler pipe.

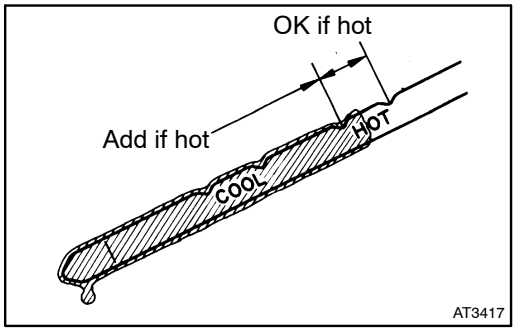
Fluid type: ATF DEXRON®II

Capacity:

A340E: 1.6 liters (1.7 US qts, 1.4 Imp. qts)

A340F: 2.0 liters (2.1 US qts, 1.8 Imp. qts)

(4) Start the engine and shift the shift lever into all positions from P to L position and then shift into P position.



(5) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.

(6) Check the fluid level at the normal operating temperature, 70 – 80°C (158 – 176°F), and add as necessary.

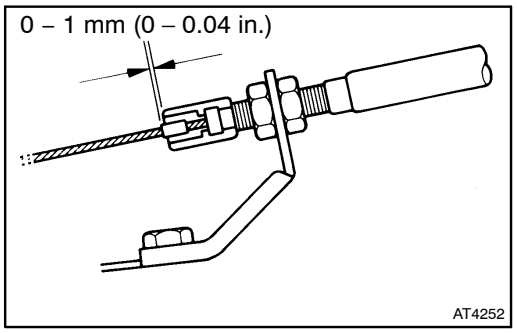
NOTICE:

Do not overfill.

(d) Check the fluid leaks.

Check for leaks in the transmission.

If there are leaks, it is necessary to repair or replace O–rings, FIPGs, oil seals, plugs or other parts.



(e) INSPECT AND ADJUST THROTTLE CABLE

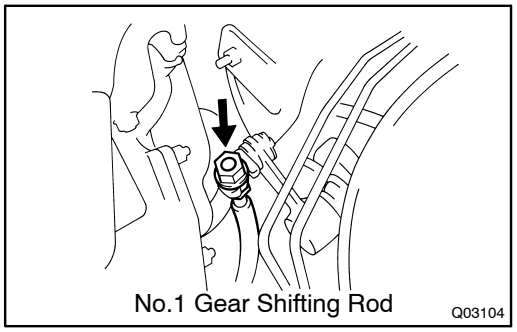
(1) Check that the accelerator pedal is fully released.

(2) Check that the inner cable is not slack.

(3) Measure the distance between the outer cable end and stopper on the cable.

Standard distance: 0 – 1 mm (0 – 0.04 in.)

If the distance is not standard, adjust the cable by the adjusting nuts.



(f) Inspect and adjust the shift lever position.

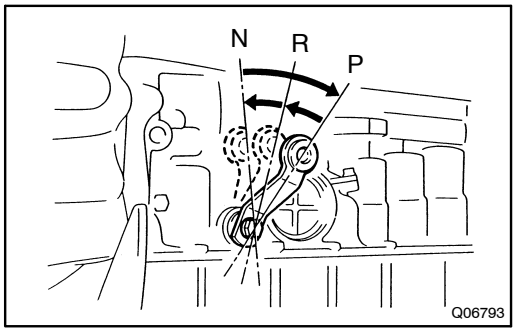
When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator is not aligned with the correct position.

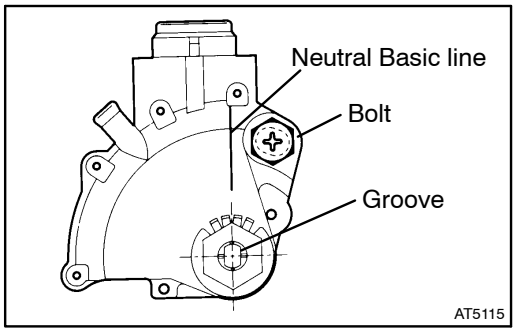
If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

(1) Remove the nut on the No.1 gear shifting rod.

(2) Push the No.1 gear shifting rod fully downward.

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(3) Return the No.1 gear shifting rod 2 notches to N position.
(4) Set the shift lever to N position.
(5) While holding the shift lever lightly toward the R position side, adjust the No.1 gear shifting rod nut.
(6) Tighten the No.1 gear shifting rod nut.

Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)

(7) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverses when shifting it to the R position.

(g) Inspect and adjust the park/neutral position.

Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.If it is not as stated above, carry out the following adjustment procedure.

(1) Loosen the park/neutral position switch bolt and set the shift lever to the N position.
(2) Align the groove and neutral basic line.
(3) Hold in position and tighten the bolt.

Torque: 13 N·m (130 kgf·cm, 10 ft·lbf)

(h) Check the idle speed.

Idle speed (In N position and air conditioner OFF):
3RZ–FE: 700 ± 50 rpm
5VZ–FE: 700 ± 50 rpm

6. MECHANICAL SYSTEM TESTS

(a) Measure the stall speed.

The object of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D and R positions.

NOTICE:

- **Do the that at normal operating fluid temperature 50 – 80˚C (122 – 176˚F)**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**

(1) Chock the 4 wheels.
(2) Connect an OBD II scan tool or TOYOTA hand–held tester to DLC3.
(3) Fully apply the parking brake.
(4) Keep your left foot pressed firmly on the brake pedal.
(5) Start the engine.
(6) Shift into the D position. Press all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.

Stall speed:
3RZ–FE: 1,950 ± 150 rpm
5VZ–FE: 2,150 ± 150 rpm

(7) Do the same test in R position.

Stall speed:
3RZ–FE: 1,950 ± 150 rpm
5VZ–FE: 2,150 ± 150 rpm

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Evaluation:

Problem	Possible cause
(a) Stall speed low in D and R positions	• Engine output may be insufficient • Stator one–way clutch is operating properly • HINT: If more than 600 rpm below the specified value, the torque converter could be faulty.
(b) Stall speed high in D position	• Line pressure too low • forward clutch slipping • No.2 one–way clutch not operating properly • O/D one–way clutch not operating properly
(c) Stall speed high in R position	• Line pressure too low • Direct clutch slipping • 1st and reverse brake slipping • O/D one–way clutch not operating properly
(d) Stall speed high in D and R positions	• Line pressure too low • Improper fluid level • O/D one–way clutch not operating properly

(b) Measure the time lag.

When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the O/D direct clutch, forward clutch, direct clutch, and 1st and reverse brake.

NOTICE:

- **Do the test at normal operating fluid temperature 50 – 80˚C (122 – 176˚F)**
- **Be sure to allow 1 minute interval between tests.**
- **Take 3 measurements and take the average value.**

(1) Fully apply the parking brake.

(2) Start the engine and check idle speed.

Idle speed (In N position and air conditioner OFF):

3RZ–FE: 700 ± 50 rpm

5VZ–FE: 700 ± 50 rpm

(3) Shift the shift lever from N to D position. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.

In the same manner, measure the time lag for N → R.

Time lag:

N → D Less than 1.2 seconds

N → R Less than 1.5 seconds

Evaluation (If N → D time or N → R time lag is longer than specified):

Problem	Possible cause
N → D time lag is longer	• Line pressure too low • Forward clutch worn • O/D one–way clutch not operating properly
N → R time lag is longer	• Line pressure too low • Direct clutch worn • 1st and reverse brake worn • O/D one–way clutch not operating properly

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7. HYDRAULIC TEST

Measure the line pressure.

NOTICE:

- **Do the test at normal operation fluid temperature 50 – 80°C (122 – 176°F).**
- **The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**

(1) Warm up the fluid.

(2) Remove the test plug on the transmission case right side and connect SST.
(See page AT–26 and AT–33 for the location to connect SST)

SST 09992–00094 (09992–00150, 09992–00270)

(3) Fully apply the parking brake and chock the 4 wheels.

(4) Start the engine and check idling speed.

(5) Keep your left foot pressed firmly on the brake pedal and shift into D position.

(6) Measure the line pressure when the engine is idling.

(7) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

NOTICE:

Release the accelerator pedal and stop test if the rear wheels begin to rotate before the engine speed reaches specified stall speed.

(8) In the same manner, do the test in R position.

Specified line pressure:

3RZ–FE

Condition	D position kPa (kgf/cm^2, psi)	R position kPa (kgf/cm^2, psi)
Idling	363 – 422 (3.7 – 4.3, 53 – 61)	490 – 588 (5.0 – 6.0, 71 – 85)
Stall	932 – 1,177 (9.5 – 12.0, 135 – 171)	1,294 – 1,638 (13.2 – 16.7, 188 – 238)

5VZ–FE

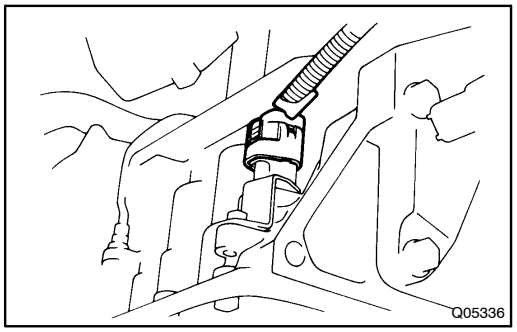
Condition	D position kPa (kgf/cm^2, psi)	R position kPa (kgf/cm^2, psi)
Idling	363 – 422 (3.7 – 4.3, 53 – 61)	608 – 696 (6.2 – 7.1, 88 – 101)
Stall	902 – 1,147 (9.2 – 11.7, 131 – 166)	1,432 – 1,942 (14.6 – 19.8, 208 – 282)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and retest.

Evaluation

Problem	Possible cause
If the measured value at all positions are higher	• Throttle cable out of adjustment • Throttle valve defective • Regulator valve defective
If the measured value at all positions are lower	• Throttle cable out of adjustment • Throttle valve defective • Regulator valve defective • Oil pump defective • O/D direct clutch defective
If pressure is low in the D position only	• D position circuit fluid leakage • Forward clutch defective
If pressure is low in the R position only	• R position circuit fluid leakage • Direct clutch defective • 1st and reverse brake defective

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8. MANUAL SHIFTING TEST

HINT:

With this test, it can be determined whether the trouble is within the electrical circuit or is a mechanical problem in the transmission.

(a) Disconnect the solenoid wire.

(b) Inspect the manual driving operation.

- Check that the shift and gear positions correspond with the table below.
- While driving, shift through the L, 2 and D positions. Check that the gear change corresponds to the shift position.

Shift Position	Gear Position
D	O/D
2	3rd
L	1st
R	Reverse
P	Pawl Lock

HINT:

If the L, 2 and D position gear positions are difficult to positions are difficult to distinguish, do the following road test.

If any abnormality is found in the above test, the problem is in the transmission itself.

(c) Connect the solenoid wire.

(d) Cancel out DTC. (See page DI–265).

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DI0VG–02

DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the page given.

*: ● ... MIL lights up

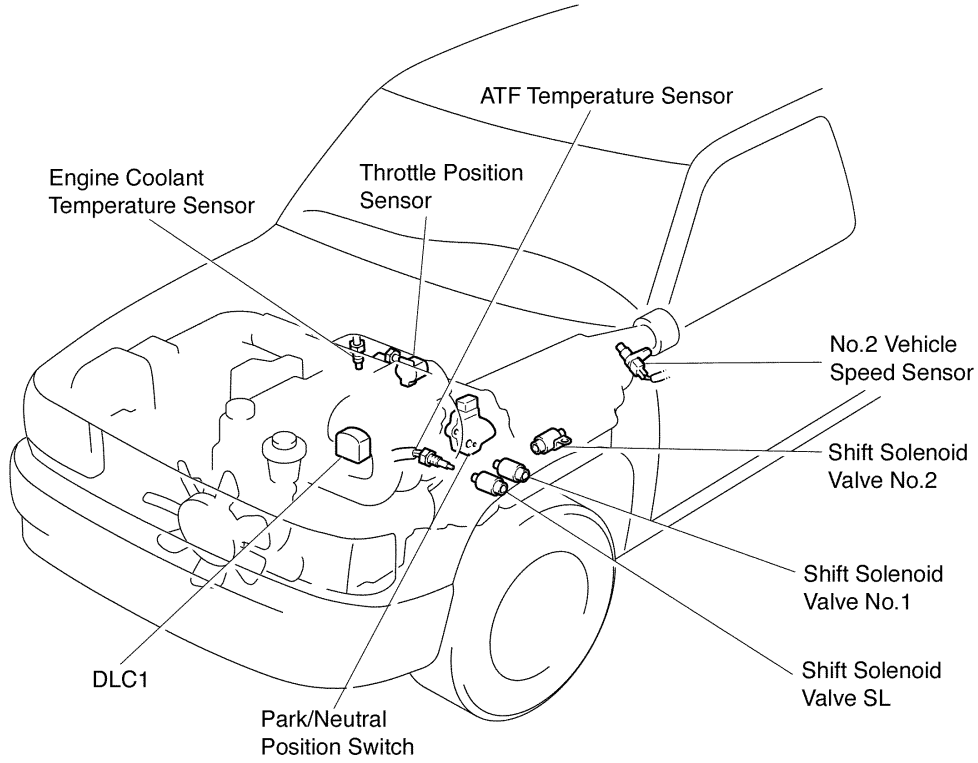
DTC No. (See Page)	Detection Item	Trouble Area	MIL *	Memory
P0500 3RZ–FE: (DI–92) 5VZ–FE: (DI–226)	Vehicle Speed Sensor Malfunction (No.1 Vehicle Speed Sensor)	• Open or short in No.1 vehicle speed sensor circuit • No.1 vehicle speed sensor • Combination meter • ECM	●	○
P0710 (DI–287)	Transmission Fluid Temperature Sensor Malfunction (ATF Temperature Sensor)	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM	●	○
P0750 (DI–289)	Shift Solenoid A Malfunction (Shift Solenoid Valve No.1)	• Shift solenoid valve No.1 is stuck open or closed • Valve body is blocked up or stuck	●	○
P0753 (DI–290)	Shift Solenoid A Electrical Malfunction (Shift Solenoid Valve No.1)	• Open or short in shift solenoid valve No.1 circuit • Shift solenoid valve No.1 • ECM	●	○
P0755 (DI–289)	Shift Solenoid B Malfunction (Shift Solenoid Valve No.2)	• Shift solenoid valve No.2 is stuck open or closed • Valve body is blocked up or stuck	●	○
P0758 (DI–290)	Shift Solenoid B Electrical Malfunction (Shift Solenoid Valve No.2)	• Open or short in shift solenoid valve No.2 circuit • Shift solenoid valve No.2 • ECM	●	○
P0770 (DI–294)	Shift Solenoid E Malfunction (Shift Solenoid Valve SL)	• Shift solenoid valve SL is stuck open or closed • Valve body is blocked up or stuck • Lock–up clutch	●	○
P0773 (DI–296)	Shift Solenoid E Electrical Malfunction (Shift Solenoid Valve SL)	• Open or short in shift solenoid valve SL circuit • Shift solenoid valve SL • ECM	●	○
P1700 (DI–300)	Vehicle Speed Sensor No.2 Malfunction (No.2 Vehicle Speed Sensor)	• Open or short in No.2 vehicle speed sensor circuit • No.2 vehicle speed sensor • ECM	●	○
P1780 (DI–306)	Park/Neutral Position Switch Malfunction	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM	●	○

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DI98H–01

PARTS LOCATION

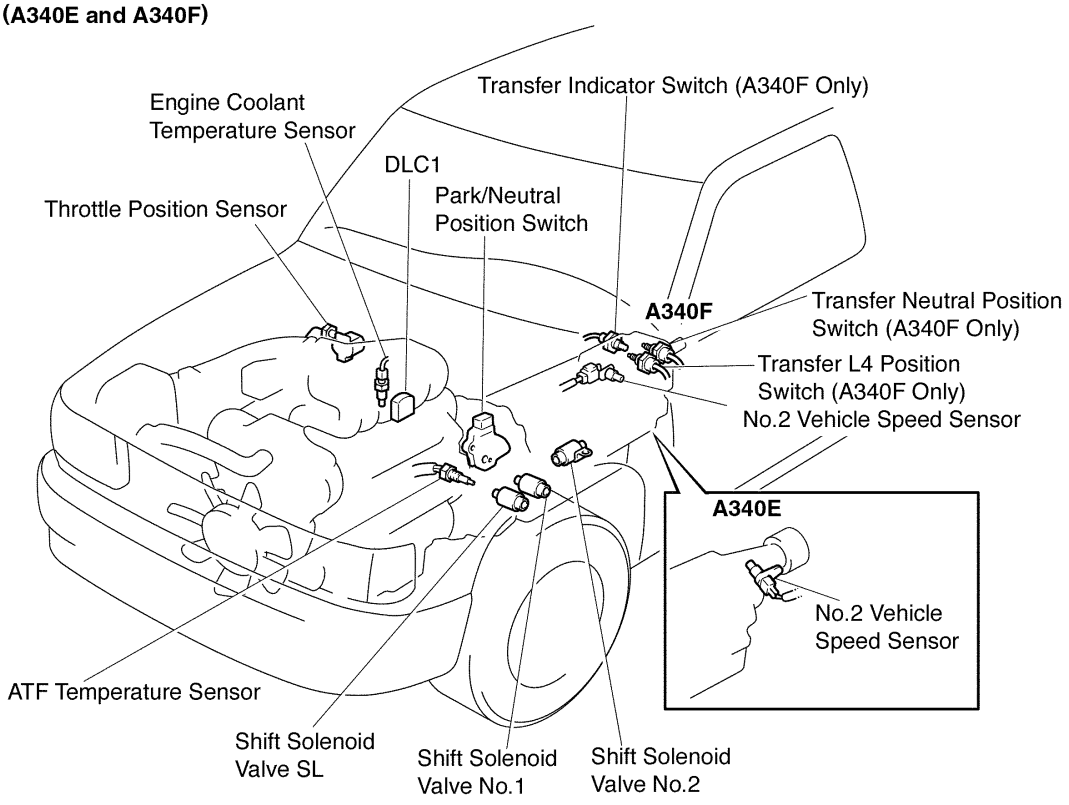
3RZ-FE (A340E)



P

D10997

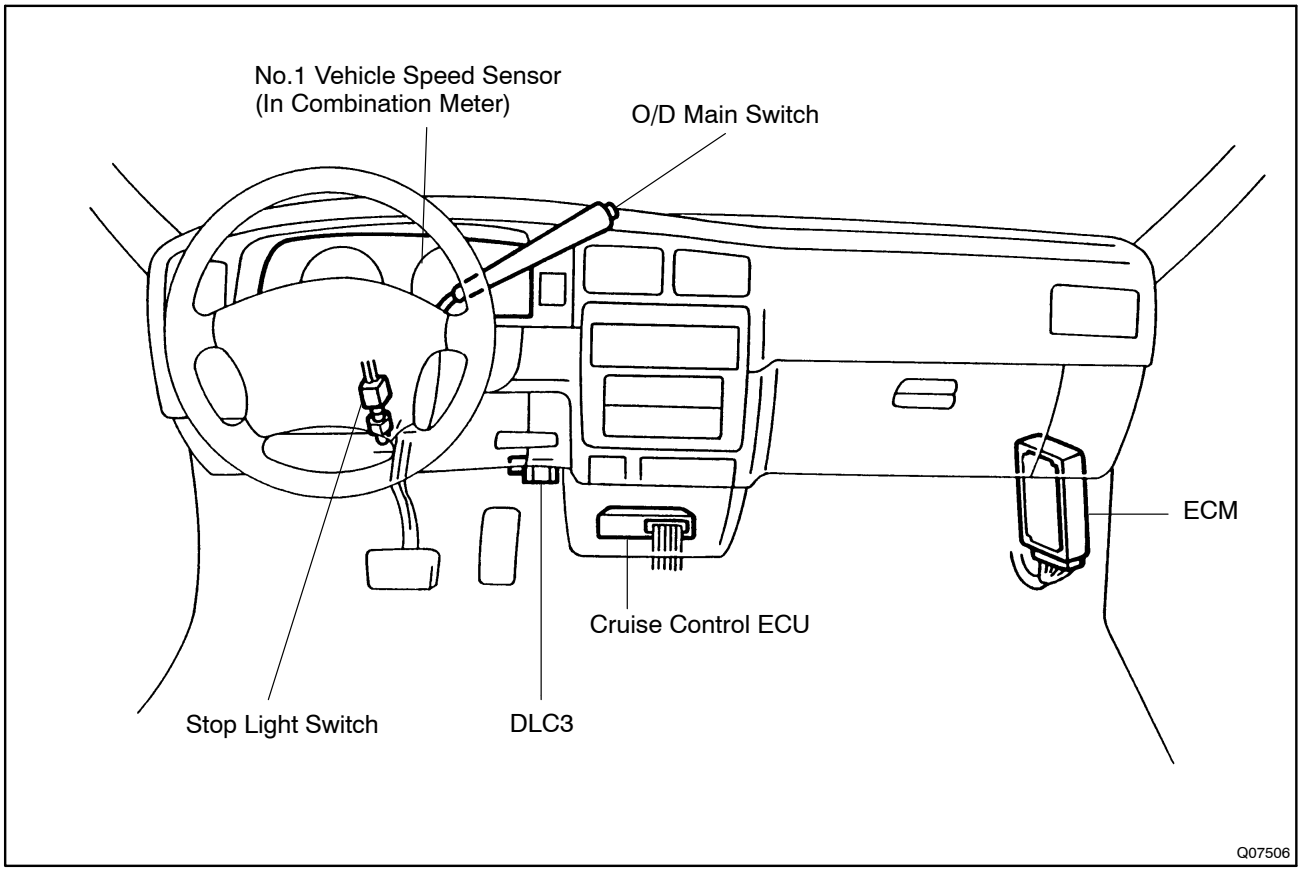
5VZ-FE (A340E and A340F)



P1996 TOYOTA T100 (RM449U)

D10998

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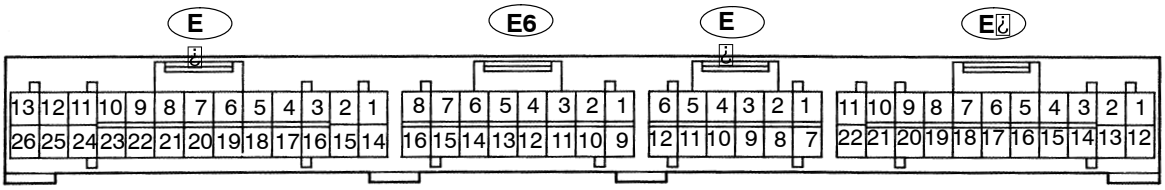
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DI0VI–02

TERMINALS OF ECM

3RZ–FE:

ECM Terminals



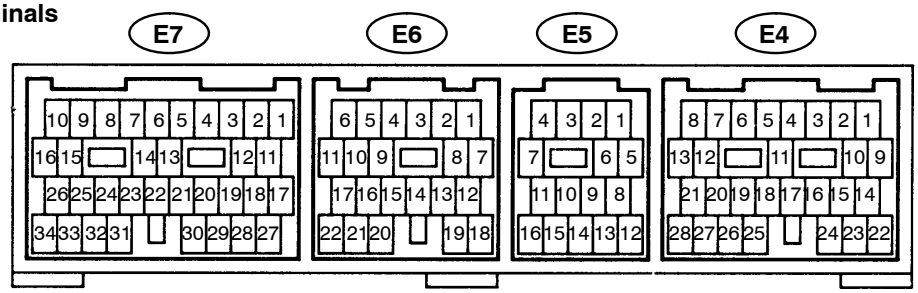
FI6526

Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
SP1 – E1 (E4, 8 – E7, 24)	G ↔ BR	IG switch ON (Disconnect cruise control connector)	Below 1.5 or 4 – 6
		Turn one rear wheel slowly (Disconnect cruise control connector)	Pulse signal is output Below 1.5 ↔ 4 – 6
S1 – E1 (E7, 10 – E7, 24)	W ↔ BR	IG switch ON	9 – 14
		1st or 2nd gear	9 – 14
		3rd or O/D gear	Below 1.5
S2 – E1 (E7, 9 – E7, 24)	B–W ↔ BR	IG switch ON	Below 1.5
		2nd or 3rd gear	9 – 14
		1st or O/D gear	Below 1.5
SL – E1 (E7, 8 – E7, 24)	Y–B ↔ BR	IG switch ON	Below 1.5
		Vehicle driving under lock–up position	9 – 14
$SP2^{+}$ – $SP2^{-}$ (E5, 10 – E5, 4)	BR–R ↔ B–R	Vehicle is running	Pulse signal is output Below 1.5 ↔ 4 – 10
OD2 – E1 (E4, 5 – E7, 24)	Y–G ↔ BR	O/D main switch ON (Pushed in)	9 – 14
		O/D main switch OFF (Pushed once again)	Below 3
OIL – E2 (E7, 21 – E6, 9)	G–B ↔ BR–B	ATF temperature: 110°C (230°F) or more	Below 1.5
L – E1 (E4, 15 – E7, 24)	V–W ↔ BR	IG switch ON, Shift lever L position	7.5 – 14
		IG switch ON, Shift lever other than L position	Below 1.5
2 – E1 (E4, 16 – E7, 24)	P–G ↔ BR	IG switch ON, Shift lever 2 position	7.5 – 14
		IG switch ON, Shift lever other than 2 position	Below 1.5
R – E1 (E4, 17 – E7, 24)	R–B ↔ BR	IG switch ON, Shift lever R position	7.5 – 14
		IG switch ON, Shift lever other than R position	Below 1.5
NSW – E1 (E4, 22 – E7, 24)	B–Y ↔ BR	IG switch ON, Shift lever P or N position	Below 3
		IG switch ON, Shift lever other than P or N position	9 – 14
B/K – E1 (E4, 21 – E7, 24)	G–W ↔ BR	IG switch ON, Brake pedal is depressed	7.5 – 14
		IG switch ON, Brake pedal is released	Below 1.5
THW – E2 (E6, 4 – E6, 9)	G–Y ↔ BR–B	Engine coolant temperature: 80°C (176°F)	Below 1.5
IDL – E2 (E6, 11 – E6, 9)	Y–L ↔ BR–B	IG switch ON, Accel. pedal is released	Below 1.5
		IG switch ON, Accel. pedal is depressed	9 – 14
VTA – E2 (E6, 10 – E6, 9)	Y–B ↔ BR–B	IG switch ON, Accel. pedal is released	Below 0.3 – 0.8
		IG switch ON, Accel. pedal is depressed	3.2 – 4.9

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5VZ–FE:

ECM Terminals



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
SPD – E1 (E4, 12– E5, 16)	G ↔ BR	IG switch ON (Disconnect cruise control connector)	Below 1.5 or 4 – 6
		Turn one rear wheel slowly (Disconnect cruise control connector)	Pulse signal is output Below 1.5 ↔ 4 – 6
S1 – E1 (E7, 11 – E5, 16)	W ↔ BR	IG switch ON	9 – 14
		1st or 2nd gear	9 – 14
		3rd or O/D gear	Below 1.5
S2 – E1 (E7, 17 – E5, 16)	B–W ↔ BR	IG switch ON	Below 1.5
		2nd or 3rd gear	9 – 14
		1st or O/D gear	Below 1.5
SL – E1 (E7, 27 – E5, 16)	Y–B ↔ BR	IG switch ON	Below 1.5
		Vehicle driving under lock–up position	9 – 14
SP2 – E1 (E6, 9 – E5, 16)	BR–R ↔ BR	Turn one rear wheel slowly	Pulse signal is output Below 1.5 ↔ 4 ~ 6
OD1 – E1 (E4, 7 – E5, 16)	Y–R ↔ BR	IG switch ON	9 – 14
OD2 – E1 (E4, 6 – E5, 16)	Y–G ↔ BR	O/D main switch ON (Pushed in)	9 – 14
		O/D main switch OFF (Pushed once again)	Below 3
OIL – E2 (E6, 12 – E6, 22)	G–B ↔ BR–B	ATF temperature: 110˚C (230˚F) or more	Below 1.5
L – E1 (E4, 3 – E5, 16)	V–W ↔ BR	IG switch ON, Shift lever L position	7.5 – 14
		IG switch ON, Shift lever other than L position	Below 1.5
2 – E1 (E4, 2 – E5, 16)	P–G ↔ BR	IG switch ON, Shift lever 2 position	7.5 – 14
		IG switch ON, Shift lever other than 2 position	Below 1.5
R – E1 (E4, 1 – E5, 16)	R–B ↔ BR	IG switch ON, Shift lever R position	7.5 – 14
		IG switch ON, Shift lever other than R position	Below 1.5
NSW – E1 (E7, 14 – E6, 22)	B–O ↔ BR	IG switch ON, Shift lever P or N position	Below 3
		IG switch ON, Shift lever other than P or N position	9 – 14
B/K – E1 (E4, 25 – E5, 16)	G–W ↔ BR	IG switch ON, Brake pedal is depressed	7.5 – 14
		IG switch ON, Brake pedal is released	Below 1.5
THW – E2 (E6, 20 – E6, 22)	G–Y ↔ BR–B	Engine coolant temperature: 80˚C (176˚F)	Below 1.5
IDL – E2 (E7, 32 – E6, 22)	Y–L ↔ BR–B	IG switch ON, Accel. pedal is released	Below 1.5
		IG switch ON, Accel. pedal is depressed	9 – 14
VTA – E2 (E6, 7 – E6, 22)	Y–B ↔ BR–B	IG switch ON, Accel. pedal is released	Below 0.3 – 0.8
		IG switch ON, Accel. pedal is depressed	3.2 – 4.9
TFN – E1 (E4, 17 – E5, 16)	Y ↔ BR	IG switch ON, Transfer N position	Below 3
		IG switch ON, Transfer other than N position	9 – 14

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L4 – E1 (E7, 29 – E5, 16)	R ↔ BR	IG switch ON, Transfer L4 position	7.5 – 14
		IG switch ON, Transfer other than L4 position	Below 1.5
4WD – E1 (E4, 26 – E5, 16)	R–G ↔ BR	IG switch ON, Transfer H2 position	9 – 14
		IG switch ON, Transfer other than H2 position	Below 3

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DI0VJ–02

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the diagnostic trouble code check but the trouble still occurs, check the circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for troubleshooting.

The Matrix Chart is divided into 3 chapters.

Chapter 1: Electronic Circuit Matrix Chart

Chapter 2: On–vehicle Repair Matrix Chart

Chapter 3: Off–vehicle Repair Matrix Chart

- If the instruction ”Proceed to next circuit inspection shown on matrix chart” is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check.
- If the trouble still occurs even though there are no abnormalities in any of the other circuits, then check and replace the ECM.

Chapter 1: Electronic Circuit Matrix Chart

Symptom	Suspect Area	See page
No up–shift (A particular gear, from 1st to 3rd gear, is not up–shifted)	1. ECM	DI–279
No up–shift (3rd → O/D)	1. O/D main switch & O/D OFF indicator light circuit 2. O/D cancel signal circuit 3. ECM	DI–311 DI–309 DI–279
No down–shift (O/D → 3rd)	1. ECM	DI–279
No down–shift (A particular gear, from 1st to 3rd gear, is not up–shifted)	1. ECM	DI–279
No lock–up	1. Stop light swich circuit 2. ECM	DI–316 DI–279
No lock–up off	1. Stop light swich circuit 2. ECM	DI–316 DI–279
Shift point too high or too low	1. ECM	DI–279
Up–shift to O/D from 3rd while O/D main switch is OFF	1. O/D main switch & O/D OFF indicator light circuit 2. ECM	DI–311 DI–279
Up–shift to O/D from 3rd while engine is cold	1. ECM	DI–279
No kick–down	1. ECM	DI–279
Engine stalls when starting off or stopping	1. Stop light swich circuit 2. ECM	DI–316 DI–279

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Chapter 2: On–Vehicle Repair Matrix Chart
(★: A340E, A340F, A340H AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM391U)
(★: A340F, A343F AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM479U)

Symptom	Suspect Area	See page
Vehicle does not move in any forward position and reverse position	1. Throttle cable 2. No.1 gear shifting rod 3. Manual valve 4. Parking lock pawl 5. Off–vehicle repair matrix chart	DI–265 DI–265 ★ AT–17 DI–282
Vehicle does not move in R position	1. Off–vehicle repair matrix chart	DI–282
Vehicle does not move in particular position or positions (except R position)	1. Off–vehicle repair matrix chart	DI–282
No up–shift (1st → 2nd)	1. 1–2 shift valve 2. Off–vehicle repair matrix chart	★ DI–282
No up–shift (2nd → 3rd)	1. 2–3 shift valve 2. Off–vehicle repair matrix chart	★ DI–282
No up–shift (3rd → O/D)	1. 3–4 shift valve 2. Off–vehicle repair matrix chart	★ DI–282
No down–shift (O/D → 3rd)	1. 3–4 shift valve 2. Off–vehicle repair matrix chart	★ DI–282
No down–shift (3rd → 2nd)	1. 2–3 shift valve 2. Off–vehicle repair matrix chart	★ DI–282
No down–shift (2nd → 1st)	1. 1–2 shift valve 2. Off–vehicle repair matrix chart	★ DI–282
No lock–up or No lock–up off	1. Lock–up relay valve 2. Off–vehicle repair matrix chart	★ DI–282
Harsh engagement (N → D)	1. Accumulator control valve 2. Off–vehicle repair matrix chart	★ DI–282
Harsh engagement (Lock–up)	1. Lock–up relay valve 2. Off–vehicle repair matrix chart	★ DI–282
Harsh engagement (N → R)	1. Accumulator control valve 2. C_2 accumulator 3. Off–vehicle repair matrix chart	★ ★ DI–282
Harsh engagement (N → L)	1. Low coast modulator valve	★
Harsh engagement (2nd → 3rd → O/D)	1. Cut–back valve	★
Harsh engagement (1st → 2nd → 3rd → O/D)	1. Throttle valve 2. Actuator control valve	★ ★
Harsh engagement (2nd → 3rd)	1. Accumulator control valve 2. C_2 accumulator 3. Off–vehicle repair matrix chart	★ ★ DI–282
Harsh engagement (3rd → O/D)	1. Accumulator control valve 2. B_0 accumulator 3. Off–vehicle repair matrix chart	★ ★ DI–282
Harsh engagement (O/D → 3rd)	1. Accumulator control valve 2. C_0 accumulator 3. Off–vehicle repair matrix chart	★ ★ DI–282
Slip or shudder (Forward and reverse)	1. Throttle cable 2. No.1 gear shifitng rod 3. Oil strainer 4. Pressure relief valve 5. Off–vehicle repair matrix chart	DI–265 DI–265 AT–12 ★ DI–282

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Slip or shudder (Particular position)	1. Throttle cable 2. No.1 gear shifting rod 3. Off–vehicle repair matrix chart	DI–265 DI–265 DI–282
No engine braking (1st: L position)	1. Low coast modulator valve 2. Off–vehicle repair matrix chart	★ DI–282
No engine braking (2nd: 2 position)	1. 2nd coast modulator valve 2. Off–vehicle repair matrix chart	★ DI–282
No kick–down	1. 1–2 shift valve 2. 2–3 shift valve	★ ★

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Chapter 3: Off–Vehicle Repair Matrix Chart
(★: A340E, A340F, A340H AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM391U)
(★: A340F, A343F AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM479U)

Symptom	Suspect Area	See page
Vehicle does not move in any forward position and reverse position	1. O/D one–way clutch (F_0) 2. O/D direct clutch (C_0) 3. O/D planetary gear unit 4. Torque converter clutch	★ ★ ★ AT–38
Vehicle does not move in R position	1. Front and rear planetary gear unit 2. Direct clutch (C_2) 3. 1st and reverse brake (B_3) 4. O/D direct clutch (C_0)	★ ★ ★ ★
No up–shift (1st → 2nd)	1. 2nd brake (B_2) 2. No. 1 one–way clutch (F_1)	★ ★
No up–shift (2nd → 3rd)	1. Direct clutch (C_2)	★
No up–shift (3rd → O/D)	1. O/D brake (B_0)	★
No lock–up or No lock–up off	1. Torque converter clutch	AT–38
Harsh engagement (N → D)	1. Forward clutch (C_1) 2. O/D one–way clutch (F_0) 3. No. 2 one–way clutch (F_2)	★ ★ ★
Harsh engagement (N → R)	1. Direct clutch (C_2) 2. 1st and reverse brake (B_3) 3. O/D one–way clutch (F_0)	★ ★ ★
Harsh engagement (N → 2)	1. Forward clutch (C_1) 2. O/D one–way clutch (F_0) 3. No. 2 one–way clutch (F_2)	★ ★ ★
Harsh engagement (N → L)	1. Forward clutch (C_1) 2. 1st and reverse brake (B_3) 3. O/D one–way clutch (F_0) 4. No. 2 one–way clutch (F_2)	★ ★ ★ ★
Harsh engagement (Lock–up)	1. Torque converter clutch	AT–38
Slip or shudder (Forward and reverse: After warm–up)	1. Torque converter clutch 2. O/D one–way clutch (F_0) 3. O/D direct clutch (C_0)	AT–38 ★ ★
Slip or shudder (Particular position: Just after engine starts)	1. Torque converter clutch	AT–38
Slip or shudder (R position)	1. Direct clutch (C_2) 2. 1st and reverse brake (B_3)	★ ★
Slip or shudder (1st)	1. Forward clutch (C_1) 2. No. 2 one–way clutch (F_2)	★ ★
Slip or shudder (2nd)	1. 2nd brake (B_2) 2. 2nd coast brake (B_1) 3. No. 1 one–way clutch (F_1)	★ ★ ★
Slip or shudder (3rd)	1. Direct clutch (C_2)	★
Slip or shudder (O/D)	1. O/D brake (B_0)	★
No engine braking (1st ~ 3rd: D position)	1. 2nd brake (B_2)	★
No engine braking (1st: L position)	1. 1st and reverse brake (B_3)	★
No engine braking (2nd: 2 position)	1. 2nd coast brake (B_1)	★
Poor acceleration (All position)	1. Torque converter clutch	AT–38
Poor acceleration (O/D)	1. O/D direct clutch (C_0) 2. O/D planetary gear unit	★ ★
Engine stalls when starting off or stopping	1. Torque converter clutch	AT–38

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DI0VK–01

CIRCUIT INSPECTION

DTC	P0500	Vehicle Speed Sensor Malfunction (No.1 Vehicle Speed Sensor)

See page 3RZ–FE DI–92, 5VZ–FE DI–226.

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DI0VL–02

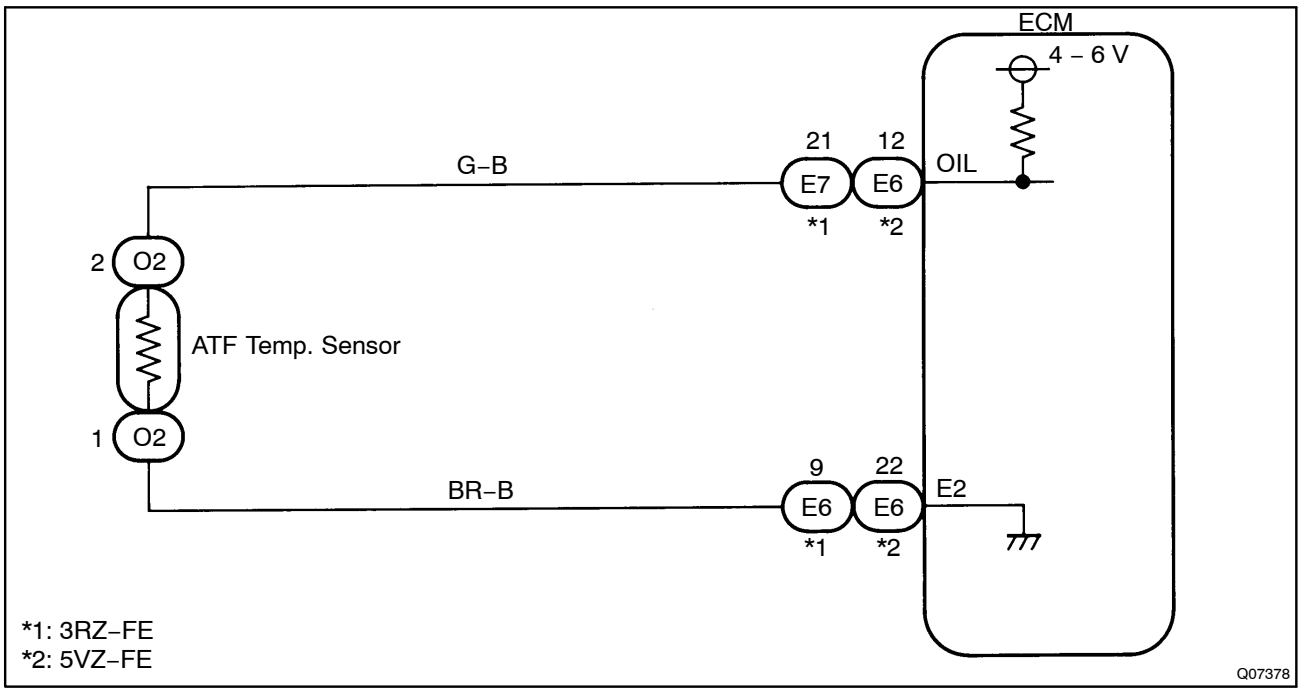
DTC	P0710	Transmission Fluid Temperature Sensor Malfunction (ATF Temperature Sensor)

CIRCUIT DESCRIPTION

The ATF temperature sensor converts fluid temperature into a resistance value which is input into the ECM.

DTC No	DTC Detecting Condition	Trouble Area
P0710	Either (a) or (b) is detected for 0.5 sec. or more: (2 trip detection logic) (a) Temp. sensor resistance is less than 79 Ω (b) After engine has been operating for 15 minutes or more, resistance at temp. sensor is more than 156 kΩ	• Open or short in ATF temp. sensor circuit • ATF temp. sensor • ECM

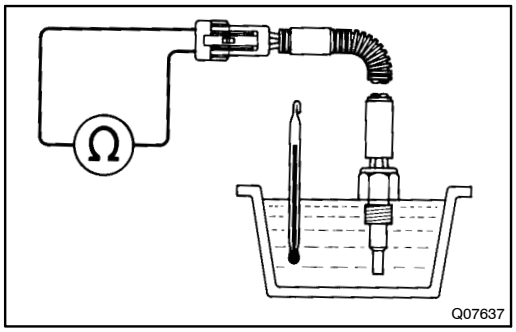
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check ATF Temperature Sensor.**



PREPARATION:
Remove the ATF temperature sensor.
CHECK:
Measure resistance between terminals of ATF temperature sensor at 20˚C (68˚F) and 110˚C (230˚F).
OK:

Resistance:
20˚C (68˚F): Approx. 13.0 kΩ
110˚C (230˚F): Approx. 800 Ω

NG → **Replace ATF temperature sensor.**

OK

2	**Check harness and connector between ATF temperature sensor and ECM (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM.

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DI0VM–01

DTC	P0750, P0755	Shift Solenoid A/B Malfunction (Shift Solenoid Valve No.1/No.2)

SYSTEM DESCRIPTION

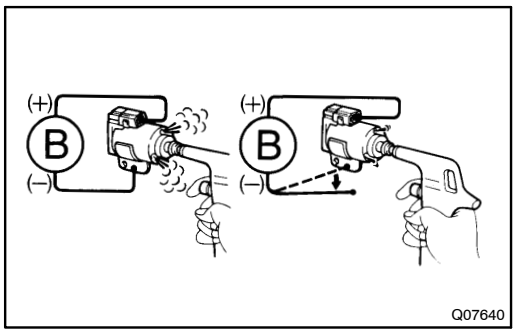
The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or O/D gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical trouble of the shift solenoid valves and valve body.

DTC No.	DTC Detecting Condition	Trouble Area
P0750 P0755	During normal driving, gear required by ECM does not match actual gear (2 trip detection logic)	• Shift solenoid valve No.1/No.2 is stuck open or closed • Valve body is blocked up or stuck

HINT:
Check the shift solenoid valve No.1 when DTC P0750 is output and check shift solenoid valve No.2 when DTC P0755 is output.

INSPECTION PROCEDURE

1	Check shift solenoid valve No.1 or No.2 operation.



Q07640

PREPARATION:
(a) Remove the oil pan.
(b) Remove the shift solenoid valve No.1 or No.2.

CHECK:
(a) Applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valve does not leak air.
(b) When battery positive voltage is supplied to the shift solenoid valve, check that the solenoid valve opens.

NG → Replace shift solenoid valve No.1 or No.2.

OK

2	Check valve body (See page DI–282).

NG → Repair or replace valve body.

OK

Repair or replace transmission (See page AT–26, AT–33).

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DI0VP-02

DTC	P0753, P0758	Shift Solenoid A/B Electrical Malfunction (Shift Solenoid Valve No.1/No.2)

CIRCUIT DESCRIPTION

Shifting from 1st to O/D is performed in combination with ON and OFF of the shift solenoid valves No.1 and No.2 controlled by ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

Fail safe function:

If either of the shift solenoid valve circuits develops an open or short, the ECM turns the other shift solenoid ON and OFF to shift to the gear positions shown in the table below. The ECM also turns the shift solenoid valve SL OFF at the same time. If both solenoids are malfunction, hydraulic control cannot be performed electronically and must be done manually.

Manual shifting as shown in the following table must be done (In the case of a short circuit, the ECM stops sending current to the short circuited solenoid).

Position	NORMAL			SHIFT SOLENOID NO.1 MALFUNCTIONING			SHIFT SOLENOID NO.2 MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING
	Solenoid valve		Gear	Solenoid valve		Gear	Solenoid valve		Gear	Gear when shift selector is manually operated
	No.1	No.2		No.1	No.2		No.1	No.2		
D	ON	OFF	1st	X	ON	3rd	ON	X	1st	O/D
	ON	ON	2nd	X	ON	3rd	OFF	X	O/D	O/D
	OFF	ON	3rd	X	ON	3rd	OFF	X	O/D	O/D
	OFF	OFF	O/D	X	OFF	O/D	OFF	X	O/D	O/D
2	ON	OFF	1st	X	ON	3rd	ON	X	1st	3rd
	ON	ON	2nd	X	ON	3rd	OFF	X	3rd	3rd
	OFF	ON	3rd	X	ON	3rd	OFF	X	3rd	3rd
L	ON	OFF	1st	X	OFF	1st	ON	X	1st	1st
	ON	ON	2nd	X	ON	2nd	ON	X	1st	1st

X: Malfunctions

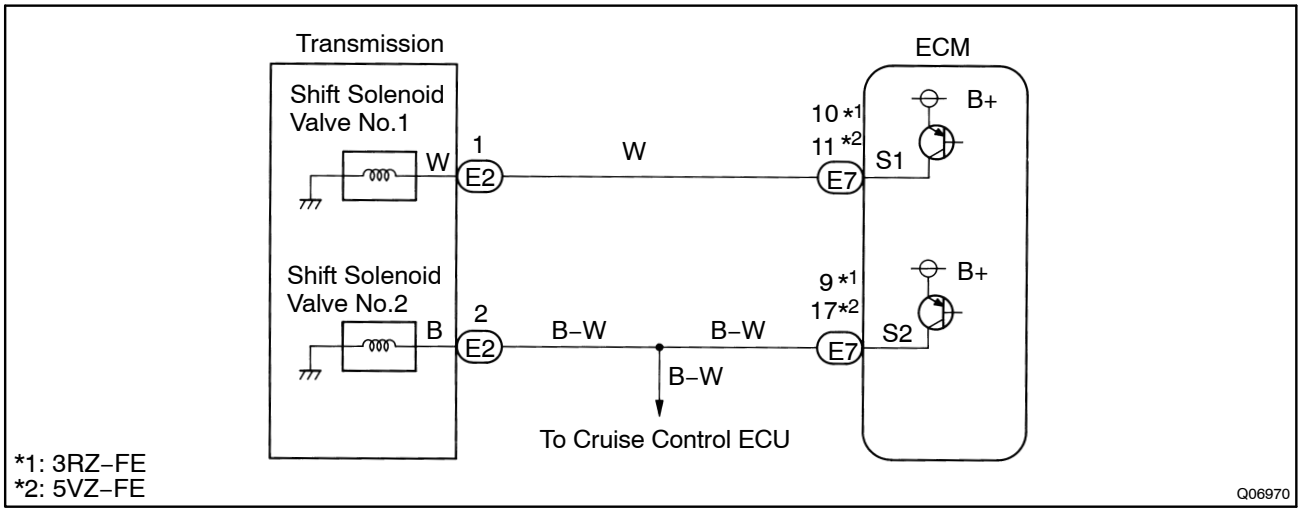
HINT:

Check the shift solenoid valve No.1 when DTC P0753 is output and check the shift solenoid valve No.2 when DTC P0758 is output.

DTC No.	DTC Detecting Condition	Trouble Area
P0753 P0758	ECM checks for open or short circuit in shift solenoid valves No.1 and No.2 circuit when it changes ECM records DTC P0753 or P0758 if condition (a) or (b) is detected once, but it does not light up MIL After ECM detects condition (a) or (b) continuously 2 times or more in one–trip, it causes MIL light up until condition (a) or (b) disappears After that, if ECM detects condition (a) or (b) once, it starts lighting up MIL again: (a) Solenoid resistance is 8 Ω or less (short circuit) when solenoid is energized (b) Solenoid resistance is 100 kΩ or more (open circuit) when solenoid is not energized	• Open or short in shift solenoid valve No.1/No.2 circuit • Shift solenoid valve No.1/No.2 • ECM

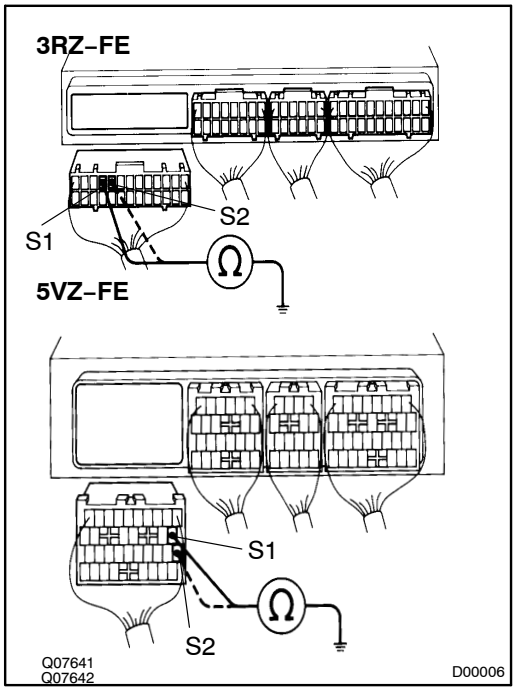
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WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Measure resistance between terminal S1 or S2 of ECM connector and body ground.**



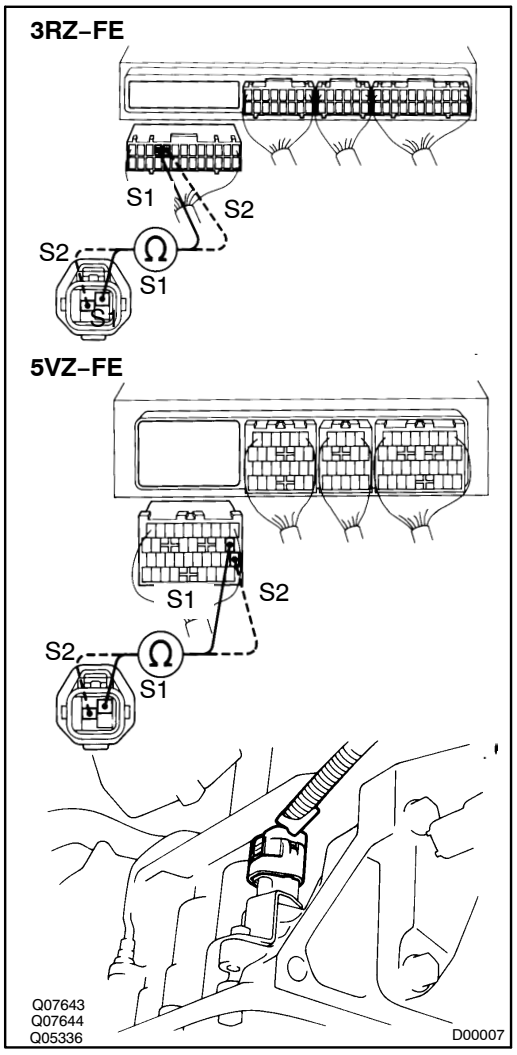
PREPARATION:
Disconnect the connector from the ECM.
CHECK:
Measure resistance between terminal S1 or S2 of ECM connector and body ground.
OK:
Resistance: 11 – 15 Ω

OK	**Check and replace ECM.**

NG

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2	**Check harness and connector between ECM connector and automatic transmission solenoid connector.**



PREPARATION:

Disconnect the solenoid connector from the automatic transmission.

CHECK:

Check the harness and connector between terminal S1 or S2 of ECM connector and terminal S1 or S2 of solenoid connector.

OK:

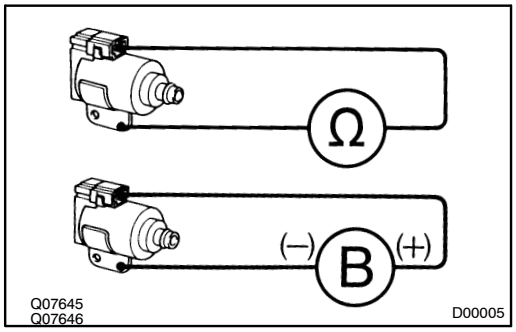
There is no open and no short circuit.

NG → **Repair or replace harness or connector.**

OK

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3	Check shift solenoid valve No.1 or No.2.



PREPARATION:

(a) Remove the oil pan.

(b) Remove the shift solenoid valve No.1 or No.2.

CHECK:

(a) Measure resistance between solenoid connector and solenoid body.

(b) Connect positive lead to terminal of solenoid connector, negative lead to solenoid body.

OK:

(a) Resistance: 11 – 15 Ω

(b) The solenoid makes an operating noise.

NG → **Replace solenoid valve.**

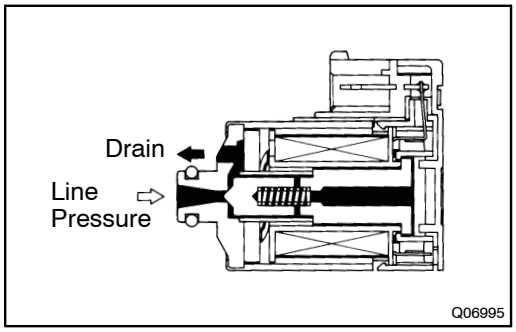
OK

Repair or replace solenoid wire.

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DI0VR–01

DTC	P0770	Shift Solenoid E Malfunction (Shift Solenoid Valve SL)



Q06995

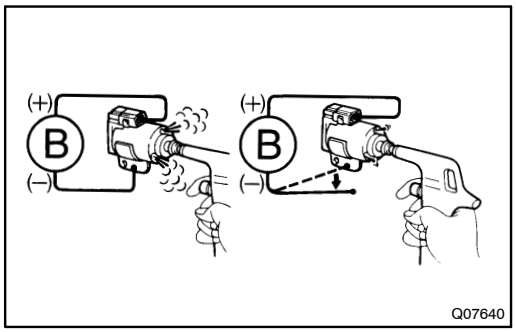
SYSTEM DESCRIPTION

The ECM uses the signals from the Throttle position sensor, mass air flow meter and crankshaft position sensor to monitor the engagement condition of the lock–up clutch.
Then the ECM compares the engagement condition of the lock–up clutch with the lock–up schedule in the ECM memory to detect mechanical trouble of the shift solenoid valve SL, valve body and torque converter clutch.

DTC No.	DTC Detecting Condition	Trouble Area
P0770	Lock–up does not occur when driving in the lock–up range (normal driving at 80 km/h [50 mph]), or lock–up remains ON in the lock–up OFF range (2 trip detection logic)	• Shift solenoid valve SL is stuck open or closed • Valve body blocked up or stuck • Lock–up clutch

INSPECTION PROCEDURE

1	Check solenoid valve SL operation.



Q07640

PREPARATION:
(a) Remove the oil pan.
(b) Remove the shift solenoid valve SL.

CHECK:
(a) Applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valve does not leak air.
(b) When battery voltage is supplied to the shift solenoid valve, check that the solenoid valve opens.

NG → **Replace solenoid valve SL.**

OK

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2	**Check valve body (See page DI–282).**

NG → **Repair or replace valve body.**

OK

Replace torque converter clutch (See page AT–26, AT–33).

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DI0VU–01

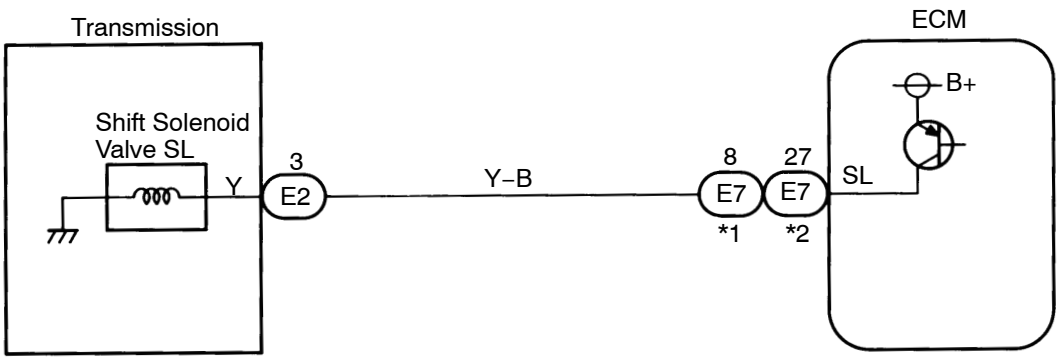
DTC	P0773	Shift Solenoid E Electrical Malfunction (Shift Solenoid Valve SL)

CIRCUIT DESCRIPTION

The shift solenoid valve SL is turned ON and OFF by signals from the ECM to control the hydraulic pressure acting on the lock–up relay valve, which then controls operation of the lock–up clutch.
Fail safe function:
If the ECM detects a malfunction, it turns the shift solenoid valve SL OFF.

DTC No.	Detection ItemDTC Detecting Condition	Trouble Area
P0773	Either (a) or (b) are detected for 1 time: (2 trip detection logic) (a) Solenoid resistance is 8 Ω or less (short circuit) when solenoid is energized (b) Solenoid resistance is 100 kΩ or more (open circuit) when solenoid is not energized	• Open or short in shift solenoid valve SL circuit • Shift solenoid valve SL • ECM

WIRING DIAGRAM



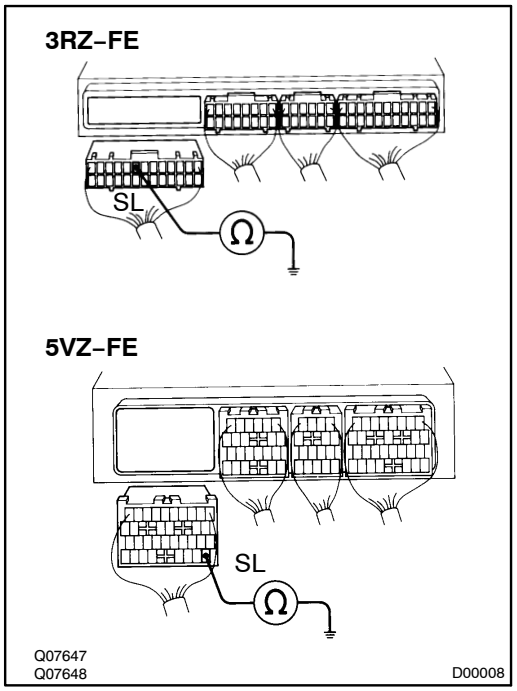
*1: 3RZ–FE
*2: 5VZ–FE

Q07379

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INSPECTION PROCEDURE

1	**Measure resistance between terminal SL of ECM connector and body ground.**



PREPARATION:

Disconnect the connector from the ECM.

CHECK:

Measure resistance between terminal SL of ECM connector and body ground.

OK:

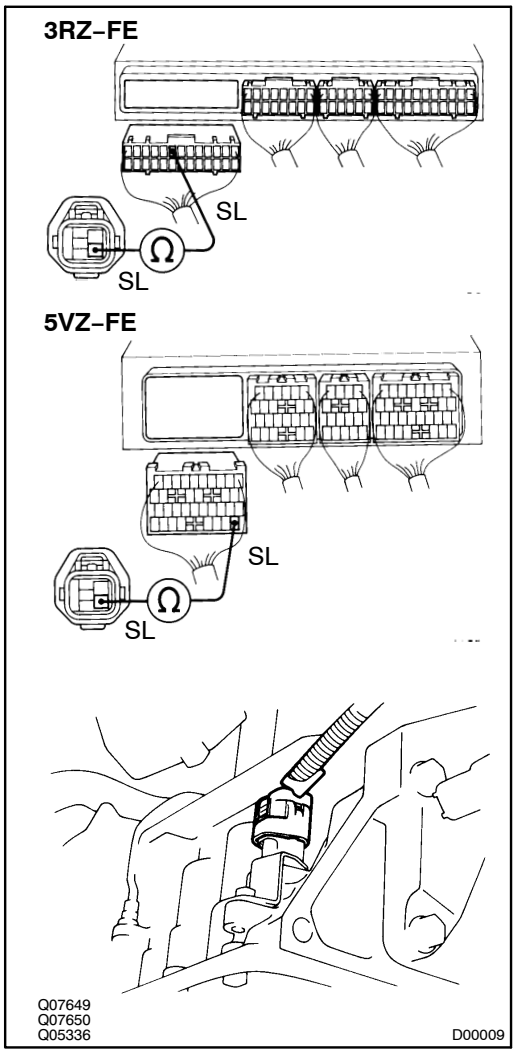
Resistance: 11 – 15 Ω

OK → **Check and replace ECM.**

NG

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2	**Check harness and connector between ECM connector and automatic transmission solenoid connector.**



PREPARATION:

Disconnect the solenoid connector from the transmission.

CHECK:

Check the harness between terminal SL of ECM connector and terminal SL of transmission solenoid connector.

OK:

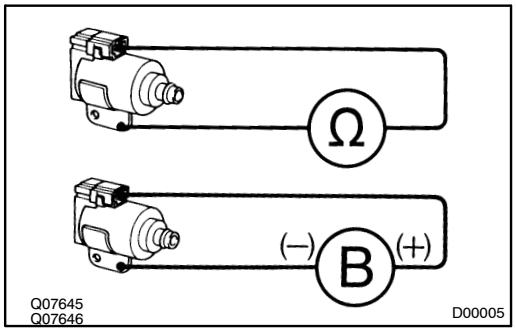
There is no open or short circuit.

OK

NG → **Repair or replace tharness or connector.**

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3	Check shift solenoid valve SL.



PREPARATION:

(a) Remove the oil pan.

(b) Remove the shift solenoid valve SL.

CHECK:

(a) Measure resistance between terminal SL of shift solenoid valve and solenoid body.

(b) Connect positive lead to terminal of solenoid connector, negative lead to solenoid body.

OK:

(a) Resistance: 11 – 15 Ω

(b) The shift solenoid valve SL makes operation noise.

NG → **Replace shift solenoid valve SL.**

OK

Repair or replace solenoid wire.

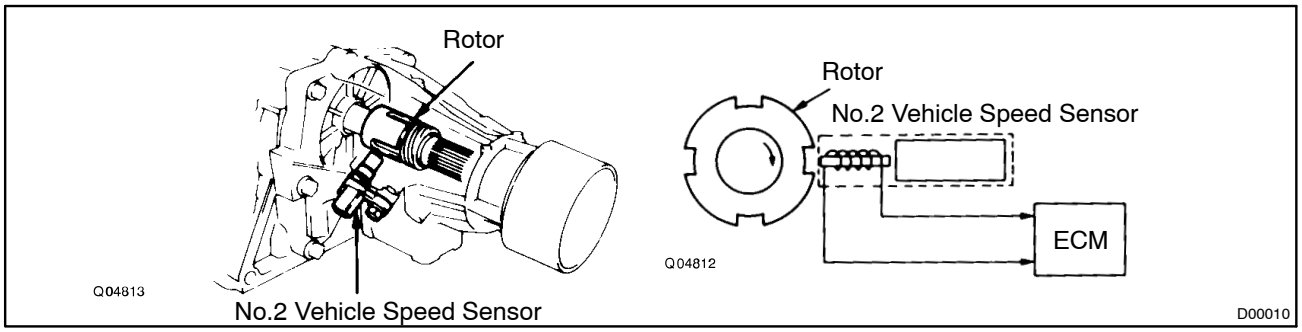
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DI0VZ–01

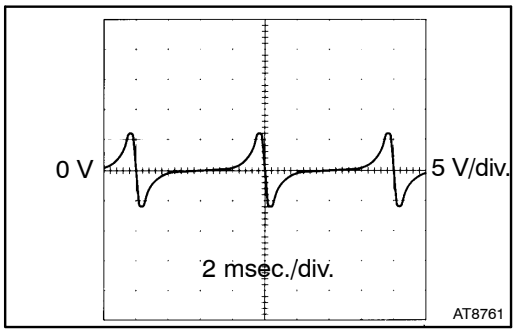
DTC	P1700	Speed Sensor No.2 Circuit Malfunction (No.2 Vehicle Speed Sensor) (3RZ–FE)

CIRCUIT DESCRIPTION

The No.2 vehicle speed sensor detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals.
An AC voltage is generated in the No.2 vehicle speed sensor coil as the rotor mounted on the output shaft rotates, and this voltage is sent to the ECM.
The gear shift point and lock–up timing are controlled by the ECM based on the signals from this vehicle speed sensor and the throttle position sensor signal.
If the No.2 vehicle speed sensor malfunctions, the ECM uses input signals from the No.1 vehicle speed sensor as a back–up signal.



DTC No.	DTC Detecting Condition	Trouble Area
P1700	All conditions below are detected 500 times or more continuously: (2 trip detection logic) (a) No signal from No.2 vehicle speed sensor is input to ECM while 4 pulses of No.1 vehicle speed sensor signal is sent (b) Vehicle speed: 9 km/h (5.6 mph) or more for as least 4 seconds (c) Park/neutral position switch: OFF (Other than P or N)	• Open or short in No.2 vehicle speed sensor circuit • No.2 vehicle speed sensor • ECM

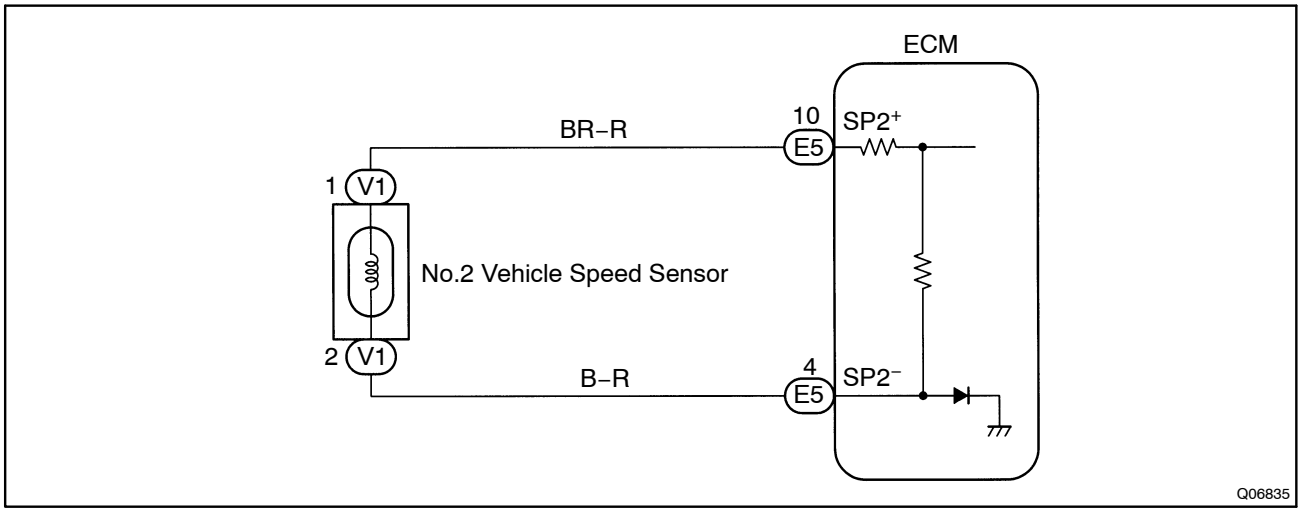


Reference

Wavefrom between terminals $SP2^+$ and $SP2^-$ when vehicle speed is approx. 60 km/h (37 mph).

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WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check vehicle speed value or resistance between terminals SP2+ and SP2– of ECM.**

When using OBD II scan tool or TOYOTA hand–held tester:

PREPARATION:

(a) Connect an OBD II scan tool or TOYOTA hand–held tester to the DLC3.

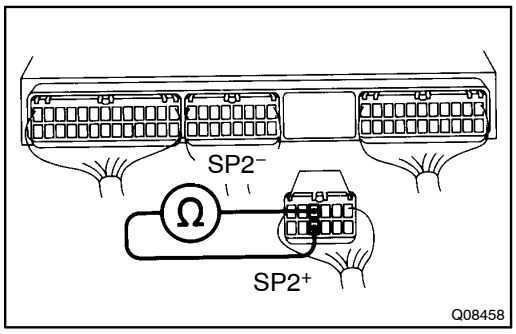
(b) Start the engine and OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

Drive the vehicle and read vehicle speed value.

OK:

Vehicle speed matches tester speed value.



When not using OBD II scan tool or TOYOTA hand–held tester:

PREPARATION:

Disconnect the connector from the ECM.

CHECK:

Check resistance between terminals SP2+ and SP2– of ECM.

OK:

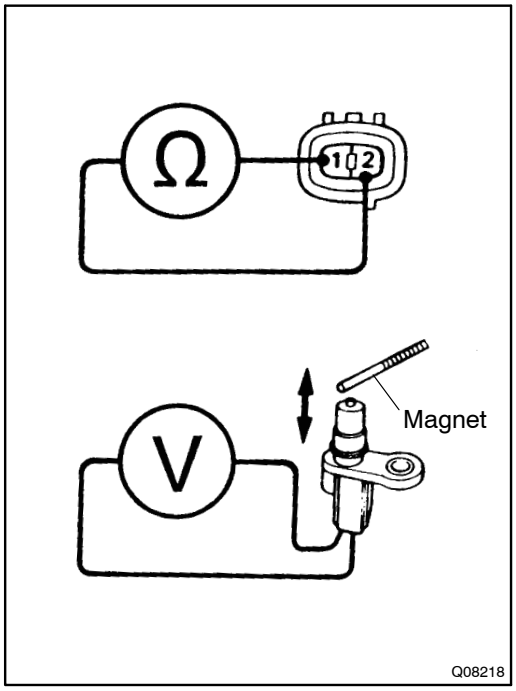
Resistance: 560 – 680 Ω

OK	**Check and replace ECM.**

NG

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2	Check No.2 vehicle speed sensor.



PREPARATION:

Remove the No.2 vehicle speed sensor from the transmission.

CHECK:

(a) Measure resistance between terminals 1 and 2 of vehicle speed sensor.

(b) Check voltage between terminals 1 and 2 of vehicle speed sensor when a magnet is put close to the front end of the vehicle speed sensor then taken away quickly.

OK:

(a) Resistance: 560 – 680 Ω

(b) Voltage is generated intermittently.

HINT:

The voltage generated is extremely low.

NG → **Replace No.2 vehicle speed sensor.**

OK

Check and repair the harness and connector between ECM and No.2 vehicle speed sensor (See page IN–26).

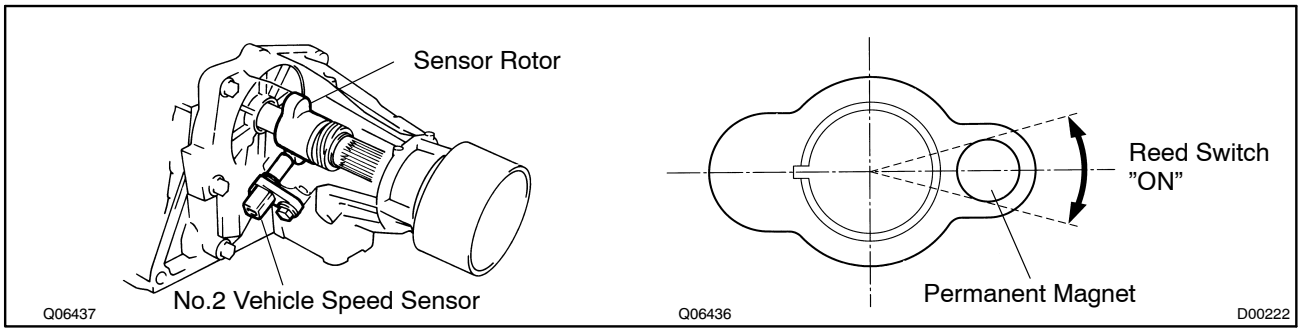
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DI0W1–01

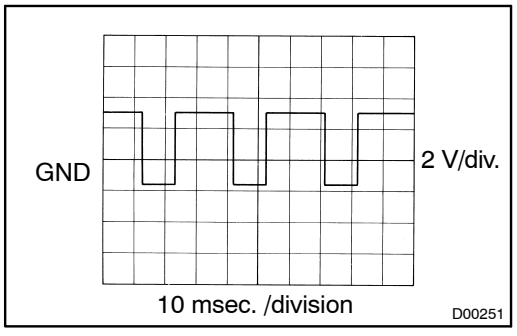
DTC	P1700	Speed Sensor No.2 Circuit Malfunction (No.2 Vehicle Speed Sensor) (5VZ–FE)

CIRCUIT DESCRIPTION

A rotor with built in permanent magnet is mounted on the output shaft. Every time the output shaft (and thus the rotor) makes one complete revolution, the permanent magnet acticates the reed switch, which is built into the No.2 vehicle speed sensor, causing it to generate signal. This shignal, which corresponds to the governor pressure in a conventional automatic transmission, is sent to the ECM, which uses it in controlling the shift points and the operation of the look–up clutch.
This sensor outputs one pulse for every one revolution of the output shaft.
If the No.2 vehicle speed sensor malfunctions, the ECM uses input signals from the No.1 vehicle speed sensor as a back–up signal.



DTC No.	DTC Detecting Condition	Trouble Area
P1700	All conditions below are detected 500 times or more continuously: (2 trip detection logic) (a) No signal from No.2 vehicle speed sensor is input to ECM while 4 pulses of No.1 vehicle speed sensor signal is sent (b) Vehicle speed: 9 km/h (5.6 mph) or more for as least 4 seconds (c) Park/neutral position switch: OFF (Other than P or N) (d) Transfer position: Other than N position (A340F only)	• Open or short in No.2 vehicle speed sensor circuit • No.2 vehicle speed sensor • ECM

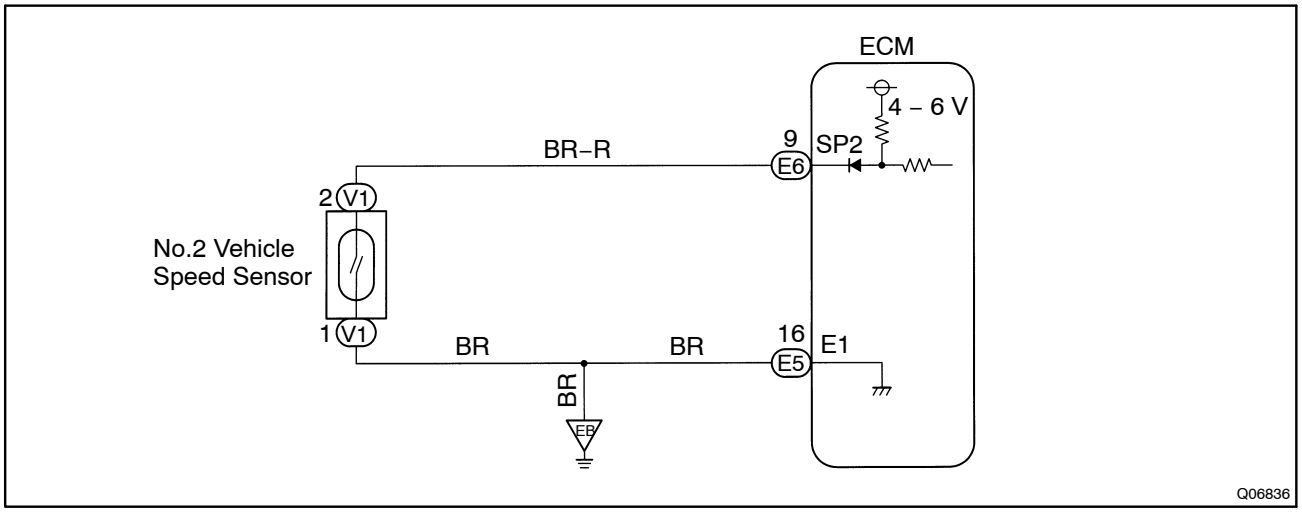


Reference

Wavefrom between terminals SP2 and E1 when vehicle speed is approx. 60 km/h (37 mph).

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WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check vehicle speed value or resistance between terminals SP2 and E1 of ECM.**

When using OBD II scan tool or TOYOTA hand–held tester:

PREPARATION:

(a) Connect an OBD II scan tool or TOYOTA hand–held tester to the DLC3.

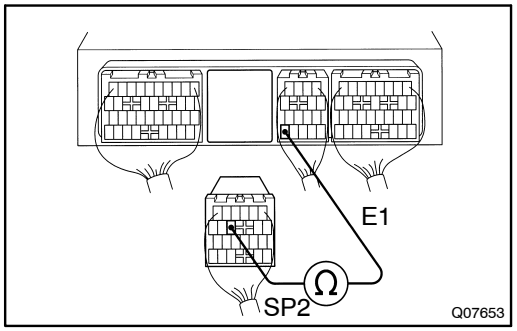
(b) Start the engine and OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

Drive the vehicle and read vehicle speed value.

OK:

Vehicle speed matches tester speed value.



When not using OBD II scan tool or TOYOTA hand–held tester:

PREPARATION:

(a) Disconnect the connector from the ECM.

(b) Shift the shift lever to N position.

(c) Jack up the rear wheels on one side.

CHECK:

Check that there is continuity between terminals SP2 and E1 of ECM while slowly turning the jacked–up wheel by hand.

OK:

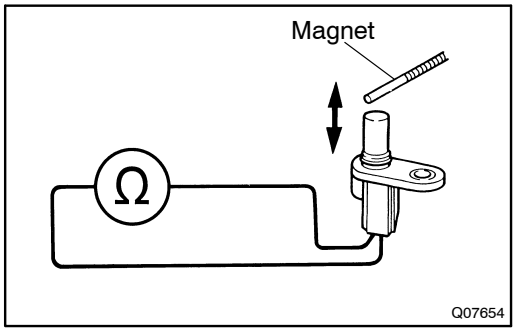
Resistance: Changes between 0 Ω and ∞ Ω

OK → **Check and replace ECM.**

NG

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2	Check No.2 vehicle speed sensor.



PREPARATION:

Remove the No.2 vehicle speed sensor from the transmission.

CHECK:

Check that there is continuity between terminals of No.2 vehicle speed sensor connector when a magnet is put close to it as shown.

OK:

Resistance: Changes between 0 Ω and ∞ Ω

NG → **Replace No.2 vehicle speed sensor.**

OK

Check and repair harness and connector between ECM and No.2 vehicle speed sensor (See page IN–26). Check and repair sensor rotor.

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DI0W5–02

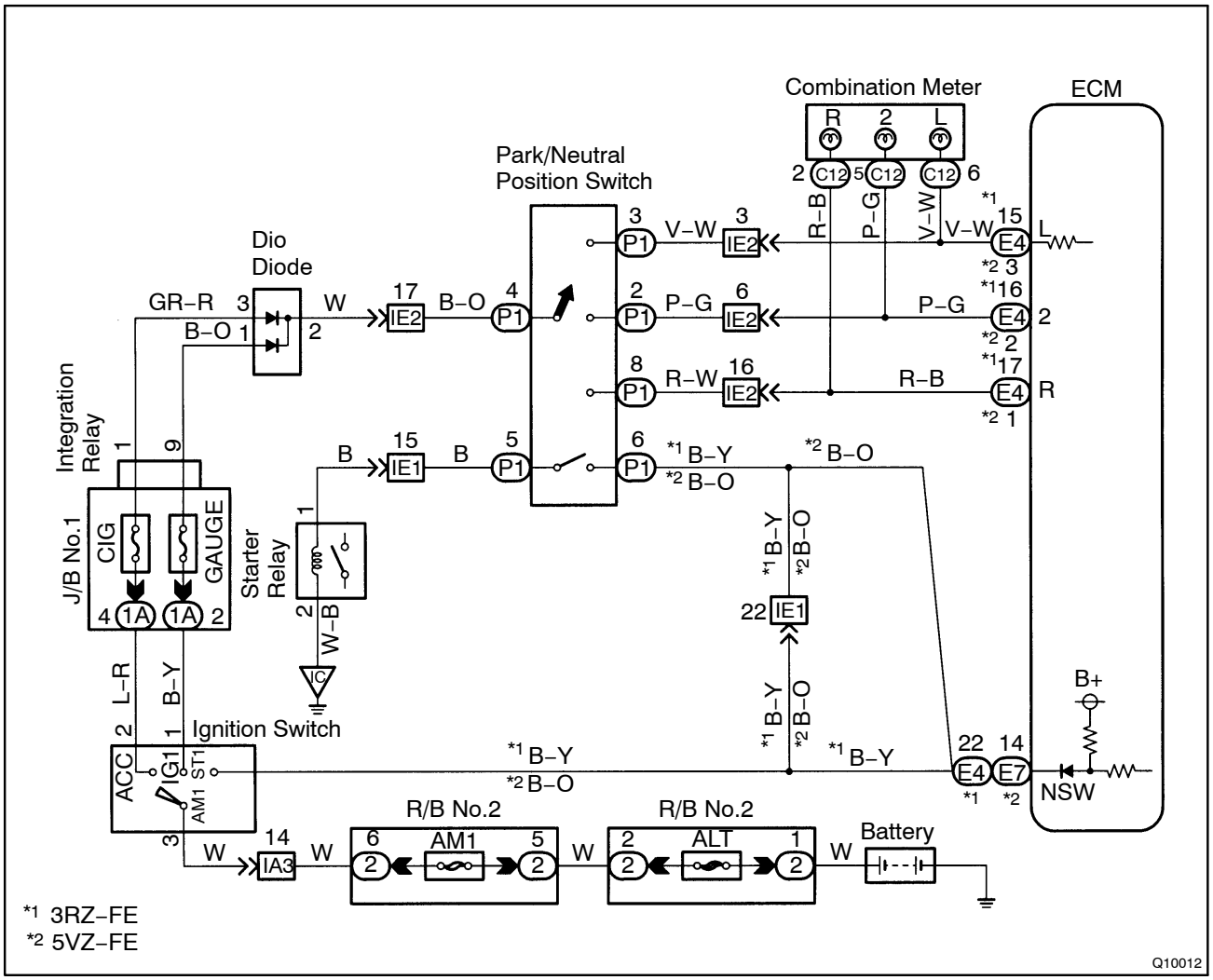
DTC	P1780	Park/Neutral Position Switch Malfunction

CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals to the ECM.
The ECM receives signals (NSW, R, 2 and L) from the park/neutral position switch. When the signal is not sent to the ECM from the park/neutral position switch, the ECM judges that the shift lever is in D position.

DTC No.	DTC Detection Condition	Trouble Area
P1780	2 or more switches are ON simultaneously for R, N, 2 and L positions (2 trip detection logic)	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM
	When driving under conditions (a), (b) and (c) for 30 seconds or more, park/neutral position switch is ON (N position) (2 trip detection logic) (a) Vehicle speed: 70 km/h (44 mph) or more (b) Engine speed: 1,500 ~ 2,500 rpm (c) Engine load: 0.6 g/rev	

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Read PNP, REVERSE, 2ND and LOW signals.**

When using TOYOTA hand–held tester:

PREPARATION:

(a) Connect a TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

CHECK:

Shift lever into the P, R, N, 2 and L positions, and read the PNP, REVERSE, 2ND and LOW signals on the TOYOTA hand–held tester.

OK:

Shift position	Signal
2	2ND OFF → ON
L	LOW OFF → ON
R	REVERSE OFF → ON
P, N	PNP OFF → ON

When not using TOYOTA hand–held tester:

PREPARATION:

Turn the ignition switch ON.

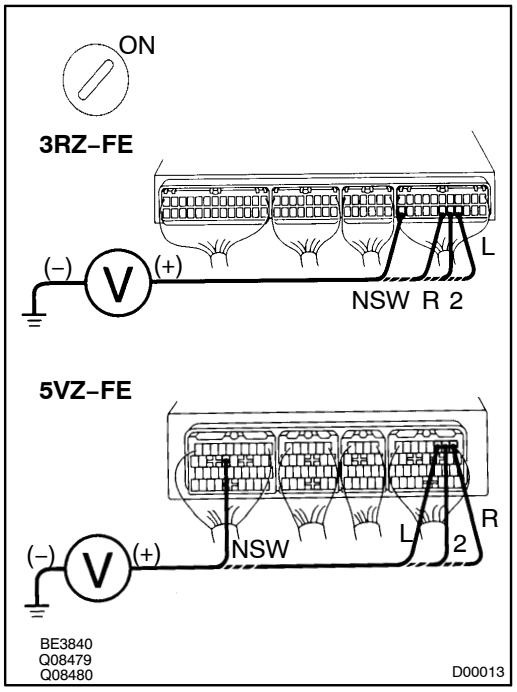
CHECK:

Measure voltage between terminals NSW, 2, L and R of ECM and body ground when the shift lever is shifted to the following positions.

OK:

Position	NSW–Body ground	R–Body ground	2–Body ground	L–Body ground
P, N	0 V	0 V	0 V	0 V
R	7.5 ~ 14 V*	7.5 ~ 14 V*	0 V	0 V
D	7.5 ~ 14 V	0 V	0 V	0 V
2	7.5 ~ 14 V	0 V	7.5 ~ 14 V*	0 V
L	7.5 ~ 14 V	0 V	0 V	7.5 ~ 14 V*

*: The voltage will drop slightly due to lighting up of the back up light.

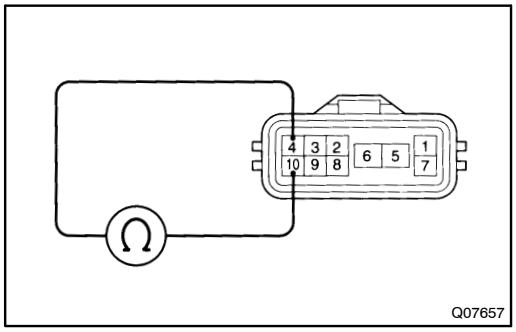


OK → **Check and replace ECM.**

NG

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2	Check park/neutral position switch.



PREPARATION:

(a) Jack up the vehicle.

(b) Disconnect the park/neutral position switch connector.

CHECK:

Check continuity between each terminal shown below when the shift lever is moved to each position.

OK:

Shift Position	Terminal No. to continuity	Terminal No. to continuity
P	4 – 7	5 – 6
R	4 – 8	–
N	4 – 10	5 – 6
D	4 – 9	–
2	2 – 4	–
L	3 – 4	–

NG → **Replace park/neutral position switch.**

OK ↓

Repair or replace harness and connector between battery and park/neutral position switch, park/neutral position switch and ECM (See page IN–26).

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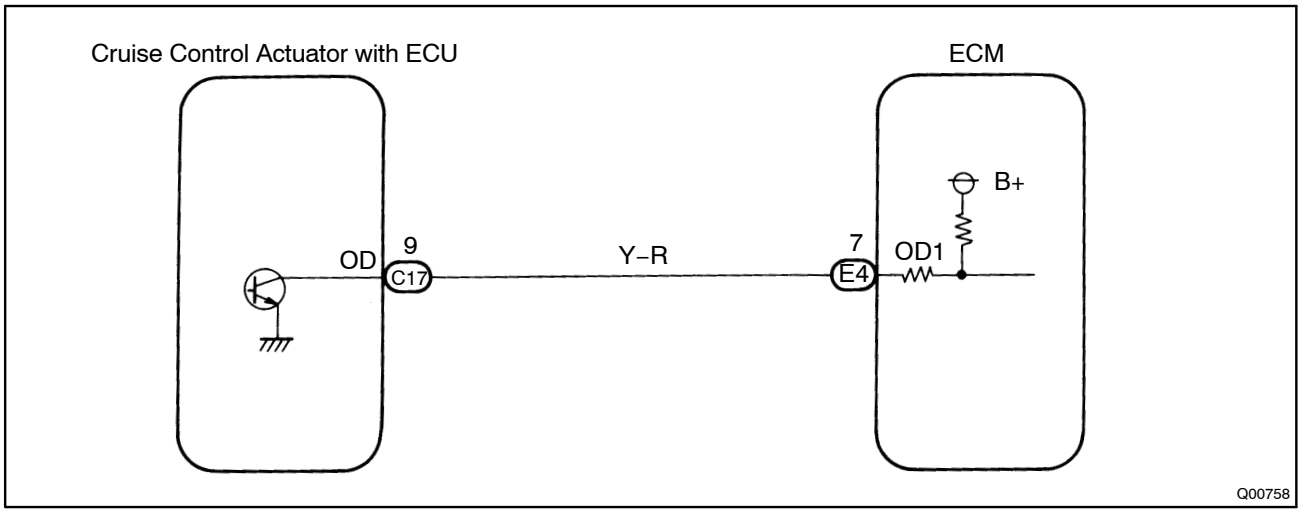
DI0W9–02

O/D Cancel Signal Circuit (5VZ–FE only)

CIRCUIT DESCRIPTION

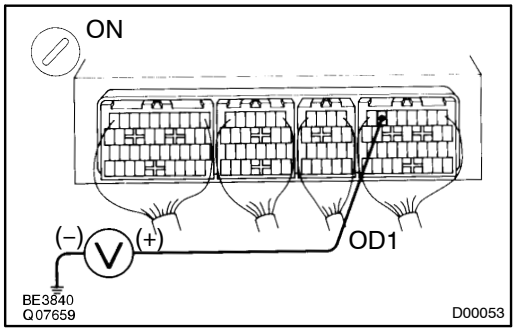
While driving uphill with cruise control activated, in order to minimize gear shifting and provide smooth cruising overdrive may be prohibited temporarily under some condition.
The cruise control ECU sends O/D cut signals to the ECM as necessary and the ECM cancels O/D shifting until these signals are discontinued.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminal OD1 of ECM and body ground.**



PREPARATION:
Turn the ignition switch ON.
CHECK:
Measure voltage between terminal OD1 of ECM and body ground.
OK:

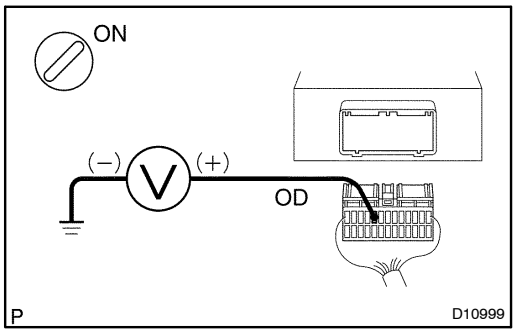
Voltage: 4 – 6 V

OK	**Proceed to next circuit inspection shown on problem symptoms table (See page DI–282).**

NG

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2	Check voltage between terminal OD of cruise control ECU harness side connector and body ground.



PREPARATION:

(a) Disconnect the cruise control ECU connector.

(b) Turn the ignition switch ON.

CHECK:

Measure voltage between terminal OD of cruise control ECU harness side connector and body ground.

OK:

Voltage: 4 – 6 V

OK	Check and replace cruise control ECU.

NG

3	Check harness and connector between cruise control ECU and ECM (See page IN–26).

NG	Repair or replace harness or connector.

OK

Check and replace ECM.

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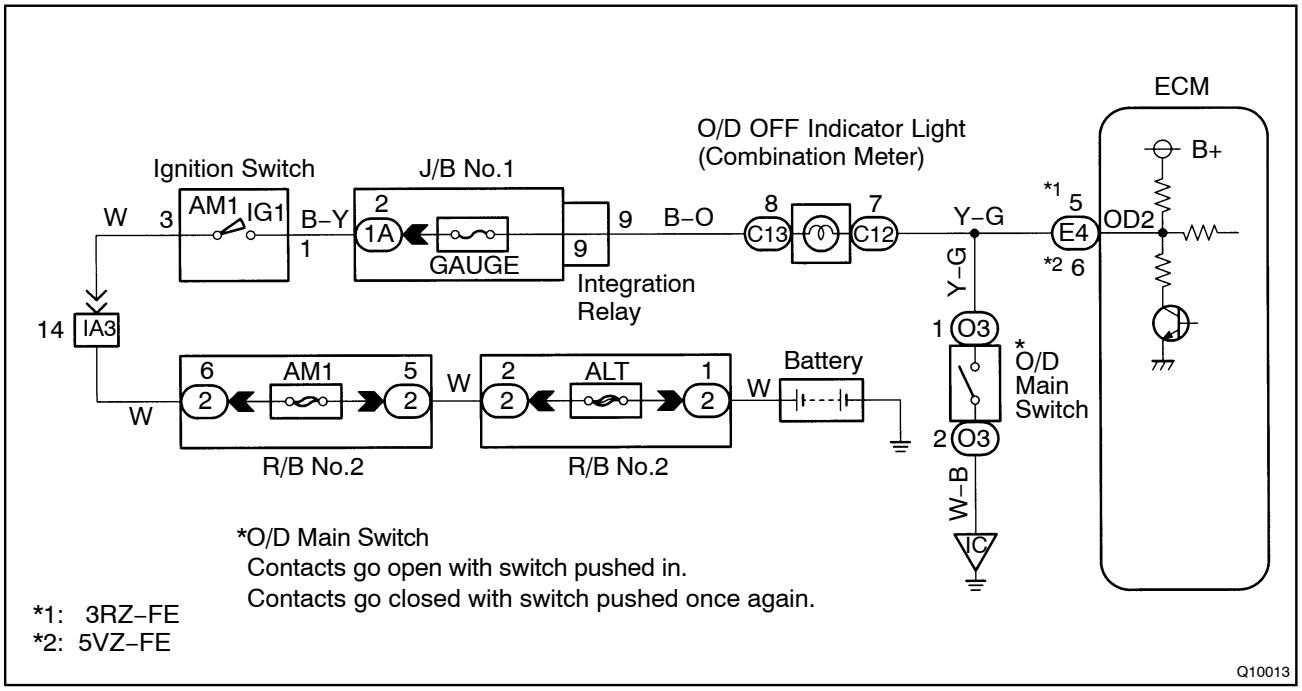
DI0WD–02

O/D Main Switch & O/D OFF Indicator Light Circuit

CIRCUIT DESCRIPTION

The O/D main switch contacts go open when the switch is pushed in and go closed when it is pushed out. In O/D main switch at OFF position, the O/D OFF indicator light lights up, and the ECM prohibits shifting O/D.

WIRING DIAGRAM

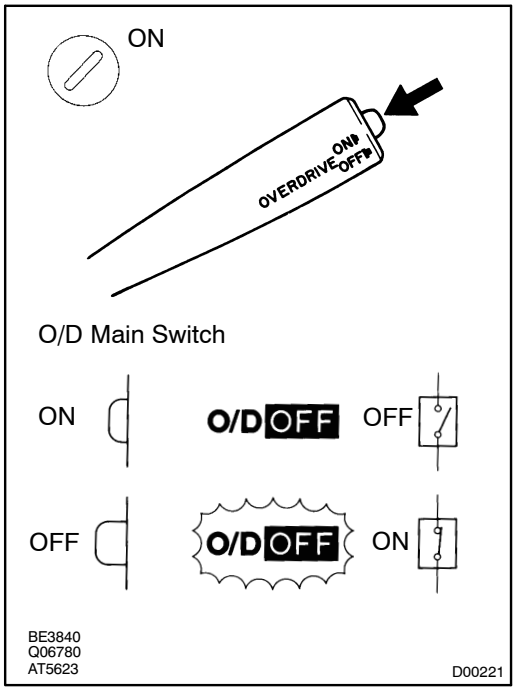


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INSPECTION PROCEDURE

O/D OFF indicator light does not light up:

1	**Check operation of O/D main switch.**



PREPARATION:

Turn the ignition switch ON.

CHECK:

(a) Check the O/D OFF indicator light when O/D main switch is pushed in to ON.

(b) Check the O/D OFF indicator light when O/D main switch is pushed again to OFF.

OK:

(a) O/D OFF indicator light goes off

(b) O/D OFF indicator light lights up

NG → **Go to step 4.**

OK

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2	Check OVRDRIVE CUT SW2 signal.

When using TOYOTA hand–held tester:

PREPARATION:

(a) Connect a TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

CHECK:

Read the "OVRDRIVE CUT SW2" signal on the TOYOTA hand–held tester.

OK:

O/D main switch condition	OVRDRIVE CUT SW2 signal
ON (Pushed in)	ON
OFF (Pushed once again)	OFF

When not using TOYOTA hand–held tester:

PREPARATION:

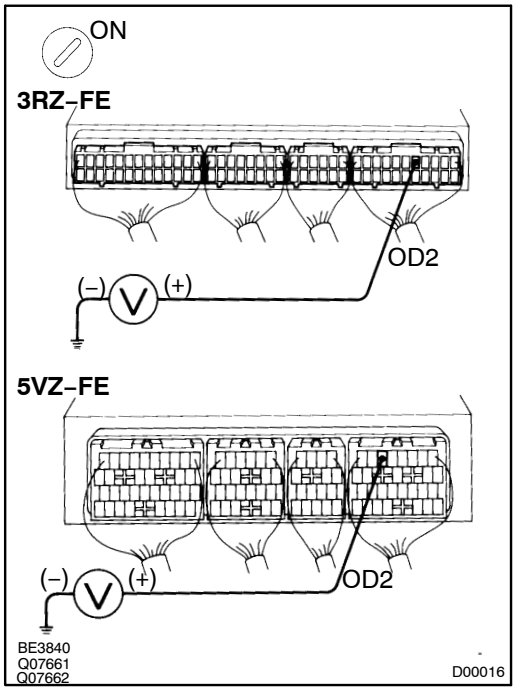
Turn the ignition switch ON.

CHECK:

Check voltage between terminal OD2 of ECM and body ground.

OK:

O/D main switch condition	Voltage
ON (Pushed in)	9 – 14 V
OFF (Pushed once again)	Below 3 V



OK → **Proceed to next circuit inspection shown on problem symptoms table (See page DI–282).**

NG

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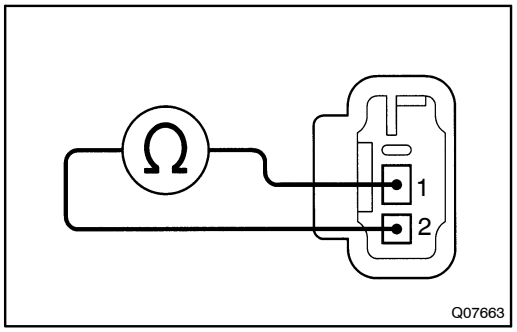
3	Check harness and connector between O/D OFF indicator light and ECM (See page IN–26).

NG → Repair or replace harness or connector.

OK

Check O/D main switch.

4	Check O/D main switch.



PREPARATION:
Disconnect the O/D main switch connector.

CHECK:
Check continuity resistance between terminal 1 and 2 of O/D main switch connector.

OK:

O/D main switch condition	Specified condition
ON (Pushed in)	No continuity
OFF (Pushed once agin)	Continuity

NG → Replace O/D main switch.

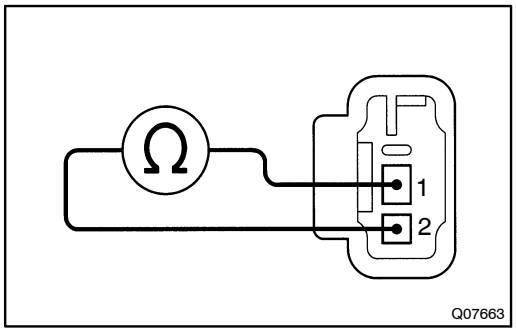
OK

Check and replace the combination meter (See page BE–38).

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O/D OFF indicator light remains ON:

1	**Check O/D main switch.**



PREPARATION:
Disconnect the O/D main switch connector.
CHECK:
Check continuity between terminals 1 and 2 of O/D main switch connector.
OK:

O/D main switch	Specified condition
ON	No continuity
OFF	Continuity

NG → **Replace O/D main switch.**

OK

2	**Check harness and connector between O/D OFF indicator light and O/D main switch, O/D OFF indicator light and ECM (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ECM.

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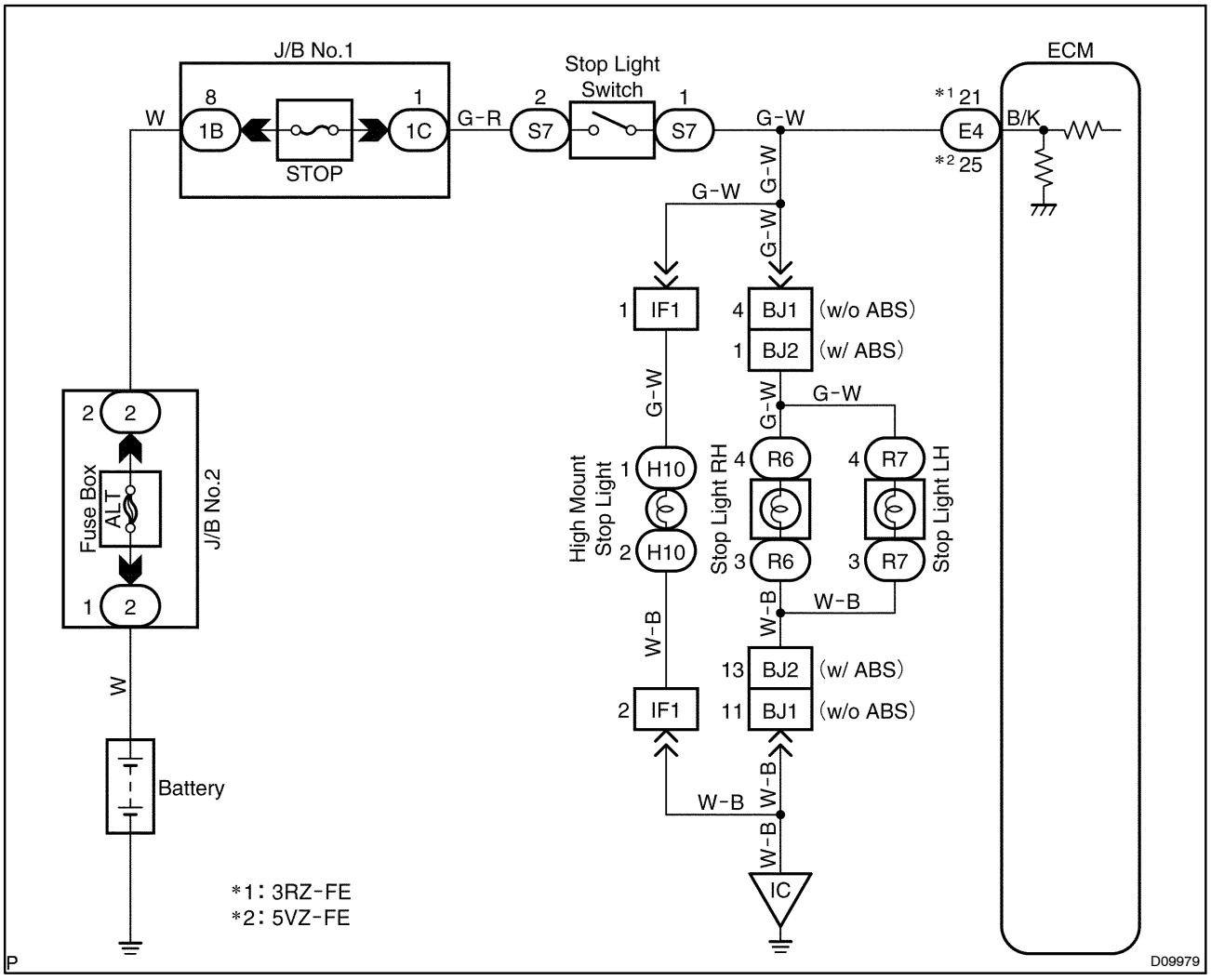
DI98I–01

Stop Light Switch Circuit

CIRCUIT DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling, while driving in lock–up condition, when brakes are suddenly applied.
When the brake pedal is operated, this switch sends a signals to the ECM. Then the ECM cancels operation of the lock–up clutch while braking is in progress.

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check operation of stop light.**

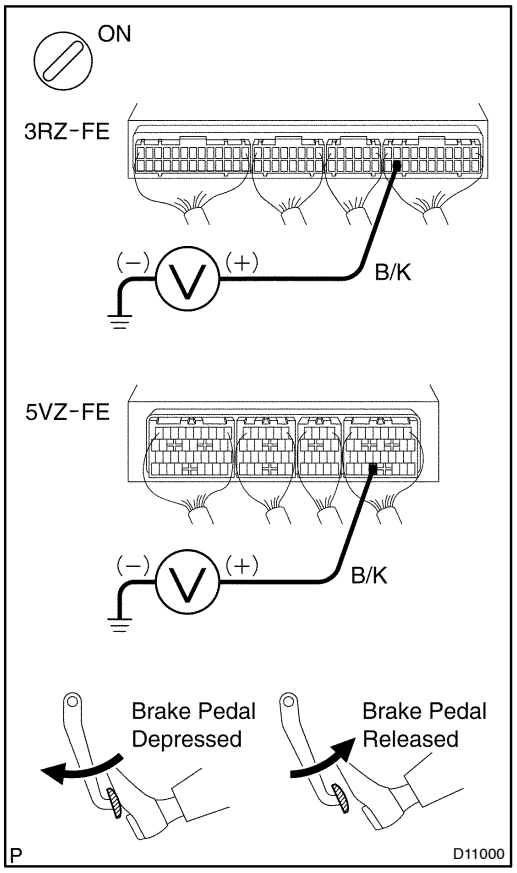
CHECK:

Check if the stop lights go on and off normally when the brake pedal is operated and released.

NG → **Check and repair stop light circuit.**

OK

2	**Check STP signal.**



When using OBD II scan tool or TOYOTA hand–held tester:

PREPARATION:

(a) Connect an OBD II scan tool or TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON and OBD II scan tool or TOYOTA hand–held tester main switch ON.

CHECK:

Read the STP signal on the TOYOTA hand–held tester.

OK:

Brake Pedal	STP Signal
Depressed	ON
Release	OFF

When not using OBD II scan tool or TOYOTA hand–held tester:

PREPARATION:

Turn the ignition switch ON.

CHECK:

Check the voltage between terminal B/K of the ECM connector and body ground.

OK:

Brake Pedal	Voltage
Depressed	7.5 – 14 V
Release	Below 1.5 V

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OK → Proceed to next circuit inspection shown on problem symptoms table (See page DI–282).

NG

3	Check harness and connector between stop light switch and ECM (See page IN–26).

NG → Repair or replace harness or connector.

OK

Check and replace ECM.

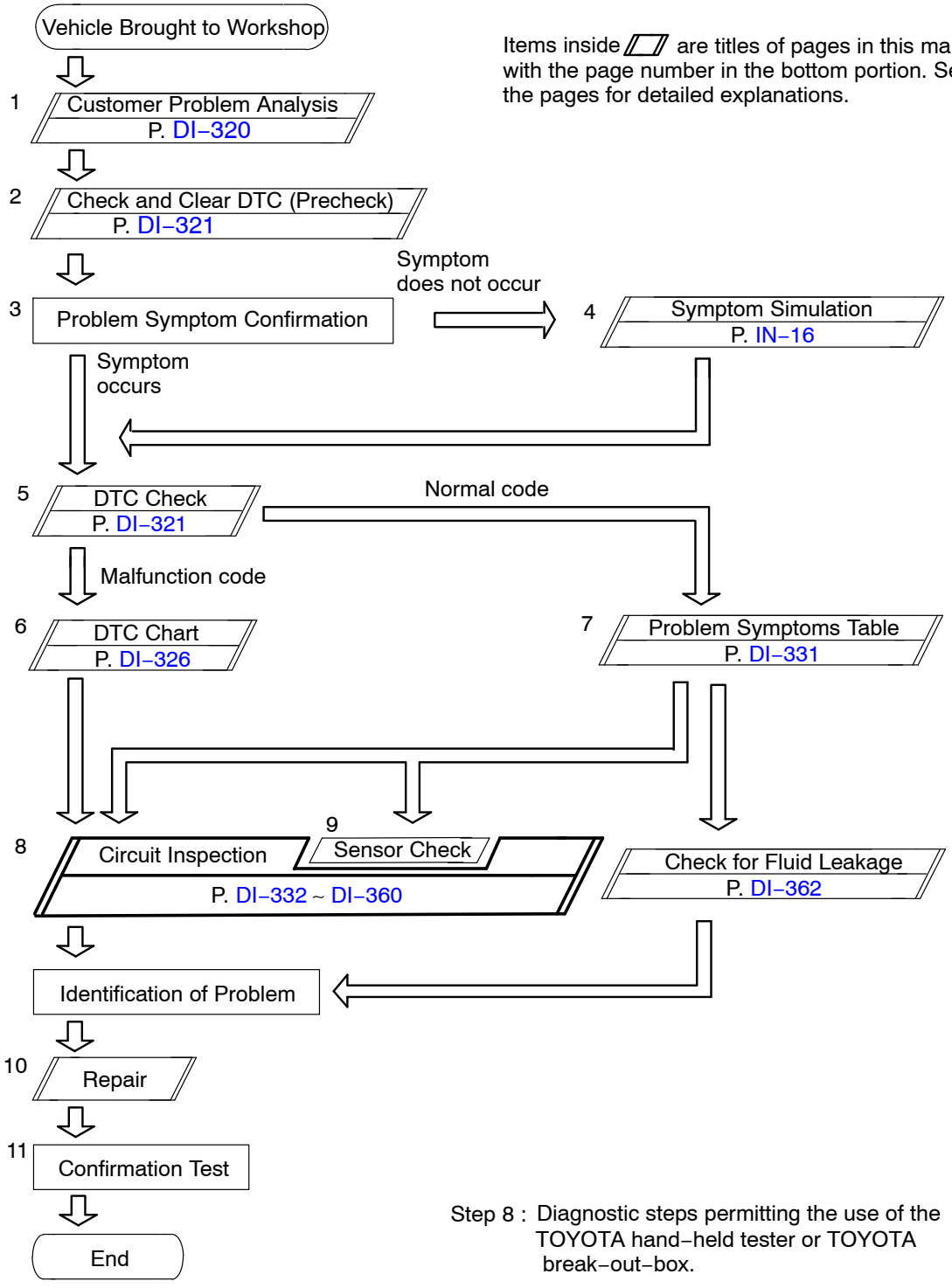
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ANTI–LOCK BRAKE SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

DI0ZF–01

Troubleshoooting in accordance with the procedure on the following pages.



Items inside ▱ are titles of pages in this manual, with the page number in the bottom portion. See the pages for detailed explanations.

Step 8 : Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA break–out–box.

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DI0ZI–01

CUSTOMER PROBLEM ANALYSIS CHECK

ABS Check Sheet

Inspector's Name :

Customer's Name		**Registration No.**	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km miles

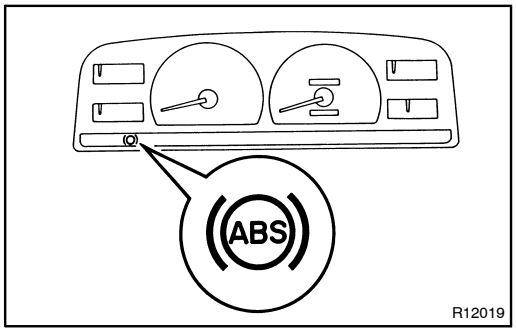
Date Problem First Occurred	/ /
Frequency Problem Occurs	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not Light Up

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

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DI0ZM–03

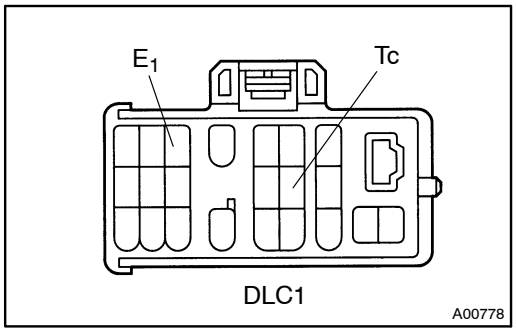


PRE–CHECK

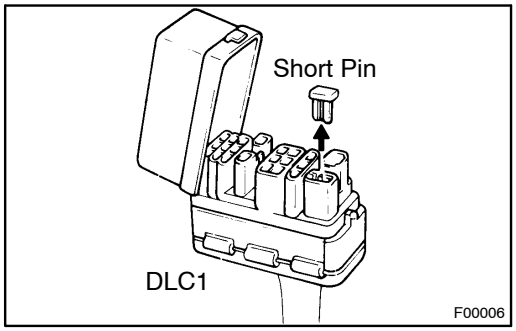
1. DIAGNOSIS SYSTEM

(a) Check the indicator light.
When the ignition switch is turned ON, check that the ABS warning light goes on for 3 seconds.

HINT:
If the indicator check result is not normal, proceed to trouble-shooting for the ABS warning light circuit (See page DI–354).

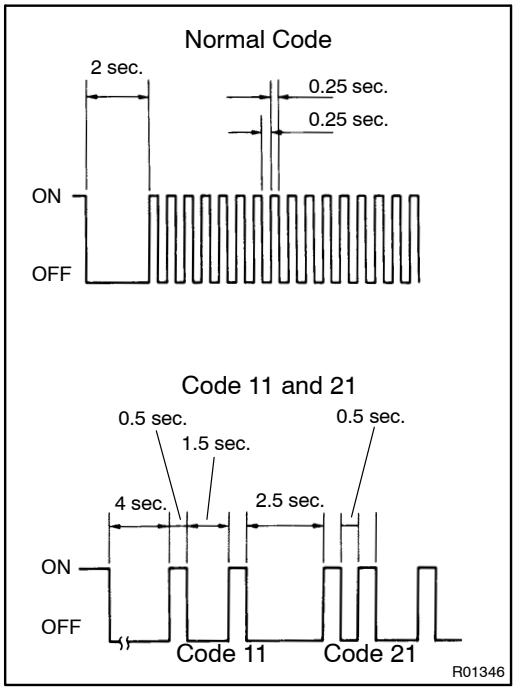


(b) Check the DTC.
(1) Using SST, connect terminals Tc and E_1 of the DLC1.
SST 09843–18020



(2) Disconnect the short pin from the DLC1.
(3) Turn the ignition switch ON.
(4) Read the DTC from the ABS warning light on the combination meter.

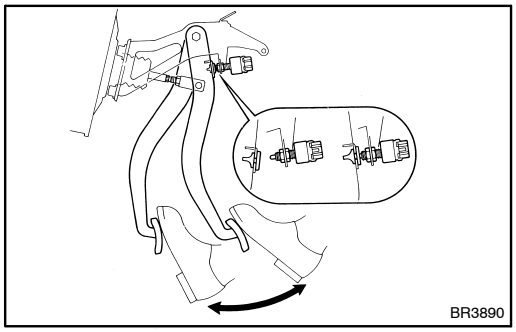
HINT:
- If no code appears, inspect the diagnostic circuit or ABS warning light circuit (See page DI–354 or DI–358).



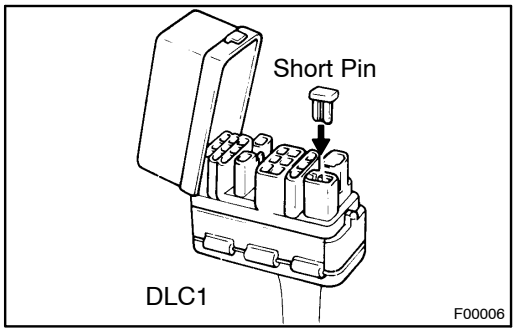
- As an example, the blinking patterns for normal code and codes 11 and 21 are shown on the left.
(5) Code are explained in the code table on page DI–326.
(6) After completing the check, disconnect terminals Tc and E_1, and turn off the display.

If 2 or more malfunctions are indicated at the same time the lowest numbered DTC will be displayed 1st.

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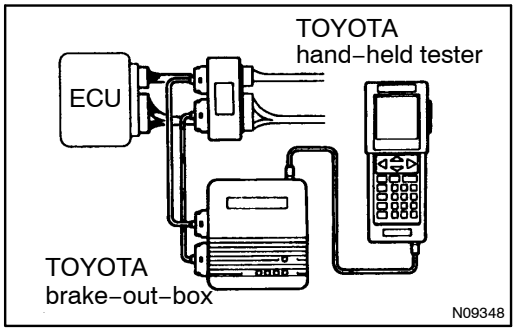


(c) Clear the DTC.
(1) Using SST, connect terminals Tc and E_1 of the DLC1 and remove the short pin from the DLC1.
SST 09843–18020
(2) Turn the ignition switch ON.
(3) Clear the DTC stored in ECU by depressing the brake pedal 8 or more times within 3 seconds.
(4) Check that the warning light shows the normal code.



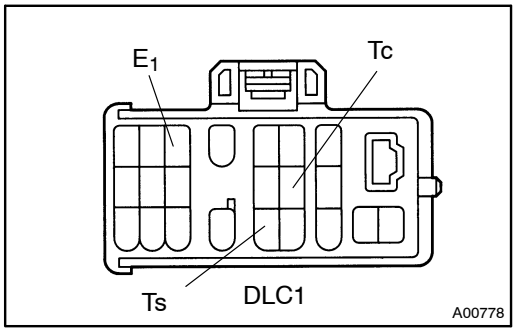
(5) Remove the SST from the terminals of the DLC1.
SST 09843–18020
(6) Connect the short pin to the DLC1.

HINT:
Cancellation can also be done by removing the ECU–B fuse, but in this case, other memory systems will also be cancelled out.



(d) Using TOYOTA brake–out–box and TOYOTA hand–held tester, measure the ECU terminal value.
(1) Hook up the TOYOTA hand–held tester and TOYOTA break–out–box to the vehicle.
(2) Read the ECU input/output values by following the prompts on the tester screen.

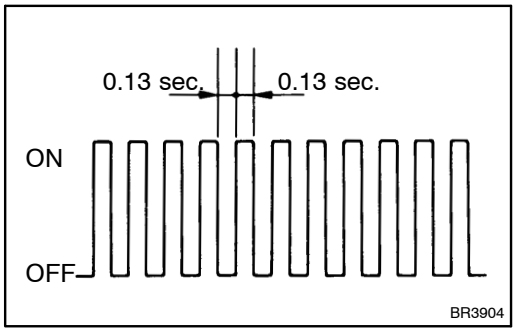
HINT:
TOYOTA hand–held tester has a ”Snapshot” function. This records the measured values and is effective in the diagnosis of intermittent problems.
Please refer to the TOYOTA hand–held tester/TOYOTA break–out–box operator’s manual for further details.



2. SPEED SENSOR SIGNAL AND DECELERATION SENSOR CHECK

(a) Check the speed sensor signal.
(1) Turn the ignition switch OFF.
(2) Using SST, connect terminals Ts and E_1 of the DLC1.
SST 09843–18020
(3) Start the engine.

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(4) Check that the ABS warning light blinks.

HINT:

If the ABS warning light does not blink, inspect the ABS warning light circuit (See page DI–354).

(5) Drive vehicle straight forward.

HINT:

Drive vehicle faster than 45 km/h (28 mph) for several seconds.

(6) Stop the vehicle.

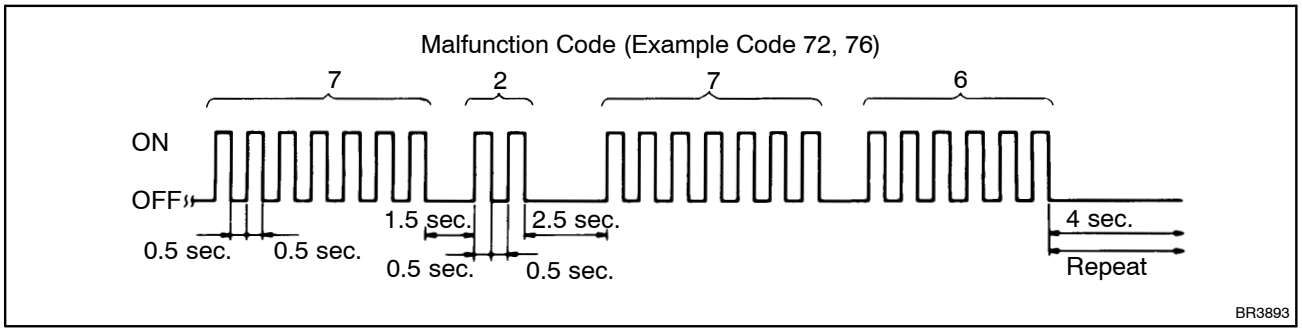
(7) Using SST, connect terminals Tc and E_1 of the DLC1.

SST 09843–18020

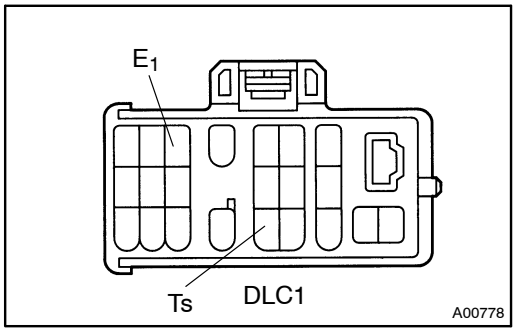
(8) Read the number of blinks of the ABS warning light.

HINT:

- See the list of DTC on page DI–326.
- If every sensor is normal, a normal code is output (A cycle of 0.25 sec. ON and 0.25 sec. OFF is repeated).
- If 2 or more malfunction are indicated at the same time, the lowest numbered code will be displayed 1st.



(9) After doing the check, disconnect terminals Ts and E_1, Tc and E_1 of the DLC1, and ignition switch turned OFF.



(b) Check the deceleration sensor detection point.

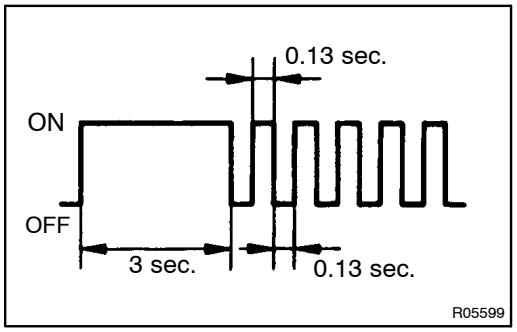
(1) Turn the ignition switch OFF.

(2) Using SST, connect terminals Ts and E_1 of the DLC1.

SST 09843–18020

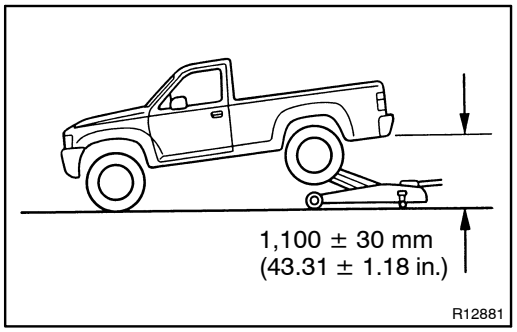
(3) Start the engine.

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(4) Check that the ABS warning light blinks.

HINT:
If the ABS warning light does not blink, inspect the ABS warning light circuit (See page DI–354).



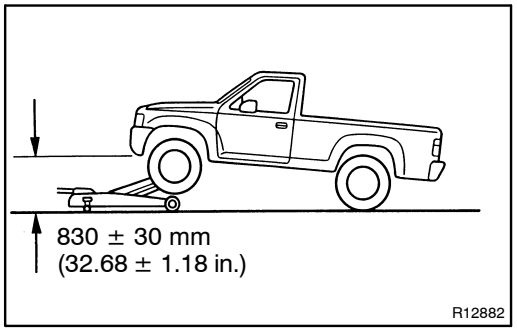
(5) Jack up the rear side of the vehicle slowly.

HINT:
When measuring the height, measure at the center of the lower body of the vehicle.

(6) Check that the warning light blinks.

If the warning light turns on, inspect the deceleration sensor installation. If the sensor installation is OK, replace the deceleration sensor.

(7) Jack down the vehicle slowly.



(8) Jack up the front side of the vehicle slowly, as shown.

HINT:
When measuring the height, measure at the center of the lower body of the vehicle.

(9) Check that the warning light blinks.

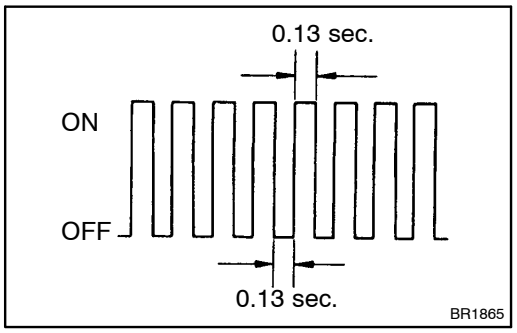
If the warning light turns on, inspect the deceleration sensor installation. If the sensor installation is OK, replace the deceleration sensor.

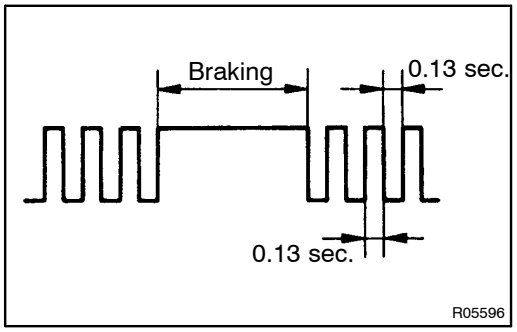
(10) Jack down the vehicle slowly.

(c) Check the deceleration sensor operation.

(1) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, lightly depress the brake pedal.

(2) Check that there is no change in the warning light pattern.

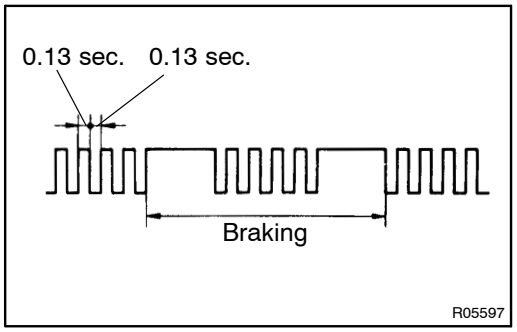




(3) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, and depress the brake pedal moderately.

(4) Check that the warning light turns on while braking.

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(5) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, and depress the brake pedal strongly.
(6) Check that the warning light pattern changes while braking, as shown.

If the operation is not as specified, inspect the deceleration sensor installation. If the sensor installation is OK, replace the deceleration sensor.

(7) Stop the vehicle and turn the ignition switch OFF.
(8) Remove the SST from the terminals of the DLC1.
SST 09843–18020

(d) Check the DTC of the speed sensor function.

Code No.	Diagnosis	Trouble Area
71	Low output voltage of right front speed sensor	• Right front speed sensor • Sensor installation
72	Low output voltage of left front speed sensor	• Left front speed sensor • Sensor installation
73	Low output voltage of right rear speed sensor	• Right rear speed sensor • Sensor installation
74	Low output voltage of left rear speed sensor	• Left rear speed sensor • Sensor installation
75	Abnormal change in output voltage of right front speed sensor	• Right front speed sensor rotor
76	Abnormal change in output voltage of left front speed sensor	• Left front speed sensor rotor
77	Abnormal change in output voltage of right rear speed sensor	• Right rear speed sensor rotor
78	Abnormal change in output voltage of left rear speed sensor	• Left rear speed sensor rotor
79*	Deceleration sensor is faulty	• Deceleration sensor • Sensor installation

*: 4WD models

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DI0ZQ–03

DIAGNOSTIC TROUBLE CODE CHART

HINT:

Using SST 09843–18020, connect terminals Tc and E_1, and remove the short pin.

If a malfunction code is displayed during the DTC check, check the circuit listed that the code. For details of each code, turn to the page referred to under the "See Page" for respective "DTC No." in the DTC chart.

DTC No. (See Page)	Detection Item	Trouble Area
11 (DI–332)	Open circuit in ABS control (solenoid) relay circuit	• ABS control (solenoid) relay • Open or short in ABS control (solenoid) relay circuit • ECU
12 (DI–332)	Short circuit in ABS control (solenoid) relay circuit	• ABS control (solenoid) relay • B+ short in ABS control (solenoid) relay circuit • ECU
13 (DI–335)	Open circuit in ABS control (motor) relay circuit	• ABS control (motor) relay • Open or short in ABS control (motor) relay circuit • ECU
14 (DI–335)	Short circuit in ABS control (motor) relay circuit	• ABS control (motor) relay • B+ short in ABS control (motor) relay circuit • ECU
21 (DI–338)	Open or short circuit in 2–position solenoid circuit for right front wheel	• ABS actuator • Open or short in SFRR or SFRH circuit • ECU
22 (DI–338)	Open or short circuit in 2–position solenoid circuit for left front wheel	• ABS actuator • Open or short in SFLR or SFLH circuit • ECU
23 (DI–338)	Open or short circuit in 2–position solenoid circuit for rear wheel	• ABS actuator • Open or short in SRR or SRH circuit • ECU
31 (DI–341)	Right front wheel speed sensor signal malfunction	• Right front, left front, right rear and left rear speed sensor • Open or short in each speed sensor circuit • ECU
32 (DI–341)	Left front wheel speed sensor signal malfunction	
33 (DI–341)	Right rear wheel speed sensor signal malfunction	
34 (DI–341)	Left rear wheel speed sensor signal malfunction	
35 (DI–341)	Open circuit in left front or right rear wheel speed sensor.	
36 (DI–341)	Open circuit in right front or left rear wheel speed sensor.	
37 (DI–345)	Neither front speed sensor rotor missing	• Front axle hub • Right front, left front speed sensor • Wire harness for sensor system • ECU
37 (DI–346)	Some tire is different size from the other tires	• Tire size • ECU
41 (DI–347)	Low battery positive voltage or abnormally high battery positive voltage	• Battery • IC regulator • Open or short in power source circuit • ECU

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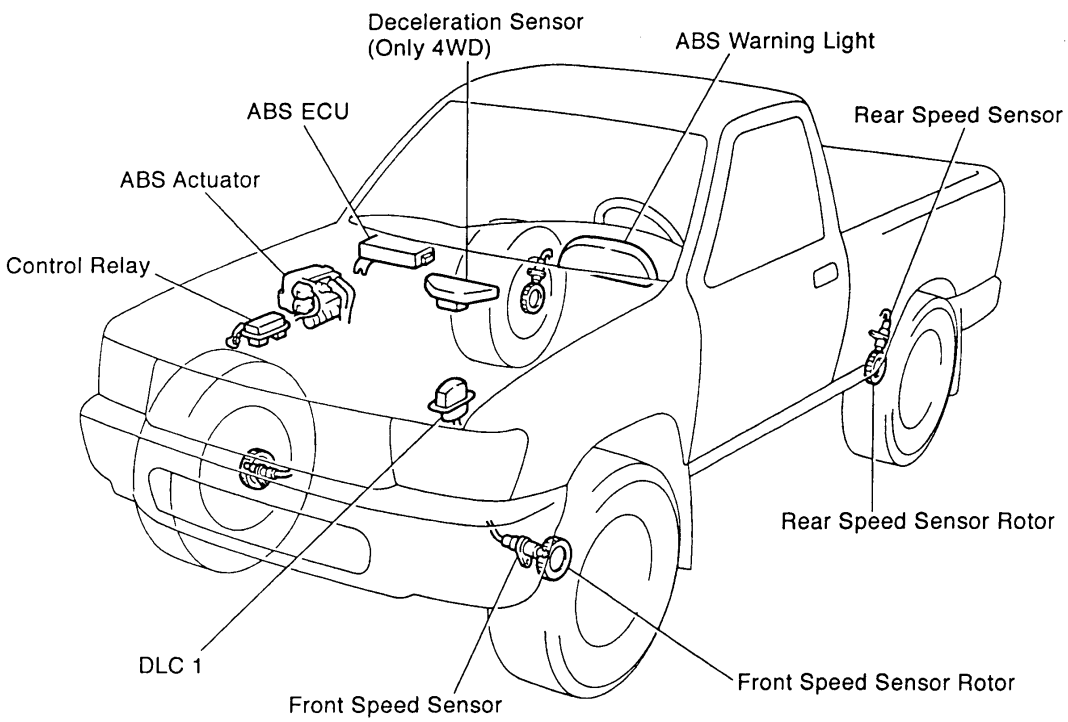
43* (DI–350)	Malfunction in deceleration sensor	• Deceleration sensor • Wire harness for deceleration sensor system • ECU
44* (DI–351)	Open or short in deceleration sensor circuit	• Deceleration sensor • Open or short in deceleration sensor circuit • ECU
51 (DI–353)	Pump motor is locked Open in pump motor ground	• ABS pump motor
Always ON	Malfunction in ECU	• ECU

*: 4WD models

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DI0ZT–03

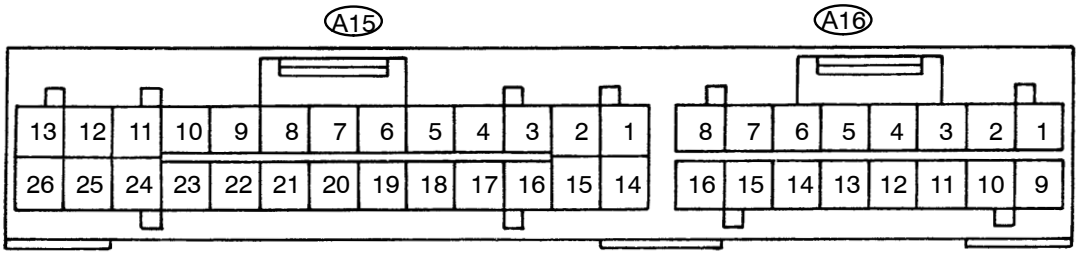
PARTS LOCATION



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DI7HH–02

TERMINALS OF ECU



R00463

Symbols (Terminals No.)	STD Voltage (V)	Condition
BAT (A15 – 22) – GND (A15 – 11, 24)	10 – 14	Always
IG1 (A15 – 10) – GND (A15 – 11, 24)	10 – 14	IG switch ON
SR (A16 – 5) – R– (A16 – 15)	9 – 14	IG switch ON, ABS warning light OFF
MR (A16 – 4) – R– (A16 – 15)	Below 1.0	IG switch ON
SFRH (A16 – 1) – GND (A15 – 11, 24)	10 – 14	IG switch ON, ABS warning light OFF
SFRR (A16 – 2) – GND (A15 –11, 24)	10 – 14	IG switch ON, ABS warning light OFF
SFLH (A15 – 13) – GND (A15 – 11, 24)	10 – 14	IG switch ON, ABS warning light OFF
SFLR (A15 – 12) – GND (A15 – 11, 24)	10 – 14	IG switch ON, ABS warning light OFF
SRR (A15 – 25) – GND (A15 – 11, 24)	10 – 14	IG switch ON, ABS warning light OFF
SRH (A15 – 26) – GND (A15 – 11, 24)	10 – 14	IG switch ON, ABS warning light OFF
AST (A16 – 11) – GND (A15 – 11, 24)	10 – 14	IG switch ON, ABS warning light OFF
WA (A16 – 12) – GND (A15 – 11, 24)	Below 2.0	IG switch ON, ABS warning light ON
	10 – 14	IG switch ON, ABS warning light OFF
STP (A15 – 21) – GND (A15 – 11, 24)	Below 1.5	Stop light switch OFF
	8 – 14	Stop light switch ON
Tc (A15 – 20) – GND (A15 – 11, 24)	10 – 14	IG switch ON
Ts (A15 – 6) – GND (A15 – 11, 24)	10 – 14	IG switch ON
FR+ (A16 – 7) – FR– (A16 – 5)	AC generation	IG switch ON Slowly turn right front wheel
FL+ (A16 – 14) – FL– (A16 – 13)	AC generation	IG switch ON Slowly turn left front wheel
RR+ (A15 – 15) – RR– (A15 – 16)	AC generation	IG switch ON Slowly turn right rear wheel
RL+ (A15 – 1) – RL– (A15 – 2)	AC generation	IG switch ON Slowly turn left rear wheel
GS1* (A15 – 19) – GND (A15 – 11, 24)	about 2 or 4	IG switch ON
GS2* (A15 – 7) – GND (A15 – 11, 24)	about 2	IG switch ON
EXI* (A15 – 8) – GND (A15 – 11, 24)	Below 2.0	IG switch ON, transfer is in L4 or H4 position
	10 – 14	IG switch ON, transfer is in H4 position
EXI3 (A15 – 9) – GND (A15 – 11, 24)	Below 2.0	IG switch ON, transfer is in L4 position
	10 – 14	IG switch ON, transfer is in a position other than L4
MT (A16 – 8) – GND (A15 – 11, 24)	Below 1.5	IG switch ON
FSS (A16 – 16) – GND (A15 – 11, 24)	Continuity	IG switch OFF
RSS (A15 – 23) – GND (A15 – 11, 24)	Continuity	IG switch OFF
PKB (A15 – 9) – GND (A15 – 11, 24)	Below 1.5	IG switch ON, PKB lever pulled
	10 – 14	IG switch ON, PKB lever released

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*: 4WD Vehicle

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DI0ZZ–03

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

Symptoms	Inspection Circuit	See page
ABS does not operate.	Only when 1. – 4. are all normal and the problem is still occurring, replace the ABS ECU. 1. Check the DTC reconfirming that the normal code is output. 2. IG power source circuit. 3. Speed sensor circuit. 4. Check the ABS actuator with a checker. If abnormal, check the hydraulic circuit for leakage (See page DI–xx).	 DI–321 DI–347 DI–341 BR–58
ABS does not operate efficiently.	Only when 1. – 4. are all normal and the problem is still occurring, replace the ABS ECU. 1. Check the DTC reconfirming that the normal code is output. 2. Speed sensor circuit. 3. Stop light switch circuit. 4. Check the ABS actuator with a checker. If abnormal, check the hydraulic circuit for leakage (See page DI–362).	 DI–321 DI–341 BR–58
ABS warning light abnormal.	1. ABS warning light circuit. 2. ABS ECU.	DI–354
DTC check cannot be done.	Only when 1. and 2. are all normal and the problem is still occurring, replace the ABS ECU. 1. ABS warning light circuit. 2. Tc terminal circuit.	 DI–354 DI–358
Speed sensor signal check cannot be done.	1. Ts terminal circuit. 2. ABS ECU.	DI–360

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DI103–03

CIRCUIT INSPECTION

DTC	11, 12	ABS Control (Solenoid) Relay Circuit

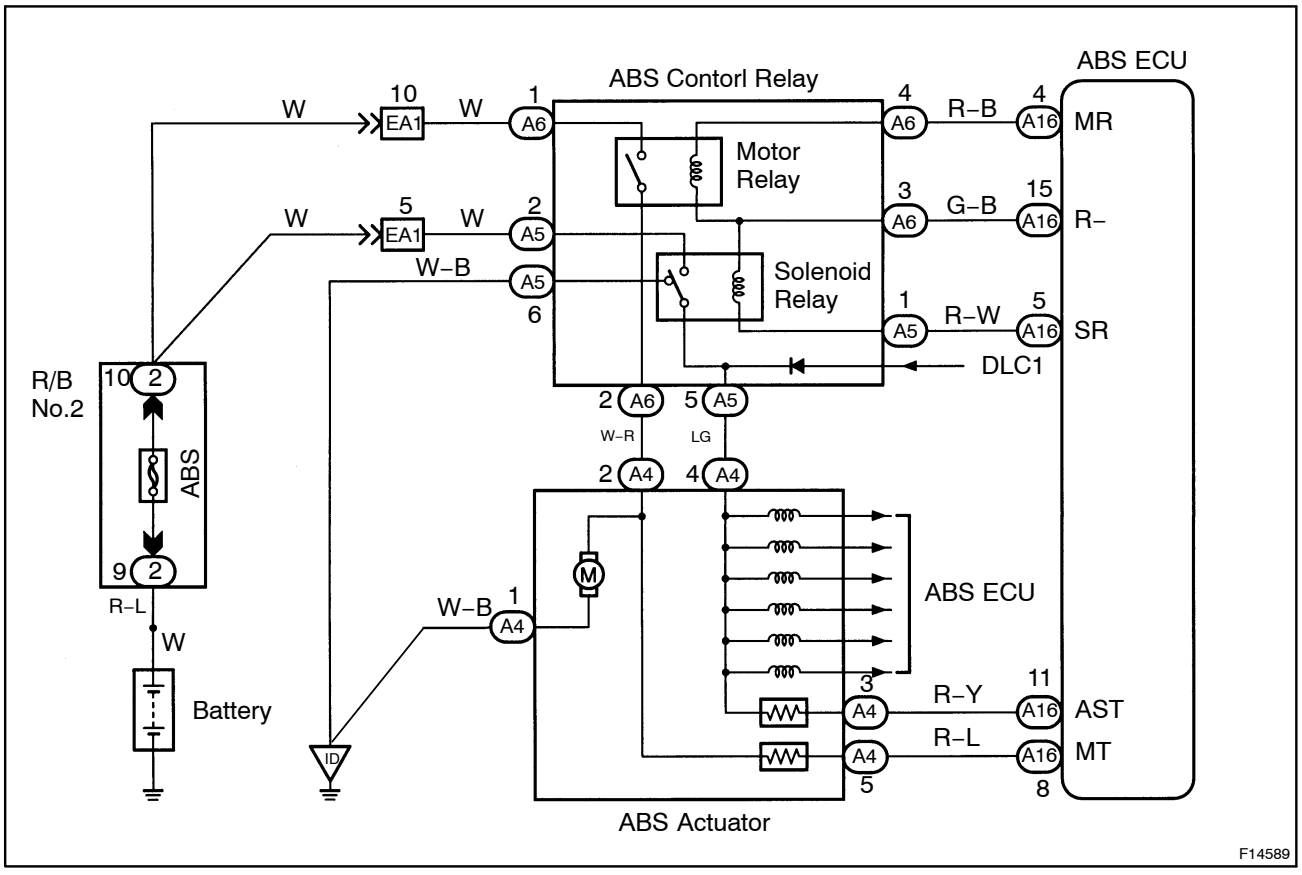
CIRCUIT DESCRIPTION

This relay supplies power to each ABS solenoid. After the ignition switch is turned ON, if the initial check is OK, the relay goes on.

DTC No.	DTC Detecting Condition	Trouble Area
11	Conditions 1 and 2 continue for 0.2 sec. or more: 1. ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage 2. ABS control (solenoid) relay monitor terminal (AST) voltage: 0V	• ABS control (solenoid) relay • Open or short in ABS control (solenoid) relay circuit • ECU
12	Conditions 1 and 2 continue for 0.2 sec. or more: 1. ABS control (solenoid) relay terminal (SR) voltage: 0 V 2. ABS control (solenoid) relay monitor terminal (AST) voltage: Battery positive voltage	• ABS control (solenoid) relay • B+ short in ABS control (solenoid) relay circuit • ECU

Fail safe function:
If trouble in the ABS control (solenoid) relay circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

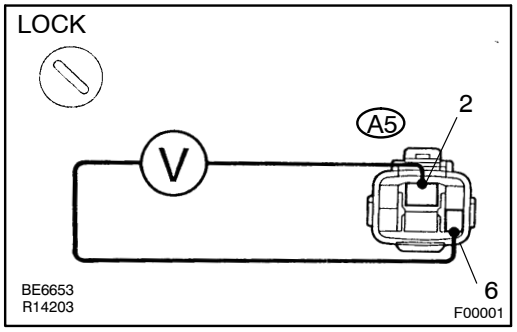
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check voltage between terminals A5 – 2 and A5 – 6 of ABS control relay connector.**



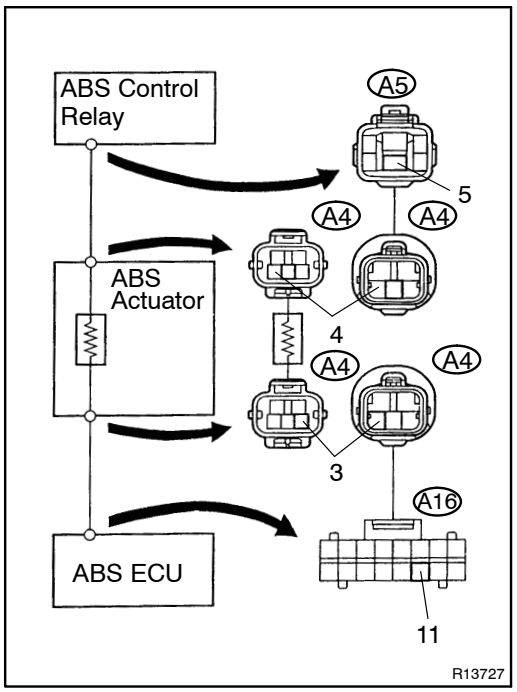
PREPARATION:
Disconnect the ABS control relay connector.
CHECK:
Measure the voltage between terminals A5 – 2 and A5 – 6 of ABS control relay harness side connector.
OK:

Voltage: 10 – 14 V

NG → **Check and repair harness or connector.**

OK

2	**Check continuity between terminals A5 – 5 and A4 – 4, A4 – 4 and A4 – 3, A4 – 3 and A16 – 11.**



PREPARATION:
Disconnect the 2 connectors from the ABS actuator.
CHECK:
Check continuity between terminals A5 – 5 and A4 – 4, A4 – 4 and A4 – 3, A4 – 3 and A16 – 11.
OK:

Continuity

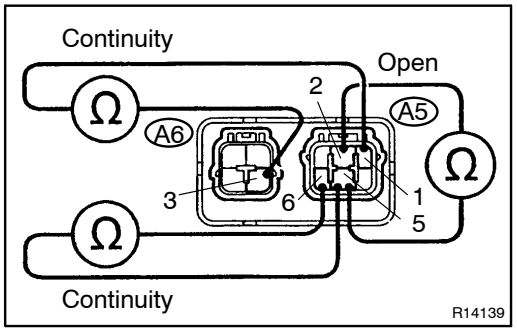
HINT:
There is a resistance of 26 ~ 40 Ω between terminals A4 – 4 and A4 – 3.

NG → **Repair or replace harness or ABS actuator.**

OK

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3	Check ABS control (solenoid) relay.

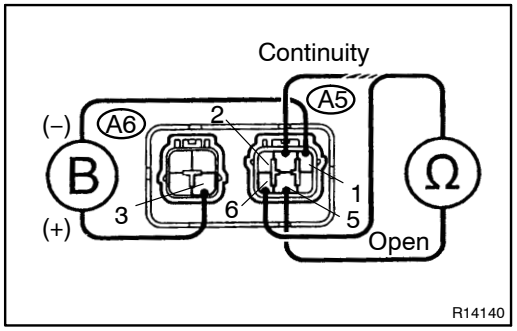


CHECK:

Check continuity between each terminal of ABS control (solenoid) relay.

OK:

Terminals A5 – 1 and A6 – 3	Continuity (Reference value 80 Ω)
Terminals A5 – 5 and A5 – 6	Continuity
Terminals A5 – 2 and A5 – 5	Open



CHECK:

(a) Apply battery positive voltage between terminals A5 – 1 and A6 – 3.

(b) Check continuity between each terminal of ABS control (solenoid) relay.

OK:

Terminals A5 – 5 and A5 – 6	Open
Terminals A5 – 2 and A5 – 5	Continuity

NG → **Replace ABS control relay.**

OK

4	Check for open and short in harness and connector between ABS control relay and ABS ECU (See page IN–26).

NG → **Repair or replace harness or connector.**

OK

If same code is still output after DTC is deleted, check contact condition of each connection. If connections are normal, ECU may be defective.

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DI106–03

DTC	13, 14	ABS Control (Motor) Relay Circuit

CIRCUIT DESCRIPTION

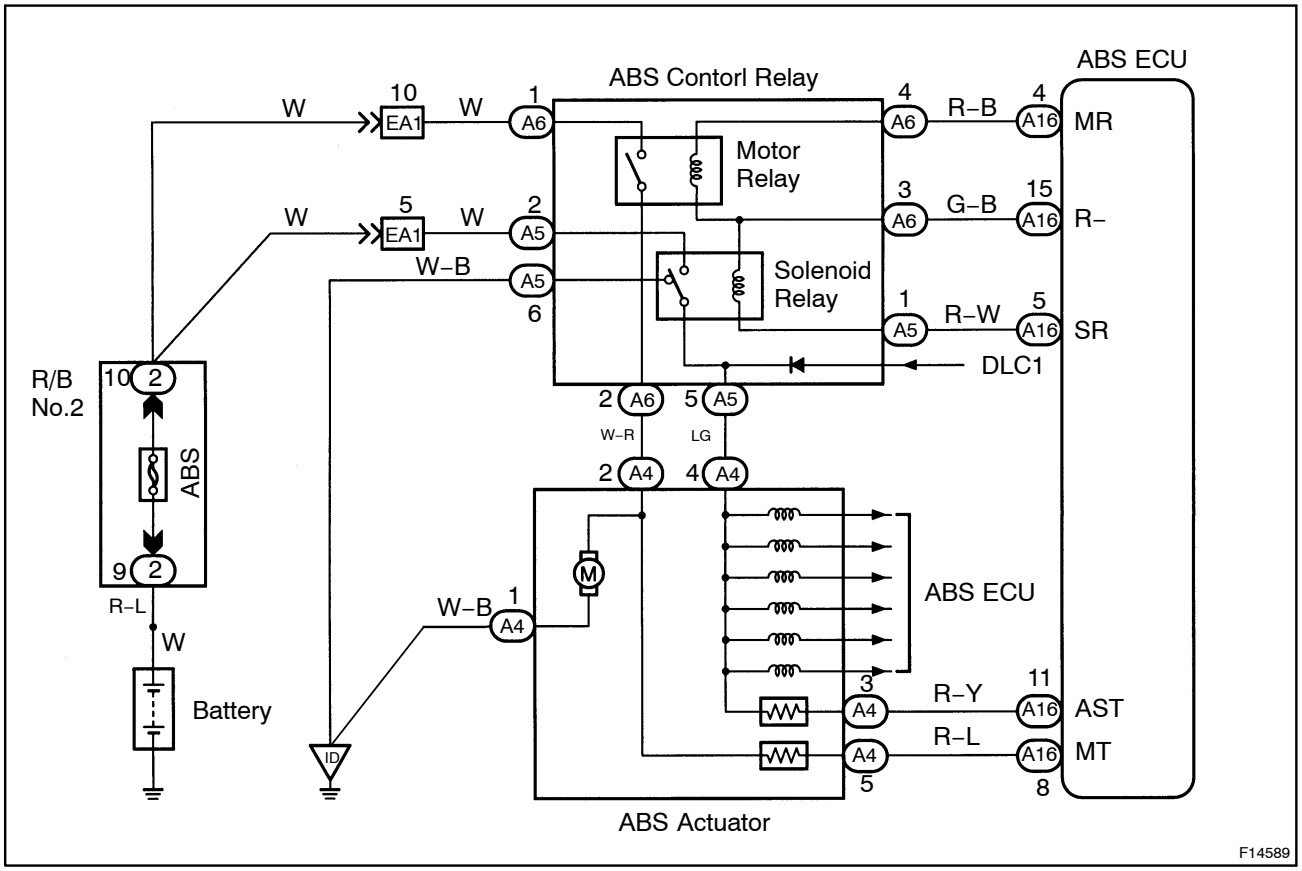
The ABS control (motor) relay supplies power to the ABS pump motor. While the ABS is activated, the ECU switches the ABS control (motor) relay ON and operates the ABS pump motor.

DTC No.	DTC Detecting Condition	Trouble Area
13	Conditions 1 and 2 continued for 0.2 sec. or more: 1. ABS control (motor) relay terminal (MR) voltage: Battery positive voltage 2. ABS control (motor) relay monitor terminal (MT) voltage: 0 V	• ABS control (motor) relay • Open or short in ABS control (motor) relay circuit • ECU
14	Conditions 1 and 2 continued for 2.5 sec. or more: 1. ABS control (motor) relay terminal (MR) voltage: 0 V 2. ABS control (motor) relay monitor terminal (MT) voltage: Battery positive voltage	• ABS control (motor) relay • B+ short in ABS control (motor) relay circuit • ECU

Fail safe function:

If trouble occurs in the ABS control (motor) relay circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

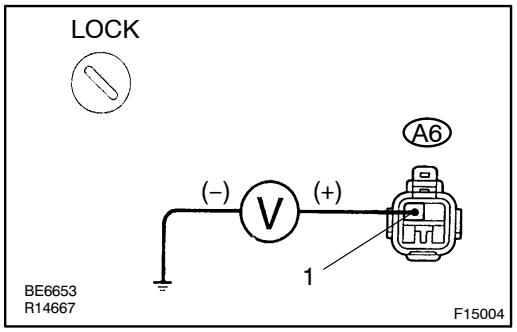
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check voltage between terminal A6 – 1 of ABS control relay and body ground.**

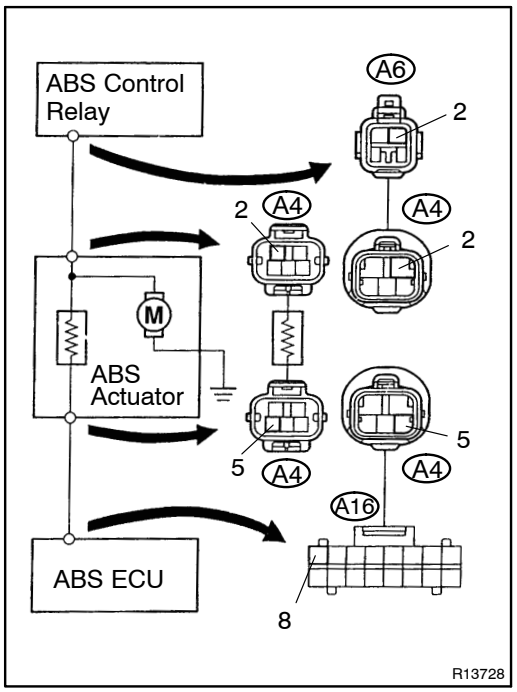


PREPARATION:
Disconnect the ABS control relay connector.
CHECK:
Measure voltage between terminal A6 – 1 of ABS control relay harness side connector and body ground.
OK:
Voltage: 10 – 14 V

NG → **Check and repair harness or connector.**

OK

2	**Check continuity between terminals A6 – 2 and A4 – 2, A4 – 2 and A4 – 5, A4 – 5 and A16 – 12.**



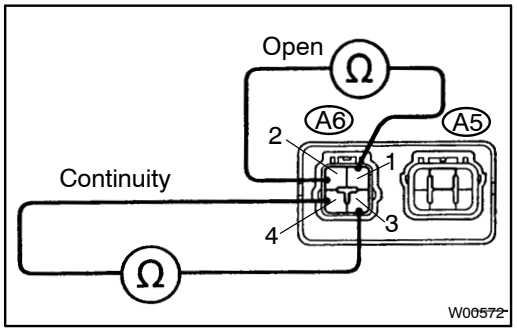
PREPARATION:
Disconnect the 2 connectors from the ABS actuator.
CHECK:
Check continuity between terminals A6 – 2 and A4 – 2, A4 – 2 and A4 – 5, A4 – 5 and A16 – 8.
OK:
Continuity
HINT:.
There is a resistance of 26 ~ 40 Ω between terminals A4 – 2 and A4 – 5

NG → **Repair or replace harness or ABS actuator.**

OK

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3	Check ABS control (motor) relay.

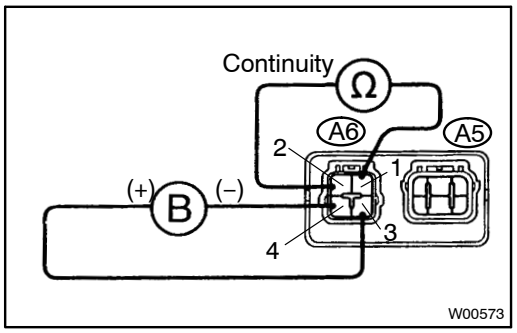


CHECK:

Check continuity between each terminal of ABS control (motor) relay.

OK:

Terminals A6 – 3 and A6 – 4	Continuity (Reference value 62 Ω)
Terminals A6 – 1 and A6 – 2	Open



CHECK:

(a) Apply battery positive voltage between terminals A6 – 3 and A6 – 4.

(b) Check continuity between terminals of ABS control relay.

OK:

Terminals A6 – 1 and A6 – 2	Continuity

NG → **Replace ABS control relay.**

OK

4	Check for open and short in harness and connector between ABS control relay and ABS ECU (See page IN–26).

NG → **Repair or replace harness or connector.**

OK

If same code is still output after DTC is deleted, check contact condition of each connection. If connections are normal, ECU may be defective.

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DI10A–03

DTC	21, 22, 23	ABS Actuator Solenoid Circuit

CIRCUIT DESCRIPTION

This solenoid goes on when signals are received from the ECU and controls the pressure acting on the wheel cylinders thus controlling the braking force.

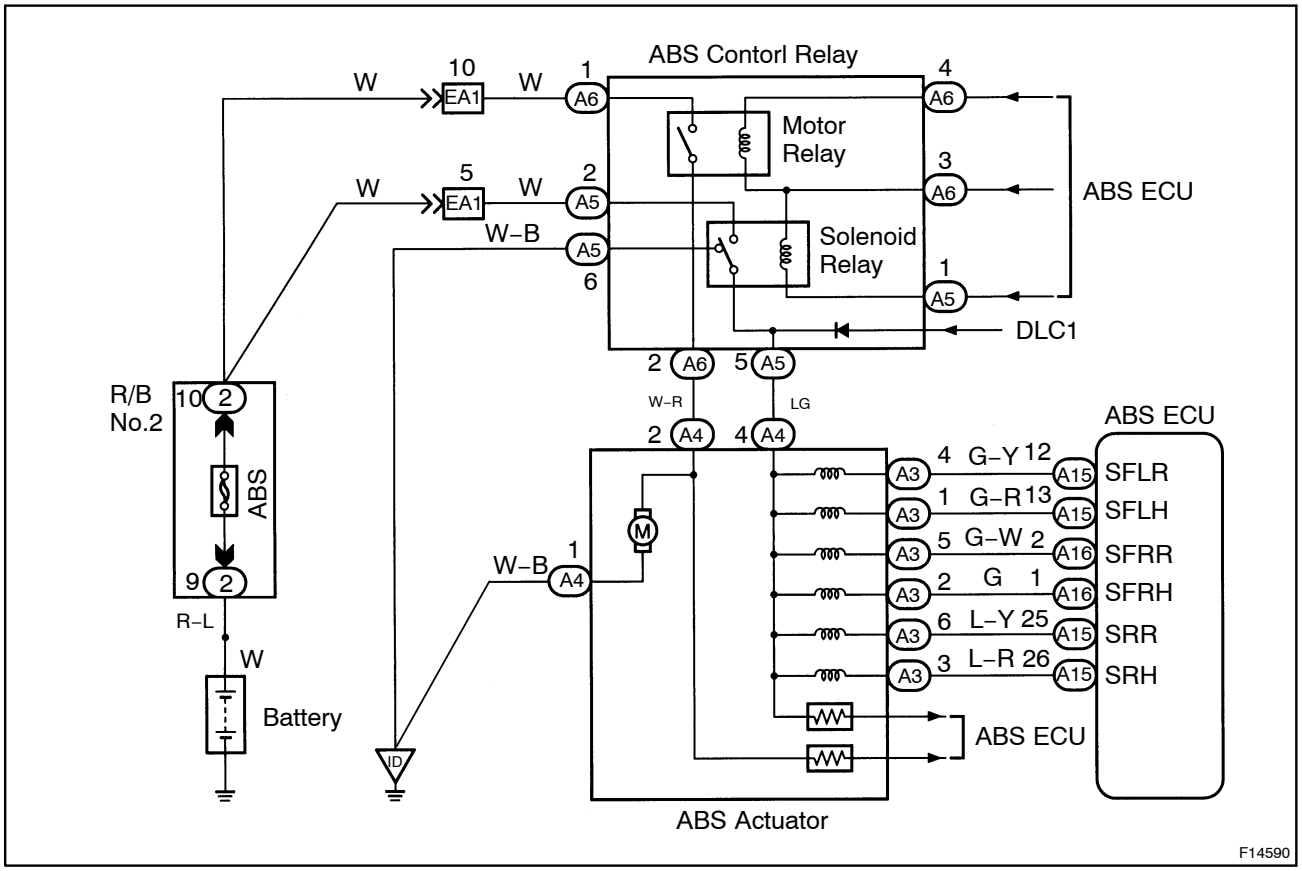
DTC No.	DTC Detecting Condition	Trouble Area
21	Conditions 1 through 3 continue for 0.02 sec. or more: 1. ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage 2. Voltage of ABS ECU terminal AST: Battery positive voltage 3. When power transistor of ECU is ON, voltage of terminal SFRR or SFRH is 0 V or battery positive voltage.	• ABS actuator • Open or short in SFRR or SFRH circuit • ECU
22	Conditions 1 through 3 continue for 0.02 sec. or more: 1. ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage 2. Voltage of ABS ECU terminal AST: Battery positive voltage 3. When power transistor of ECU is ON, voltage of terminal SFLR or SFLH is 0 V or battery positive voltage.	• ABS actuator • Open or short in SFLR or SFLH circuit • ECU
23	Conditions 1 through 3 continue for 0.02 sec. or more: 1. ABS control (solenoid) relay terminal (SR) voltage: Battery positive voltage 2. Voltage of ABS ECU terminal AST: Battery positive voltage 3. When power transistor of ECU is ON, voltage of terminal SRR or SRH is 0 V or battery positive voltage.	• ABS actuator • Open or short in SRR or SRH circuit • ECU

Fail safe function:

If trouble occurs in the actuator solenoid circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

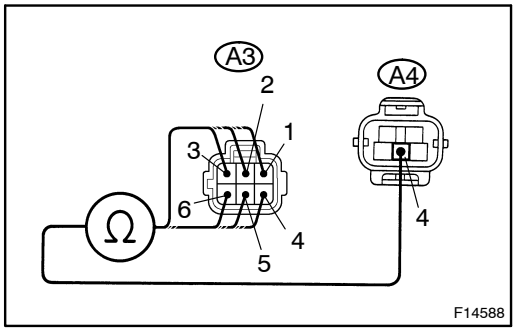
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WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check ABS actuator solenoid.**



PREPARATION:

Disconnect the 2 connectors from the ABS actuator.

CHECK:

Check continuity between terminals A4 – 4 and A3 – 1, 2, 3, 4, 5, 6 of ABS actuator connector.

OK:

Continuity

HINT:

Resistance of each solenoid coil

SFRH, SFLH, SRH: 5.0 Ω

SFRR, SFLR, SRR: 2.2 Ω

NG	**Replace ABS actuator.**

OK

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2	**Check for open and short in harness and connector between ABS ECU and actuator (See page IN–26).**

NG → **Repair or replace harness or connector.**

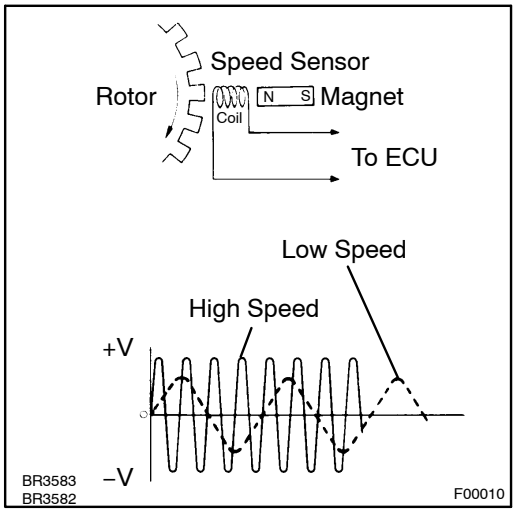
OK

If same code is still output after DTC is deleted, check contact condition of each connection. If connector are normal, ECU may be defective.

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DTC	31 – 36	Speed Sensor Circuit

CIRCUIT DESCRIPTION



The speed sensor detects wheel speed and sends the appropriate signals to the ECU. These signals are used to control the ABS system. The front and rear rotors each have 48 serrations.

When the rotors rotate, the magnetic field emitted by the permanent magnet in the speed sensor generates an AC voltage. Since the frequency of this AC voltage changes in direct proportion to the speed of the rotor, the frequency is used by the ECU to detect the speed of each wheel.

DTC No.	DTC Detecting Condition	Trouble Area
31, 32, 33, 34	Detection of any of conditions 1 through 3: 1. At vehicle speed of 10 km/h (6 mph) or more, pulses are not input for 15 sec. 2. Momentary interruption of speed sensor signal occurs at least 7 times in time between switching the ignition switch ON and switching it OFF. 3. Abnormal fluctuation of speed sensor signals with vehicle speed 20 km/h (12 mph) or more. 4. An open is detected in speed sensor circuit for 0.6 sec.	• Right front, left front, right rear, left rear speed sensor • Open or short in each speed sensor circuit • ECU
35	Speed sensor signal is not input for about 1 sec. while left front and right rear speed sensor signals are being checked with IG switch ON.	• Open in left front or right rear speed sensor circuit • ECU
36	Speed sensor signal is not input for about 1 sec. while right front and left rear speed sensor signals are being checked with IG switch ON.	• Open in right front or left rear speed sensor circuit • ECU

HINT:

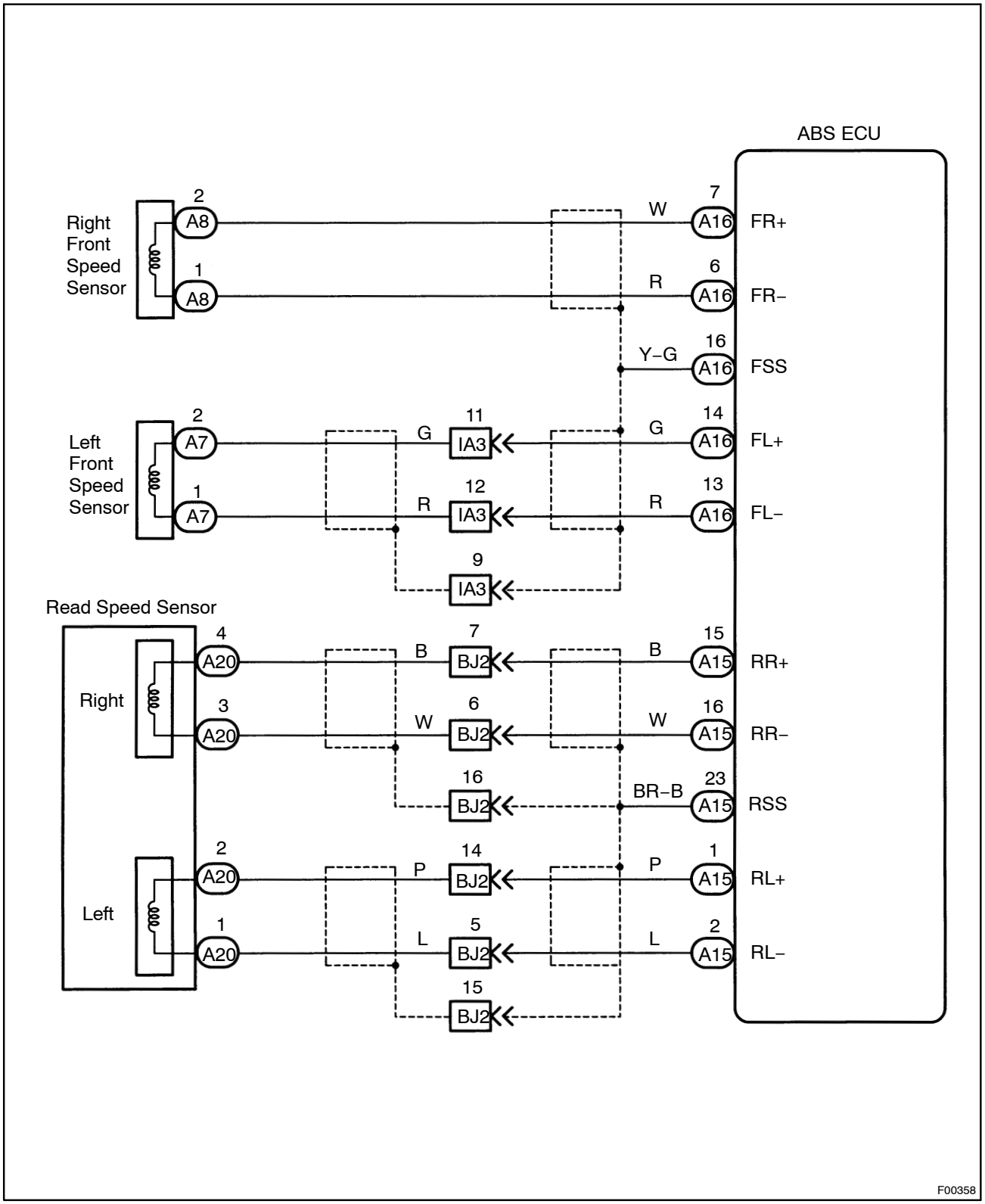
- DTC No. 31 is for the right front speed sensor.
- DTC No. 32 is for the left front speed sensor.
- DTC No. 33 is for the right rear speed sensor.
- DTC No. 34 is for the left rear speed sensor.

Fail safe function:

If trouble occurs in the speed sensor circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

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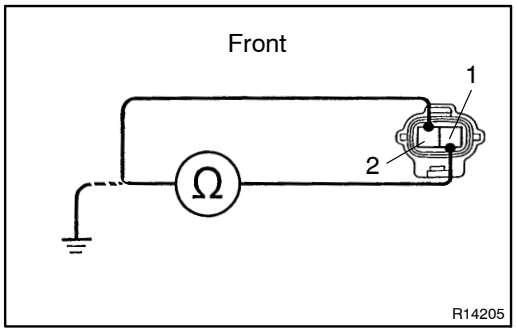
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check speed sensor.**



Front

PREPARATION:

Disconnect the speed sensor connector.

CHECK:

Measure resistance between terminals 1 and 2 of speed sensor connector.

OK:

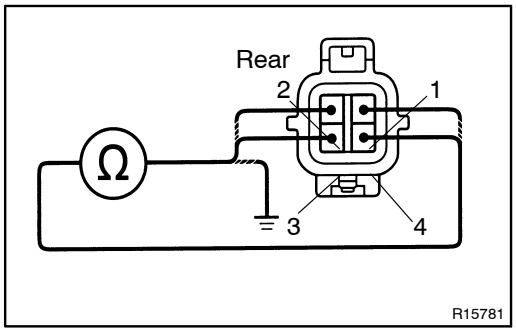
Resistance: 0.6 – 1.8 kΩ

CHECK:

Measure resistance between terminals 1 and 2 of speed sensor connector and body ground.

OK:

Resistance: 1 MΩ or higher



Rear

PREPARATION:

Disconnect the speed sensor connector.

CHECK:

Measure resistance between terminals 1 and 2, 3 and 4 of speed sensor connector.

OK:

Resistance: 0.6 – 2.05 kΩ

CHECK:

Measure resistance between terminals 1 and 2, 3 and 4 of speed sensor connector and body ground.

OK:

Resistance: 1 MΩ or higher

NG	**Replace speed sensor.**

NOTICE:

Check the speed sensor signal last (See page DI–321).

OK

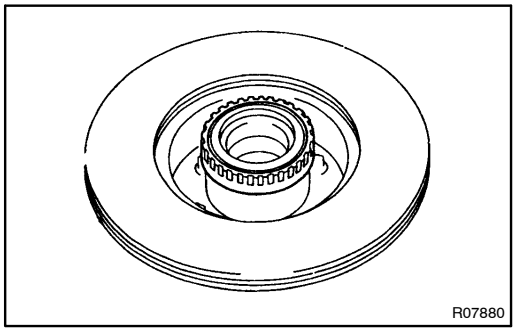
2	**Check for open and short in harness and connector between each speed sensor and ECU (See page IN–26).**

NG	**Repair or replace harness or connector.**

OK

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3	Check sensor rotor and sensor installation.



Front

PREPARATION:

Remove the axle hub (See page SA–16 or SA–23).

CHECK:

Check the sensor rotor serrations.

OK:

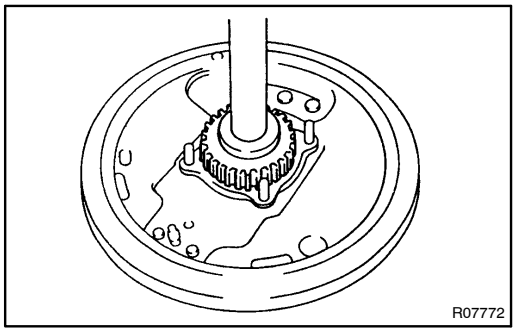
No scratches or missing teeth.

CHECK:

Check the sensor tip.

OK:

No scratches or foreign objects on the sensor tip.



Rear

PREPARATION:

Remove the axle shaft (See page SA–131).

CHECK:

Check the sensor rotor serrations.

OK:

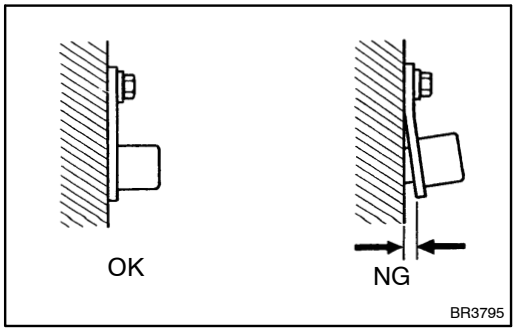
No scratches or missing teeth.

CHECK:

Check the sensor tip.

OK:

No scratches or foreign objects on the sensor tip.



CHECK:

Check the speed sensor installation.

OK:

The installation bolt is tightened properly and there is no clearance between the sensor and steering knuckle or rear axle carrier.

NG	Replace speed sensor or rotor.

NOTICE:

Check the speed sensor signal last (See page DI–321).

OK

Check and repalce ABS ECU.

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DI10F–01

DTC	37	Neither Front Speed Sensor Rotor Missing

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
37	With front wheels stationary and rear wheels rotating at 20+ km/h (12+ mph) for 10+ secs, turn ignition switch ON then OFF 8 times, in succession.	• Front axle hub • Right front, left front speed sensor • Wire harness for sensor system • ECU

INSPECTION PROCEDURE

1	**Check front axle hub (See page SA–15 or SA–22).**

NG → **Replace front axle hub.**

OK

2	**Check front speed sensor (See page DI–341).**

NG → **Replace front speed sensor.**

OK

3	**Check for open or short in harness and connector between speed sensor and ECU (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ABS ECU.

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DI10H–01

DTC	37	Tires of Different Size

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
37	Driving at more than 30 km/h (19 mph) for more than 60 seconds with 1 or 2 tires of different size.	• Tire size • ECU

INSPECTION PROCEDURE

1	Check tire size.

NG → Replace tires so that all 4 tires are of the same size.

OK →

Check and replace ABS ECU.

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DI10J–01

DTC	41	IG Power Source Circuit

CIRCUIT DESCRIPTION

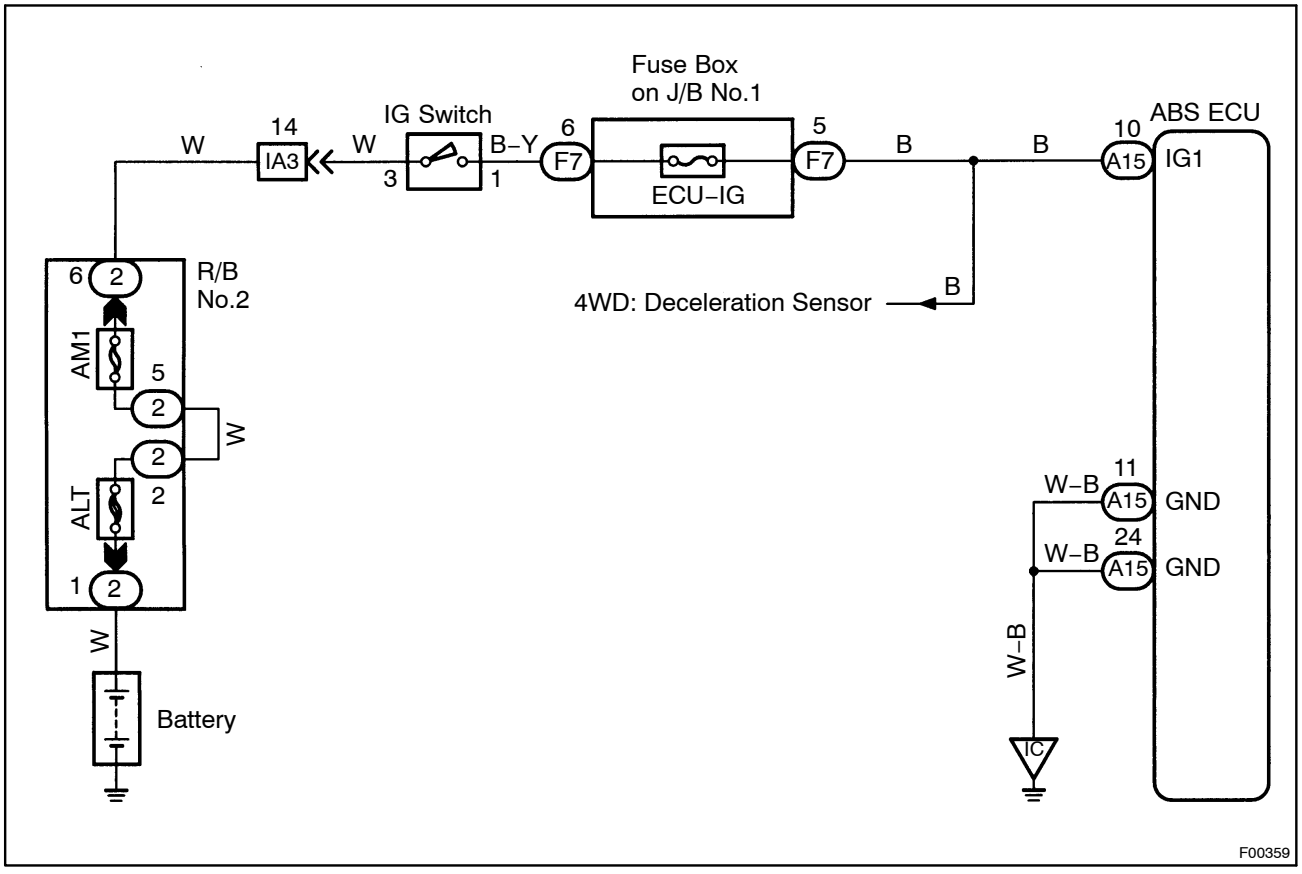
This is the power source for the ECU, hence the actuators.

DTC No.	DTC Detecting Condition	Trouble Area
41	Vehicle speed is 3 km/h (1.9 mph) or more and voltage of ECU terminal IG1 remains at more than 17 V or below 9.5 V for more than 10 sec.	• Battery • IC regulator • Open or short in power source circuit • ECU

Fail safe function:

If trouble occurs in the power source circuit, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check battery positive voltage.**

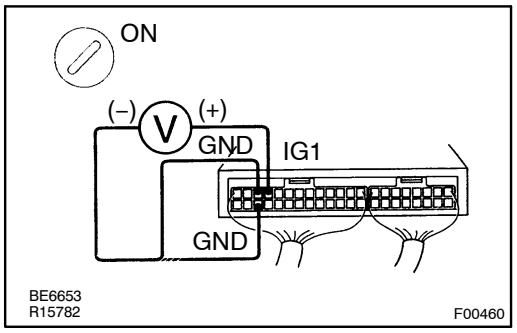
OK:

Voltage: 10 – 14 V

NG → **Check and repair charging system.**

OK

2	**Check voltage between terminals IG1 and GND of ABS ECU connector.**



PREPARATION:

Remove the ABS ECU with the connectors still connected.

CHECK:

(a) Turn the ignition switch ON.

(b) Measure voltage between terminals IG1 and GND of ABS ECU connector.

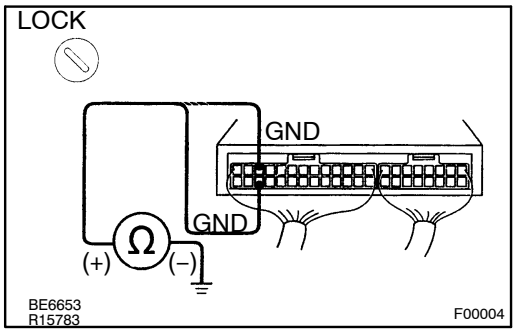
OK:

Voltage: 10 – 14 V

OK → **Check and replace ABS ECU.**

NG

3	**Check continuity between terminals GND of ABS ECU connector and body ground.**



CHECK:

Measure resistance between terminals GND of ABS ECU connector and body ground.

OK:

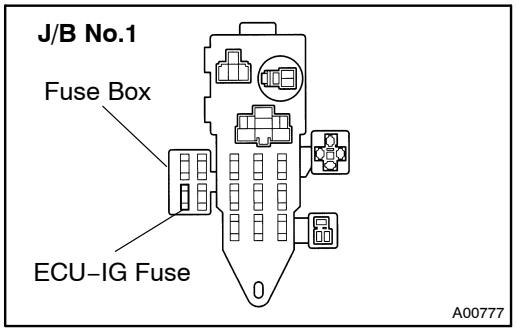
Resistance: 1 Ω or less

NG → **Repair or replace harness or connector.**

OK

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4	Check ECU–IG fuse.



PREPARATION:
Remove the ECU–IG fuse from the J/B No.1.
CHECK:
Check continuity of ECU–IG fuse.
OK:

Continuity

NG → **Check for short in all harness and components connected to ECU–IG fuse (See attached wiring diagram).**

OK

Check for open in harness and connector between ABS ECU and battery (See page IN–26).

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DI10K–01

DTC	43	Malfunction in Deceleration Sensor

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
43	Either of following 1 or 2 is detected: 1. After the battery terminal is connected, input from the deceleration sensor does not change at one cycle (0 km/h → more than 30 km/h → 0 km/h) for 16 times continuously. 2. When the brake pedal is not depressed at vehicle speed of 5 km/h or more, forward and backward G (more than 0.4 G) is detected for 30 seconds or more.	• Deceleration sensor • Wire harness for deceleration sensor system • ECU

INSPECTION PROCEDURE

1	Check deceleration sensor (See page DI–321).

NG → Replace deceleration sensor.

OK

2	Check for open or short in harness and connector between sensor and ECU (See page IN–26).

NG → Repair or replace harness or connector.

OK

Check and replace ABS ECU.

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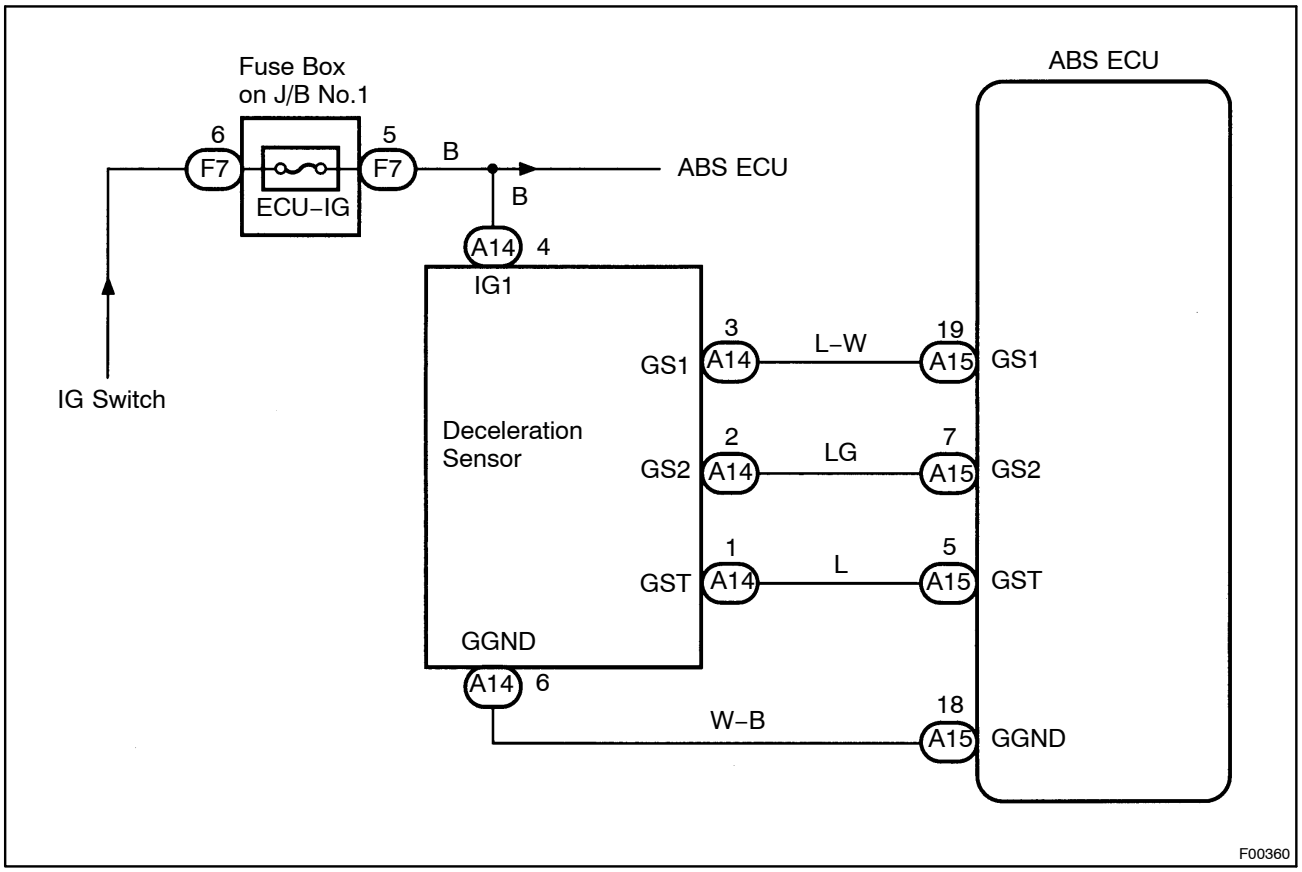
DTC	44	Deceleration Sensor Circuit

CIRCUIT DESCRIPTION

This sensor detects deceleration on the vehicle. The sensor signal is used in ABS control. If the sensor functions abnormally, the ABS warning light comes on but the ABS still operates.

DTC No.	DTC Detecting Condition	Trouble Area
44	Either of following 1 or 2 is detected: 1. An open or short is detected in circuit GS1 or GS2 for 1sec. 2. After the ignition is turned ON, test signal is output by GST. During this time, a trouble signal is detected for 0.5 sec.	• Deceleration sensor • Open or short in deceleration sensor circuit • ECU

WIRING DIAGRAM



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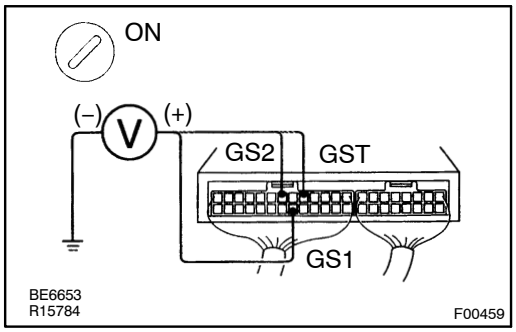
INSPECTION PROCEDURE

1	**Check for open and short in harness and connector between Deceleration sensor and ECU (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

2	**Check voltage between terminals GS1, GS2, GST of ABS ECU and body ground.**



PREPARATION:

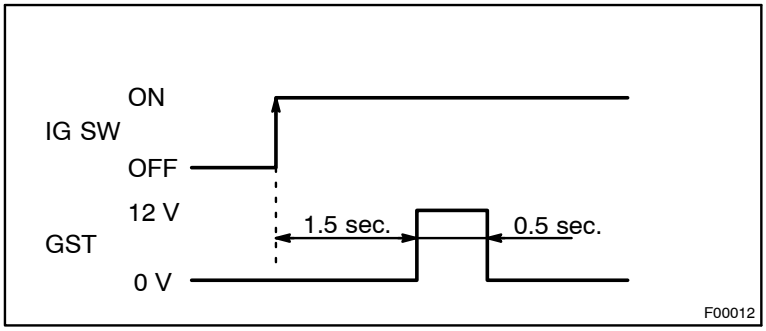
(a) Remove the ABS ECU with the connectors still connected.
(b) Disconnect the deceleration sensor connector.
(c) Turn the ignition switch ON.

CHECK:

Measure voltage between terminals GS1, GS2, GST of ECU and Body ground.

OK:

Voltage:
GS1, GS2: about 5 V
GST: As shown below



NG → **Check and replace ABS ECU.**

OK

Check and replace deceleration sensor.

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DI10Q–03

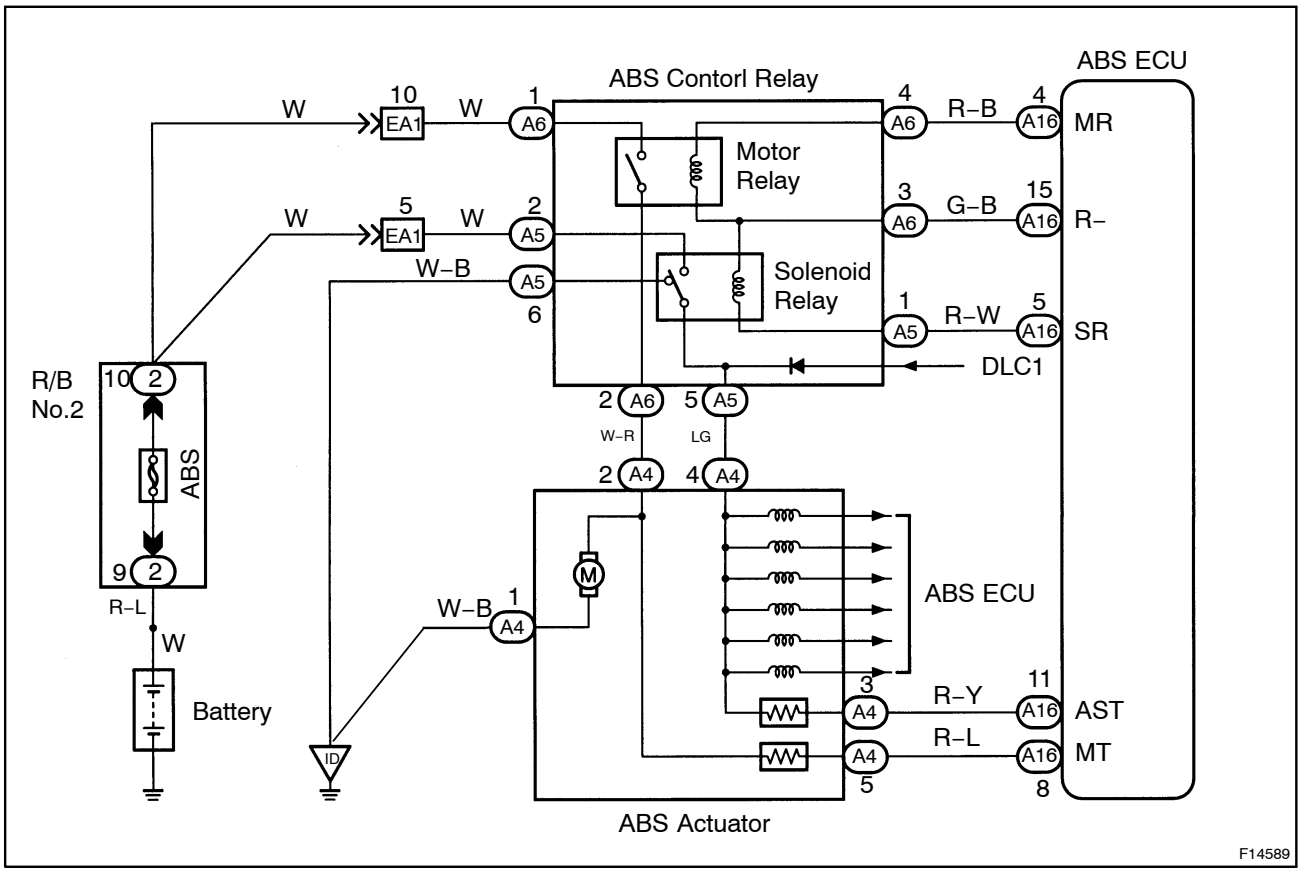
DTC	51	ABS Pump Motor Lock

CIRCUIT DESCRIPTION

DTC No.	DTC Detecting Condition	Trouble Area
51	Pump motor is not operating normally during initial check.	• ABS pump motor

Fail safe function:
If trouble occurs in the ABS pump motor, the ECU cuts off current to the ABS control (solenoid) relay and prohibits ABS control.

WIRING DIAGRAM



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DI10S–03

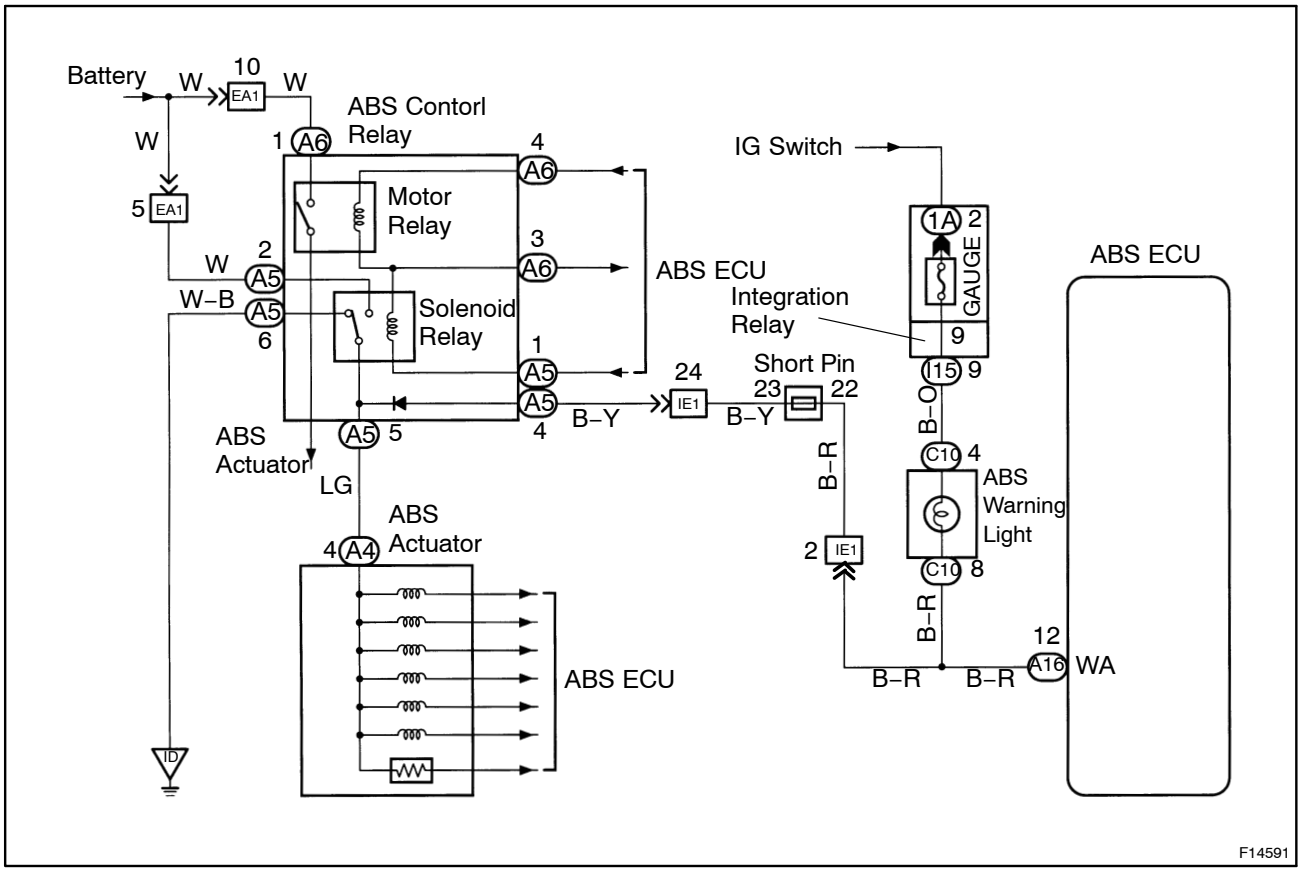
ABS Warning Light Circuit

CIRCUIT DESCRIPTION

If the ECU detects trouble, it lights the ABS warning light while at the same time prohibiting ABS control. At this time, the ECU records a DTC in memory.

After removing the short pin of the DLC1, connect terminals Tc and E_1 of the DLC1 to make the ABS warning light blink and output the DTC.

WIRING DIAGRAM



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INSPECTION PROCEDURE

Troubleshooting in accordance with the chart below for each trouble symptom.

ABS warning light does not light up	Go to step 1
ABS warning light remains on	Go to step 3

1	**Check ABS warning light.**

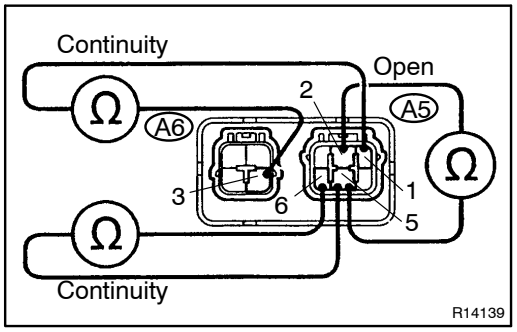
See Combination Meter Troubleshooting on page BE–2.

NG → **Repair bulb or combination meter assembly.**

OK

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2	Check ABS control relay.



PREPARATION:

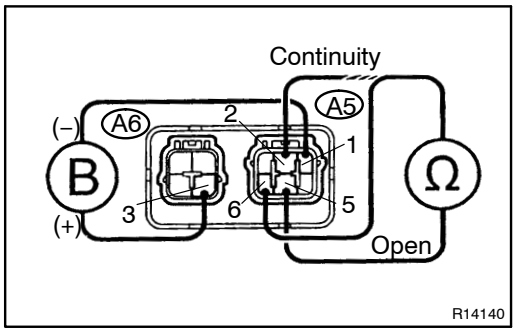
Disconnect the connectors from the control relay.

CHECK:

Check continuity between each terminal of ABS control relay.

OK:

Terminals A5 – 1 and A6 – 3	Continuity (Reference value 80 Ω)
Terminals A5 – 5 and A5 – 6	Continuity
Terminals A5 – 2 and A5 – 5	Open



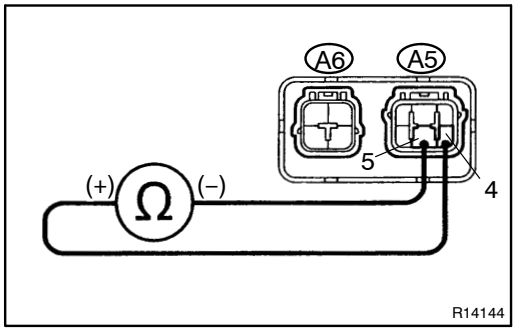
CHECK:

(a) Apply battery positive voltage between terminals A5 – 1 and A6 – 3.

(b) Check continuity between each terminal of ABS control relay.

OK:

Terminals A5 – 5 and A5 – 6	Open
Terminals A5 – 2 and A5 – 5	Continuity



CHECK:

Connect the ⊕ test lead to terminal A5 – 4 and the ⊖ test lead to terminal A5 – 5. Check continuity between terminals.

OK:

Continuity

If there is no continuity, connect the ⊖ test lead to terminal A5 – 4 and the ⊕ lead to terminal A5 – 5. Recheck continuity between terminals.

NG	Replace ABS control relay.

OK

Check for open in harness and connector between DLC1, ABS control relay and body ground (See page IN–26).

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3	**Is DTC output?**

Check DTC on page DI–321.

YES → **Repair circuit indicated by code output.**

NO

4	**Does ABS warning light go off if short pin is removed?**

NO → **Check for short in harness and connector between warning light, DLC1 and ECU (See page IN–26).**

YES

5	**Check ABS control relay (See step 2).**

NG → **Replace ABS control relay.**

OK

Check for short in harness and connector between DLC1 and ABS control relay (See page IN–26).

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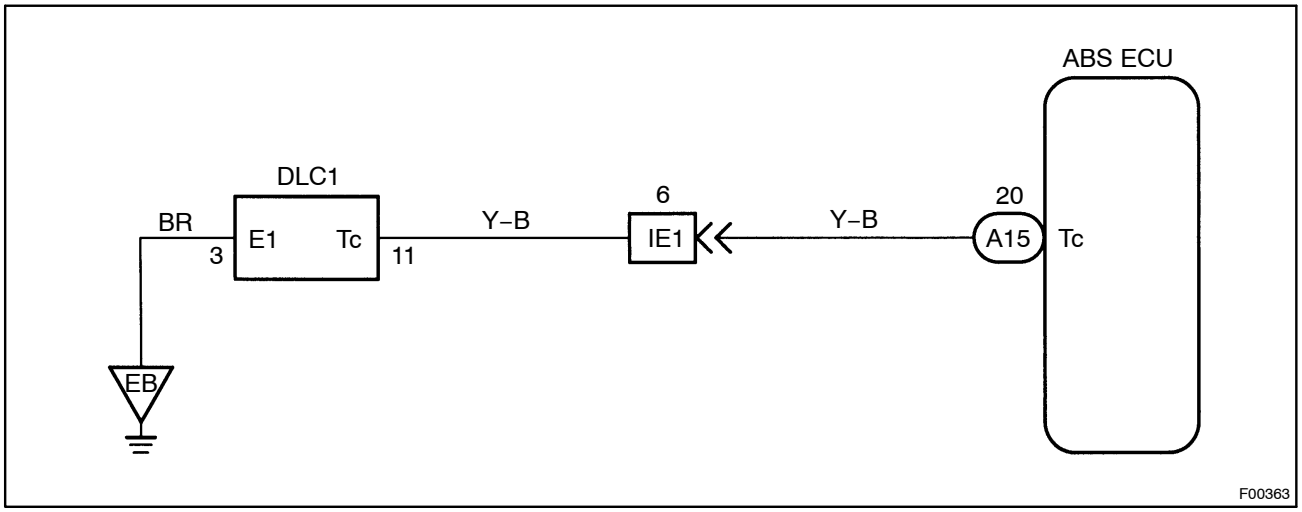
DI10U–03

Tc Terminal Circuit

CIRCUIT DESCRIPTION

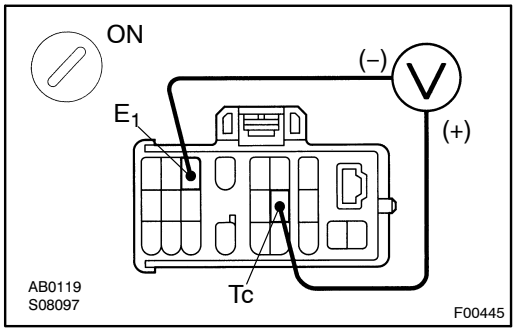
Connecting terminals Tc and E_1 of the DLC1 causes the ECU to display the DTC by flashing the ABS warning light.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals Tc and E_1 of DLC1.**



CHECK:

(a) Turn the ignition switch ON.

(b) Measure voltage between terminals Tc and E_1 of DLC1.

OK:

Voltage: 10 – 14 V

OK	**If ABS warning light does not blink even after Tc and E_1 are connected, ECU may be defective.**

NG

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2	**Check for open and short in harness and connector between ABS ECU and DLC1, DLC1 and body ground (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

Check and replace ABS ECU.

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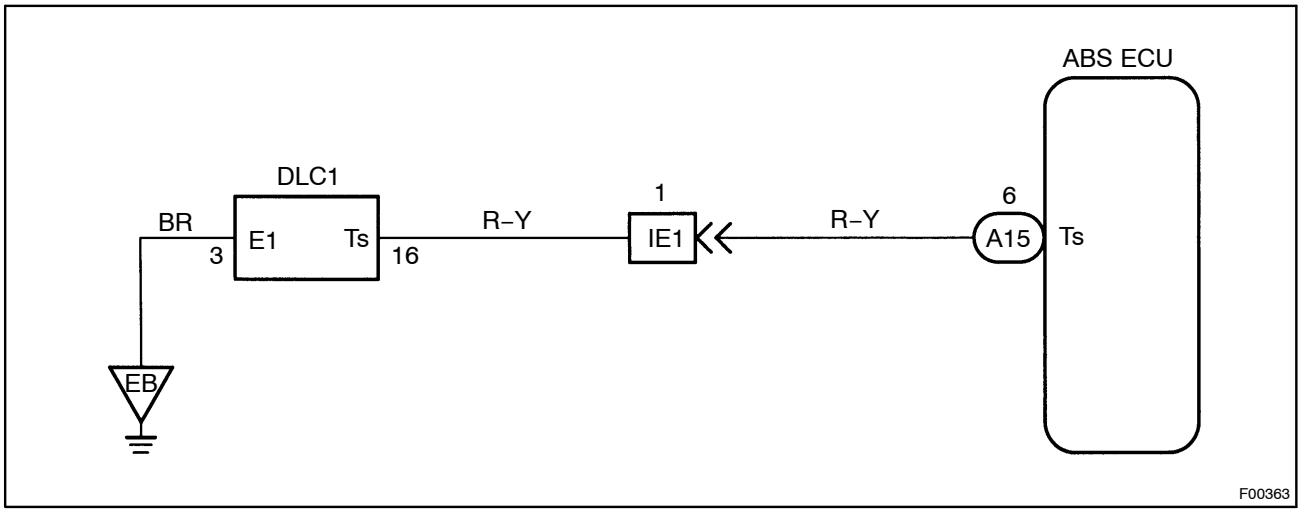
DI10W–03

Ts Terminal Circuit

CIRCUIT DESCRIPTION

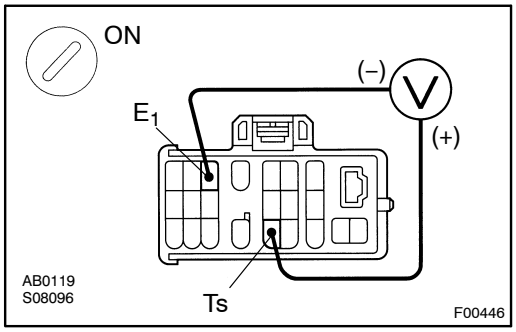
The sensor check circuit detects abnormalities in the speed sensor signal which cannot be detected with the DTC check.
Connecting terminals Ts and E_1 of the DLC1 in the engine compartment starts the check.

WIRING DIAGRAM



INSPECTION PROCEDURE

1	**Check voltage between terminals Ts and E_1 of DLC1.**



CHECK:

(a) Turn the ignition switch ON.
(b) Measure voltage between terminals Ts and E_1 of DLC1.

OK:

Voltage: 10 – 14 V

OK	**If ABS warning light does not blink even after Ts and E_1 are connected, ECU may be defective.**

NG

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2	**Check for open and short in harness and connector between ABS ECU and DLC1, DLC1 and body ground (See page IN–26).**

NG → **Repair or replace harness or connector.**

OK

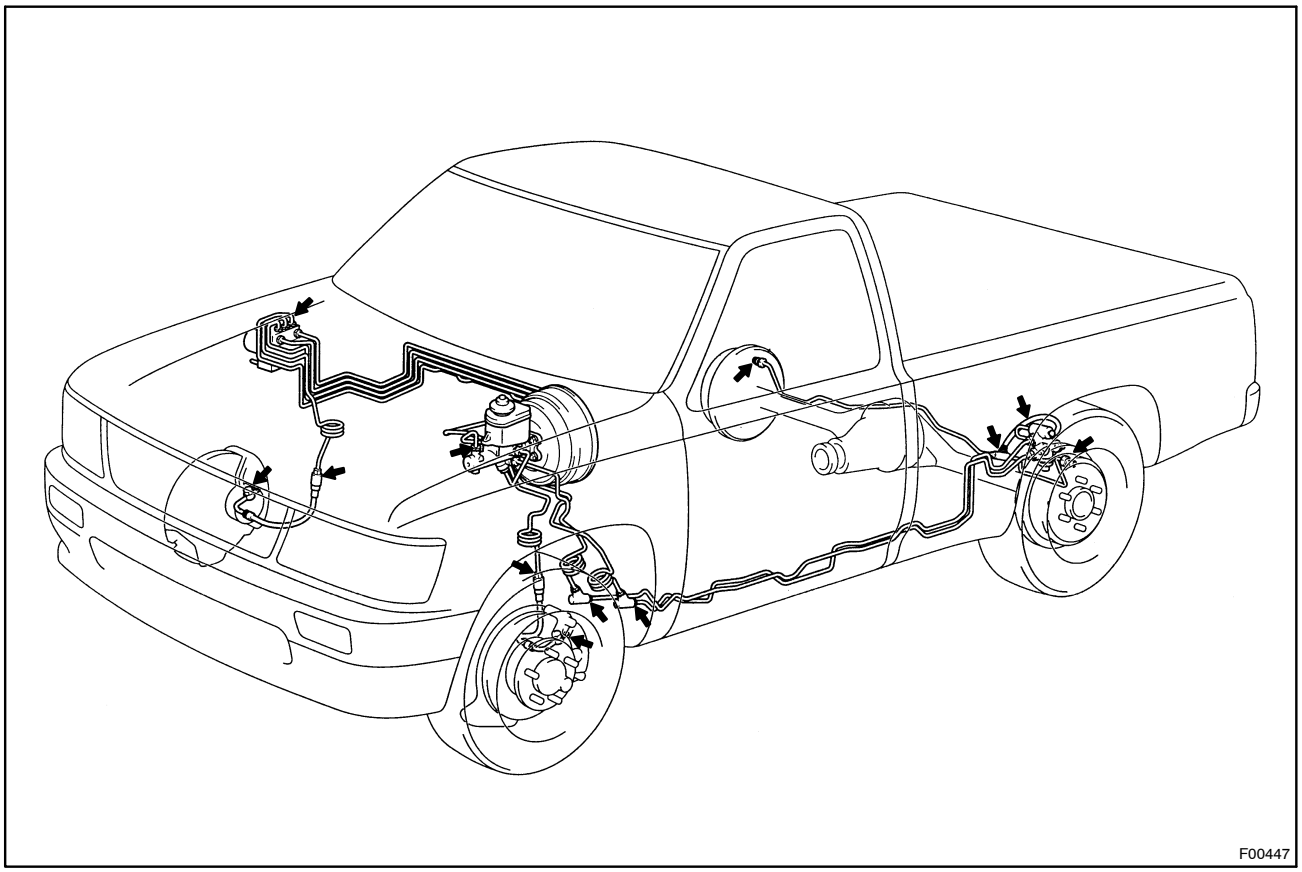
Check and replace ABS ECU.

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DI10Y–01

Check for fluid Leakage

Check for fluid leakage from actuator or hydraulic lines.



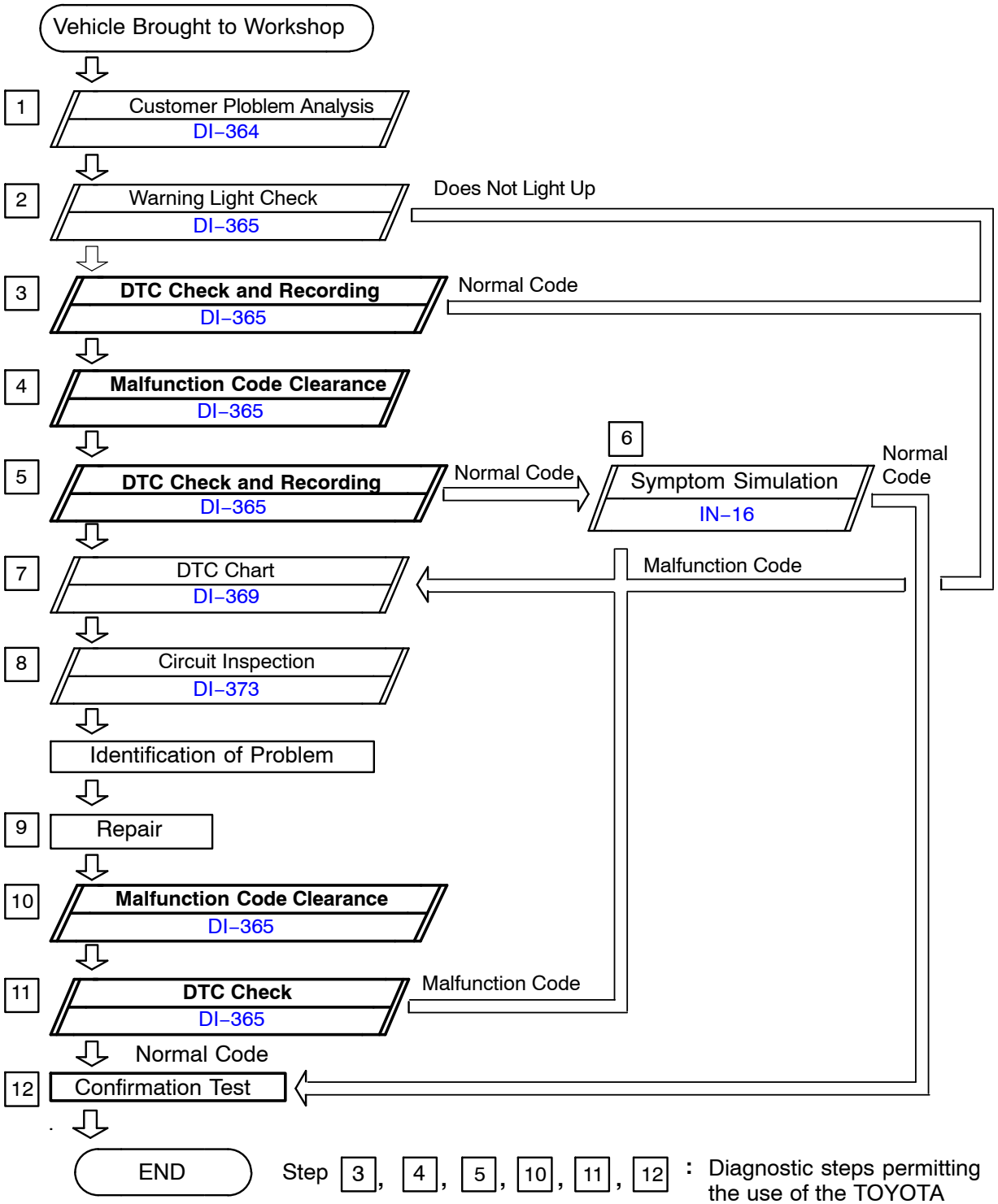
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SUPPLEMENTAL RESTRAINT SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

DI0XG–01

Troubleshooting in accordance with the procedure on the following pages.



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DI0XH–01

CUSTOMER PROBLEM ANALYSIS CHECK

Supplemental Restraint System Check Sheet

Inspector's Name _____

Customer's Name		**Registration No.**	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	**km Miles**

Date Problem Dist Occurred	/ /
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Other
Temperature	**Approx.**

Vehicle Operation	☐ Starting ☐ Idling ☐ Driving [☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ Other]
Road Conditions	
Details of Problem	

Vehicle Inspection, Repair History Prior to Occurrence of Malfunction (Including Supplemental Restraint System)	

Diagnosis System Inspection

SRS Warning Light Inspection	**1st Time**	☐ Remains ON ☐ Sometimes Lights Up ☐ Does Not Light Up
	2nd Time	☐ Remains ON ☐ Sometimes Lights Up ☐ Does Not Light Up
DTC Inspection	**1st Time**	☐ Normal Code ☐ Malfunction Code [Code.]
	2nd Time	☐ Normal Code ☐ Malfunction Code [Code.]

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DI0XJ–02

PRE–CHECK

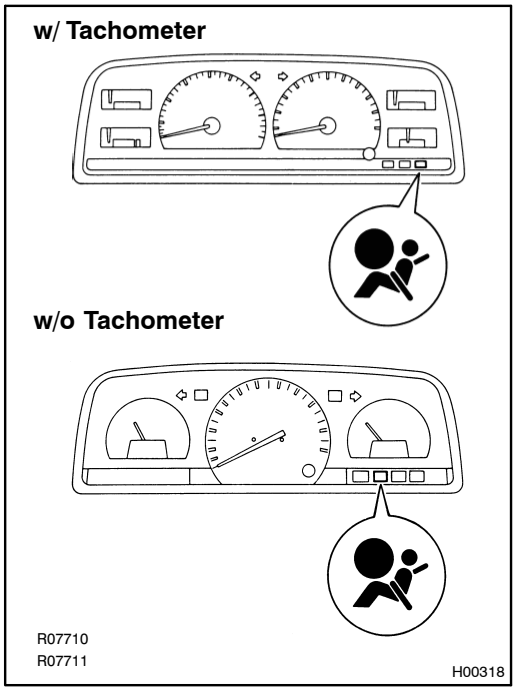
1. SRS WARNING LIGHT CHECK

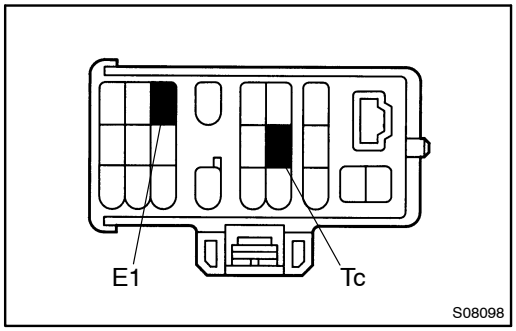
(a) Turn the ignition switch to ACC or ON and check that the SRS warning light lights up.

(b) Check that the SRS warning light goes out after approx. 6 seconds.

HINT:

- When the ignition switch is at ACC or ON and the SRS warning light remains on or flashes, the airbag sensor assembly has detected a malfunction code.
- If, after approx. 6 seconds have elapsed, the SRS warning light sometimes lights up or the SRS warning light lights up even when the ignition switch is OFF, a short in the SRS warning light circuit can be considered likely. Proceed to "SRS warning light system malfunction" on page DI–398, DI–400.





2. DTC CHECK (Using diagnosis check wire)

(a) Output the DTC.

(1) Turn the ignition switch to ACC or ON position and wait approx. 20 seconds.

(2) Using SST, connect terminals Tc and E1 of the DLC1.

SST SST 09843–18020

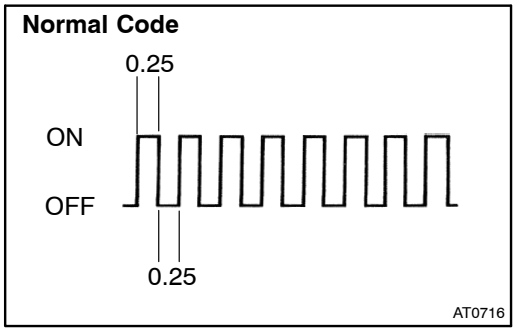
NOTICE:

Never make a mistake with the terminal connection position as this will cause a malfunction.

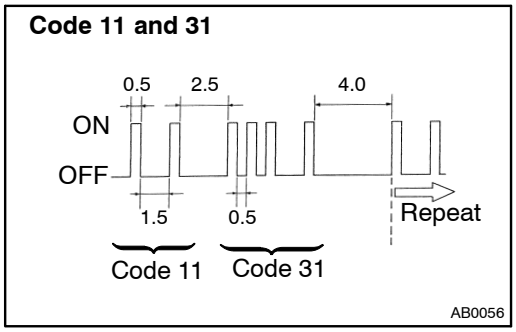
(b) Read the DTC.

Read the 2–digit DTC as indicated by the number of times the SRS warning light blinks. As an example, the blinking patterns, normal, 11 and 31 are as shown on the illustration.

- Normal code indication:
  The light will blink 2 times per second.
- Malfunction code indication:
  The first blinking output indicates the first digit of a 2–digit DTC. After a 1.5 second pause, the second blinking output will indicate the second digit.

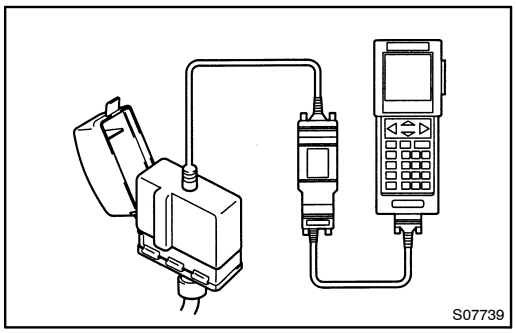


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If there are 2 or more codes, there will be a 2.5 second pause between each codes. After al the codes have been output, there will be a 4.0 second pause and they will all be repeated.
HINT:

- In the event of a number of trouble codes, indication will start from the smallest numbered code.
- If it does not output a DTC or outputs a DTC without terminal connection, proceed to the Tc terminal circuit inspection on page DI–403.



3. DTC CHECK (Using TOYOTA hand–held tester)

(a) Hook up the TOYOTA hand–held tester to the DLC1.
(b) Read the DTCs by following the prompts on the tester screen.

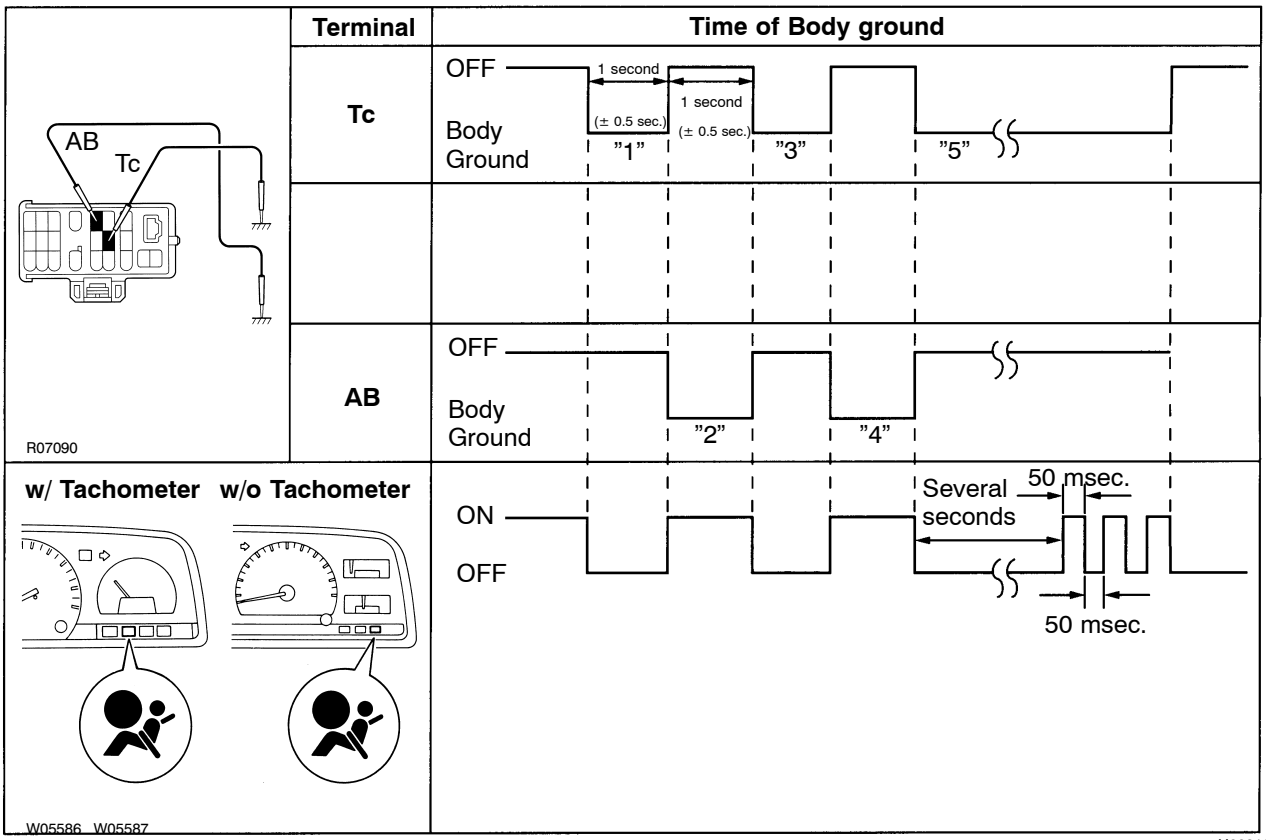
HINT:
Please refer to the TOYOTA hand–held tester operator's manual, for further details.

4. DTC CLEARANCE (Using diagnosis check wire)

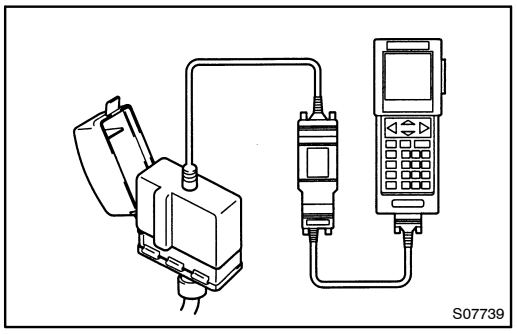
(a) Conncect the 2 service wires to terminals Tc nad AB of DLC1.
(b) Turn the ignition switch to ACC or ON and wait approx. 6 seconds.
(c) Starting with the Tc terminal, apply body ground alternately to terminal Tc and terminal AB twice each in cycles of 1.0 seconds. Confirm that body ground is absolute. Finally, keep applying body ground to terminal Tc.

HINT:
When alternately groundling terminals Tc and AB, release grounf from one terminal and immediately apply it to the other terminal within an interval of 0.2 second. If DTCs do not clear, repeat the above procedure until the codes are cleared.

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(d) Several seconds after doing the clearing procedure, the SRS warning light will blink in a 50 msec. cycle to indicate the codes have been cleared.



5. DTC CLEARANCE (Using TOYOTA hand–held tester)

(a) Hook up the TOYOTA hand–held tester to the DLC1.

(b) Clear the DTCs by following the prompts on the tester screen.

HINT:

Please refer to the TOYOTA hand–held tester operator's manual for further details.

6. RELEASE METHOD OF AIRBAG ACTIVATION PREVENTION MECHANISM

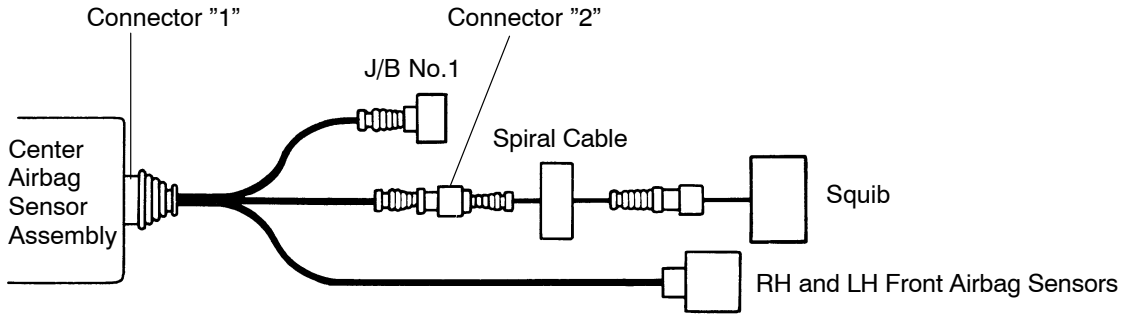
An airbag activation prevention mechanism is built into the connector for the squib circuit of the SRS.

When release of the airbag activation prevention mechanism is directed in the troubleshooting procedure, as shown in the illustration of the connectors "1" and "2" below, insert paper which is the same thickness as the male terminal, between the terminal and the short spring.

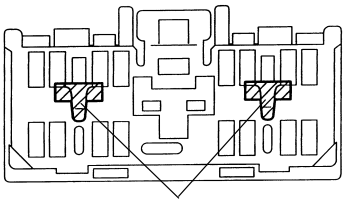
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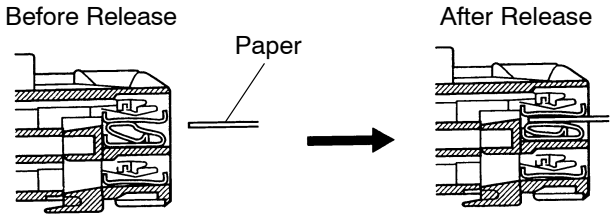
CAUTION:
Never release the airbag activation prevention mechanism on the steering wheel pad connector.
NOTICE:

- **Do not release the airbag activation prevention mechanism unless specifically directed by the troubleshooting procedure.**
- **If the paper inserted is too thick the terminal and short spring may be damaged, so always use paper the same thickness as the male terminal.**

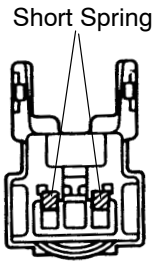


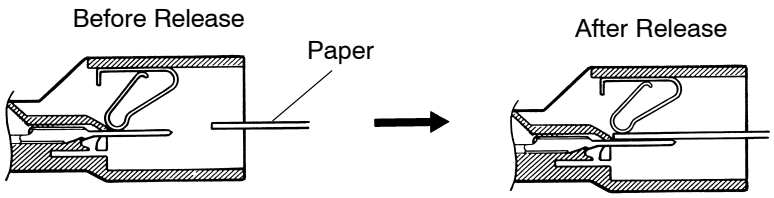
Airbag Sensor Assembly Connector (Connector "1")





Spiral Cable Connector (Connector "2")





AB0027
W03146 W03147
AB0130 AB0045 AB0046

H00320

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DI0XK–02

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the table below (Proceed to the page given for that circuit.).

DTC No. (See Page)	Detection Item	Trouble Area	SRS Warning Light
Normal (DI–396)	• System normal	–	OFF
	• Source voltage drop	• Battery • Center airbag sensor assembly	ON
11 (DI–373)	• Short in squib circuit or front airbag sensor circuit (to ground)	• Steering wheel pad (D squib) • Front airbag sensor • Spiral cable • Center airbag sensor assembly • Wire harness	ON
12 (DI–379)	• Short in squib circuit or front airbag sensor circuit (to B+)	• Steering wheel pad (D squib) • Front airbag sensor • Spiral cable • Center airbag sensor assembly • Wire harness	ON
14 (DI–385)	• Open in D squib circuit	• Steering wheel pad (D squib) • Spiral cable • Center airbag sensor assembly • Wire harness	ON
15 (DI–390)	• Open in front airbag sensor circuit	• Front airbag sensor • Center airbag sensor assembly • Wire harness	ON
31 (DI–394)	• Center airbag sensor assembly malfunction	• Center airbag sensor assembly	ON

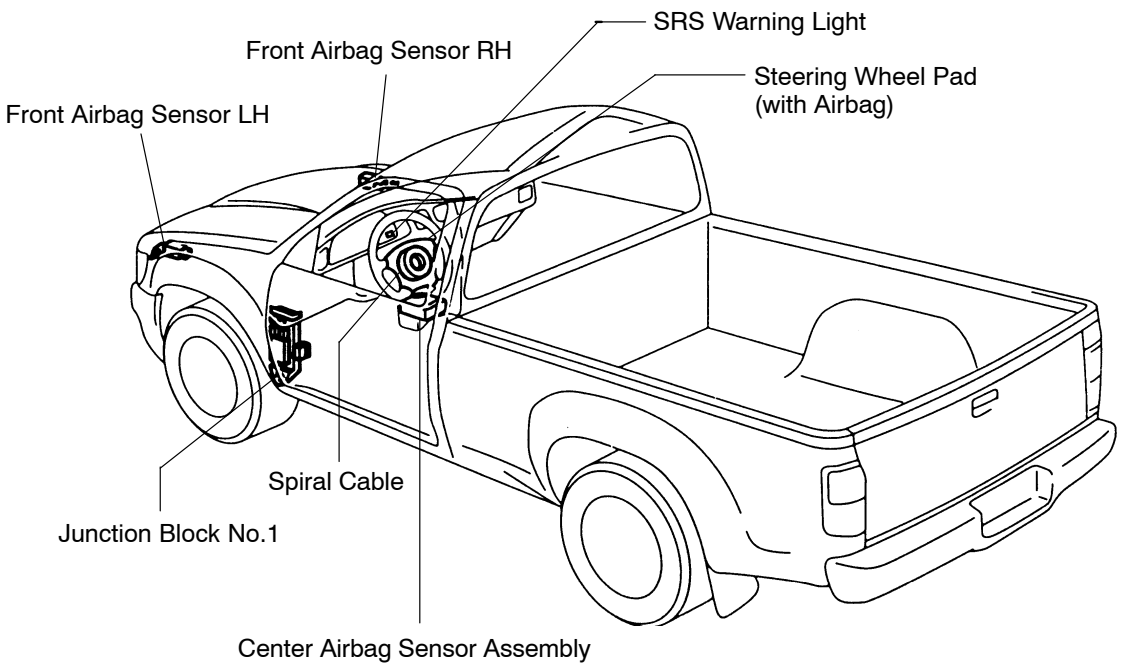
HINT:

- When the SRS warning light remains lit up and the DTC is the normal code, this means a source voltage drop. This malfunction is not stored in memory by the center airbag sensor assembly and if the power source voltage returns to normal, approx. 10 seconds the SRS warning light will automatically go out.
- When 2 or more codes are indicated, the lowest numbered code will apper first.
- If a code not listed on the chart is displayed, the center airbag sensor assembly is faulty.

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DI0XL–02

PARTS LOCATION

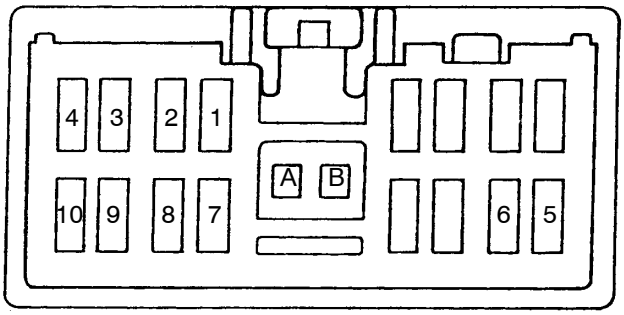


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DI7HL–02

TERMINALS OF ECU



W02759

No.	Symbol	Terminal Name
A	–	Electrical Connection Check Mechanism
B	–	Electrical Connection Check Mechanism
1	LA	SRS Warning Light
2	D–	Squib ⊖ (Driver)
3	D+	Squib ⊕ (Driver)
4	T_C	Diagnosis
5	E2	Ground
6	E1	Ground
7	+SR	Front Airbag Sensor RH ⊕
8	+SL	Front Airbag Sensor LH ⊖
9	IG2	Power Source (IGN Fuse)
10	ACC	Power Source (CIG Fuse)

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DI0XN–01

PROBLEM SYMPTOMS TABLE

Proceed with troubleshooting of each circuit in the table below.

Symptom	Suspect Area	See page
• With the ignition switch at ACC or ON, the SRS warning light sometimes lights up after approx. 6 seconds have elapsed. • SRS warning light is always lit up even when ignition switch is in the LOCK position.	• SRS warning light circuit (Always lit up when ignition switch is in LOCK position.)	DI–398
• With the ignition switch at ACC or ON, the SRS warning lights does not light up.	• SRS warning light circuit (Does not light up when ignition switch is turned to ACC or ON.)	DI–400
• DTC not displayed. • SRS warning light is always lit up a DTC check procedure. • DTC displayed without Tc and E1 terminal connection.	• Tc terminal circuit	DI–403

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DI0XO-02

CIRCUIT INSPECTION

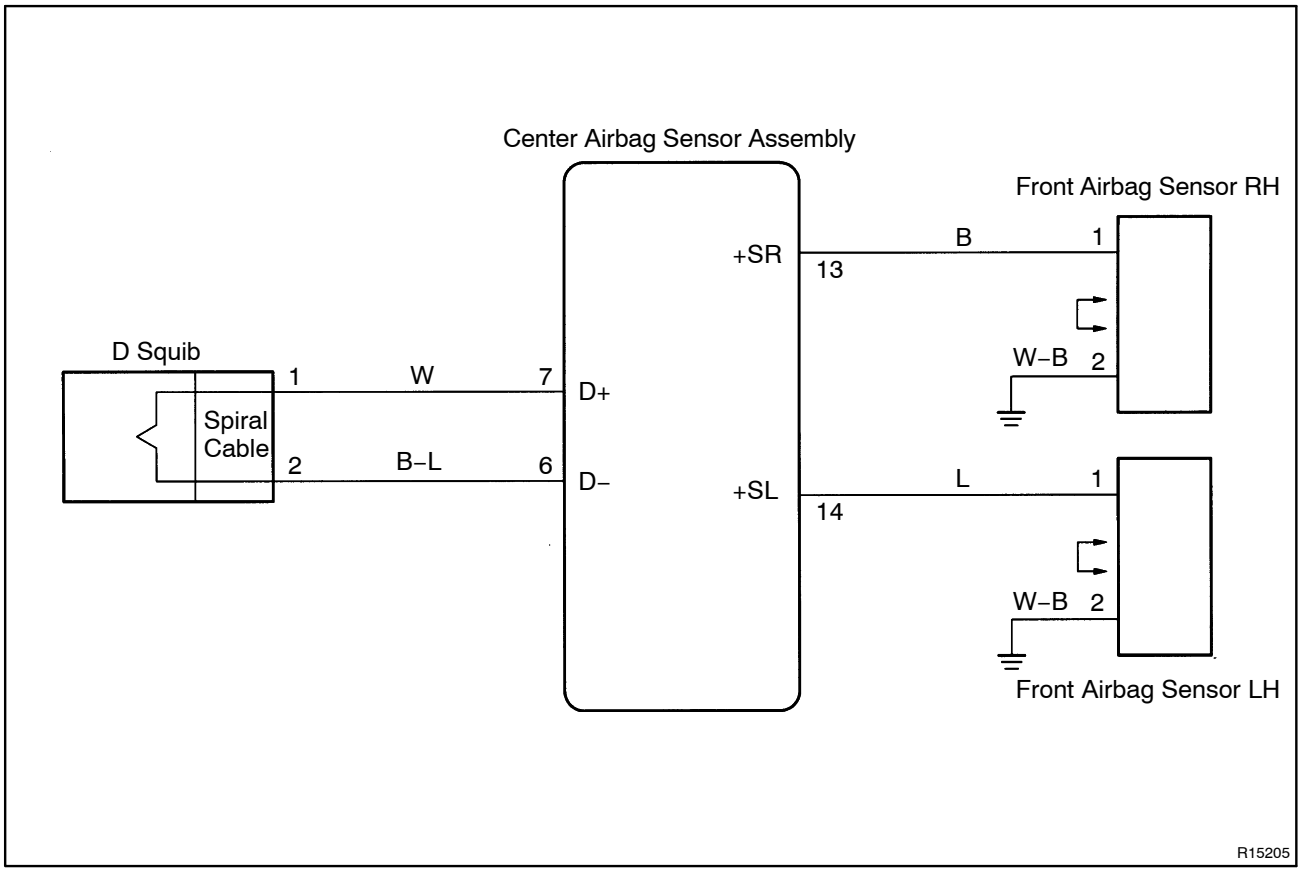
DTC	11	Short in Squib Circuit (to Ground)

CIRCUIT DESCRIPTION

The squib circuit consists of the center airbag sensor assembly, spiral cable and steering wheel pad. If causes the SRS to deploy when the SRS deployment conditions are satisfied.
The front airbag sensor detects the deceleration force in a frontal collision and is located in the front fender apron on the left and right sides.
For details of the function of each component, see OPERATION on page RS–2.
DTC 11 is recorded when ground short is detected in the squib circuit or front airbag sensor circuit.

DTC No.	DTC Detecting Condition	Trouble Area
11	• Short circuit in squib wire harness (to ground) • Squib malfunction • Short circuit in front airbag sensor +S wire harness (to ground) • Front airbag snesor malfunction • Spiral cable malfunction • Center airbag sensor assembly malfunction	• Steering wheel pad (D squib) • Front airbag sensor • Spiral cable • Center airbag sensor assembly • Wire harness

WIRING DIAGRAM

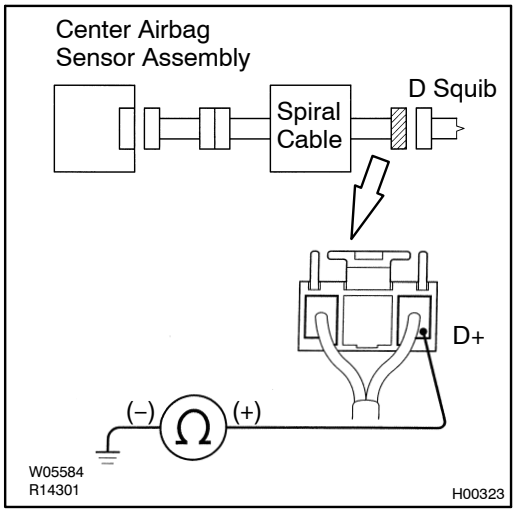


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INSPECTION PROCEDURE

1	**Preparation. (See step 1 on page DI–396)**

2	**Check D squib circuit.**



CHECK:

For connector on spiral cable side between spiral cable and steering wheel pad, measure resistance between D+ and body ground.

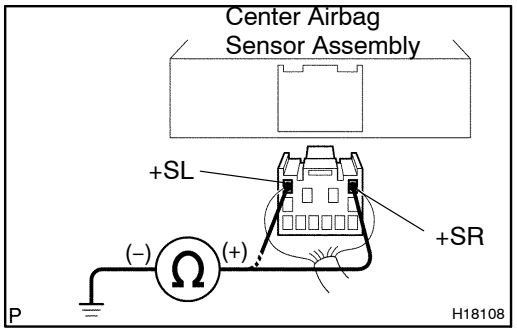
OK:

Resistance: 1MΩ or higher

NG → **Go to step 6.**

OK

3	**Check front airbag sensor circuit. (Measure resistance between terminals +SR, +SL of center airbag sensor assembly connector.)**



CHECK:

Measure resistance between terminals +SR, +SL of harness side connector of center airbag sensor assembly and body ground.

OK:

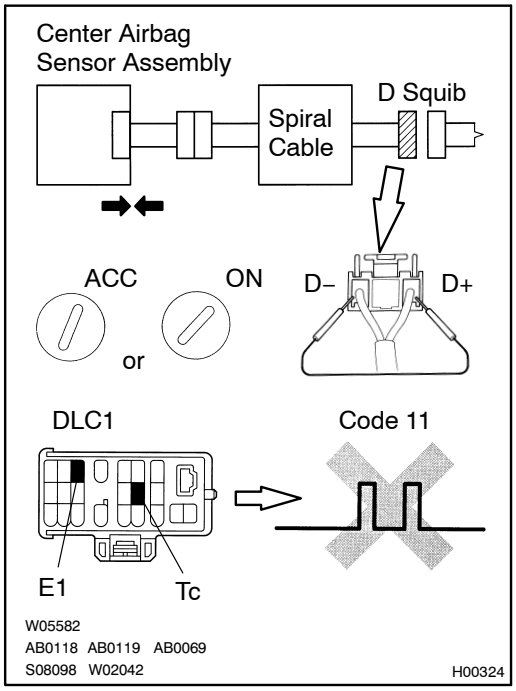
Resistance: 755 – 855 Ω

NG → **Go to step 7.**

OK

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4	Check center airbag sensor assembly.



PREPARATION:

(a) Connect connector to center airbag sensor assembly.
(b) Using a service wire, connect D+ and D– on spiral cable side of connector between spiral cable and steering wheel pad.
(c) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.

CHECK:

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(b) Clear malfunction code stored in memory.
(See page DI–365)
(c) Turn ignition switch to LOCK, and wait at least 20 seconds.
(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(e) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020
(f) Check DTC.

OK:

DTC 11 is not output.

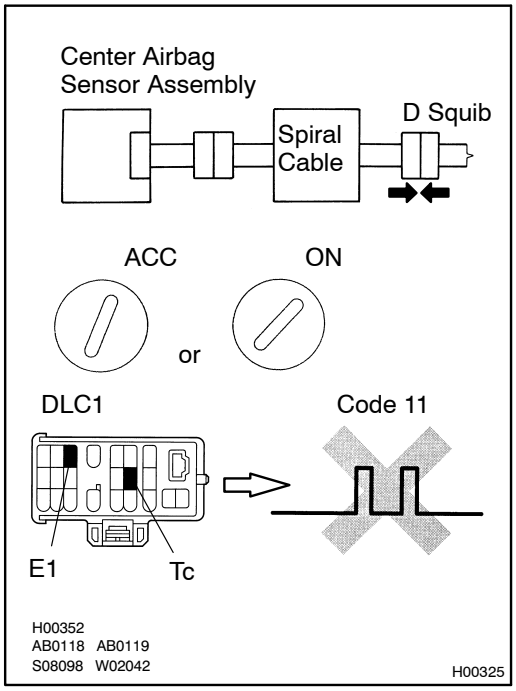
HINT:
Codes other than code 11 may be output at this time, but they are not relevant to this check.

NG	Replace center airbag sensor assembly.

OK

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5	Check D squib.



PREPARATION:

(a) Turn ignition switch to LOCK.
(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.
(c) Connect steering wheel pad connector.
(d) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.

CHECK:

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(b) Clear malfunction code stored in memory.
(See page DI–365)
(c) Turn ignition switch to LOCK, and wait at least 20 seconds.
(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(e) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020
(f) Check DTC.

OK:

DTC 11 is not output.

HINT:
Codes other than code 11 may be output at this time, but they are not relevant to this check.

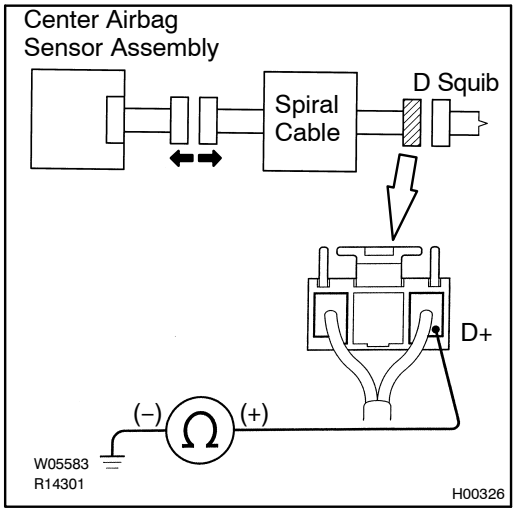
NG	Replace steering wheel pad.

OK

**From results of above inspection, malfunctioning part can now be considered normal.
To make sure of this, use simulation method to check. If malfunctioning part can not be detected by imulation method, replace all SRS components including wire harness.**

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6	Check spiral cable.



PREPARATION:

Disconnect connector between center airbag sensor assembly and spiral cable.

CHECK:

For connector on spiral cable side between spiral cable and steering wheel pad, measure resistance between D+ and body ground.

OK:

Resistance: 1MΩ or higher

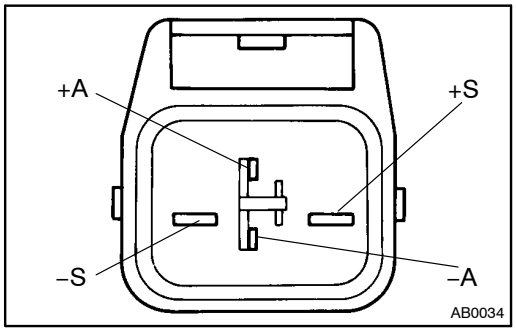
NG → **Repair or replace spiral cable.**

OK

Repair or replace harness or connector between center airbag sensor assembly and spiral cable.

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7	Check front airbag sensor.



PREPARATION:

Disconnect front airbag sensor connector.

CHECK:

Measure resistance between each terminal of front airbag sensor.

OK:

Terminal	Resistance
+S – +A	Less than 1 Ω
+S – –S	1 MΩ or higher
–S – –A	755 – 855 Ω

NOTICE:

- **Do not press ohmmeter probes too strongly against terminals of front airbag sensor.**
- **Make sure front airbag sensor connector is properly connected.**

NG → **Replace front airbag sensor.**

OK

Repair or replace harness or connector between center airbag sensor assembly and front airbag sensor.

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DI986-01

DTC	12	Short in Squib Circuit or Front Airbag Sensor Circuit (to B+)

CIRCUIT DESCRIPTION

The squib circuit consists of the airbag sensor assembly, spiral cable, steering wheel pad and front passenger airbag assembly. It causes the SRS to deploy when the SRS deployment conditions are satisfied.
The front airbag sensor detects the deceleration force in a frontal collision and is located in the front fender on the left and right sides.
For details of the function of each components, see page OPERATION on page RS–2.
DTC 12 is recorded when a B+ short is detected in the squib circuit or front airbag sensor circuit.

DTC No.	DTC Detecting Condition	Trouble Area
12	• Short circuit in squib wire harness (to B+) • Squib malfunction • Short circuit in front airbag sensor +S wire harness (to B+) • Open circuit in RH and LH front airbag sensor harness • Spiral cable malfunction • Center airbag sensor assembly malfunction	• Steering wheel pad (D squib) • Front airbag sensor • Spiral cable • Center airbag sensor assembly • Wire harness

WIRING DIAGRAM

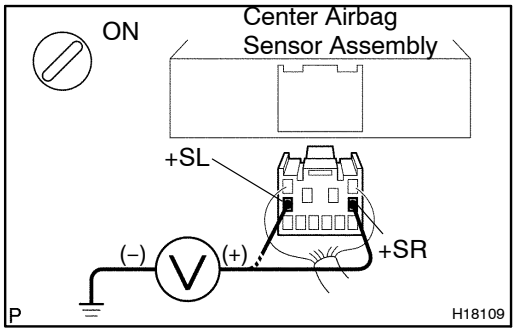
See page DI–373.

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INSPECTION PROCEDURE

1	**Preparation (See step 1 on page DI–396)**

2	**Check D squib circuit (Measure voltage between terminals D+ or D– of center airbag sensor assembly connector and body ground.).**



PREPARATION:

(a) Connect negative (–) terminal cable to battery.

(b) Turn ignition switch to ON.

CHECK:

Measure voltage between terminals D+ or D– of harness side connector of center airbag sensor assembly and body ground.

OK:

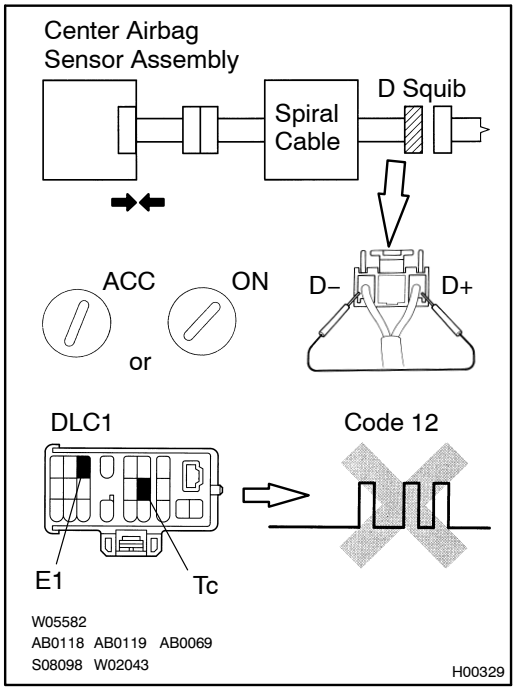
Voltage: 0 V

NG	**Go to step 5.**

OK

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3	Check center airbag sensor assembly.



PREPARATION:

(a) Turn ignition switch LOCK.
(b) Disconnect negative (–) terminal cable from battery.
(c) Connect connector to center airbag sensor assembly.
(d) Using a service wire, connect D+ and D– on spiral cable side of connector between spiral cable and steering wheel pad.
(e) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.

CHECK:

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(b) Clear malfunction code stored in memory (See page DI–365).
(c) Turn ignition switch to LOCK, and wait at least 20 seconds.
(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(e) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020
(f) Check DTC.

OK:

DTC 12 is not output.

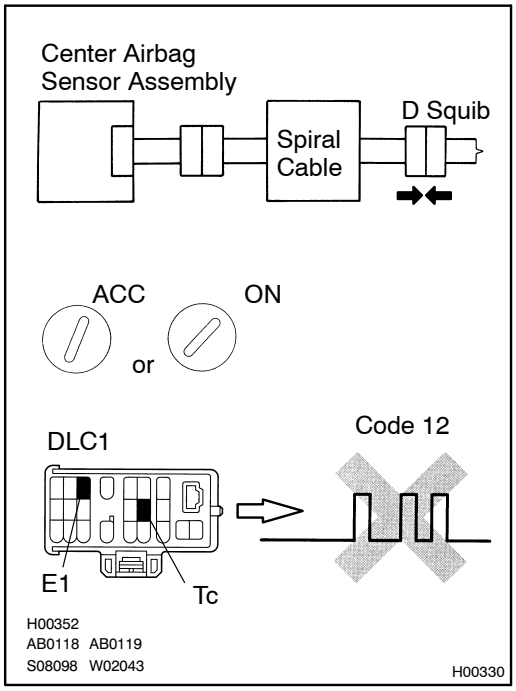
HINT:
Codes other than code 12 may be output at this time, but they are not relevant to this check.

NG → **Replace center airbag sensor assembly.**

OK

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4	Check D squib.



PREPARATION:

(a) Turn ignition switch to LOCK.
(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.
(c) Connect steering wheel pad connector.
(d) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.

CHECK:

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(b) Clear malfunction code stored in memory (See page DI–365).
(c) Turn ignition switch to LOCK, and wait at least 20 seconds.
(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(e) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020
(f) Check DTC.

OK:

DTC 12 is not output.

HINT:
Codes other than code 12 may be output at this time. but they are not relevant to this check.

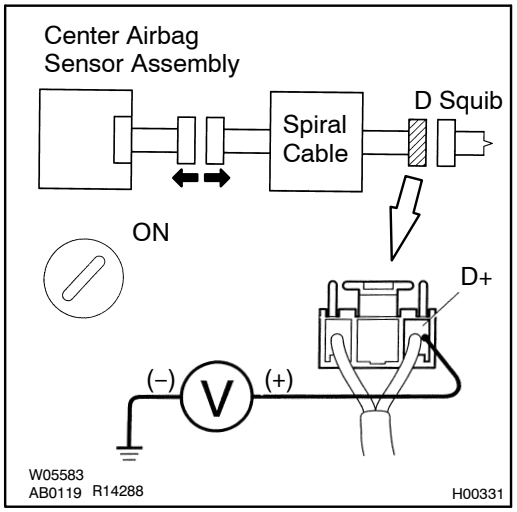
NG	Replace steering wheel pad.

OK

**From results of above inspection, malfunctioning part can now be considered normal.
To make sure of this, use simulation method to check.**

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5	Check D squib circuit.



PREPARATION:

(a) Turn ignition switch to LOCK.
(b) Disconnect connector between center airbag sensor assembly and spiral cable.
(c) Turn ignition switch ON.

CHECK:

For connector on spiral cable side between spiral cable and steering wheel pad, measure voltage between D+ and body ground.

OK:

Voltage: 0 V

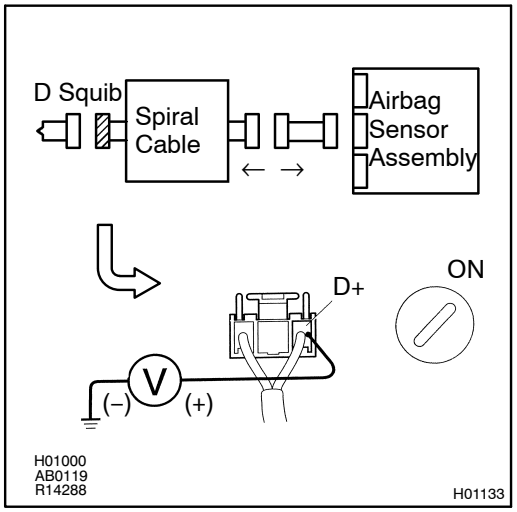
NG → **Repair or replace spiral cable.**

OK

Repair or replace harness or connector between center airbag sensor assembly and spiral cable.

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6	Check spiral cable.



PREPARATION:

(a) Turn ignition switch to LOCK.
(b) Disconnect connector between center airbag sensor assembly and spiral cable.
(c) Turn ignition switch ON.

CHECK:

Measure voltage at D+, D– on spiral cable side of connector between spiral cable and steering wheel pad.

OK:

Voltage: 0 V

NG → **Repair or replace spiral cable.**

OK

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

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DI987–01

DTC	14	Open in D Squib Circuit

CIRCUIT DESCRIPTION

The D squib circuit consists of the center airbag sensor assembly, spiral cable and steering wheel pad. It causes the airbag to deploy when the airbag deployment conditions are satisfied.
For details of the function of each components, see OPERATION on page RS–2.
DTC 14 is recorded when an open is detected in the D squib circuit.

DTC No.	DTC Detecting Condition	Trouble Area
14	• Open circuit in D+ wire harness or D– wire harness of squib • D squib malfunction • Spiral cable malfunction • Center airbag sensor assembly malfunction	• Steering wheel pad (D squib) • Spiral cable • Center airbag sensor assembly • Wire harness

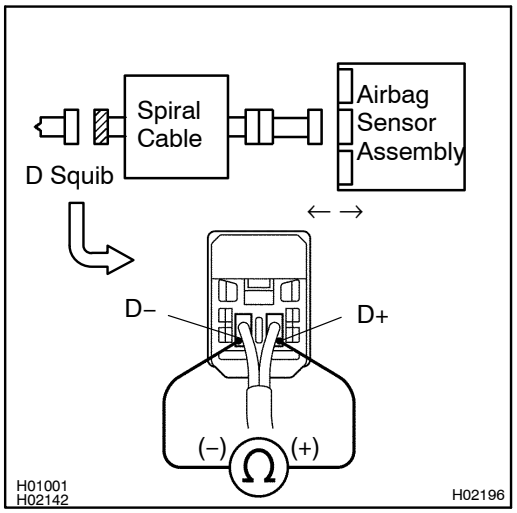
WIRING DIAGRAM

See page DI–373.

INSPECTION PROCEDURE

1	Preparation (See step 1 on page DI–396)

2	Check D squib circuit.



PREPARATION:

(a) Disconnect center airbag sensor assembly connector.
(b) Using a service wire, connect D+ and D– on center airbag sensor assembly side connector.

CHECK:

For the connector (on the spiral cable side) between the spiral cable and steering wheel pad, measure the resistance between D+ and D–.

OK:

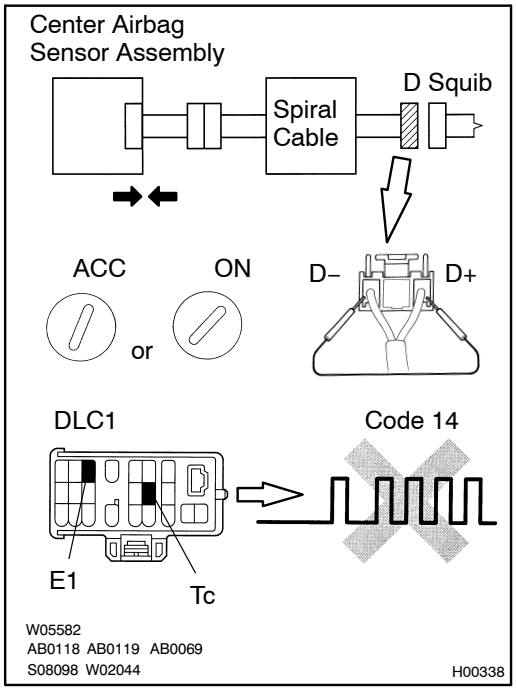
Resistance: Below 1 Ω

NG → **Go to step 5.**

OK

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3	Check center airbag sensor assembly.



PREPARATION:

(a) Connect connector to center airbag sensor assembly.
(b) Using a service wire, connect D+ and D– on spiral cable side of connector between spiral cable and steering wheel pad.
(c) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.

CHECK:

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(b) Clear malfunction code stored in memory (See page DI–365).
(c) Turn ignition switch to LOCK, and wait at least 20 seconds.
(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(e) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020
(f) Check DTC.

OK:

DTC 14 is not output.

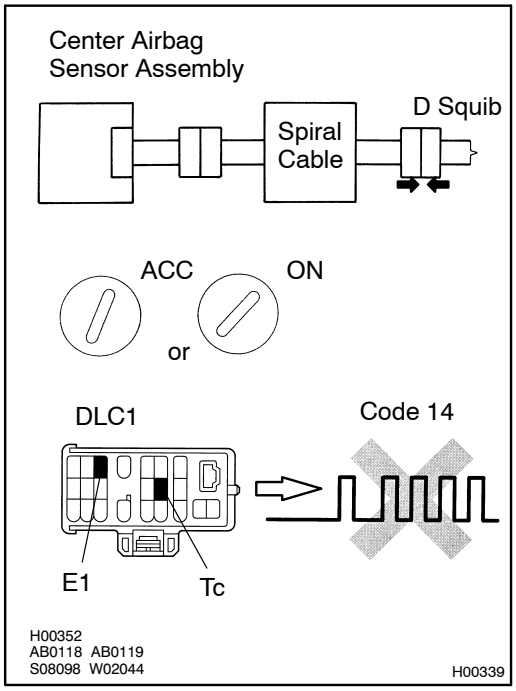
HINT:
Codes other than code 14 may be output at this time, but they are relevant to this check.

NG	Go to step 7.

OK

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4	Check D squib.



PREPARATION:

(a) Turn ignition switch to LOCK.
(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.
(c) Connect steering wheel pad connector.
(d) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.

CHECK:

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(b) Clear malfunction code stored in memory (See page DI–365).
(c) Turn ignition switch to LOCK, and wait at least 20 seconds.
(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(e) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020
(f) Check DTC.

OK:

DTC 14 is not output.

HINT:
Codes other than code 14 may be output at this time, but they are not relevant to this check.

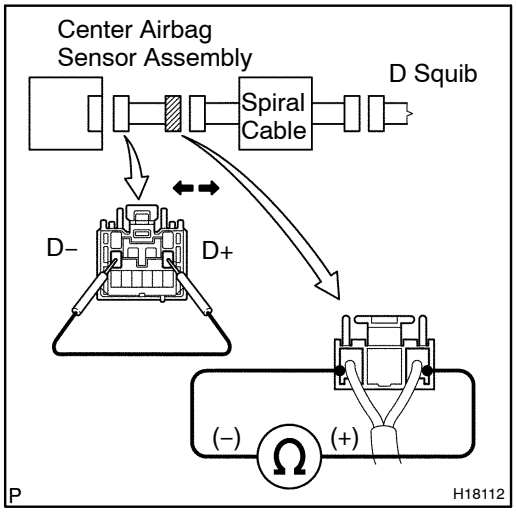
NG	Replace steering wheel pad.

OK

**From results of above inspection, malfunctioning part can now be considered normal.
To make sure of this, use simulation method to check.**

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5	Check harness between center airbag sensor assembly and spiral cable.



PREPARATION:

Using a service wire, connect D+ and D– on center airbag sensor assembly side connector.

CHECK:

For the connector (on the center airbag sensor assembly side) between the center airbag sensor assembly and spiral cable, measure the resistance between D+ and D–.

OK:OK:

Resistance: Below 1 Ω

NG → **Repair or replace harness or connector between center airbag sensor assembly and spiral cable.**

OK

6	Check spiral cable.

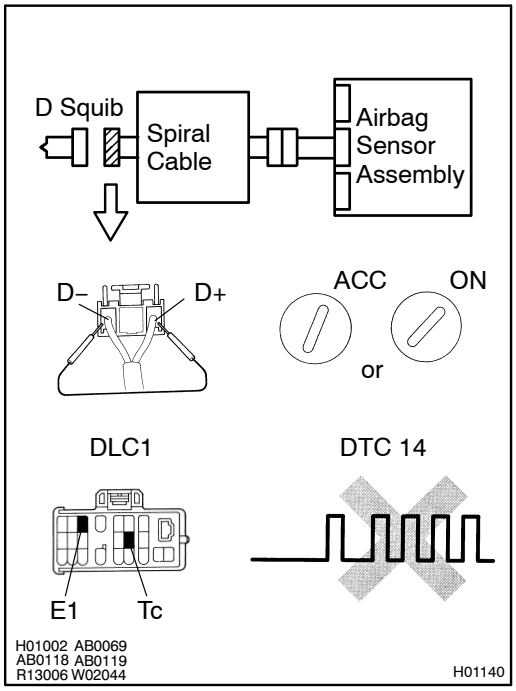
NG → **Repair or replace spiral cable.**

OK

From results of above inspection, malfunctioning part can now be considered normal. To make sure of this, use simulation method to check.

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7	Check center airbag sensor assembly.



CHECK:

(a) Turn ignition switch to ACC or ON and wait at least 20 seconds.

(b) Clear malfunction code stored in memory (See page DI–365).

(c) Turn ignition switch to LOCK, and wait at least 20 seconds.

(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(e) Using SST, connect terminals Tc and E_1 of DLC1.
SST 09843–18020

(f) Check DTC.

OK:

DTC 14 is not output.

HINT:

Codes other than code 14 may be output at this time, but they are not relevant to this check.

NG → **Replace center airbag sensor assembly.**

OK →

From the results of the above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

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DI0XV–02

DTC	15	Open in Front Airbag Sensor Circuit

CIRCUIT DESCRIPTION

The front airbag sensor detects the deceleration force in a frontal collision and is located in the front fender on the left and right sides.
For details of the function of each component, see OPERATION on page RS–2.
DTC 15 is recorded when an open is detected in the front airbag sensor circuit.
NOTICE:
The front airbag sensor connector is equipped with an electrical connection check mechanism for the purpose of detecting an open in the front airbag sensor (See page RS–2). This mechanism is constructed so that when the terminals of the front airbag sensor have been connected (when the connector housing lock is in the locked condition), the connection detection pin on the wire harness side connects with the terminals for diagnosis use on the sensor side. If the connector is not properly connected, the diagnosis system may detect only a malfunction code, even through the SRS is functioning normally. When connecting the front airbag sensor connector, make sure it is connected properly. If DTC 15 is displayed after the front airbag sensor connector has been connected, check again that it is properly connected.

DTC No.	DTC Detecting Condition	Trouble Area
15	• Open cirxuit in +S wire harness or –S wire harness of front airbag sensor. • Front airbag sensor malfunction. • Malfunction of electrical connection check mechanism of front airbag sensor • Center airbag sensor assembly malfunction.	• Front airbag sensor • Center airbag sensor • Wire harness

WIRING DIAGRAM

See page DI–373.

INSPECTION PROCEDURE

1	**Preparaiton (See step 1 on page DI–396)**

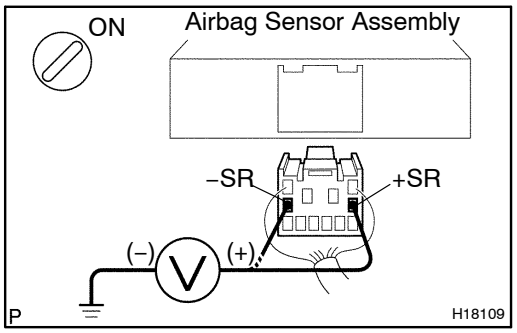
2	**Check front airbag sensor circuit (Measure resistance between terminals +SR and +SL of center airbag sensor assembly connector and body ground.) (See step 2 on page DI–373).**

NG → **Go to step 8.**

OK

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3	**Check front airbag sensor circuit (Measure voltage between terminals +SR, +SL of center airbag sensor assembly connector and body ground.).**



PREPARATION:

(a) Connect negative (–) terminal cable to the battery, and wait at least 2 seconds.

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminals +SR and body ground, +SL and body ground of harness side connector of center airbag sensor assembly.

OK:

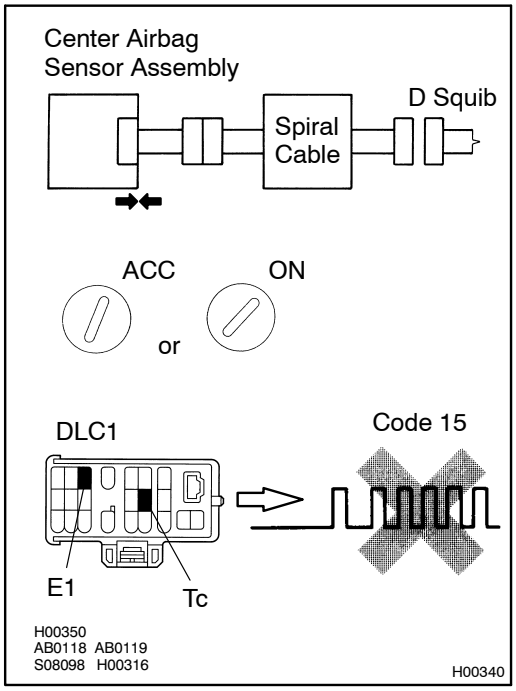
Voltage: 0 V

NG	**Repair or replace wire harness.**

OK

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4	Check center airbag sensor assembly.



PREPARATION:

(a) Connect center airbag assembly connector.
(b) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.

CHECK:

(a) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(b) Clear malfunction code stored in memory (See page DI–365).
(c) Turn ignition switch to LOCK, and wait at least 20 seconds.
(d) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(e) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020
(f) Check DTC.

OK:

DTC 15 is not output.

HINT:
Codes other than code 15 may be output at this time, but they are not relevant to this check.

NG → **Replace center airbag sensor assembly.**

OK

**From results of above inspection, malfunction part can now be considered normal.
To make sure of this, use simulation method to check.**

5	Check connection of center airbag sensor assembly connector.

NG → **Repair.**

OK

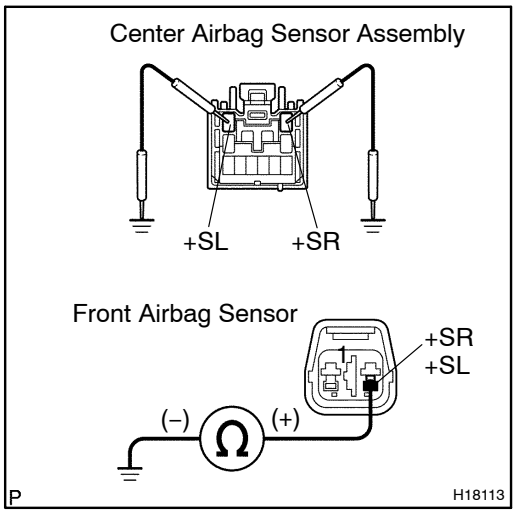
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6	**Check front airbag sensor (See step 6 on page DI–373).**

NG → **Replace front airbag sensor.**

OK

7	**Check harness between center airbag sensor assembly and front airbag sensor.**



PREPARATION:

(a) Disconnect center airbag sensor assembly connector.

(b) Using service wires, connect +SR, +SL and body ground on the wire harness side of the center airbag sensor assembly.

CHECK:

Measure resistance between terminal +SR, +SL and body ground of front airbag sensor connector.

OK:

Resistance: Less than 1 Ω

NOTICE:

Lightly touch ohmmeter probes at position shown in illustration.

NG → **Repair or replace wire harness.**

OK

8	**Check front airbag sensor circuit (Measure voltage between terminals +SR, +SL of center airbag sensor assembly connector and body ground.) (See step 3).**

NG → **Repair or replace wire harness.**

OK

From results of above inspection, the malfunctioning part can now be considered normal. To make sure of this, use the simulation method to check.

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DI0XW–02

DTC	31	Center Airbag Sensor Assembly Malfunction

CIRCUIT DESCRIPTION

The center airbag sensor assembly consists of a center airbag sensor, safing sensor, drive circuit, diagnosis circuit and ignition control, etc.
It receives signals from the airbag sensors, judges whether or not the SRS must be activated, and diagnosis system malfunction.
DTC 31 is recorded when occurrence of a malfunction in the center airbag sensor assembly is detected.

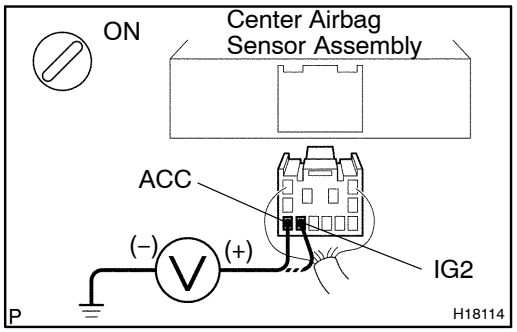
DTC No.	DTC Detecting Condition	Trouble Area
31	• Center airbag sensor assembly malfunction	• Center airbag sensor assembly

INSPECTION PROCEDURE

HINT:
When a malfunction code other than code 31 is displayed at the same time, first repair the malfunction indicated by the malfunction code other than code 31.

1	**Preparation (See step 1 on page DI–396)**

2	**Check voltage at IG2 and ACC of center airbag sensor assembly.**



PREPARATION:
(a) Disconnect center airbag sensor assembly connector.
(b) Turn ignition switch ON.

CHECK:
Measure voltage between terminals IG_2 and ACC of center airbag sensor assembly and body ground.

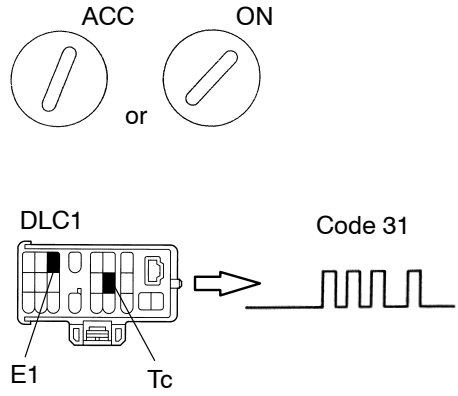
OK:
Voltage: Below 16 V

NG	**Check battery and charging system.** **(3RZ–FE: See page CH–2)** **(5VZ–FE: See page CH–1)**

OK

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3	Is DTC 31 output again?



PREPARATION:

Clear malfunction code.

CHECK:

(a) Turn ignition switch to LOCK, and wait at least 20 seconds.

(b) Turn ignition switch to ACC or ON, and wait at least 20 seconds.

(c) Repeat operation in steps (a) and (b) at least 5 times.

(d) Using SST, connect terminals Tc and E1 of DLC1.
SST 09843–18020

(e) Check the DTC.

NO → **Using simulation method, reproduce malfunction symptoms (See page IN–16).**

YES

Replace center airbag sensor assembly.

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DI989–01

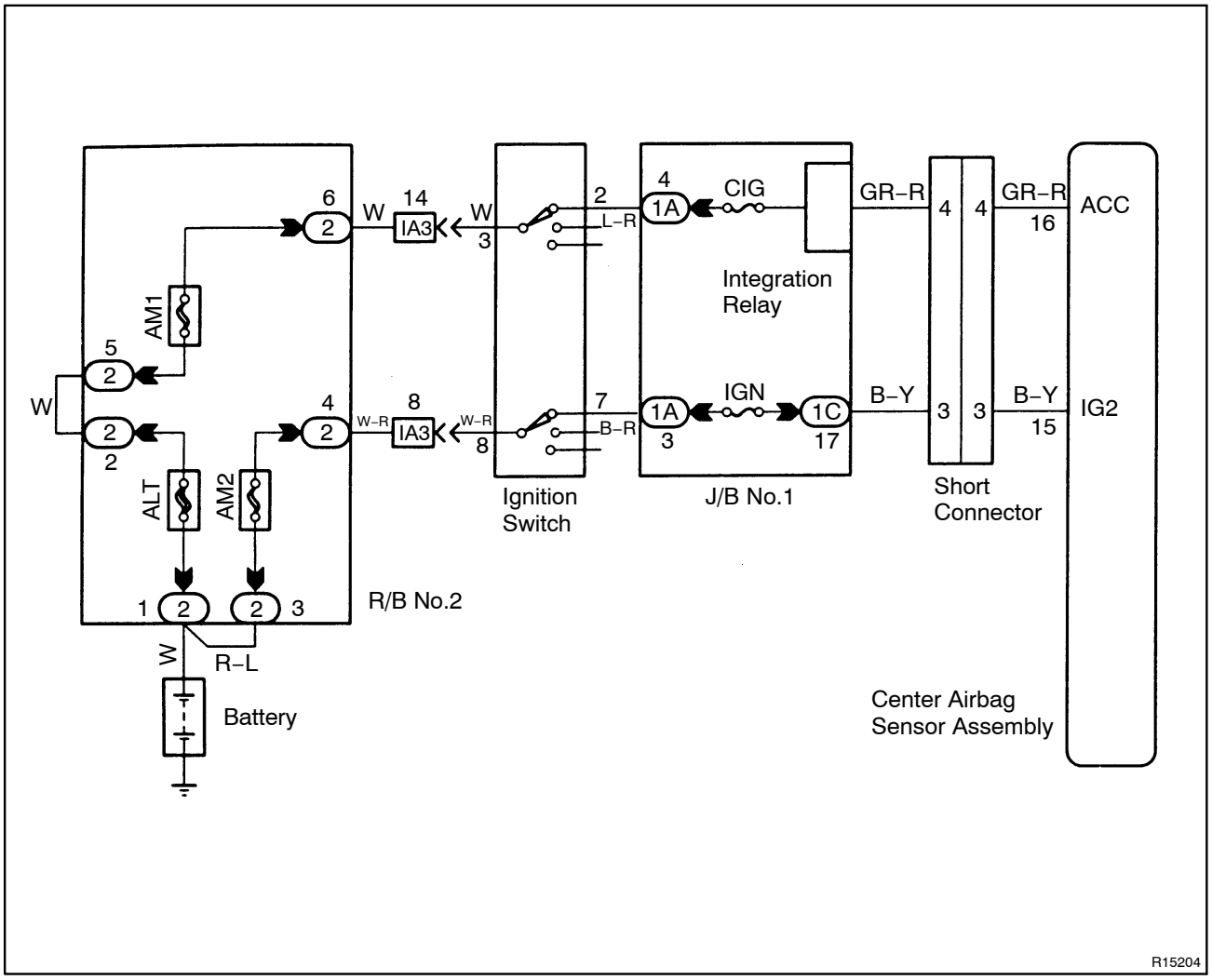
DTC	Normal	Source Voltage Drop

CIRCUIT DESCRIPTION

The SRS is equipped with a voltage–increase circuit (DC–DC converter) in the center airbag sensor assembly in case the source voltage drops.
When the battery voltage drops, the voltage–increase circuit (DC–DC converter) functions to increase the voltage of the SRS to normal voltage.
The diagnosis system malfunction display for this circuit is different to other circuits–when the SRS warning light remains lit up and the DTC is a normal code, source voltage drop is indicated.
Malfunction in this circuit is not recorded in the center airbag sensor assembly, and the source voltage returns to normal, after approx. 10 seconds the SRS warning light automatically goes off.

DTC No.	Diagnosis
(Normal)	Source voltage drop

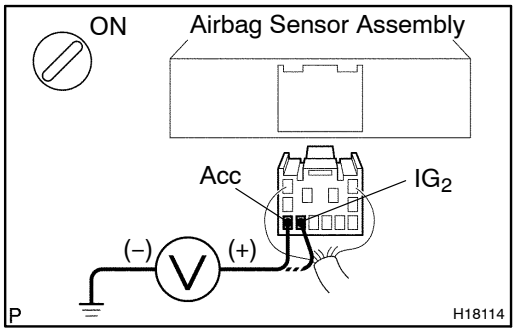
WIRING DIAGRAM



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INSPECTION PROCEDURE

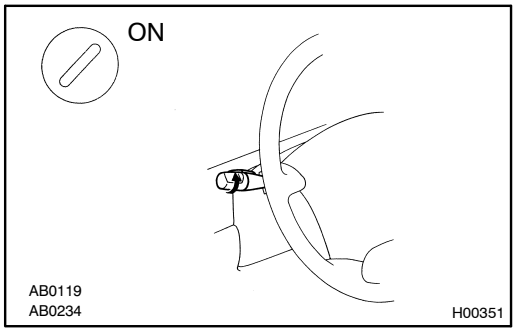
1	Preparation.



PREPARATION:

(a) Turn ignition switch to LOCK.
(b) Disconnect center airbag sensor assembly connector.
(c) Turn ignition switch ON. But do not start engine.
(d) Measure voltage between terminal IG_2 or ACC on connector wire harness side of center airbag sensor assembly and body ground, and operate electric system (defogger, wiper, headlight, heater blower, etc.).
Voltage: 6 V – 11.5 V at IG_2 and ACC
(e) Turn electric system switch OFF.
(f) Turn ignition switch to LOCK.
(g) Remove voltmeter and connect center airbag sensor assembly connector.

2	Does SRS warning light turn off?



PREPARATION:

(a) Turn ignition switch to LOCK.
(b) Connect steering wheel pad connector.
(c) Connect center airbag sensor assembly connector.
(d) Turn ignition switch ON.

CHECK:

Operate electric system (defogger, wiper, headlight, heater blower, etc.), and check that SRS warning light goes off.

NO → **Check for DTCs. If a DTC is output, perform troubleshooting for DTC. If a normal code is output, replace center airbag sensor assembly.**

YES

From results of above inspection, malfunctioning part can now be considered normal. To make sure of this, use simulation method to check.

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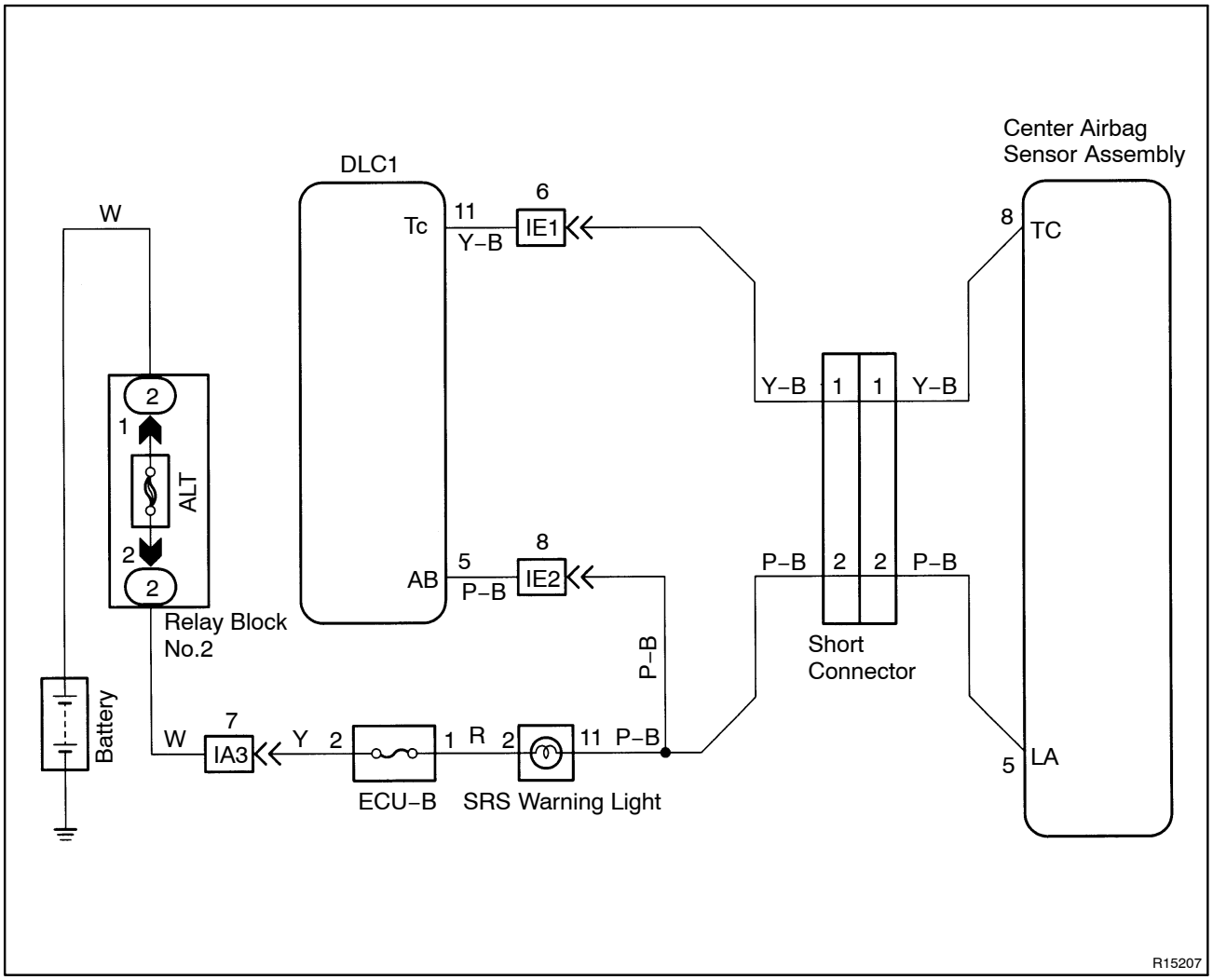
DI98A–01

SRS Warning Light Circuit Malfunction (Always lit up, when ignition switch is in LOCK position.)

CIRCUIT DESCRIPTION

The SRS warning light is located on the combination meter.
When the SRS is normal, the SRS warning light lights up for approx. 6 seconds after the ignition switch is turned from LOCK position to ACC or ON position, and then turns off automatically.
If there is a malfunction in the SRS, the SRS warning light lights up to inform the driver of the abnormality.
When terminals Tc and E1 of the DLC1 are connected, the DTC is displayed by the blinking of the SRS warning light.

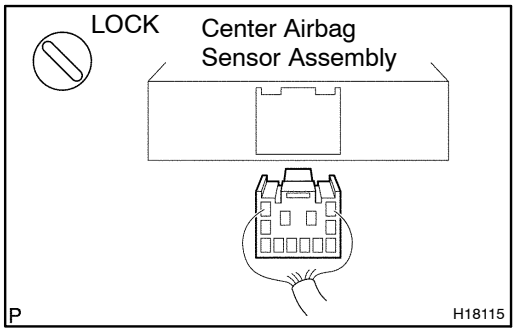
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Does SRS warning light turn off?**



PREPARATION:

(a) Turn ignition switch to LOCK.
(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.
(c) Disconnect center airbag sensor assembly connector.
(d) Connect negative (–) terminal cable to battery.

CHECK:

Check operation of SRS warning light.

NO → **Check SRS warning light circuit or terminal AB circuit of DLC1.**

YES

Replace center airbag sensor assembly.

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DI98B–01

SRS Warning Light Circuit Malfunction (Does not light up, when ignition switch is turned to ACC or ON.)

CIRCUIT DESCRIPTION

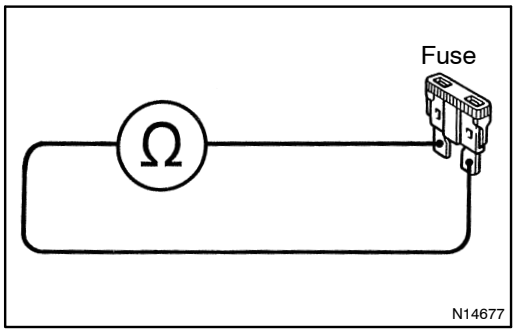
The SRS warning light is located on the combination meter.
When the SRS is normal, the SRS warning light lights up for approx. 6 seconds after the ignition switch is turned from LOCK position to ACC or ON position, and then turns off automatically.
If there is a malfunction in the SRS, the SRS warning light lights up to inform the driver of the abnormality When terminal Tc and E1 of the DLC1 are connected, the DTC is displayed by the blinking of the SRS warning light.

WIRING DIAGRAM

See page DI–398.

INSPECTION PROCEDURE

1	**Check ECU–B Fuse.**



PREPARATION:
Remove ECU–B fuse.
CHECK:
Check continuity of ECU–B fuse.
OK:

Continuity

HINT:

- Fuse may be burnt out even if it appears to be OK during visual inspection.
- If fuse is OK, install it.

NG → **Go to step 6.**

OK

2	**Check connection of center airbag sensor assembly connector.**

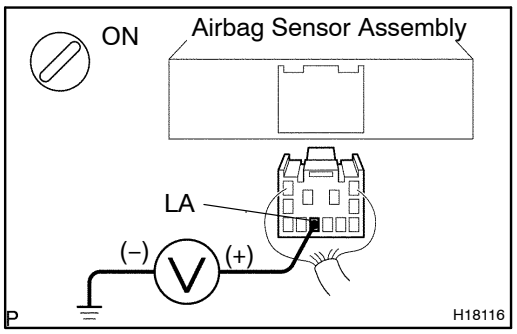
NG → **Repair.**

OK

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3	**Preparation. (See step 1 on page DI–396)**

4	**Check SRS warning light circuit.**



PREPARATION:

(a) Connect negative (–) terminal cable to battery.

(b) Turn ignition switch to ACC or ON.

CHECK:

Measure voltage LA terminal of harness side connector of center airbag sensor assembly and body ground.

OK:

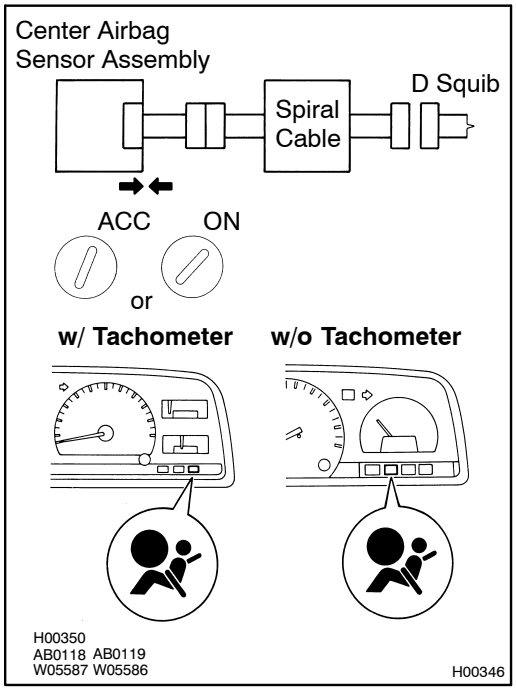
Voltage: 10 – 16 V

NG → **Check SRS warning light bulb/repair SRS warning light circuit.**

OK

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5	Does SRS warning light come on?



PREPARATION:

(a) Disconnect negative (–) terminal cable from the battery.
(b) Connect center airbag sensor assembly connector.
(c) Connect negative (–) terminal cable to battery, and wait at least 2 seconds.
(d) Turn ignition switch to ACC or ON.

CHECK:

Check operation of SRS warning light.

OK:

SRS warning light comes on.

NO → **Check terminal LA of center airbag sensor assembly. If normal, replace center airbag sensor assembly.**

YES

From results of above inspection, malfunctioning part can now be considered normal. To make sure of this, use simulation method to check.

6	Is new ECU–B fuse burnt out again?

NO → **Using simulation method, reproduce malfunction symptoms. (See page IN–16)**

YES

Check harness between ECU–B fuse and SRS warning light.

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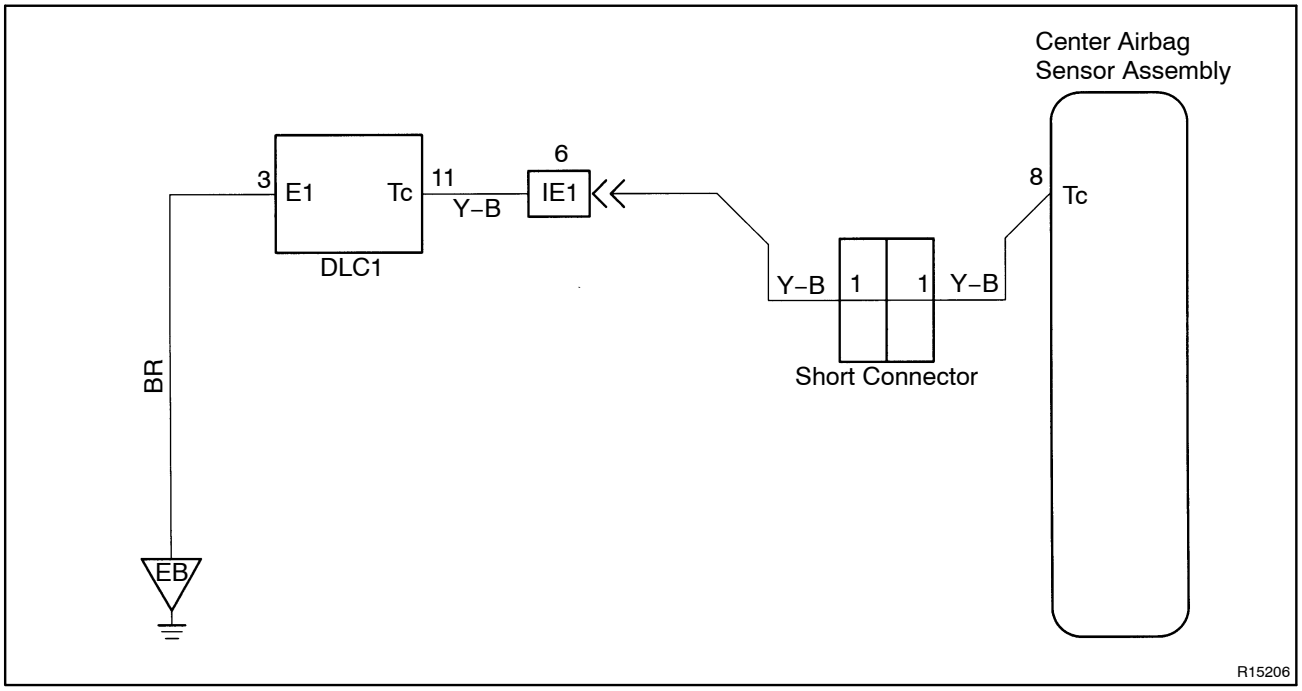
DI0Y1–02

Tc Terminal Circuit

CIRCUIT DESCRIPTION

By connecting terminal Tc and E1 of the DLC1, the airbag sensor assembly is set in the DTC output mode. The DTCs are displayed by the blinking of the SRS warning light.

WIRING DIAGRAM

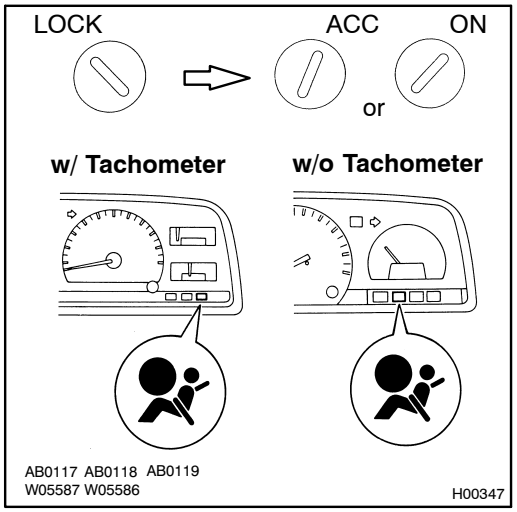


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INSPECTION PROCEDURE

If DTC is not displayed, do following troubleshooting:

1	**Does SRS warning light up for approx. 6 seconds?**



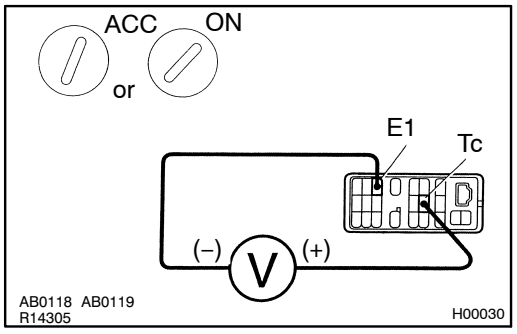
PREPARATION:

Check operation of SRS warning light after ignition switch is turned from LOCK position to ACC or ON position.

NO → **Check SRS warning light system (See page DI–365).**

YES

2	**Check voltage between terminals Tc and E1 of DLC1.**



PREPARATION:

Turn ignition switch to ACC or ON.

CHECK:

Measure voltage between terminals Tc and E1 of DLC1.

OK:

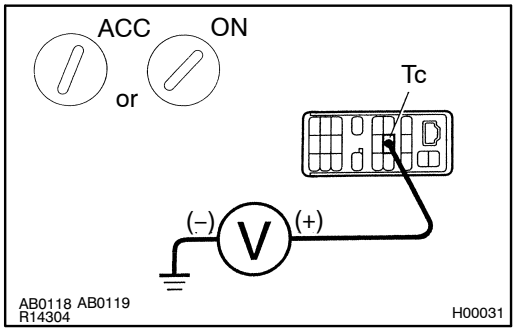
Voltage: 10 – 16 V

OK → **Go to step 4.**

NG

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3	Check voltage between terminals Tc of DLC1 and body ground.



CHECK:

Measure voltage between terminal Tc of DLC1 and body ground.

OK:

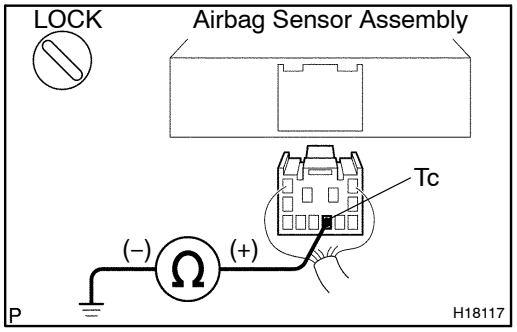
Voltage: 10 – 16 V

OK	Check harness between terminal E1 of DLC1 and body ground.

NG

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4	Check center airbag sensor assembly.



PREPARATION:

(a) Turn ignition switch to LOCK.
(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.
(c) Remove steering wheel pad (See page SR–13 or SR–26).
(d) Disconnect center airbag sensor assembly connector.
(e) Insert service wire into terminal Tc from back side as shown.
(f) Connect center airbag sensor assembly connector with service wire.
(g) Connect negative (–) terminal cable to battery.
(h) Turn ignition switch to ACC or ON, and wait at least 20 seconds.
(i) Connect service wire of terminal Tc to body ground.

CHECK:

Check operation of SRS warning light.

OK:

SRS waning light comes on.

NOTICE:

Never make a mistake with the terminal connection position as this cause a malfunction.

OK → **Check harness between center airbag sensor assembly and DLC1.**

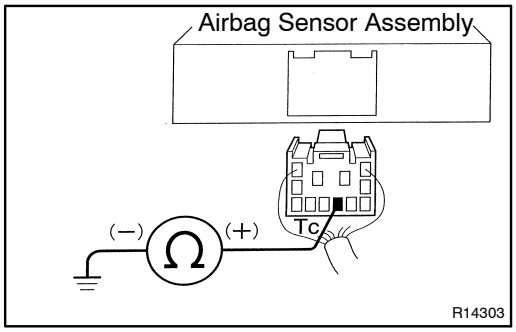
NG

Replace center airbag sensor assembly.

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If DTC is displayed without DTC check procedure, perform following trouble-shooting:

1	**Check resistance between terminal Tc of center airbag sensor assembly and body ground.**



PREPARATION:

(a) Turn ignition switch to LOCK.
(b) Disconnect negative (–) terminal cable from the battery, and wait at least 90 seconds.
(c) Disconnect center airbag sensor assembly connector.

CHECK:

Check resistance between terminal Tc of center airbag sensor assembly connector and body ground.

OK:

Resistance: 1MΩ or Higher

NG → **Repair or replace harness or connector.**

OK

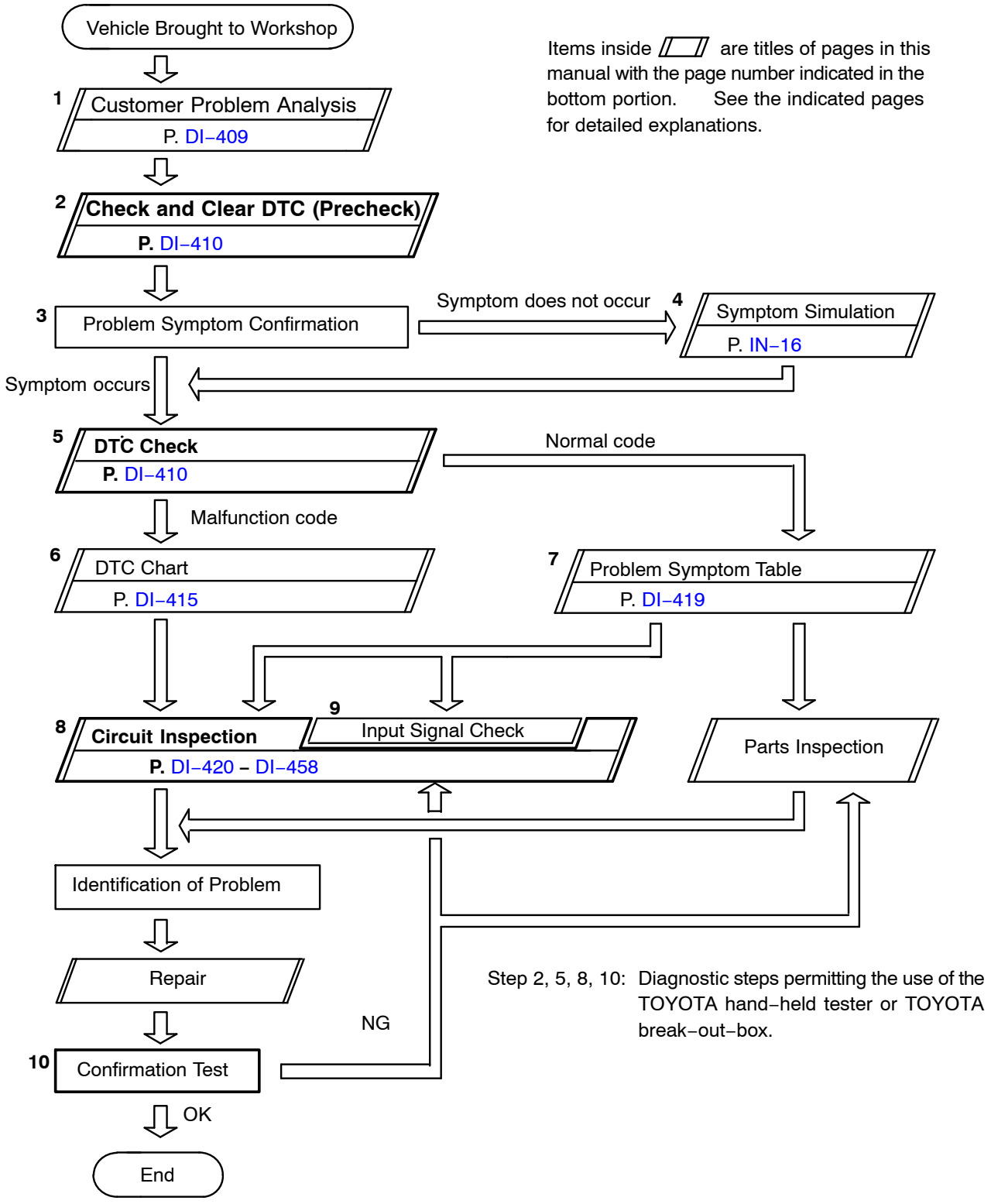
Replace center airbag sensor assembly.

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CRUISE CONTROL SYSTEM

HOW TO PROCEED WITH TROUBLESHOOTING

DI34T–02



Items inside ▱ are titles of pages in this manual with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.

Step 2, 5, 8, 10: Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA break–out–box.

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DI34U–02

CUSTOMER PROBLEM ANALYSIS CHECK

CRUISE CONTROL SYSTEM Check Sheet

Inspector's name: _____

Customer's Name		**Registration No.**	
		Registration Year	
		Frame No.	
Date of Vehicle Brought in	/ /	**Odometer Reading**	**km Mile**

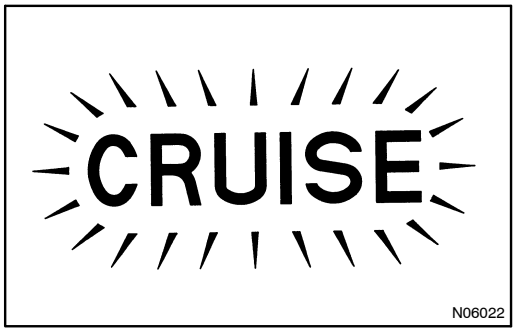
Condition of Problem Occurrence	**Date of Problem Occurrence**	/ /
	How Often does Problem Occur?	☑ Continuous ☑ Intermittent (Times a day)
	Vehicle Speed when Problem Occurred	**km Mile**

Symptoms	☑ Auto cancel occurs	● Driving condition ☐ City driving ☐ Freeway ☐ Up hill ☐ Down hill ● After cancel occurred, did the driver activate cruise control again? ☐ Yes ☐ No
	☐ Cancel does not occur	☐ With brake ON ☐ Except D position shift ☐ At 40 km/h (25 mph) or less ☐ When control SW turns to CANCEL position
	☐ Cruise control malfunction	☐ Slip to acceleration side ☐ Slip to deceleration side ☐ Hunting occurs ☐ O/D cut off does not occur ☐ O/D does not return
	☐ Switch malfunction	☐ SET ☐ ACCEL ☐ COAST ☐ RESUME ☐ CANCEL
	☐ Cruise MAIN indicator light	☐ Remains ON ☐ Does not light up ☐ Blinking

DTC Check	**1st Time**	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)

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DI34V–02



PRE–CHECK

1. DIAGNOSIS SYSTEM

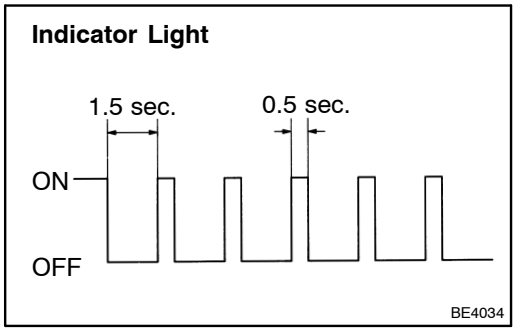
(a) Check the indicator.

(1) Turn the ignition switch to ON.

(2) Check that the CRUISE MAIN indicator light comes on when the cruise control main switch is turned on, and that the indicator light goes off when the main switch is turned OFF.

HINT:

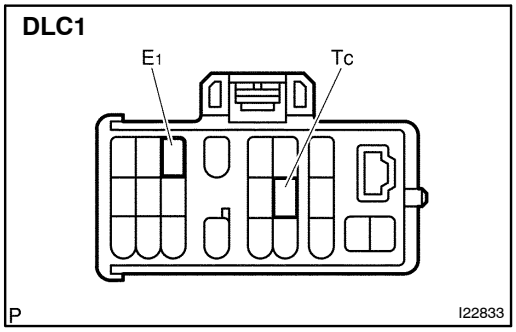
If the indicator check result is not normal, proceed to trouble-shooting (See page BE–36) for the combination meter section.



(b) Check the DTC.

HINT:

If a malfunction occurs in the No. 1 vehicle speed sensors or actuator, etc. during cruise control driving, the ECU actuates AUTO CANCEL of the cruise control and turns on and off the CRUISE MAIN indicator light to inform the driver of a malfunction. At the same time, the malfunction is stopped in memory as a diagnostic trouble code.



(c) Using diagnosis check wire, check the output of DTC.

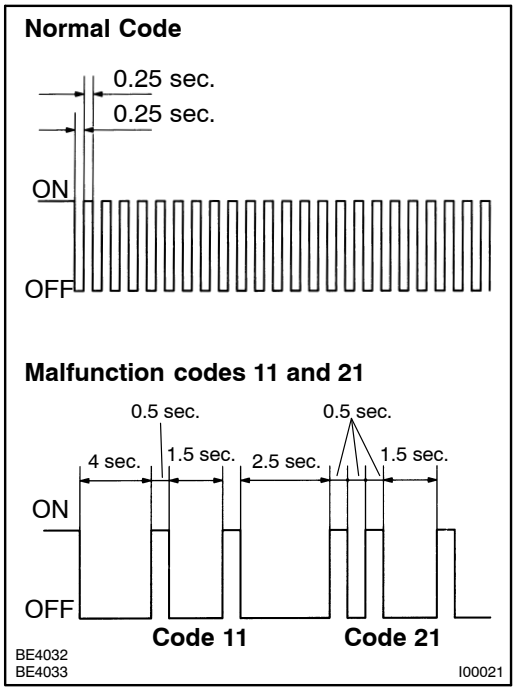
(1) Turn the ignition switch ON.

(2) Using SST, connect terminals Tc and E_1 of DLC1.

SST 09843–18020

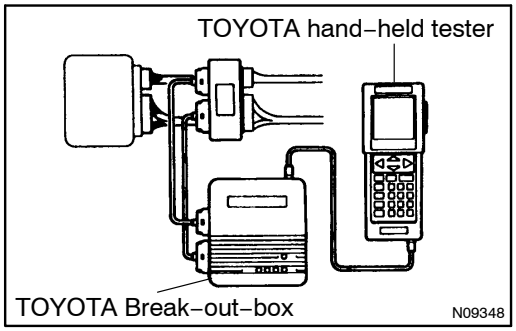
(3) Read the DTC on the CRUISE MAIN indicator light.

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HINT:

- If the DTC is not output, inspect the Tc circuit (See page DI–456).
- As an example, the blinking patterns for codes; normal, 11 and 21 are shown in the illustration.



2. ECU TERMINAL VALUES MEASUREMENT BY USING TOYOTA BREAK–OUT–BOX AND TOYOTA HAND–HELD TESTER

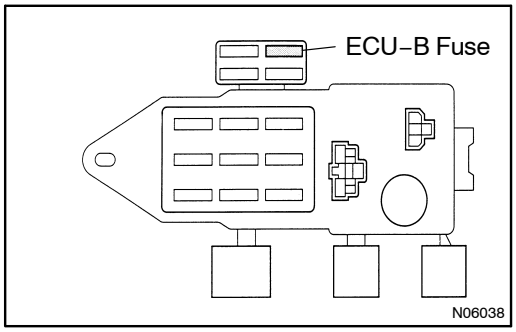
(a) Hook up the TOYOTA break–out–box and TOYOTA hand–held tester to the vehicle.

(b) Read the ECU input/output values by following the prompts on the tester screen.

HINT:

TOYOTA hand–held tester has a ”Snapshot” function. This records the measured values and is effective in the diagnosis of intermittent problems.

Please refer to the TOYOTA hand–held tester /TOYOTA break–out–box operator’s manual for further details.

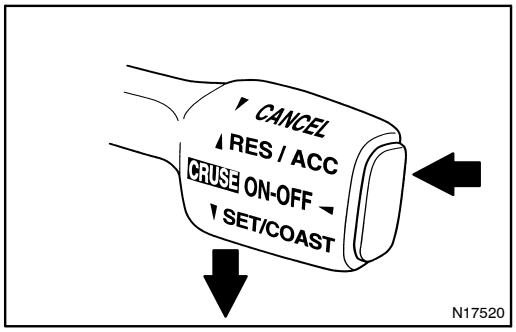


3. DTC CLEARANCE

(a) After completing repairs, the diagnostic trouble code retained in memory can be cleared by removing the ECU–B fuse for 10 seconds or more, with the ignition switch OFF.

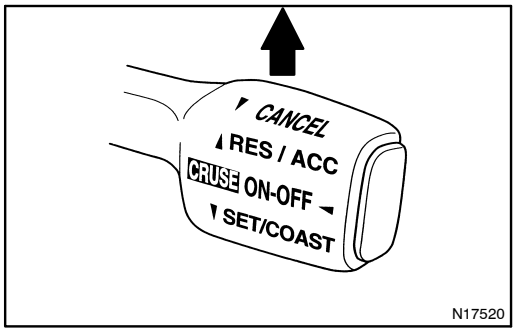
(b) Check that the normal code is displayed after connecting the fuse.

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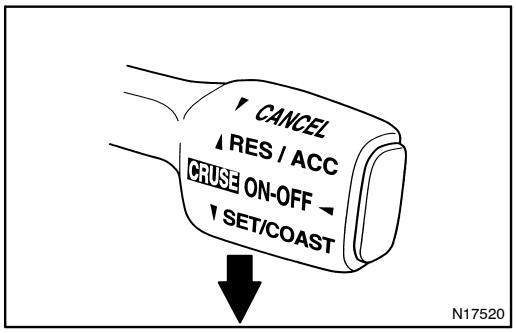


4. PROBLEM SYMPTOM CONFIRMATION (ROAD TEST)

(a) Inspect the SET switch.
- (1) Push the main switch ON.
- (2) Drive at a desired speed (40 km/h (25 mph) or higher).
- (3) Press the control switch to the SET/COAST.
- (4) After releasing the switch, check that the vehicle cruises at the desired speed.

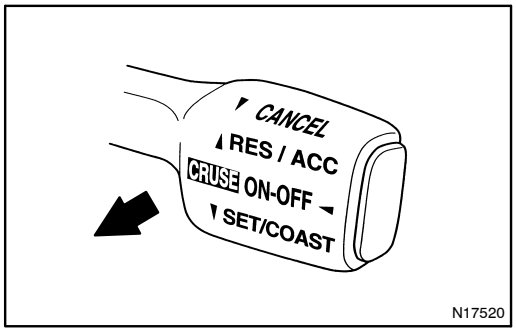


(b) Inspect the ACCEL switch.
- (1) Push the main switch ON.
- (2) Drive at a desired speed (40 km/h (25 mph) or higher).
- (3) Check that the vehicle speed is increased while the control switch turned to RES/ACC, and that the vehicle cruises at the set speed when the switch is released.
- (4) Momentarily press the control switch upward in the RES/ACC and then immediately release it. Check that the vehicle speed increases by about 1.5 km/h (Tap–up function).

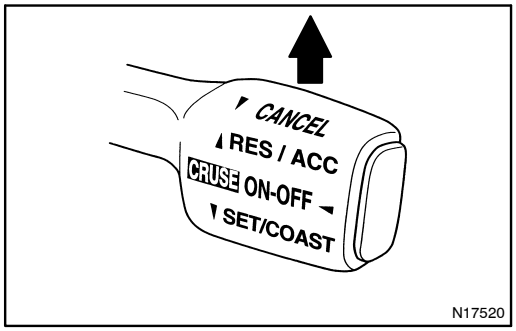


(c) Inspect the COAST.
- (1) Push the main switch ON.
- (2) Drive at a desired speed (40 km/h (25 mph) or higher).
- (3) Check that the vehicle speed is decreased while the control switch is turned to SET/COAST, and the vehicle cruise at the set speed when the switch is released.
- (4) Momentarily press the control switch is turned to SET/COAST, and then immediately release it. Check that the vehicle speed decreases by about 1.5 km/h (Tap–down function).

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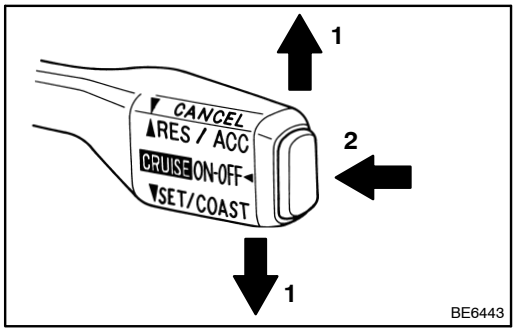
(d) Insepct the CANCEL switch.
(1) Push the main switch ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) When operating one of the followings, check that the cruise control system is cancelled and that the normal driving mode is reset.
- Depress the brake pedal
- Shift to except D position
- Push the main switch OFF
- Pull the cruise control switch to CANCEL



(e) Inspect the RESUME switch.
(1) Push the main switch ON.
(2) Drive at a desired speed (40 km/h (25 mph) or higher).
(3) When operating one of the followings, check that the cruise control system is cancelled and that the normal driving mode is reset.
- Depress the brake pedal
- Shift to except D position
- Pull the cruise control switch to CANCEL

(4) After the control switch is turned to RES/ACC at the driving speed of more than 40 km/h (25 mph), check that the vehicle restores the speed prior to the cancellation.

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5. INPUT SIGNAL CHECK

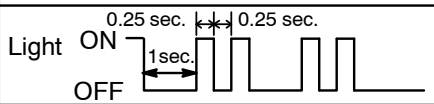
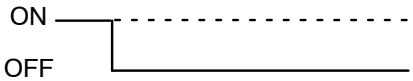
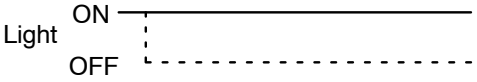
HINT:

- For check No.1 ~ No.3
  Turn ignition switch ON.
- For check No.4
  Jack up the vehicle.
  Start the engine.
  Shift to D position.

(a) Press the control switch to SET/COAST or RES/ACC position and hold it down or hold it up "(1)".
(b) Push the main switch ON "(2)".
(c) Check that the CRUISE MAIN indicator light blinks twice or 3 times repeatedly after 3 seconds.
(d) Turn the SET/COAST or RES/ACC switch OFF.
(e) Operate each switch as listed in the table below.
(f) Read the blinking pattern of the CRUISE MAIN indicator light.
(g) After performing the check, turn the main switch OFF.

HINT:

When 2 or more signals are input to the ECU, the lowest numbered code will be displayed first.

No.	Operation Method	CRUISE MAIN Indicator LIght Blinking Pattern	Diagnosis
1	Push the speed control switch SET/COAT on.		SET/COAST switch circuit is normal
2	Push the speed control switch RESUME/ACCEL on.		RES/ACC switch circuit is normal
3	Each cancel switch turned ON. • Speed control switch (to CANCEL) • Stop light switch • Park/Neutral position switch (to N or O Position) • Clutch start switch • Parking brake switch		Each cancel switch is normal
4	Drive approx. 40 km/h (25 mph) or over		Speed sensor circuit is normal
5	Drive approx 40 km/h (25 mph) or below		Speed sensor circuit is normal

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DI34W–02

DIAGNOSTIC TROUBLE CODE CHART

If a malfunction code is displayed during the DTC check, check the circuit listed for that code in the table below and proceed to the appropriate page.

DTC No. (See Page)	Detection Item	Trouble Area
11 (DI–420)	• Actuator Motor Circuit	• Actuator • Wire harness • Cruise control ECU
12 (DI–422)	• Actuator Magnetic Clutch Circuit	• Actuator • Stop light switch • Wire harness • Cruise control ECU
13 (DI–425)	• Actuator Position Sensor Circuit	• Actuator • Wire harness • Cruise control ECU
21 (DI–428)	• Vehicle Speed Sensor Circuit	• Vehicle speed sensor • Wire harness • Cruise control ECU
*23 (DI–428)	• Actuator Control Cable • Vehicle Speed Sensor circuit	• Vehicle speed sensor • Speed control cable function • Wire harness • Cruise control ECU
32 (DI–431)	• Control Switch Circuit	• Cruise control switch • Wire harness • Cruise control ECU
34 (DI–431)	• Voltage abnormality in control switch circuit	• Control switch • Wire harness • Cruise control ECU
41	• Cruise Control ECU	• Cruise control ECU

HINT:

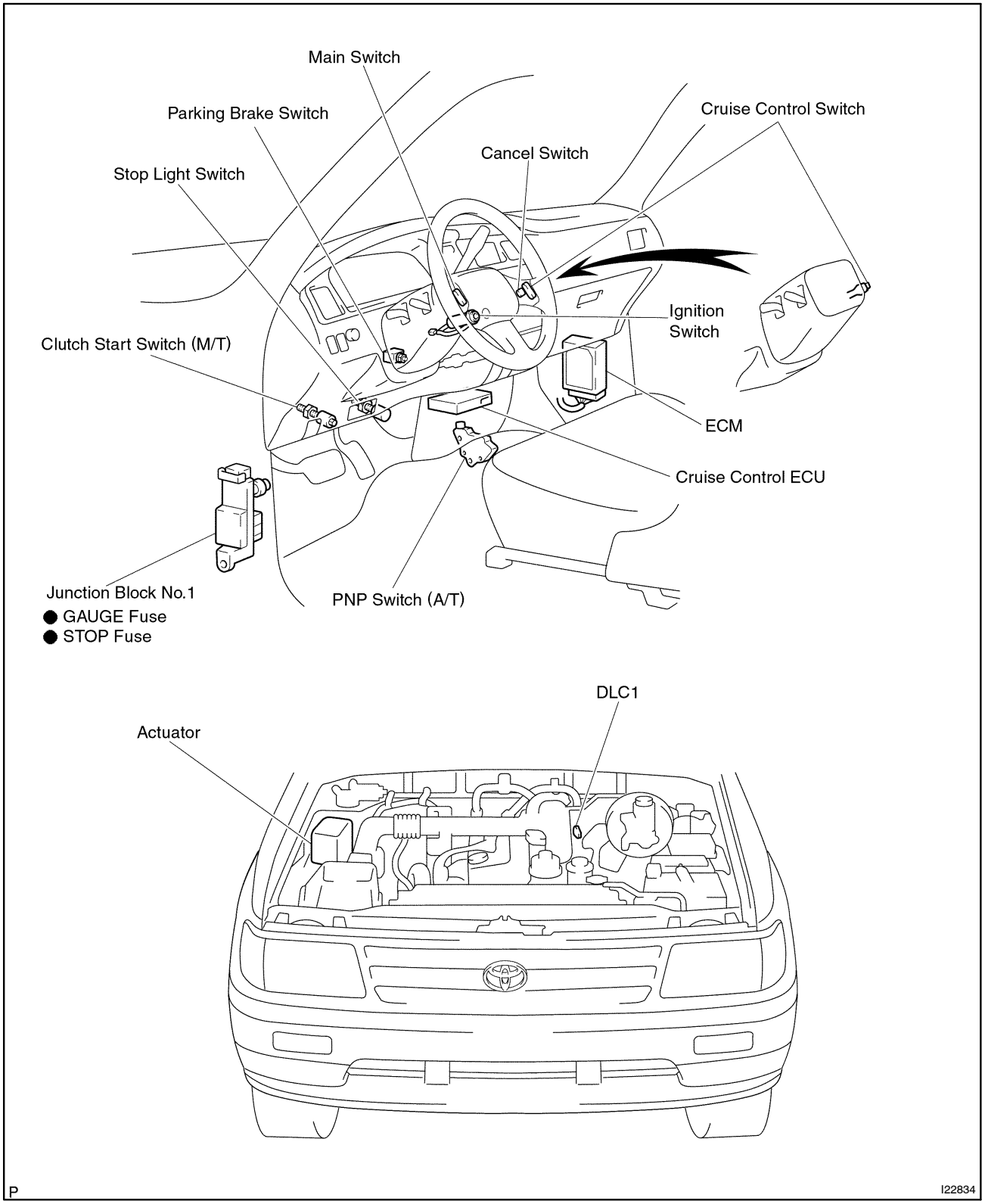
When 2 or more codes are indicated, the lowest numbered code will be displayed first.

*When the vehicle speed decreases on uphill roads, the speed can be set again and drive can be continued (This is not a malfunction.).

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DI0YO–05

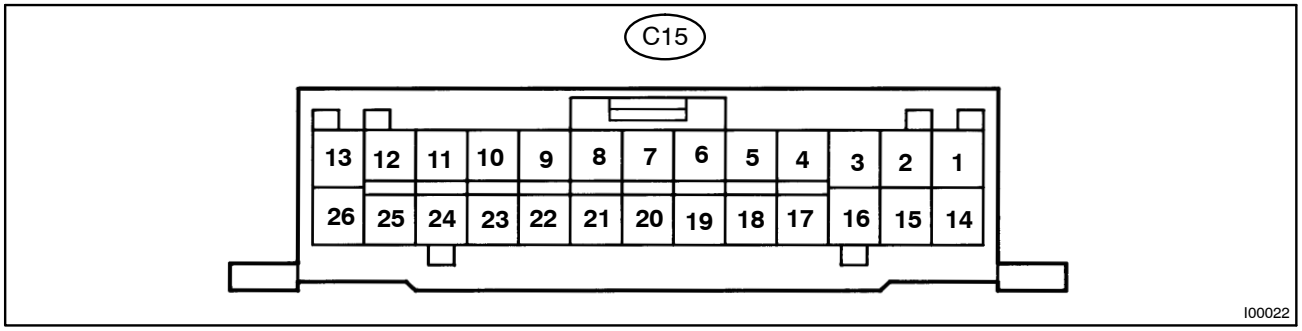
PARTS LOCATION



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DI34Y–02

TERMINALS OF ECU



Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
D ↔ GND (C15–2 ↔ C15–13)	B–W ↔ B–O	Shift to except D position (A/T Vehicle) Depress Clutch Pedal (M/T Vehicle)	Below 1 V
		Shift to D position (A/T Vehicle) Depress Clutch Pedal (M/T Vehicle)	10 – 16 V
PI ↔ GND (C15–5 ↔ C15–13)	B–Y ↔ B–O	Ignition switch ON Cruise control main switch ON	Below 1.2 V
		Ignition switch ON Cruise control main switch OFF	10 – 16 V
TC ↔ GND (C15–8 ↔ C15–13)	Y–B ↔ B–O	Ignition switch ON	10 – 16 V
OD ↔ GND (C15–9 ↔ C15–13)	Y–R ↔ B–O	During cruise control driving OD switch ON.	10 – 16 V
		During cruise control driving OD switch OFF (3rd driving)	Below 1 V
L ↔ GND (C15–10 ↔ C15–13)	Y–R ↔ B–O	During cruise control driving	9 – 15 V
		Except during cruise control driving	Below 1 V
MC ↔ GND (C15–11 ↔ C15–13)	B–R ↔ B–O	During cruise control driving COAST switch held ON	9 – 16 V
		During cruise control driving ACC switch held ON	Below 1 V
MO ↔ GND (C15–12 ↔ C15–13)	LG ↔ B–O	During cruise control driving ACC switch held ON	9 – 15 V
		During cruise control driving COAST switch held ON	Below 1 V
GND ↔ Body Ground (C15–13 ↔ Body Ground)	B–O ↔ Body Ground	Constant	Below 1 V
B ↔ GND (C15–14 ↔ C15–13)	L–R ↔ B–O	Ignition switch ON	10 – 16 V
BATT ↔ GND (C15–15 ↔ C15–13)	R ↔ B–O	Constant	10 – 16 V
STP– ↔ GND (C15–16 ↔ C15–13)	G–W ↔ B–O	Depress brake pedal	10 – 16 V
		Release brake pedal	Below 1 V

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Symbols (Terminals No.)	Wiring Color	Condition	STD Voltage (V)
CCS ↔ GND (C15–18 ↔ C15–13)	G–Y ↔ B–O	Ignition switch ON	10 – 16 V
		Ignition switch ON CANCEL switch held ON	5.1 – 8.3 V
		Ignition switch ON SET/COAST switch held ON	2.4 – 4.0 V
		Ignition switch ON RES/ACC switch held ON	0.8 – 1.4 V
CMS ↔ GND (C15–4 ↔ C15–13)	G–B ↔ B–O	Ignition switch ON Main switch ON	Below 1 V
		Ignition switch ON Main switch OFF	10 – 16 V
SPD ↔ GND (C15–20 ↔ C15–13)	G ↔ B–O	Ignition switch ON	4.7 – 5.2 V
		During driving	3 – 7 V
IDL ↔ GND (C15–23 ↔ C15–13)	Y–L ↔ B–O	Ignition switch ON Throttle valve fully closed	Below 1 V
		Ignition switch ON Throttle valve fully opened	10 – 16 V
ECT ↔ GND (C15–22 ↔ C15–13)	R–Y ↔ B–O	During cruise control driving Gear position O/D	Below 1 V
		During cruise control driving Gear position 3rd	10 – 16 V
VR1 ↔ GND (C15–24 ↔ C15–13)	R–W ↔ B–O	Ignition switch ON	4.7 – 5.2 V
VR2 ↔ VR3 (C15–25 ↔ C15–26)	R ↔ L	During cruise control driving	1.0 – 4.7 V
		Ignition switch ON Actuator control plate fully opened	4.2 – 4.7 V
		Ignition switch ON Actuator control plate fully closed	1.0 – 1.2 V
VR3 ↔ GND (C15–26 ↔ C15–13)	L ↔ B–O	Constant	Below 1 V
L– ↔ GND (C15–10 ↔ C15–13)	Y–R ↔ B–O	Constant	Below 1 V

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DI34Z–02

PROBLEM SYMPTOMS TABLE

Symptom	Suspect Area	See page
SET not occurring or CANCEL occurring. (DTC is Normal)	1. Main Switch Circuit (Cruise control switch) 2. Vehicle Speed Sensor 3. Control Switch Circuit (Cruise control switch) 4. Stop Light Switch Circuit 5. Park/Neutral Position Switch Circuit 6. Actuator Motor Circuit 7. Cruise Control Cable 8. Cruise Control ECU	 DI–454 DI–428 DI–431 DI–434 DI–443 DI–420 DI–458 IN–26
SET not occurring or CANCEL occurring. (DTC is not output)	1. ECU Power Source Circuit 2. Cruise Control ECU	DI–449 IN–26
Actual vehicle speed deviates above or below the set speed.	1. Cruise Control Cable 2. Vehicle Speed Signal Abnormal 3. Electronically Controlled Transmission Communication Circuit 4. Actuator Motor Circuit 5. Idle Signal Circuit (Main throttle position sensor) 6. Cruise Control ECU	DI–458 DI–428 DI–440 DI–420 DI–437 IN–26
Gear shifting frequent between 3rd and O/D when driving on uphill road. (Hurting)	1. Electronically Controlled Transmission Communication Circuit 2. Cruise Control ECU	DI–440 IN–26
Cruise control not cancelled, even when brake pedal is de-pressed.	1. Cruise Control Cable 2. Stop Light Switch Circuit 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–458 DI–434 DI–420 IN–26
Cruise control not cancelled, even when transmission is shifted to ”N” postion.	1. Cruise Control Cable 2. Park/Neutral Position Switch Circuit 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–458 DI–443 DI–420 IN–26
Control switch does not operate. (SET/COAST, ACC/RES, CANCEL not possible)	1. Cruise Control Cable 2. Control Switch Circuit 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–458 DI–431 DI–420 IN–26
SET possible at 40 km/h (25 mph) or less, or CANCEL does not operate at 40 km/h (25 mph) or less.	1. Cruise Control Cable 2. Vehicle Speed Signal Abnormal 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–458 DI–428 DI–420 IN–26
Poor response in ACCEL and RESUME modes.	1. Cruise Control Cable 2. Electronically Controlled Transmission Communication Circuit 3. Actuator Motor Circuit 4. Cruise Control ECU	DI–458 DI–440 DI–420 IN–26
O/D does not resume, even though the road is not uphill.	1. Electronically Controlled Transmission Communication Circuit 2. Cruise Control ECU	 DI–440 IN–26
DTC memory is erased.	1. Back–up Power Source Circuit 2. Cruise Control ECU	DI–452 IN–26
DTC is not output, or is output when it should not be.	1. Tc Circuit 2. Cruise Control ECU	DI–456 IN–26
Cruise MAIN indicator light remains ON or fails to light up.	1. Cruise MAIN Indicator Light Switch Circuit	–

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DI350–02

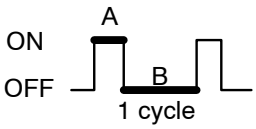
CIRCUIT INSPECTION

DTC	11	Actuator Motor Circuit

CIRCUIT DESCRIPTION

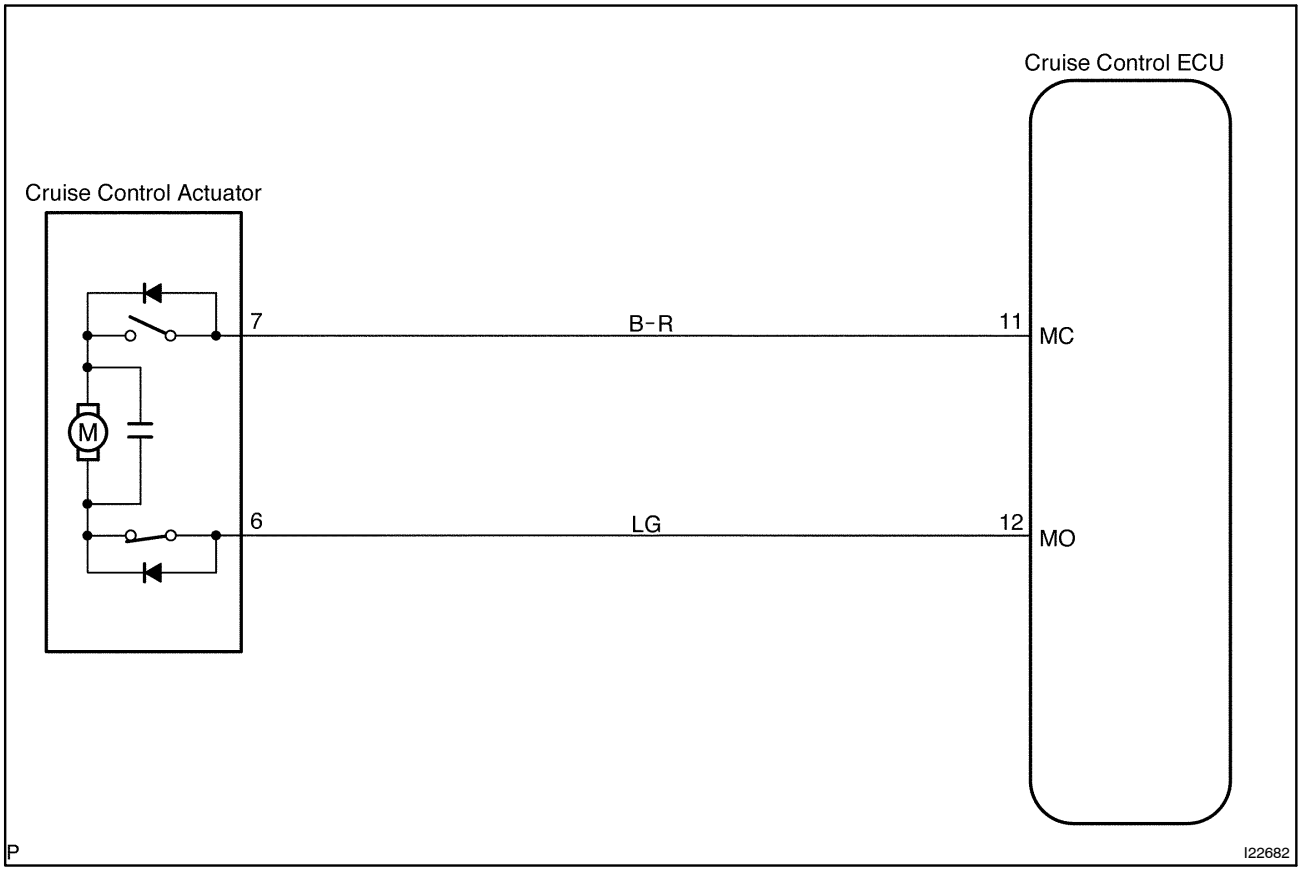
The actuator motor is operated by signals from the ECU. Acceleration and deceleration signals are transmitted by changes in the Duty Ratio (See note below).
Duty Ratio:
The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then.

$$\text{Duty Ratio} = \frac{A}{A + B} \times 100\ (\%)$$



DTC No.	Detection Item	Trouble Area
11	• Short in actuator motor circuit.	• Actuator motor • Wire harness • Cruise control ECU

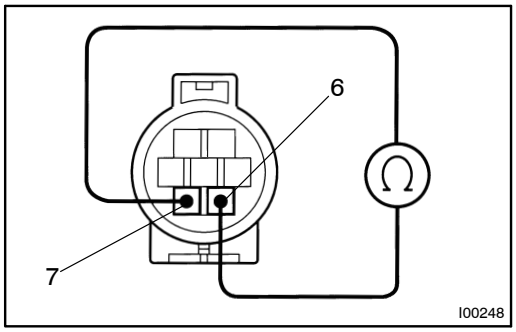
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	Check resistance between terminals MO and MC of actuator motor.



PREPARATION:

(a) Turn ignition switch OFF.

(b) Disconnect the actuator connector.

CHECK:

Measure resistance between terminals 6 and 7.

HINT:

If control plate position is fully opened or fully closed, resistance can not be measured.

OK:

Resistance: more than 4.2 Ω

NG → **Replace cruise control actuator.**

OK

2	Check for open and short in harness and connectors between cruise control ECU and actuator motor (See page IN–16).

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–26).

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DI351–02

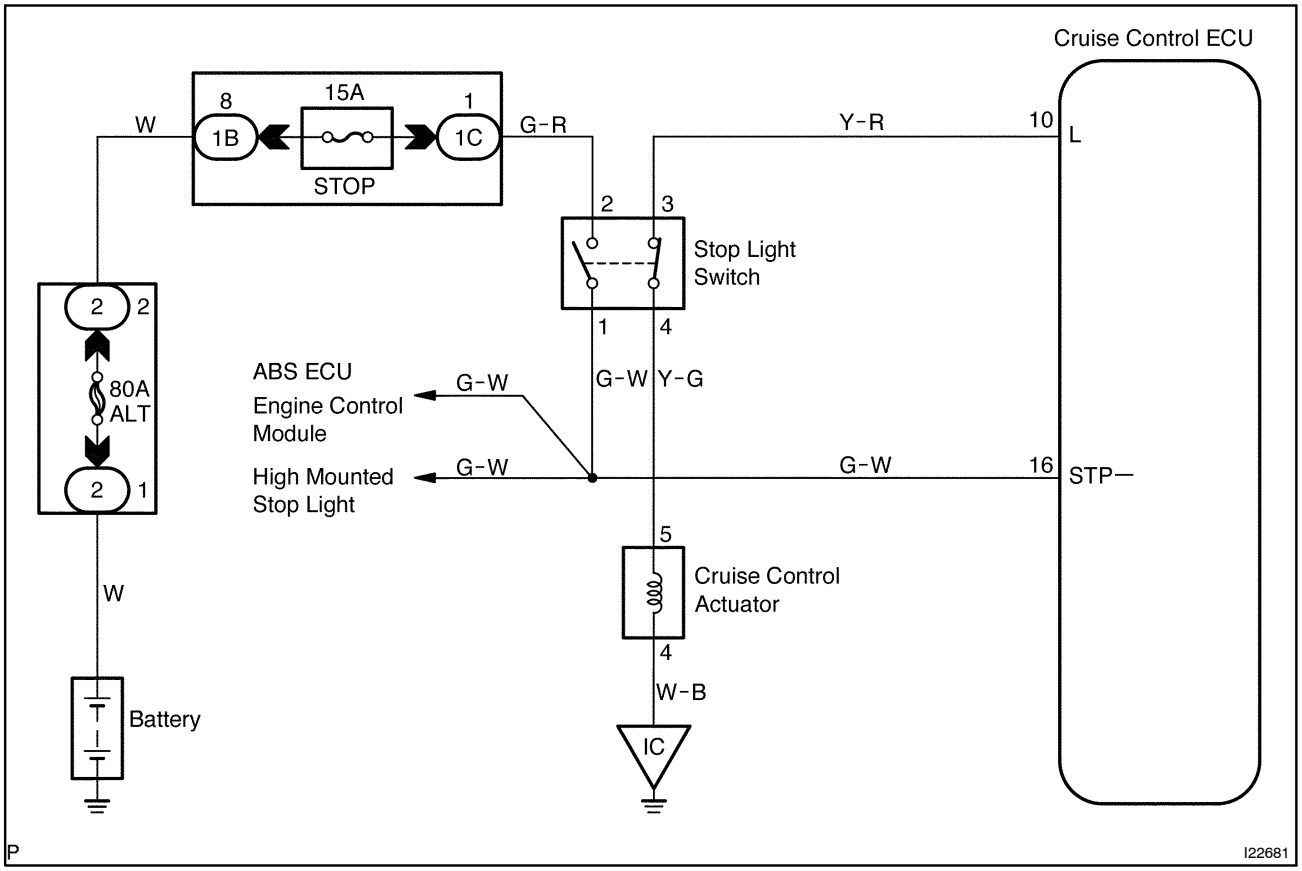
DTC	12	Actuator Magnetic Clutch Circuit

CIRCUIT DESCRIPTION

This circuit turns on the magnetic clutch inside the actuator during cruise control operation according to the signal from the ECU. If a malfunction occurs in the actuator or speed sensor, etc. during cruise control operation, the rotor shaft between the motor and control plate is released.
When the brake pedal is depressed, the stop light switch turns ON, supplying electrical power to the stop light. Power supply to the magnetic clutch is mechanically cut and the magnetic clutch is turned OFF.
When driving downhill, if the vehicle speed exceeds the set speed by 15 km/h (9 mph), the ECU turns the safety magnet clutch OFF. If the vehicle speed later drops to within 10 km/h (6 mph) above the set speed, then cruise control at the set speed is resumed.

DTC No.	Detection Item	Trouble Area
12	• Short in actuator magnetic clutch circuit. • Open (0.8 sec.) in actuator magnetic clutch circuit.	• Actuator • Stop light switch • Wire harness • Cruise control ECU

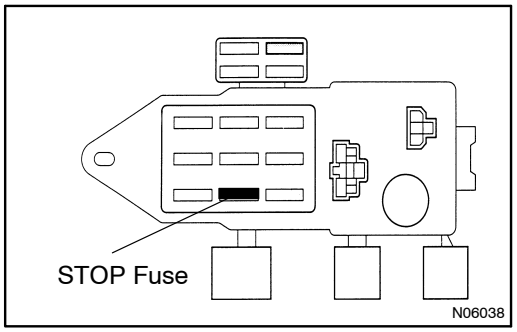
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	Check STOP fuse.



PREPARATION:

(a) Turn ignition switch OFF.

(b) Remove the STOP fuse from instrument panel junction block.

CHECK:

Check fuse continuity.

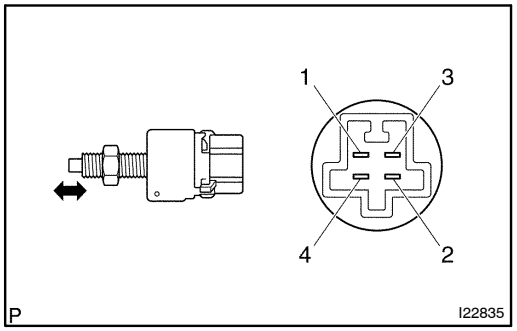
OK:

Continuity

NG → **Replace STOP fuse.**

OK

2	Check stop light switch.



PREPARATION:

Disconnect the stop light switch connector.

CHECK:

Check continuity between terminals.

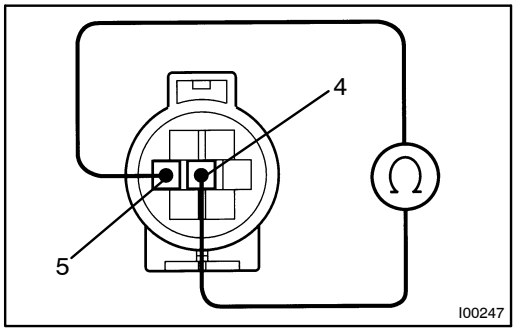
Switch position	Continuity
Switch pin free (Brake pedal depressed)	2 – 4
Switch pin pushed in (Brake pedal released)	1 – 3

NG → **Replace stop light switch.**

OK

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3	**Check resistance between terminal L and GND of actuator magnetic clutch.**



PREPARATION:

(a) Turn ignition switch OFF.

(b) Disconnect the actuator connector.

CHECK:

Measure resistance between terminals 4 and 5.

OK:

Resistance: 34.65 ~ 42.35 Ω

NG → **Replace cruise control actuator.**

OK

4	**Check for open and short in harness and connectors between cruise control ECU and actuator magnetic clutch, actuator magnetic clutch and body ground (See page IN–16).**

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–26).

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DI352-02

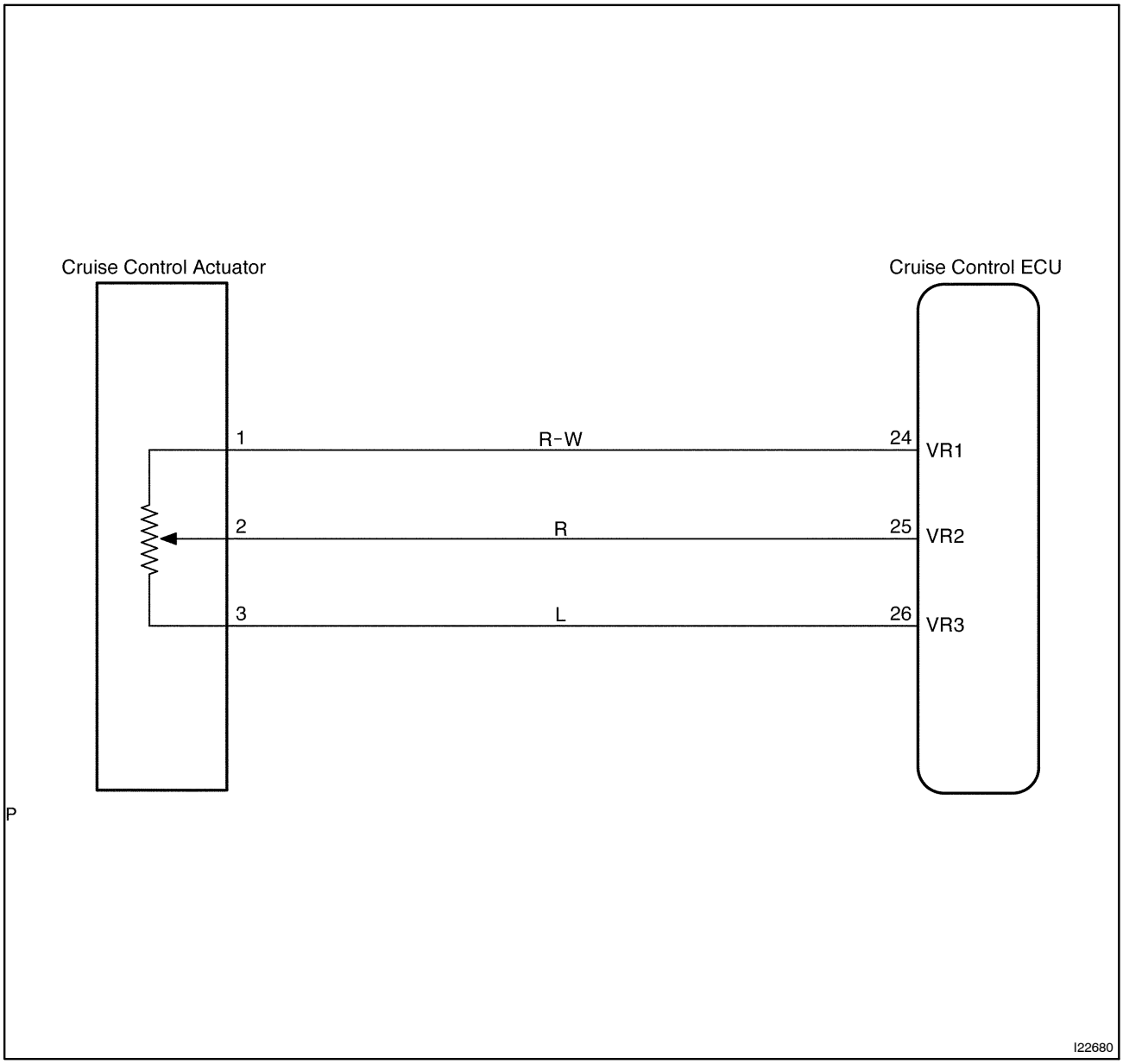
DTC	13	Actuator Position Sensor Circuit

CIRCUIT DESCRIPTION

The circuit detects the rotation position of the actuator control plate and sends a signal to the ECU.

DTC No..	Detection Item	Trouble Area
13	• Position sensor detects abnormal voltage.	• Actuator • Wire harness • Cruise control ECU

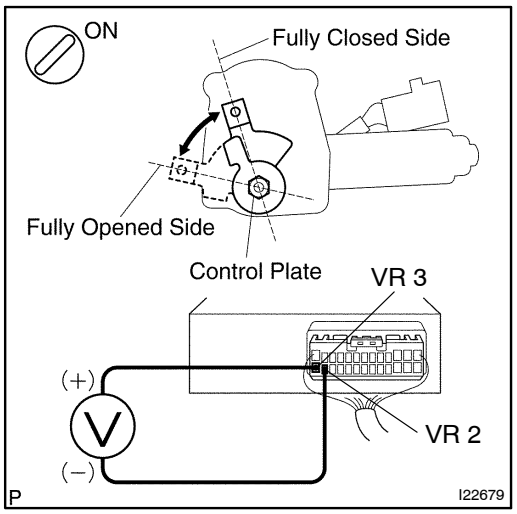
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	Check resistance between terminals VR2 and VR3 of cruise control ECU connector.



PREPARATION:

(a) Remove the ECU with connectors still connected.

(b) Turn ignition switch OFF.

CHECK:

Measure voltage between terminals VR2 and VR3 of ECU connector while turning control plate slowly by hand from the deceleration side to the acceleration side.

OK:

Voltage:

Fully closed: Approx. 1.3 V

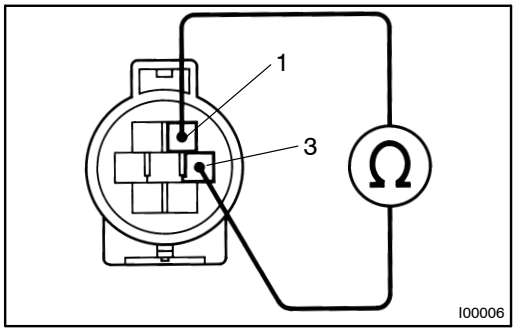
Fully opened: Approx. 4.0 V

As the control plate is turned, the voltage should increase gradually without interruption.

NG	Proceed to next circuit inspection shown in problem symptoms table (See page DI–419).

OK

2	Check resistance between terminals VR1 and VR3 of actuator position sensor.



PREPARATION:

(a) Turn ignition switch OFF.

(b) Disconnect the actuator connector.

CHECK:

Measure resistance between actuator terminals 1 and 3 of actuator connector.

OK:

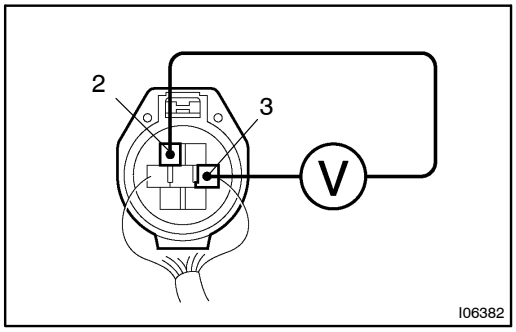
Resistance: Approx. 2.2 kΩ (25 °C)

NG	Replace cruise control actuator.

OK

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3	Check voltage between terminals VR2 and VR3 of actuator position sensor.



PREPARATION:

(a) Turn ignition switch ON.

(b) Connect the actuator connector.

CHECK:

Measure voltage between terminals 2 and 3 of actuator connector while turning control plate slowly by hand from the deceleration side to the acceleration side.

OK:

Voltage: 1.3 – 4.0 V

HINT:

As the control plate is turned, the voltage should increase gradually without interruption.

NG → **Replace cruise control actuator.**

OK ↓

4	Check for open and short in harness and connector between cruise control ECU and actuator position sensor (See page IN–16).

NG → **Repair or replace harness or connector.**

OK ↓

Check and replace cruise control ECU (See page IN–26).

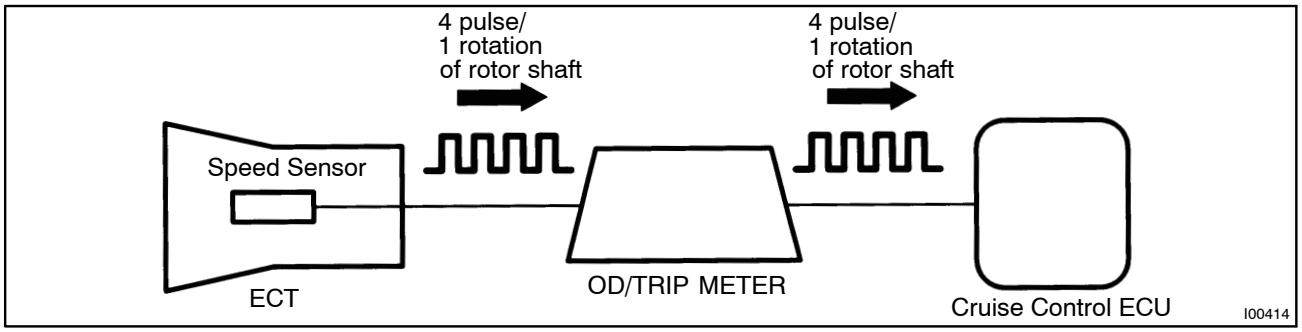
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DI353–02

DTC	21	Vehicle Speed Sensor Circuit

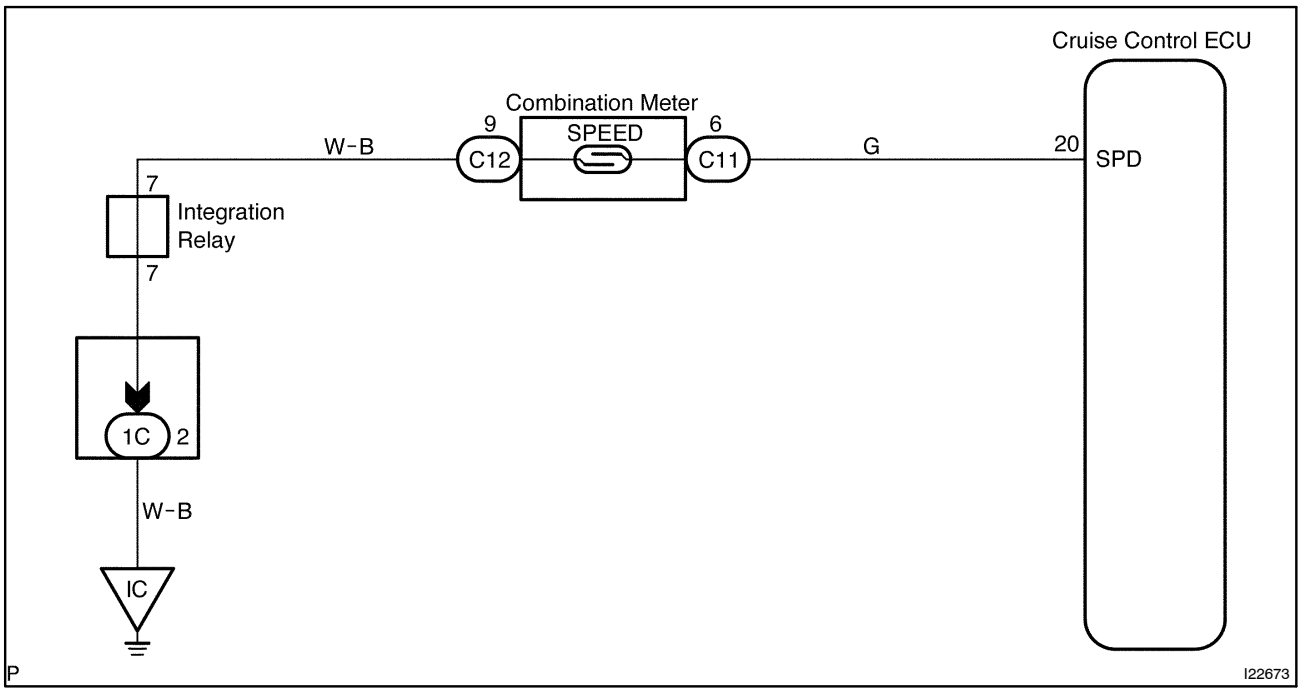
CIRCUIT DESCRIPTION

The vehicle speed siggnal is sent to cruise control ECU from the vehicle speed sensor.
The rotor shaft is driven by the gear of the transmission.
For each rotation of the shaft, the vehicle speed sensor sends a 4–pulse signal through the combination meter to the cruise control ECU (See the following).
This signal is converted inside the combination meter and sent as a 4–pulse signal to the cruise control ECU.
The ECU calculates the vehicle speed from this pulse frequency.



DTC No.	Detection Item	Trouble Area
21	• Speed signal is not input to the cruise control ECU while cruise control is set.	• Vehicle speed sensor • Wire harness • Cruise control ECU

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Input signal check.**

Input Signal	Indicator Light Blinking Pattern
Drive at about 40 km/h (25 mph) or below	Light: ON — OFF
Drive at about 40 km/h (25 mph) or higher	Light: ON / OFF (blinking)

CHECK:

(a) See input signal check on page DI–410.

(b) Check indicator light operation when driving at vehicle speed above 40 km/h (25 mph), and at vehicle speed below 40 km/h (25 mph).

OK:

Vehicle speed above 40 km/h (25 mph):
Indicator light blinks

Vehicle speed below 40 km/h (25 mph):
Indicator light stays on

OK → **Check and replace cruise control ECU (See page IN–26).**

NG

2	**Check speedometer circuit (See Combination meter troubleshooting on page BE–36).**

NG → **Repair or replace harness, connector or combination meter assembly.**

OK

3	**Check harness and connector between cruise control ECU and combination meter, combination meter and vehicle speed sensor (See page IN–16).**

NG → **Repair or replace harness or connector.**

OK

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4	Check vehicle speed sensor (See page BE–38).

NG → Replace vehicle speed sensor.

OK

Check and replace cruise control ECU (See page IN–26).

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DI354–02

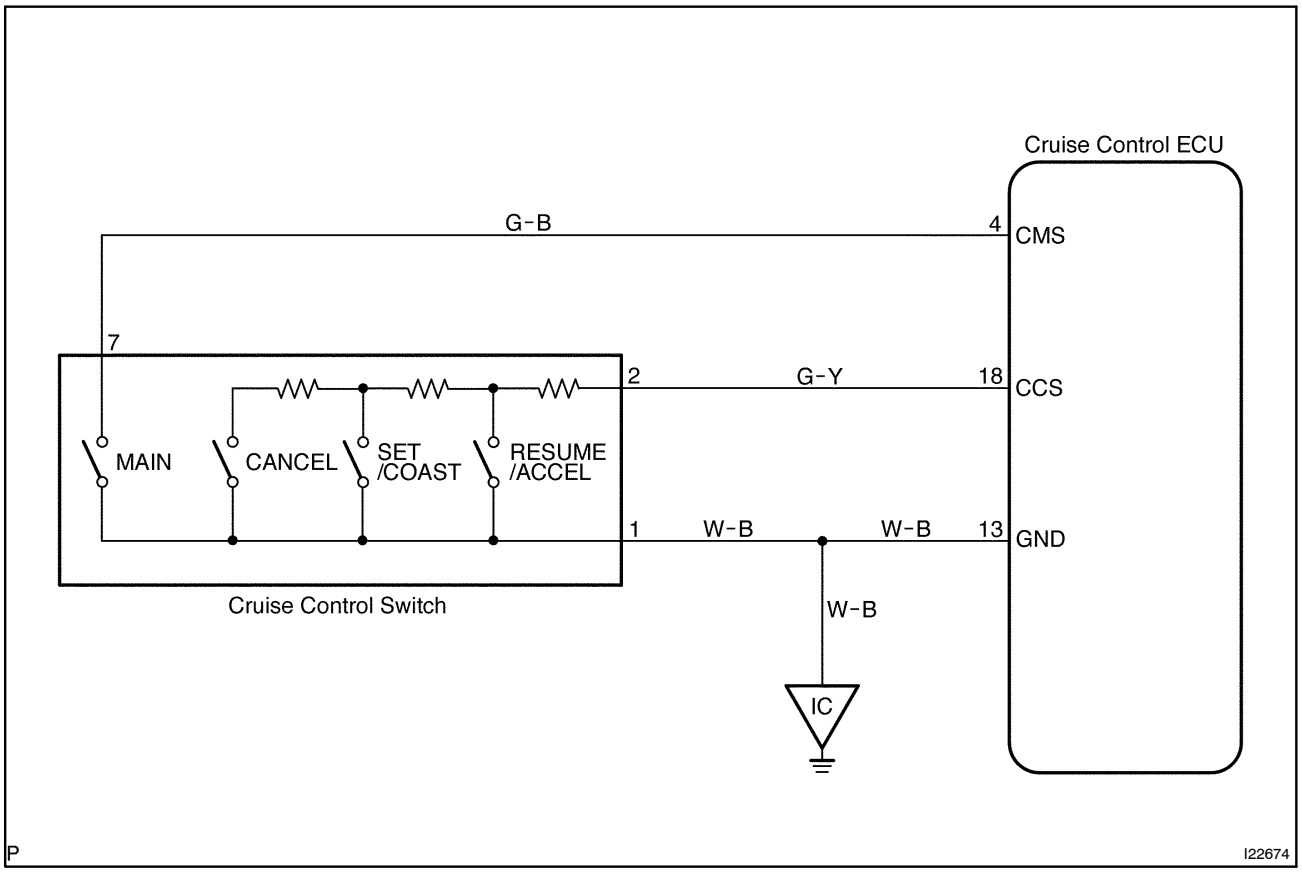
DTC	32, 34	Control Switch Circuit

CIRCUIT DESCRIPTION

This circuit sends the SET/COAST, RESUME/ACCEL and CANCEL signals (each voltage) to the ECU.

DTC No.	Detection Item	Trouble Area
32	• Short in control switch circuit.	• Cruise control switch • Wire harness • Cruise control ECU
34	• Voltage abnormality in control switch circuit	

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	Input signal check.

Input Signal	Indicator Light Blinking Pattern
SET/COAST switch	2 Pulses: ON / OFF
RESUME/ACCEL switch	3 Pulses: ON / OFF
CANCEL switch	SW OFF: ON / OFF; SW ON

PREPARATION:

See input signal check on page DI–410.

CHECK:

Check the indicator light operation when each of the SET/COAST, RESUME/ACCEL and CANCEL is turned ON.

OK:

SET/COAST, RESUME/ACCEL switch

The signals shown in the table on the left should be output when each switch is ON. The signal should disappear when the switch is turned OFF.

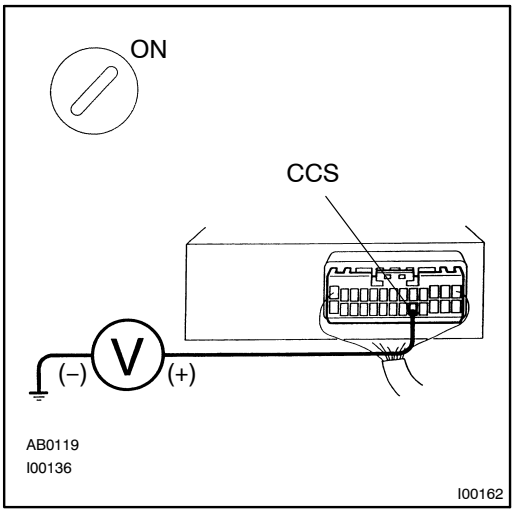
CANCEL switch

The indicator light goes off when the cancel switch is turned ON.

OK	Wait and see.

NG

2	Check voltage between terminal CCS of cruise control ECU connector and body ground.



PREPARATION:

(a) Remove the ECU with connector still connected.

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminal CCS of ECU connector and body ground, when each of the SET/COAST, RESUME/ACCEL and CANCEL is turned ON.

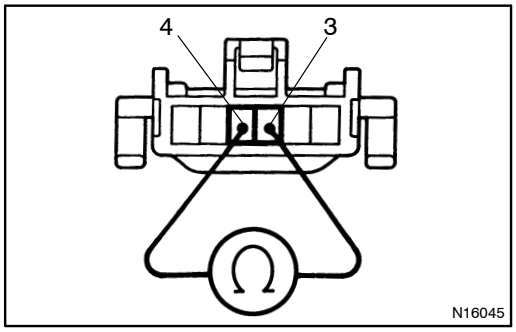
Switch position	Voltage (V)
Neutral	10 – 16
RES/ACC	0.8 – 14 V
SET/COAST	2.4 – 4.0 V
CANCEL	5.1 – 8.3 V

NG	Proceed to next circuit inspection shown in problem symptom table (See page DI–419).

OK

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3	**Check control switch.**



PREPARATION:

(a) Remove steering wheel center pad.

(b) Disconnect the control switch connector.

CHECK:

Measure resistance between terminals 3 and 4 of control switch connector when control switch is operated.

Switch position	Resistance (Ω)
Neutral	∞ (No continuity)
RES/ACC	50 – 80
SET/COAST	180 – 220
CANCEL	400 – 440

NG → **Replace control switch.**

OK ↓

4	**Check harness and connector between cruise control ECU and cruise control switch, cruise control switch and body ground (See page IN–16).**

NG → **Repair or replace harness or connector.**

OK ↓

5	**Input signal check (See step 1).**

OK → **Wait and see.**

NG ↓

Check and replace cruise control ECU (See page IN–26).

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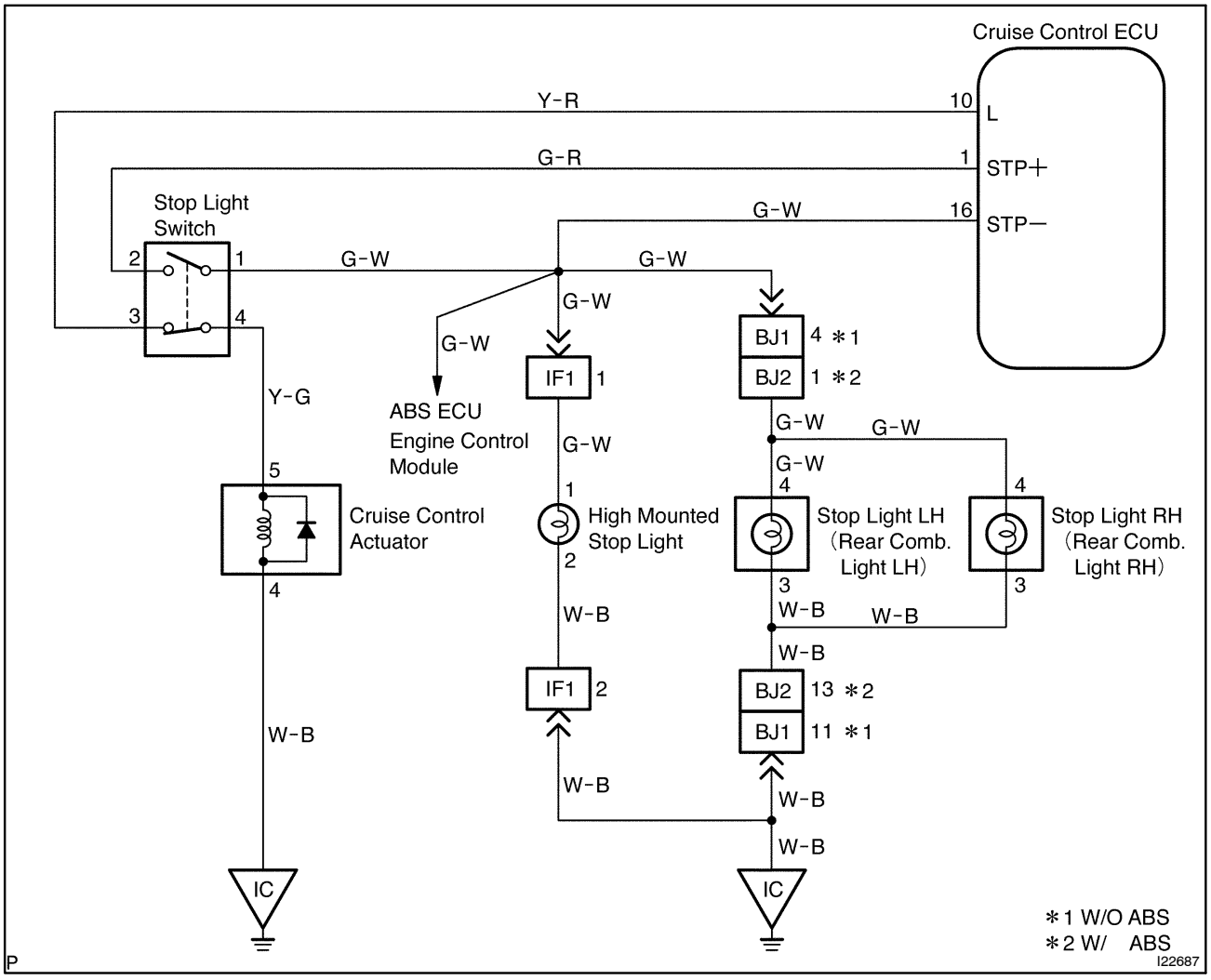
DI355–02

Stop Light Switch Circuit

CIRCUIT DESCRIPTION

When the brake pedal is depressed, the stop light switch sends a signal to the ECU. When the ECU receives this signal, it cancels the cruise control.
A fail–safe function is provided so that the cancel functions normally, even if there is a malfunction in the stop light signal circuit.
The cancel conditions are: Battery positive voltage at terminal STP–
When the brake is ON, battery positive voltage is normally applied through the STOP fuse and stop light switch to terminal STP– of the ECU, and the ECU turns the cruise control OFF.
If the harness connected to terminal STP– has an open circuit, terminal STP– will have battery positive voltage and the cruise control will be turned OFF.
Also, when the brake is ON, the magnetic clutch circuit is cut mechanically by the stop light switch, turning the cruise control OFF (See page DI–422 for operation of the magnetic clutch).

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check operation of stop light.**

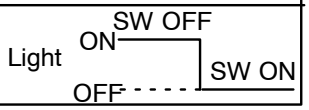
CHECK:

Check that stop light comes on when brake pedal is depressed, and turns off when brake pedal is released.

NG → **Check stop light system (See page BE–30).**

OK

2	**Input signal check.**

Input Signal	Indicator Light Blinking Pattern
Stop Light switch ON	

CHECK:

(a) See input signal check on DI–410.

(b) Check the indicator light when the brake pedal is depressed.

OK:

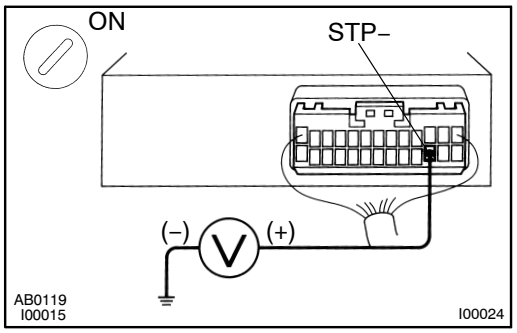
The indicator light goes off when the brake pedal is depressed.

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–419).**

NG

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3	Check voltage between terminal STP– of cruise control ECU connector and body ground.



PREPARATION:

(a) Remove the ECU with connectors still connected.

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminal STP– of cruise control ECU connector and body ground, when the brake pedal is depressed and released.

OK:

Depressed	10 – 16 V
Released	Below 1 V

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–419).**

NG

4	Check for open in harness and connectors between terminal STP– of cruise control ECU and stop light switch (See page IN–16).

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–26).

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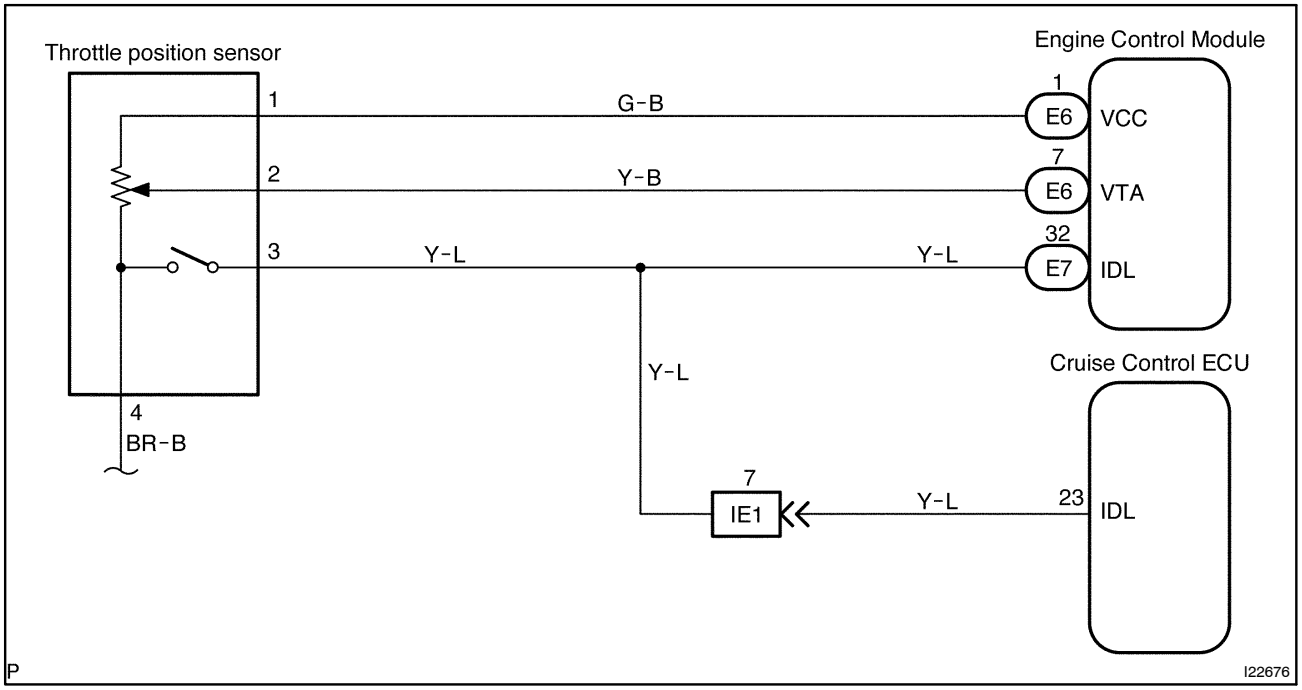
DI356-02

Idle Switch Circuit

CIRCUIT DESCRIPTION

When the idle switch is turned ON, a signal is sent to the ECU. The ECU uses this signal to correct the discrepancy between the throttle valve position and the actuator position sensor value to enable accurate cruise control at the set speed. If the idle switch is malfunctioning, problem symptoms also occur in the engine, so also inspect the engine.

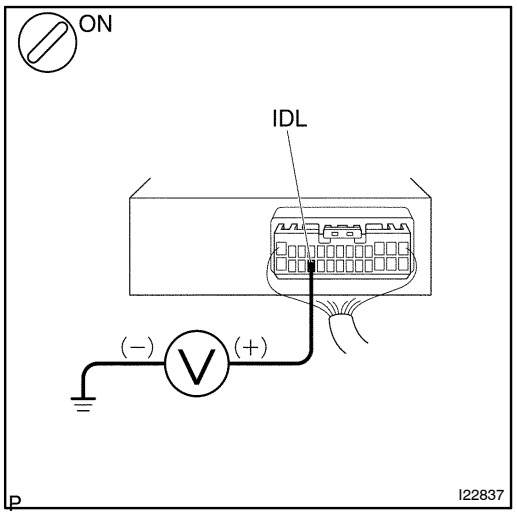
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check voltage between terminal IDL of cruise control ECU connector and body ground.**



PREPARATION:

(a) Remove the ECU with connector still connected.
(b) Disconnect the ECM and ABS ECU connectors.
(c) Turn ignition switch ON.

CHECK:

Measure voltage between terminal IDL of ECU connector and body ground when the throttle valve is fully closed and fully opened.

OK:

Throttle valve position	Voltage
Fully opened	10 – 16 V
Fully closed	Below 1 V

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–419).**

NG

2	**Check harness and connector between ECM and throttle position sensor (See page IN–16).**

NG → **Repair or replace harness or connector.**

OK

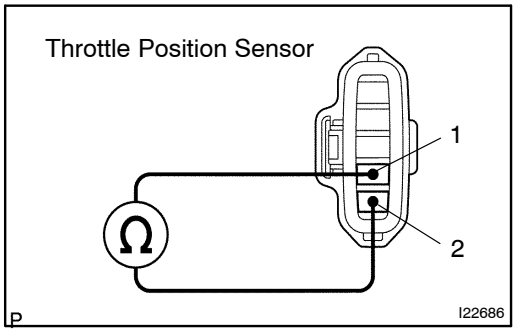
3	**Check throttle position sensor circuit.** **(3RZ–FE: See page MF–25)** **(5VZ–FE: See page SF–31)**

NG → **Replace throttle position sensor.**

OK

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4	Check throttle position sensor.



PREPARATION:

Disconnect the throttle position sensor connector.

CHECK:

Measure resistance between terminals 1 and 2 of throttle position sensor connector when the throttle valve is fully closed and fully opened.

OK:

Throttle valve position	Resistance
Fully opened	1 MΩ or higher
Fully closed	Below 500 Ω

NG → Replace throttle position sensor.

OK

5	Check for open and short in harness and connector between cruise control ECU and throttle position sensor, throttle position sensor and body ground (See page IN–16).

NG → Repair or replace harness or connector.

OK

Check and replace cruise control ECU (See page IN–26).

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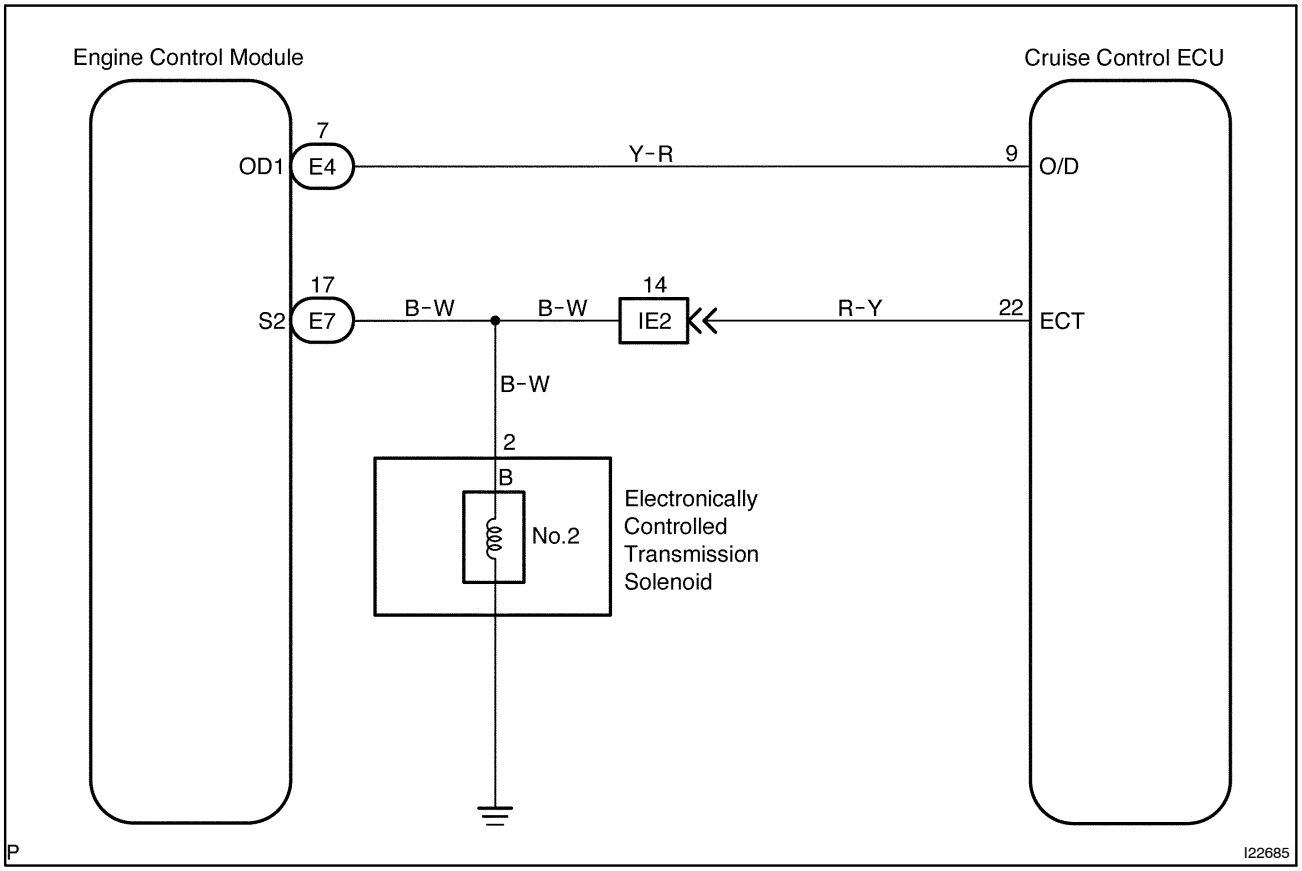
DI357–02

Electronically Controlled Transmission Communication Circuit

CIRCUIT DESCRIPTION

When driving uphill under cruise control, in order to reduce shifting due to ON–OFF overdrive operation and to provide smooth driving, when down shifting in the electronically controlled transmission occurs, a signal to prevent upshift until the end of the up hill slope is sent from the cruise control ECU to the electronically controlled transmission.
Terminal ECT of the cruise control ECU detects the shift change signal (output to electronically controlled transmission No. 2 solenoid) from the ECM.
If vehicle speed down, also when terminal ECT of the cruise control ECU receives down shifting signal, it sends a signal from terminal OD to ECM to cut overdrive until the end of the uphill slope, and the gear shifts are reduced and gear shift points in the electronically controlled transmission are changed.

WIRING DIAGRAM



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INSPECTION PROCEDURE

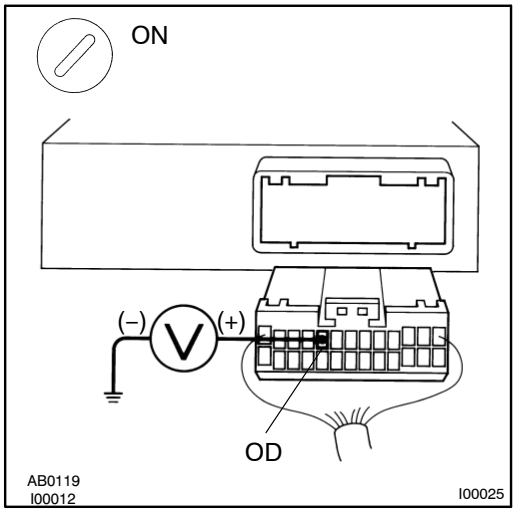
1	**Check operation of overdrive.**

PREPARATION:
Test drive after engine warms up.
CHECK:
Check that overdrive ON ↔ OFF occurs with operation of OD switch ON–OFF.

NG → **Check and repair electronically controlled transmission (See page DI–311).**

OK

2	**Check voltage between terminal OD of harness side connector of cruise control ECU and body ground.**



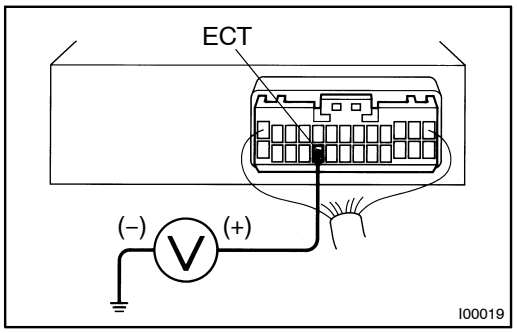
PREPARATION:
(a) Remove the ECU with connector still connected.
(b) Turn ignition switch ON.
(c) Disconnect the ECU connector.
CHECK:
Measure voltage between terminal OD of ECU connector on the harness side and body ground.
OK:
Voltage: 10 – 16 V

NG → **Go to step 5.**

OK

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3	Check voltage between terminal ECT of cruise control ECU connector and body ground (On test drive).



PREPARATION:

(a) Connect the ECU connector.

(b) Test drive after engine warms up.

CHECK:

Check voltage between terminal ECT of ECU connector and body ground when OD switch is ON and OFF.

OK:

OD switch position	Voltage
ON	Below 1 V
OFF	10 – 16 V

OK → Proceed to next circuit inspection shown in problem symptoms table (See page DI–419).

NG

4	Check harness and connector between terminal ECT of cruise control ECU and electronically controlled transmission solenoid (See page IN–16).

NG → Repair or replace harness or connector.

OK

Check and replace cruise control ECU.(See page IN–26)

5	Check harness and connector between terminal OD of cruise control ECU and terminal OD1 of ECM (See page IN–16).

NG → Repair or replace harness or connector.

OK

Check and replace cruise control ECU (See page IN–26).

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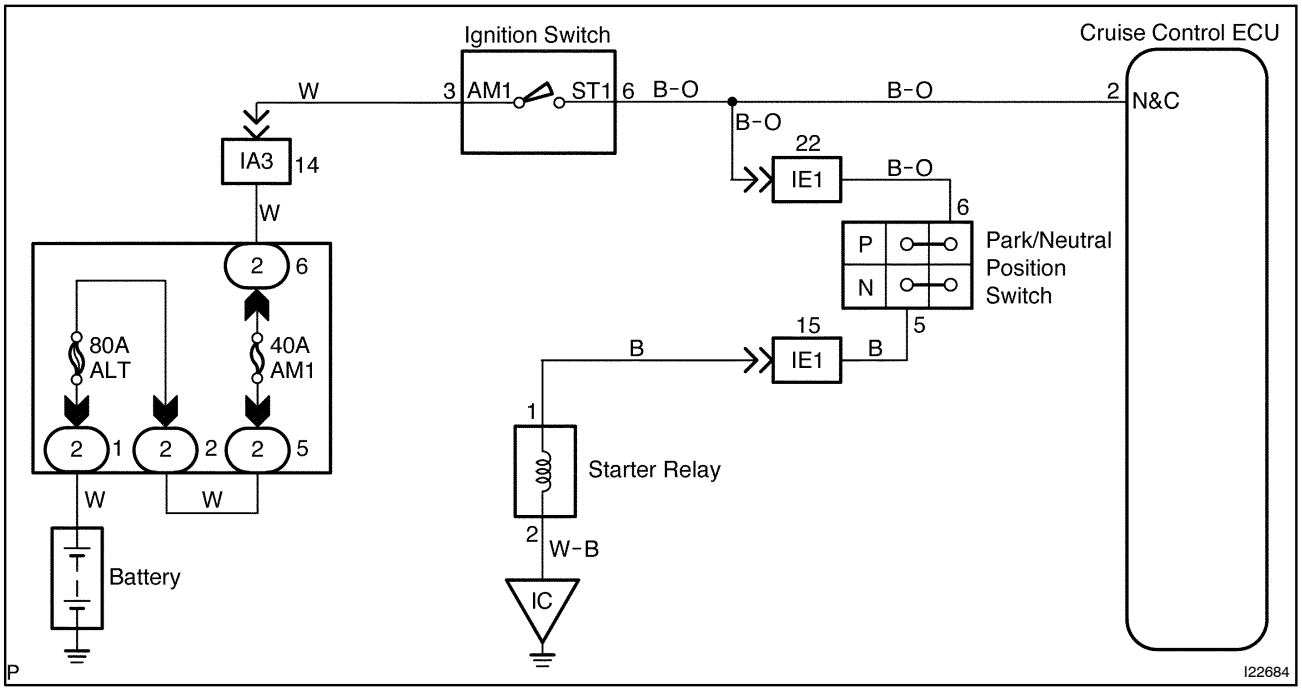
DI358-02

Park/Neutral Position Switch Circuit

CIRCUIT DESCRIPTION

When the shift position is in except D position, a signal is sent from the park/neutral position switch to the ECU. When this signal is input during cruise control driving, the ECU cancels the cruise control.

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	Check starter operation.

CHECK:

Check that the starter operates normally and that the engine starts.

NG → **Proceed to engine troubleshooting.**
(3RZ–FE: See page DI–1)
(5VZ–FE: See page DI–127)

OK

2	Input signal check.

Input Signal	Indicator Light Blinking Pattern
Turn PNP switch OFF (Shift to except D position)	Light: ON — SW ON; OFF — SW OFF

PREPARATION:

See input signal check on page DI–410.

CHECK:

Check the indicator light when shifting into except D position.

OK:

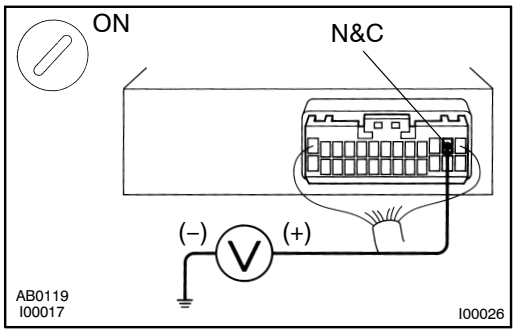
The indicator light goes off when shifting into except D position.

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–419).**

NG

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3	Check voltage between terminal N & C of cruise control ECU connector and body ground.



PREPARATION:

Turn ignition switch ON.

CHECK:

Measure each voltage between terminal N & C of ECU connector and body ground when shifting into D position and other positions.

OK:

Shift Position	Voltage
D position	10 – 16 V
Other positions	Below 1 V

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–419).**

NG

4	Check harness and connector between cruise control ECU and park/neutral position switch (See page IN–16).

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–26).

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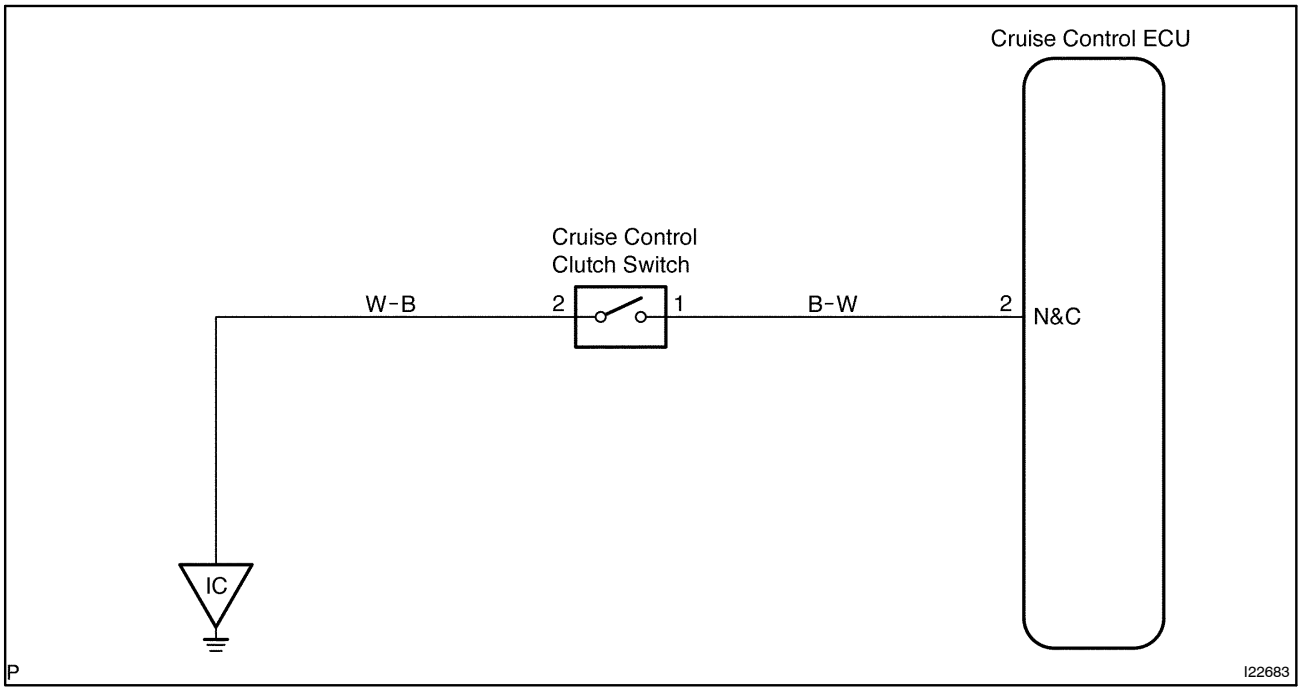
DI359–02

Clutch Switch Circuit

CIRCUIT DESCRIPTION

When the clutch pedal is depressed, the clutch switch sends a signal to the cruise control ECU. When the signal is input to the cruise control ECU during cruise control driving, the cruise control ECU cancels cruise control.

WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check starter operation.**

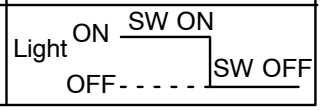
CHECK:

Check that the starter operates normally and that the engine starts.

NG → **Proceed to engine troubleshooting.**
(3RZ–FE: See page DI–1)
(5VZ–FE: See page DI–127)

OK

2	**Input signal check.**

Input Signal	Indicator Light Blinking Pattern
Clutch switch OFF (Depress clutch pedal)	

PREPARATION:

See input signal check on page DI–410.

CHECK:

Check the indicator light when clutch pedal is depressed.

OK:

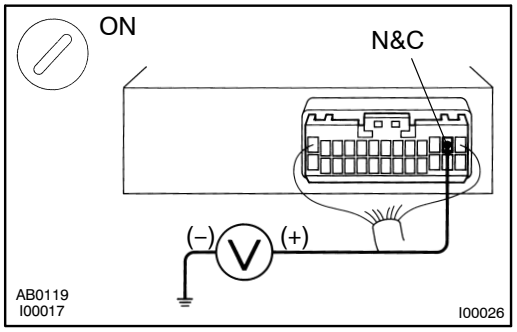
The indicator light goes off when depressing the clutch pedal .

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–419).**

NG

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3	Check voltage between terminal N & C of cruise control ECU and body ground.



PREPARATION:

Turn ignition switch ON.

CHECK:

Measure voltage between terminal N & C of cruise control ECU connector and body ground when clutch pedal is depressed and released.

OK:

Shift Position	Voltage
Clutch pedal released	Below 1 V
Clutch pedal depressed	10 – 16 V

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–419).**

NG

4	Check for open in harness and connector between ECU and GAUGE fuse (See page IN–16).

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–26).

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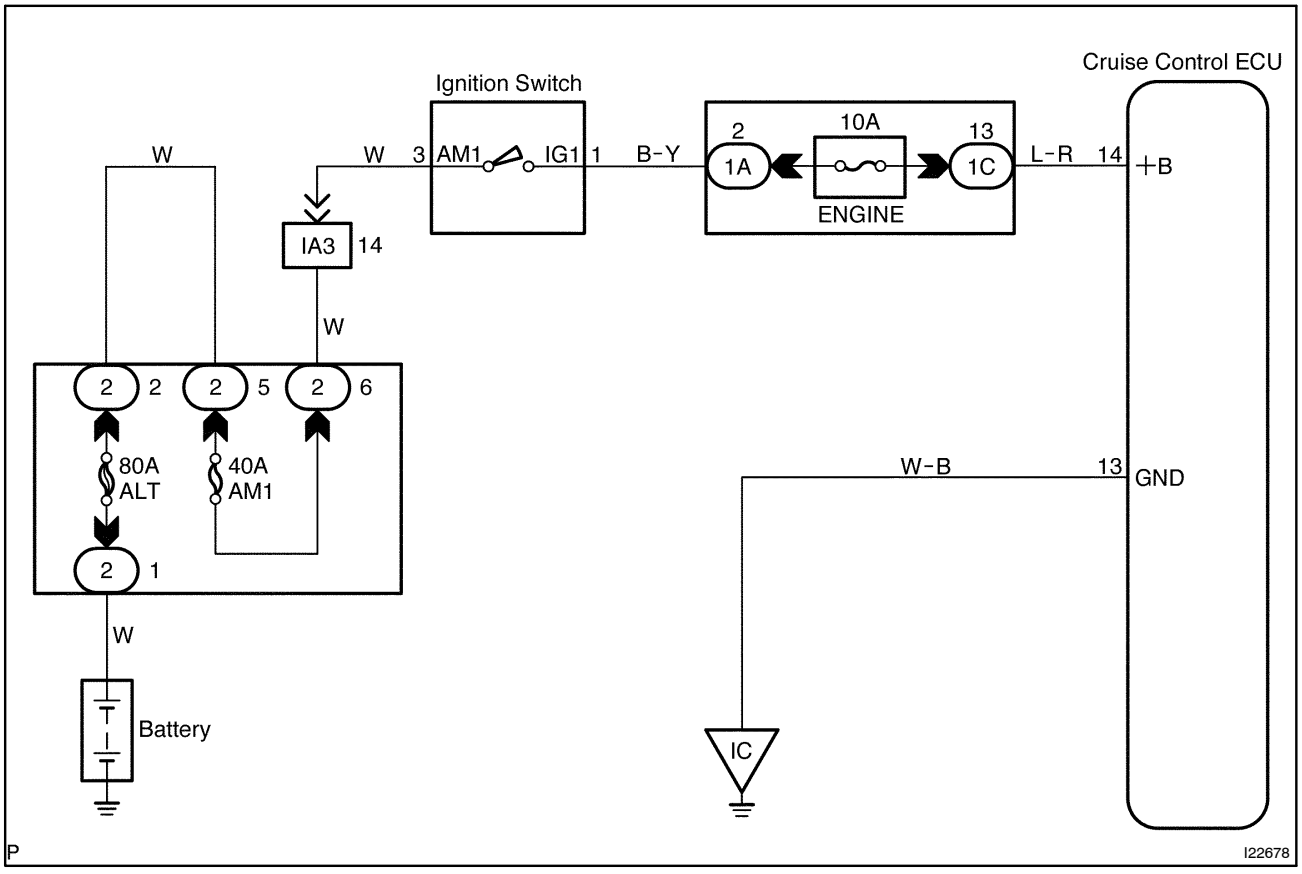
DI35A–02

ECU Power Source Circuit

CIRCUIT DESCRIPTION

The ECU power source supplies power to the actuator and sensors, etc. when terminal GND and the cruise control ECU case are grounded.

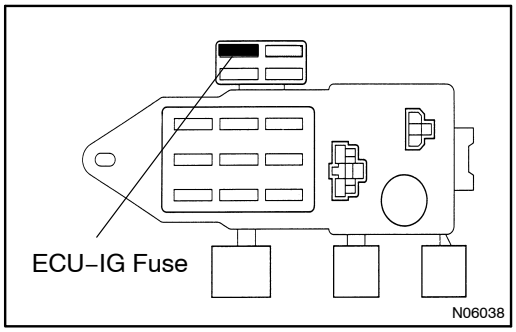
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	Check ECU–IG fuse.

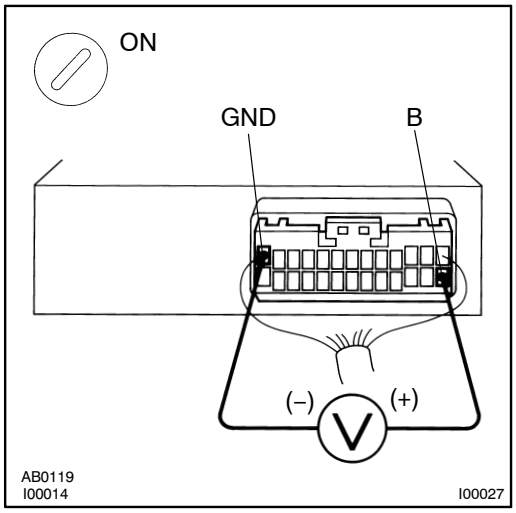


PREPARATION:
Remove the ECU–IG fuse from instrument panel junction block.
CHECK:
Check continuity of ECU–IG fuse.
OK:
Continuity

NG → **Check for short in all the harness and components connected to ECU–IG fuse.**

OK

2	Check voltage between terminals B and GND of cruise control ECU connector.



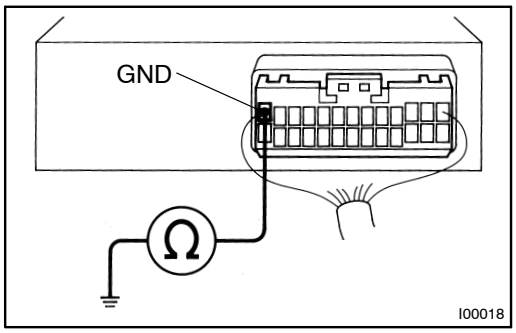
PREPARATION:
(a) Remove the ECU with connector still connected.
(b) Turn ignition switch ON.
CHECK:
Measure voltage between terminals B and GND of ECU connector.
OK:
Voltage: 10 – 16 V

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–419).**

NG

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3	**Check resistance between terminal GND of cruise control ECU connector and body ground (See page IN–16).**



CHECK:

Measure resistance between terminal GND of ECU connector and body ground.

OK:

Resistance: Below 1 Ω

NG → **Repair or replace harness or connector.**

OK

Check and repair harness and connector between cruise control ECU and battery (See page IN–26).

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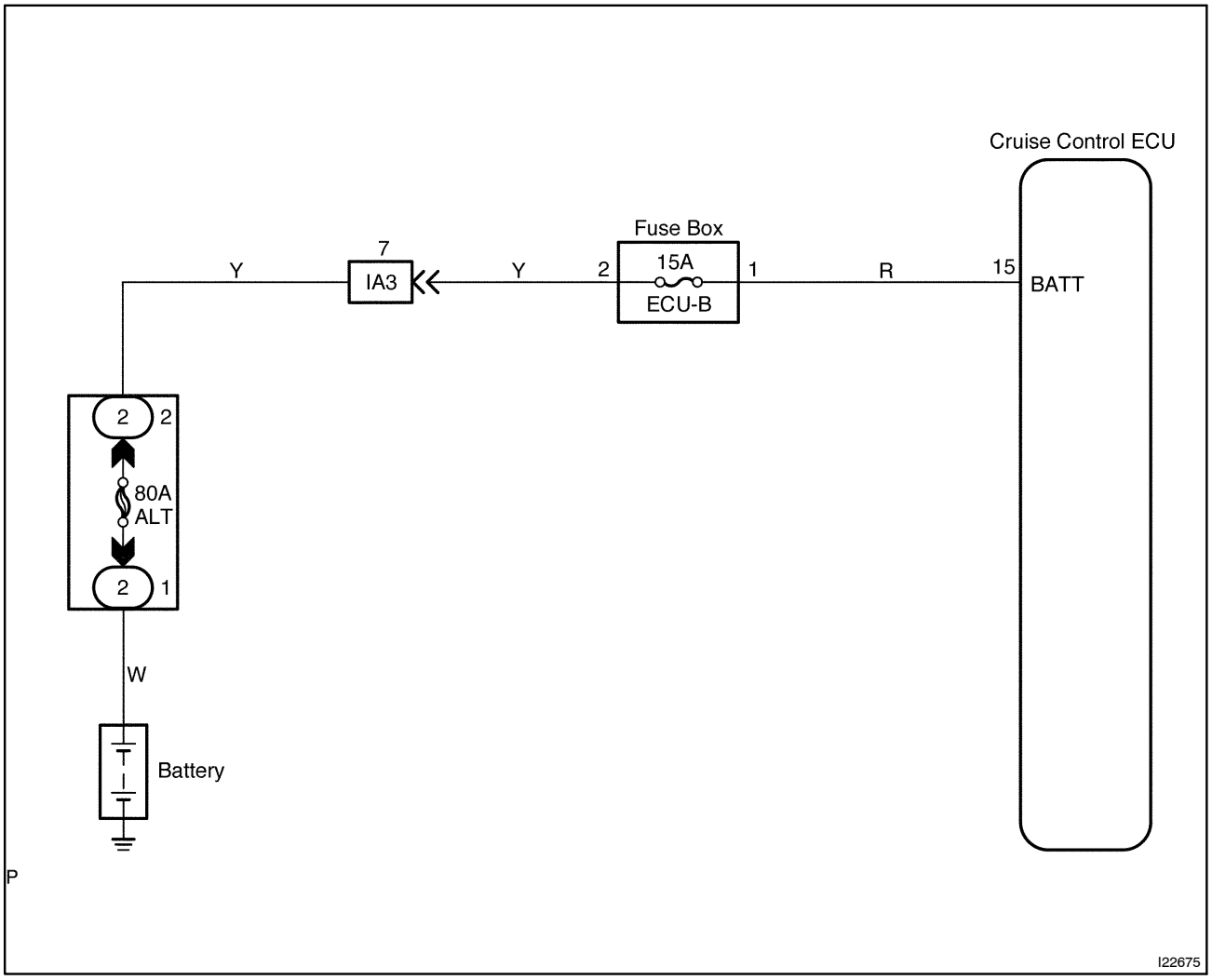
DI35B–02

Back–up Power Source Circuit

CIRCUIT DESCRIPTION

The ECU back–up power source provides power even when the ignition is OFF, and it is used for DTC memory, etc..

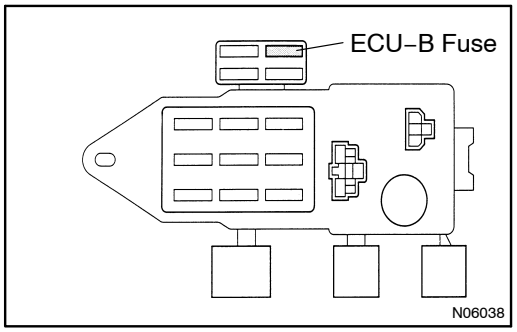
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check ECU–B fuse.**

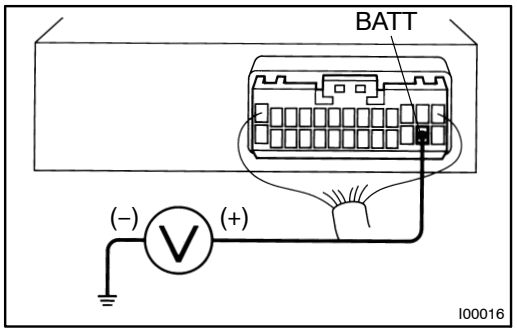


PREPARATION:
Remove the ECU–B fuse from relay block No.1.
CHECK:
Check continuity of ECU–B fuse.
OK:
Continuity

NG → **Check for short in all the harness and components connected to the ECU–B fuse.**

OK

2	**Check voltage between terminal BATT of cruise control ECU connector and body ground (See page IN–16).**



PREPARATION:
Remove the ECU with connector still connected.
CHECK:
Measure voltage between terminal BATT of ECU connector and body ground.
OK:
Voltage: 10 – 16 V

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–419).**

NG

Check and repair harness and connector between battery and cruise control ECU (See page IN–16).

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DI35C–02

Main Switch Circuit

CIRCUIT DESCRIPTION

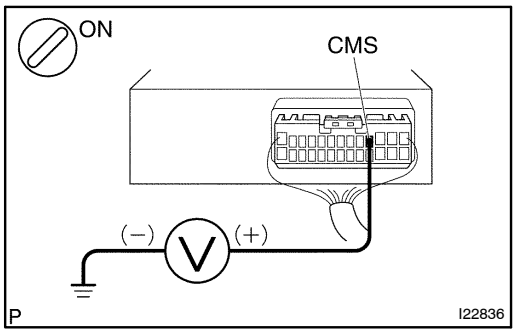
When the cruise control main switch is turned OFF, the cruise control does not operate.

WIRING DIAGRAM

See page DI–431.

INSPECTION PROCEDURE

1	**Check voltage between terminal CMS of cruise control ECU connector and body ground.**



PREPARATION:

(a) Remove the ECU with connector still connected.

(b) Turn ignition switch ON.

CHECK:

Measure voltage between terminal CMS of cruise control ECU connector when main switch is held ON and OFF.

OK:

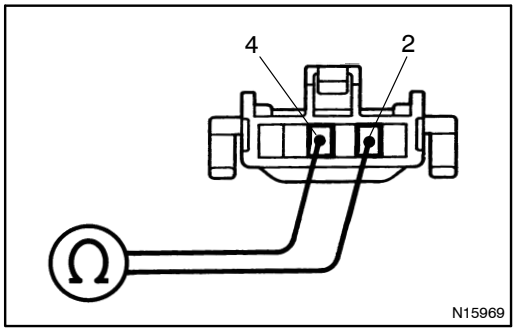
Main switch	Voltage
OFF	10 – 16 V
ON	Below 1 V

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–419).**

NG

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2	Check main switch continuity.



PREPARATION:

(a) Remove steering wheel center pad. (See SR section)

(b) Disconnect the control switch connector.

CHECK:

Check continuity between terminals 2 and 4 of control switch connector when main switch is held ON and OFF.

OK:

Switch position	Tester connection	Specified condition
OFF	2 – 4	No continuity
Hold ON	2 – 4	Continuity

NG → **Replace control switch.**

OK

3	Check harness and connector between cruise control ECU and main switch (See page IN–16).

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–26).

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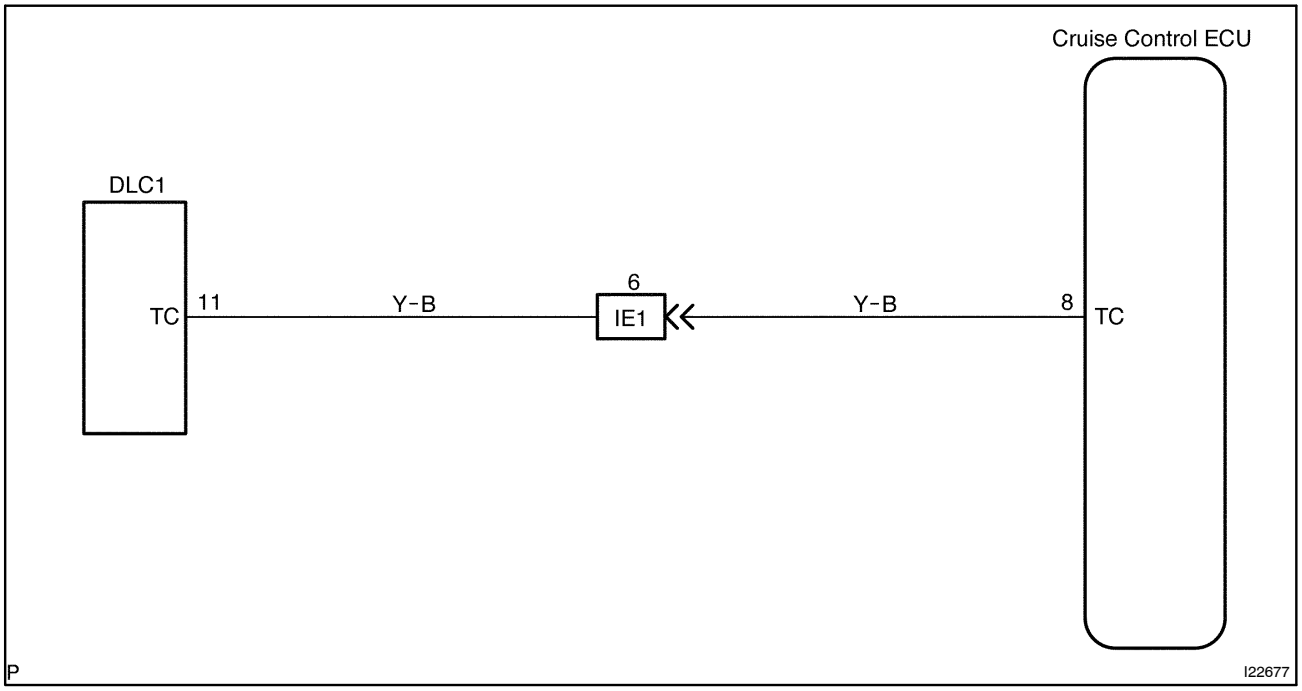
DI35D–02

Tc Circuit

CIRCUIT DESCRIPTION

This circuit sends a signal to the ECU that DTC output is required.

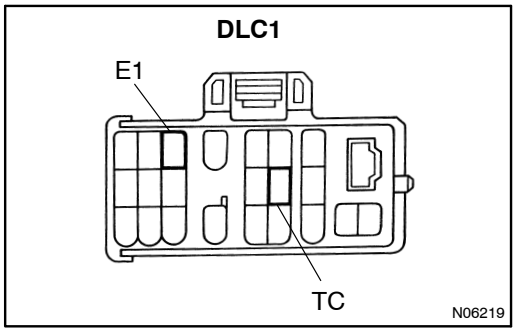
WIRING DIAGRAM



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INSPECTION PROCEDURE

1	**Check voltage between terminals Tc and E_1 of DLC1.**



PREPARATION:
Turn ignition switch ON.
CHECK:
Measure voltage between terminals Tc and E_1 of DLC1.
OK:
Voltage: 10 – 16 V

OK → **Proceed to next circuit inspection shown in problem symptoms table (See page DI–419).**

NG

2	**Check harness and connector between cruise control ECU and DLC1, DLC1 and body ground (See page IN–16).**

NG → **Repair or replace harness or connector.**

OK

Check and replace cruise control ECU (See page IN–26).

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DI35E–01

Actuator Control Cable Inspection

INSPECTION PROCEDURE

1	**Actuator control cable inspection.**

CHECK:

(a) Check that the actuator and control cable throttle link are properly installed and that the cable and link are connected correctly.

(b) Check that the actuator and bell crank are operating smoothly.

(c) Check that the cable is not loose or too tight.

OK:

Freeplay: less than 10 mm

HINT:

- If the control cable is very loose, the vehicle's loss of speed going uphill will be large.
- If the control cable is too tight, the idle RPM will become high.

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EM – ENGINE MECHANICAL (3RZ-FE)

CO/HC	EM-1
COMPRESSION	EM-3
VALVE CLEARANCE	EM-5
IGNITION TIMING	EM-11
IDLE SPEED	EM-12
TIMING CHAIN	EM-13
CYLINDER HEAD	EM-26
ENGINE UNIT	EM-61
CYLINDER BLOCK	EM-75
EXHAUST SYSTEM	EM-104

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CO/HC

EM06Q–03

INSPECTION

HINT:

This check is used only to determine whether or not the idle CO/HC complies with regulations.

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected

HINT:

All vacuum hoses for EGR systems, etc. should be properly connected.

(f) SFI system wiring connectors fully plugged
(g) Ignition timing set correctly
(h) Transmission in neutral position
(i) Tachometer and CO/HC meter calibrated by hand

2. START ENGINE

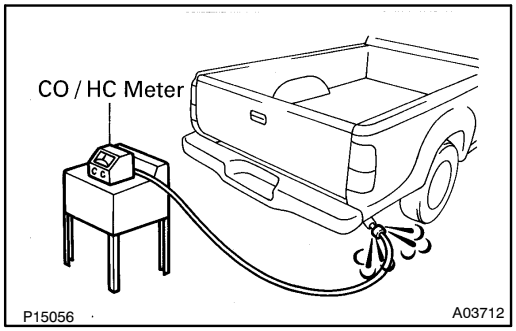
3. RACE ENGINE AT 2,500 RPM FOR APPROX. 180 SECONDS

4. INSERT CO/HC METER TESTING PROBE AT LEAST 40 cm (1.3 ft) INTO TAILPIPE DURING IDLING

5. IMMEDIATELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM

HINT:

When doing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the applicable local regulations.



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6. TROUBLESHOOTING

If the CO/HC concentration does not comply with regulations, troubleshoot according to the table below.

(a) Check heated oxygen sensor operation.

(b) Check and correct the cause if necessary.

CO	HC	Symptom	Causes
Normal	High	Rough Idle	1. Faulty ignitions: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed high–tension cords • Cracked distributor cap 2. Incorrect valve clearance 3. Leaky EGR valves 4. Leaky exhaust valves 5. Leaky cylinder
Low	High	Rough Idle (Fluctuating HC reading)	1. Vacuum leaks: • Vacuum hose • Intake manifold • Intake chamber • PCV line • Throttle body
High	High	Rough Idle (Black smoke from exhaust)	1. Clogged air filter 2. Plugged PCV valve 3. Faulty SFI systems: • Faulty fuel pressure regulator • Clogged fuel return line • Faulty MAF meter • Defective ECT sensor • Defective IAT sensor • Faulty engine control module (ECM) • Faulty injector

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COMPRESSION

EM06R–03

INSPECTION

HINT:

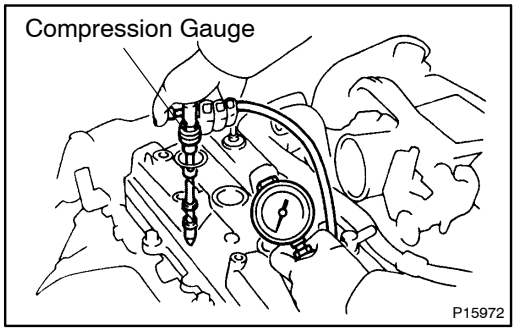
If there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

1. **WARM UP AND STOP ENGINE**
2. **REMOVE INTAKE AIR CONNECTOR**
   (See page EM–65)
3. **DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS**

NOTICE:

Pulling on or bending the cords may damage the conductor inside.

4. **REMOVE SPARK PLUGS**



5. **CHECK CYLINDER COMPRESSION PRESSURE**

(a) Insert a compression gauge into the spark plug hole.

(b) Fully open the throttle.

(c) While cranking the engine, measure the compression pressure.

HINT:

Always use a fully charged battery to obtain engine speed of 250 rpm or more.

(d) Repeat steps (a) through (c) for each cylinder.

NOTICE:

This measurement must be done in as short a time as possible.

Compression pressure:
1,230 kPa (12.5 kgf/cm^2, 178 psi) or more
Minimum pressure:
880 kPa (9.0 kgf/cm^2, 127 psi)
Difference between each cylinder:
98 kPa (1.0 kgf/cm^2, 14 psi) or less

(e) If the cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression.

- If adding oil helps the compression, chances are that the piston rings and/or cylinder bore are worn or damage.
- If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.

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6. **REINSTALL SPARK PLUGS**
   Torque:19 N·m (200 kgf·cm, 14 ft·lbf)
7. **REINSTALL HIGH–TENSION CORDS TO SPARK PLUGS**
8. **REINSTALL AIR INTAKE CONNECTOR**
   (See page EM–70)

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VALVE CLEARANCE

EM06S–03

INSPECTION

HINT:

Inspect and adjust the valve clearance when the engine is cold.

1. **DRAIN ENGINE COOLANT**
2. **REMOVE AIR CLEANER CAP, MAF METER AND RESONATOR (See page EM–65)**
3. **REMOVE NO.1 AND NO.2 PCV HOSES**
4. **DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS**

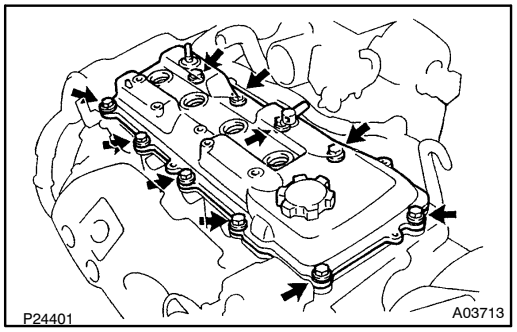
NOTICE:

Pulling on or bending the cords may damage the conductor inside.

5. **REMOVE THROTTLE BODY (See page MF–28)**
6. **DISCONNECT ENGINE WIRE**

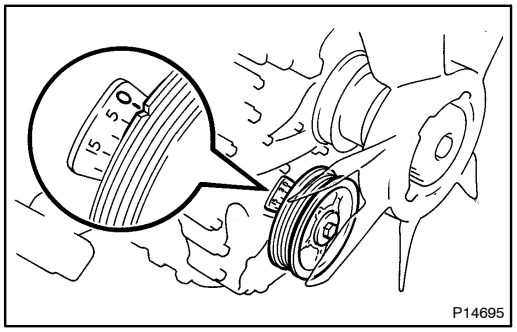
(a) Disconnect these connectors:
- w/ A/C:
  A/C compressor connector
- Oil pressure sensor connector
- ECT sensor connector

(b) Disconnect the 5 engine wire clamps and engine wire.



7. **REMOVE CYLINDER HEAD COVER**

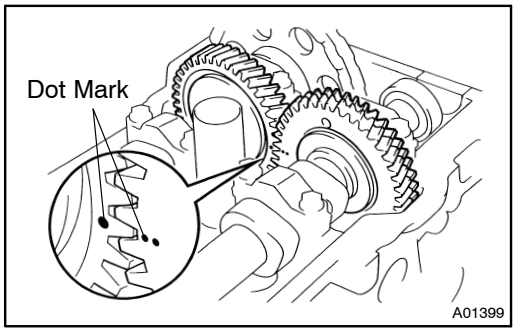
Remove the 10 bolts, cylinder head cover and gasket.



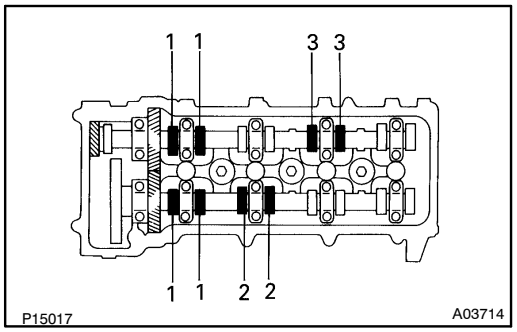
8. **SET NO.1 CYLINDER TO TDC/COMPRESSION**

(a) Turn the crankshaft pulley clockwise and align its groove with the ”0” mark on the timing chain cover.

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(b) Check that the timing marks (one and two dots) of the camshaft drive and driven gears are in straight line on the cylinder head surface as shown in the illustration. If not, turn the crankshaft 1 revolution (360°) and align the marks as above.



9. INSPECT VALVE CLEARANCE

(a) Check only the valves indicated.

- Using a thickness gauge, measure the clearance between the valve lifter and camshaft.
- Record the out–of–specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

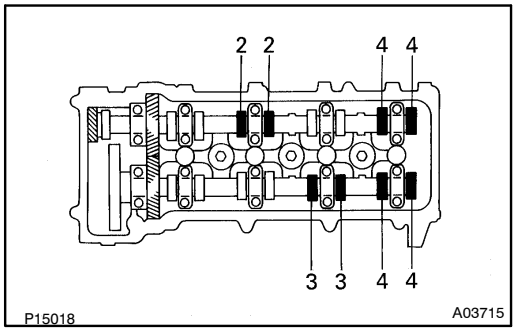
Valve clearance (Cold):

Intake

0.15 – 0.25 mm (0.006 – 0.010 in.)

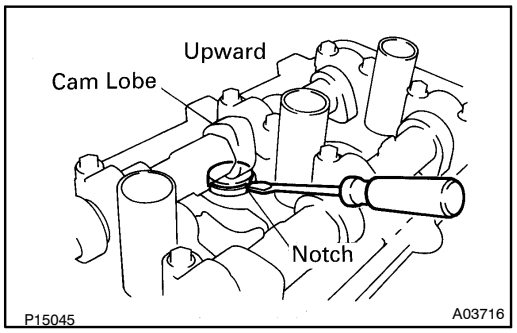
Exhaust

0.25 – 0.35 mm (0.010 – 0.014 in.)



(b) Turn the crankshaft pulley 1 revolution (360°) and align its groove with timing mark "0" of the timing chain cover.

(c) Check only the valves indicated as shown. Measure the valve clearance (See procedure in step (a)).

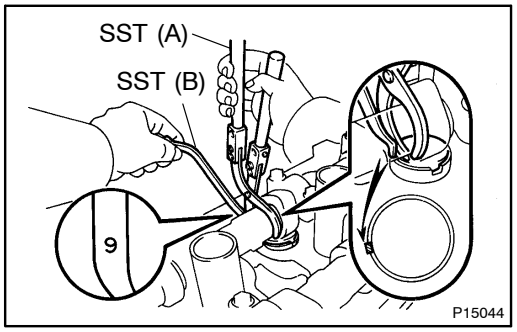


10. ADJUST VALVE CLEARANCE

(a) Remove the adjusting shim.

- Turn the crankshaft to position the cam lobe of the camshaft on the adjusting valve upward.
- Position the notch of the valve lifter toward the spark plug side.
- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter flange. Remove SST (A).

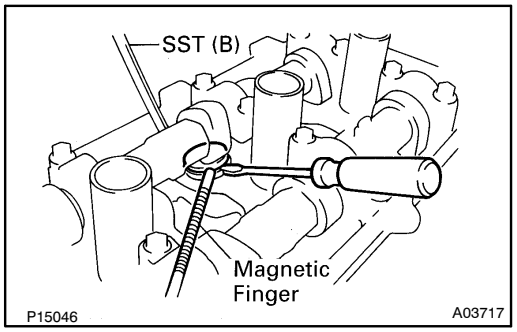
SST 09248–55040 (09248–05410, 09248–05420)



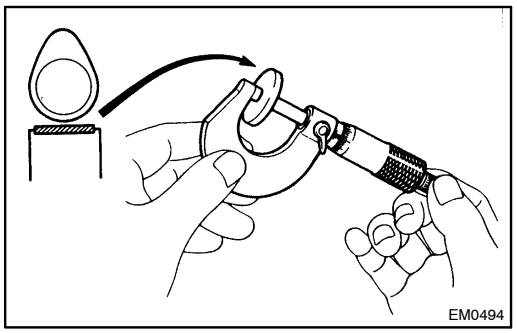
HINT:

- Apply SST (B) at slight angle on the side marked with "9", at the position shown in the illustration.
- When SST (B) is inserted too deeply, it will get pinched by the shim. To prevent it from being stuck, insert it shallowly from the outside of the cylinder head, at a slight angle.

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- Remove the adjusting shim with a small screwdriver and magnetic finger.



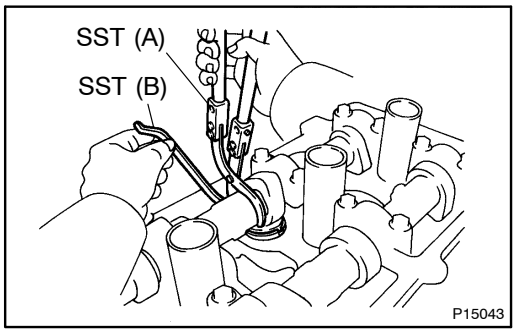
(b) Determine the replacement adjusting shim size by following the Formula or Charts:

- Using a micrometer, measure the thickness of the removed shim.
- Calculate the thickness of a new shim so that the valve clearance comes within the specified value.

T ..... Thickness of removed shim
A ..... Measured valve clearance
N ..... Thickness of new shim
Intake:
N=T + (A – 0.20 mm (0.008 in.))
Exhaust:
N=T + (A – 0.30 mm (0.012 in.))

- Select a new shim with a thickness as close as possible to the calculated value.

HINT:
Shims are available in 17 sized in increments of 0.05 mm (0.0020 in.), from 2.50 mm (0.0984 in.) to 3.30 mm (0.1299 in.).



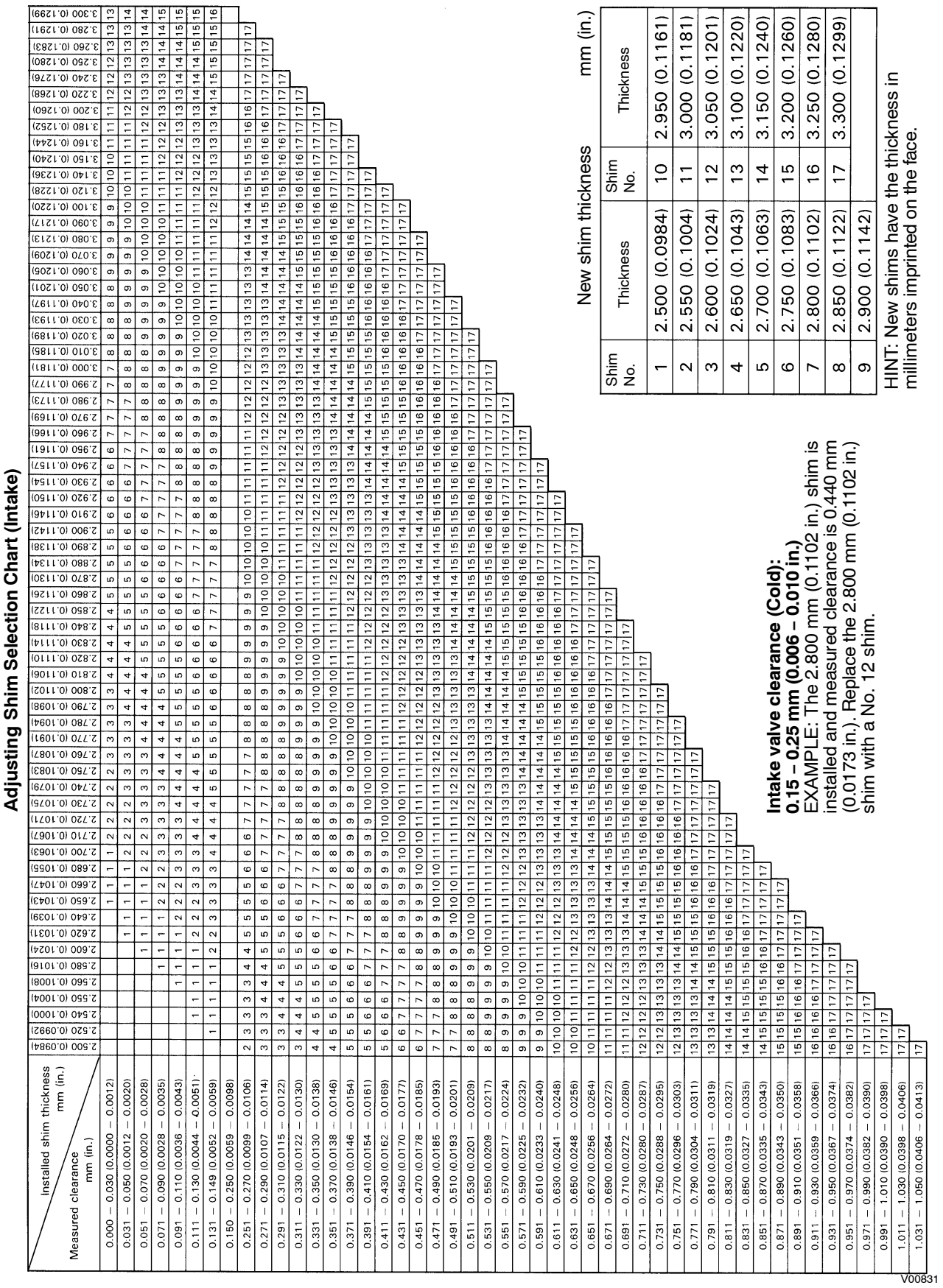
(c) Install a new adjusting shim.

- Place a new adjusting shim on the valve lifter.
- Using SST (A), press down the valve lifter and remove SST (B).

SST 09248–55040 (09248–05410, 09248–05420)

(d) Recheck the valve clearance.

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New shim thickness mm (in.)

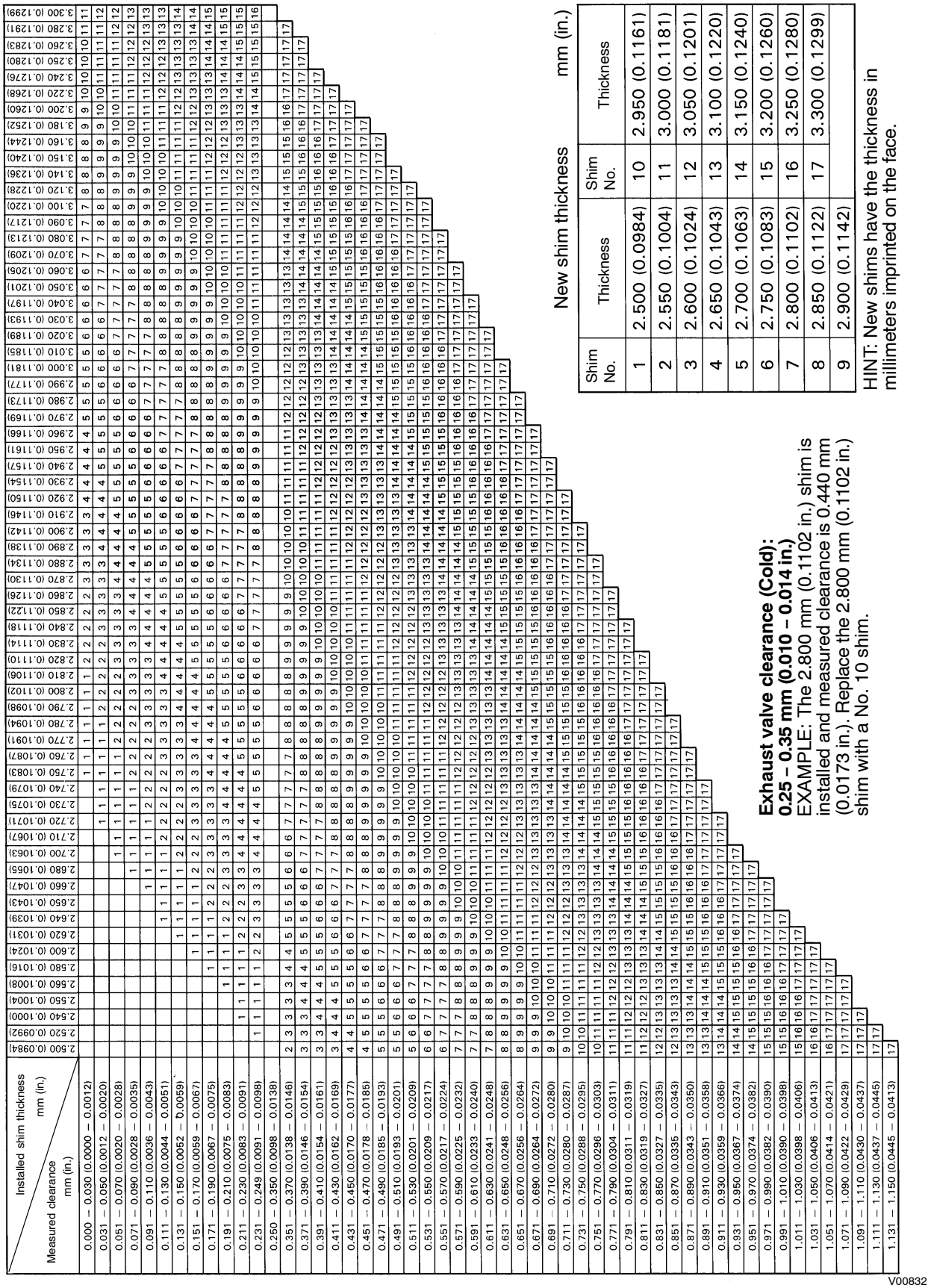
Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

HINT: New shims have the thickness in millimeters imprinted on the face.

Intake valve clearance (Cold):
0.15 – 0.25 mm (0.006 – 0.010 in.)
EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed and measured clearance is 0.440 mm (0.0173 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 12 shim.

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Adjusting Shim Selection Chart (Exhaust)



Exhaust valve clearance (Cold):
0.25 – 0.35 mm (0.010 – 0.014 in.)
EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed and measured clearance is 0.440 mm (0.0173 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 10 shim.

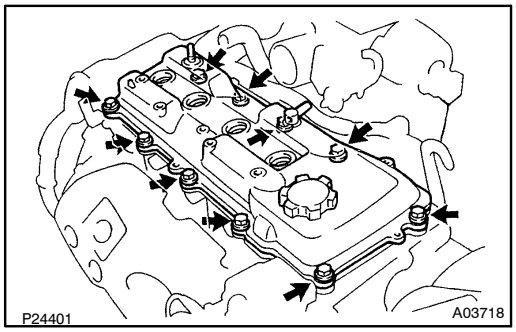
New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

HINT: New shims have the thickness in millimeters imprinted on the face.

V00832

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11. REINSTALL CYLINDER HEAD COVER

(a) Install the gasket to the cylinder head cover.

(b) Install the cylinder head cover with the 10 bolts.

12. RECONNECT ENGINE WIRE

(a) Connect the 5 engine wire clamps.

(b) Connect these connectors:

- ECT sensor connector
- Oil pressure sensor connector
- w/ A/C:
  A/C compressor connector

13. REINSTALL THROTTLE BODY (See page MF–30)

14. REINSTALL HIGH–TENSION CORDS TO SPARK PLUGS

15. REINSTALL NO.1 AND NO.2 PCV HOSES

16. REINSTALL AIR INTAKE CONNECTOR (See page EM–70)

17. REFILL WITH ENGINE COOLANT

18. CHECK IGNITION TIMING

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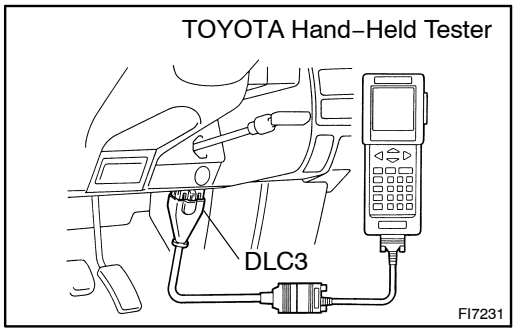
IGNITION TIMING

EM06T–02

INSPECTION

1. WARM UP ENGINE

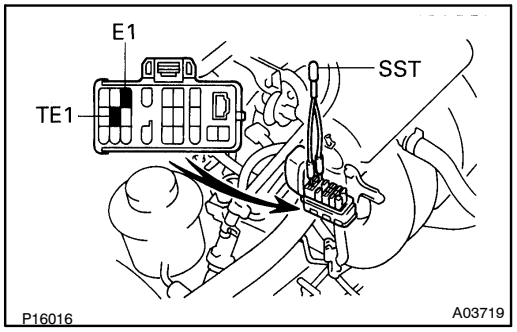
Allow the engine to warm up to normal operating temperature.



2. CONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL

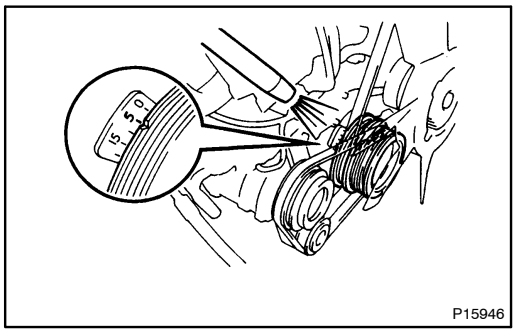
(a) Connect the TOYOTA hand–held tester or OBDII scan tool to the DLC3.

(b) Please refer to the TOYOTA hand–held tester or OBDII scan tool operators manual for further details.



3. CHECK IGNITION TIMING

(a) Using SST, connect terminals TE1 and E1 of the DLC1.
SST 09843–18020



(b) Using a timing light, connect the tester to No.1 high–tension cord.

(c) Check ignition timing.
Ignition timing:
3 – 7° BTDC @ idle
(Air Conditioner OFF)

If the ignition timing is not as specified, check that following conditions are normal:

- Throttle valve fully closed
- Continuity between terminals IDL and E2 of the throttle position sensor
- Valve timing

(d) Remove the SST from the DLC1.
SST 09843–18020

4. DISCONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL, AND TIMING LIGHT

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IDLE SPEED

EM1OJ–01

INSPECTION

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected

HINT:

All vacuum hoses for EGR system, etc. should be properly connected.

(f) MFI system wiring connectors fully plugged
(g) Ignition timing set correctly
(h) Transmission in neutral position

2. CONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL (See page EM–11)

3. INSPECT IDLE SPEED

(a) Race the engine speed at 2,500 rpm for approx. 90 seconds.
(b) Check the idle speed.

Idle speed: 650 – 750 rpm

If the idle speed is not as specified, check the IAC valve.

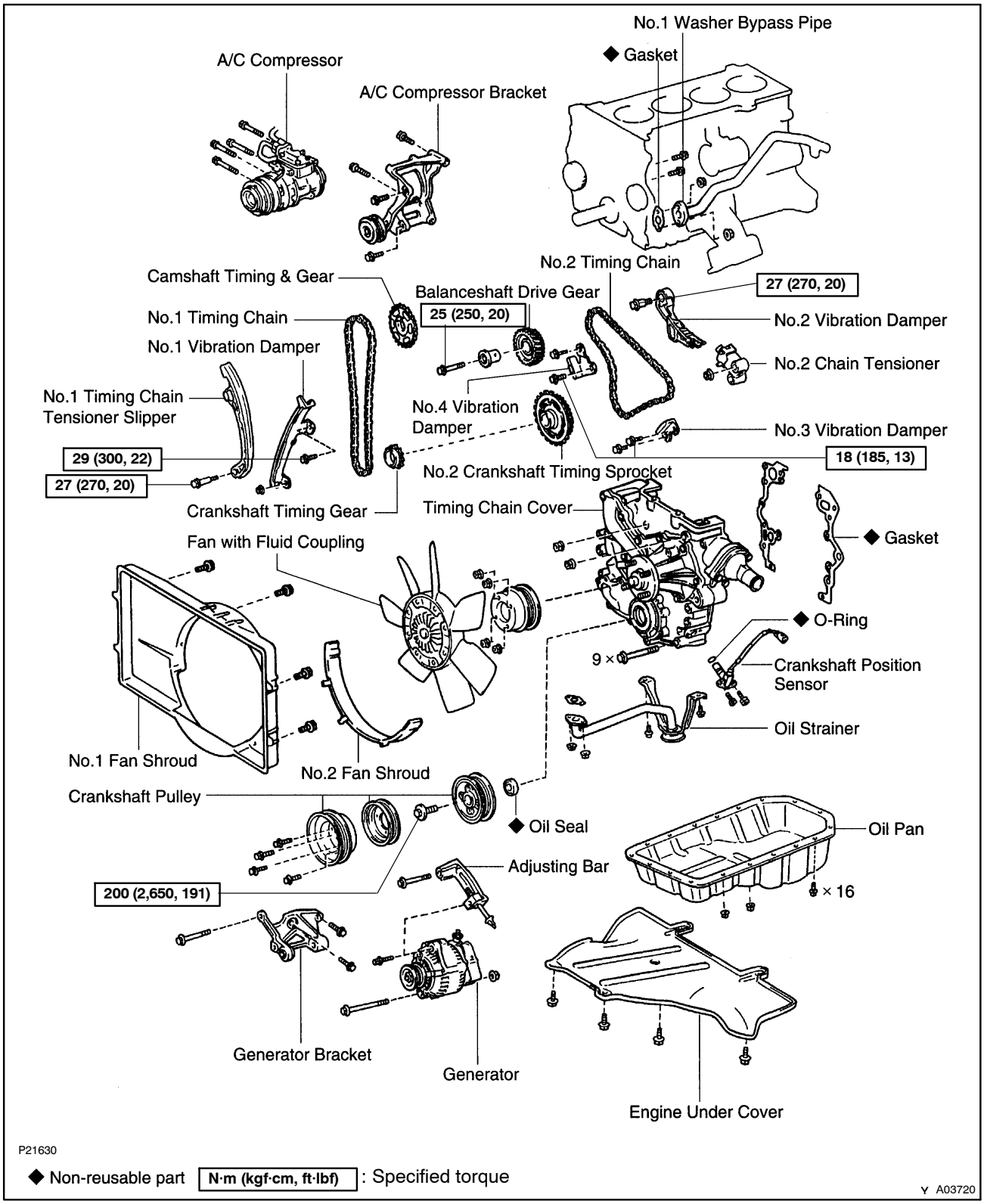
4. DISCONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL

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TIMING CHAIN

COMPONENTS

EM06X–02



P21630

◆ Non-reusable part **N·m (kgf·cm, ft·lbf)** : Specified torque

Y A03720

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EM06Z–03

REMOVAL

1. DRAIN ENGINE OIL

2. DRAIN ENGINE COOLANT

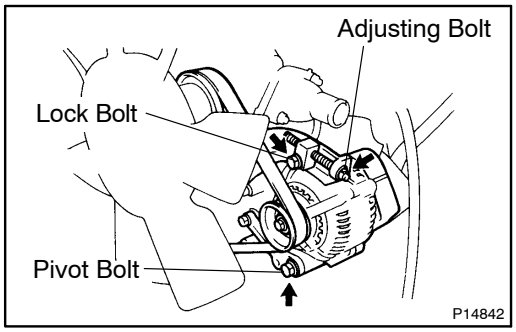
3. REMOVE CYLINDER HEAD
(See page EM–28)

4. REMOVE ENGINE UNDER COVER

Remove the 4 bolts and engine under cover.

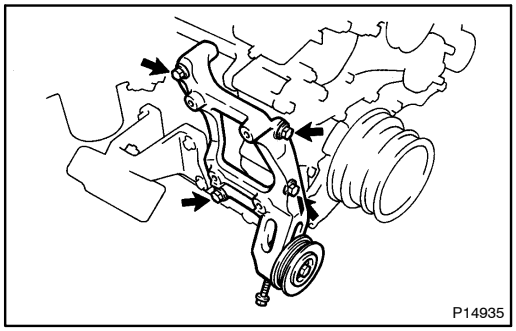
5. w/ A/C:
REMOVE A/C COMPRESSOR DRIVE BELT

Loosen the idler pulley nut and adjusting bolt, and remove the drive belt.



6. REMOVE DRIVE BELT, FAN WITH FLUID COUPLING, WATER PUMP PULLEY AND FAN SHROUD

(a) Stretch the belt and loosen the water pump pulley mounting nuts.
(b) Loosen the lock, pivot and adjusting bolts of the generator, and remove the drive belts.
(c) Remove the 4 water pump pulley mounting nuts.
(d) Pull out the fan with fluid coupling and water pump pulley.
(e) Remove the No.2 fan shroud.
(f) Remove the 4 bolts and No.1 fan shroud.

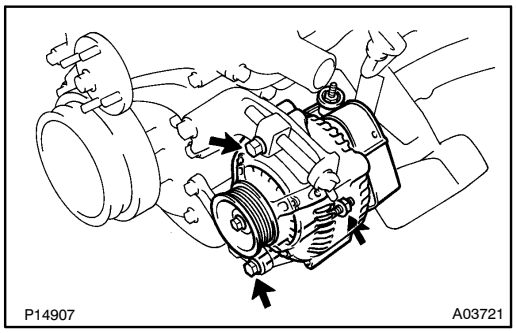


7. w/ A/C:
DISCONNECT A/C COMPRESSOR AND BRACKET

(a) Remove the 4 mounting bolts, and disconnect the compressor from the bracket.

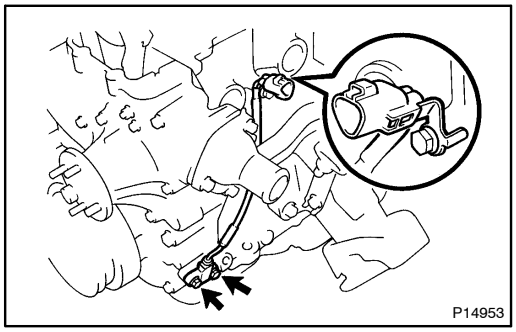
HINT:
Put a side the compressor, and suspend it.

(b) Remove the 4 bolts and A/C compressor bracket.



8. REMOVE GENERATOR, ADJUSTING BAR AND BRACKET

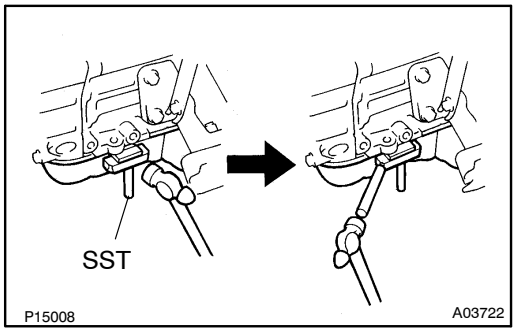
(a) Remove the lock, pivot bolts and the generator.
(b) Remove the bolt and adjusting bar.
(c) Remove the 3 bolts and bracket.



9. REMOVE CRANKSHAFT POSITION SENSOR

(a) Remove the 2 bolts and crankshaft position sensor.
(b) Remove the O–ring from the crankshaft position sensor.

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10. REMOVE OIL PAN

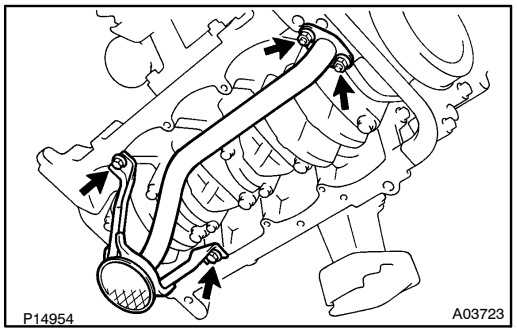
(a) Remove the 16 mounting bolts and 2 nuts.

(b) Insert the blade of SST between the cylinder block and oil pan, cut off applied sealer and remove the oil pan.

SST 09032–00100

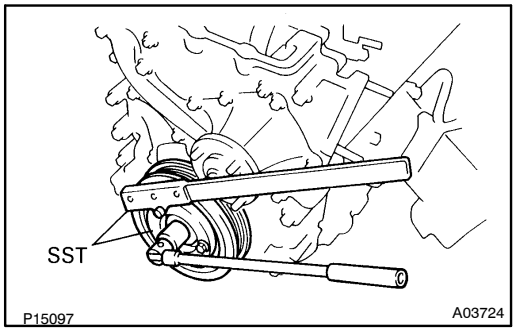
NOTICE:

Be careful not to damage the oil pan flanges of the oil pan and cylinder block.



11. REMOVE OIL STRAINER

Remove the 2 bolts, 2 nuts, oil strainer and gasket.



12. REMOVE CRANKSHAFT PULLEY

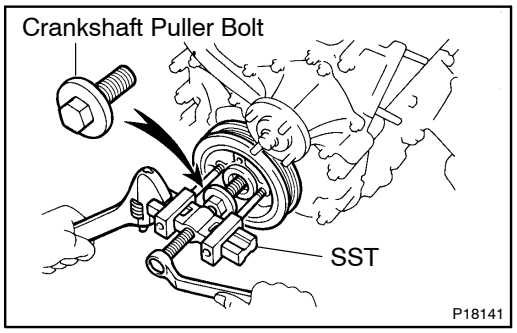
(a) w/ A/C:

Remove the 4 bolts, No.2 and No.3 crankshaft pulleies.

(b) Using SST, remove the pulley bolt.

SST 09213–54015, 09330–00021

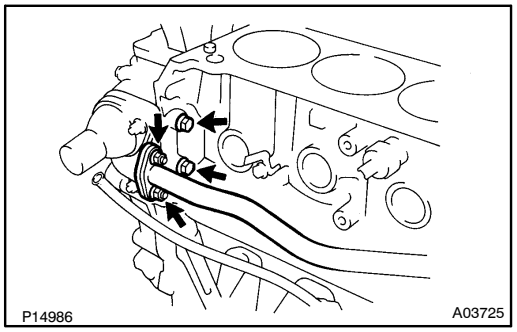
(c) Remove the crankshaft pulley.



HINT:

If necessary, remove the pulley with SST and crankshaft pulley bolt.

SST 09950–50010 (09951–05010, 09952–05010, 09953–05010, 09954–05020)

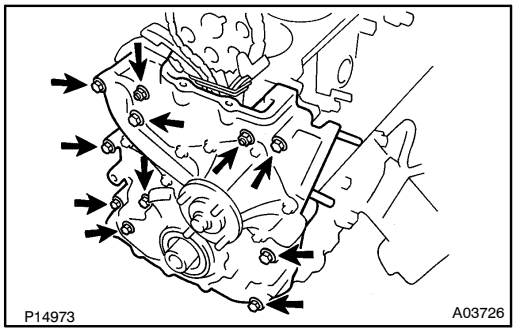


13. REMOVE TIMING CHAIN COVER

(a) Remove the 2 water by pass pipe mounting nuts.

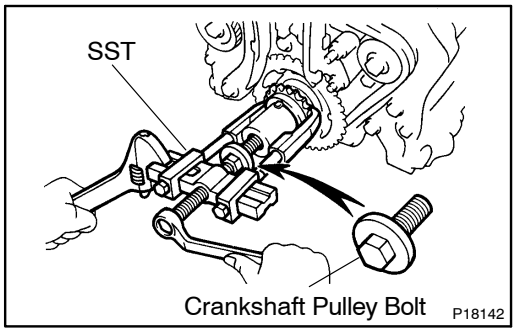
(b) Remove the 2 timing chain cover mounting bolts.

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(c) Remove the 9 mounting bolts and 2 mounting nuts.
(d) Using a plastic–faced hammer, loosen the chain cover and remove the timing chain cover and 3 gaskets.

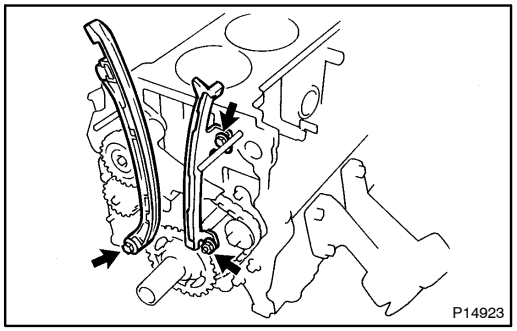
14. REMOVE NO.1 TIMING CHAIN AND CAMSHAFT TIMING GEAR



15. REMOVE CRANKSHAFT TIMING GEAR

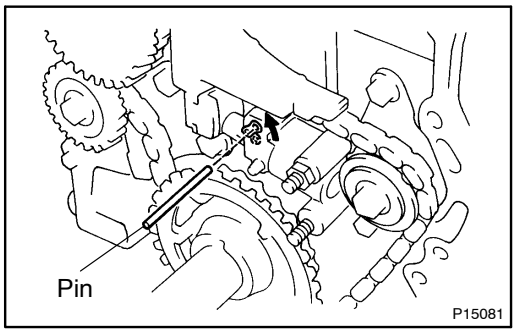
HINT:
If necessary, remove the gear with SST and crankshaft pulley bolt.

SST 09950–40010 (09951–04010, 09952–04010, 09953–04010, 09954–04010, 09955–04060)



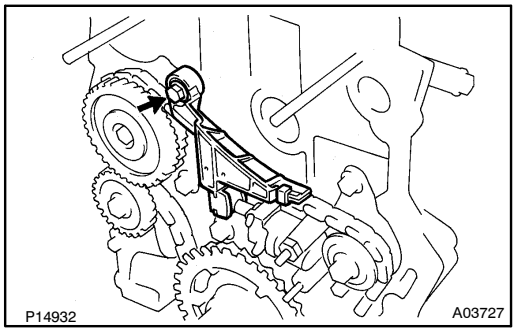
16. REMOVE NO.1 TIMING CHAIN TENSIONER SLIPPER AND NO.1 VIBRATION DAMPER

(a) Remove the bolt and slipper.
(b) Remove the bolt, nut and No.1 damper.



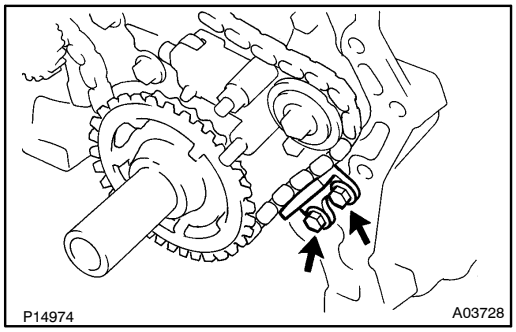
17. REMOVE NO.2, NO.3 VIBRATION DAMPERS AND NO.2 CHAIN TENSIONER

(a) Install a pin to the No.2 chain tensioner and lock the plunger.

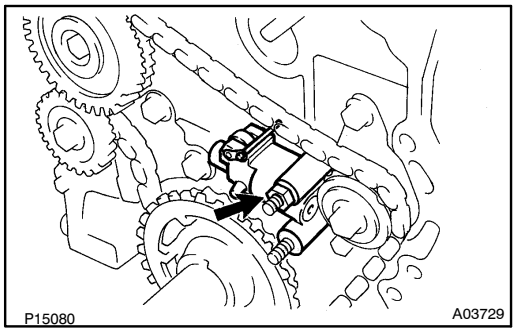


(b) Remove the bolt and No.2 damper.

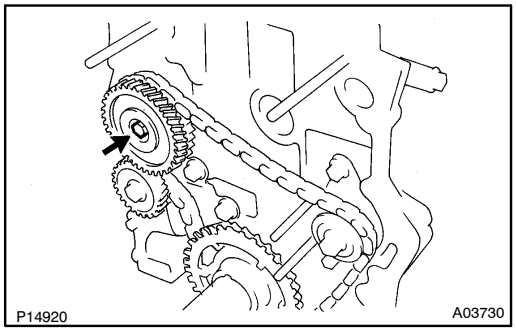
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(c) Remove the 2 bolts and No.3 damper.

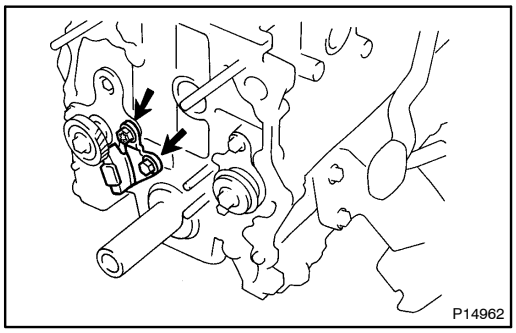


(d) Remove the nut and No.2 chain tensioner.



18. REMOVE NO.2 TIMING CHAIN

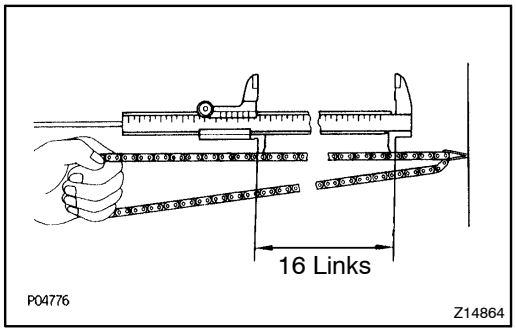
(a) Remove the bolt from the balance shaft drive gear.
(b) Remove the balance shaft drive gear with shaft.
(c) Remove the No.2 timing chain with the No.2 crankshaft timing sprocket.

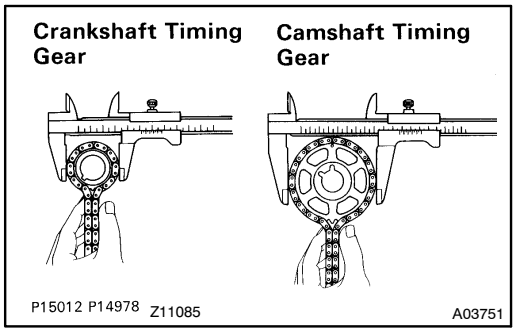


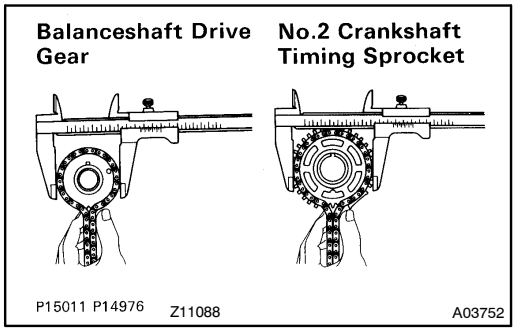
19. REMOVE NO.4 VIBRATION DAMPER

Remove the 2 bolts and No.4 damper.

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EM070–02

INSPECTION

1. INSPECT TIMING CHAINS, TIMING GEARS AND TIMING SPROCKETS

(a) Measure the length of 16 links with the chain fully stretched.

Maximum chain elongation:
No.1 Timing chain
147.5 mm (5.807 in.)
No.2 Timing chain
123.6 mm (4.866 in.)

If the elongation is greater than maximum, replace the chain.

HINT:

Make the same measurements pulling at 3 or more places selected at random.

(b) Wrap the chain around the timing gear and timing sprocket.

(c) Using vernier calipers, measure the timing gear and timing sprocket diameter with the chain.

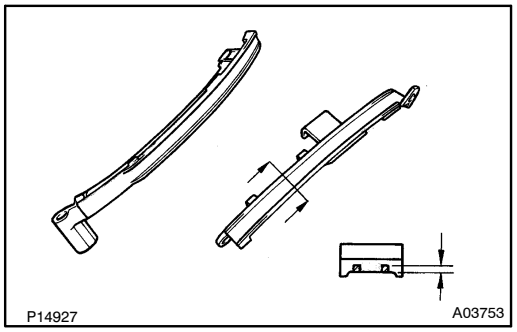
NOTICE:

Vernier calipers must contact the chain rollers for measuring.

Minimum gear diameter:
Camshaft
113.8 mm (4.480 in.)
Crankshaft
59.4 mm (2.339 in.)
Balance shaft
75.9 mm (2.988 in.)
Minimum sprocket diameter:
No.2 crankshaft
96.7 mm (3.807 in.)

If the diameter is less than minimum, replace the chain, gears and sprocket.

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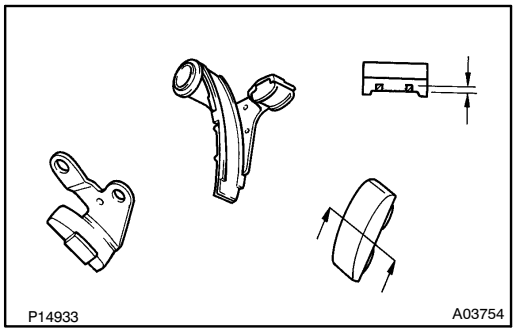


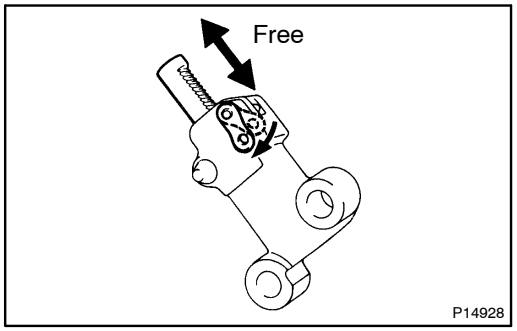
2. INSPECT CHAIN TENSIONER SLIPPER AND VIBRATION DAMPERS

Measure the chain tensioner slipper and vibration damper wears.

Maximum wear: 1.0 mm (0.039 in.)

If the wear is greater than maximum, replace the slipper and/or dampers.

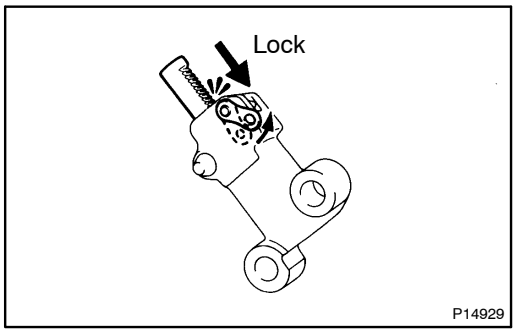




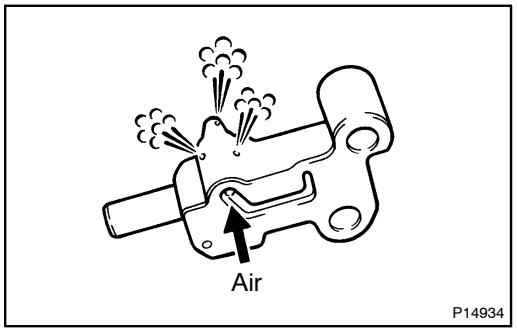
3. INSPECT NO.2 CHAIN TENSIONER

(a) Inspect the chain tensioner

- Check that the plunger moves smoothly when the ratchet pawl is raised with your finger.



- Release the ratchet pawl and check that the plunger is locked in place by the ratchet pawl and does not move when pushed with your finger.



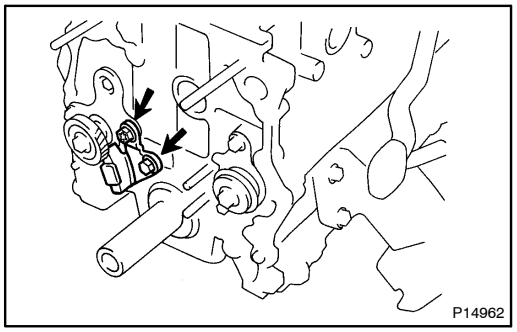
(b) Inspect the oil jet (No.2 chain tensioner).
Check the oil jet for damage or clogging.

If necessary, replace the oil jet (No.2 chain tensioner).

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EM073–03

INSTALLATION

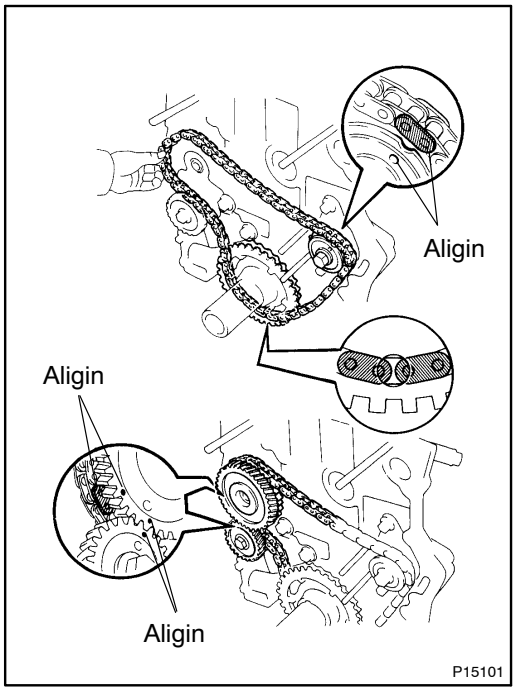


NOTICE:

Check that No.1 cylinder is at TDC and that the weights of the No.1 and No.2 balance shafts are at the bottom side.

1. INSTALL NO.4 VIBRATION DAMPER

Install the No.4 damper with the 2 bolts.



2. INSTALL NO.2 TIMING CHAIN

(a) Install the No.2 timing chain by matching its mark links with the timing marks on the No.2 crankshaft timing sprocket and balance shaft timing sprocket.

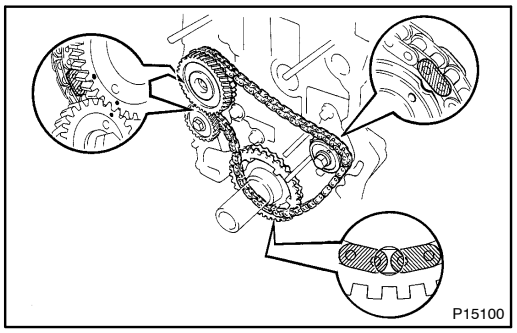
(b) Fit the other mark link of No.2 timing chain onto the sprocket behind the large timing mark of the balance shaft drive gear.

(c) Insert the balance shaft drive gear shaft through the balance shaft drive gear so that it fits into the thrust plate hole.

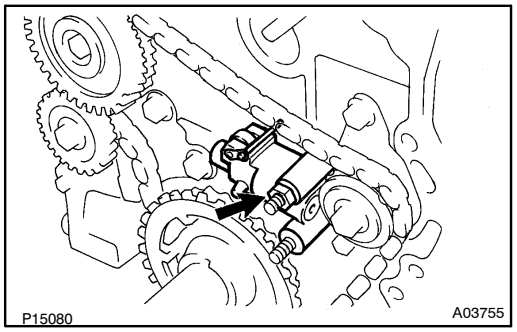
Then align the small timing mark of the balance shaft drive gear with the timing mark of the balance shaft timing gear.

(d) Install the bolt to the balance shaft drive gear and tighten it.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)



(e) Check that each timing mark is matched with the corresponding mark link.



3. INSTALL NO.2, NO.3 VIBRATION DAMPERS AND NO.2 CHAIN TENSIONER

NOTICE:

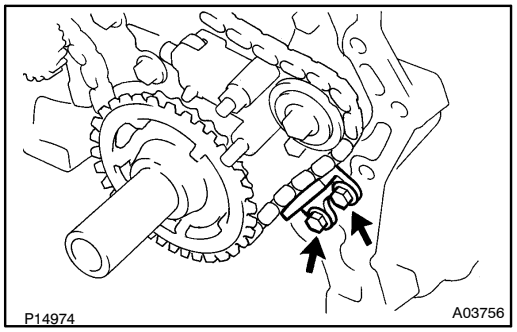
Assemble the chain tensioner with the pin installed, then remove the pin after assembly.

When doing this, avoid pushing the No.2 vibration damper against the chain.

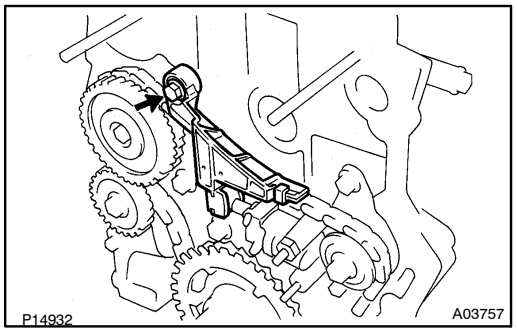
(a) Install the No.2 chain tensioner with the nut.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

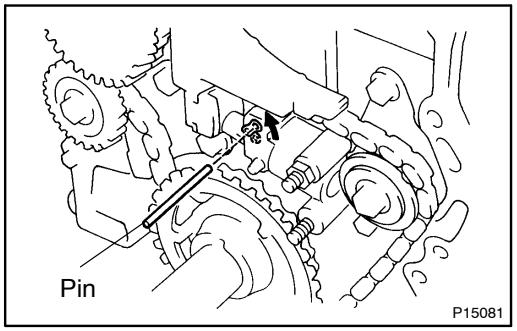
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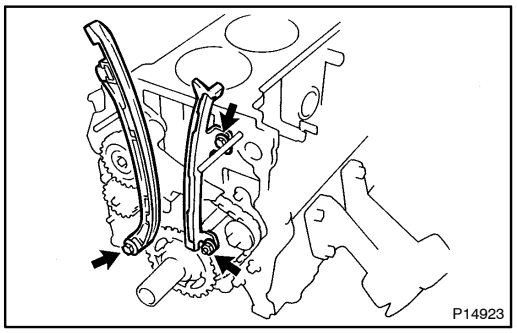
(b) Install No.3 damper with the 2 bolts.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



(c) Install No.2 damper with the bolt.
Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)



(d) Remove a pin from the No.2 chain tensioner and free the plunger.

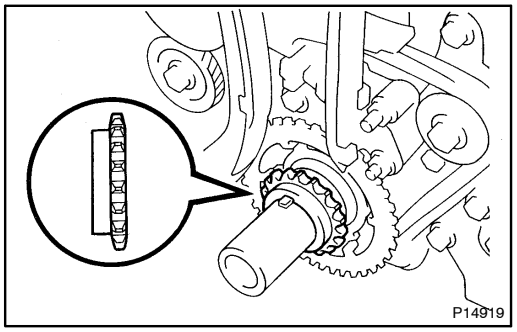


4. INSTALL NO.1 TIMING CHAIN TENSIONER SLIPPER AND NO.1 VIBRATION DAMPER

(a) Install the No.1 damper with the bolt and nut.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

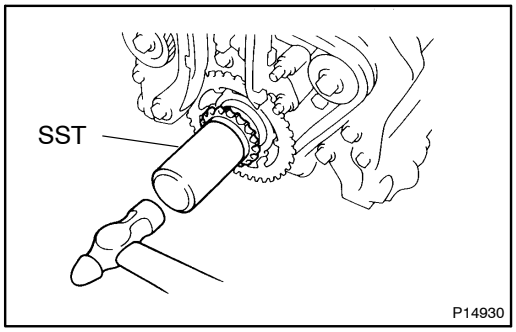
(b) Install the slipper with the bolt.
Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)

(c) Check that the slipper moves smoothly.

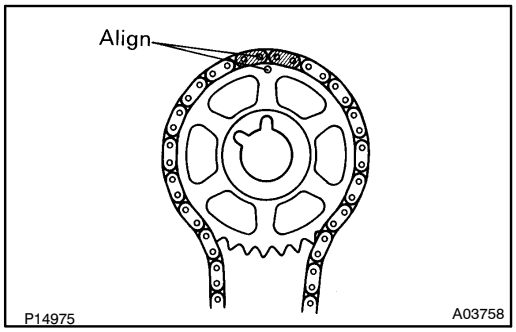


5. INSTALL CRANKSHAFT TIMING GEAR

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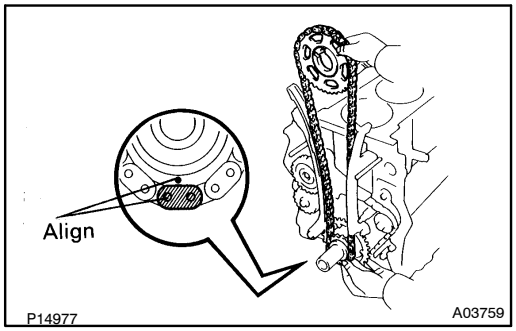


HINT:
If necessary, install the gear with SST.
SST 09636–20010



6. INSTALL NO.1 TIMING CHAIN AND CAMSHAFT TIMING GEAR

(a) Align the timing mark between the mark link of the No.1 timing chain, and install the No.1 timing chain to the timing gear.



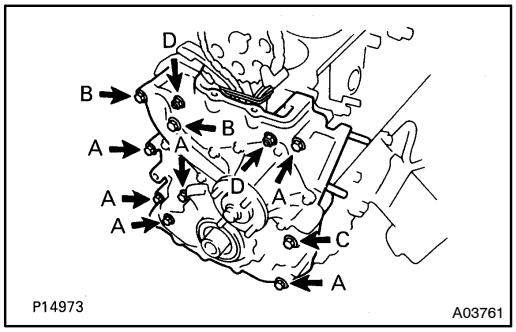
(b) Align the timing mark of the crankshaft timing gear with the mark link of the No.1 timing chain and install the No.1 timing chain.



(c) Tie the No.1 timing chain with a cord as shown in the illustration and make sure it doesn't come loose.

7. INSTALL TIMING CHAIN COVER

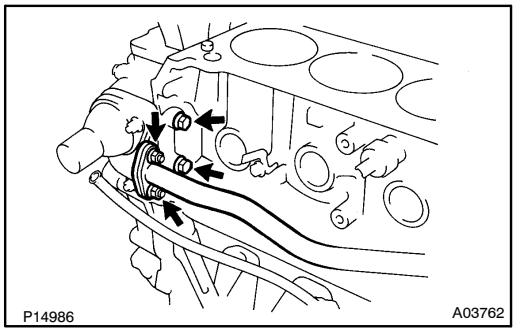
(a) Install 3 new gaskets to the cylinder block and No.1 water bypass pipe.



(b) Install the timing chain cover with the 9 bolts and 2 nuts.
Torque:
Bolt A: 20 N·m (200 kgf·cm, 14 ft·lbf)
Bolt B: 24.5 N·m (250 kgf·cm, 18 ft·lbf)
Bolt C: 44 N·m (440 kgf·cm, 32 ft·lbf)
Nut D: 20 N·m (200 kgf·cm, 14 ft·lbf)

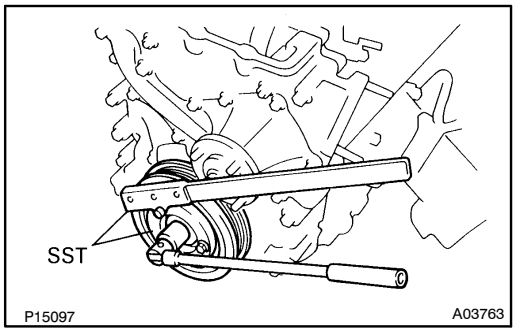
(c) Remove the cord from the chain.

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(d) Install the 2 timing chain cover mounting bolts.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

(e) Install the 2 No.1 water bypass pipe mounting nuts.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

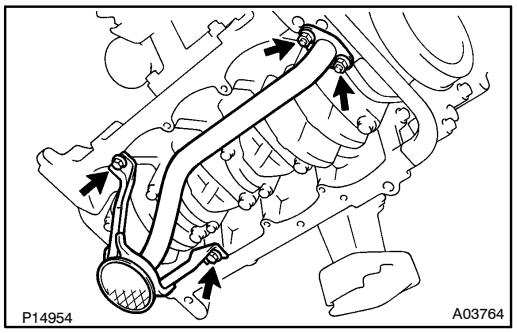


8. INSTALL CRANKSHAFT PULLEY

(a) Align the pulley set key with the key groove of the pulley, and slide on the pulley.

(b) Using SST, install and torque the pulley bolt.
SST 09213–54015, 09330–00021
Torque: 260 N·m (2,650 kgf·cm, 193 ft·lbf)

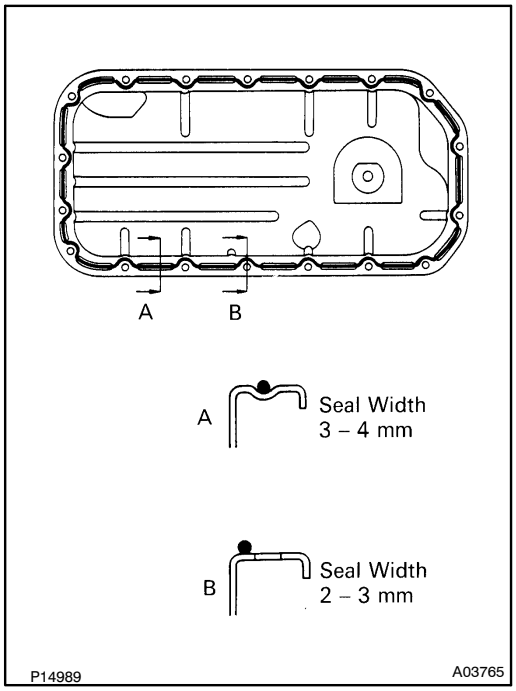
(c) w/ A/C:
Install the No.3 and No.2 crankshaft pulleies with the 4 bolts.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)



9. INSTALL OIL STRAINER

Install a new gasket and oil strainer with the 2 bolts and 2 nuts.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

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10. INSTALL OIL PAN

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surface of the oil pan.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

NOTICE:

Do not use a solvent which will affect the painted surfaces.

(b) Apply seal packing to the oil pan as shown in the illustration.

Seal packing:

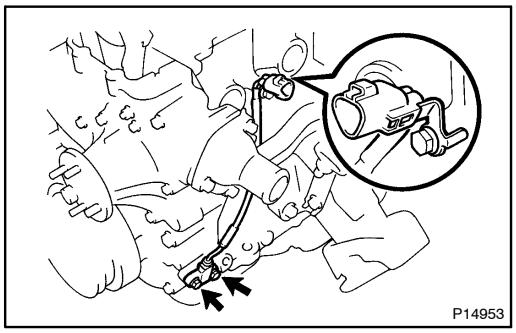
Part No. 08826–00080 or equivalent
- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.)opening or 3 – 4 mm (0.012 – 0.016 in.) opening.

HINT:

Avoid applying an excessive amount to the surface.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the oil pan with the 16 bolts and 2 nuts.

Torque: 12.5 N·m (130 kgf·cm, 9 ft·lbf)

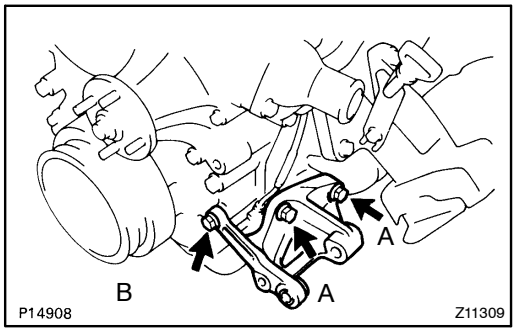


11. INSTALL CRANKSHAFT POSITION SENSOR

(a) Install a new O–ring.

(b) Install the crankshaft position sensor with the 2 bolts.

Torque: 8.5 N·m (85 kgf·cm, 74 in.·lbf)



12. INSTALL GENERATOR, ADJUSTING BAR AND BRACKET

(a) Install the bracket with the 3 bolts.

Torque:

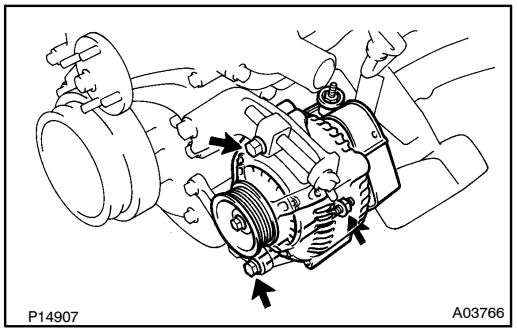
Bolt A: 74.5 N·m (760 kgf·cm, 55 ft·lbf)

Bolt B: 18 N·m (185 kgf·cm, 13 ft·lbf)

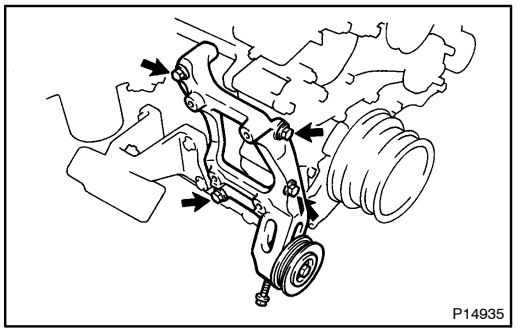
(b) Install the adjusting bar with the bolt.

Torque: 63.5 N·m (650 kgf·cm, 47 ft·lbf)

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(c) Install the generator with the pivot bolt and lock bolt.



13. w/ A/C:
INSTALL A/C COMPRESSOR AND BRACKET

(a) Install the A/C compressor bracket with the 4 bolts.
Torque: 44 N·m (440 kgf·cm, 32 ft·lbf)

(b) Install the A/C compressor with the 4 bolts.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

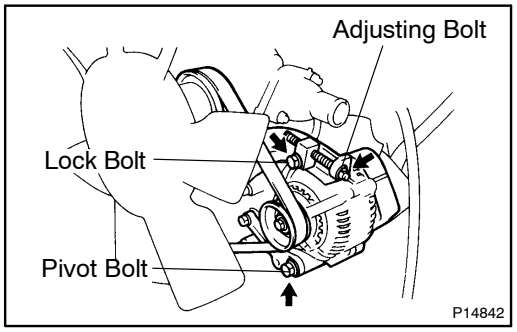
14. INSTALL WATER PUMP PULLEY, FAN SHROUD, FAN WITH FLUID COUPLING AND DRIVE BELT

(a) Place the fan with fluid coupling, water pump pulley and fan shroud in position.

(b) Temporarily install the water pump pulley mounting nuts.

(c) Install the No.1 fan shroud with the 4 bolts.

(d) Install the No.2 fan shroud with the 2 clips.



(e) Install the drive belts with the adjusting bolt and pivot bolt.

(f) Stretch the belt tight and tighten the 4 water pump pulley mounting nuts.
Torque: 21 N·m (210 kgf·cm, 16 ft·lbf)

(g) Adjust the drive belts.

15. w/ A/C:
INSTALL A/C COMPRESSOR DRIVE BELT

Install and adjust the drive belt (See page CH–2).

16. INSTALL ENGINE UNDER COVER

Install the engine under cover with the bolts.

17. INSTALL CYLINDER HEAD (See page EM–50)

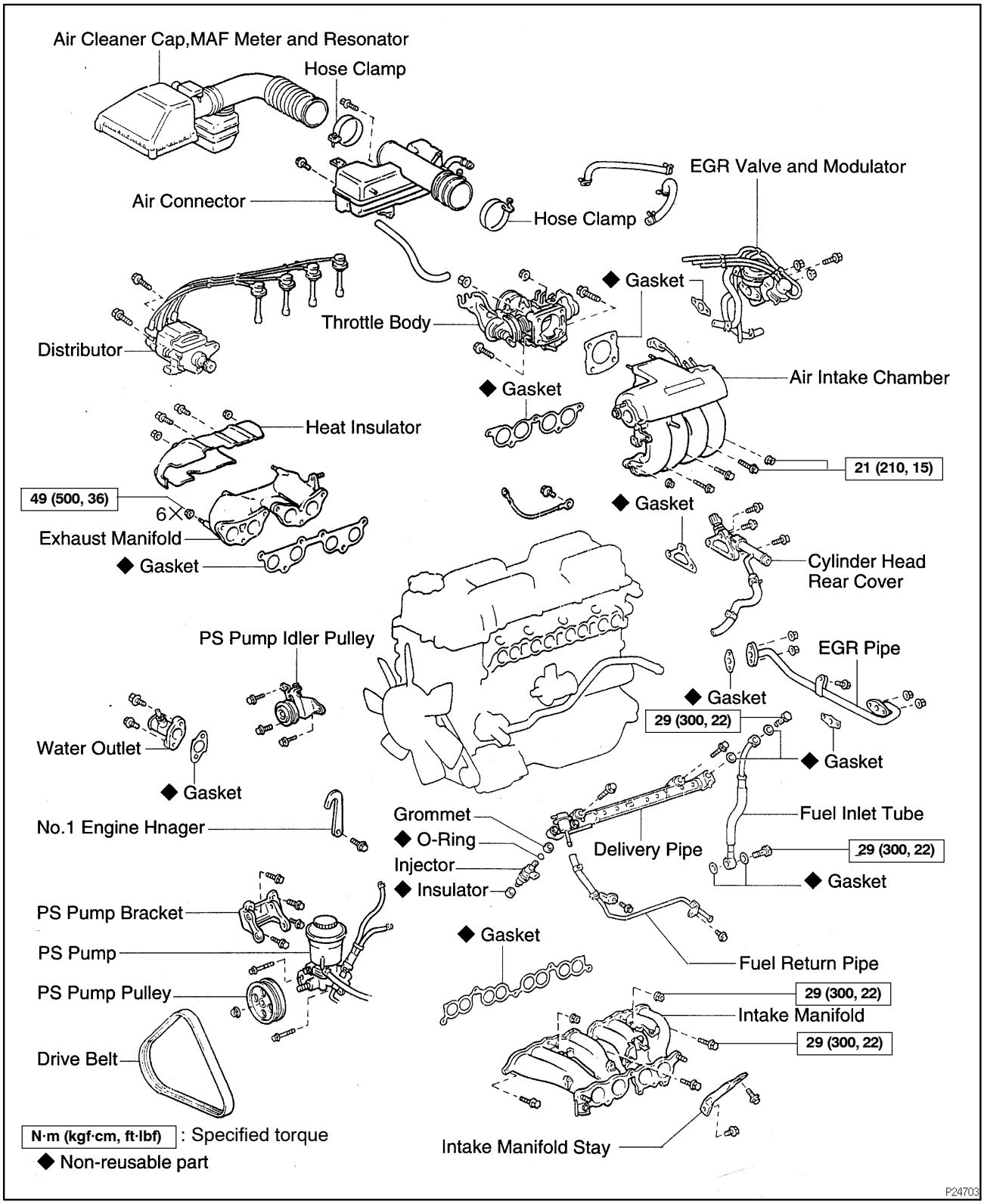
18. START ENGINE AND CHECK FOR LEAKS

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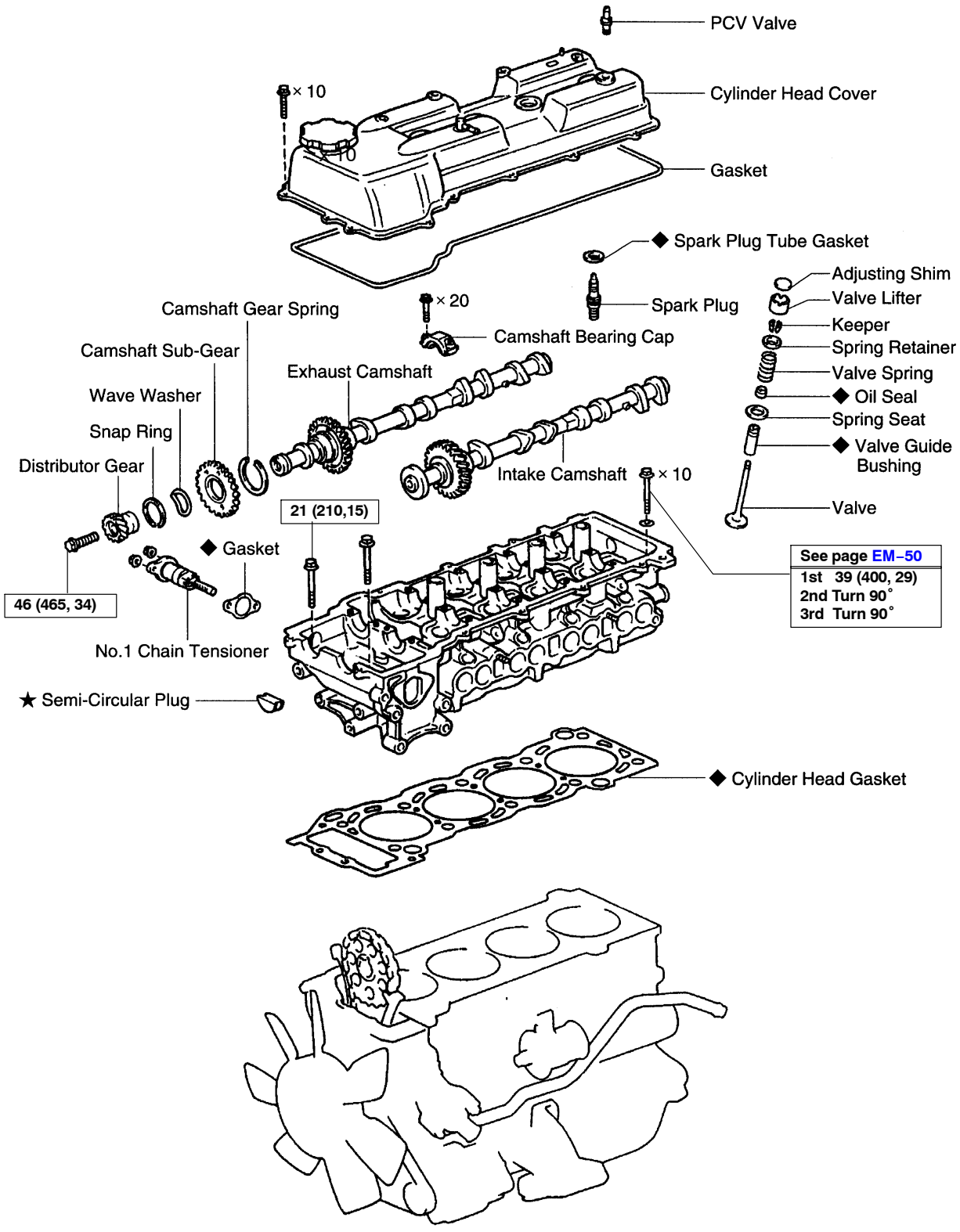
CYLINDER HEAD

COMPONENTS

EM075–02



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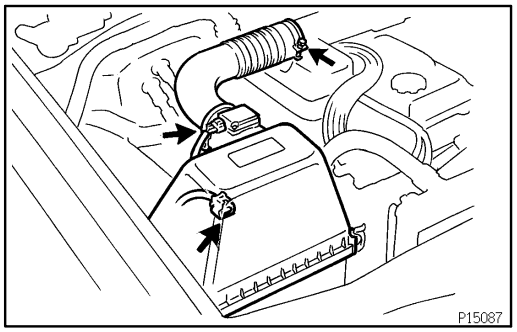


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EM1OK–01

REMOVAL

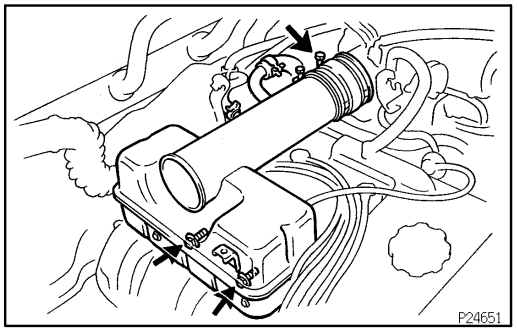
1. DRAIN ENGINE COOLANT



2. REMOVE AIR CLEANER CAP, MAF METER AND RESONATOR

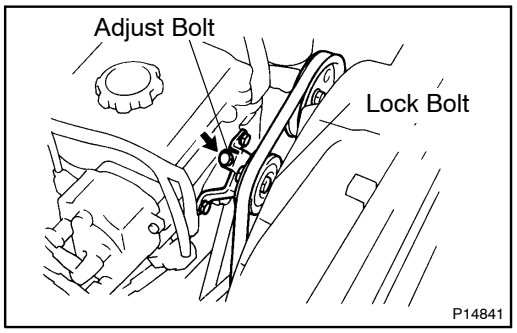
(a) Disconnect the MAF meter connector, IAT sensor connector and wire clamp.
(b) Loosen the air cleaner hose clamp.
(c) Loosen the 4 clips, and remove the air cleaner cap, MAF meter and resonator.

3. M/T:
DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY



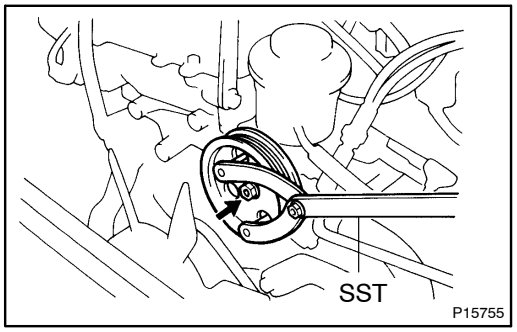
4. REMOVE INTAKE AIR CONNECTOR

(a) Disconnect the 2 air hoses and VS hose.
(b) Remove the 2 bolts, hose clamp and intake air connector.



5. REMOVE PS PUMP DRIVE BELT AND IDLER PULLEY

(a) Loosen the lock bolt and adjusting bolt and remove the drive belt.
(b) Remove the 3 bolts and idler pulley.

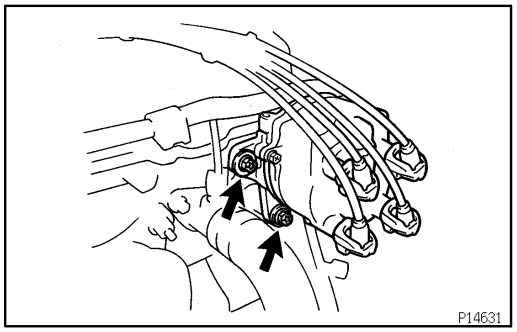


6. REMOVE PS PUMP AND BRACKET

(a) Using SST, remove the nut and PS pump pulley.
SST 09960–10010 (09962–01000, 09963–01000)
(b) Disconnect the 2 air hoses from air intake chamber.
(c) Remove the 2 bolts, and disconnect the PS pump.
(d) Remove the 4 bolts and PS pump bracket.

7. REMOVE NO.1 AND NO.2 PCV HOSES

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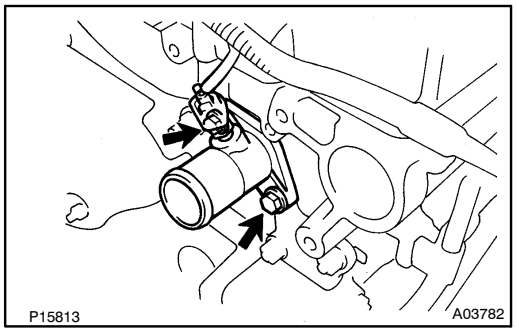


8. REMOVE DISTRIBUTOR

NOTICE:

Pulling on or bending the cords may damage the conductor inside.

(a) Disconnect the distributor connector.
(b) Remove the hold–down bolts and distributor.
(c) Remove the O–ring.



9. REMOVE WATER OUTLET

(a) Disconnect the radiator inlet hose.
(b) Disconnect the ECT sender gauge connector.
(c) Remove the 2 bolts, water outlet and gasket.

10. REMOVE THROTTLE BODY (See page MF–28)

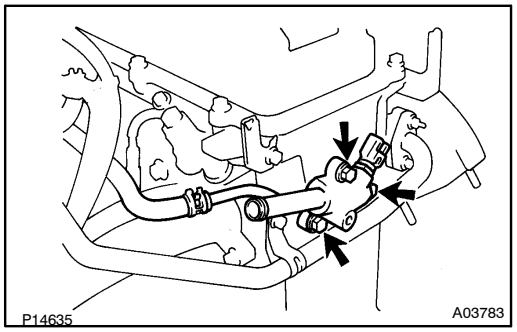
11. DISCONNECT ENGINE WIRE

(a) Disconnect these connectors:
- w/ A/C:
  A/C compressor connector
- Oil pressure sensor connector
- ECT sensor connector
- EGR gas temperature sensor connector
- EGR VSV connector

(b) Remove the 2 bolts and disconnect engine wire from the intake chamber.
(c) Disconnect the 5 engine wire clamps and engine wire.
(d) Disconnect these connectors:
- Knock sensor connector
- Crankshaft position sensor connector
- Fuel pressure control VSV connector

(e) Disconnect the DLC1 from the bracket.
(f) Disconnect the 2 engine wire clamps.
(g) Remove the bolt and disconnect the engine wire.

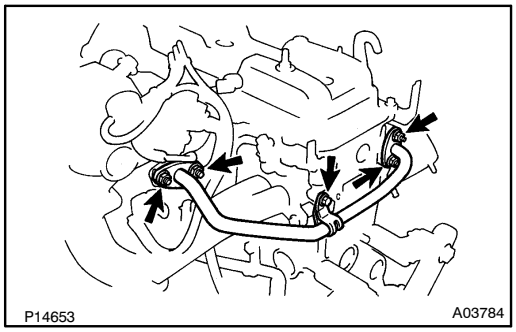
12. DISCONNECT INJECTOR CONNECTORS



13. REMOVE CYLINDER HEAD REAR COVER

(a) Disconnect the heater water bypass hose.
(b) Remove the 3 bolts and the rear cover and gasket.

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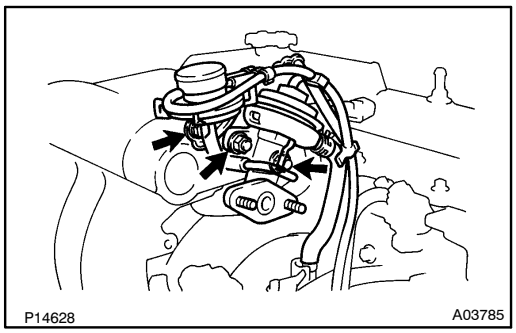


14. REMOVE EGR VALVE AND VACUUM MODULATOR

(a) Remove the bolt, 4 nuts, EGR pipe and 2 gaskets.

(b) Disconnect these hoses:

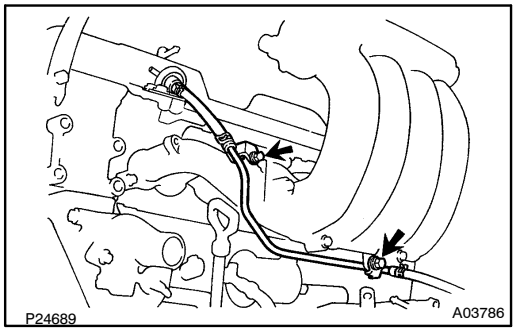
- 2 vacuum hoses from EGR VSV (with clamp)
- Water bypass hose from water bypass pipe



(c) Remove the bolt, 2 nuts, EGR valve, vacuum modulator and gasket.

15. REMOVE INTAKE CHAMBER STAY

Remove the 2 bolts and intake chamber stay.

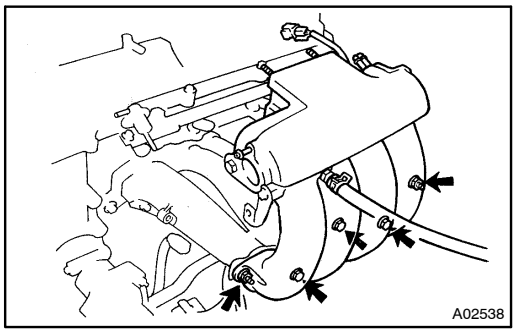


16. REMOVE FUEL RETURN PIPE

(a) Disconnect these hoses:

- Fuel return hose from fuel pressure regulator
- Fuel return hose from fuel return pipe

(b) Remove the 2 bolts and fuel return pipe.

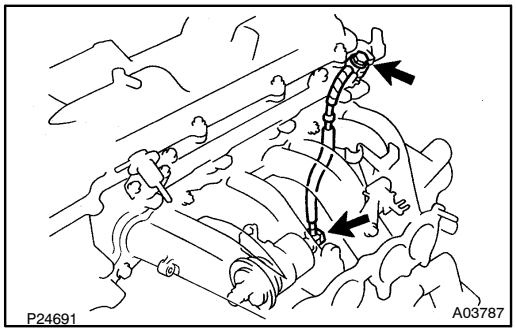


17. REMOVE AIR INTAKE CHAMBER

(a) Disconnect the vacuum hose from the gas filter.

(b) Disconnect the brake booster vacuum hose from intake chamber.

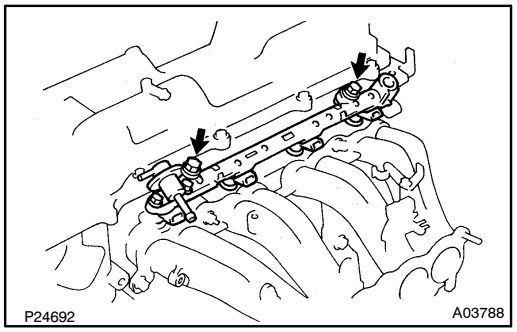
(c) Remove the 3 bolts, 2 nuts, air intake chamber and gasket.



18. REMOVE FUEL INLET TUBE

Remove the 2 union bolts, 4 gaskets and fuel inlet tube.

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19. REMOVE DELIVERY PIPE AND INJECTORS

(a) Disconnect the vacuum hose from the fuel pressure regulator.

(b) Remove the 2 bolts and delivery pipe together with the 4 injectors.

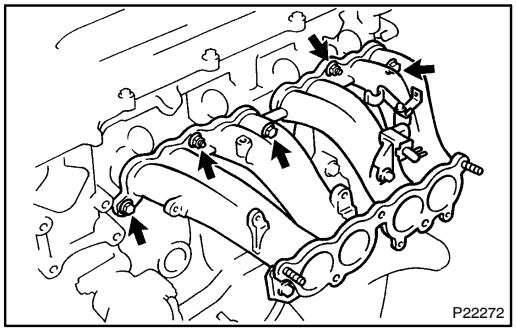
NOTICE:

Be careful not to drop the injectors when removing the delivery pipe.

(c) Remove the 4 insulators from the 4 spacers.

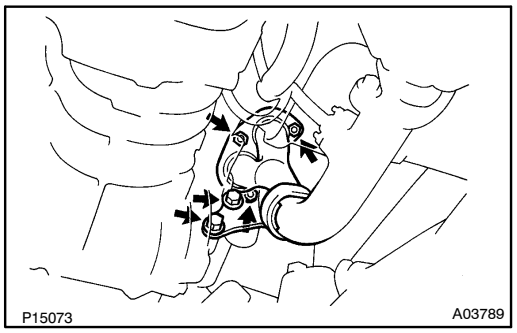
(d) Pull out the 4 injectors from the delivery pipe.

(e) Remove the O–ring and grommet from each injector.



20. REMOVE INTAKE MANIFOLD

Remove the 3 bolts, 2 nuts, intake manifold and gasket.



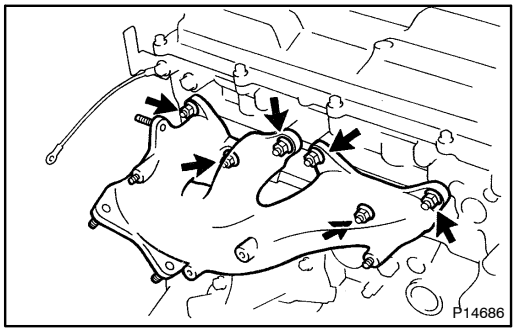
21. REMOVE FRONT EXHAUST PIPE

(a) Remove the 2 bolts, and retainer holding the front exhaust pipe from the TWC.

(b) Loosen the clamp bolt and disconnect the clamp from the support bracket.

(c) Remove the 2 bolts and support bracket.

(d) Remove the 3 nuts, front exhaust pipe and 3 gaskets.



22. REMOVE EXHAUST MANIFOLD

(a) Remove the 2 bolts, 2 nuts and heat insulator.

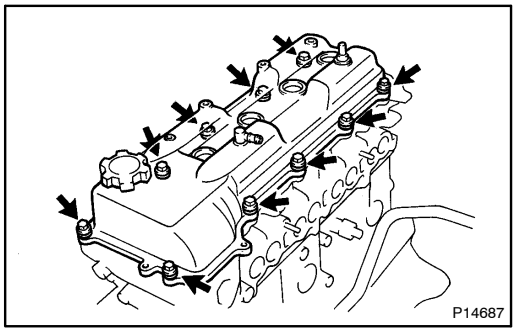
(b) Remove the 6 nuts, exhaust manifold and gasket.

23. REMOVE NO.1 ENGINE HANGER

(a) Remove the bolt and No.1 engine hanger.

(b) Remove the bolt and ground strap.

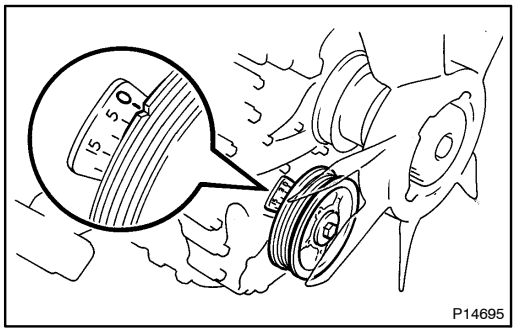
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24. REMOVE CYLINDER HEAD COVER

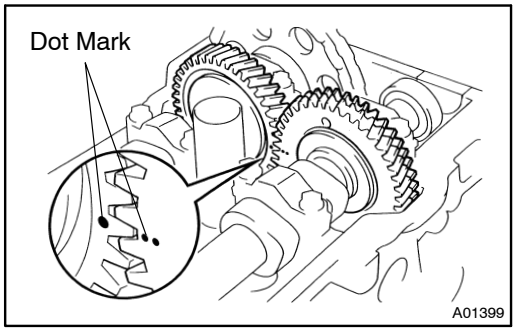
Remove the 10 bolts, cylinder head cover and gasket.

25. REMOVE SPARK PLUGS

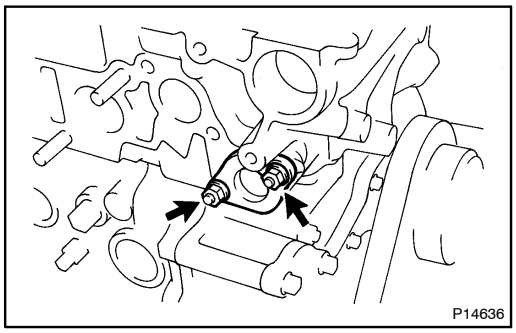


26. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley clockwise and align its groove with the ”0” mark on the timing chain cover.

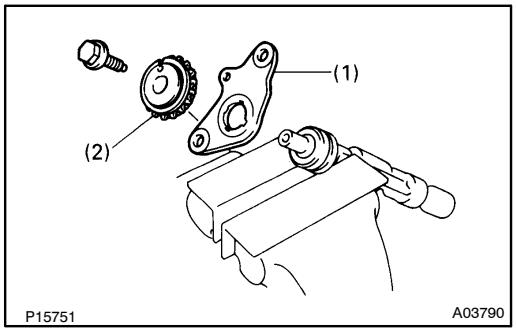


(b) Check that the timing marks (1 and 2 dots) of the camshaft drive and driven gears are in straight line on the cylinder head surface as shown in the illustration. If not, turn the crankshaft 1 revolution (360˚) and align the marks as above.



27. REMOVE CHAIN TENSIONER

Remove the 2 nuts, chain tensioner and gasket.

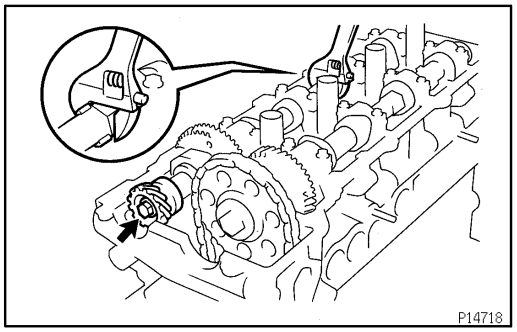


28. REMOVE CAMSHAFT TIMING GEAR

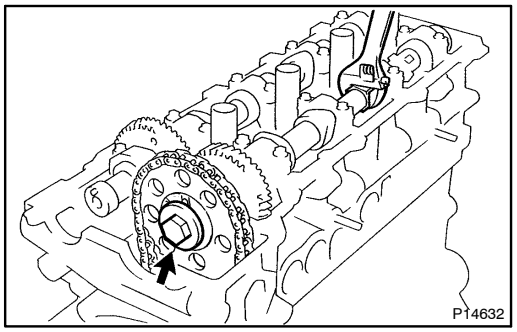
(a) Remove the 2 semi–circular plugs.

(b) Place the matchmarks on the camshaft timing gear and No.1 timing chain.

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(c) Hold the exhaust camshaft with a wrench, remove the bolt and distributor gear.



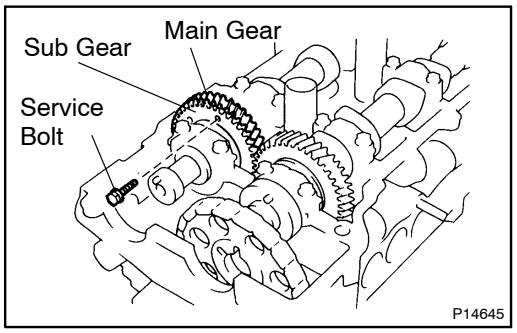
(d) Hold the intake camshaft with a wrench and remove the bolt.

(e) Remove the camshaft timing gear and chain from the intake camshaft and leave on the slipper and damper.

29. REMOVE CAMSHAFTS

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



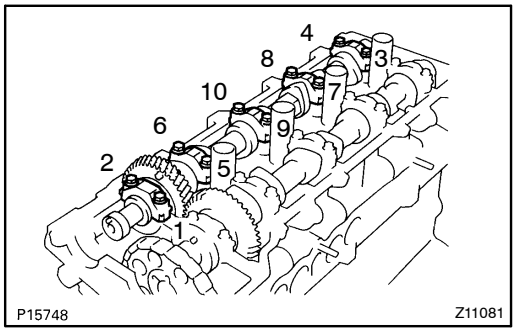
(a) Remove exhaust camshaft.

(1) Bring a service bolt hole of the driven sub–gear upward by turning the hexagon wrench head portion of the exhaust camshaft with a wrench.

(2) Secure the exhaust camshaft sub–gear to the main gear with a service bolt.

Recommended service bolt:

Thread diameter 6 mm (0.24 in.)
Thread pitch 1.0 mm (0.039 in.)
Bolt length 16 – 20 mm (0.63 – 0.79 in.)



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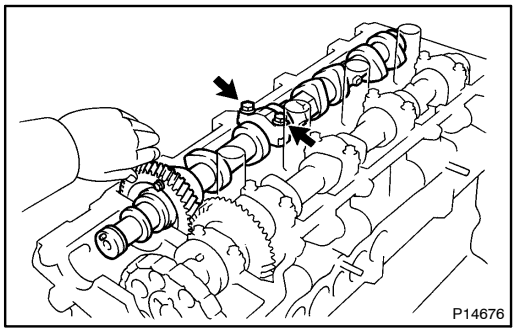
HINT:
When removing the camshaft, make sure that the torsional spring force of the sub–gear has been eliminated by the above operation.

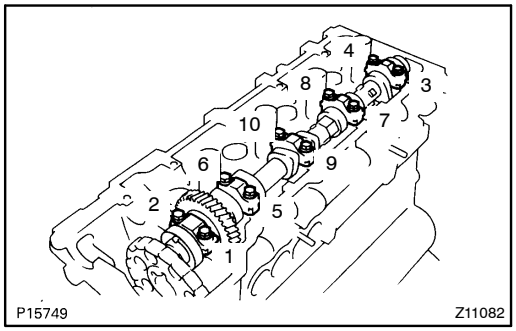
(b) Uniformly loosen and remove the 10 bearing cap bolts in several passes, in the sequence shown.

(c) Remove the 5 bearing caps and camshaft.

HINT:
If the camshaft is not being lifted out straight and level, reinstall the No.3 bearing cap with the 2 bolts. Then alternately loosen and remove the bearing cap bolts with the camshaft gear pulled up.

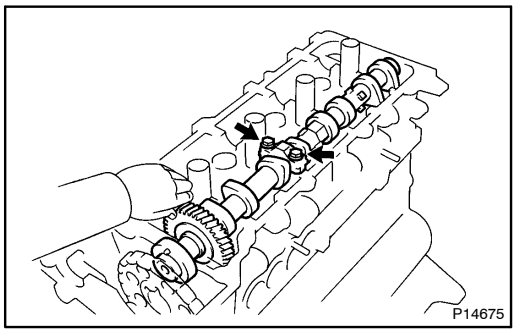
NOTICE:
Do not pry on or attempt to force the camshaft with a tool or other object.


P14676



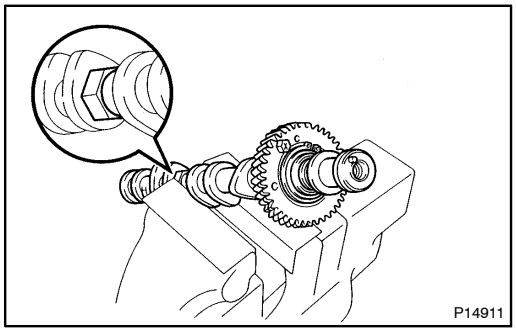
P15749 Z11082

(d) Remove intake camshaft.
(1) Uniformly loosen and remove 10 bearing cap bolts in several passes, in the sequence shown.
(2) Remove the 5 bearing caps and camshaft.


P14675

HINT:
If the camshaft is not being lifted out straight and level, reinstall the No.3 bearing cap with the 2 bolts. Then alternately loosen and remove the 2 bearing cap bolts with the camshaft gear pulled up.

NOTICE:
Do not pry on or attempt to force the camshaft with a tool or other object.

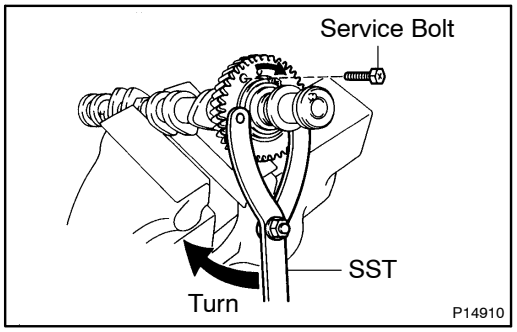

P14911

30. DISASSEMBLE EXHAUST CAMSHAFT

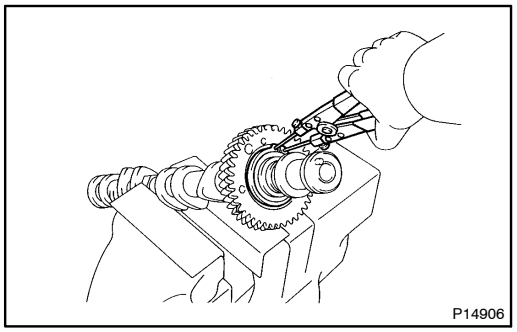
(a) Mount the hexagon wrench head portion of the camshaft in a vise.

NOTICE:
Be careful not to damage the camshaft.

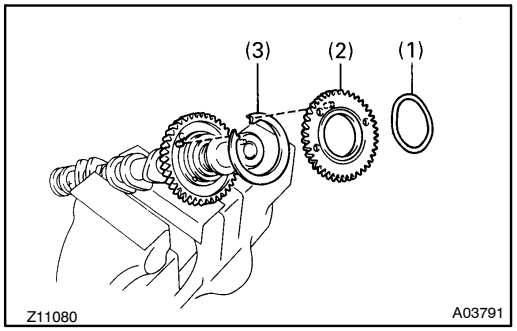
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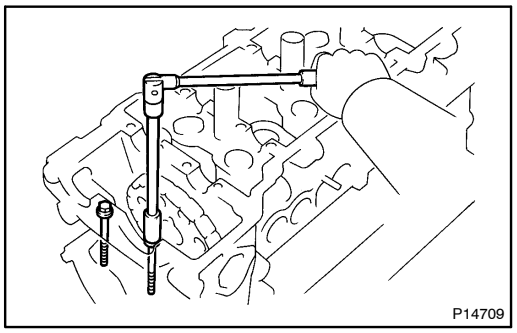
(b) Using SST, turn the sub–gear clockwise, and remove a service bolt.
SST 09960–10010 (09962–01000, 09963–00500)



(c) Using snap ring pliers, remove the snap ring.



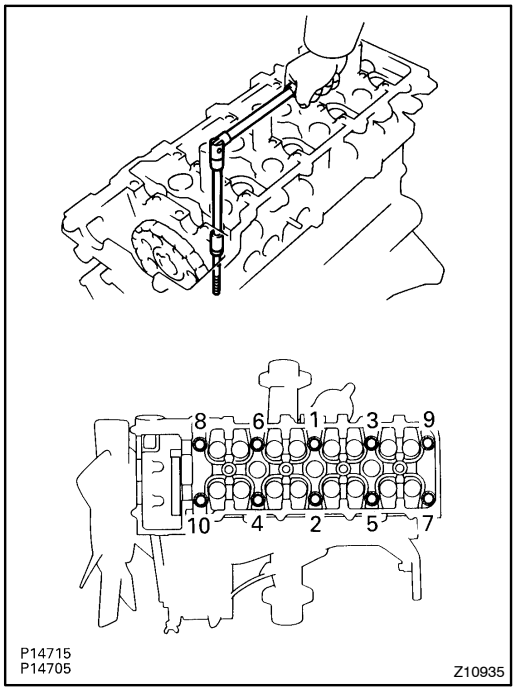
(d) Remove these parts:
(1) Wave washer
(2) Camshaft sub–gear
(3) Camshaft gear spring



31. REMOVE CYLINDER HEAD

(a) Remove the 2 bolts in front of the head before the other head bolts are removed.

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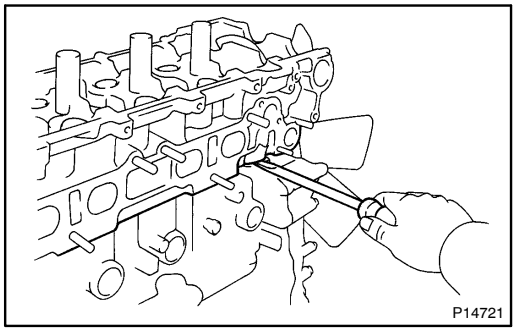


(b) Uniformly loosen and remove the 10 cylinder head bolts, in several passes, in the sequence shown.

NOTICE:

Cylinder head warpage or cracking could result from removing bolts in incorrect order.

(c) Lift the cylinder head from the dowels on the cylinder block, and place the cylinder head on wooden blocks on a bench.



HINT:

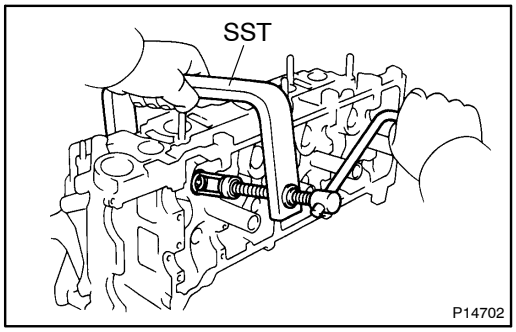
If the cylinder head is difficult to lift off, pry between the cylinder head and cylinder block with a screwdriver.

NOTICE:

Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

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EM079–02



DISASSEMBLY

1. REMOVE VALVE LIFTERS AND SHIMS

HINT:

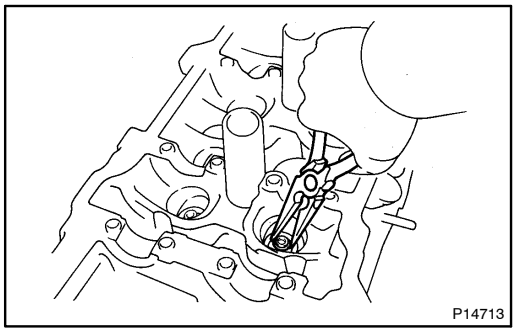
Arrange the valve lifters and shims in correct order.

2. REMOVE VALVES

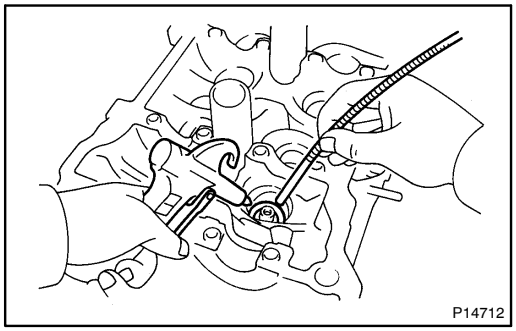
(a) Using SST, compress the valve spring and remove the 2 keepers.

SST 09202–70020

(b) Remove the spring retainer, valve spring and valve.



(c) Using needle–nose pliers, remove the oil seal.



(d) Using compressed air and a magnetic finger, remove the spring seat by blowing air.

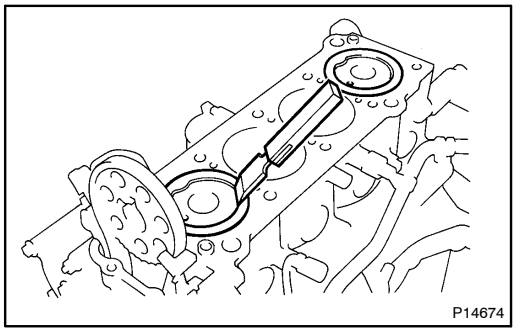
HINT:

Arrange the valves, valve springs, spring seats and spring retainers in correct order.

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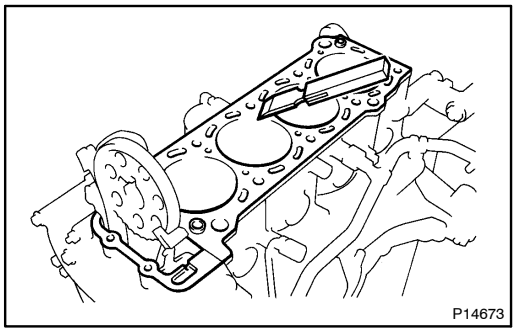
EM07C–03

INSPECTION



1. CLEAN TOP SURFACES OF PISTONS ANDCYLINDER BLOCK

(a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surface.

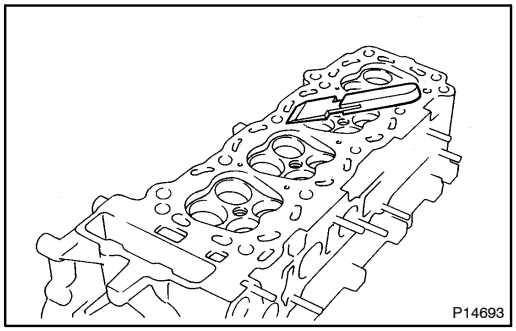


(b) Using a gasket scraper, remove all the gasket material from the cylinder block surface.

(c) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION:

Protect your eyes when using high–compressed air.

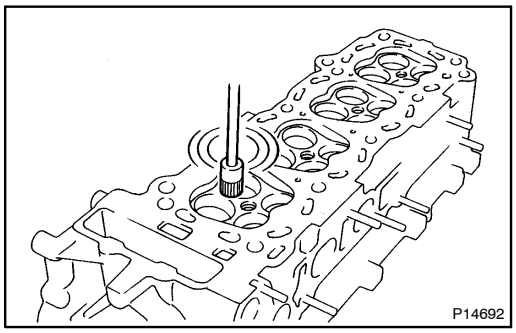


2. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all the gasket material from the cylinder block contact surface.

NOTICE:

Be careful not to scratch the cylinder block contact surface.

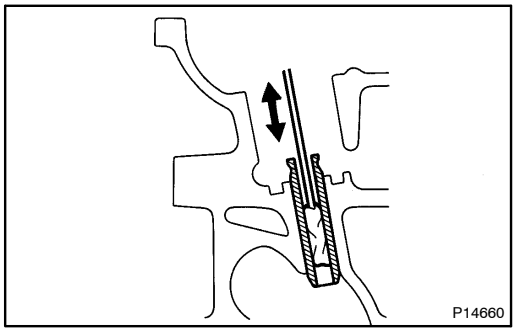


3. CLEAN COMBUSTION CHAMBERS

Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE:

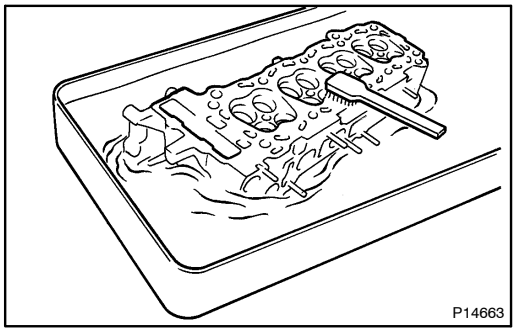
Be careful not to scratch the cylinder block contact surface.



4. CLEAN VALVE GUIDE BUSHINGS

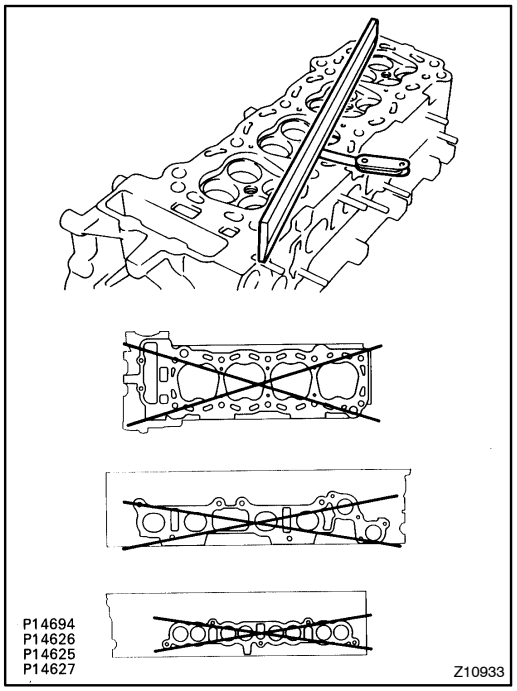
Using a valve guide bushing brush and solvent, clean all the guide bushings.

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5. CLEAN CYLINDER HEAD

Using a soft brush and solvent, thoroughly clean the cylinder head.

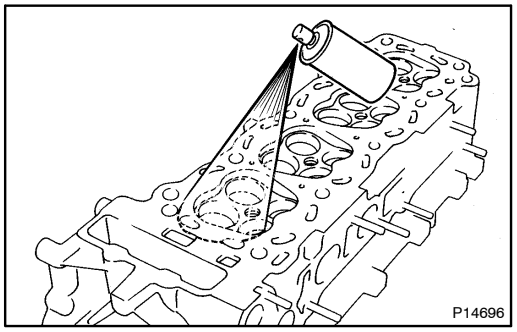


6. INSPECT FOR FLATNESS

Using a precision straight edge and thickness gauge, measure the surfaces contacting the cylinder block and the manifolds for warpage.

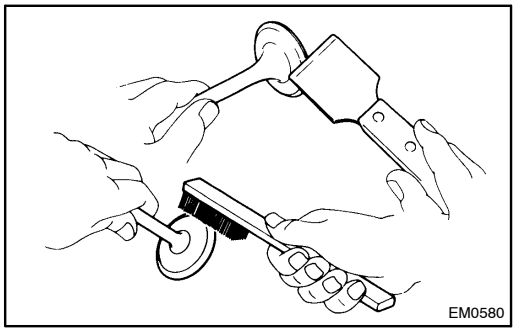
Maximum warpage:
Cylinder block side
0.05 mm (0.0020 in.)
Manifold side
0.10 mm (0.0039 in.)

If warpage is greater than maximum, replace the cylinder head.



7. INSPECT FOR CRACKS

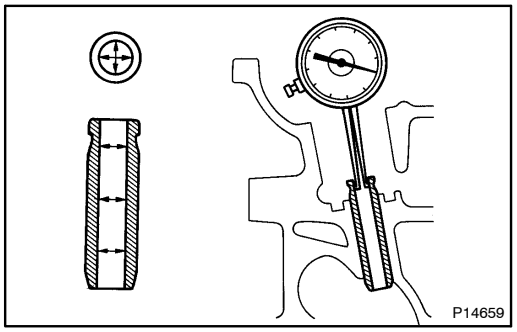
Using a dye penetrant, check the combustion chambers, intake ports, exhaust ports and cylinder block surface for cracks.
If cracked, replace the cylinder head.



8. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.
(b) Using a wire brush, thoroughly clean the valve.

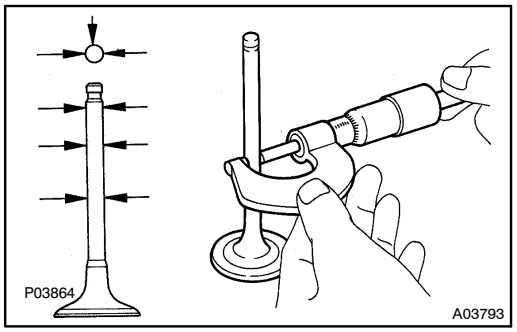
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9. INSPECT VALVE STEMS AND GUIDE BUSHINGS

(a) Using a caliper gauge, measure the inside diameter of the guide bushing.

Bushing inside diameter:
6.010 – 6.030 mm (0.2366 – 0.2374 in.)



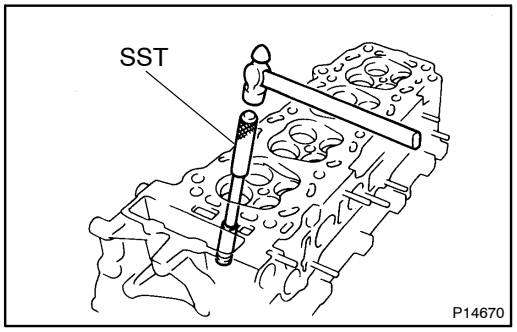
(b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:
Intake
5.970 – 5.985 mm (0.2350 – 0.2356 in.)
Exhaust
5.965 – 5.980 mm (0.2348 – 0.2354 in.)

(c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

Standard oil clearance:
Intake
0.025 – 0.060 mm (0.0010 – 0.0024 in.)
Exhaust
0.030 – 0.065 mm (0.0012 – 0.0026 in.)
Maximum oil clearance:
Intake
0.08 mm (0.0031 in.)
Exhaust
0.10 mm (0.0039 in.)

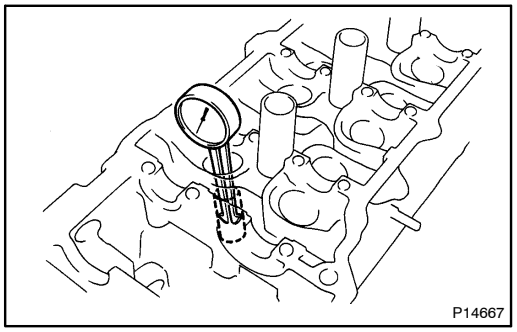
If the clearance is greater than maximum, replace the valve and guide bushing.



10. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

(a) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).

(b) Using SST and a hammer, tap out the guide bushing.
SST 09201–10000 (09201–01060),
09550–10012 (09252–10010)



(c) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

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Both intake and exhaust

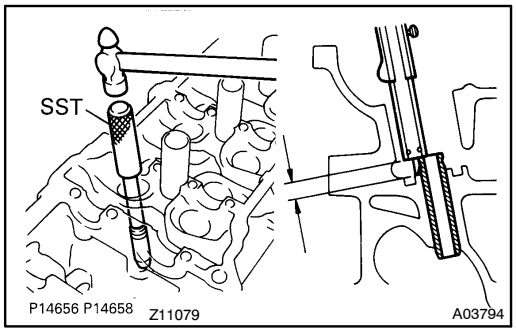
Bushing bore diameter mm (in.)	Bushing size
11.000 – 11.027 (0.4331 – 0.4341)	Use STD
11.050 – 11.077 (0.4350 – 0.4361)	Use O/S 0.05

(d) Select a new guide bushing (STD size or O/S 0.05).

If the bushing bore diameter of the cylinder head is greater than 11.027 mm (0.4341 in.), machine the bushing bore to these dimension:

11.050 – 11.077 mm (0.4350 – 0.4361 in.)

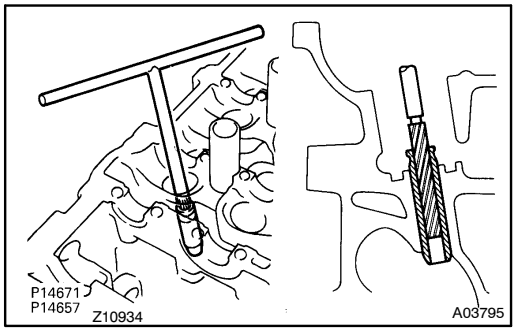
If the bushing bore diameter of the cylinder head is greater than 11.077 mm (0.4361 in.), replace the cylinder head.



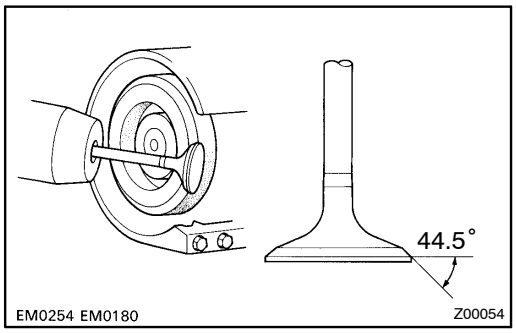
(e) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).

(f) Using SST and a hammer, tap in a new guide bushing to where there 8.2 – 8.6 mm (0.323 – 0.339 in.) protruding from the cylinder head.

SST 09201–10000 (09201–01060), 09550–10012 (09252–10010)



(g) Using a sharp 6 mm reamer, ream the guide bushing to obtain the standard specified clearance (See step 9 above) between the guide bushing and valve stem.

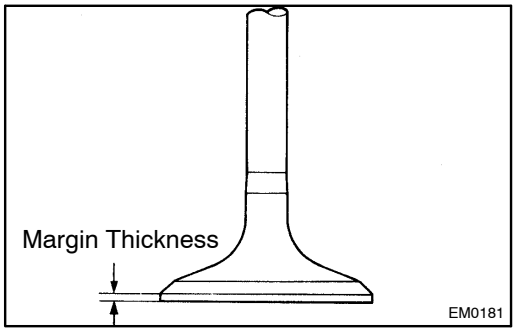


11. INSPECT AND GRIND VALVES

(a) Grind the valve enough to remove pits and carbon.

(b) Check that the valve is ground to the correct valve face angle.

Valve face angle:
44.5°

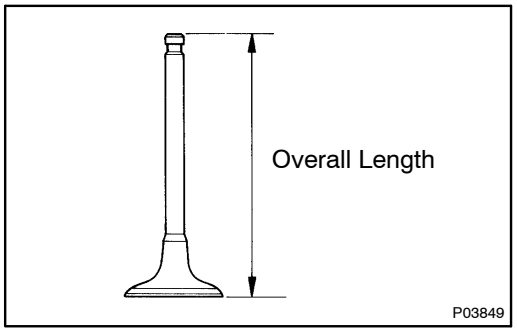


(c) Check the valve head margin thickness.

Standard margin thickness:
1.0 mm (0.039 in.)
Minimum margin thickness:
0.5 mm (0.020 in.)

If the margin thickness is less than minimum, replace the valve.

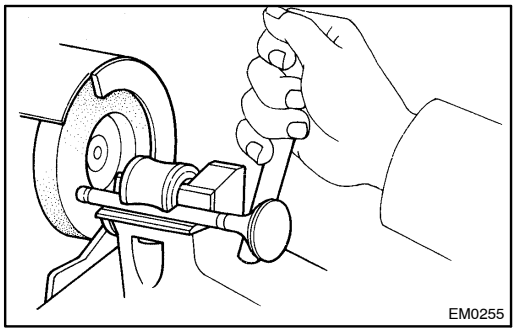
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(d) Check the valve overall length.

Standard overall length:
Intake
103.45 mm (4.0728 in.)
Exhaust
103.60 mm (4.0787 in.)
Minimum overall length:
Intake
102.95 mm (4.0531 in.)
Exhaust
103.10 mm (4.0590 in.)

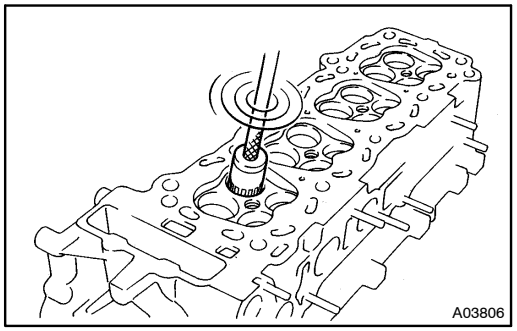
If the overall length is less than minimum, replace the valve.



(e) Check the surface of the valve stem tip for wear.

If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

NOTICE:
Do not grind off more than minimum.



12. INSPECT AND CLEAN VALVE SEATS

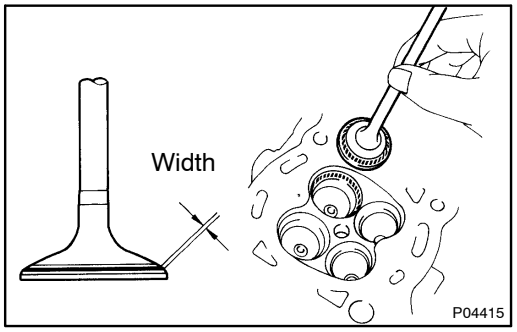
(a) Using a 45° carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.

(b) Check the valve seating position.
Apply a light coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate valve.

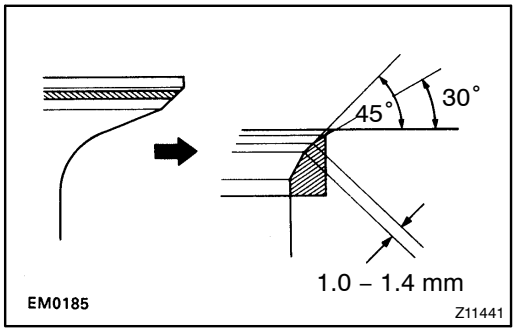
(c) Check the valve face and seat for these:

- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with these width:

1.0 – 1.4 mm (0.039 – 0.055 in.)

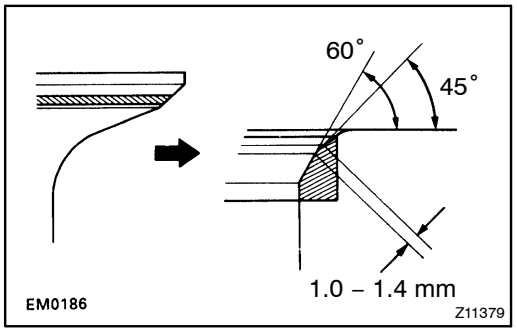


If not, correct the valve seats as follows:

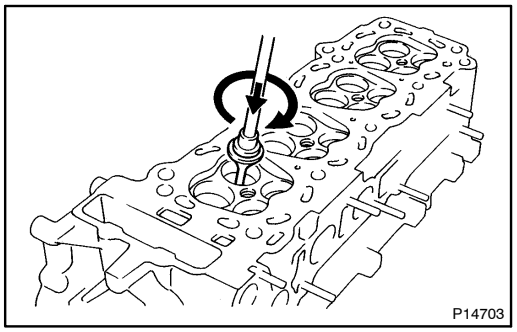


- Intake:
  If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

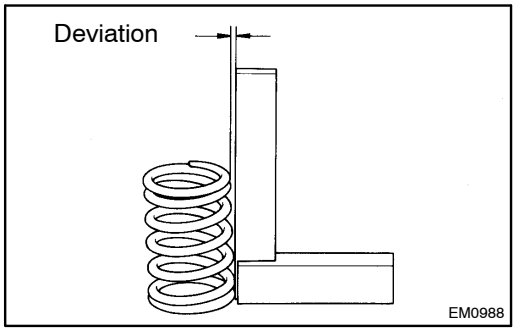
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- If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.



(d) Hand–lap the valve and valve seat with an abrasive compound.
(e) After hand–lapping, clean the valve and valve seat.

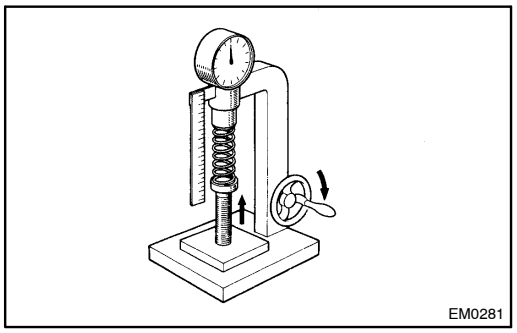


13. INSPECT VALVE SPRINGS

(a) Using a steel square, measure the deviation of the valve spring.

Maximum deviation:
2.0 mm (0.079 in.)

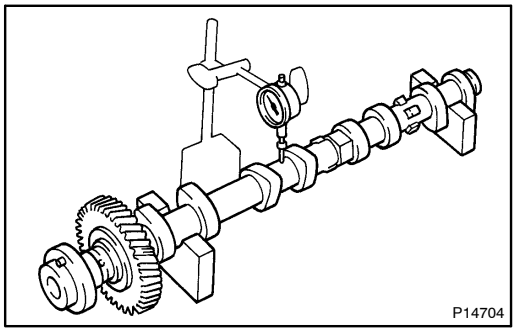
If the deviation is greater than maximum, replace the valve spring.



(b) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:
177 – 204 N (18.0 – 20.8 kgf, 45.9 – 39.7 lbf)
at 35.7 mm (1.406 in.)

If the installed tension is not as specified, replace the valve spring.



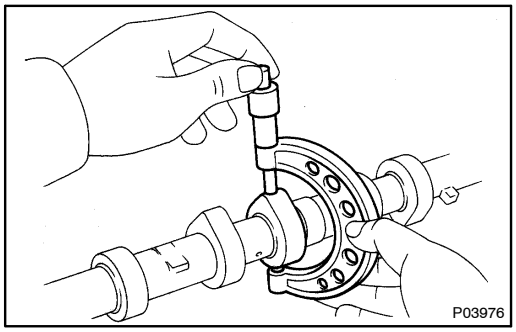
14. INSPECT CAMSHAFT FOR RUNOUT

(a) Place the camshaft on V–blocks.
(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:
0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the camshaft.

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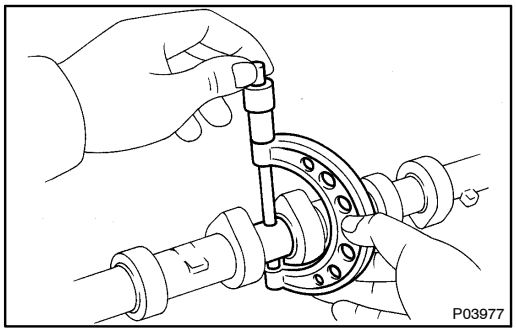


15. INSPECT CAM LOBES

Using a micrometer, measure the cam lobe height.

Standard cam lobe height:
Intake
45.31 – 45.41 mm (1.7839 – 1.7878 in.)
Exhaust
45.06 – 45.16 mm (1.7740 – 1.7779 in.)

If the cam lobe height is less than standard allowable, replace the camshaft.



16. INSPECT CAMSHAFT JOURNALS

Using a micrometer, measure the journal diameter.

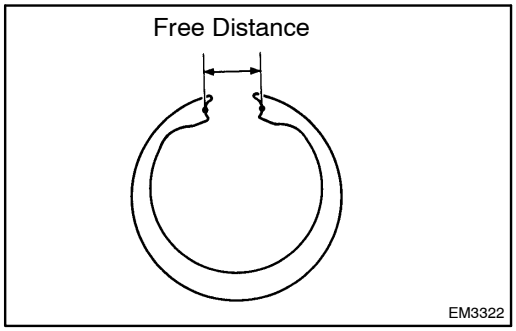
Journal diameter:
26.959 – 26.975 mm (1.0614 – 1.0620 in.)

If the journal diameter is not as specified, check the oil clearance.

17. INSPECT CAMSHAFT BEARING

Check the bearings for flaking and scoring.

If the bearings are damaged, replace the bearing caps and cylinder head as a set.

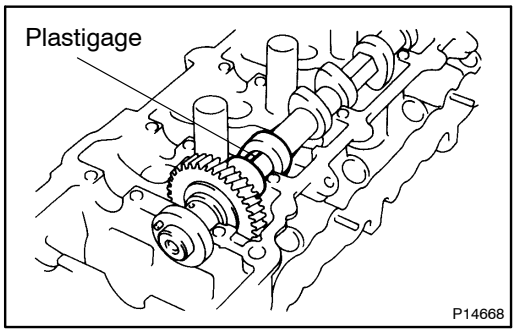


18. INSPECT CAMSHAFT GEAR SPRING

Using a vernier caliper, measure the free distance between the spring ends.

Free distance:
22.5 – 22.9 mm (0.886 – 0.902 in.)

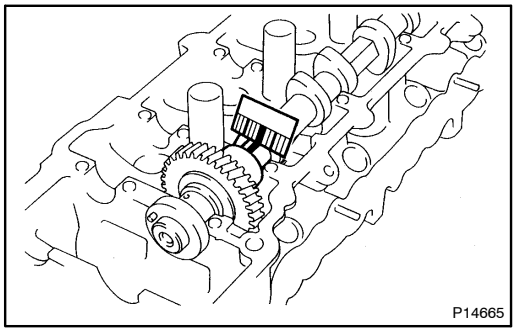
If the free distance is not as specified, replace the gear spring.



19. INSPECT CAMSHAFT JOURNAL OIL CLEARANCE

(a) Clean the bearing caps and camshaft journals.
(b) Place the camshafts on the cylinder head.
(c) Lay a strip of Plastigage across each of the camshaft journals.
(d) Install the bearing caps (See page EM–50).
Torque: 15.5 N·m (160 kgf·cm, 12 ft·lbf)

NOTICE:
Do not turn the camshaft.



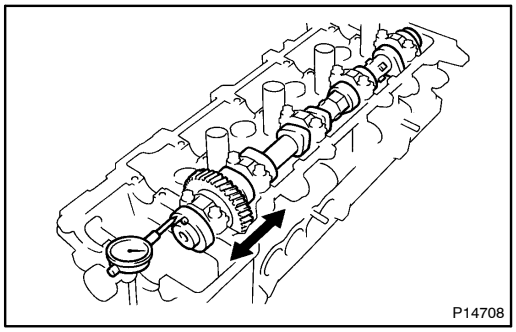
(e) Remove the bearing caps.
(f) Measure the Plastigage at its widest point.

Standard oil clearance:
0.025 – 0.062 mm (0.0010 – 0.0024 in.)
Maximum oil clearance:
0.08 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(g) Completely remove the Plastigage.

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P14708

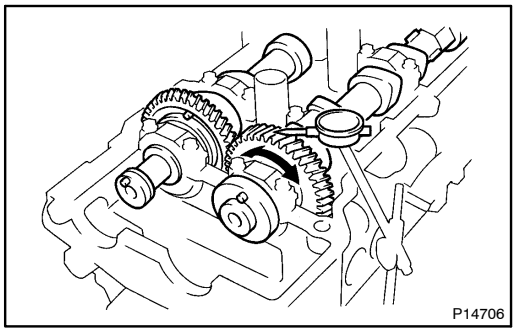
20. INSPECT CAMSHAFT THRUST CLEARANCE

(a) Install the camshaft (See page EM–50).

(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

Standard thrust clearance:
0.040 – 0.095 mm (0.0016 – 0.0037 in.)
Maximum thrust clearance:
0.12 mm (0.0047 in.)

If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.


P14706

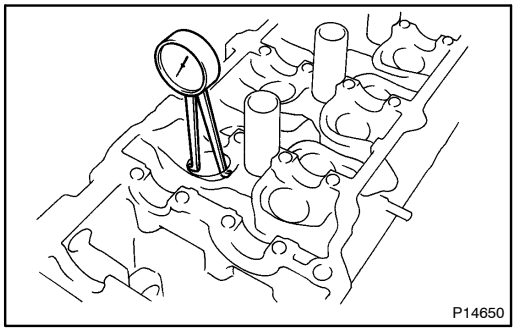
21. INSPECT CAMSHAFT GEAR BACKLASH

(a) Install the camshafts without installing the exhaust cam sub–gear (See page EM–50).

(b) Using a dial indicator, measure the backlash.

Standard backlash:
0.020 – 0.200 mm (0.0008 – 0.0079 in.)
Maximum backlash:
0.30 mm (0.0188 in.)

If the backlash is greater than maximum, replace the camshafts.


P14650

22. INSPECT VALVE LIFTERS AND LIFTER BORES

(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

Lifter bore diameter:
31.000 – 31.016 mm (1.2205 – 1.2211 in.)

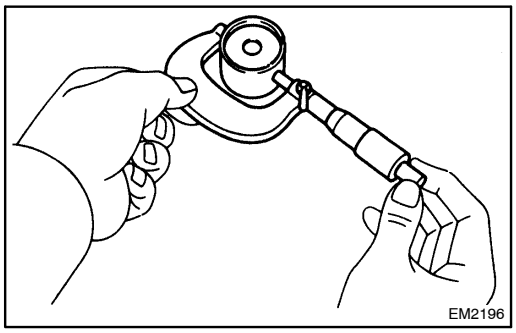
(b) Using a micrometer, measure the lifter diameter.

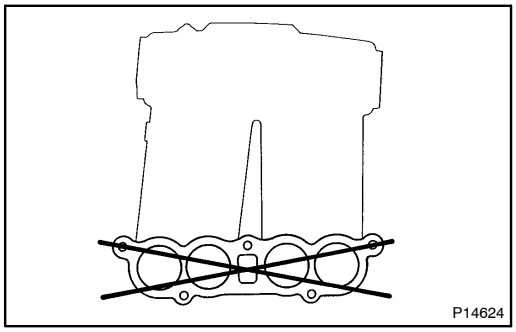
Lifter diameter:
30.966 – 30.976 mm (1.1578 – 1.2195 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

Standard oil clearance:
0.024 – 0.055 mm (0.0009 – 0.0022 in.)
Maximum oil clearance:
0.07 mm (0.0028 in.)

If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.


EM2196


P14624

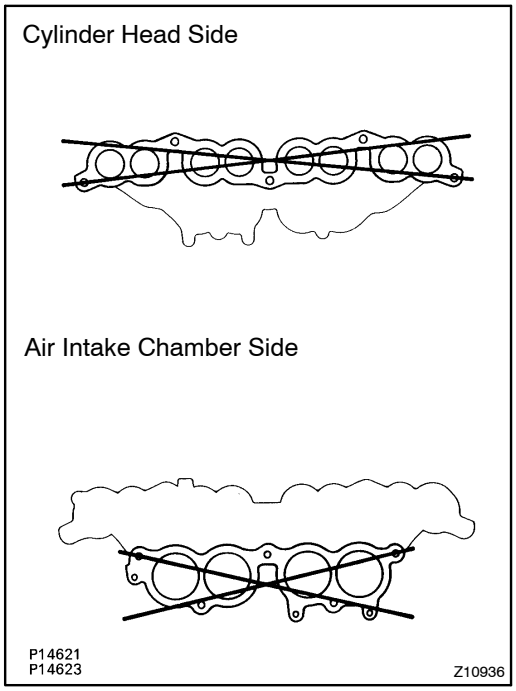
23. INSPECT AIR INTAKE CHAMBER

Using a precision straight edge and thickness gauge, measure the surface contacting the intake manifold for warpage.

Maximum warpage: 0.20 mm (0.0078 in.)

If warpage is greater than maximum, replace the air intake chamber.

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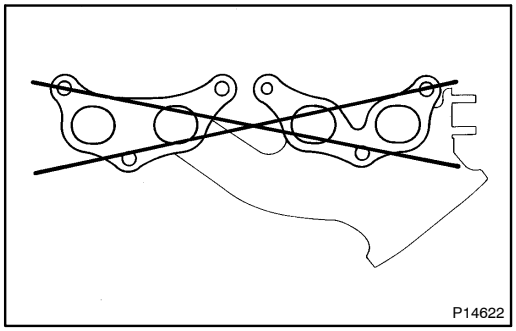


24. INSPECT INTAKE MANIFOLD

Using a precision straight edge and thickness gauge, measure the surface contacting the cylinder head and air intake chamber for warpage.

Maximum warpage: 0.20 mm (0.0078 in.)

If warpage is greater than maximum, replace the manifold.

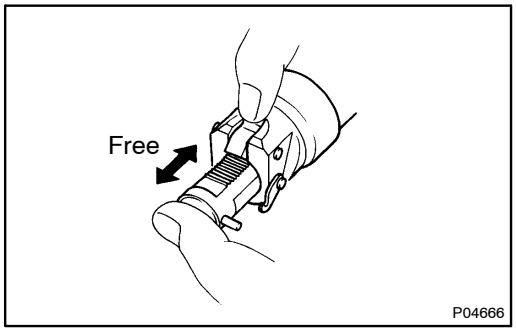


25. INSPECT EXHAUST MANIFOLD

Using a precision straight edge and thickness gauge, measure the surface contacting the cylinder head for warpage.

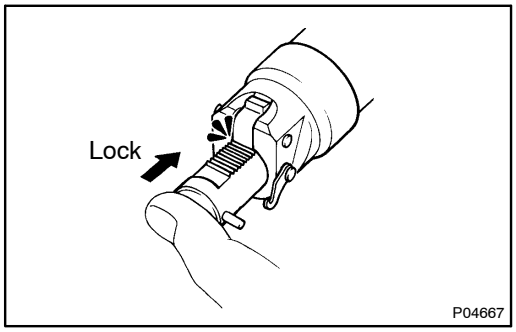
Maximum warpage: 0.50 mm (0.0197 in.)

If warpage is greater than maximum, replace the manifold.



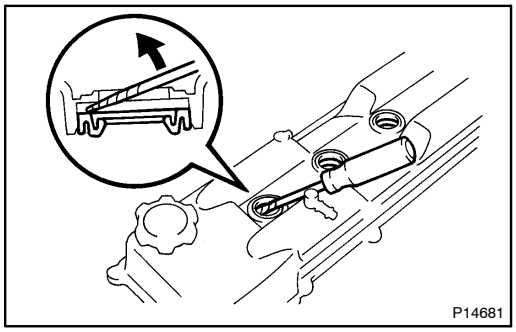
26. INSPECT CHAIN TENSIONER

(a) Check that the plunger moves smoothly when the ratchet pawl is raised with your finger.



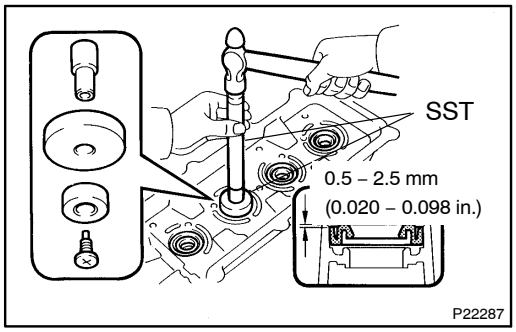
(b) Released the ratchet pawl and check that the plunger is locked in place by the ratchet pawl and does not move when pushed with your finger.

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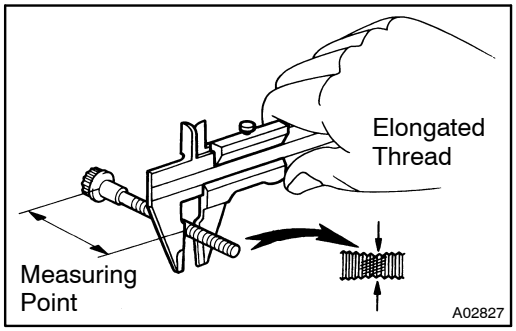
27. IF NECESSARY, REPLACE SPARK PLUG TUBE GASKETS

(a) Using a screwdriver, pry out the tube gasket.



(b) Using SST and a hammer, tap in a new tube gasket as shown in the illustration.
SST 09950–60010 (09951–00260, 09951–00490), 09950–70010 (09951–07150)

(c) Apply a light coat of MP grease to the gasket lip.



28. INSPECT CYLINDER HEAD BOLTS

Using vernier calipers, measure the minimum diameter of the elongate d thread at the measuring point.

Standard diameter:
10.76 – 10.97 mm (0.4236 – 0.4319 in.)
Minimum diameter:
10.40 mm (0.4094 in.)

If the diameter is less than minimum, replace the bolt.

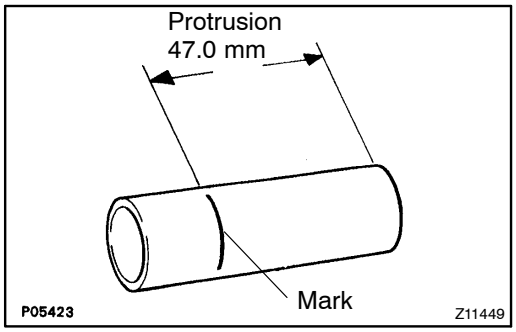
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EM07D–02

REASSEMBLY

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.



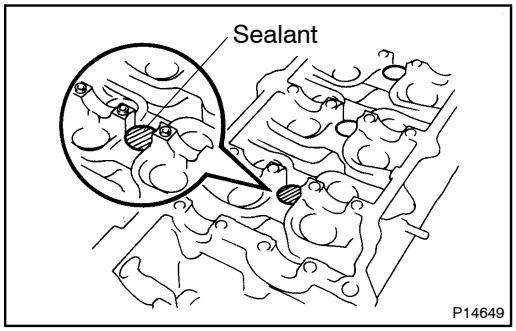
1. INSTALL SPARK PLUG TUBES

HINT:

When using a new cylinder head, spark plug tubes must be installed.

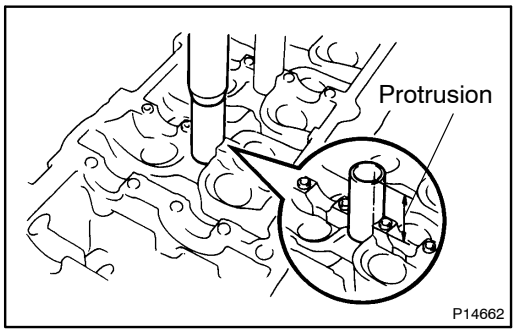
(a) Mark the standard position away from the edge, onto the spark plug tube.

Standard protrusion: 47.0 mm (1.850 in.)



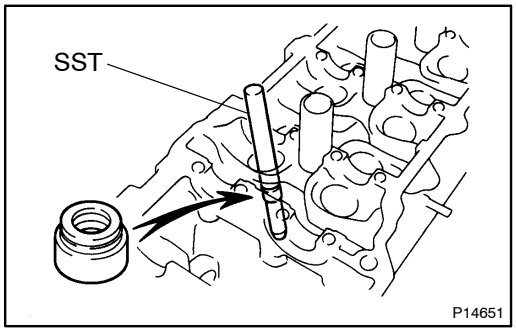
(b) Apply adhesive to the spark plug tube hole of the cylinder head.

Sealant:
Part No.08833–00070, Adhesive 1324, THREE BOND 1324 or equivalent



(c) Using a press, press in a new spark plug tube until there is 47.0 mm (1.850 in.) protruding from the camshaft bearing cap installation surface of the cylinder head.

NOTICE:
Avoid pressing a new spark plug tube in too far by measuring the amount of protrusion while pressing.



2. INSTALL VALVES

(a) Using SST, push in a new oil seal.

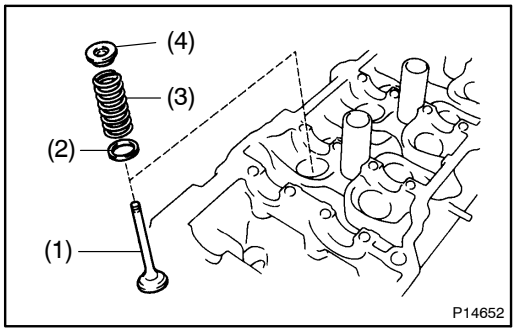
SST 09236–00101 (09236–15010)

HINT:

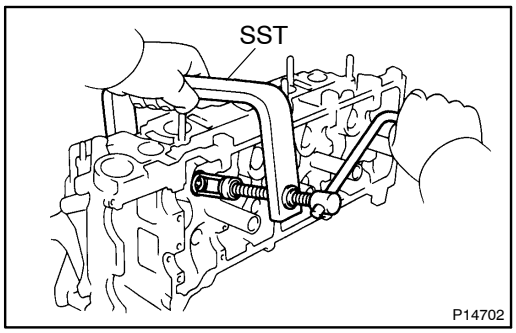
Different oil seals are used for the intake and exhaust.

Code mark (Intake side only): "H"

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(b) Install these parts:
(1) Valve
(2) Spring seat
(3) Valve spring
(4) Spring retainer



(c) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202–70020

(d) Using a plastic–faced hammer, lightly tap the valve stem tip to ensure a proper fit.

3. INSTALL VALVE LIFTERS AND SHIMS

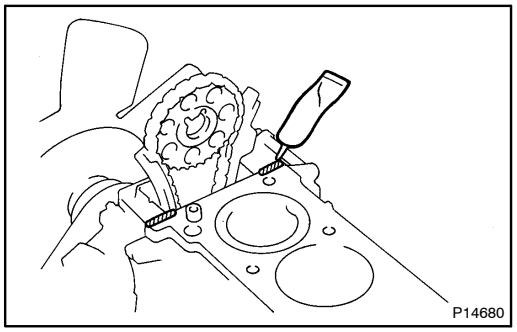
(a) Install the valve lifter and shim.

(b) Check that the valve lifter rotates smoothly by hand.

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EM1OL–01

INSTALLATION



1. PLACE CYLINDER HEAD ON CYLINDER BLOCK

(a) Apply seal packing to the 2 locations as shown.
Seal packing:
Part No. 08826–00080 or equivalent

NOTICE:
Do not apply too much seal packing.

(b) Place a new cylinder head gasket in position on the cylinder block.

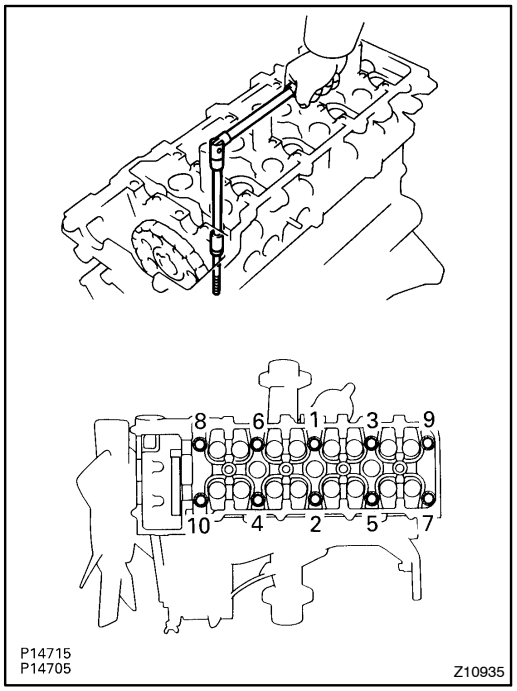
NOTICE:
Be careful of the installation direction.

(c) Place the cylinder head in position on the cylinder head gasket.

2. INSTALL CYLINDER HEAD BOLTS

HINT:

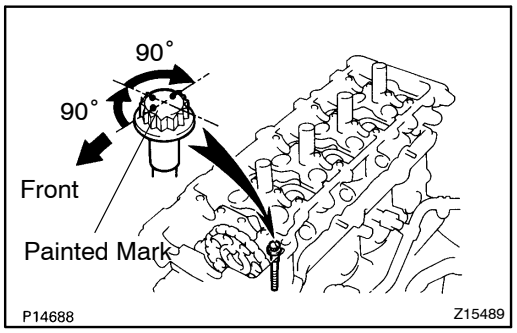
- The cylinder head bolts are tightened in 3 progressive steps (steps (b) and (d)).
- If any cylinder head bolt is broken or deformed, replace it.



(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) Install and uniformly tighten the 10 cylinder head bolts and plate washers in several passes, in the sequence shown.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

If any of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.

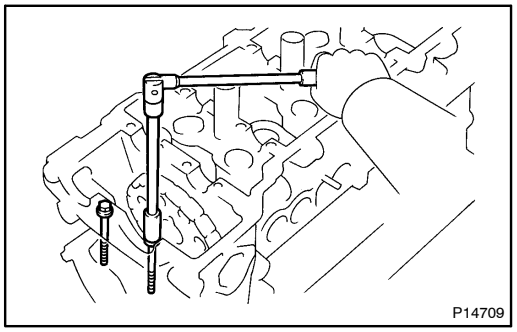


(c) Mark the front of the cylinder head bolt head with paint.

(d) Retighten the cylinder head bolts by 90° in the numerical order shown.

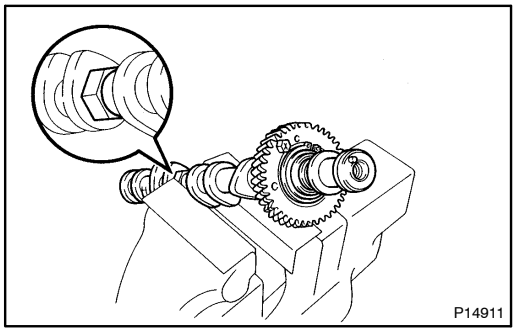
(e) Retighten the cylinder head bolts by an additional 90°.

(f) Check that the painted mark is now facing rearward.



(g) Install and torque the 2 mounting bolts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

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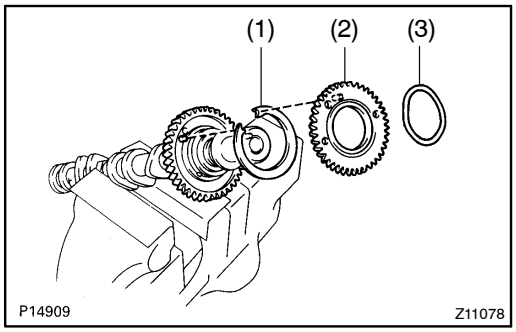


3. ASSEMBLE EXHAUST CAMSHAFT

(a) Mount the hexagon wrench head portion of the camshaft in a vise.

NOTICE:

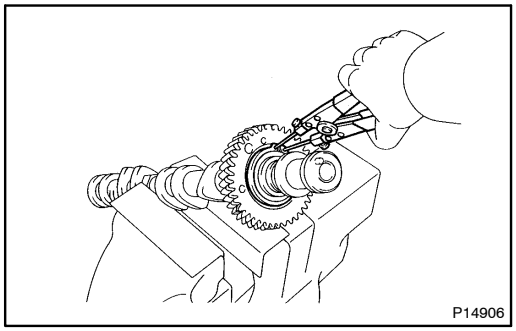
Be careful not to damage the camshaft.



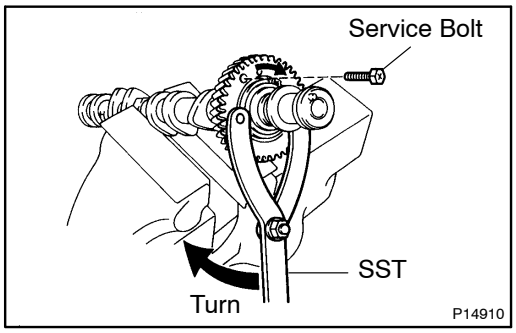
(b) Install these parts:
- (1) Camshaft gear spring
- (2) Camshaft sub–gear
- (3) Wave washer

HINT:

Align the pins on the gears with the spring ends.



(c) Using snap ring pliers, install the snap ring.



(d) Using SST, align the holes of the camshaft main gear and sub–gear by turning sub–gear clockwise, and install a service bolt.

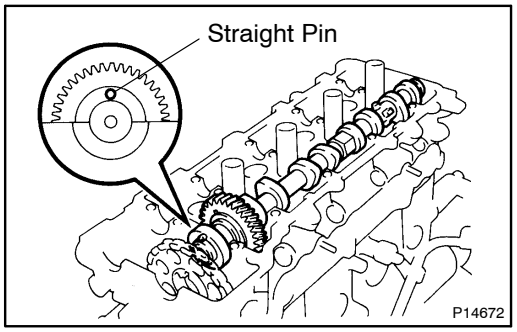
SST 09960–10010 (09962–01000, 09963–00500)

4. INSTALL CAMSHAFTS

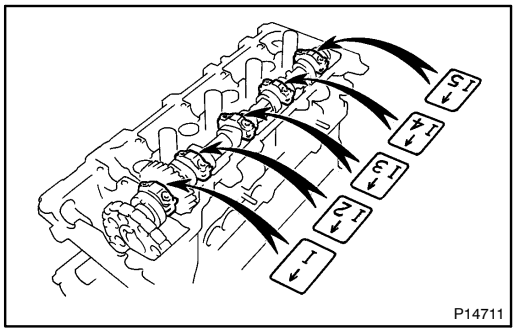
NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be kept level while it is being installed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, these steps should be carried out.

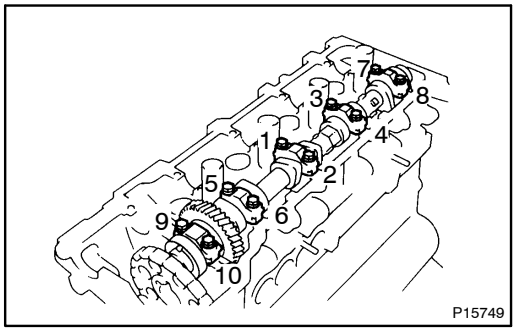
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(a) Install intake camshaft.
(1) Apply MP grease to the thrust portion of the intake camshaft.
(2) Place the intake camshaft with knock pin facing upward of camshaft angle on the cylinder head.

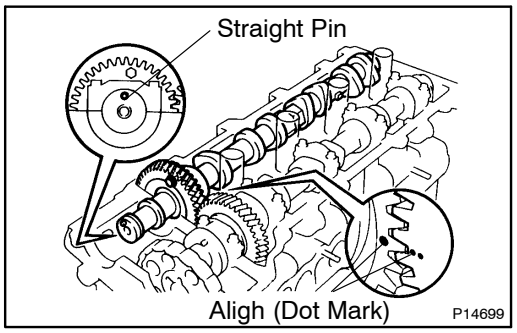


(3) Install the bearing caps in their proper locations.



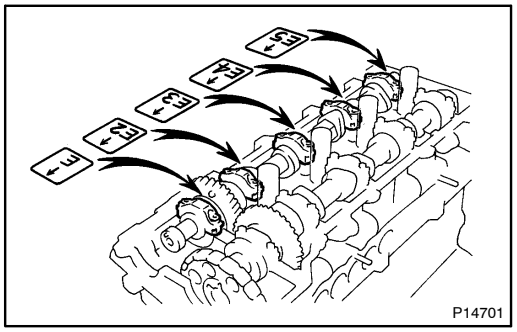
(4) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(5) Install and uniformly tighten the 10 bearing cap bolts in the sequence shown.

Torque: 15.5 N·m (160 kgf·cm, 12 ft·lbf)



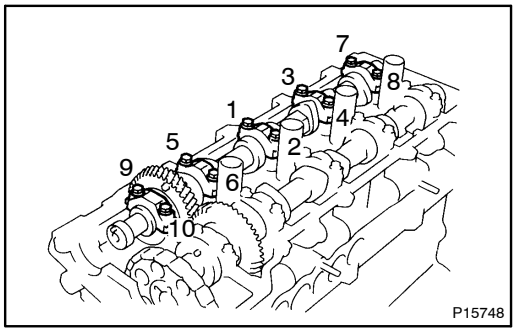
(b) Install exhaust camshaft.
(1) Apply MP grease to the thrust portion of the exhaust camshaft.
(2) Engage the exhaust camshaft gear to the intake camshaft gear by matching the timing marks (1 and 2 dots) on each gear.

NOTICE:
There are also timing marks (for TDC) on each gear as shown in the illustration. Do not use these marks.

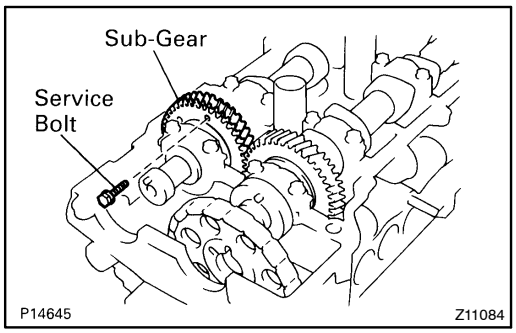


(3) Roll down the exhaust camshaft onto the bearing journals while engaging gears with each other.
(4) Install the bearing caps in their proper locations.

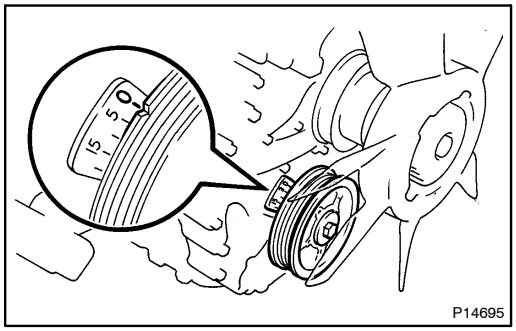
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(5) Apply light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(6) Install and uniformly tighten the 10 bearing cap bolts in several passes in the sequence shown.

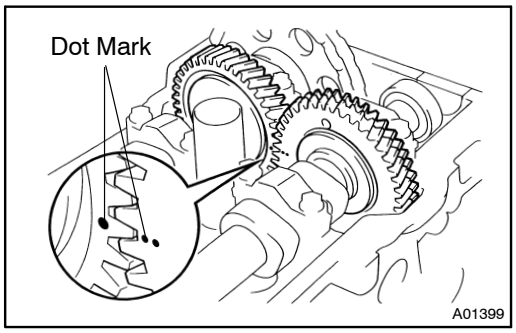


(7) Remove a service bolt.
(8) Check that the intake and exhaust camshafts turn smoothly.

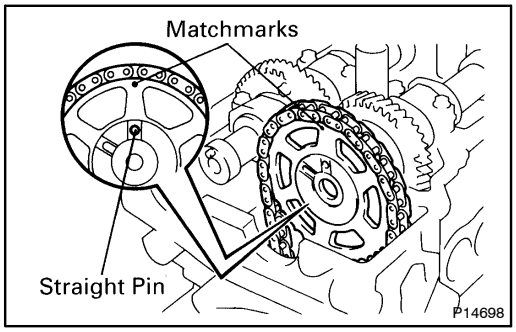


5. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley clockwise, and align its groove with the timing mark ”0” of the timing chain cover.



(b) Turn the camshafts so that the timing marks with one and 2 dots will be in straight line on the cylinder head surface as shown in the illustration.

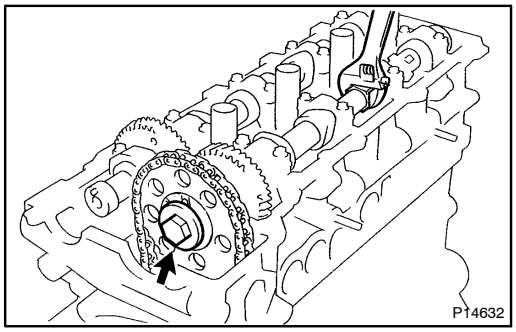


6. INSTALL CAMSHAFT TIMING GEAR

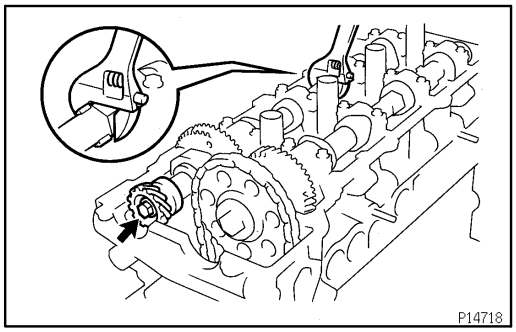
HINT:
Check that the matchmarks on the camshaft timing gear and timing chain are aligned.

(a) Place the gear over the straight pin of the intake camshaft.

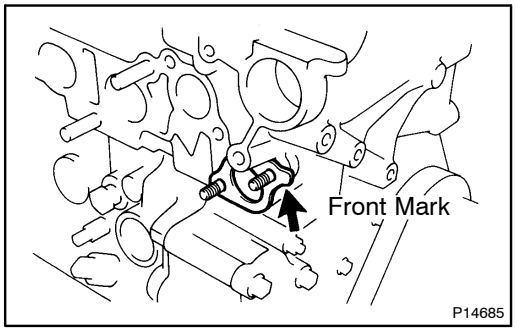
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(b) Hold the intake camshaft with a wrench, install and torque the bolt.
Torque: 73.5 N·m (750 kgf·cm, 54 ft·lbf)

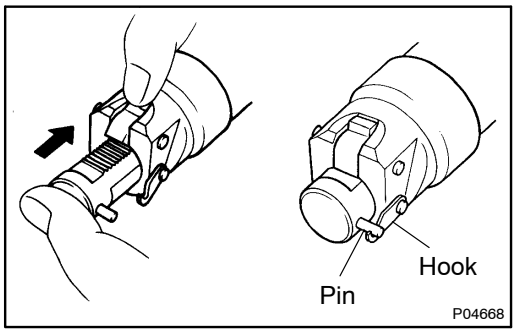


(c) Hold the exhaust camshaft with a wrench, install the bolt and distributor gear.
Torque: 46 N·m (465 kgf·cm, 34 ft·lbf)



7. INSTALL CHAIN TENSIONER

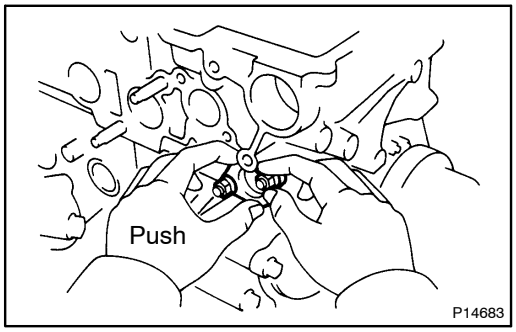
(a) Place a new gasket so that the front mark is toward the front side.



(b) Release the ratchet pawl, fully push in the plunger and apply the hook to the pin so that the plunger cannot spring out.

(c) Turn the crankshaft pulley clockwise to provide some slack for the chain on the tensioner side.

NOTICE:
Do not turn the pulley counterclockwise.



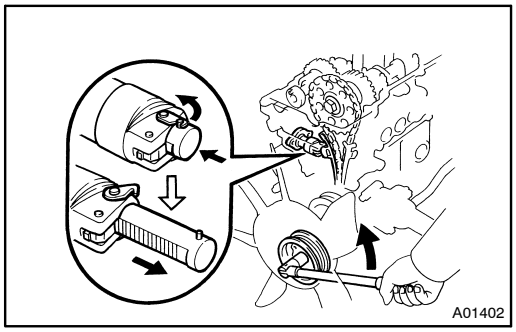
(d) Push the tensioner by hand until it touches the head installation surface, then install the 2 nuts.

(e) Tighten the 2 nuts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

(f) Check that the hook of the tensioner is not released.

NOTICE:
If the plunger springs out during installation of the chain tensioner, repeat the operation in step (b) before installing the tensioner.

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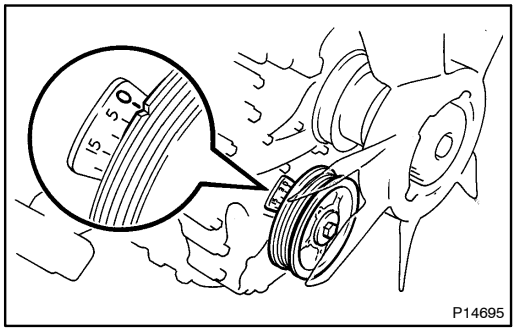
8. SET CHAIN TENSIONER

Turn the crankshaft to the left so that the hook of the chain tensioner is released from the pin of the plunger, causing the plunger to spring out and the slipper to be pushed into the chain.



HINT:

If the plunger does not spring out, press the slipper into the chain tensioner with a screwdriver or your finger so that the hook is released and the plunger springs out.

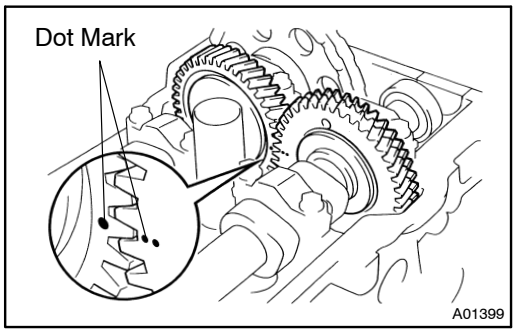


9. CHECK VALVE TIMING

(a) Turn the crankshaft pulley, and align its groove with the timing mark ”0” of the timing chain cover.

NOTICE:

Always turn the crankshaft clockwise.



(b) Check that the timing marks (1 and 2 dots) of the camshaft drive and driven gears are in straight line on the cylinder head surface as shown in the illustration.

If not, turn the crankshaft 1 revolution (360˚) and align the marks as above.

10. CHECK AND ADJUST VALVE CLEARANCE (See page EM–5)

Turn the camshaft and position the cam lobe upward and check and adjust the valve clearance.

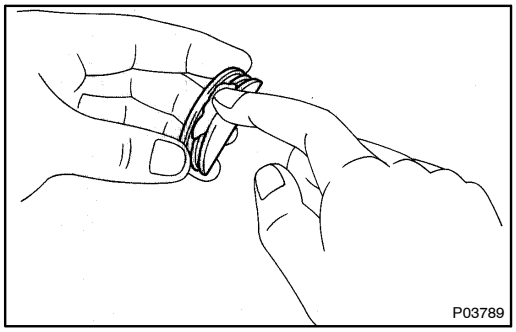
Valve clearance (Cold):
Intake
0.15 – 0.25 mm (0.006 – 0.010 in.)
Exhaust
0.25 – 0.35 mm (0.010 – 0.014 in.)

11. INSTALL SPARK PLUGS

Using a 16 mm plug wrench, install the spark plug.

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

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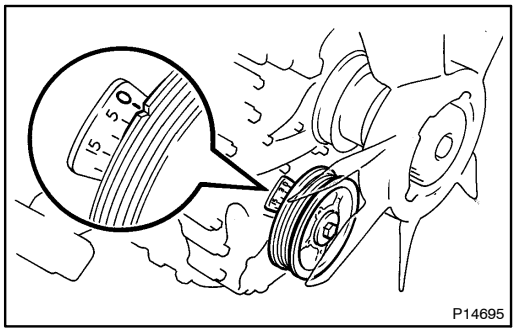
12. INSTALL SEMI–CIRCULAR PLUGS

(a) Remove any old packing (FIPG) material.

(b) Apply seal packing to the cylinder head installation surface of the semi–circular plugs.

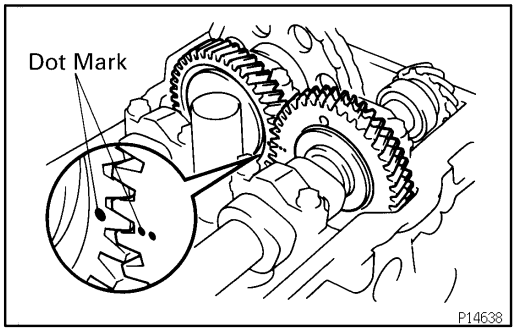
Seal packing:
Part No. 08826–00080 or equivalent

(c) Install the semi–circular plug to the cylinder head.



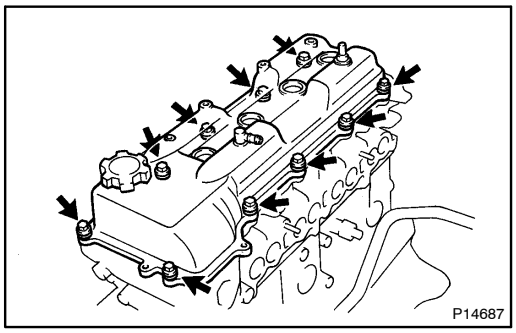
13. SET NO. 1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley clockwise, and align its groove with the timing mark ”0” of the timing chain cover.



(b) Check that the timing marks with 1 and 2 dots are in straight line on the cylinder head surface as shown in the illustration.

If not, turn the crankshaft 1 revolution (360°) and align the mark as above.



14. INSTALL CYLINDER HEAD COVER

(a) Install the gasket to the cylinder head cover.

(b) Install the cylinder head cover with the 10 bolts.

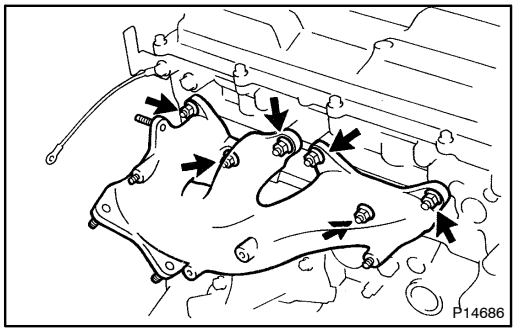
Install the No.2 engine hanger and ground strap with the bolt.

Torque: 42 N·m (420 kgf·cm, 30 ft·lbf)

15. INSTALL NO.1 ENGINE HANGER

Install the No.1 engine hanger with the bolt.

Torque: 42 N·m (420 kgf·cm, 30 ft·lbf)



16. INSTALL EXHAUST MANIFOLD

(a) Install a new gasket and exhaust manifold with the 6 nuts.

Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

(b) Install the heat insulator with the 2 bolts and 2 nuts.

Torque: 5.5 N·m (55 kgf·cm, 48 in.·lbf)

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17. INSTALL FRONT EXHAUST PIPE

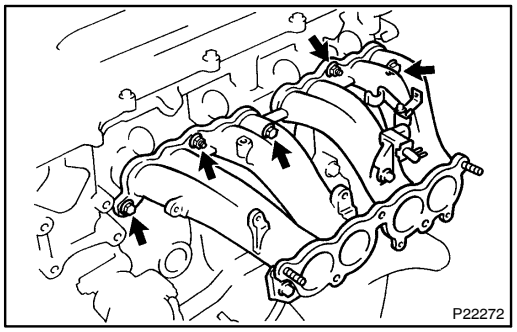
(a) Install 2 new gaskets and the front exhaust pipe assembly with the 3 nuts.
Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)

(b) Install the support bracket with the 2 bolts.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(c) Connect the clamp and tighten the clamp bolt.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

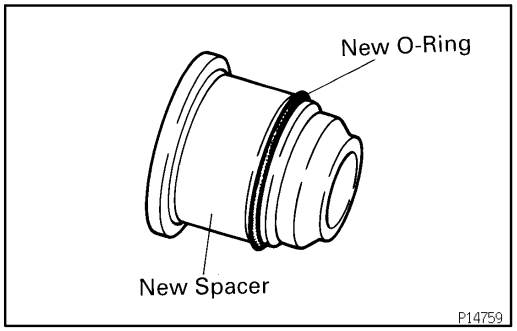
(d) Connect a new gasket and the front exhaust pipe assembly to the TWC with the 2 bolts and retainer.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(e) Install camshaft position sensor.



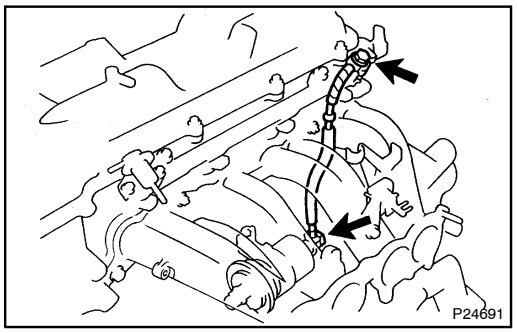
18. INSTALL INTAKE MANIFOLD

Install a new gasket and intake manifold with the 3 bolts and 2 nuts.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



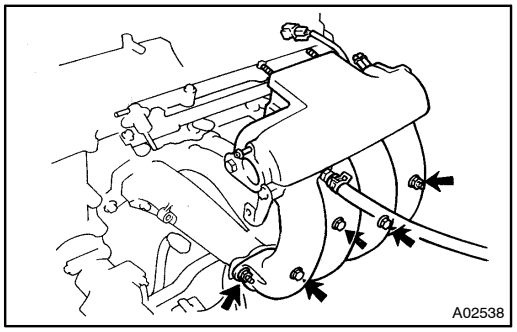
19. INSTALL INJECTORS AND DELIVERY PIPE (See page MF–21)

HINT:
When using a new cylinder head, spacers must be installed.
Apply a light coat of gasoline to a new O–ring a nd install it to a new spacer.



20. INSTALL FUEL TUBE

Install the fuel inlet tube and 4 new gaskets with 2 union bolts.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



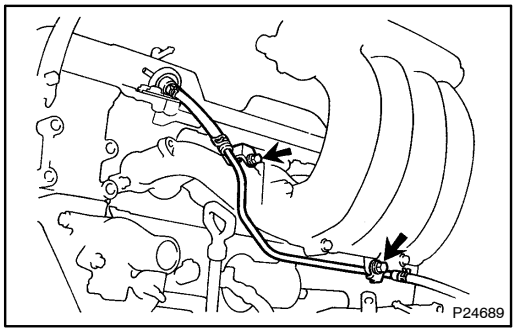
21. INSTALL AIR INTAKE CHAMBER

(a) Install a new gasket and the air intake chamber with the 3 bolts and 2 nuts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

(b) Connect the vacuum hose to the gas filter.

(c) Connect the brake booster vacuum hose to the intake camber.

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22. INSTALL FUEL RETURN PIPE

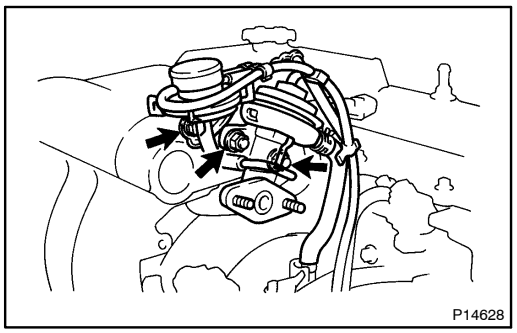
(a) Install the fuel return pipe with the 2 bolts.

(b) Connect these hoses:
- Fuel return hose to fuel pressure regulator
- Fuel return hose to fuel return pipe

23. INSTALL INTAKE CHAMBER STAY

Install the intake chamber stay with the 2 bolts.

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

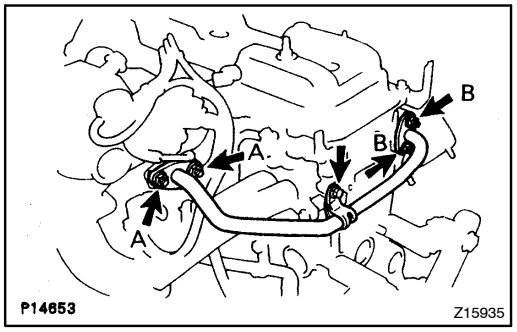


24. INSTALL EGR VALVE AND VACUUM MODULATOR

(a) Install a new gasket, EGR valve and vacuum modulator with the bolt and 2 nuts.

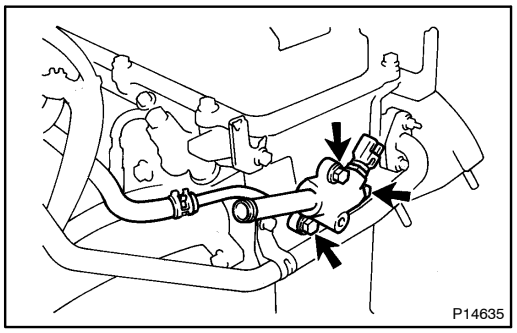
Torque:
Bolt: 8.5 N·m (85 kgf·cm, 74 in.·lbf)
Nut: 19 N·m (195 kgf·cm, 14 ft·lbf)

(b) Connect these hoses:
- 2 vacuum hoses to EGR VSV (with clamp)
- Water bypass hose to water bypass pipe



(c) Install 2 new gaskets and EGR pipe with the bolt and 4 nuts.

Torque:
Bolt: 18 N·m (185 kgf·cm, 14 ft·lbf)
Nut A: 19 N·m (195 kgf·cm, 14 ft·lbf)
Nut B: 20 N·m (200 kgf·cm, 15 ft·lbf)



25. INSTALL CYLINDER HEAD REAR COVER

(a) Install a new gasket and rear cover with the 3 bolts.

Torque: 13.5 N·m (135 kgf·cm, 10 ft·lbf)

(b) Connect the heater water bypass pipe.

26. CONNECT INJECTOR CONNECTORS

27. CONNECT ENGINE WIRE

(a) Connect the engine wire to the intake manifold with the bolt.

(b) Connect the 2 engine wire clamps.

(c) Connect the DLC1 to the bracket.

(d) Connect these connectors:
- Fuel pressure control VSV connector
- Knock sensor connector
- Crankshaft position sensor connector

(e) Connect the 5 engine wire clamps.

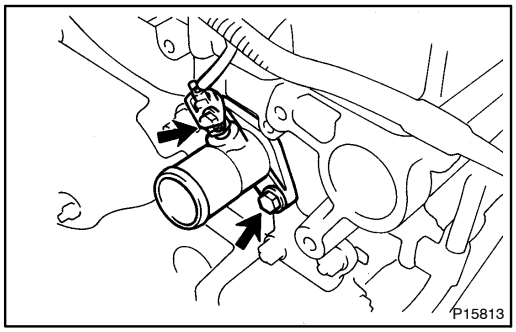
(f) Connect the engine wire to the intake chamber with the 2 bolts.

(g) Connect these connectors:
- EGR VSV connector
- EGR gas temperature sensor connector

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- ECT sensor connector
- Oil pressure sensor connector
- w/ A/C:
  A/C compressor connector

28. INSTALL THROTTLE BODY (See page MF–30)



29. INSTALL WATER OUTLET

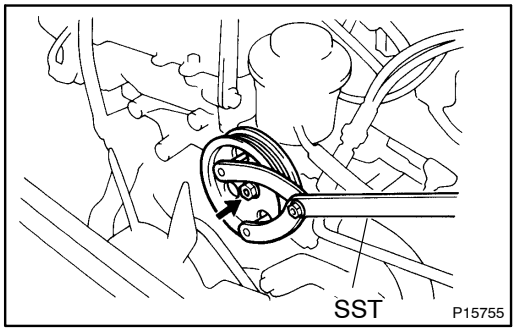
(a) Install a new gasket and water outlet with the 2 bolts.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

(b) Connect the ECT sender gauge connector.

(c) Connect the radiator inlet hose.

30. INSTALL IGNITION COIL.

31. INSTALL NO.1 AND NO.2 PCV HOSES



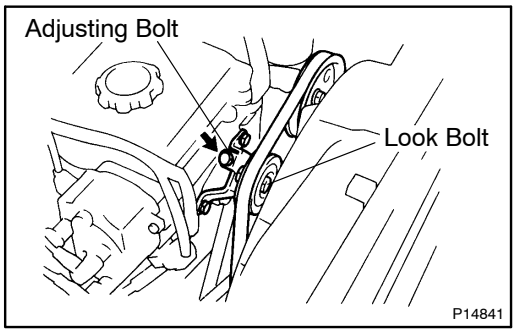
32. INSTALL PS PUMP AND BRACKET

(a) Install the PS pump bracket with the 4 bolts.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

(b) Connect the PS pump to the bracket with the 2 bolts.
Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)

(c) Connect the 2 air hoses to the intake chamber.

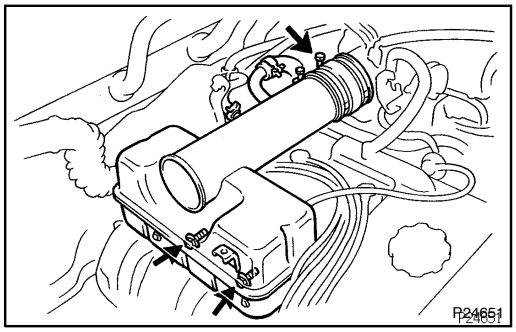
(d) Using SST, install the PS pump pulley with the nut.
SST 09960–10010 (09962–01000, 09963–01000)
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)



33. INSTALL PS PUMP DRIVE BELT AND IDLER PULLEY

(a) Install the idler pulley with the 3 bolts.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

(b) Install and adjust drive belt (See page CH–2).



34. INSTALL AIR INTAKE CONNECTOR

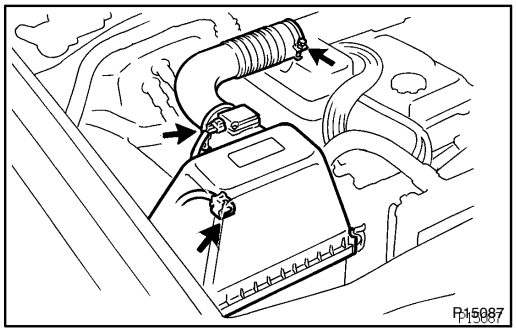
(a) Install the air intake connector with the 2 bolts and hose clamp.

(b) Connect the 2 air hoses.

35. M/T:
CONNECT ACCELERATOR CABLE TO THROTTLE BODY

36. A/T:
CONNECT THROTTLE AND ACCELERATOR CABLES TO THROTTLE BODY

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37. INSTALL MAF METER, RESONATOR AND AIR CLEANER CAP

(a) Connect the air cleaner hose clamp.

(b) Install the air cleaner cap, MAF meter and resonator with the 4 clips.

(c) Connect the MAF meter connector, IAT sensor connector and wire clamp.

38. FILL WITH ENGINE COOLANT

39. START ENGINE AND CHECK FOR LEAKS

40. CHECK IGNITION TIMING (See page EM–11)

41. VEHICLE ROAD TEST

Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

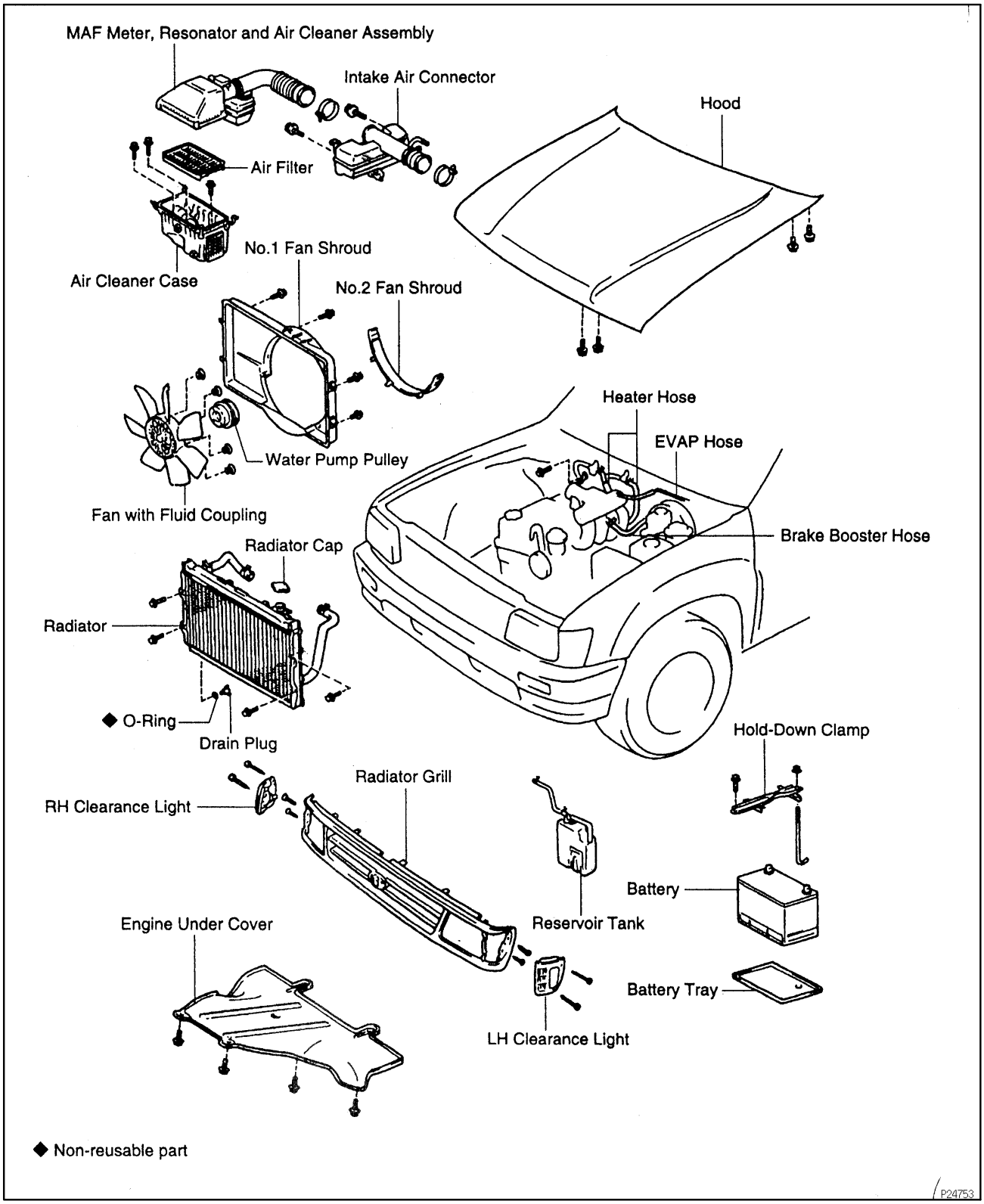
42. RECHECK ENGINE COOLANT LEVEL

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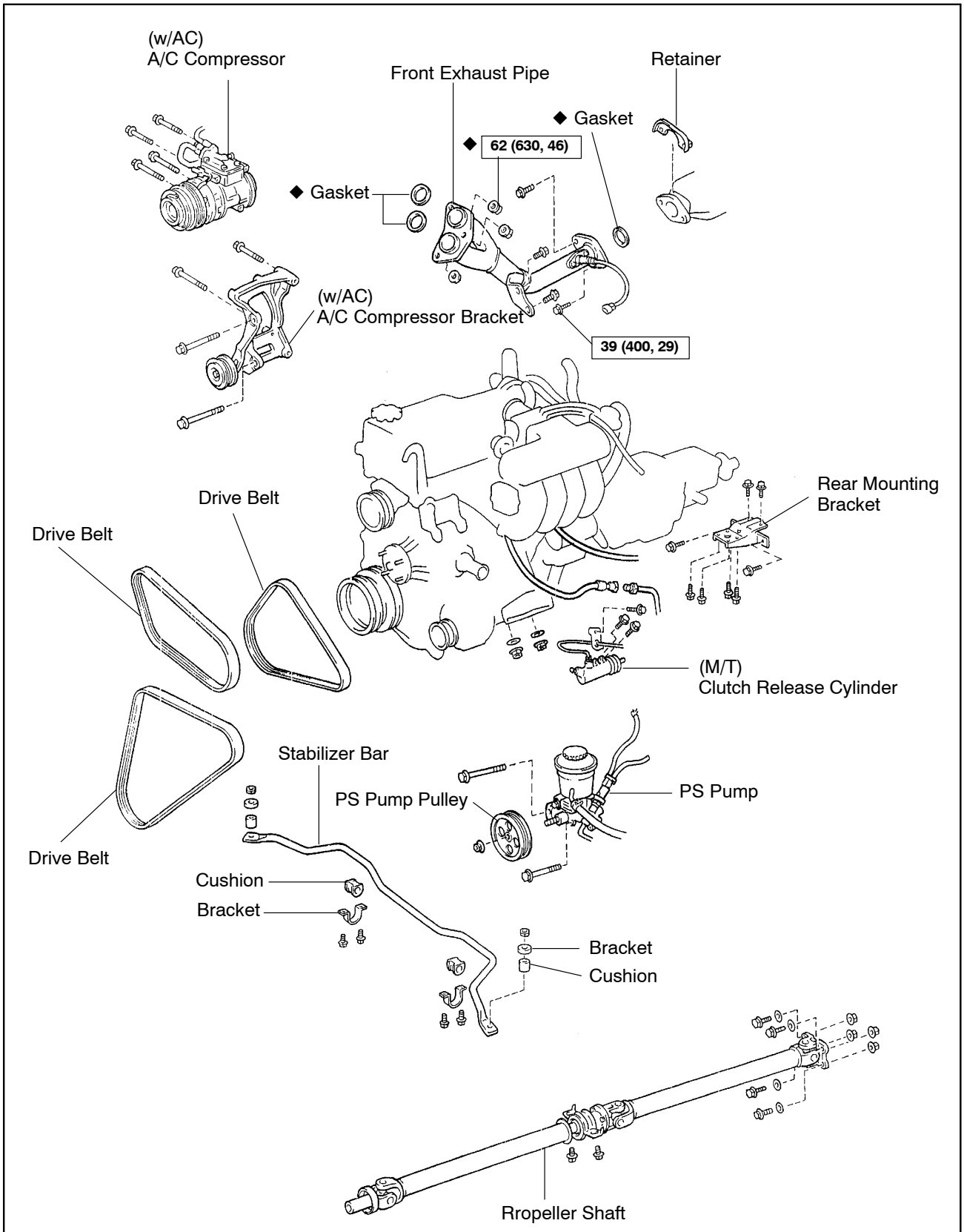
ENGINE UNIT

COMPONENTS

EM07H–03



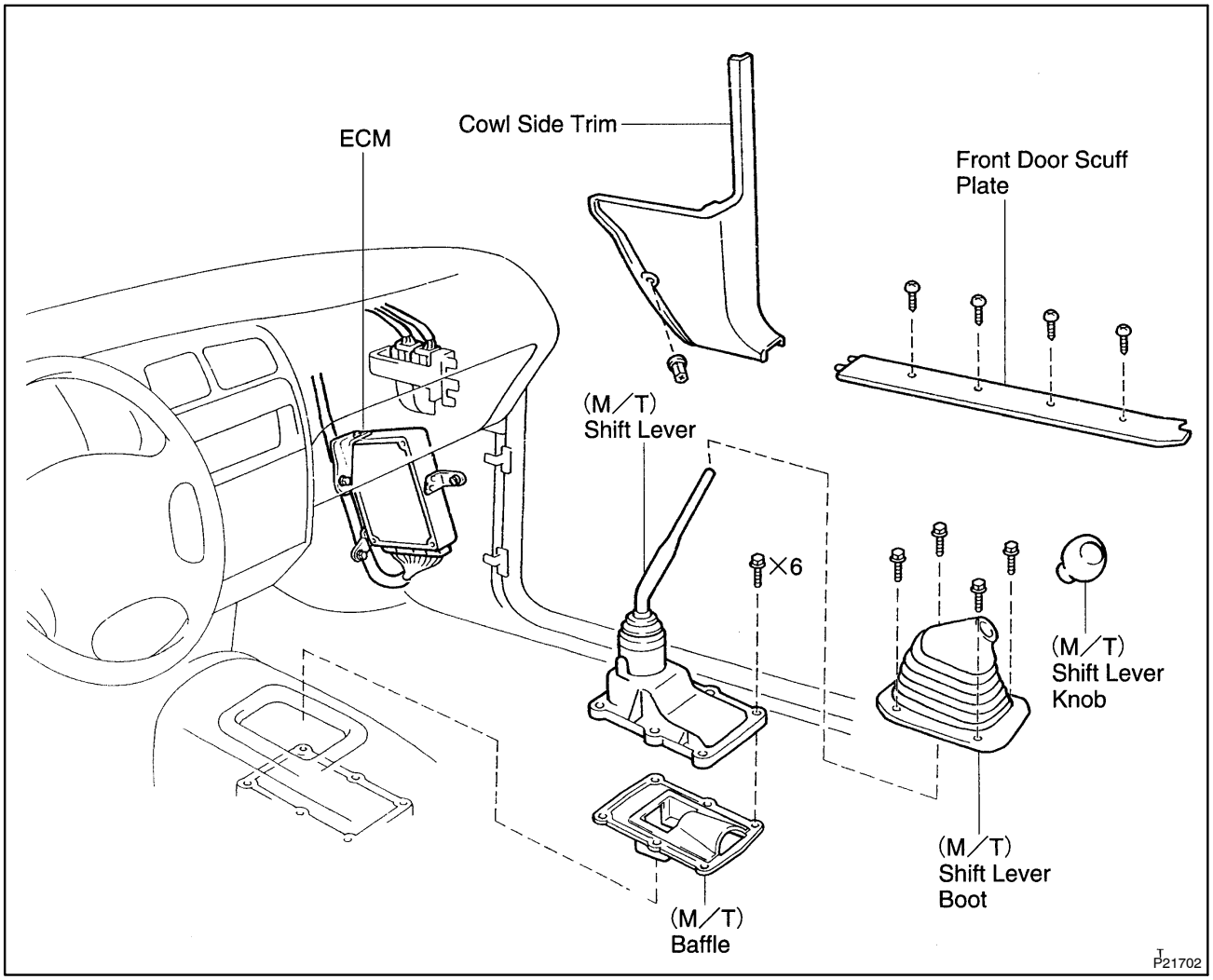
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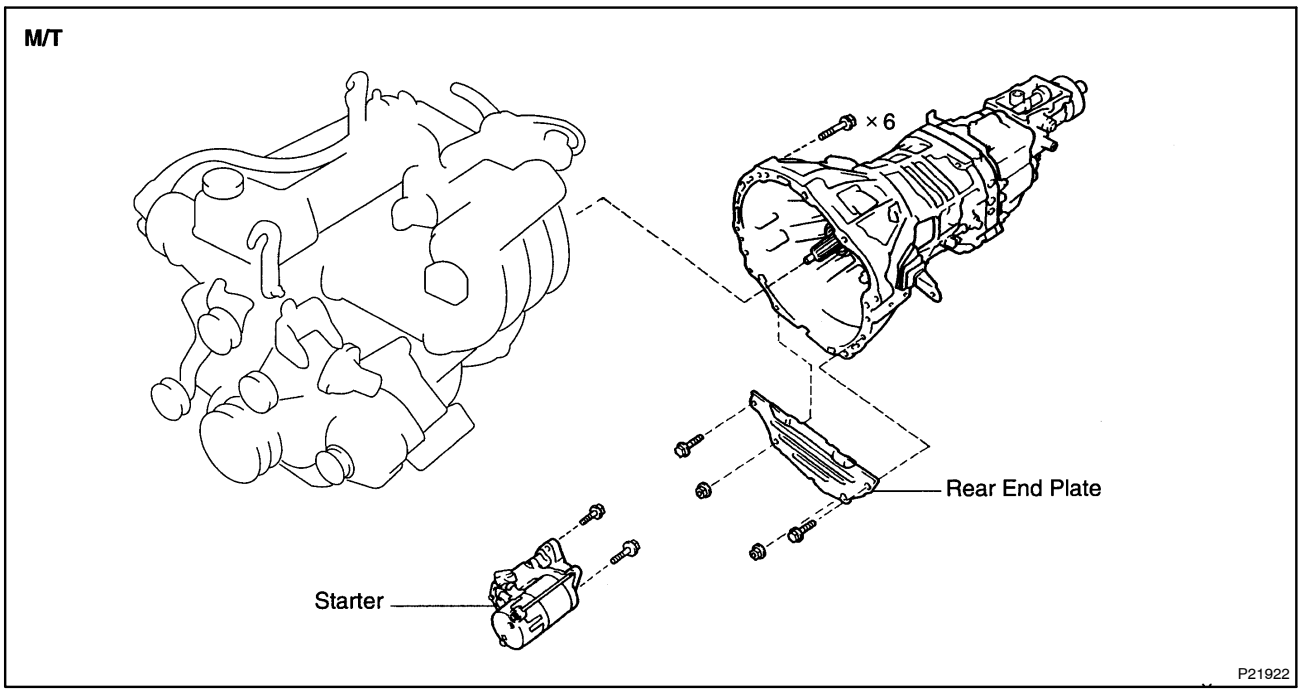


N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non – reusable part

A02533

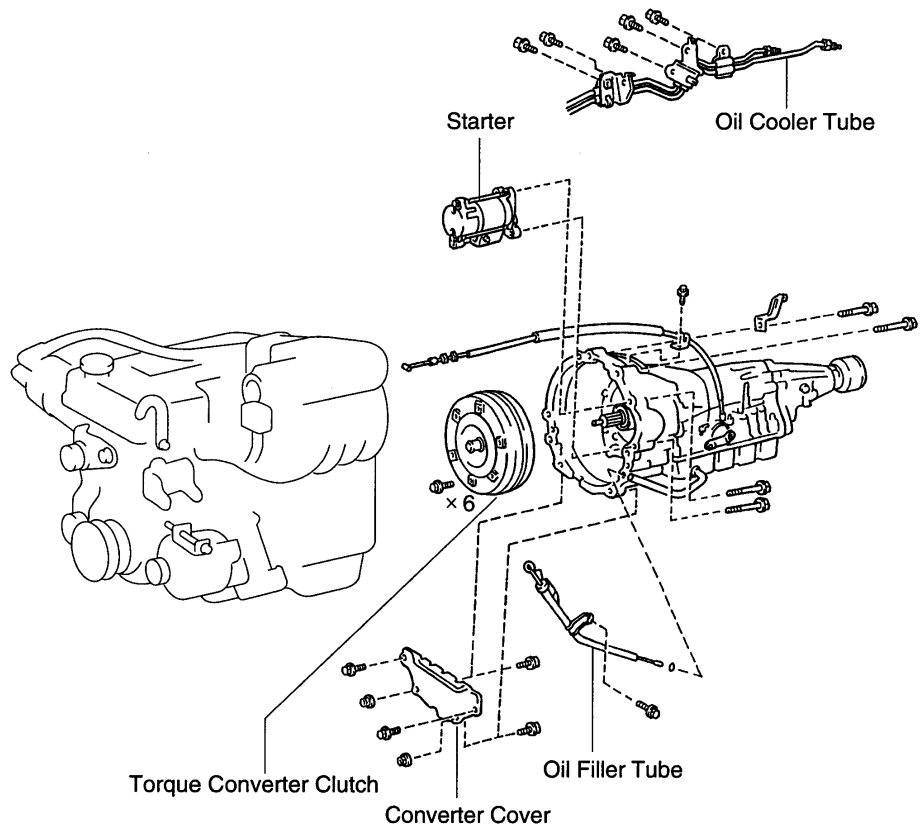
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A/T



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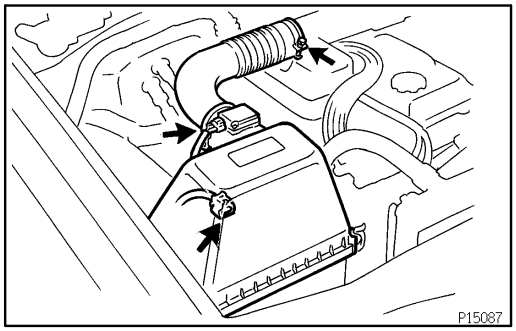
EM07I–03

REMOVAL

1. **REMOVE BATTERY**
2. **REMOVE ENGINE UNDER COVER**

Remove the 4 bolts and engine under cover.

3. **DRAIN ENGINE COOLANT**
4. **DRAIN ENGINE OIL**
5. **DRAIN TRANSMISSION OIL**
6. **REMOVE HOOD**
7. **REMOVE RADIATOR RESERVOIR TANK**
8. **REMOVE RADIATOR (See page CO–15)**



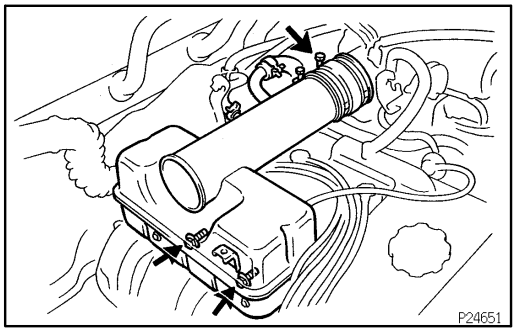
9. **REMOVE AIR CLEANER CAP, MAF METER AND RESONATOR**

(a) Disconnect the MAF meter connector, IAT sensor connector and wire clamp.
(b) Loosen the air cleaner hose clamp.
(c) Loosen the 4 clips, and remove the air cleaner cap, MAF meter and resonator.

10. **REMOVE AIR CLEANER CASE**

(a) Remove the air cleaner element.
(b) Remove the 3 bolts and air cleaner case.

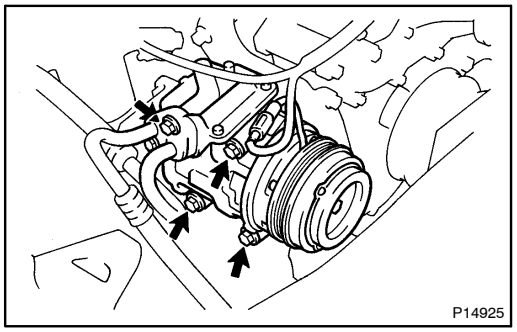
11. **M/T:**
DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY
12. **A/T:**
DISCONNECT ACCELERATOR AND THROTTLE CABLES FROM THROTTLE BODY



13. **REMOVE INTAKE AIR CONNECTOR**

(a) Disconnect the 2 air hoses and vs hose.
(b) Remove the 2 bolts, hose clamp and intake air connector.

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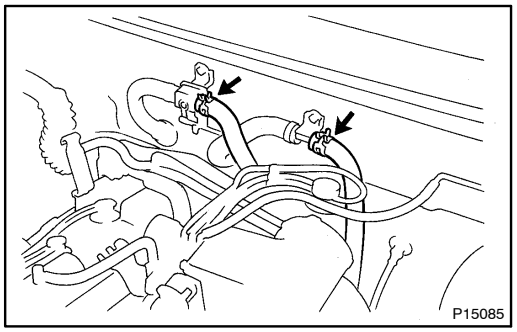


14. w/ A/C:
DISCONNECT A/C COMPRESSOR AND BRACKET

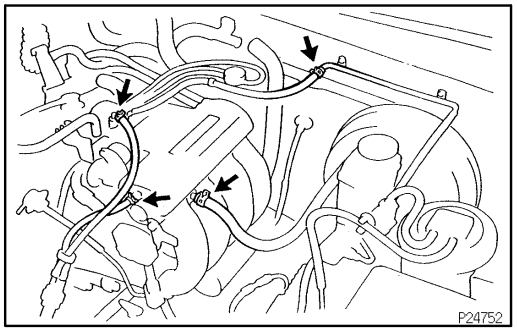
(a) Disconnect the A/C compressor connector.
(b) Remove the 4 mounting bolts, and disconnect the compressor from the bracket.

HINT:
Put a side the compressor, and suspend it.

(c) Remove the 4 bolts and A/C compressor bracket.



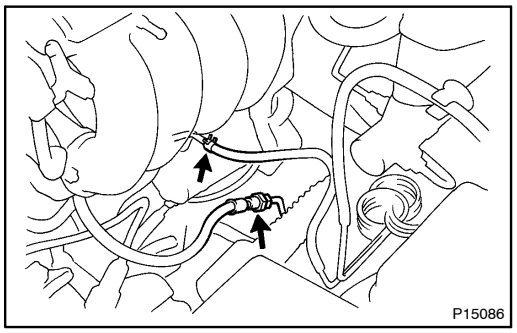
15. DISCONNECT HEATER HOSES



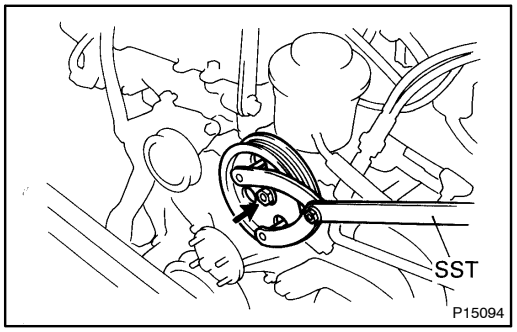
16. DISCONNECT HOSES

Disconnect these hoses:

- Brake booster vacuum hose
- EVAP hose
- 2 PS air hoses



- Fuel return hose
- Fuel inlet hose



17. DISCONNECT PS PUMP

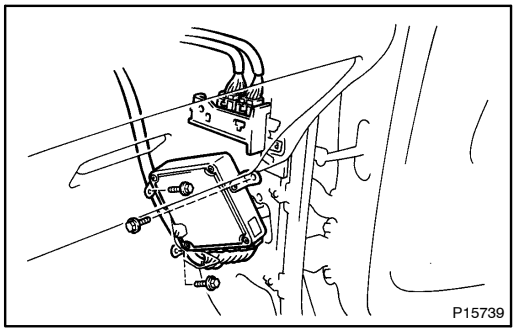
(a) Using SST, remove the nut and PS pump pulley.
SST 09960–10010 (09962–01000, 09963–01000)
(b) Remove the 2 bolts, and disconnect the PS pump.

HINT:
Put aside the pump, and suspend it.

18. DISCONNECT GENERATOR WIRE

(a) Disconnect the generator connector.
(b) Remove the nut, and disconnect the generator wire and wire clip.

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19. REMOVE FRONT DOOR SCUFF PLATE AND COWL SIDE TRIM

(a) Remove the 4 screws and front door scuff plate.

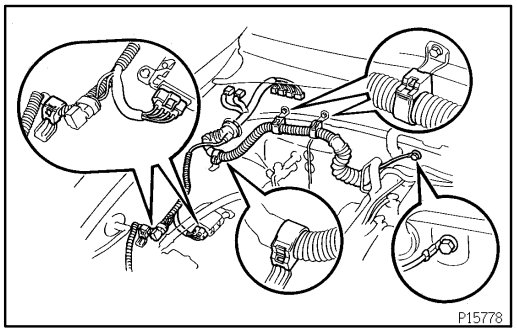
(b) Remove the clip and cowl side trim.

20. DISCONNECT ENGINE WIRE AND CONNECTORS

(a) Remove the 3 bolts and ECM.

(b) Disconnect the 4 ECM connectors.

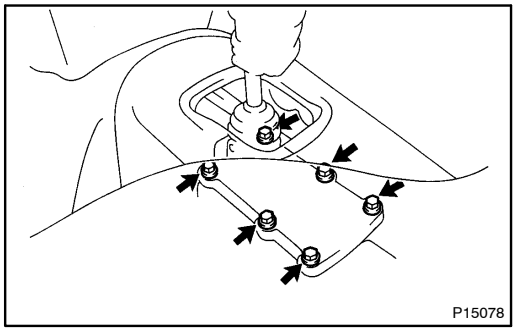
(c) Disconnect the 2 connectors from the cowl wire.



(d) Disconnect these wires and connectors:
- Igniter connector
- Ground strap from cowl top panel

(e) Disconnect the 4 engine wire clamps.

(f) Pull out the engine wire from the cabin.



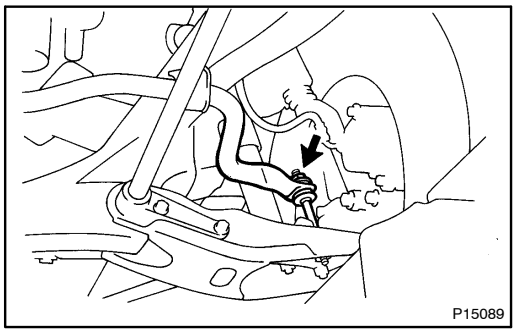
21. M/T:
REMOVE SHIFT LEVER ASSEMBLY

(a) Remove the shift lever knob.

(b) Remove the 4 screws and shift lever boot.

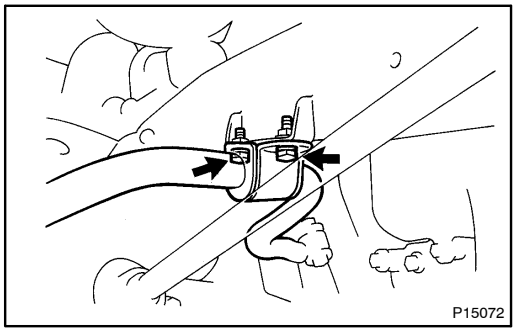
(c) Remove the 6 bolts, shift lever assembly and baffle.

NOTICE:
Do not lose the washers.



22. REMOVE STABILIZER BAR

(a) Remove the nuts and cushions holding both sides of the stabilizer bar to the lower arms, and disconnect the stabilizer bar.



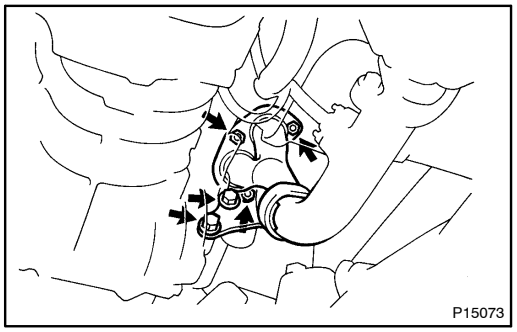
(b) Remove both stabilizer bar bushings and brackets, and remove the stabilizer bar.

23. REMOVE PROPELLER SHAFT (See page PR–3)

24. DISCONNECT SPEED METER CABLE

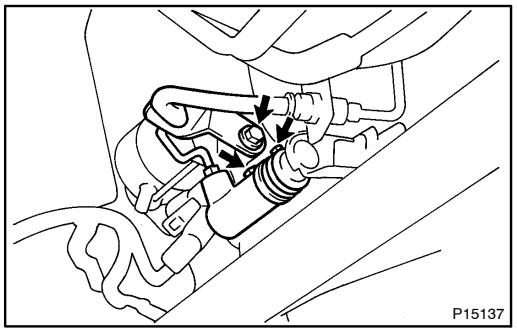
NOTICE:
Do not lose the felt protector and washers.

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25. REMOVE FRONT EXHAUST PIPE

(a) Disconnect the 2 heated oxygen sensor connectors.
(b) Remove the 2 bolts, and retainer holding the front exhaust pipe to the TWC.
(c) Loosen the clamp bolt and disconnect the clamp from the support bracket.
(d) Remove the 2 bolts and support bracket.
(e) Remove the 3 nuts, front exhaust pipe and 3 gaskets.



26. M/T:
REMOVE CLUTCH RELEASE CYLINDER

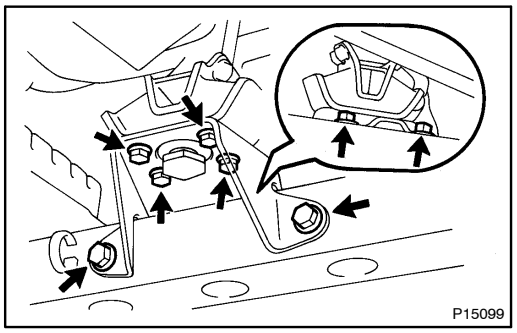
(a) Remove the 2 bolts, and disconnect clutch release cylinder.
(b) Remove the bolt and disconnect the clutch line.

27. A/T:
REMOVE CROSS SHAFT

28. DISCONNECT STARTER WIRE

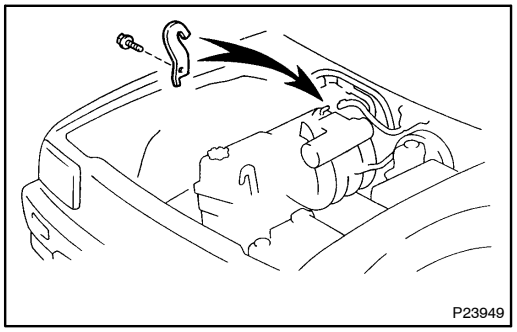
(a) Remove the nut and disconnect the starter wire.
(b) Disconnect the starter connector.
(c) Remove the bolt and disconnect ground strap.

29. PLACE JACK UNDER TRANSMISSION



30. REMOVE ENGINE REAR MOUNTING BRACKET

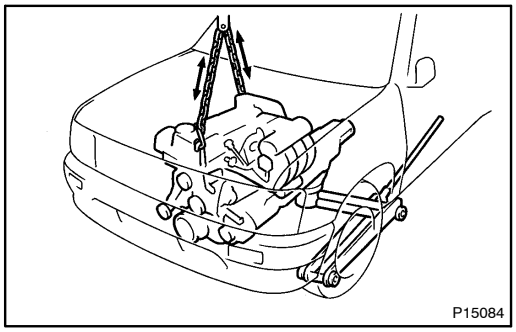
- M/T:
  Remove the 8 bolts holding the mounting bracket to the mounting insulator and cross member.
- A/T:
  Remove the 7 bolts holding the mounting bracket to the mounting insulator and cross member.



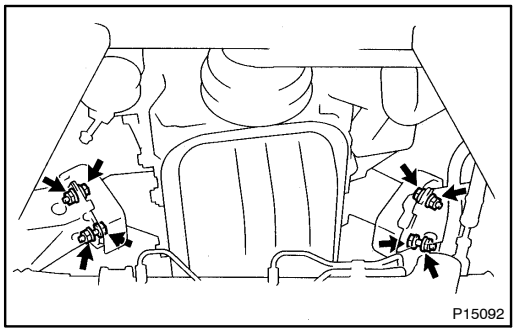
31. REMOVE ENGINE WITH TRANSMISSION

(a) Install a rear engine hanger in the correct direction.
Part No:
HANGER, ENGINE, NO.2 12282–75020
BOLT 91512–61020
Torque: 42 N·m (420 kgf·cm,30 ft·lbf)

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(b) Attach the engine hoist chain to the 2 engine hangers.



(c) Remove the 4 bolts and nuts holding the engine front mounting insulators to the frame.

(d) Lift the engine with transmission out of the vehicle slowly and carefully.

NOTICE:

Make sure the engine is clear of all wiring and hoses.

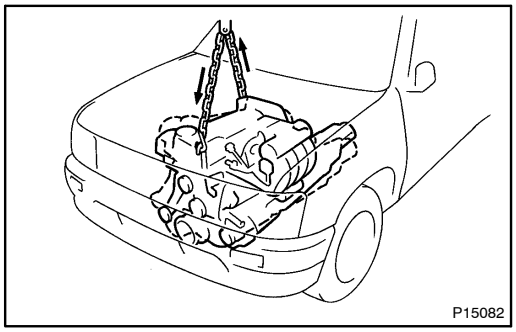
(e) Place the engine and transmission assembly onto the stand.

32. SEPARATE ENGINE AND TRANSMISSION

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EM1OM–01

INSTALLATION

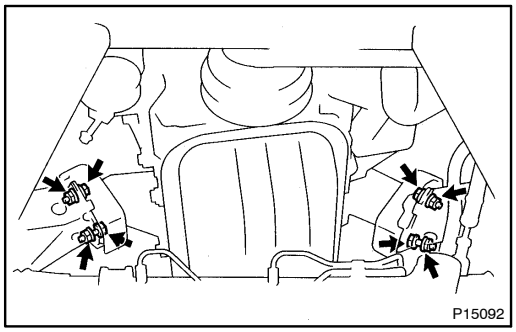

P15082

1. INSTALL TRANSMISSION TO ENGINE

2. INSTALL ENGINE AND TRANSMISSION ASSEMBLY IN VEHICLE

(a) Attach the engine hoist chain to the engine hangers.

(b) Lower the engine and transmission assembly into the engine compartment.


P15092

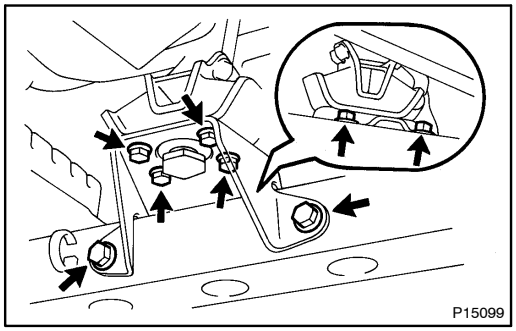
(c) Keep the engine level, and align the RH and LH mountings and body mountings.

(d) Attach the RH and LH mounting insulators to the body mountings, and temporarily install the 4 bolts and nuts.

(e) Jack up and put the transmission onto the frame.

(f) Remove the hoist chain.

(g) Remove the bolt and rear engine hanger.


P15099

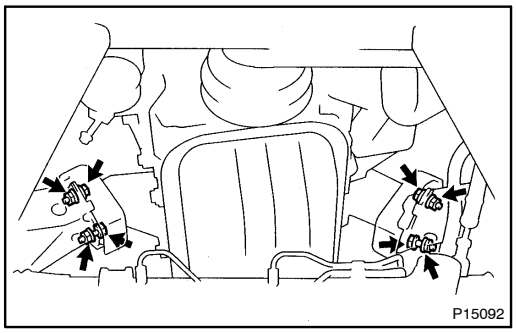
3. INSTALL ENGINE REAR MOUNTING BRACKET

(a) Raise the transmission slightly by raising the engine with a jack and a wooden block under the transmission.

(b) Install the engine rear mounting bracket to the frame.
Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)

(c) Lower the transmission and rest it on the extension housing.

(d) Install the mounting bracket to the mounting insulator.
Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)


P15092

4. TIGHTEN RH AND LH ENGINE MOUNTING INSULATOR BOLTS AND NUTS

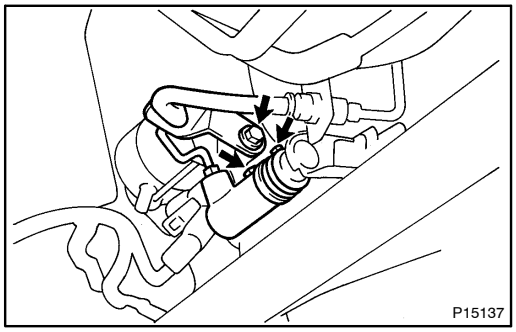
Tighten the 4 bolts and nuts holding the mounting insulators to the body mountings.
Torque: 38 N·m (380 kgf·cm, 28 ft·lbf)

5. CONNECT STARTER WIRE

(a) Connect the ground strap with the bolt.

(b) Connect the starter connector.

(c) Connect the starter wire with the nut.


P15137

6. M/T:
INSTALL CLUTCH RELEASE CYLINDER

(a) Connect the clutch line with the bolt.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Install the clutch release cylinder with the 2 bolts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

7. A/T:
INSTALL CROSS SHAFT

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8. INSTALL FRONT EXHAUST PIPE

(a) Install 2 new gaskets and the front exhaust pipe assembly with new 3 nuts.
Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)

(b) Install the support bracket with the 2 bolts.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

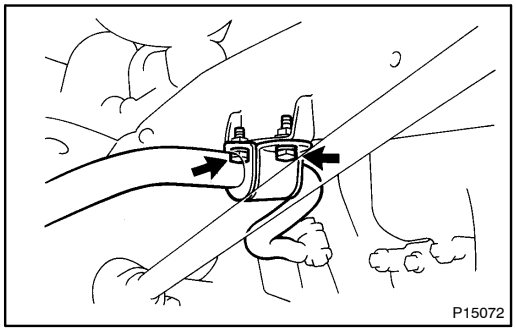
(c) Connect the clamp and tighten the clamp bolt.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

(d) Connect a new gasket and the front exhaust pipe assembly to the TWC with the 2 bolts and retainer.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(e) Connect the 2 heated oxygen sensor connectors.

9. CONNECT SPEEDOMETER CABLE

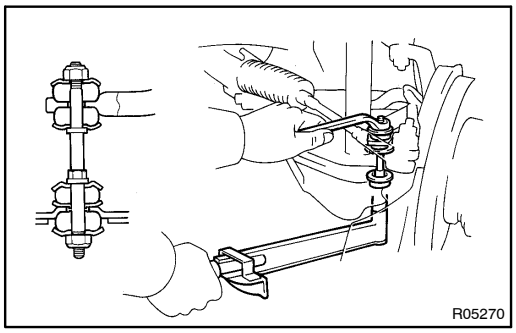
10. INSTALL PROPELLER SHAFT (See page PR–9)



11. INSTALL STABILIZER BAR

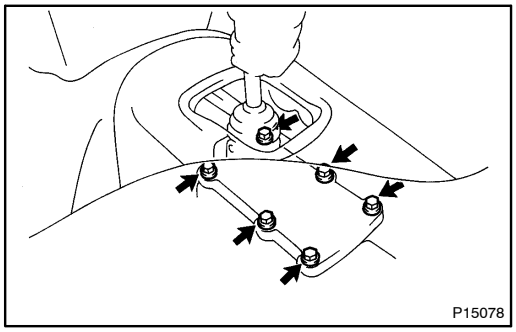
(a) Place the stabilizer bar in position and install both stabilizer bar bushings and brackets to the frame.

(b) Torque the stabilizer bar mounting bolts.
Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)



(c) Connect the stabilizer bar on both sides to the lower arms with brackets, cushions and new nuts as shown.

(d) Torque the nuts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)



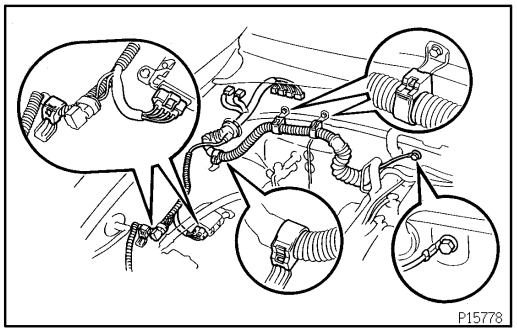
12. M/T:
INSTALL SHIFT LEVER ASSEMBLY

(a) Install baffle and shift lever assembly with the 6 bolts.

(b) Install the shift lever boot with the 4 screws.

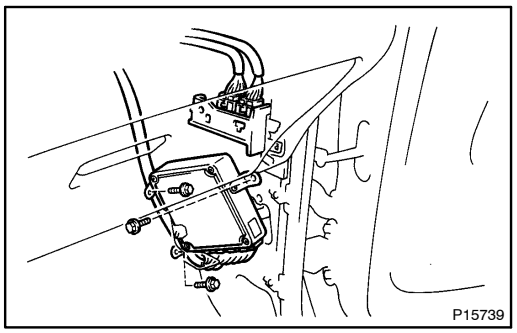
(c) Install the shift lever knob.

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13. CONNECT WIRES AND CONNECTORS

(a) Push in the engine wire through the cowl panel.
(b) Connect the 4 engine wire clamps
(c) Connect these wires and connectors:
- Ground strap to cowl top panel
- Igniter connector



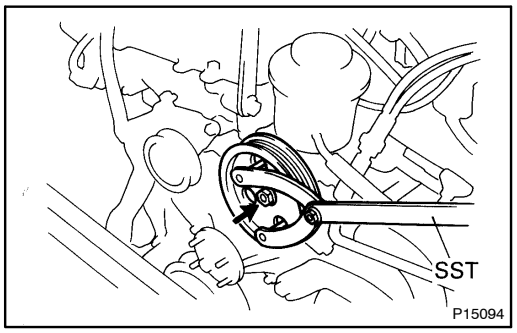
(d) Connect 2 connectors to cowl wire.
(e) Connect 4 connectors to the ECM.
(f) Install the ECM with the 3 bolts.

14. INSTALL FRONT DOOR SCUFF PLATE AND COWL SIDE TRIM

(a) Install the cowl side trim with the clip.
(b) Install the front door scuff plate with the 4 screws.

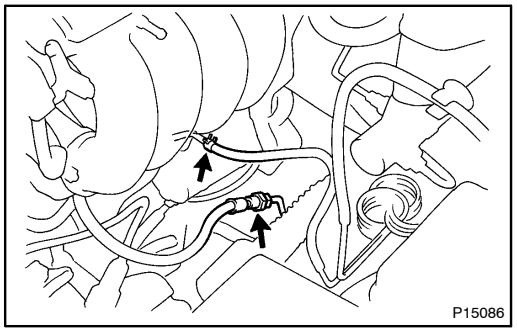
15. CONNECT GENERATOR WIRE

(a) Connect the generator connector.
(b) Connect the generator wire with the nut.
(c) Connect the wire harness clip to the generator.



16. CONNECT PS PUMP

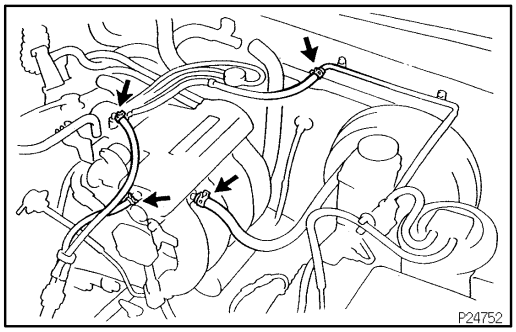
(a) Connect the PS pump to the bracket with the 2 bolts.
Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)
(b) Using SST, install the PS pump pulley with the nut.
SST 09960–10010 (09962–01000, 09963–01000)
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)



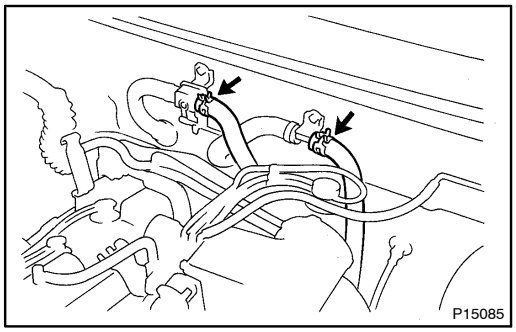
17. CONNECT HOSES

Connect these hoses:
- Fuel return hose
- Fuel inlet hose

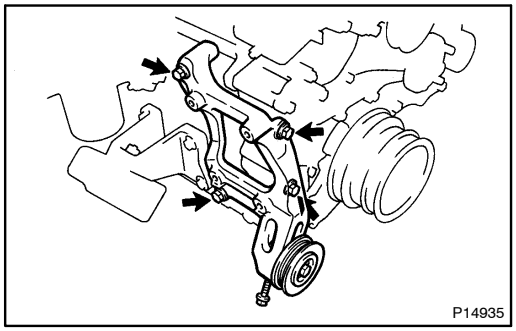
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- Brake booster vacuum hose
- EVAP hose
- 2 PS hoses



18. CONNECT HEATER HOSES

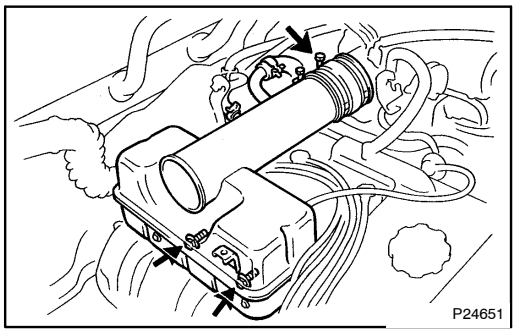


19. w/ A/C:
INSTALL A/C COMPRESSOR AND BRACKET

(a) Install the A/C compressor bracket with the 4 bolts.
Torque: 44 N·m (440 kgf·cm, 32 ft·lbf)

(b) Install the A/C compressor with the 4 bolts.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(c) Connect the A/C compressor connector.



20. INSTALL INTAKE AIR CONNECTOR

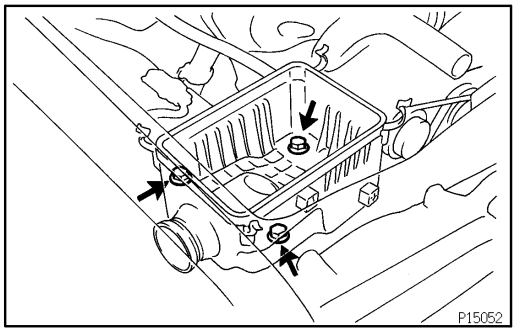
(a) Install the intake air connector with the 2 bolts and hose clamp.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

(b) Connect the 2 air hoses.

21. M/T:
CONNECT ACCELERATOR CABLE TO THROTTLE BODY

22. A/T:
CONNECT ACCELERATOR AND THROTTLE CABLES TO THROTTLE BODY

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23. INSTALL AIR CLEANER CASE

(a) Install the air cleaner case with 3 bolts.

(b) Install the air cleaner element.

24. INSTALL MAF METER, RESONATOR AND AIR CLEANER CAP

(a) Connect the air cleaner hose clamp.

(b) Install the air cleaner cap, MAF meter and resonator with the 4 clips.

(c) Connect the MAF meter connector, IAT sensor connector and wire clamp.

25. INSTALL RADIATOR (See page CO–20)

26. INSTALL RADIATOR RESERVOIR TANK

27. FILL WITH ENGINE OIL

28. FILL WITH ENGINE COOLANT

29. FILL TRANSMISSION OIL

30. INSTALL BATTERY

31. START ENGINE AND CHECK FOR LEAKS

32. CHECK IGNITION TIMING (See page EM–11)

33. INSTALL ENGINE UNDER COVER

Install the engine under cover with the 4 bolts.

34. INSTALL HOOD

35. VEHICLE ROAD TEST

Check for abnormal noise, shock, slippage, and smooth operation.

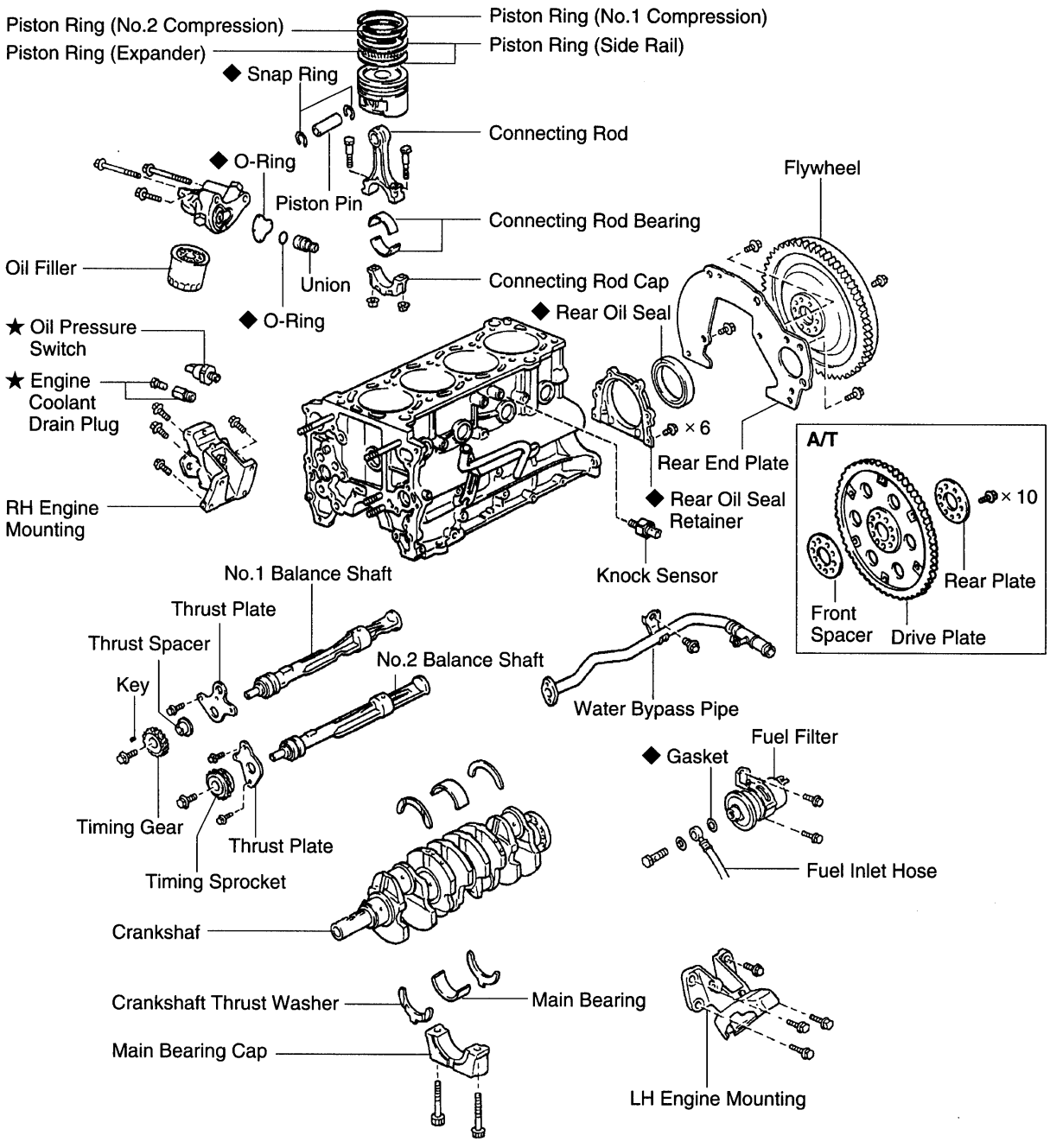
36. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS

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CYLINDER BLOCK

COMPONENTS

EM07K–03



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EM07L–02

DISASSEMBLY

1. M/T:
REMOVE FLYWHEEL

Remove the 10 bolts and flywheel.

2. A/T:
REMOVE DRIVE PLATE

Remove the 10 bolts, front spacer, drive plate and rear spacer.

3. REMOVE REAR END PLATE

Remove the 3 bolts and rear end plate.

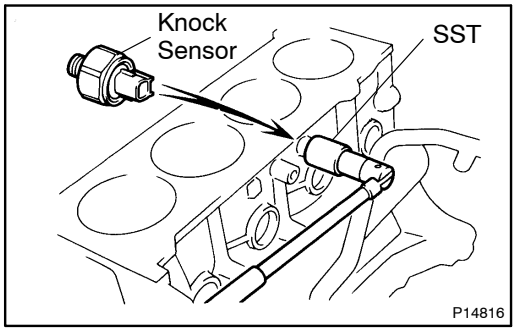
4. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY

5. REMOVE CYLINDER HEAD (See page EM–28)

6. REMOVE TIMING CHAINS, GEARS AND SPROCKET (See page EM–14)

7. REMOVE FUEL FILTER

Remove the 2 bolts and fuel filter.



8. REMOVE KNOCK SENSOR

Using SST, remove the knock sensor.

SST 09816–30010

9. REMOVE WATER BYPASS PIPE

Remove the bolt and water bypass pipe.

10. REMOVE OIL FILTER AND BRACKET

(a) Remove the oil filter (See page LU–3).

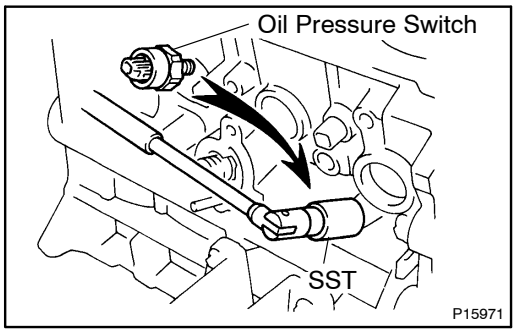
(b) Remove the 2 bolts, nut, oil filter bracket and O–ring.

11. REMOVE OIL FILTER BRACKET UNION

Using 14 mm hexagon wrench, remove the union and O–ring.

12. REMOVE ENGINE COOLANT DRAIN PLUG

13. REMOVE OIL PRESSURE SWITCH



Using SST, remove the oil pressure switch.

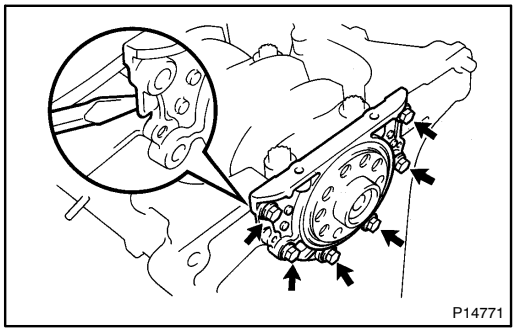
SST 09816–30010

14. REMOVE RH ENGINE MOUNTING BRACKET

Remove the 4 bolts and bracket.

15. REMOVE LH ENGINE MOUNTING BRACKET

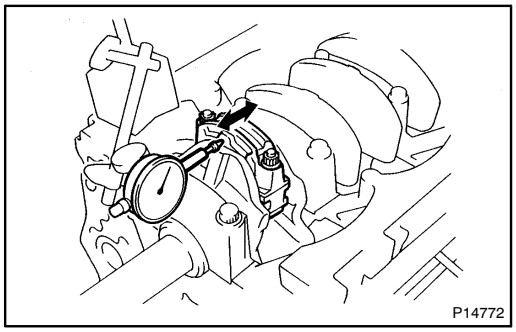
Remove the 5 bolts and bracket.



16. REMOVE REAR OIL SEAL RETAINER

Remove the 6 bolts and retainer.

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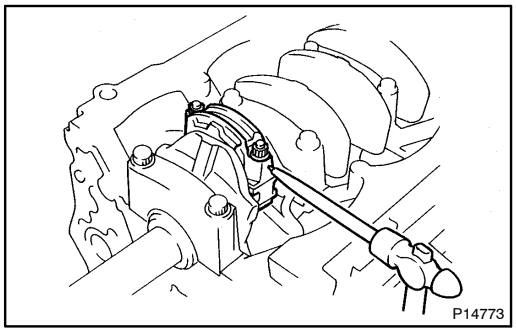


17. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:
0.160 – 0.312 mm (0.0063 – 0.0123 in.)
Maximum thrust clearance:
0.35 mm (0.0138 in.)

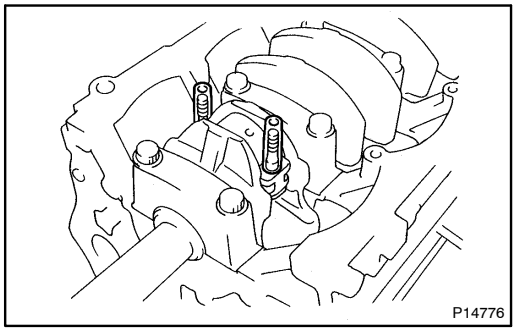
If the thrust clearance is greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.



18. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

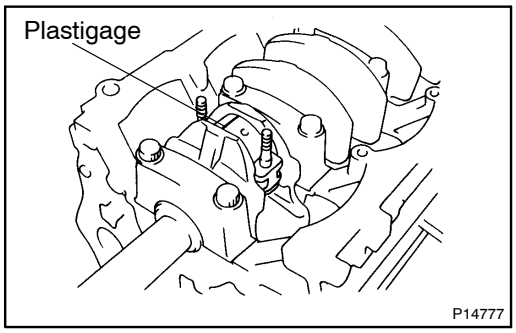
(a) Using a punch or numbering stamp, place the matchmark on the connecting rod cap to ensure correct reassembly.
(b) Remove the connecting rod cap nuts.
(c) Using a plastic–faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.

HINT:
Keep the lower bearing inserted with the connecting rod cap.



(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.
(e) Clean the crank pin and bearing.
(f) Check the crank pin and bearing for pitting and scratches.

If the crank pin or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.



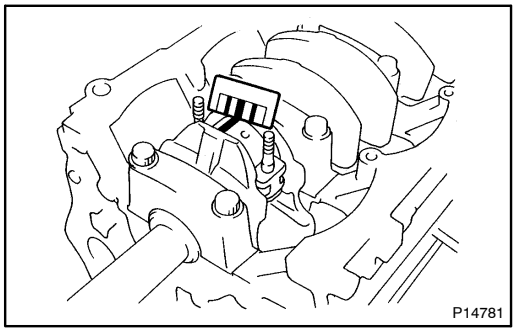
(g) Lay a strip of Plastigage across the crank pin.
(h) Install the connecting rod cap with the 2 nuts (See page EM–95).

Torque:
1st 45 N·m (460 kgf·cm, 33 ft·lbf)
2nd Turn 90°

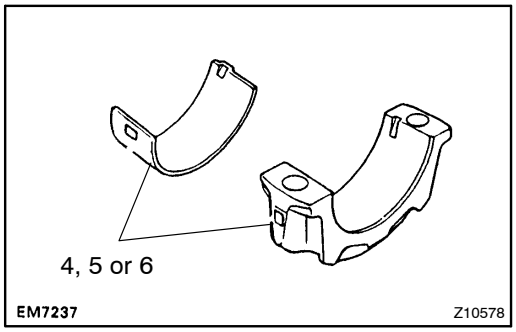
NOTICE:
Do not turn the crankshaft.

(i) Remove the 2 nuts and connecting rod cap (See procedure (b) and (c) above).
(j) Measure the Plastigage at its widest point.

Standard oil clearance:
STD
0.030 – 0.055 mm (0.0012 – 0.0022 in.)
U/S 0.25
0.031 – 0.071 mm (0.0012 – 0.0026 in.)
Maximum oil clearance:
0.10 mm (0.0039 in.)



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If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.

HINT:

If using a standard bearing, replace with 1 having the same number as marked on the bearing cap. There are 3 sizes of standard bearings, marked ”4”, ”5”, ”6” accordingly.

Reference:

Connecting rod big end inside diameter:

STD Mark ”4”	56.000 – 56.006 mm (2.2047 – 2.2050 in.)
STD Mark ”5”	56.006 – 56.012 mm (2.2050 – 2.2052 in.)
STD Mark ”6”	56.012 – 56.018 mm (2.2052 – 2.2054 in.)
U/S 0.25	56.000 – 56.018 mm (2.2047 – 2.2054 in.)

Crankshaft crank pin diameter:

STD	52.987 – 53.000 mm (2.0861 – 2.0866 in.)
U/S 0.25	52.745 – 52.755 mm (2.0766 – 2.0770 in.)

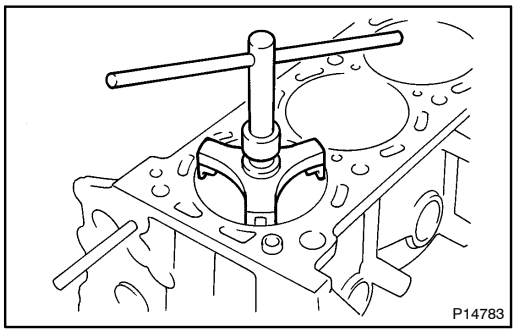
Standard sized bearing center wall thickness:

STD Mark ”4”	1.482 – 1.485 mm (0.0583 – 0.0585 in.)
STD Mark ”5”	1.485 – 1.488 mm (0.0585 – 0.0586 in.)
STD Mark ”6”	1.488 – 1.491 mm (0.0586 – 0.0587 in.)
U/S 0.25	1.601 – 1.607 mm (0.0630 – 0.0633 in.)

(k) Completely remove the Plastigage.

19. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

(a) Using a ridge reamer, remove the all carbon from the top of the cylinder.

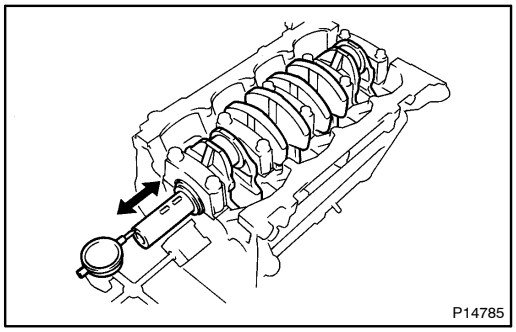


(b) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.

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P14785

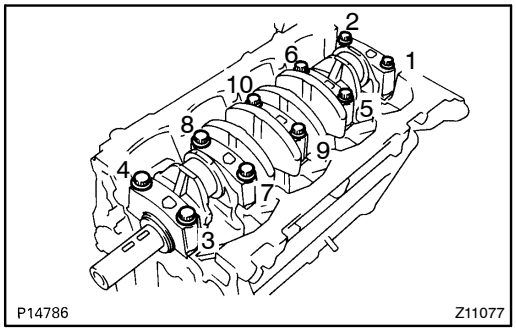
20. CHECK CRANKSHAFT THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

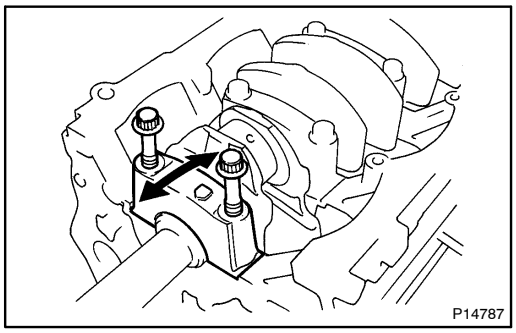
Standard thrust clearance:
0.020 – 0.220 mm (0.0008 – 0.0087 in.)
Maximum thrust clearance:
0.30 mm (0.0118 in.)

If the thrust clearance is greater than maximum, replace the thrust washers as a set.

Thrust washer thickness:
2.440 – 2.490 mm (0.0961 – 0.0980 in.)



P14786 Z11077


P14787

21. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

(a) Uniformly loosen and remove the main bearing cap bolts in several passes, in the sequence shown.

(b) Using the removed main bearing cap bolts, pry the main bearing cap back and forth, and remove the main bearing caps, lower bearings and (No.3 main bearing cap only) lower thrust washers.

HINT:

- Keep the lower bearing and main bearing cap together.
- Arrange the main bearing caps and lower thrust washers in correct order.

(c) Lift out the crankshaft.

HINT:

Keep the upper bearings and upper thrust washers together with the cylinder block.

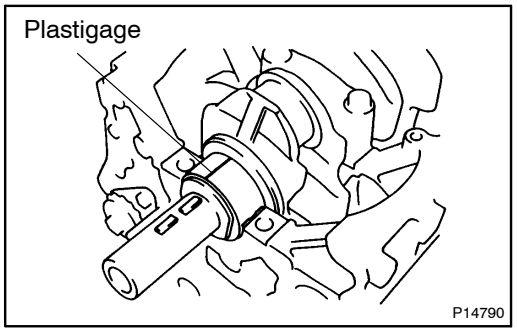
(d) Clean each main journal and bearing.

(e) Check each main journal and bearing for pitting and scratches.

If the journal or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.

(f) Place the crankshaft on the cylinder block.

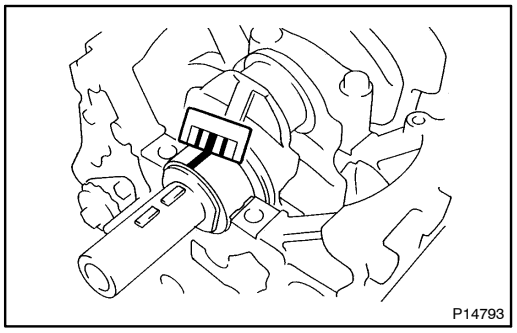
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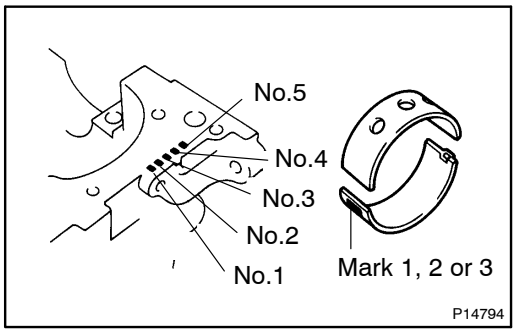
(g) Lay a strip of Plastigage across each journal.
(h) Install the main bearing caps (See page EM–95).
Torque:
1st 39 N·m (400 kgf·cm, 29 ft·lbf)
2nd Turn 90°

NOTICE:
Do not turn the crankshaft.

(i) Remove the main bearing caps (See procedure (a) and (b) above).



(j) Measure the Plastigage at its widest point.
Standard clearance:
STD
No.3
0.030 – 0.055 mm (0.0012 – 0.0022 in.)
Others
0.024 – 0.049 mm (0.0009 – 0.0019 in.)
U/S 0.25
No.3
0.030 – 0.070 mm (0.0012 – 0.0028 in.)
Others
0.025 – 0.065 mm (0.0010 – 0.0026 in.)
Maximum clearance:
0.10 mm (0.0039 in.)



HINT:
- If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.
- If using a standard bearing, replace with 1 having the same number as marked on the block. There are 3 sizes of standard bearings, marked ”1”, ”2” and ”3” accordingly.

Reference:
Cylinder block main journal bore diameter:

STD Mark ”1”	64.004 – 64.010 mm (2.5198 – 2.5201 in.)
STD Mark ”2”	64.011 – 64.016 mm (2.5201 – 2.5203 in.)
STD Mark ”3”	64.017 – 64.022 mm (2.5203 – 2.5205 in.)
U/S 0.25	64.000 – 64.024 mm (2.5197 – 2.5206 in.)

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Crankshaft Journal diameter:

STD NO.3	59.981 – 59.994 mm (2.2615 – 2.3620 in.)
STD Others	59.987 – 60.000 mm (2.3617 – 2.3622 in.)
U/S 0.25 No.3	59.740 – 59.750 mm (2.3520 – 2.3524 in.)
U/S 0.25 Others	59.745 – 59.755 mm (2.3522 – 2.3526 in.)

Bearing center wall thickness:

STD Mark "1"	1.987 – 1.990 mm (0.0782 – 0.0783 in.)
STD Mark "2"	1.991 – 1.993 mm (0.0784 – 0.0785 in.)
STD Mark "3"	1.994 – 1.996 mm (0.0785 – 0.0786 in.)
U/S 0.25	2.106 – 2.112 mm (0.0829 – 0.0831 in.)

(k) Completely remove the Plastigage.

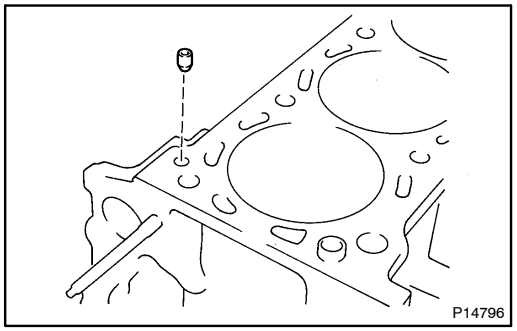
22. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

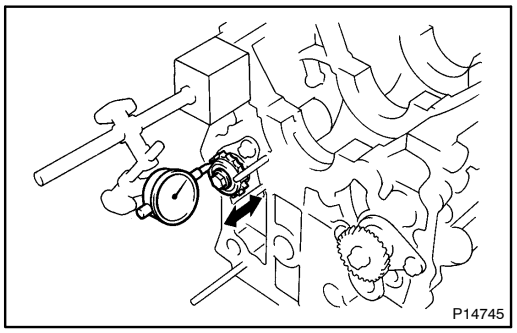
(b) Remove the upper main bearings and upper thrust washers from the cylinder block.

HINT:

Arrange the main bearings and thrust washers in correct order.



23. REMOVE CYLINDER BLOCK ORIFICE



24. CHECK THRUST CLEARANCES OF NO.1 AND NO.2 BALANCE SHAFTS OF ENGINE BALANCER

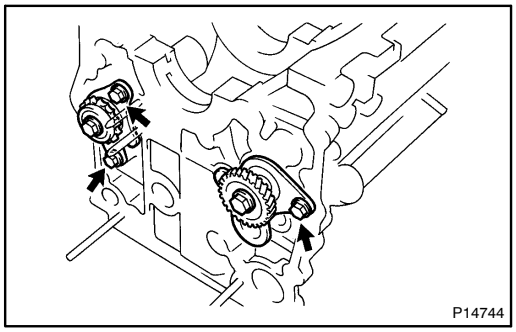
Using a dial indicator, measure the thrust clearance while moving the balance shaft back and forth.

Standard thrust clearance:
0.07 – 0.13 mm (0.0027 – 0.0051 in.)
Maximum thrust clearance:
0.2 mm (0.0079 in.)

If the thrust clearance is greater than maximum, replace the balance shaft thrust washer.

If necessary, replace the balance shaft.

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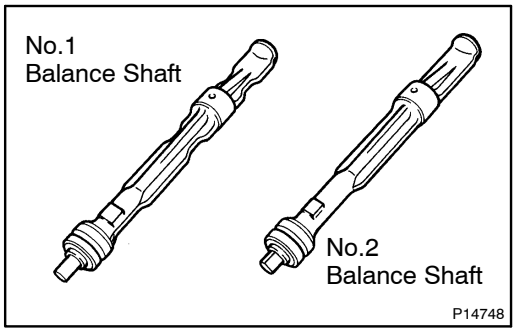


25. REMOVE NO.1 AND NO.2 BALANCE SHAFTS

(a) Remove the 1 bolt from the No.1 balance shaft.
(b) Remove the 2 bolts from the No.2 balance shaft.
(c) Remove the balance shafts.

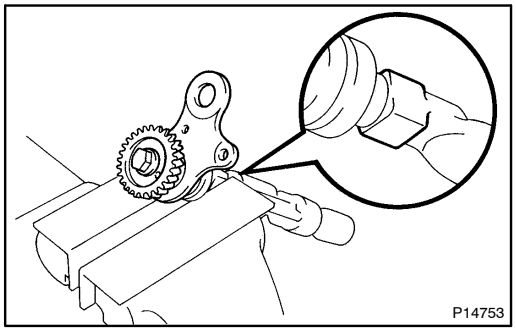
NOTICE:

When removing the balance shaft make sure you support the balance shaft with both hands and avoid scratching the balance shaft bearing on the cylinder block side.



HINT:

- No.1 balance shaft (RH):
  Has indentations.
- No.2 balance shaft (LH):
  Has no indentations.

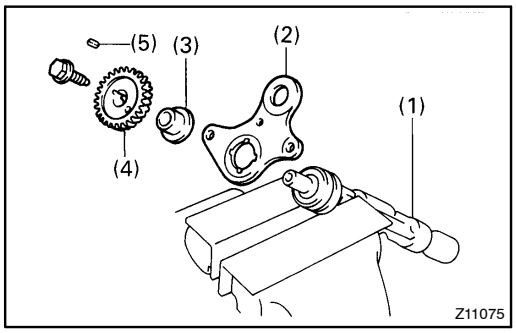


26. DISASSEMBLE NO.1 BALANCE SHAFT

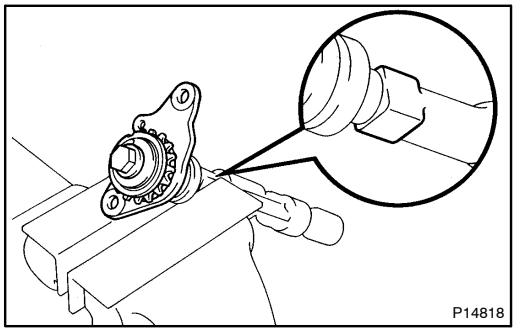
(a) Mount the hexagon wrench head portion of the balance shaft in a vise.

NOTICE:

Be careful not to damage the balance shaft.



(b) Remove these parts from balance shaft assembly:
  (1) No.1 balance shaft
  (2) No.1 balance shaft thrust plate
  (3) Balance shaft thrust spacer.
  (4) Balance shaft timing gear.
  (5) Key



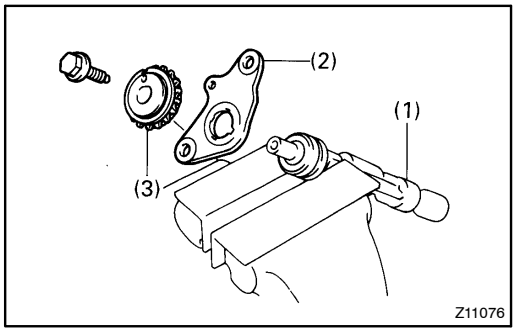
27. DISASSEMBLE NO.2 BALANCE SHAFT

(a) Mount the hexagon wrench head portion of the balance shaft in a vise.

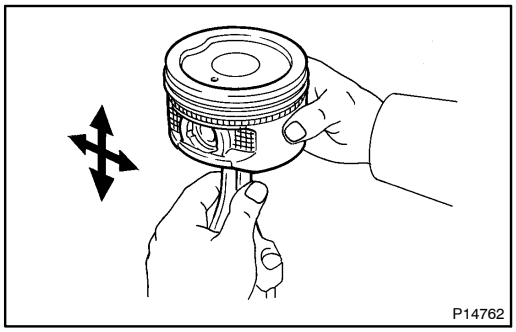
NOTICE:

Be careful not to damage the balance shaft.

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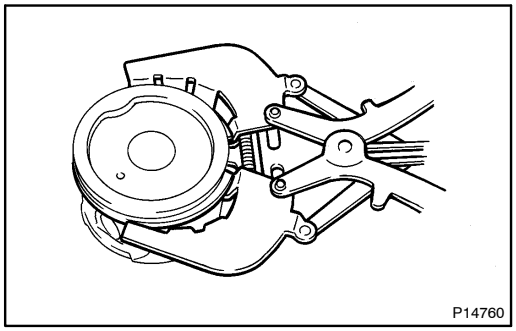


(b) Remove these parts from balance shaft assembly:
(1) No.2 balance shaft
(2) No.2 balance shaft thrust prate
(3) Balance shaft timing sprocket



28. CHECK FIT BETWEEN PISTON AND PISTON PIN

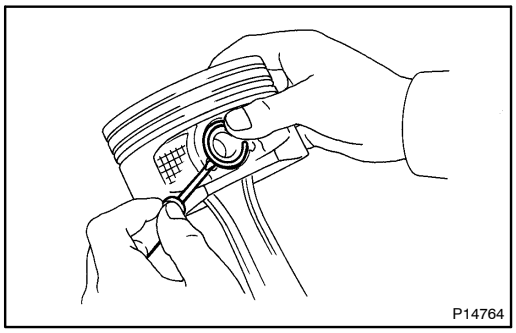
Try to move the piston back and forth on the piston pin.
If any movement is felt, replace the piston and pin as a set.



29. REMOVE PISTON RINGS

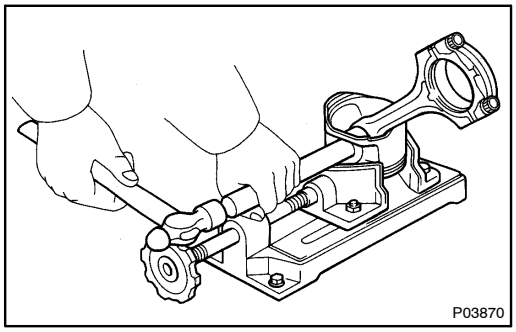
(a) Using a piston ring expander, remove the 2 compression rings.
(b) Remove the 2 side rails and oil ring by hand.

HINT:
Arrange the rings in correct order only.



30. DISCONNECT CONNECTING ROD FROM PISTON

(a) Using a small screwdriver, pry out the 2 snap rings.
(b) Gradually heat the piston to 80 – 90°C (176 – 194 °F).

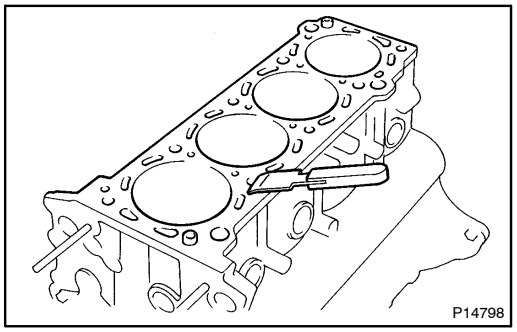


(c) Using plastic–faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

HINT:
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order.

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EM07M–03

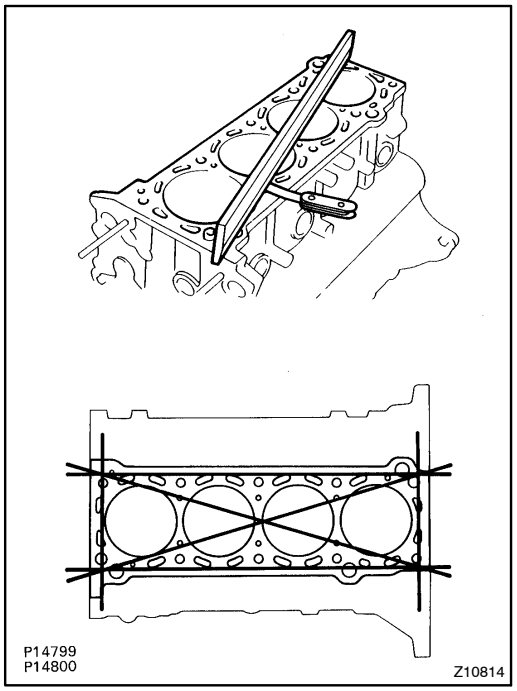


INSPECTION

1. CLEAN CYLINDER BLOCK

(a) Remove gasket material.
Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

(b) Clean cylinder block.
Using a soft brush and solvent, thoroughly clean the cylinder block.



2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

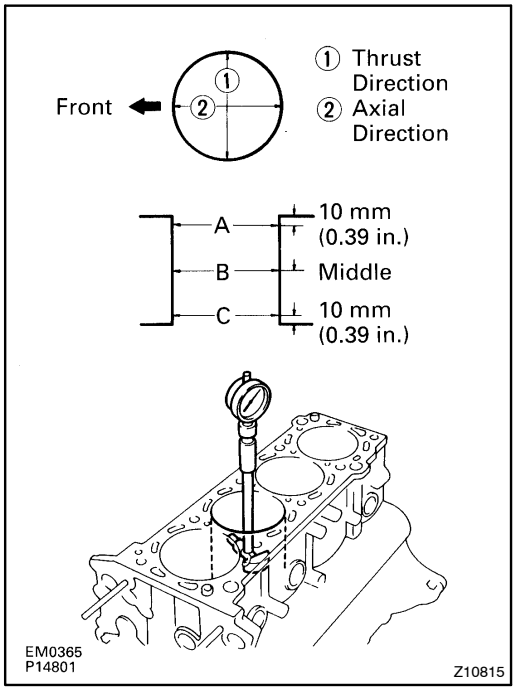
Using a precision straight edge and thickness gauge, measure the surfaces contacting the cylinder head gasket for warpage.

Maximum warpage:
0.05 mm (0.0020 in.)

If warpage is greater than maximum, replace the cylinder block.

3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

Visually check the cylinder for vertical scratches.
If deep scratches are present, rebore all the 4 cylinders. If necessary, replace the cylinder block.



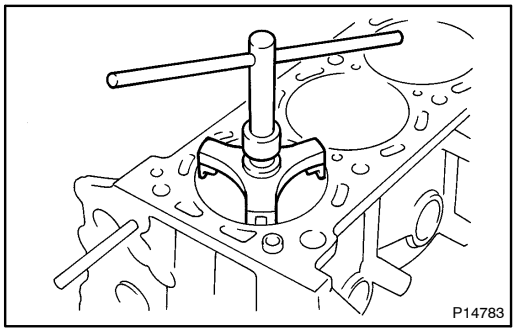
4. INSPECT CYLINDER BORE DIAMETER

Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

Standard diameter:
STD
94.990 – 95.003 mm (3.7398 – 3.7403 in.)
Maximum diameter:
STD
95.06 mm (3.7425 in.)

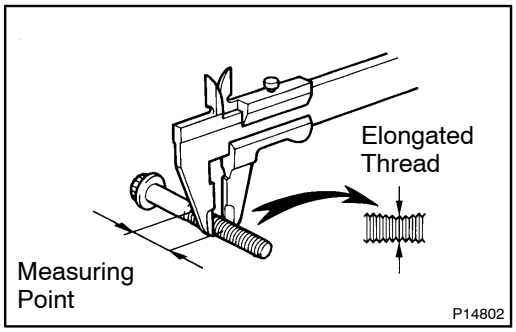
If the diameter is greater than maximum, rebore all the 4 cylinders. If necessary, replace the cylinder block.

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5. REMOVE CYLINDER RIDGE

If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.



6. INSPECT MAIN BEARING CAP BOLTS

Using vernier calipers, measure the thread outside diameter of the bolt.

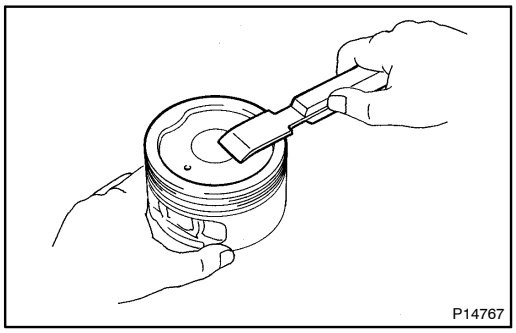
Standard outside diameter:
10.76 – 10.97 mm (0.4236 – 0.4319 in.)
Minimum outside diameter:
10.40 mm (0.4094 in.)

If the diameter is less than minimum, replace the bolt.

7. INSPECT CYLINDER BLOCK ORIFICE

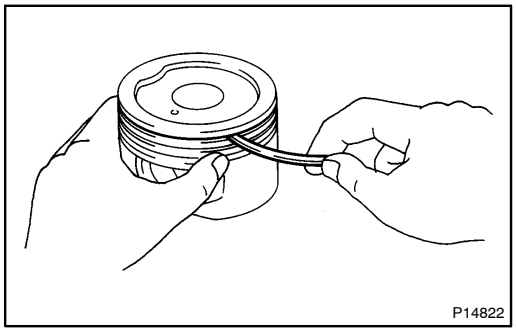
Check the orifice for clogging.

If necessary, replace the orifice.



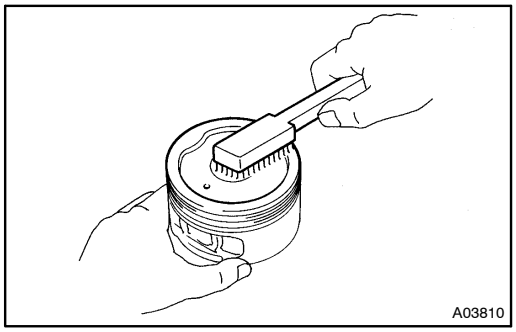
8. CLEAN PISTON

(a) Using a gasket scraper, remove the carbon from the piston top.



(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.

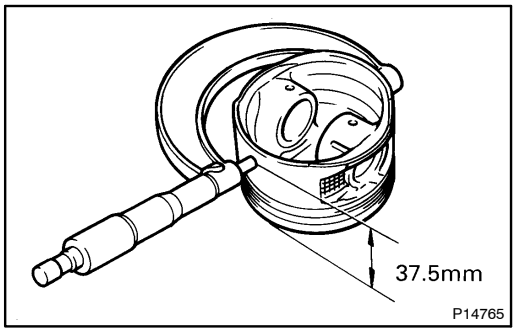
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(c) Using solvent and a brush, thoroughly clean the piston.

NOTICE:

Do not use a wire brush.



9. INSPECT PISTON OIL CLEARANCE

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 37.5 mm (1.47 in.) from the piston head.

Piston diameter:
STD
94.933 – 94.943 mm (3.7375 – 3.7379 in.)
O/S 0.50
95.433 – 95.443 mm (3.7572 – 3.7576 in.)

(b) Measure the cylinder bore diameter in the thrust directions (See step 4.).

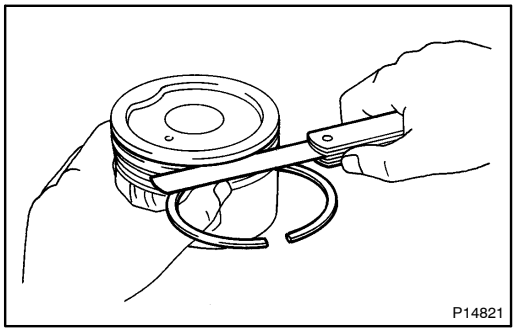
(c) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:
0.047 – 0.070 mm (0.0019 – 0.0028 in.)

If the oil clearance is greater than maximum, replace all the 4 pistons and rebore all the 4 cylinders. If necessary, replace the cylinder block.

HINT:

Use new cylinder block: Use a piston with the same number mark as the cylinder bore diameter marked on the cylinder block.



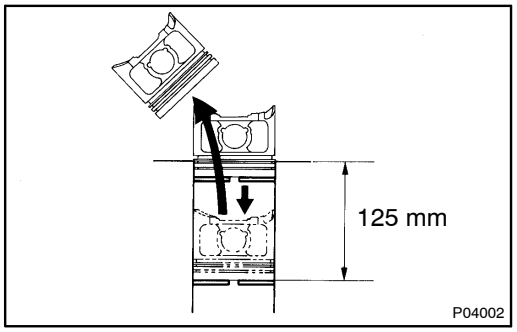
10. INSPECT PISTON RING GROOVE CLEARANCE

Using a thickness gauge, measure the clearance between new piston ring and the wall of the piston ring groove.

Ring groove clearance:
No.1
0.020 – 0.070 mm (0.0008 – 0.0028 in.)
No.2
0.030 – 0.070 mm (0.0012 – 0.0028 in.)

If the clearance is not as specified, replace the piston.

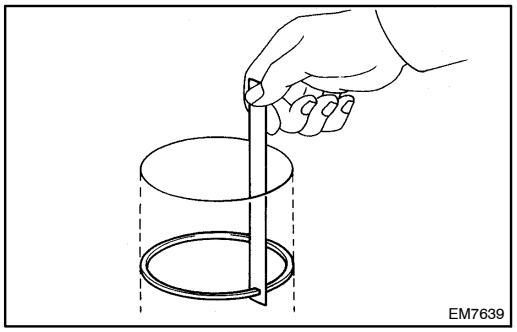
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11. INSPECT PISTON RING END GAP

(a) Insert the piston ring into the cylinder bore.

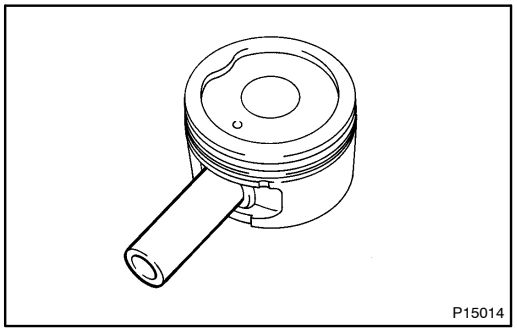
(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 125 mm (4.92 in.) from the top of the cylinder block.



(c) Using a thickness gauge, measure the end gap.

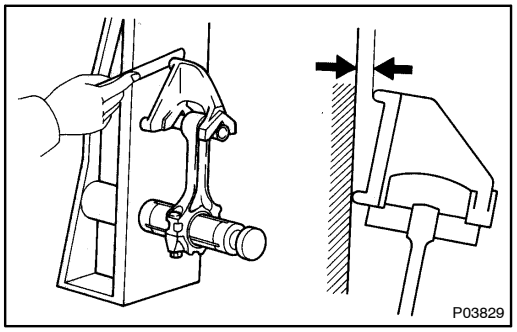
Standard end gap:
No.1
0.300 – 0.400 mm (0.0118 – 0.0157 in.)
No.2
Code mark "T"
0.400 – 0.500 mm (0.0157 – 0.0196 in.)
Code mark "N"
0.400 – 0.500 mm (0.0157 – 0.0196 in.)

If the end gap is not as specified, replace the piston ring. If the end gap is not as specified, even with a new piston ring, rebore all the 4 cylinders or replace the cylinder block.



12. INSPECT PISTON PIN FIT

At 80 – 90°C (176 – 194°F), you should be able to push the piston pin into the piston pin hole with your thumb.



13. INSPECT CONNECTING ROD ALIGNMENT

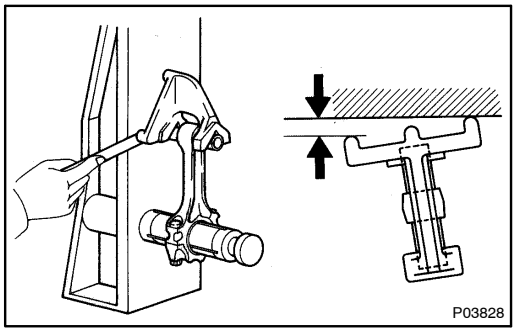
Using a connecting rod aligner and thickness gauge, check the connecting rod alignment.

- Check for out–of–alignment.

Maximum out–of–alignment:
0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If out–of–alignment is greater than maximum, replace the connecting rod assembly.

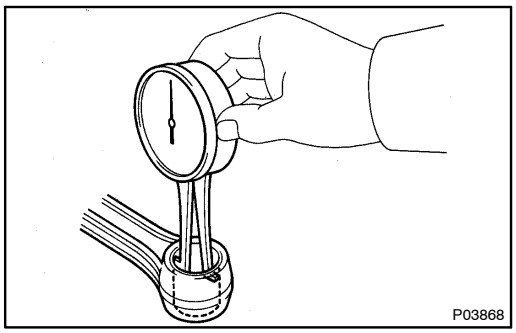
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- Check for twist

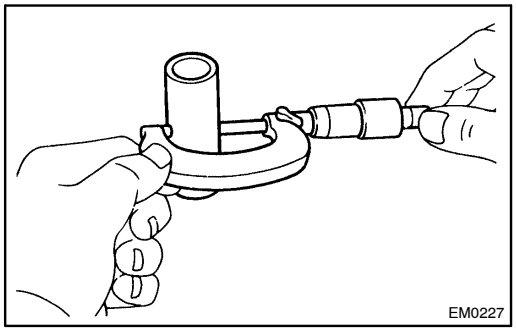
Maximum twist:
0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If twist is greater than maximum, replace the connecting rod assembly.



14. INSPECT PISTON PIN OIL CLEARANCE

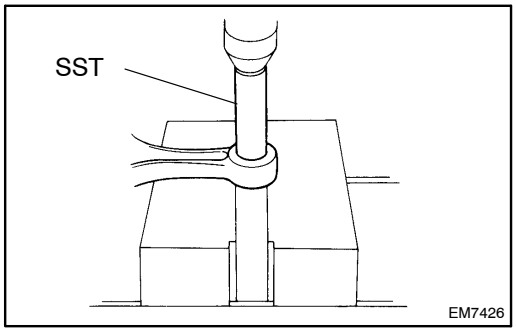
(a) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.
Bushing inside diameter:
24.008 – 24.017 mm (0.9452 – 0.9455 in.)



(b) Using a micrometer, measure the piston pin diameter.
Piston pin diameter:
24.000 – 24.009 mm (0.9449 – 0.9452 in.)

(c) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.
Standard oil clearance:
0.005 – 0.011 mm (0.0002 – 0.0004 in.)
Maximum oil clearance:
0.015 mm (0.0006 in.)

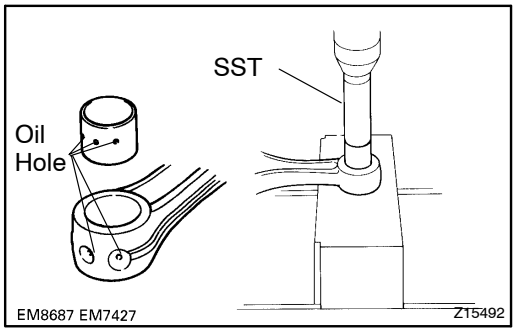
If the oil clearance is greater than maximum, replace the bushing. If necessary, replace the piston and piston pin as a set.



15. IF NECESSARY, REPLACE CONNECTING ROD BUSHING

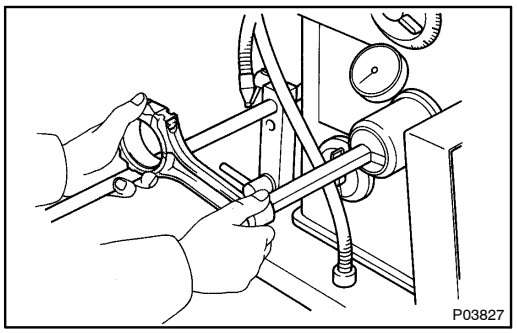
(a) Using SST and a press, press out the bushing.
SST 09207–76010

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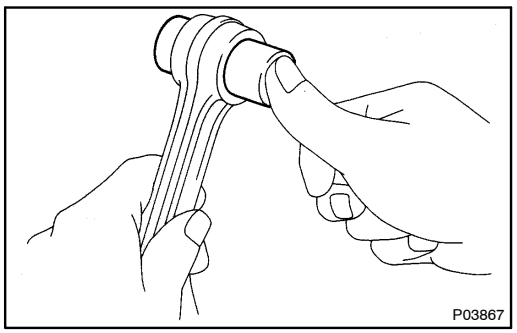


(b) Align the oil holes of a new bushing and the connecting rod.

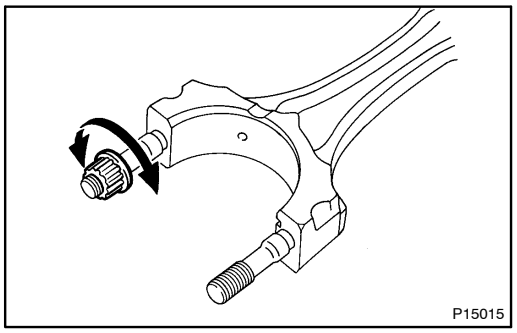
(c) Using SST and a press, press in the bushing.
SST 09207–76010



(d) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance (see step 14 above) between the bushing and piston pin.



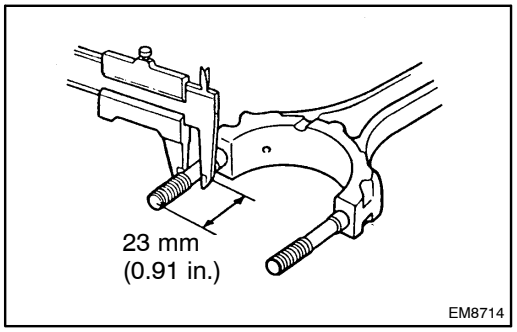
(e) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.



16. INSPECT CONNECTING ROD BOLTS

(a) Install the cap nut to the connecting rod bolt. Check that the cap nut can be turned easily by hand to the end of the thread.

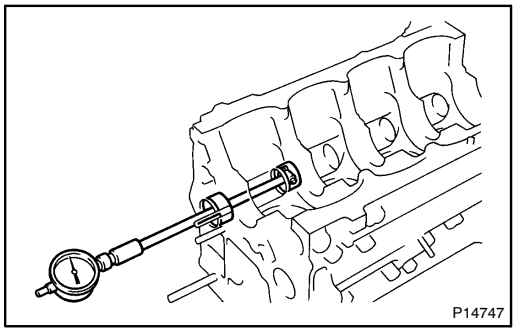
(b) If the cap nut cannot be turned easily, measure the minimum outside diameter of the connecting rod bolt with vernier calipers.
Standard outside diameter:
7.80 – 7.90 mm (0.3071 – 0.3110 in.)
Minimum outside diameter:
7.60 mm (0.2992 in.)



HINT:

- If the location of minimum diameter cannot be judged by visual inspect ion, measure the outer diameter at the location shown in the illustration.
- If the outside diameter is less than limit, replace the connecting rod bolt and nut as a set.

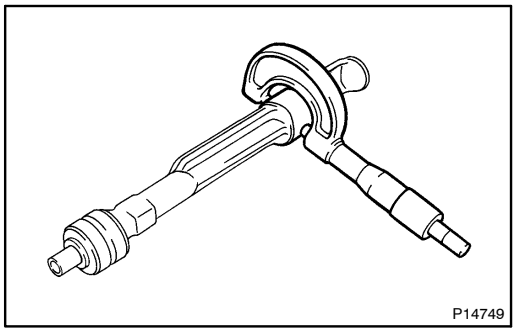
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P14747

17. INSPECT RH AND LH BALANCE SHAFTS

(a) Using a cylinder gauge, measure the inside diameter of the balance shaft bearing.

Bearing inside diameter (from front side):
No.1 38.025 – 38.045 mm (1.4970 – 1.4978 in.)
No.2 37.525 – 37.545 mm (1.4774 – 1.4781 in.)


P14749

(b) Using a micrometer, measure the diameter of the balance shaft main journals.

Main journal diameter (from front side):
No.1 37.969 – 37.985 mm (1.4948 – 1.4955 in.)
No.2 37.449 – 37.465 mm (1.4744 – 1.4750 in.)

(c) Subtract the balance shaft main journal diameter measurement from the balance shaft bearing inside diameter measurement.

Standard oil clearance:
No.1 0.040 – 0.076 mm (0.0016 – 0.0031 in.)
No.2 0.060 – 0.096 mm (0.0024 – 0.0038 in.)
Maximum oil clearance:
No.1 0.15 mm (0.0059 in.)
No.2 0.15 mm (0.0059 in.)

If the clearance is greater than maximum, replace the cylinder block and balance shaft.

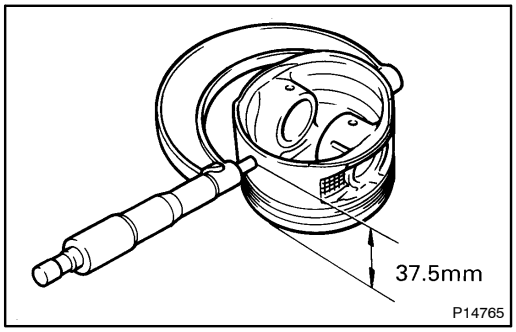
18. CYLINDER BORING

HINT:

- Bore all the 4 cylinders for the oversized piston outside diameter.
- Replace all the piston rings with ones to match the oversized pistons.

(a) Select oversized pistons

Oversized piston diameter:
O/S 0.50
95.433 – 95.443 mm (3.7572 – 3.7576 in.)



P14765

(b) Calculate amount to bore cylinders

(1) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 37.5 mm (1.47 in.) from the piston head.

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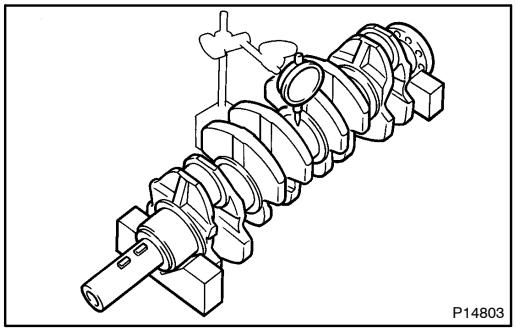
(2) Calculate the amount of each cylinder is to be rebored as follows:

Size to be rebored = P + C – H
P = Piston diameter
C = Piston clearance
0.047 – 0.070 mm (0.0019 – 0.0028 in.)
H = Allowance for honing
0.020 mm (0.0008 in.) or less

(c) Bore and hone cylinder to calculated dimensions

Maximum honing:
0.02 mm (0.0008 in.)

NOTICE:
Excess honing will destroy the finished roundness.



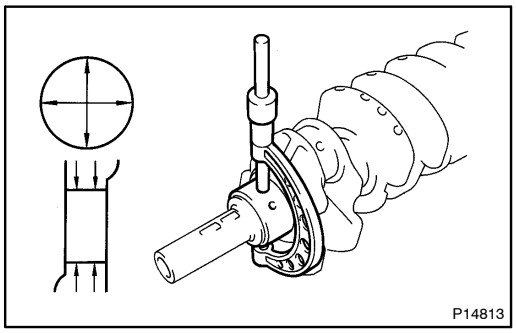
19. INSPECT CRANKSHAFT FOR RUNOUT

(a) Place the crankshaft on V–blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:
0.03 mm (0.0012 in.)

If the circle runout is greater than maximum, replace the crankshaft.



20. INSPECT MAIN JOURNALS AND CRANK PINS

(a) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:
STD size
No.3
59.981 – 59.994 mm (2.2615 – 2.3620 in.)
Others
59.987 – 60.000 mm (2.3617 – 2.3622 in.)
U/S 0.25
No.3
59.740 – 59.750 mm (2.3520 – 2.3524 in.)
Others
59.745 – 59.755 mm (2.3522 – 2.3526 in.)
Crank pin diameter:
STD
52.987 – 53.000 mm (2.0861 – 2.0866 in.)
U/S 0.25
52.745 – 52.755 mm (2.0766 – 2.0770 in.)

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If the diameter is not as specified, check the oil clearance (See disassembly in cylinder block) If necessary, grind or replace the crankshaft.

(b) Check each main journal and crank pin for taper and out–of–round as shown.

Maximum taper and out–of–round:
0.005 mm (0.0002 in.)

If the taper and out–of–round is greater than maximum, replace the crankshaft.

21. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

- Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure in step 20).
- Install new main journal and/or crankshaft pin undersized bearings.

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EM07N–02

REPLACEMENT

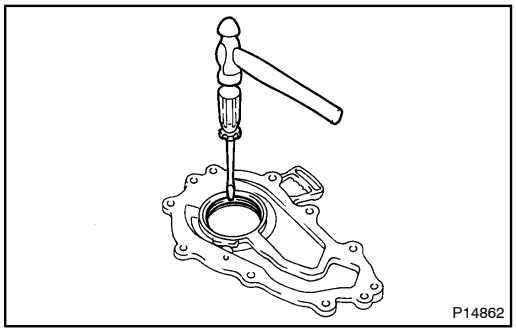
1. REPLACE CRANKSHAFT FRONT OIL SEAL

HINT:

There are 2 methods (A and B) to replace the oil seal which are as follows:

(a) If oil pump is removed from cylinder block.

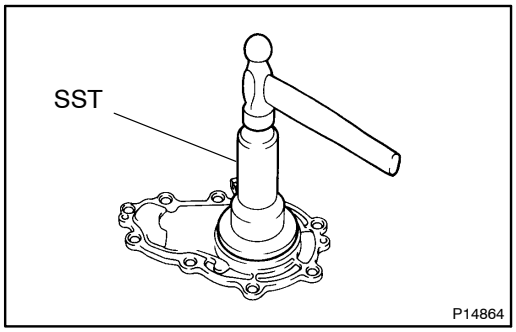
(1) Using a screwdriver and a hammer, tap out the oil seal.



(2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump case edge.

SST 09223 – 50010

(3) Apply MP grease to the oil seal lip.



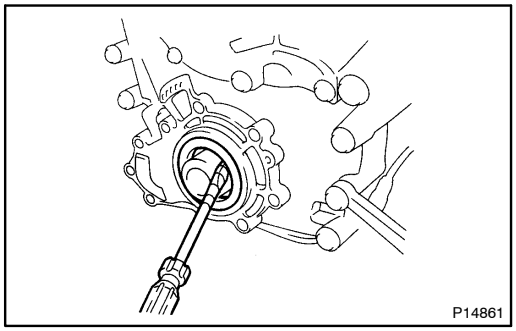
(b) If oil pump is installed to the cylinder block.

(1) Using a screwdriver, pry out the oil seal.

NOTICE:

Be careful not to damage the crankshaft.

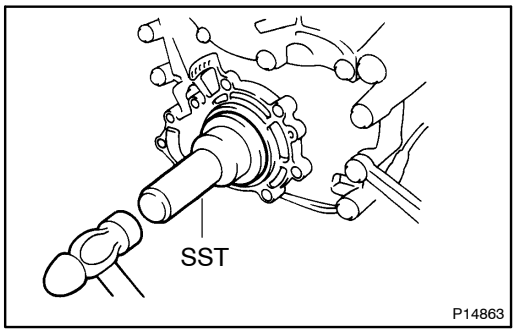
Tape the screwdriver tip.



(2) Apply MP grease to a new oil seal lip.

(3) Using SST and a hammer, tap, in the oil seal until its surface is flush with the oil pump case edge.

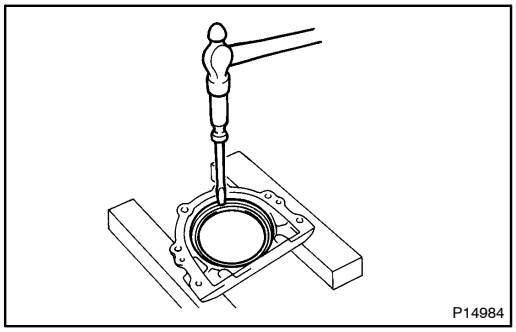
SST 09223 – 50010



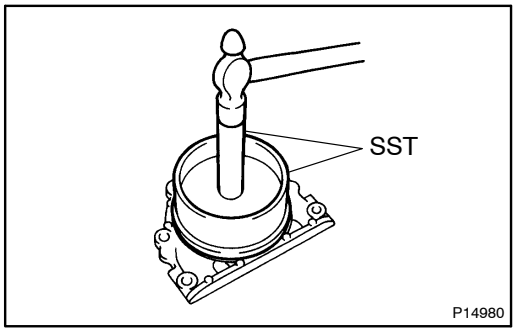
2. REPLACE CRANKSHAFT REAR OIL SEL

(a) If rear oil seal retainer is removed from cylinder block.

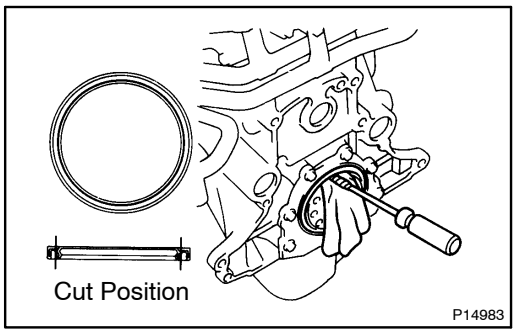
(1) Using a screwdriver and a hammer, tap out the oil seal.



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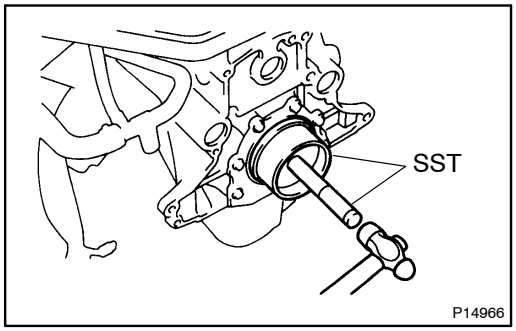


(2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil seal retainer edge.
SST 09223 – 15030, 09608 – 30012 (09608 – 04020)
(3) Apply MP grease to the seal lip.



(b) If rear oil seal retainer is installed to cylinder block.
(1) Using knife, cut off the oil seal lip.
(2) Using a screwdriver pry out the oil seal.

NOTICE:
Be careful not to damage the crankshaft.
Tape the screwdriver tip.



(3) Apply MP grease to a new oil seal lip.
(4) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223 – 15030, 09608 – 30012 (09608 – 04020)

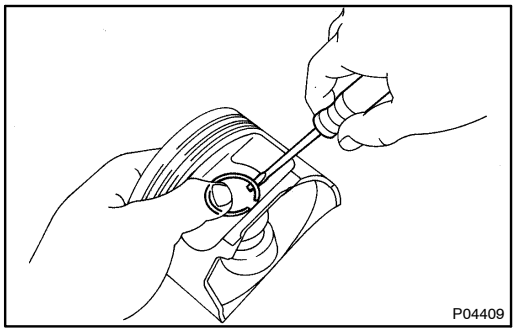
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EM1ON–01

REASSEMBLY

HINT:

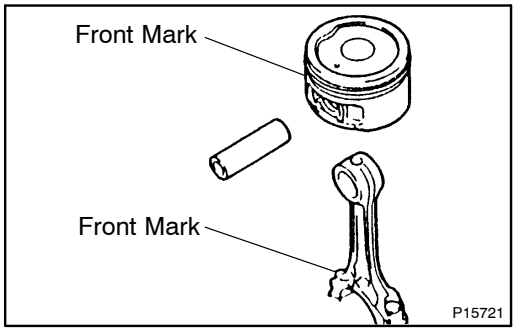
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O–rings and oil seals with new parts.



1. ASSEMBLE PISTON AND CONNECTING ROD

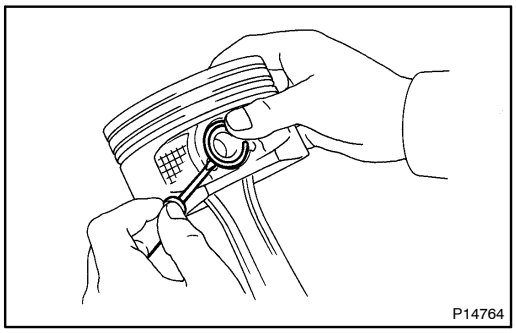
(a) Install a new snap ring on one side of the piston pin hole.

(b) Gradually heat the piston to at 80 – 90°C (176 – 194°F).



(c) Coat the piston pin with engine oil.

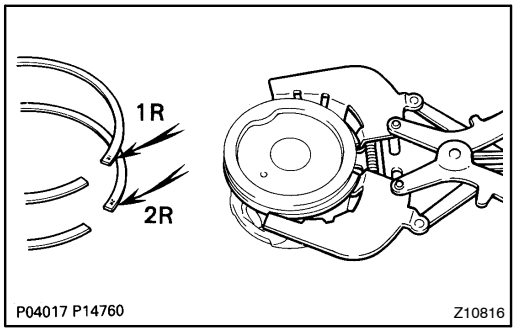
(d) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.



(e) Install a new snap ring on the other side of the piston pin hole.

2. INSTALL PISTON RINGS

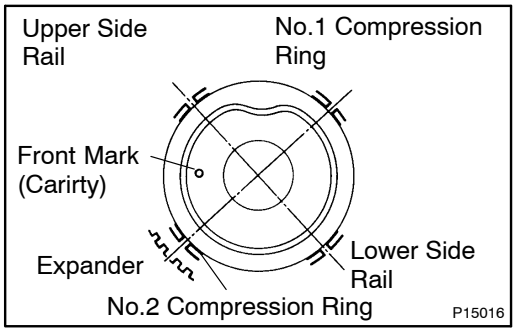
(a) Install the oil ring expander and 2 side rails by hand.



(b) Using a piston ring expander, install the 2 compression rings with the code mark facing upward.

Code mark:
"1T" or "1N" for No.1
"2T" or "2N" for No.2

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(c) Position the piston rings so that the ring ends are as shown.

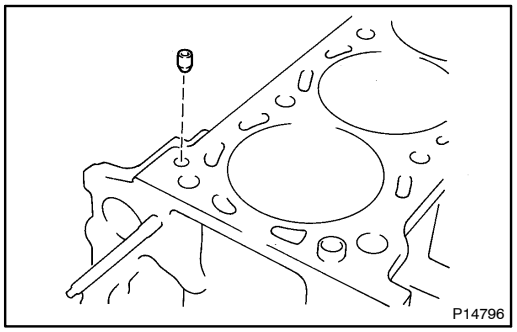
NOTICE:

Do not align the ring ends.

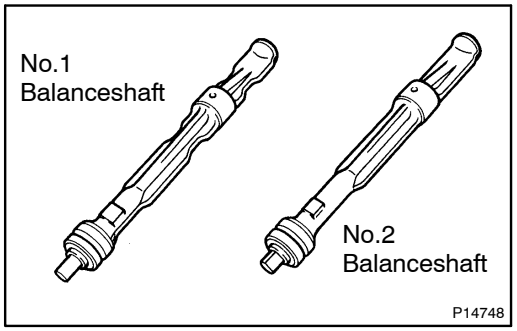
3. INSTALL BEARINGS

(a) Align the bearing claw with the groove of the connecting rod or connecting rod cap.

(b) Install the bearings in the connecting rod and connecting rod cap.



4. INSTALL CYLINDER BLOCK ORIFICE



5. INSTALL NO.1 AND NO.2 BALANCE SHAFTS

(a) No.1 balance shaft (RH):
Has indentations.

(b) No.2 balance shaft (LH):
Has no indentations.

6. ASSEMBLY NO.1 BALANCE SHAFT

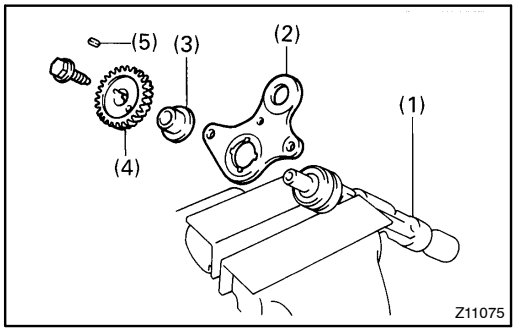
(a) Mount the hexagon wrench head portion of the balance shaft in a vise.

NOTICE:

Be careful not to damage the balance shaft.

(b) Install these parts to the balance shaft:
(1) No.1 balance shaft
(2) No.1 balance shaft thrust plate
(3) Balance shaft thrust spacer
(4) Balance shaft timing gear
(5) Key

(c) Install and torque the bolt.
Torque: 36 N·m (365 kgf·cm, 26 ft·lbf)



7. ASSEMBLY NO.2 BALANCE SHAFT

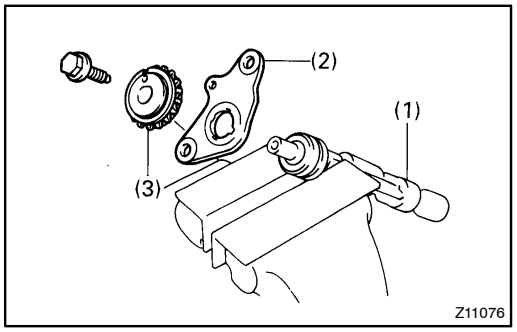
(a) Mount the hexagon wrench head portion of the balance shaft in a vise.

NOTICE:

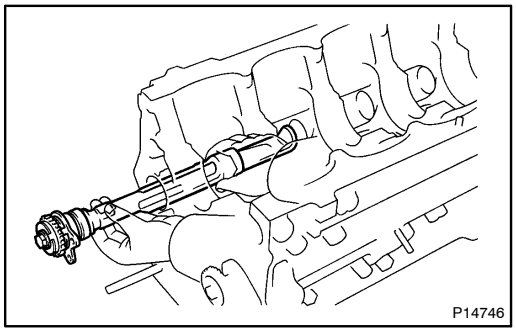
Be careful not to damage the balance shaft.

(b) Install these parts to the balance shaft:
(1) No.2 balance shaft
(2) No.2 balance shaft thrust plate
(3) Balance shaft timing sprocket

(c) Install and torque the bolt.
Torque: 36 N·m (365 kgf·cm, 26 ft·lbf)



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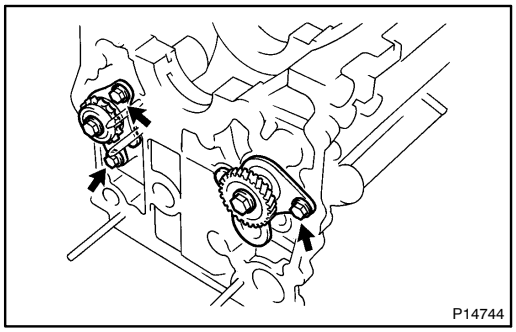


8. INSTALL BALANCE SHAFTS

(a) Install balance shafts.

NOTICE:

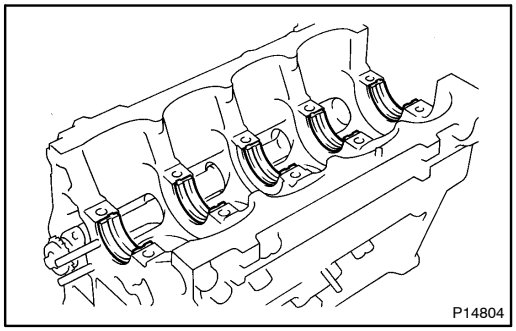
When installing the balance shaft make sure you support the balance shaft with both hands and avoid scratching the balance shaft bearing on the cylinder block side.



(b) Install the No.1 balance shaft with the bolt.

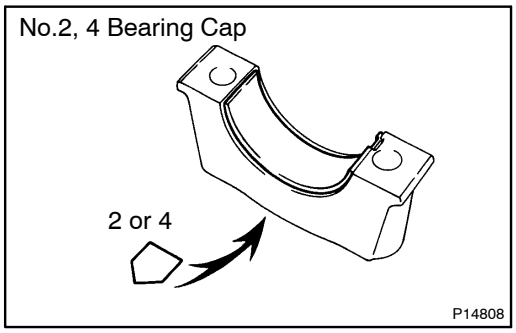
(c) Install the No.2 balance shaft with the 2 bolts.

Torque: 18 N·m (185 kgf·cm, 13.4 ft·lbf)



9. INSTALL MAIN BEARINGS

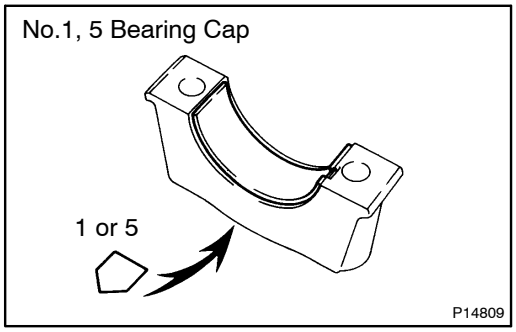
(a) Align the bearing claw with the claw groove of the cylinder block, and push in the 5 upper bearings.



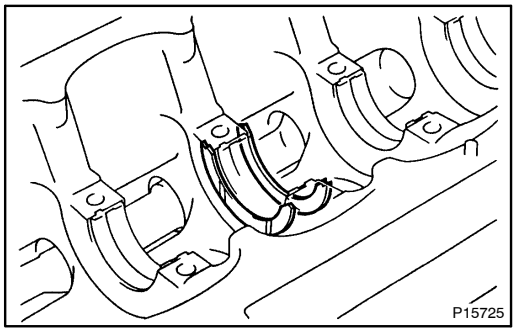
(b) Align the bearing claw with the claw groove of the main bearing cap, and push in the 5 lower bearings.

HINT:

A number is marked on each main bearing cap to indicate the installation position.



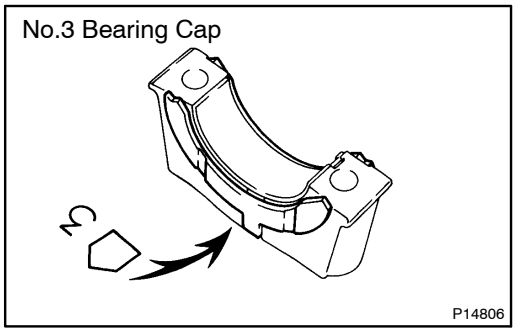
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10. INSTALL UPPER THRUST WASHERS

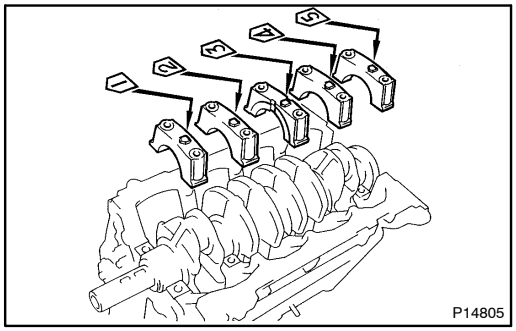
Install the 2 thrust washers under the No.3 journal position of the cylinder block with the oil grooves facing outward.

11. PLACE CRANKSHAFT ON CYLINDER BLOCK



12. PLACE MAIN BEARING CAPS AND LOWER THRUST WASHERS ON CYLINDER BLOCK

(a) Install the 2 thrust washers on the No.3 bearing cap with the grooves facing outward.



(b) Install the 5 main bearing caps in their proper locations.

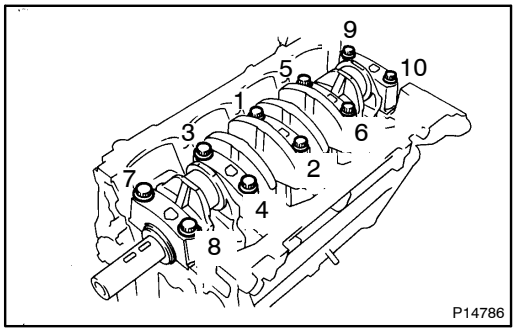
HINT:

Each bearing cap has a number and front mark.

13. INSTALL MAIN BEARING CAP BOLTS

HINT:

- The main bearing cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any of the main bearing cap bolts is broken or deformed, replace it.



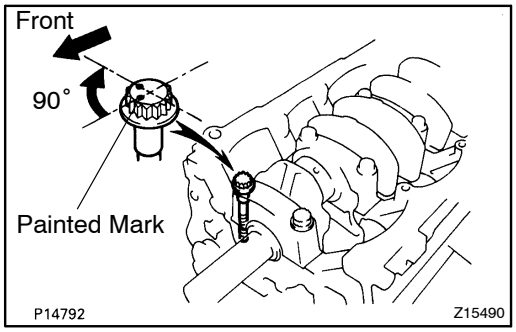
(a) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts.

(b) Install and uniformly tighten the 10 bolts of the main bearing caps, in several passes, in the sequence shown.

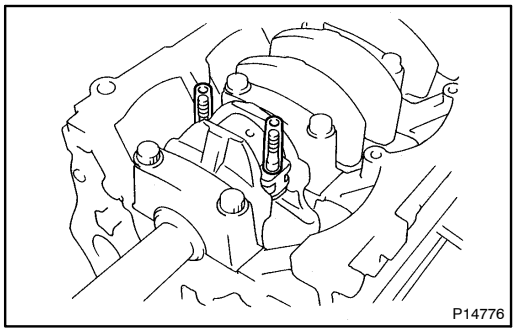
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

If any one of the main bearing cap bolts does not meet the torque specification, replace the main bearing cap bolt.

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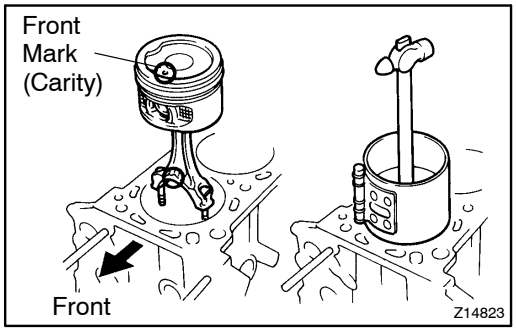


(c) Mark the front of the main bearing cap bolt with paint.
(d) Retighten the main bearing cap bolts by 90° in the numerical order shown above.
(e) Check that the painted mark is now at a 90° angle to the front.
(f) Check that the crankshaft turns smoothly.
(g) Check the crankshaft thrust clearance (See page EM–84).

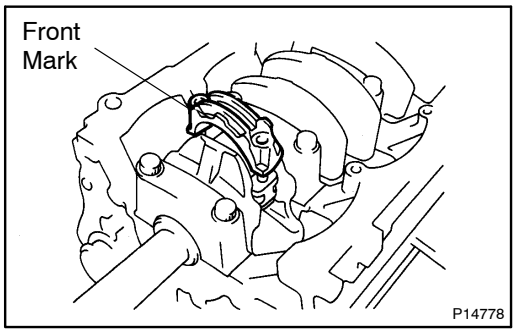


14. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



(b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



15. PLACE CONNECTING ROD CAP ON CONNECTING ROD

(a) Match the numbered connecting rod cap with the connecting rod.
(b) Install the connecting rod cap with the front mark facing forward.

16. INSTALL CONNECTING ROD CAP NUTS

HINT:

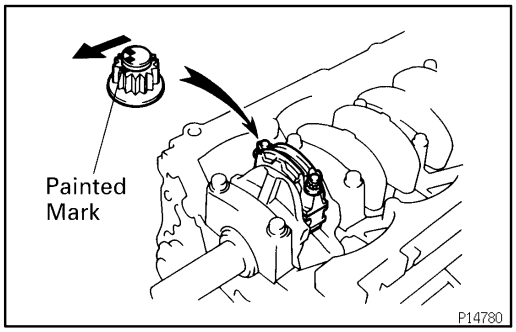
- The connecting rod cap nuts are tightened in 2 progressive steps (steps (b) and (d)).
- If any connecting rod bolt is broken or deformed, replace it.

(a) Apply a light coat of engine oil on the threads and under the nuts of the connecting rod cap.

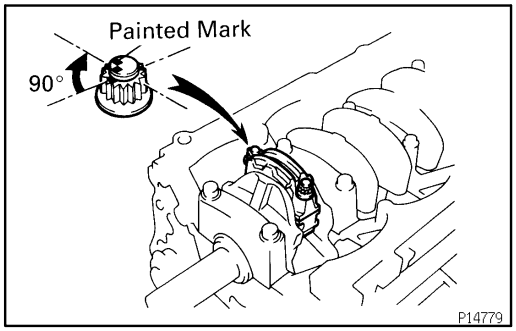
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(b) Install and alternately tighten the nuts of the connecting rod cap in several passes.
Torque:45 N·m (460 kgf·cm, 33 ft·lbf)

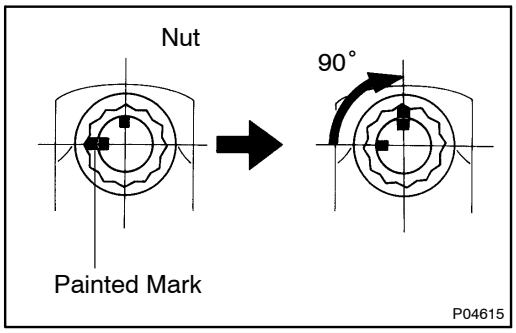
If any one of the connecting rod cap nuts does not meet the torque specification, replace the connecting rod bolt and cap nut as a set.



(c) Mark the front of the connecting rod cap nut and bolt with paint.



(d) Retighten the connecting rod cap nuts 90° as shown.

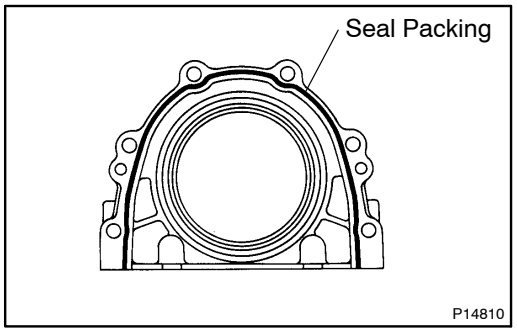


(e) Check that the painted mark on the nut is at a 90° angle in relation to the mark on the bolt.
(f) Check that the crankshaft turns smoothly.
(g) Check the connecting rod thrust clearance (See page EM–84).

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17. INSTALL REAR OIL SEAL RETAINER

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the retainer and cylinder block.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.



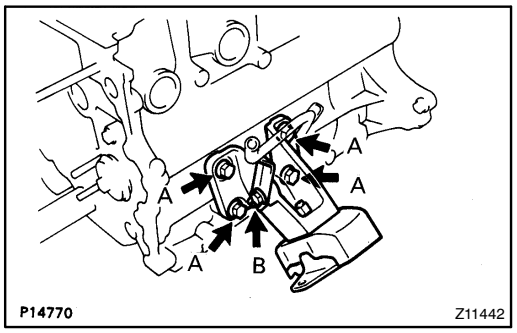
(b) Apply seal packing to the retainer as shown in the illustration.

Seal packing:
Part No. 08826–00080 or equivalent
- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.

HINT:
Avoid applying an excessive amount to the surface.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the retainer with the 6 bolts.

Torque: 13.5 N·m (135 kgf·cm, 9.7 ft·lbf)



18. INSTALL LH ENGINE MOUNTING BRACKET

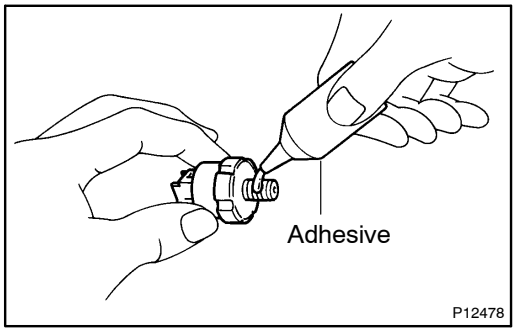
Install the bracket with the 5 bolts.

Torque:
Bolt A: 51 N·m (520 kgf·cm, 34 ft·lbf)
Bolt B: 20 N·m (200 kgf·cm, 14 ft·lbf)

19. INSTALL RH ENGINE MOUNTING BRACKET

Install the bracket with the 4 bolts.

Torque: 51 N·m (520 kgf·cm, 34 ft·lbf)

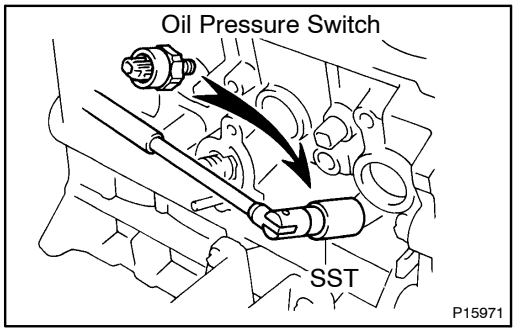


20. INSTALL OIL PRESSURE SWITCH

(a) Apply adhesive to 2 or 3 threads of the oil pressure switch.

Adhesive:
Part No. 08833–00080, THREE BOND 1344,
LOCTITE 242 or equivalent

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(b) Using SST, install the oil pressure switch.
SST 09816–30010

21. INSTALL ENGINE COOLANT DRAIN PLUG

(a) Apply adhesive to 2 or 3 threads of the engine coolant drain plug.
Adhesive:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Install the engine coolant drain plug.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

22. INSTALL OIL FILTER BRACKET UNION

(a) Install a new O–ring.

(b) Using 14 mm hexagon wrench, install the oil filter bracket union.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

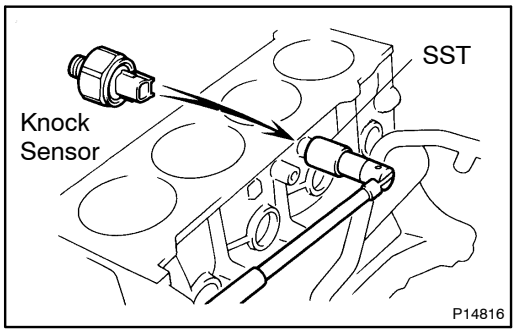
23. INSTALL OIL FILTER AND BRACKET

(a) Install a new O–ring and oil filter bracket with the 2 bolts and nut.
Torque: 28 N·m (290 kgf·cm, 21 ft·lbf)

(b) Install the oil filter (See page LU–3).

24. INSTALL WATER BYPASS PIPE

Install the bolt and water bypass pipe.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)



25. INSTALL KNOCK SENSOR

Using SST, install the knock sensor.
SST 09816–30010
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

26. INSTALL FUEL FILTER

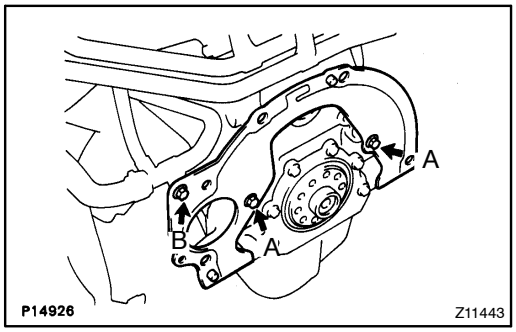
Install the 2 bolts and fuel filter.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

27. INSTALL TIMING CHAINS, GEARS AND SPROCKETS (See page EM–20)

28. INSTALL CYLINDER HEAD (See page EM–50)

29. REMOVE ENGINE STAND

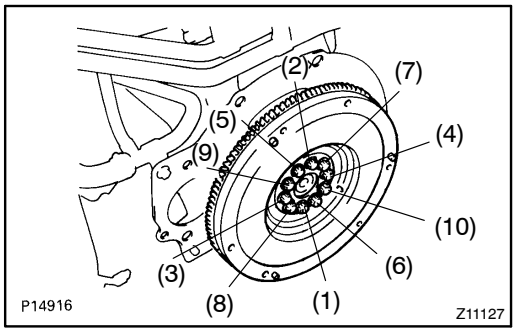
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30. INSTALL REAR END PLATE

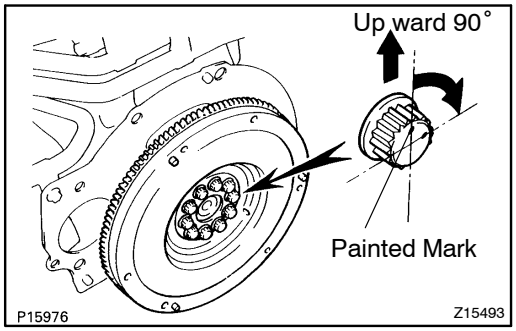
Install the rear end plate with the 3 bolts.

Torque:
Bolt A: 18 N·m (185 kgf·cm, 13 ft·lbf)
Bolt B: 20 N·m (200 kgf·cm, 14 ft·lbf)



31. M/T:
INSTALL FLYWHEEL

(a) Install and uniformly tighten 10 new bolts to the flywheel, in several passes, in the sequence shown.
Torque: 26.5 N·m (270 kgf·cm, 19 ft·lbf)



(b) Mark the top of the flywheel bolt with paint.
(c) Retighten the flywheel bolts by 90° in the numerical order shown above.
(d) Check that the painted mark is now at a 90° angle to the top.

32. A/T:
INSTALL DRIVE PLATE

Install the front spacer, drive plate and rear spacer with the 10 bolts.

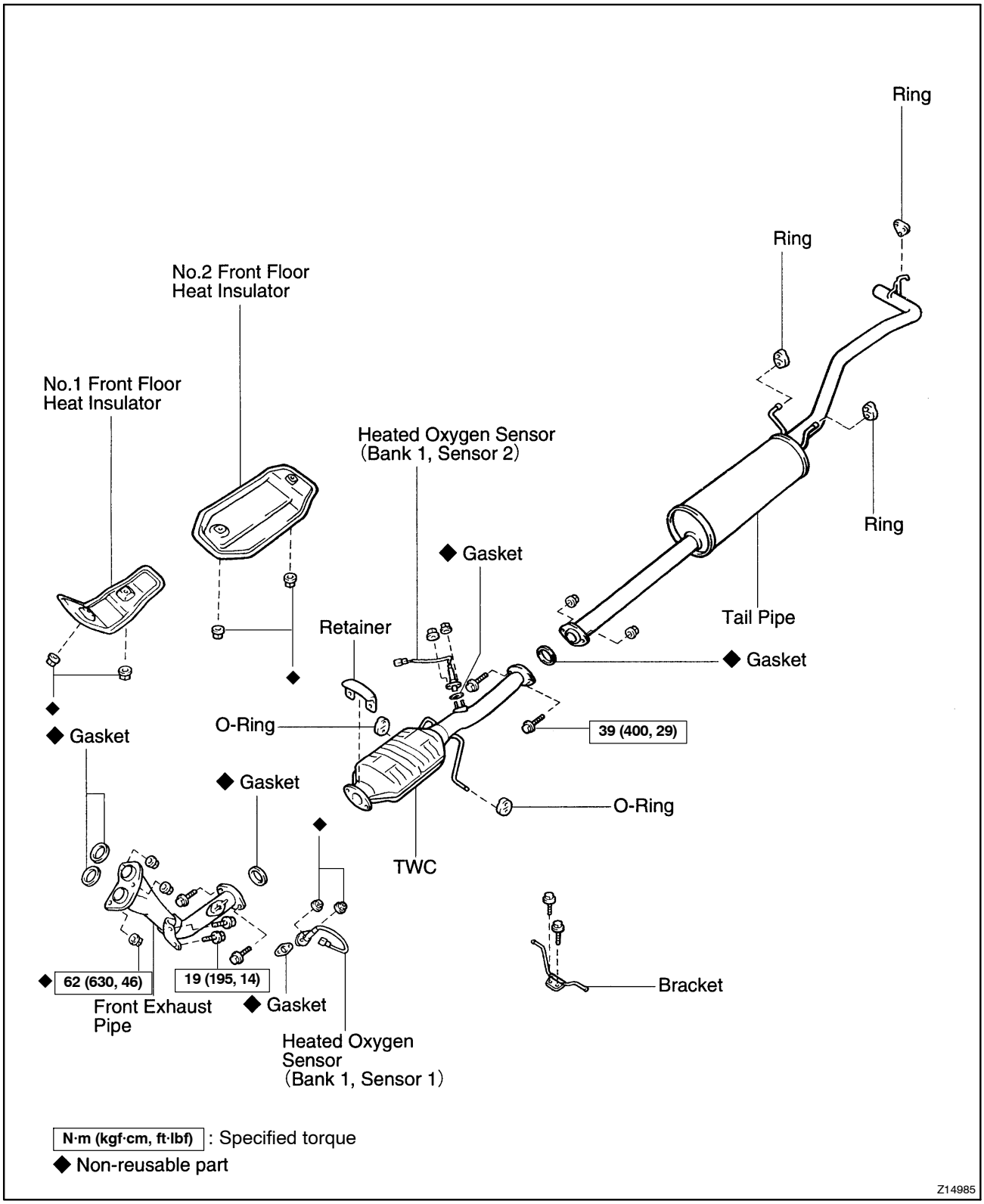
Torque: 74 N·m (750 kgf·cm, 56 ft·lbf)

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EXHAUST SYSTEM

COMPONENTS

EM07P–02



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EM – ENGINE MECHANICAL (5VZ-FE)

CO/HC	EM-1
COMPRESSION	EM-2
VALVE CLEARANCE	EM-4
IGNITION TIMING	EM-9
IDLE SPEED	EM-10
TIMING BELT	EM-11
CYLINDER HEAD	EM-25
ENGINE UNIT (2WD)	EM-62
ENGINE UNIT (4WD)	EM-73
CYLINDER BLOCK	EM-82
EXHAUST SYSTEM	EM-108

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CO/HC

EM06B–03

INSPECTION

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected

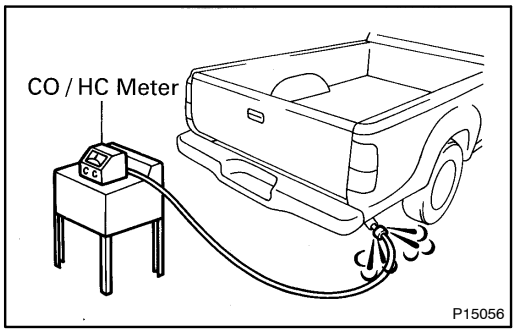
HINT:

All vacuum hoses for EGR systems, etc. should be properly connected.

(f) SFI system wiring connectors fully plugged
(g) Ignition timing checked correctly
(h) Transmission in neutral position
(i) Tachometer and CO/HC meter calibrated by hand

2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX. 180 SECONDS



4. INSERT CO/HC METER TESTING PROBE AT LEAST 40 cm (1.3 ft) INTO TAILPIPE DURING IDLING

5. IMMEDIATELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM

HINT:

When doing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the applicable local regulations

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COMPRESSION

EM06C–05

INSPECTION

HINT:

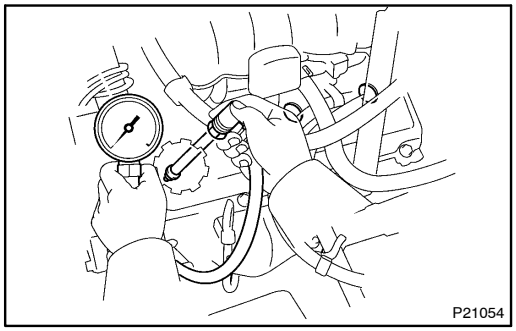
If there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

1. WARM UP AND STOP ENGINE

Allow the engine to warm up to normal operating temperature.

2. REMOVE HIGH–TENSION CORDS WITH IGNITION COILS (See page IG–1)

3. REMOVE SPARK PLUGS


P21054

4. CHECK CYLINDER COMPRESSION PRESSURE

(a) Insert a compression gauge into the spark plug hole.

(b) Fully open the throttle.

(c) While cranking the engine, measure the compression pressure.

HINT:

Always use a fully charged battery to obtain engine speed of 250 rpm or more.

(d) Repeat steps (a) through (c) for each cylinder.

NOTICE:

This measurement must be done in as short a time as possible.

Compression pressure:
1,200 kPa (12.2 kgf/cm^2, 174 psi) or more
Minimum pressure:
1,000 kPa (10.2 kgf/cm^2, 145 psi)
Difference between each cylinder:
100 kPa (1.0 kgf/cm^2, 15 psi) or less

(e) If the cylinder compression in 1 or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression.

- If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.

5. REINSTALL SPARK PLUGS

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6. **REINSTALL HIGH–TENSION CORDS WITH IGNITION COILS (See page IG–1)**

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VALVE CLEARANCE

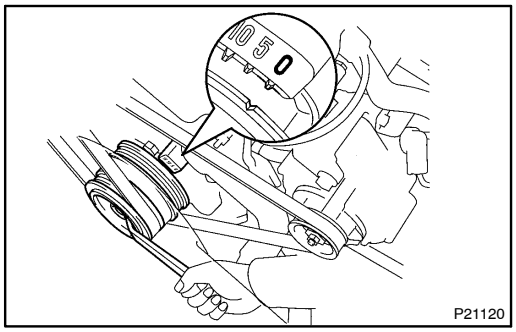
INSPECTION

EM06D–03

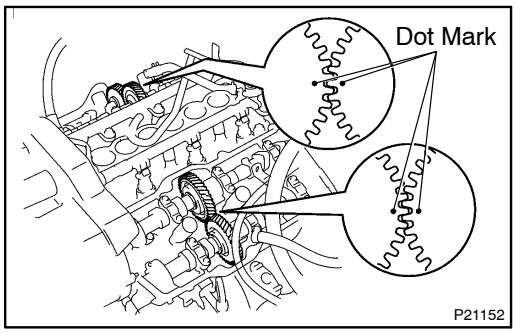
HINT:

Inspect and adjust the valve clearance when the engine is cold.

1. **DRAIN ENGINE COOLANT**
2. **REMOVE INTAKE AIR CONNECTOR**
   (See page EM–65)
3. **REMOVE CYLINDER HEAD COVERS**
   (See page EM–30)
4. **SET NO.1 CYLINDER TO TDC/COMPRESSION**

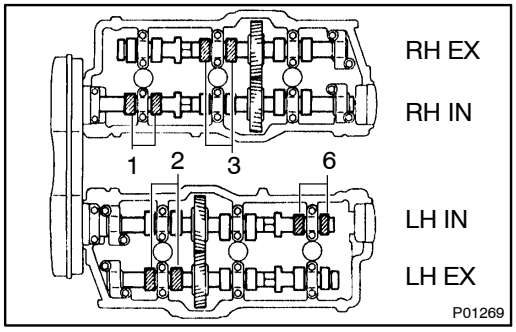


(a) Turn the crankshaft pulley, and align its groove with the timing mark ”0” of the No.1 timing belt cover.



(b) Check that the timing marks (1 dot) of the camshaft drive and driven gears are in straight line on the cylinder heads surface as shown in the illustration.

If not, turn the crankshaft 1 revolution (360˚) and align the marks.

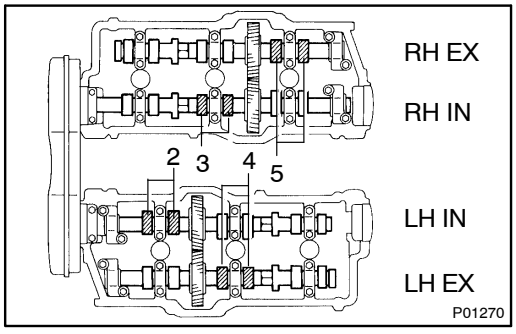


5. **INSPECT VALVE CLEARANCE**

(a) Check only the valves indicated in the illustration.

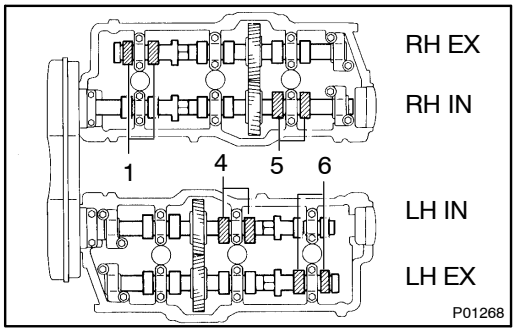
- Using a thickness gauge, measure the clearance between the valve lifter and camshaft.
- Record out of specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold):
Intake 0.13 – 0.23 mm (0.006 – 0.009 in.)
Exhaust 0.27 – 0.37 mm (0.011 – 0.014 in.)

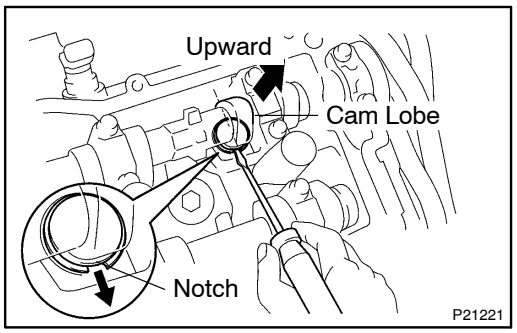


(b) Turn the crankshaft 2/3 of a revolution (240˚), and check only the valves indicated in the illustration. Measure the valve clearance. (See procedure step (a))

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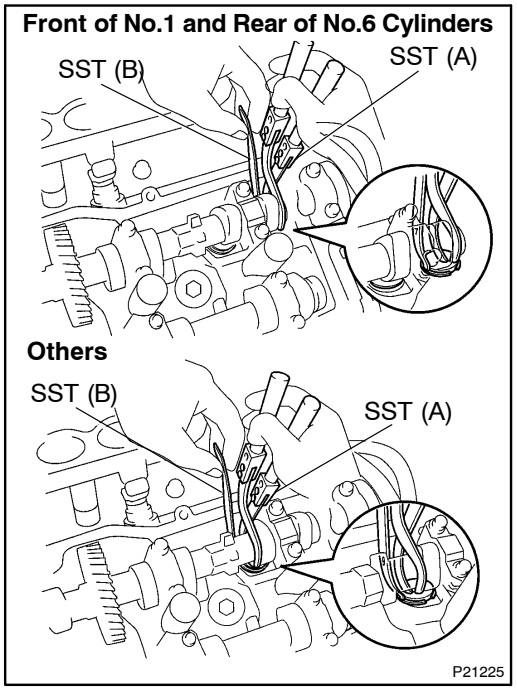
(c) Turn the crankshaft a further 2/3 of a revolution (240°), and check only the valves indicated in the illustration. Measure the valve clearance (See procedure step (a)).



6. ADJUST VALVE CLEARANCE

(a) Remove the adjusting shim.

- Turn the camshaft so that the cam lobe for the valve to be adjusted faces up.
- Turn the valve lifter with a screwdriver so that the notches are perpendicular to the camshaft.

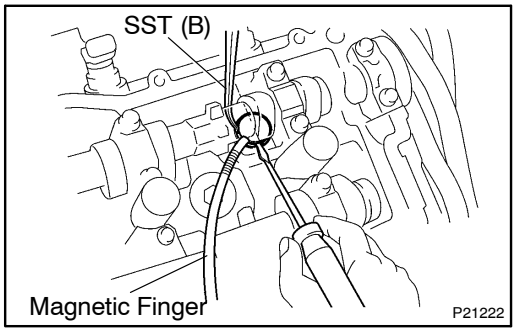


- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

SST 09248–55040 (09248–05410, 09248–05420)

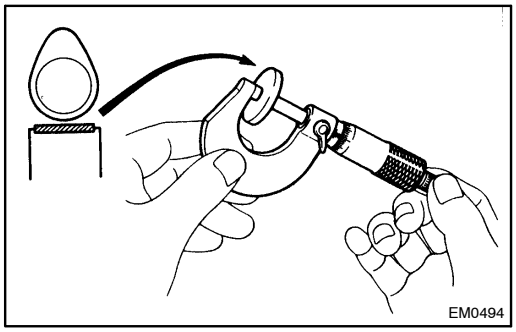
HINT:

- Apply SST (B) at a slight angle on the side marked with "9" or "7", at the position shown in the illustration.
- When SST (B) is inserted too deeply, it will get pinched by the shim. To prevent it from being stuck, insert it gently from the intake side, at a slight angle.



- Using a small screwdriver and magnetic finger, remove the adjusting shim.

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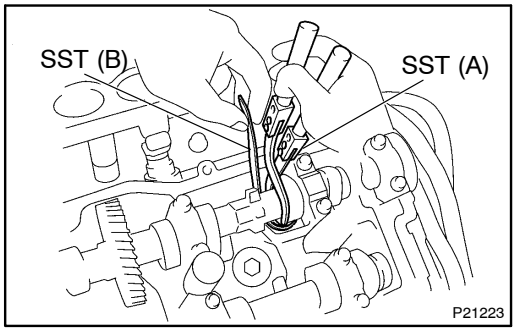
(b) Determine the replacement adjusting shim size according to these Formula or Charts:

- Using a micrometer, measure the thickness of the removed shim.
- Calculate the thickness of a new shim so the valve clearance comes within the specified value.

T ..... Thickness of used shim
A ..... Measured valve clearance
N ..... Thickness of new shim
Intake
N = T + (A – 0.18 mm (0.007 in.))
Exhaust
N = T + (A – 0.32 mm (0.013 in.))

- Select a new shim with a thickness as close as possible to the calculated values.

HINT:
Shims are available in 17 sizes in increments of 0.050 mm (0.0020 in.), from 2.500 mm (0.0984 in.) to 3.300 mm (0.1299 in.).



(c) Install a new adjusting shim.

- Place a new adjusting shim on the valve lifter, with imprinted numbers facing down.
- Press down the valve lifter with SST (A), and remove SST (B).

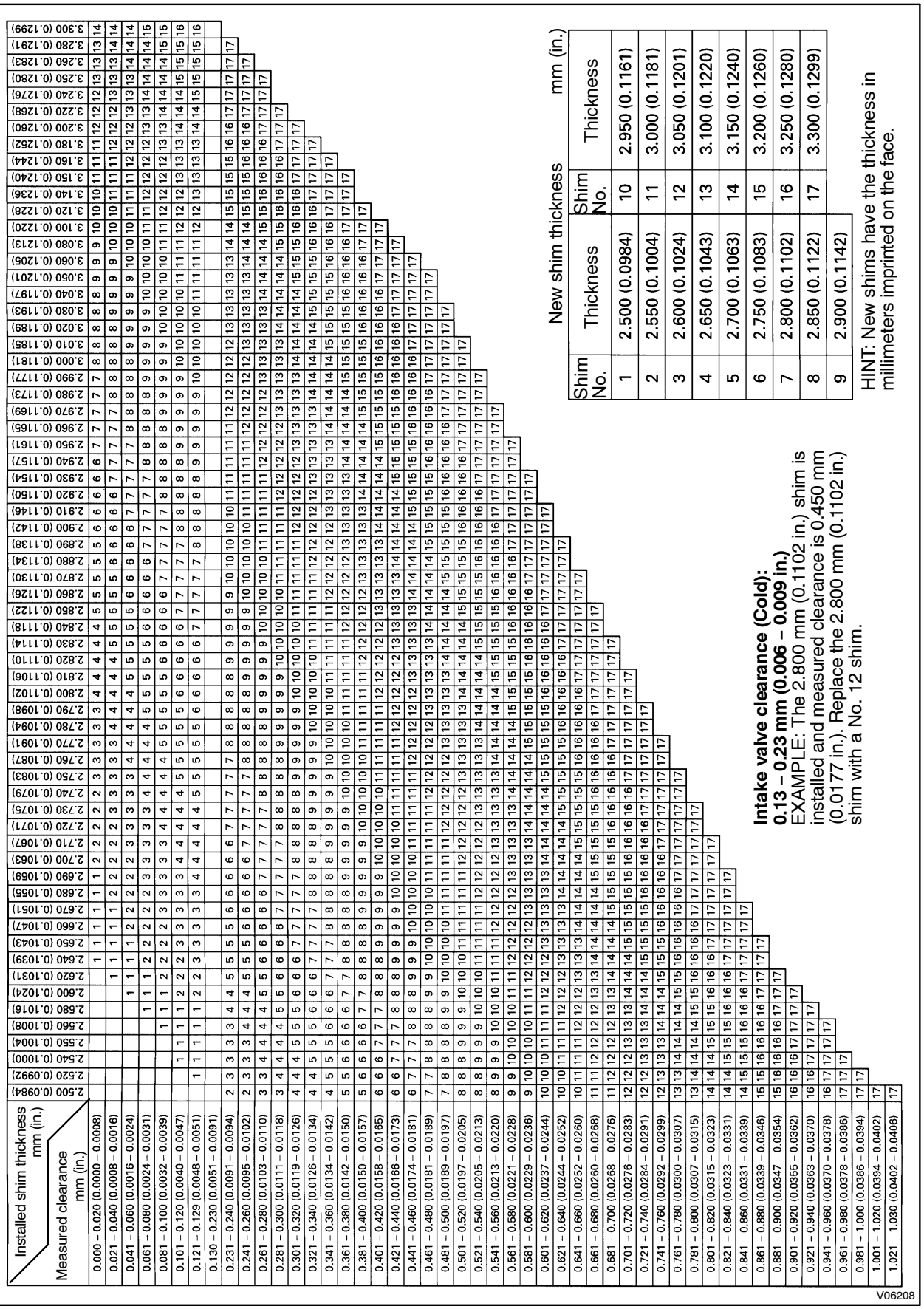
SST 09248–55040 (09248–05410, 09248–05420)

(d) Recheck the valve clearance.

7. REINSTALL CYLINDER HEAD COVERS (See page EM–51)
8. REINSTALL INTAKE AIR CONNECTOR (See page EM–69)
9. REFILL WITH ENGINE COOLANT
10. START ENGINE AND CHECK FOR LEAKS

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Adjusting Shim Selection Chart (Intake)



New shim thickness mm (in.)

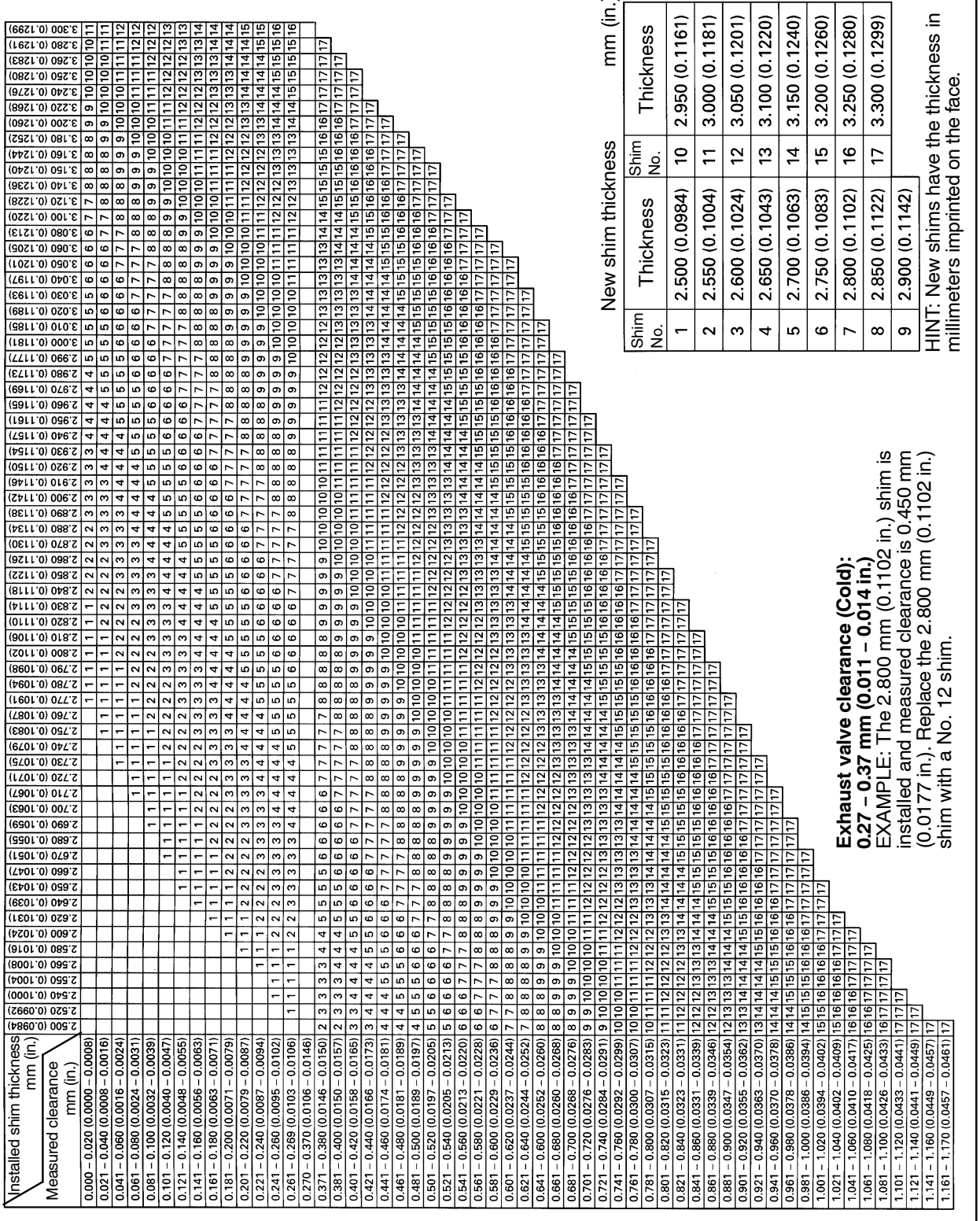
Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

HINT: New shims have the thickness in millimeters imprinted on the face.

Intake valve clearance (Cold):
0.13 – 0.23 mm (0.006 – 0.009 in.)
EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed and measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 12 shim.

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Adjusting Shim Selection Chart (Exhaust)



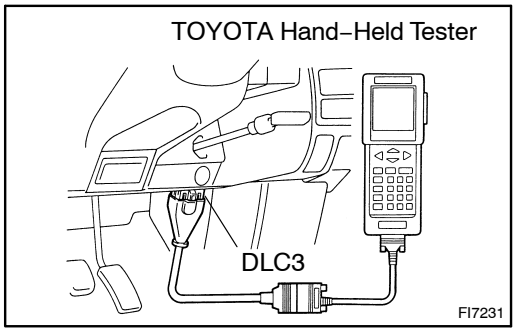
Exhaust valve clearance (Cold):
0.27 – 0.37 mm (0.011 – 0.014 in.)
EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed and measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 12 shim.

New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

HINT: New shims have the thickness in millimeters imprinted on the face.

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IGNITION TIMING

EM06E–05

INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

2. CONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL

(a) Connect the TOYOTA hand–held tester or OBDII scan tool to the DLC3.

(b) Please refer to the TOYOTA hand–held tester or OBDII scan tool operator's manual for further details.

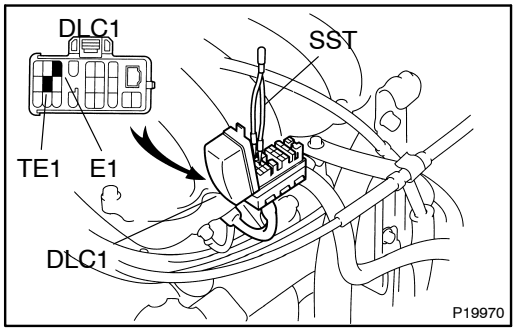
3. CONNECT TIMING LIGHT TO ENGINE

4. CHECK IDLE SPEED

(a) Race the engine speed at 2,500 rpm for approx. 90 seconds.

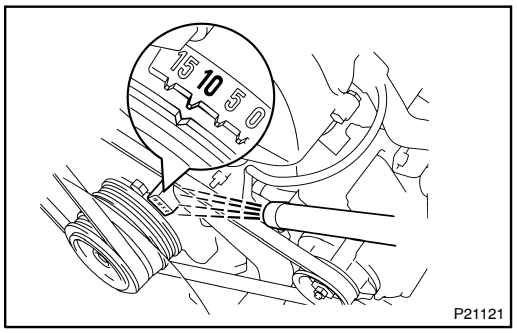
(b) Check the idle speed.

Idle speed:
700 ± 50 rpm



5. INSPECT IGNITION TIMING

(a) Using SST, connect terminals TE1 and E1 of the DLC1.
SST 09843–18020



(b) Using a timing light, check the ignition timing.

Ignition timing:
8 – 12° BTDC @ idle
(Transmission in neutral position)

(c) Remove the SST from the DLC1.
SST 09843–18020

6. FURTHER CHECK IGNITION TIMING

Ignition timing:
12.5 – 22° BTDC @ idle
(Transmission in neutral position)

HINT:
The timing mark moves in a range between 12.5° and 22°.

7. DISCONNECT TIMING LIGHT FROM ENGINE

8. DISCONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL

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IDLE SPEED

EM06F–01

INSPECTION

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected

HINT:

w/ EGR: All vacuum hoses for EGR system, etc. should be properly connected.

(f) SFI system wiring connectors fully plugged
(g) Ignition timing check correctly
(h) Transmission in neutral position

2. CONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL (See page EM–9)

3. INSPECT IDLE SPEED

(a) Race the engine speed at 2,500 rpm for approx. 90 seconds.
(b) Check the idle speed.

Idle speed:
700 ± 50 rpm

If the idle speed is not as specified, check the IAC valve and air intake system.

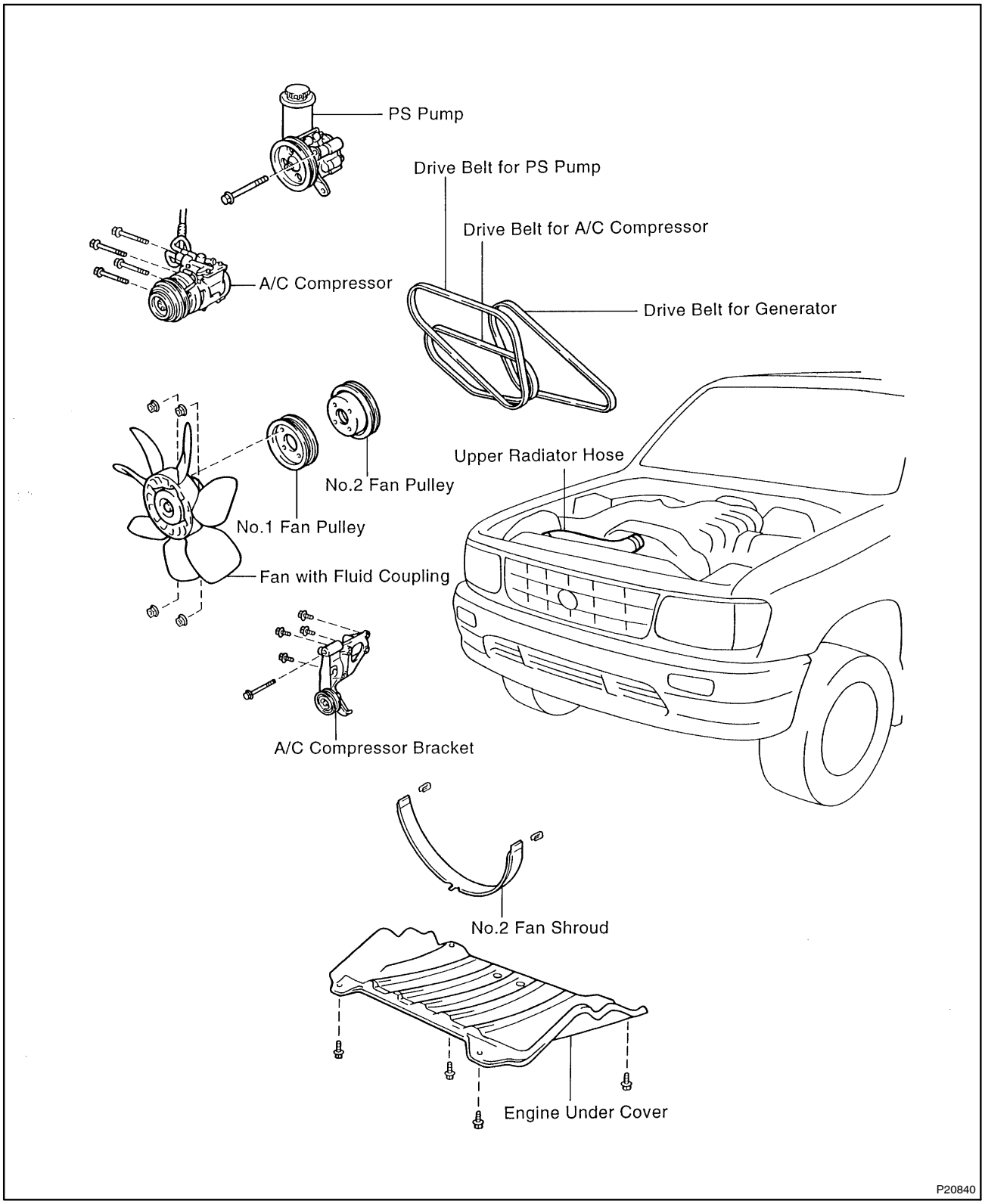
4. DISCONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL

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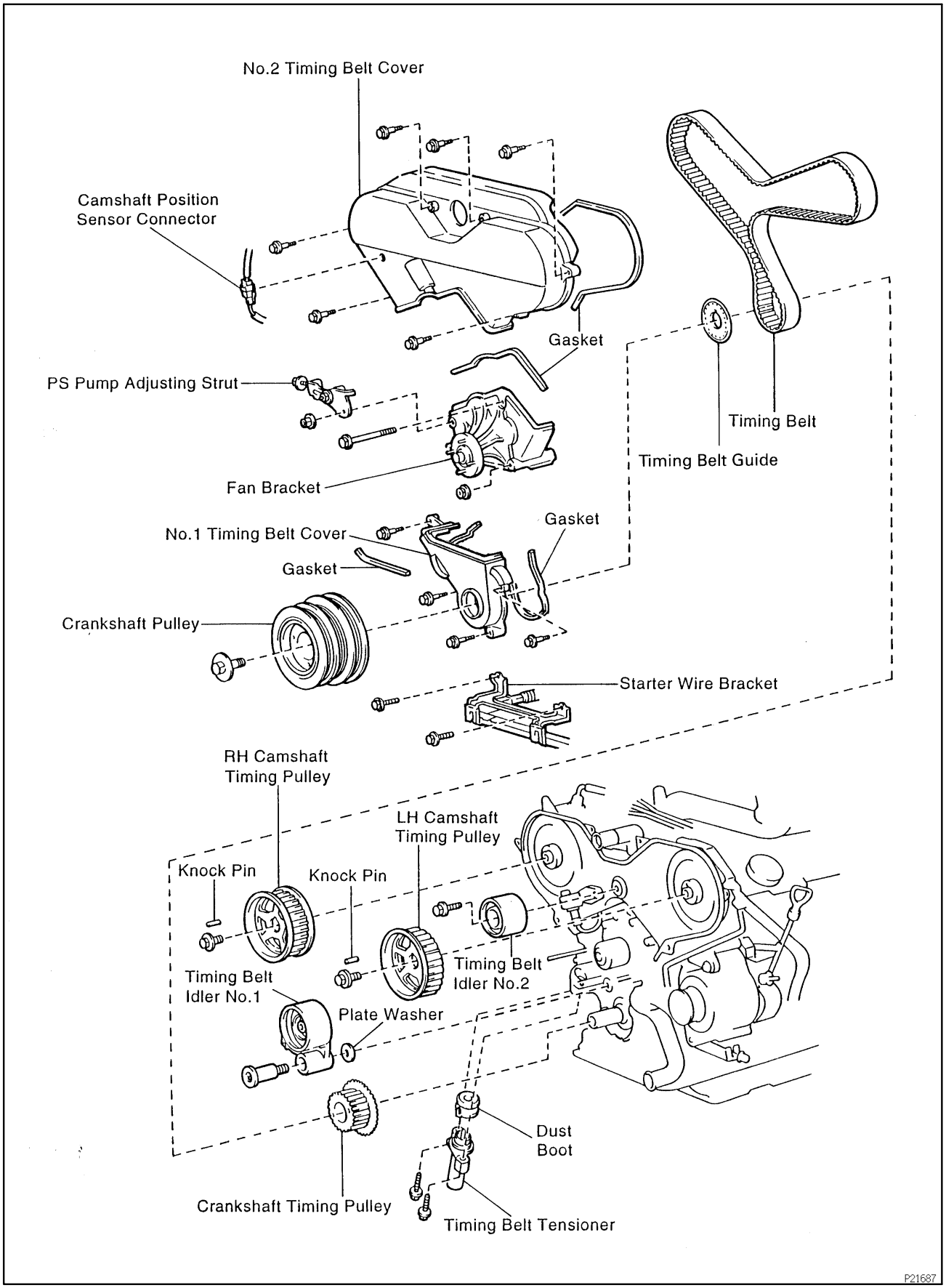
TIMING BELT

COMPONENTS

EM06G–03



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EM1OO–01

REMOVAL

1. **4WD:**
   REMOVE ENGINE UNDER COVER
2. **DRAIN ENGINE COOLANT**
3. **DISCONNECT UPPER RADIATOR HOSE**
4. **REMOVE DRIVE BELT FOR PS PUMP**
5. **w/ A/C:**
   REMOVE DRIVE BELT FOR A/C COMPRESSOR
6. **REMOVE DRIVE BELT FOR GENERATOR**
7. **REMOVE NO. 2 FAN SHROUD**
8. **REMOVE FAN WITH FLUID COUPLING AND FAN PULLEYS**
9. **DISCONNECT PS PUMP FROM ENGINE**

HINT:

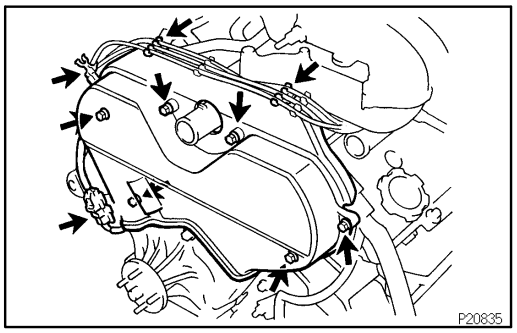
Put aside the pump, and suspend it.

10. **w/ A/C:**
    DISCONNECT A/C COMPRESSOR FROM ENGINE

HINT:

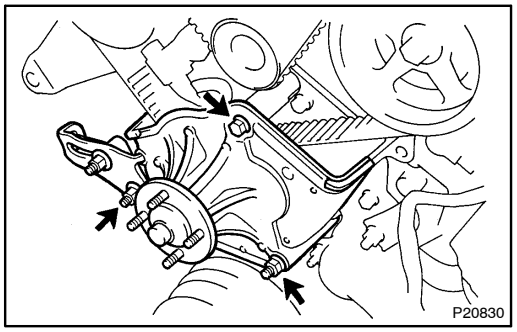
Put aside the compressor, and suspend it.

11. **w/ A/C:**
    REMOVE A/C COMPRESSOR BRACKET



12. **REMOVE NO.2 TIMING BELT COVER**

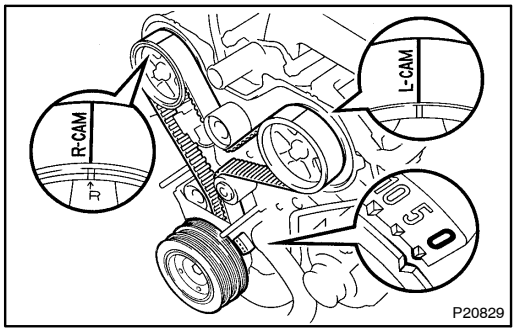
(a) Disconnect the camshaft position sensor connector from the No.2 timing belt cover.
(b) Disconnect the 3 high–tension cord clamps from the No.2 timing belt cover.
(c) Remove the 6 bolts, and timing belt cover.



13. **REMOVE FAN BRACKET**

(a) Remove the nut and PS pump adjusting strut.
(b) Remove the bolt, nut, and fan bracket.

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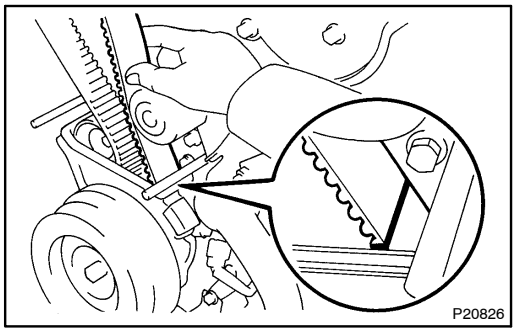


14. SET NO.1 CYLINDER AT TDC/COMPRESSION

(a) Turn the crankshaft pulley and align its groove with timing mark "0" of the No.1 timing belt cover.

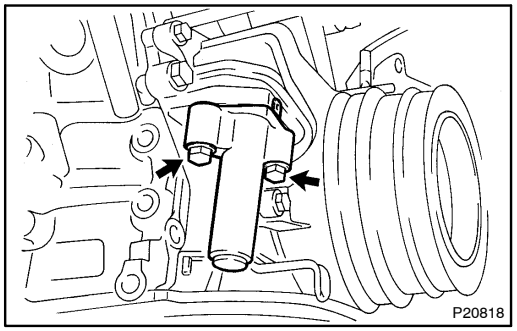
(b) Check that the timing marks of the camshaft timing pulleys and No.3 timing belt cover are aligned.

If not, turn the crankshaft pulley 1 revolution (360°).



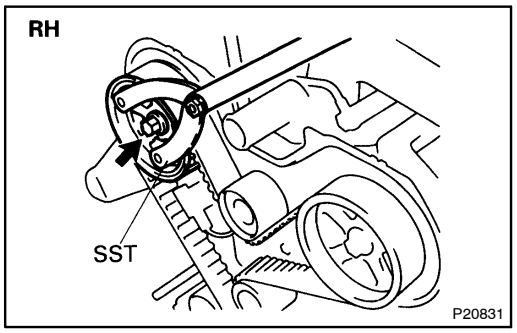
HINT:

When re–using timing belt: Place the matchmarks on the timing belt and camshaft timing pulleys, and place matchmark on timing belt to match the end of the No.1 timing belt cover.



15. REMOVE TIMING BELT TENSIONER

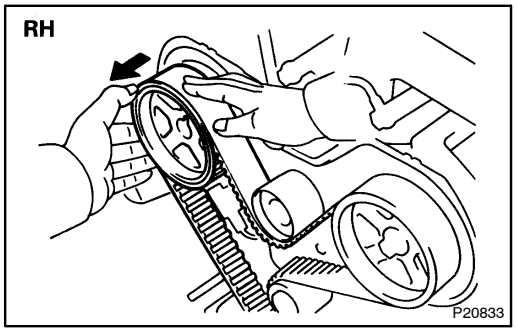
Alternately loosen the 2 bolts, and remove them, the belt tensioner and dust boot.



16. REMOVE RH CAMSHAFT TIMING PULLEY WITH TIMING BELT

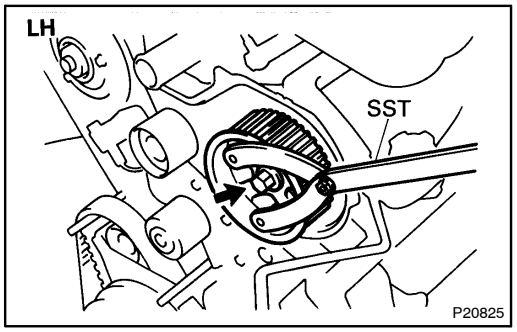
(a) Using SST, loosen the pulley bolt.

SST 09960–10010 (09962–01000, 09963–01000)



(b) Remove the bolt, knock pin and camshaft timing pulley with timing belt.

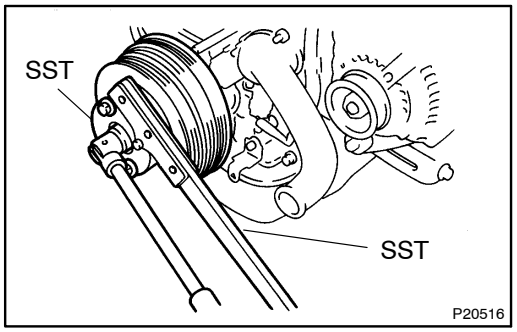
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17. REMOVE LH CAMSHAFT TIMING PULLEY

(a) Using SST, loosen the pulley bolt.
SST 09960–10010 (09962–01000, 09963–01000)

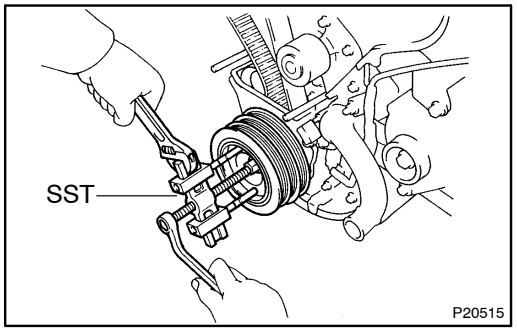
(b) Remove the bolt, knock pin and camshaft timing pulley.



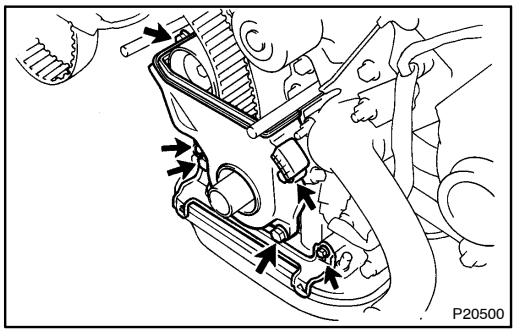
18. REMOVE CRANKSHAFT PULLEY

(a) Using SST, loosen the pulley bolt.
SST 09213–54015 (90119–08216), 09330–00021

(b) Remove the SST, pulley bolt and pulley.



HINT:
If necessary, remove the pulley with SST and service bolt.
SST 09950–50010 (09551–05010, 09552–05010, 09553–05020, 09554–05030)

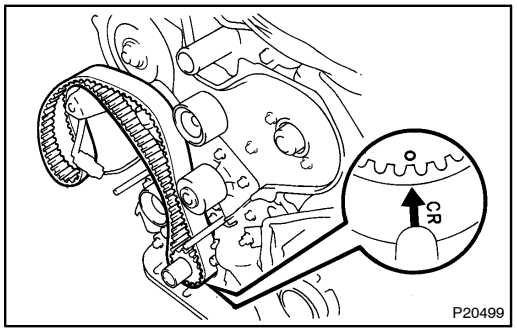


19. REMOVE STARTER WIRE BRACKET AND NO.1 TIMING BELT COVER

(a) Remove the 2 bolts, starter wire bracket.

(b) Remove the 4 bolts, timing belt cover.

20. REMOVE TIMING BELT GUIDE



21. REMOVE TIMING BELT

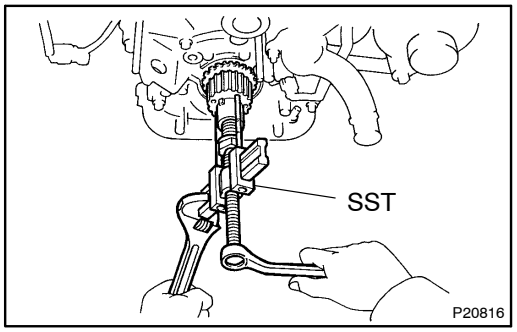
HINT:
When re–using timing belt: If the installation marks have disappeared, place a new installation mark on the timing belt to match the drilled mark of the crankshaft timing pulley.

22. REMOVE NO.2 IDLER PULLEY AND NO.1 IDLER PULLEY

(a) Remove the bolt and No.2 idler pulley.

(b) Using a 10 mm hexagon wrench, remove the pivot bolt, No.1 idler pulley and plate washer.

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23. REMOVE CRANKSHAFT TIMING PULLEY

Remove crankshaft timing pulley.

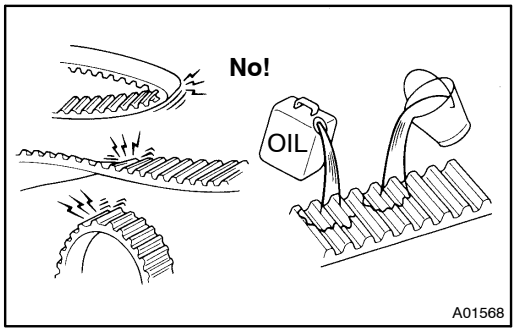
HINT:

If the pulley cannot be removed by hand, use SST and service bolt to remove the crankshaft timing pulley.

SST 09950–50010 (09951–05010, 09952–05010, 09953–05020, 09954–05010)

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EM06I–06



INSPECTION

1. INSPECT TIMING BELT

NOTICE:

Do not bend, twist or turn the timing belt inside out.Do not allow the timing belt to come into contact with oil, water or steam. Do not utilize timing belt tension when installing or removing the mount bolt of the camshaft timing pulley.

If there are any defects, as shown in the illustrations, check these points:

(a) Premature parting
- Check for proper installation.
- Check the timing cover gasket for damage and proper installation.

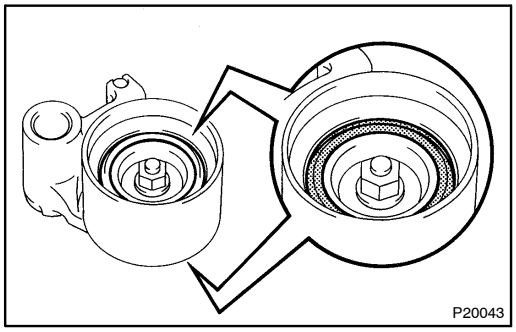
(b) If the belt teeth are cracked or damaged, check to see if either camshaft is locked.

(c) If there is noticeable wear or cracks on the belt face, check to see if there are nicks on the side of the idler pulley lock and water pump.

(d) If there is wear or damage on only one side of the belt, check the belt guide and the alignment of each pulley.

(e) If there is noticeable wear on the belt teeth, check timing cover for damage and check gasket has been installed correctly and for foreign material on the pulley teeth.

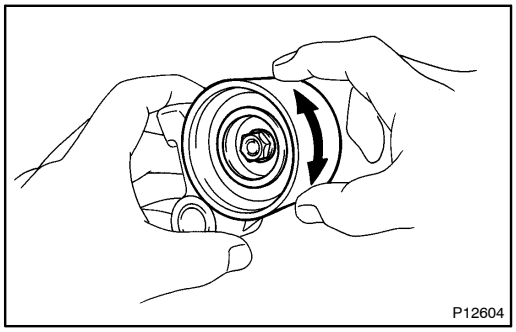
If necessary, replace the timing belt.



2. INSPECT IDLER PULLEYS

(a) Visually check the seal portion of the idler pulley for oil leakage.

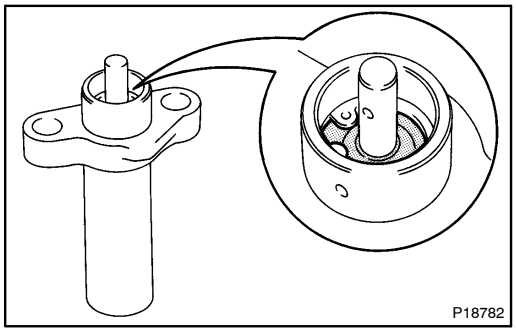
If leakage is found, replace the idler pulley.



(b) Check that the idler pulley turns smoothly.

If necessary, replace the idler pulley.

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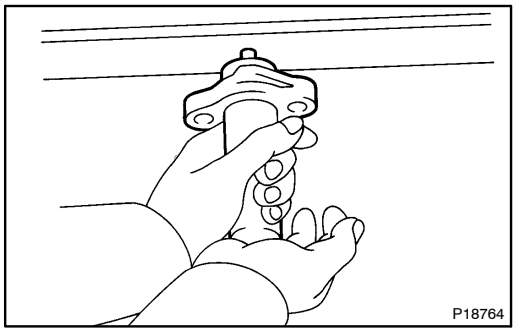
3. INSPECT TIMING BELT TENSIONER

(a) Visually check the seal portion of the tensioner for oil leakage.

HINT:

If there is only the faintest trace of oil on the seal on the push rod side, the tensioner is all right.

If leakage is found, replace the tensioner.

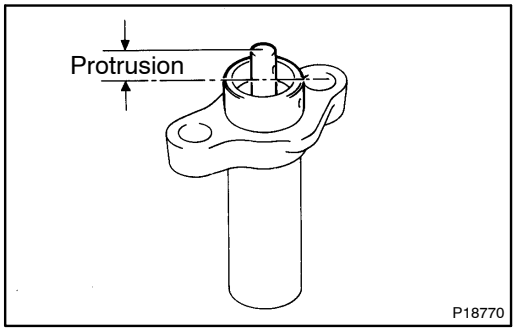


(b) Hold the tensioner with both hands and push the push rod strongly as shown to check that it doesn't move.

If the push rod moves, replace the tensioner.

NOTICE:

Never hold the tensioner push rod facing downward.



(c) Measure the protrusion of the push rod from the housing end.

Protrusion:

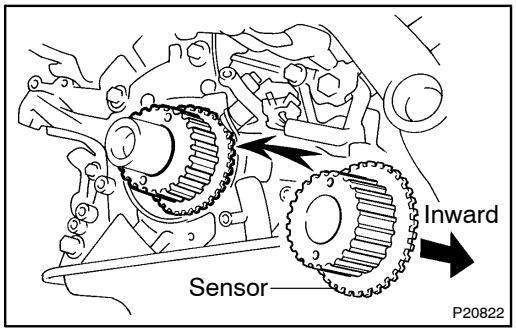
10.0 – 10.8 mm (0.394 – 0.425 in.)

If the protrusion is not as specified, replace the tensioner.

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EM06J–03

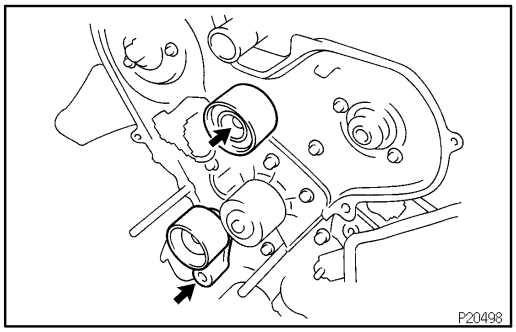
INSTALLATION



1. INSTALL CRANKSHAFT TIMING PULLEY

(a) Align the pulley set key with the key groove of the timing pulley and slide on the timing pulley.

(b) Slide on the timing pulley, facing the flange side inward.



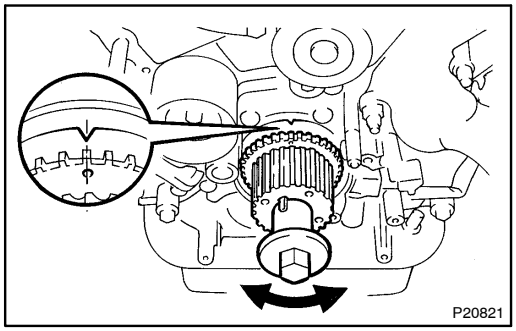
2. INSTALL NO. 1 IDLER PULLEY AND NO.2 IDLER PULLEY

(a) Using a 10 mm hexagon wrench, install the No.1 idler pulley with the plate washer and bolt.
Torque: 35 N·m (350 kgf·cm, 26 ft·lbf)

(b) Check that the pulley bracket moves smoothly.

(c) Install the No.2 idler pulley with the bolt.
Torque: 40 N·m (400 kgf·cm, 30 ft·lbf)

(d) Check that the pulley moves smoothly.



3. TEMPORARILY INSTALL TIMING BELT

NOTICE:

The engine should be cold.

(a) Use the crankshaft pulley bolt to turn the crankshaft and align the timing marks on the crankshaft timing pulley and on the oil pump body.

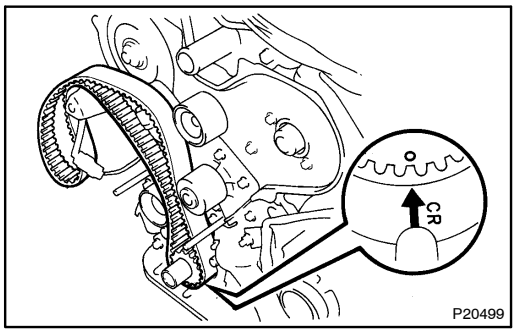
(b) Remove any oil or water on the crankshaft timing pulley, idler pulley and water pump pulley, and keep them clean.

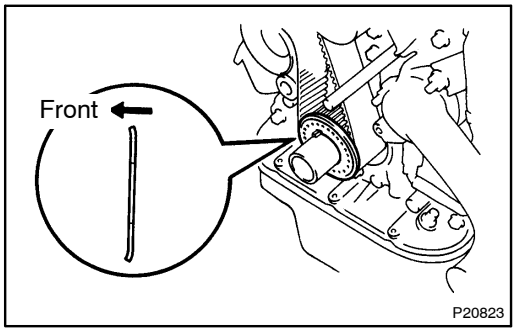
NOTICE:

Only wipe the pulleys; do not use any cleansing agent.

(c) Align the installation mark on the timing belt with the drilled mark of the crankshaft timing pulley.

(d) Install the timing belt on the crankshaft timing pulley, No.1 idler and water pump pulleys.

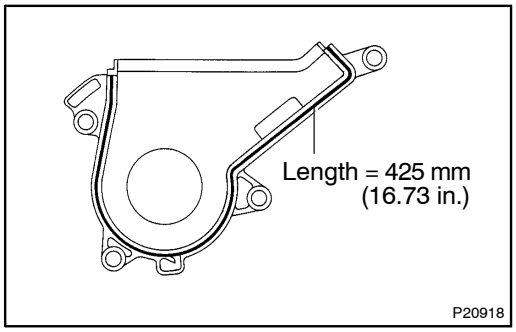


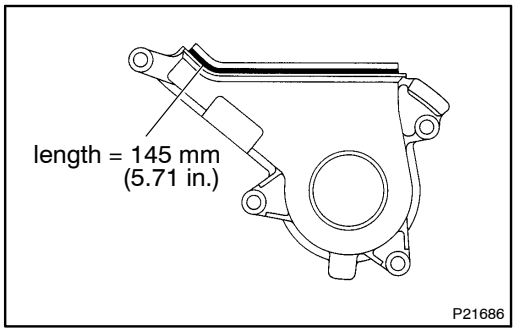


4. INSTALL TIMING BELT GUIDE

Install the guide, facing the cup side outward.

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5. INSTALL NO.1 TIMING BELT COVER AND STARTER WIRE BRACKET

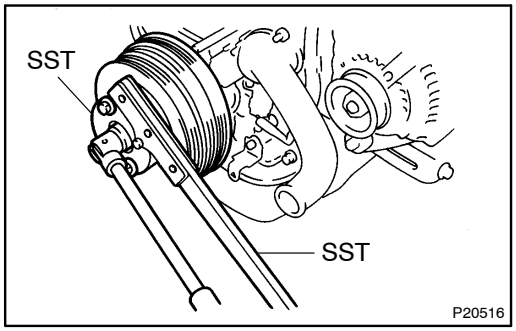
(a) Check that the timing belt cover gaskets have cracks or peeling, etc.

If the gasket does have cracks or peeling, etc., replace it using following steps.peeling, etc., replace them using following steps.

- Using a screwdriver and gasket scraper, remove all the old gasket material.
- Thoroughly clean all components to remove all the loose material.
- Remove the backing paper from a new gasket and install the gasket evenly to the part of the belt cover shaded back in the illustration.

(b) Install the timing belt cover with the 4 bolts.
Torque: 9 N·m (90 kgf·cm, 80 in.·lbf)

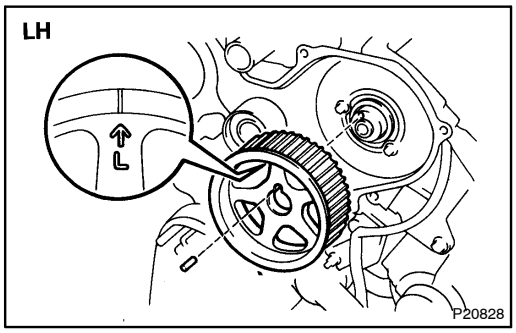
(c) Install the starter wire bracket with the 2 bolts.



6. INSTALL CRANKSHAFT PULLEY

(a) Align the pulley set key with the key groove of the pulley, and slide the pulley.

(b) Using SST, install and torque the bolt.
SST 09213–54015 (90119–08216), 09330–00021
Torque: 250 N·m (2,500 kgf·cm, 184 ft·lbf)



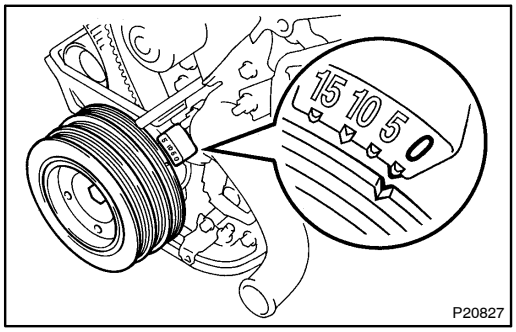
7. INSTALL LH CAMSHAFT TIMING PULLEY

(a) Slide the timing pulley, facing the flange side outward.

(b) Align the knock pin hole of the camshaft with the knock pin groove of the timing pulley as shown.

(c) Install the knock pin.

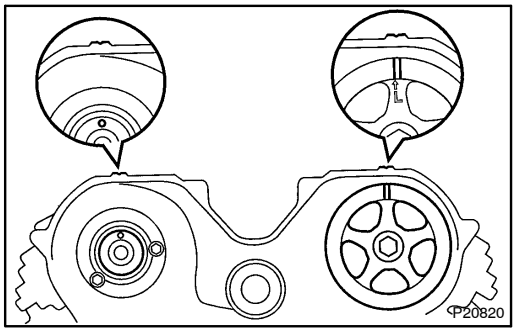
(d) Using SST, install and torque the bolt.
SST 09960–10010 (09962–01000, 09963–01000)
Torque: 110 N·m (1,100 kgf·cm, 81 ft·lbf)



8. SET NO.1 CYLINDER TO TDC/COMPRESSION

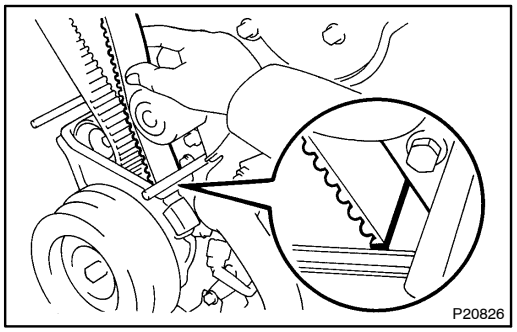
(a) Crankshaft Position:
Turn the crankshaft pulley, and align its groove with the "O" timing mark of the No.1 timing belt cover.

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(b) RH Camshaft Position:
Turn the camshaft, align the knock pin hole of the camshaft with the timing mark of the No.3 timing belt cover.

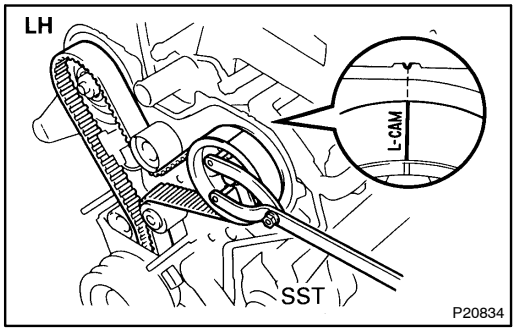
(c) LH Camshaft Pulley Position:
Turn the camshaft timing pulley, align the timing marks of the camshaft timing pulley and No.3 timing belt cover.



9. INSTALL TIMING BELT TO LH CAMSHAFT TIMING PULLEY

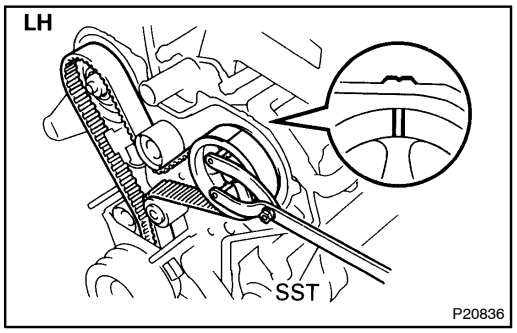
(a) HINT (When re–using timing belt):
Check that the installation mark on the timing belt matches the end of the No.1 timing belt cover.

If the installation mark do not align, shift the meshing of the timing belt and crankshaft timing pulley until they align.



(b) Remove any oil or water on the LH camshaft timing pulley, and keep it clean.

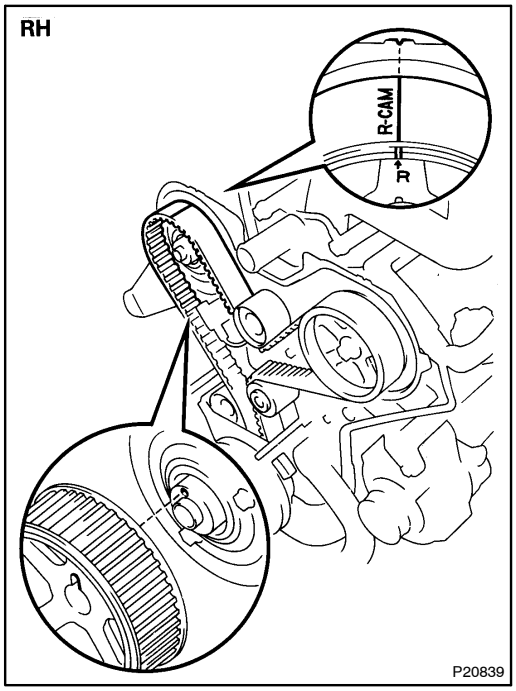
(c) Using SST, slightly turn the LH camshaft timing pulley clockwise. Align the installation mark on the timing belt with the timing mark of the camshaft timing pulley, and hang the timing belt on the LH camshaft timing pulley.
SST 09960–10010 (09962–01000, 09963–01000)



(d) Using SST, align the timing marks of the LH camshaft pulley and No.3 timing belt cover.
SST 09960–10010 (09962–01000, 09963–01000)

(e) Check that the timing belt has tension between the crankshaft timing and LH camshaft timing pulleys.

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10. INSTALL RH CAMSHAFT TIMING PULLEY AND TIMING BELT

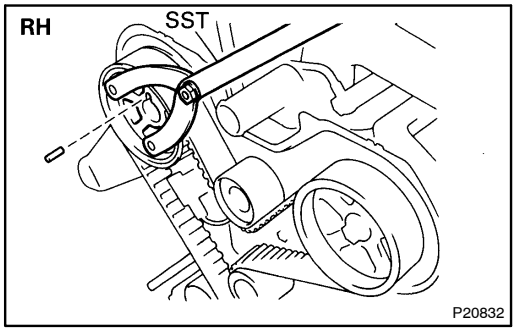
(a) Remove any oil or water on the RH camshaft timing and No.2 idler pulleys, and keep them clean.

(b) Align the installation mark on the timing belt with the timing mark of the RH camshaft timing pulley as shown.

(c) Hang the timing belt on the RH camshaft timing pulley.

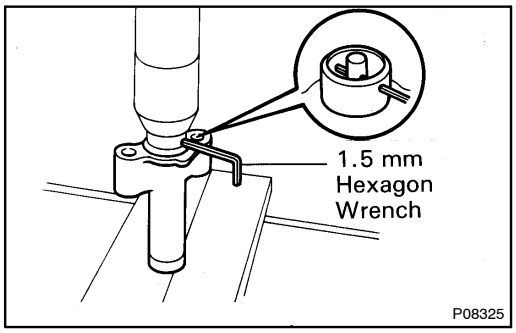
(d) Align the timing marks of the RH camshaft timing pulley and No.3 timing belt cover.

(e) Slide the RH camshaft timing pulley on the camshaft.



(f) Using SST, align the knock pin hole of the camshaft with the knock pin groove marked R of the pulley and install the knock pin.
SST 09960–10010 (09962–01000, 09963–01000)

(g) Using SST, install and torque the bolt.
SST 09960–10010 (09962–01000, 09963–01000)
Torque: 110 N·m (1,100 kgf·cm, 81 ft·lbf)

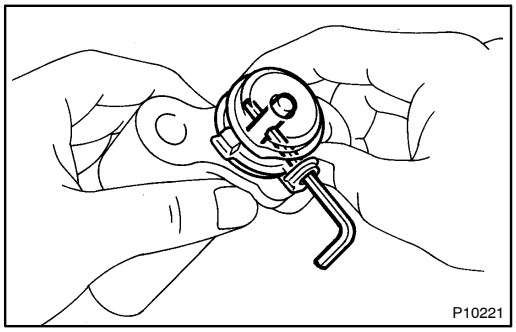


11. SET TIMING BELT TENSIONER

(a) Using a press, slowly press in the push rod using 100 – 1,000 kg (220 – 2,205 lb, 981 – 9,807 N) of pressure.

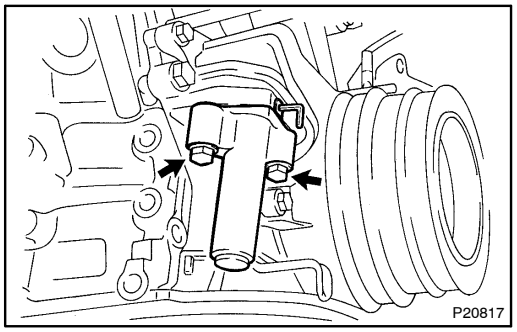
(b) Align the holes of the push rod and housing, pass a 1.5 mm hexagon wrench through the holes to keep the setting position of the push rod.

(c) Release the press.



(d) Install the dust boot to the tensioner.

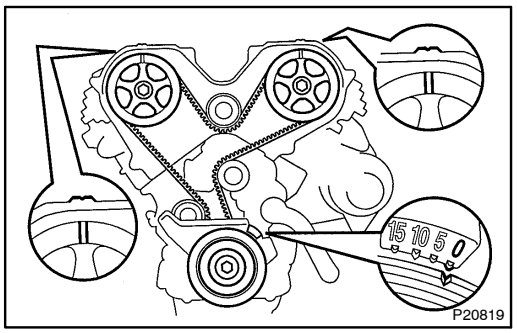
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12. INSTALL TIMING BELT TENSIONER

(a) Install the tensioner with the 2 bolts.
Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)

(b) Remove the 1.5 mm hexagon wrench from the tensioner.



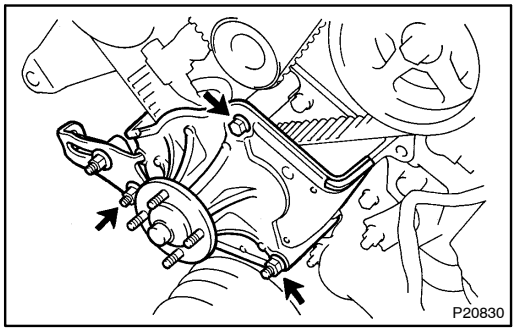
13. CHECK VALVE TIMING

(a) Turn the crankshaft pulley 2 revolutions from TDC to TDC.

HINT:
Always turn the crankshaft clockwise.

(b) Check that each pulley aligns with the timing marks as shown in the illustration.

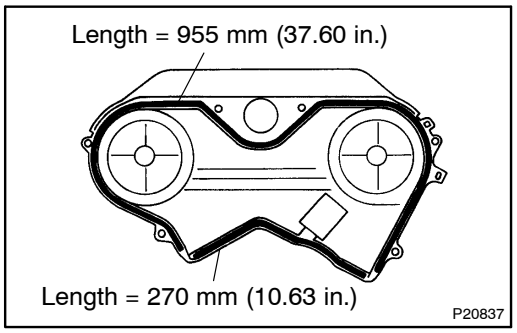
If the marks do not align, remove the timing belt and reinstall it.



14. INSTALL FAN BRACKET

(a) Install the fan bracket with the bolt and nut.

(b) Install the PS pump adjusting strut with the nut.



15. INSTALL NO.2 TIMING BELT COVER

(a) Check that the timing belt cover gasket has no cracks or peeling, etc.

If the gasket does have cracks or peeling, etc., replace it using following steps.

- Using a screwdriver and gasket scraper, remove all the old gasket material.
- Thoroughly clean all components to remove all the loose material.
- Remove the backing paper from a new gasket and install the gasket evenly to the part of the belt cover shaded black in the illustration.

(b) Install the belt cover with the 6 bolts.
Torque: 9 N·m (90 kgf·cm, 80 in.·lbf)

(c) Connect the 3 high–tension cord clamps to the No.2 timing belt cover.

(d) Connect the camshaft position sensor connector to the No.2 timing belt cover.

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16. **w/ A/C:**
    INSTALL A/C COMPRESSOR BRACKET
17. **w/ A/C:**
    CONNECT A/C COMPRESSOR TO ENGINE
18. **CONNECT PS PUMP TO ENGINE**
19. **INSTALL FAN WITH FLUID COUPLING AND FAN PULLEYS**
    Torque:5.4 N·m (54 kgf·cm, 48 in.·lbf)
20. **INSTALL NO.2 FAN SHROUD**
21. **INSTALL AND ADJUST DRIVE BELT FOR GENERATOR (See page CH–1)**
22. **w/ A/C:**
    INSTALL AND ADJUST DRIVE BELT FOR A/C COMPRESSOR
23. **INSTALL AND ADJUST DRIVE BELT FOR PS PUMP**
24. **CONNECT UPPER RADIATOR HOSE**
25. **FILL ENGINE WITH COOLANT**
26. **START ENGINE CHECK FOR LEAKS**
27. **4WD:**
    INSTALL ENGINE UNDER COVER
28. **ROAD TEST VEHICLE**

Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

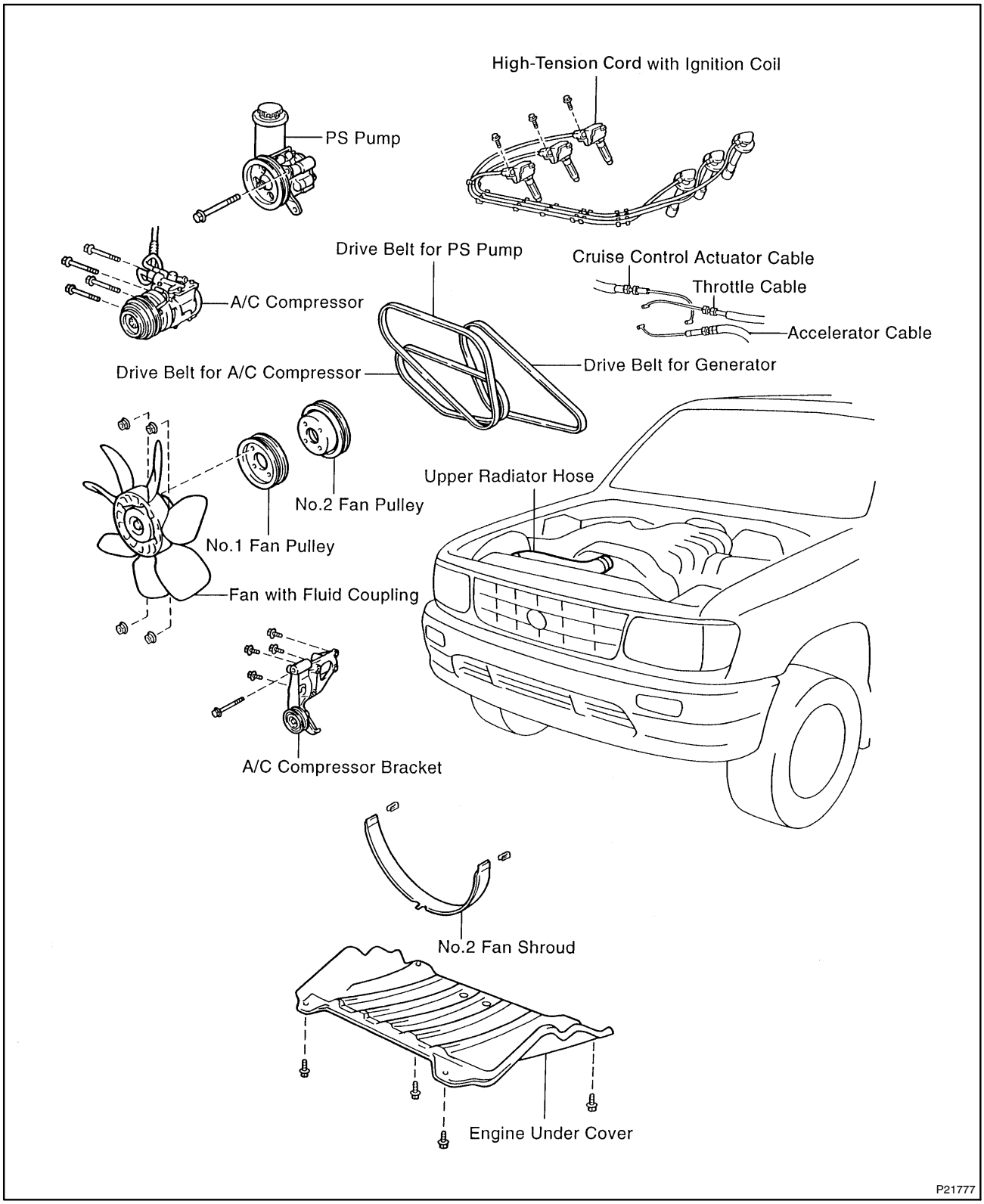
29. **RECHECK ENGINE COOLANT LEVEL**

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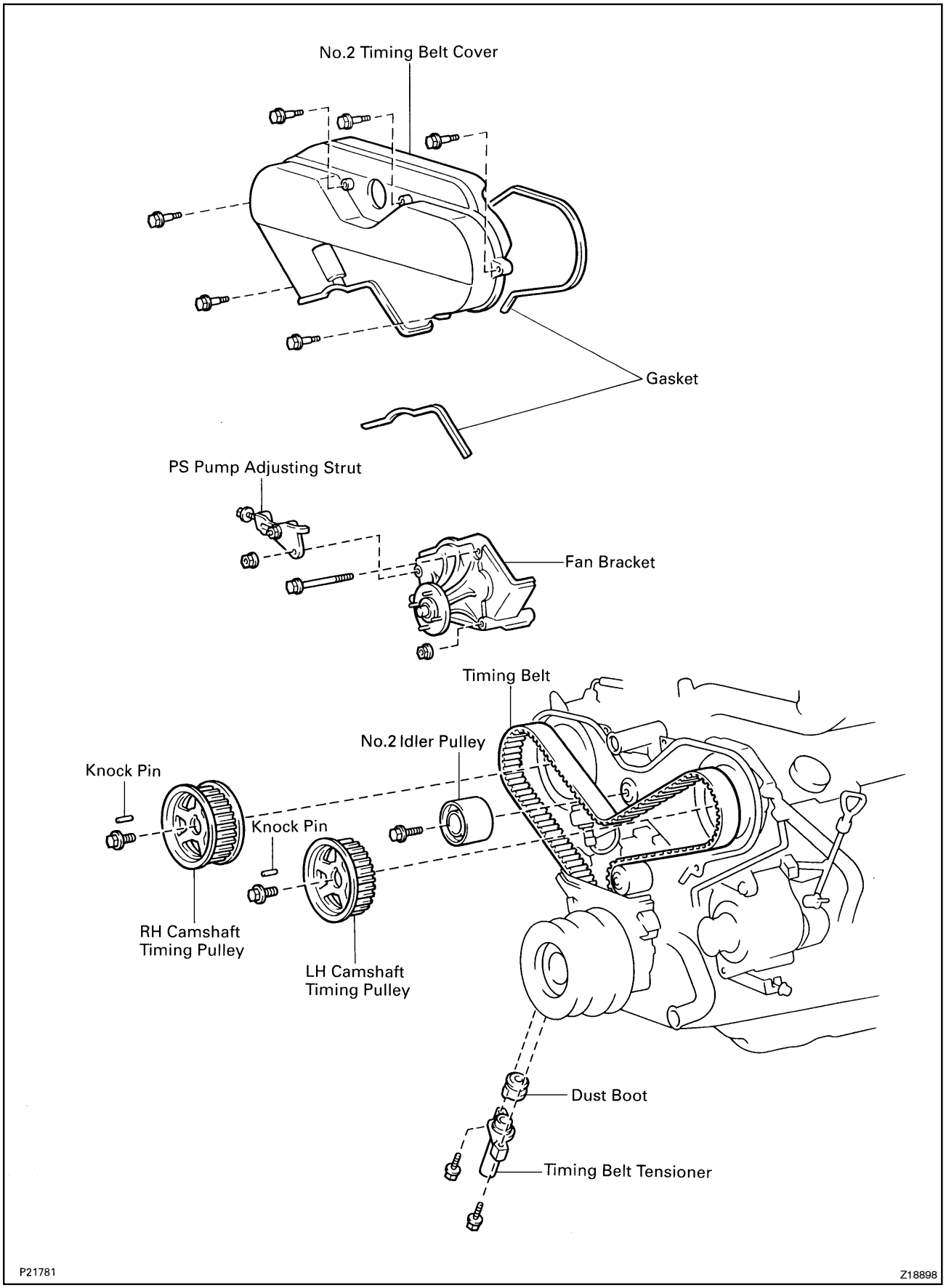
CYLINDER HEAD

COMPONENTS

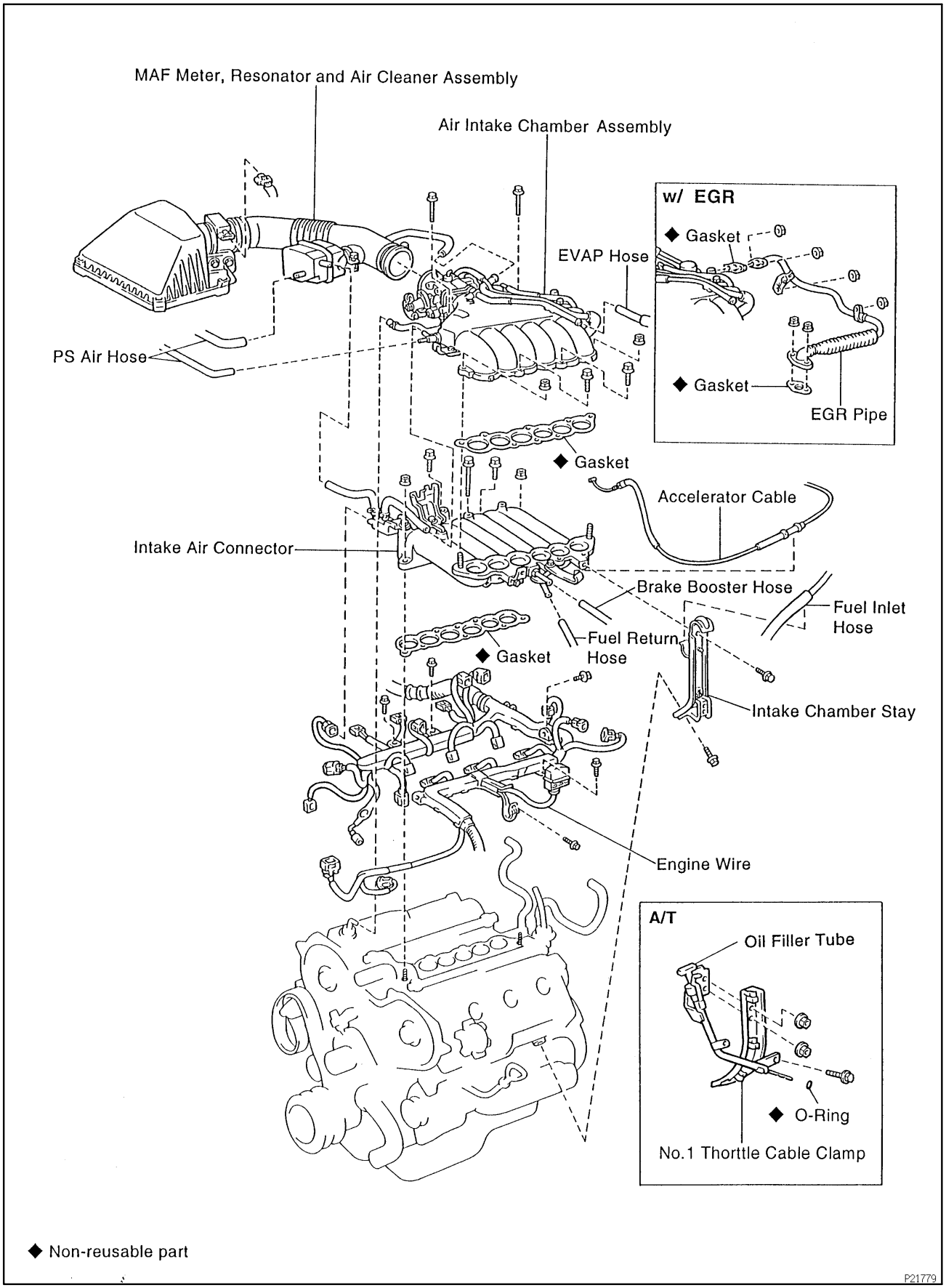
EM06K–02



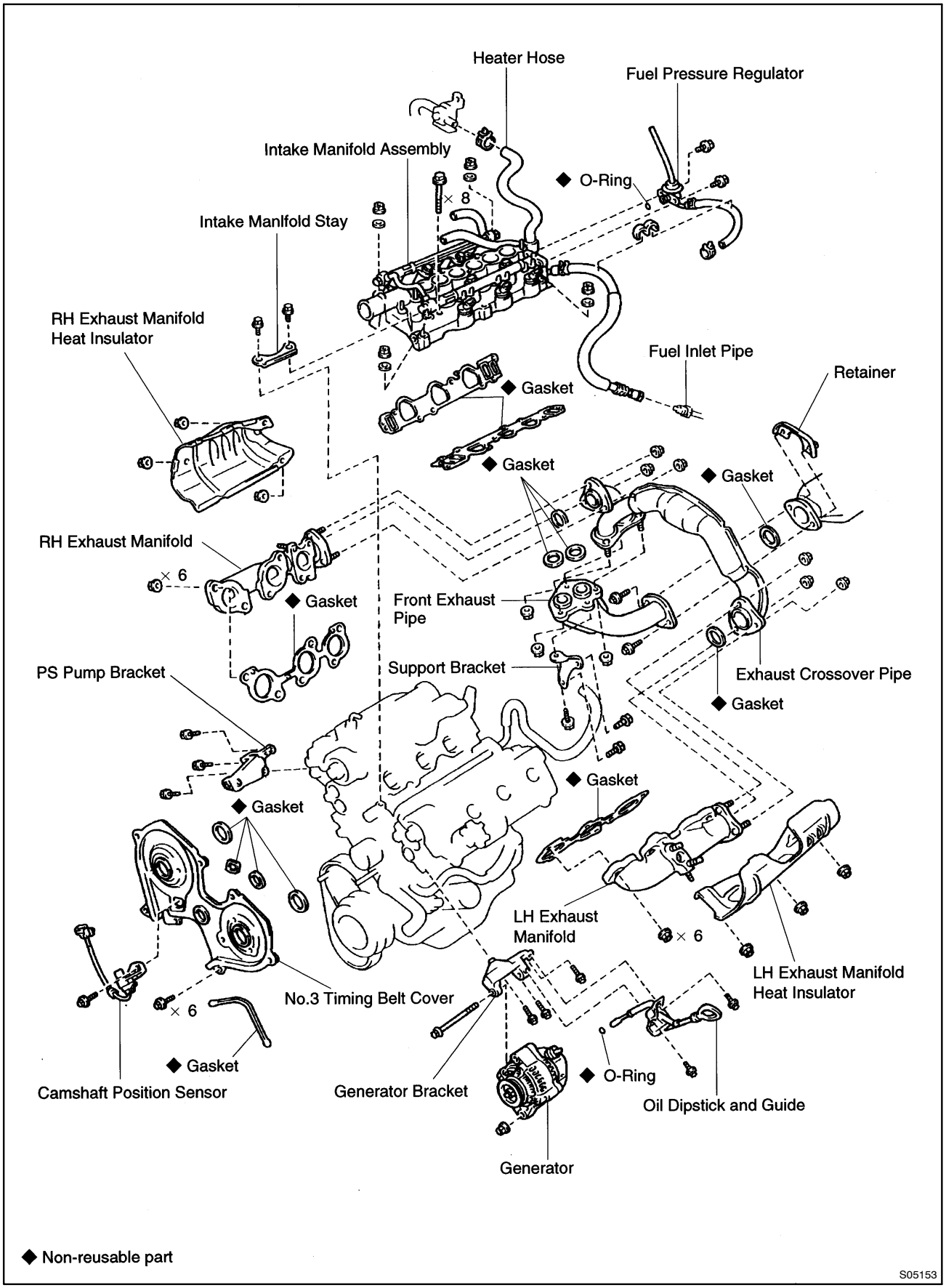
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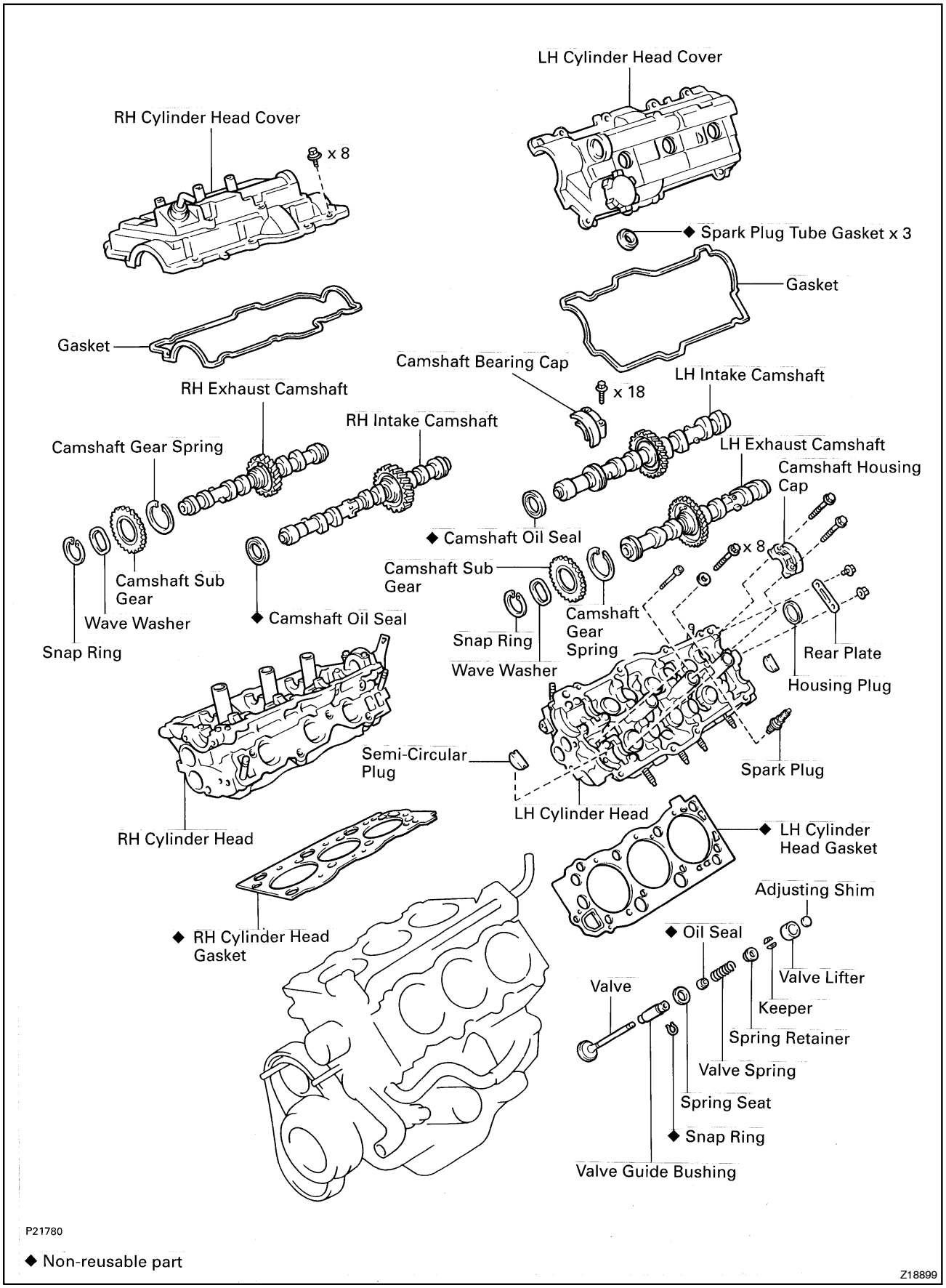
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EM1OP–01

REMOVAL

1. **4WD:**
   REMOVE ENGINE UNDER COVER
2. **DRAIN ENGINE COOLANT**
3. **REMOVE FRONT EXHAUST PIPE (See page EM–108)**
4. **REMOVE AIR CLEANER CAP, MAF METER AND RESONATOR**
5. **DISCONNECT THESE CABLES:**

(a) w/ Cruise control:
Cruise control actuator cable
(b) Accelerator cable
(c) A/T:
Throttle cable

6. **DISCONNECT HEATER HOSE**
7. **DISCONNECT UPPER RADIATOR HOSE**
8. **REMOVE DRIVE BELT FOR PS PUMP**

(a) Stretch the belt and loosen the fan pulley mounting nuts.

9. **w/ A/C:**
   REMOVE DRIVE BELT FOR A/C COMPRESSOR
10. **REMOVE DRIVE BELT FOR GENERATOR**
11. **REMOVE NO. 2 FAN SHROUD**
12. **REMOVE FAN WITH FLUID COUPLING AND FAN PULLEYS**
13. **DISCONNECT PS PUMP FROM ENGINE**

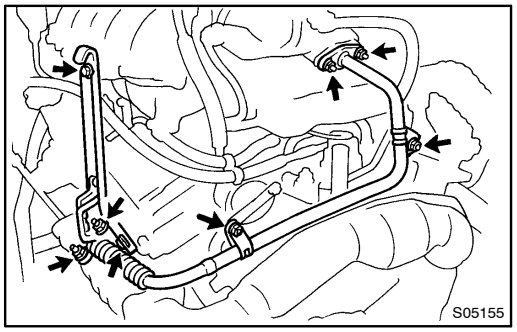
HINT:
Put aside the pump, and suspend it.

14. **w/ A/C:**
    DISCONNECT A/C COMPRESSOR FROM ENGINE

HINT:
Put aside the compressor, and suspend it.

15. **w/ A/C:**
    REMOVE A/C COMPRESSOR BRACKET
16. **REMOVE HIGH–TENSION CORDS WITH IGNITION COILS**
17. **REMOVE SPARK PLUGS**
18. **REMOVE TIMING BELT AND CAMSHAFT TIMING PULLEYS (See page EM–13)**
19. **REMOVE TIMING BELT IDLER NO. 2 (See page EM–13)**
20. **REMOVE GENERATOR**

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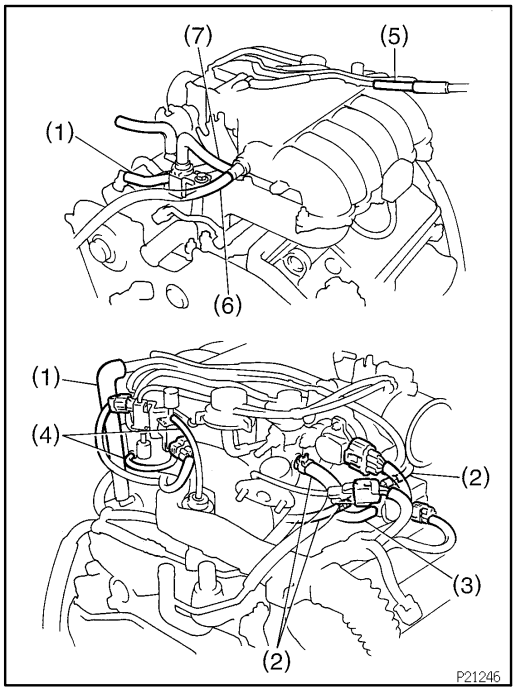
21. w/ EGR:
REMOVE EGR PIPE

Remove the 6 nuts, EGR pipe and 2 gaskets.

22. REMOVE INTAKE CHAMBER STAY

(a) A/T:
Remove the bolt, 2 nuts, oil filler tube and No.1 throttle cable clamp.

(b) Remove the 2 bolts and intake chamber stay.



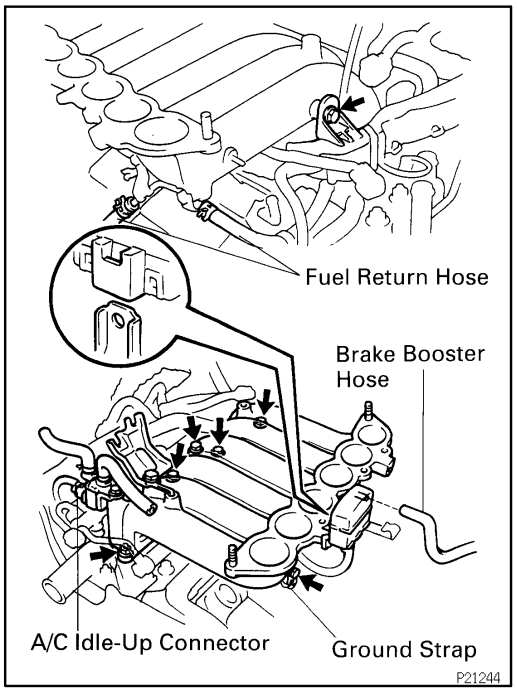
23. REMOVE AIR INTAKE CHAMBER ASSEMBLY

(a) Disconnect these connectors:
- VSV connector for fuel pressure control
- Throttle position sensor connector
- IAC valve connector
- w/ EGR:
  EGR gas temperature sensor connector
- VSV connector for EGR

(b) Disconnect these hoses:
(1) 2 PCV hoses
(2) 2 water bypass hoses
(3) Air assist hose from throttle body
(4) 2 Vacuum sensing hoses from VSV
- w/ A/C
  Air hose from A/C idle–up valve

(5) EVAP hose
(6) Air hose from PS pump

(c) Remove the 4 bolts, 2 nuts, the air intake chamber assembly and gasket.



24. REMOVE INTAKE AIR CONNECTOR

(a) Remove the bolt, and disconnect the engine wire.

(b) Disconnect the 2 fuel return hoses.

(c) Disconnect the brake booster vacuum hose from the intake air connector.

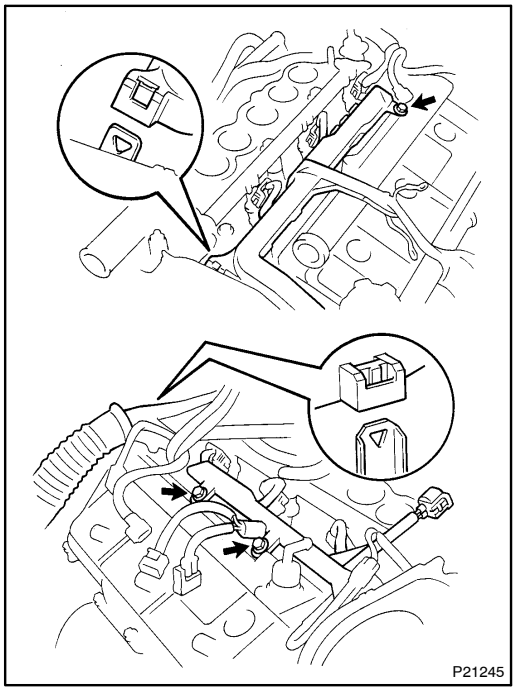
(d) Remove the bolt, and disconnect the ground strap from the intake air connector.

(e) Disconnect the DLC1 from the bracket.

(f) w/ A/C
Disconnect the A/C idle–up valve connector.

(g) Remove the 3 bolts, 2 nuts, intake air connector and gasket.

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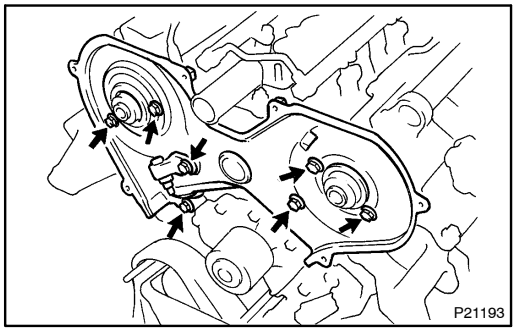


25. DISCONNECT ENGINE WIRE

(a) Disconnect these connectors:
- Oil pressure sensor connector
- Crankshaft position sensor connector
- 6 Injector connectors
- ECT sender gauge connector
- ECT sensor connector
- Knock sensor connector
- Camshaft position sensor connector

(b) Disconnect the 3 engine wire clamps.

(c) Remove the 3 bolts, and disconnect the engine wire from the cylinder head.

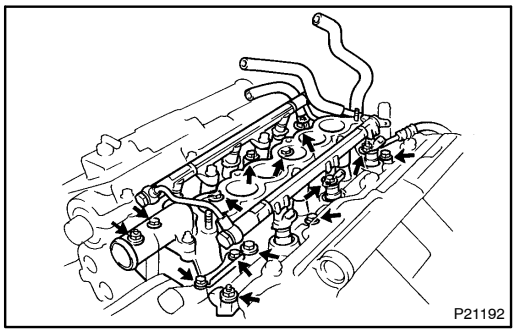


26. REMOVE CAMSHAFT POSITION SENSOR

27. REMOVE NO.3 TIMING BELT COVER

Remove the 6 bolts and timing belt cover.

28. REMOVE FUEL PRESSURE REGULATOR



29. REMOVE INTAKE MANIFOLD ASSEMBLY

(a) Disconnect the fuel inlet hose.

(b) Remove the 2 bolts and the intake manifold stay.

(c) Remove the 8 bolts, 4 nuts, 4 plate washers, intake manifold, delivery pipes and injectors assembly and 2 gaskets.

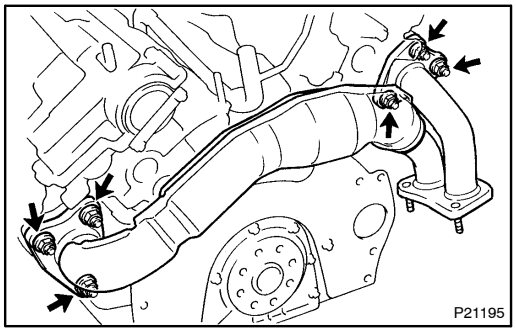
30. REMOVE PS PUMP BRACKET

31. REMOVE OIL DIPSTICK AND GUIDE

(a) Remove the 2 bolts holding the dipstick guide to the generator bracket.

(b) Pull out the dipstick guide together with the dipstick from the oil pan.

(c) Remove the O–ring from the dipstick guide.



32. REMOVE GENERATOR BRACKET

33. REMOVE EXHAUST CROSSOVER PIPE

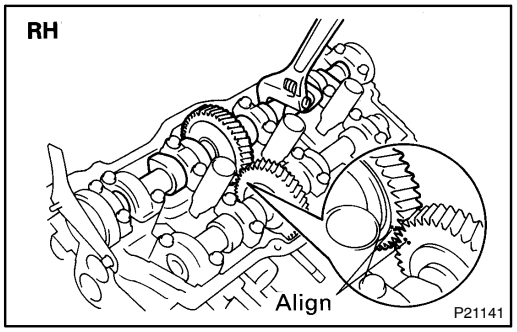
Remove the 6 nuts, crossover pipe and 2 gaskets.

34. REMOVE LH AND RH EXHAUST MANIFOLDS

(a) Remove the 6 nuts and exhaust manifold heat insulators.

(b) Remove the 12 nuts, LH, RH exhaust manifolds and gasket.

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35. REMOVE CYLINDER HEAD COVERS

Remove the 8 bolts, seal washers, cylinder head cover and gasket. Remove the 2 cylinder head covers.

36. REMOVE SEMI–CIRCULAR PLUGS

37. Exhaust:

REMOVE CAMSHAFTS OF RH CYLINDER HEAD

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be held level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, these steps should be carried out.

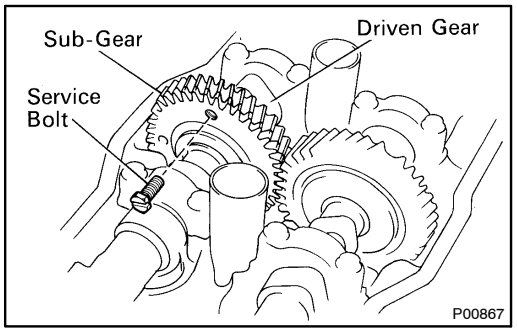
(a) Align the timing marks (2 dot marks) of the camshaft drive and driven gears by turning the camshaft with a wrench.

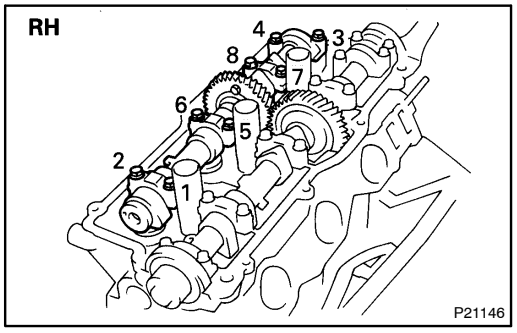
(b) Secure the exhaust camshaft sub–gear to the main gear with a service bolt.

Recommended service bolt:
Thread diameter 6 mm
Thread pitch 1.0 mm
Bolt length 16 – 20 mm

HINT:

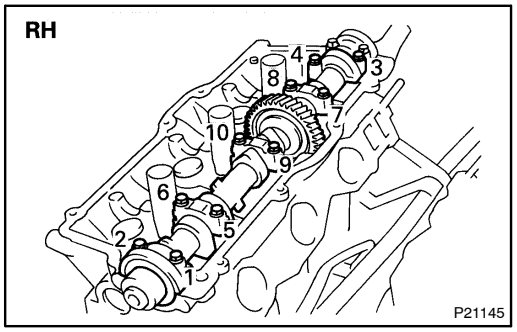
When removing the camshaft, mark certain that the torsional spring force of the sub–gear has been eliminated by the above operation.





(c) Uniformly loosen and remove the 8 bearing cap bolts, in several passes, in the sequence shown.

(d) Remove the 4 bearing caps and exhaust camshaft.



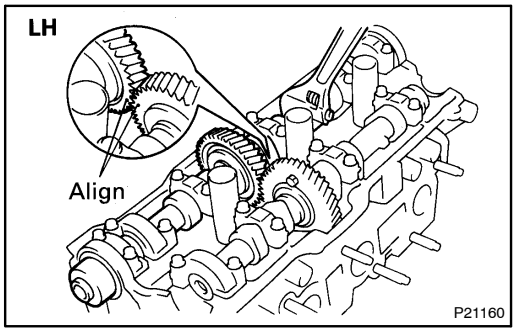
38. Intake:

REMOVE CAMSHAFTS OF RH CYLINDER HEAD

(a) Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown.

(b) Remove the 5 bearing caps, oil seal and intake camshaft.

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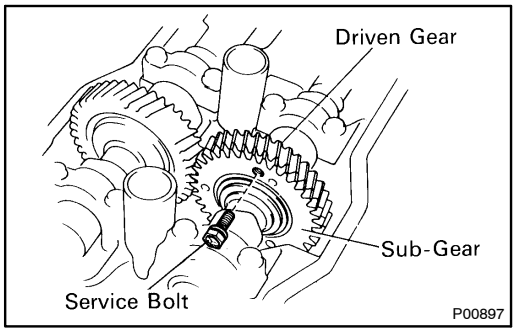


39. Exhaust:

REMOVE CAMSHAFTS OF LH CYLINDER HEAD

NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be held level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, these steps should be carried out.



(a) Align the timing marks (1 dot mark) of the camshaft drive and driven gears by turning the camshaft with a wrench.

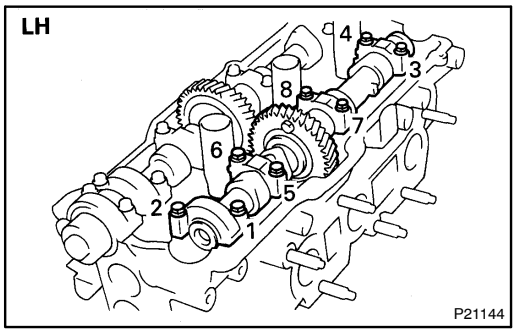
(b) Secure the exhaust camshaft sub–gear to the main gear with a service bolt.

Recommended service bolt:

Thread diameter	**6 mm**
Thread pitch	**1.0 mm**
Bolt length	**16 – 20 mm**

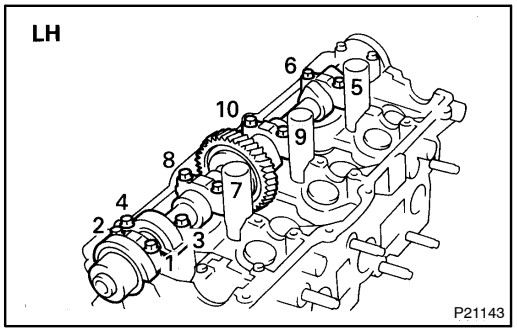
HINT:

When removing the camshaft, make sure that the torsional spring force of the sub–gear has been eliminated by the above operation.



(c) Uniformly loosen and remove the 8 bearing cap bolts, in several passes, in the sequence shown.

(d) Remove the 4 bearing caps and exhaust camshaft.



40. Intake:

REMOVE CAMSHAFTS OF LH CYLINDER HEAD

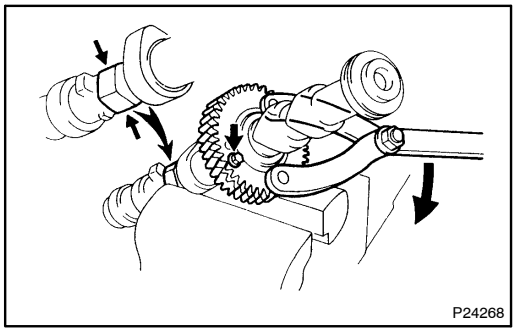
(a) Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown.

(b) Remove the 5 bearing caps, oil seal and intake camshaft.

HINT:

- Arrange the camshafts in the correct order.
- Arrange the bearing caps in the correct order.

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41. DISASSEMBLE EXHAUST CAMSHAFTS

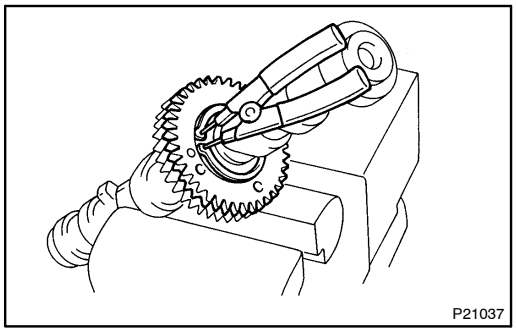
(a) Mount the hexagonal wrench head portion of the camshaft in a vise.

NOTICE:

Be careful not to damage the camshaft.

(b) Using SST, turn the sub–gear clockwise, and remove the service bolt.

SST 09960–10010 (09962–01000, 09963–00600)



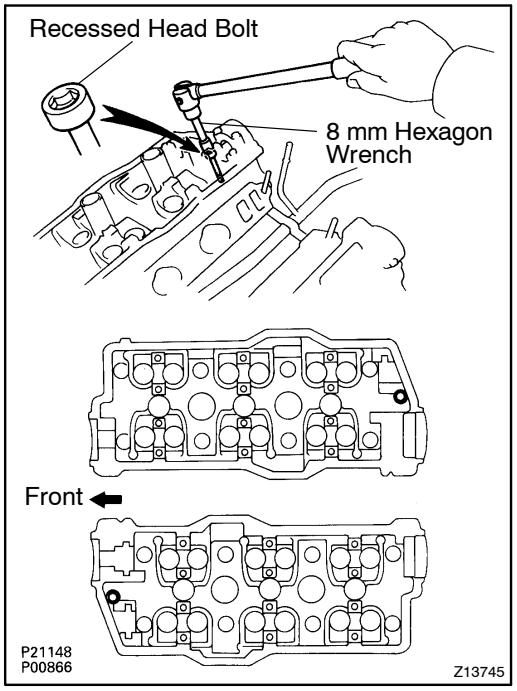
(c) Using snap ring pliers, remove the snap ring.

(d) Remove these parts:

- Wave washer
- Camshaft sub–gear
- Camshaft gear spring

HINT:

Arrange the camshaft sub–gears and gear springs (RH and LH side).

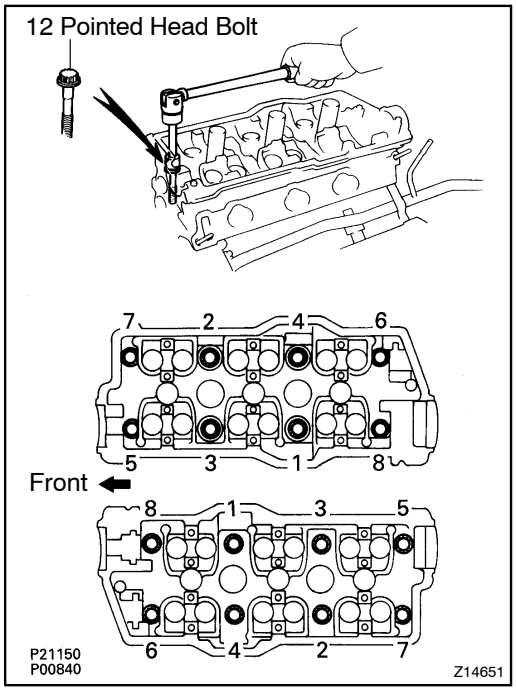


42. REMOVE CYLINDER HEADS

(a) Remove the bolt, and disconnect the ground strap.

(b) Using an 8 mm hexagon wrench, remove the cylinder head (recessed head) bolt on each cylinder head, then repeat for the other side, as shown.

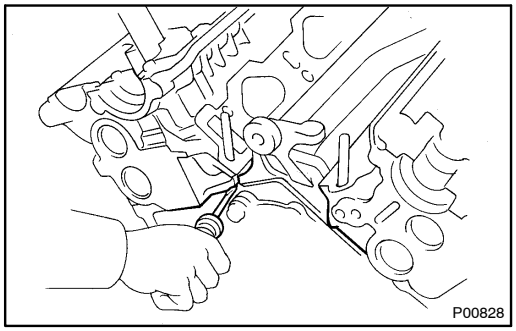
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(c) Uniformly loosen and remove the 8 cylinder head (12 pointed head) bolts on each cylinder head, in several passes, in the sequence shown, then repeat for the other side, as shown. Remove the 16 cylinder head bolts and plate washers.

NOTICE:

Head warpage or cracking could result from removing bolts in an incorrect order.



(d) Lift the cylinder head from the dowels on the cylinder block and place the 2 cylinder heads on wooden blocks on a bench.

HINT:

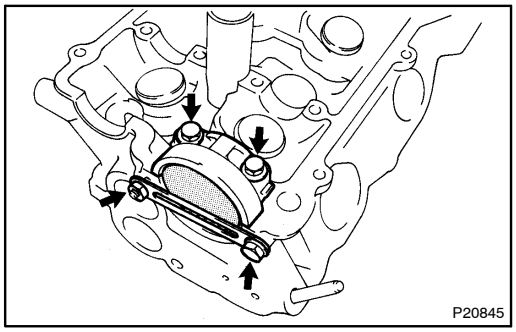
- If the cylinder head is difficult to lift off, pry between the cylinder head and cylinder block with a screwdriver.
- Arrange the cylinder heads in the correct order.

NOTICE:

Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

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EM06M–03



DISASSEMBLY

1. REMOVE CAMSHAFT HOUSING PLUGS

(a) Remove the bolt, nut, cylinder head rear plate and ground strap.

(b) Remove the 2 bolts and camshaft bearing cap.

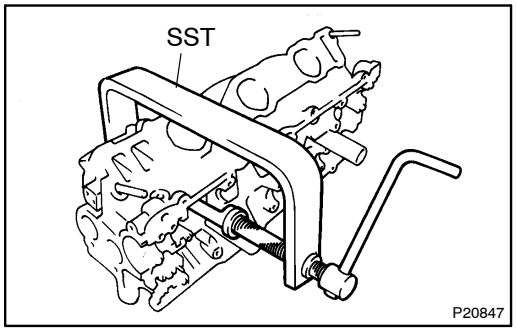
(c) Remove the housing plug.

2. REMOVE VALVE LIFTERS AND SHIMS

Pull out the valve lifter and shim by hand.

HINT:

Arrange the valve lifters and shims in correct order.



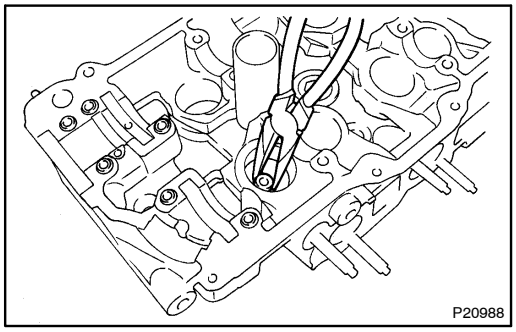
3. REMOVE VALVES

(a) Using SST, compress the valve spring and remove the 2 keepers.

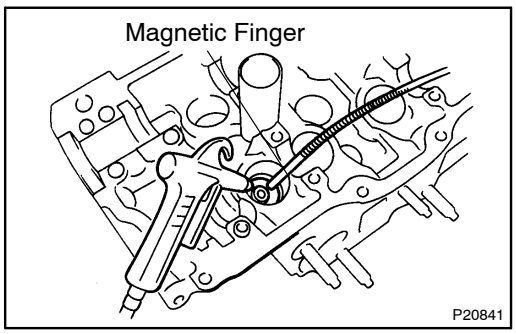
SST 09202–70020 (09202–00010)

(b) Remove these parts:

- Spring retainer
- Valve spring
- Valve



(c) Using needle–nose pliers, remove the oil seal.



(d) Using compressed air and a magnetic finger, remove the spring seat by blowing air.

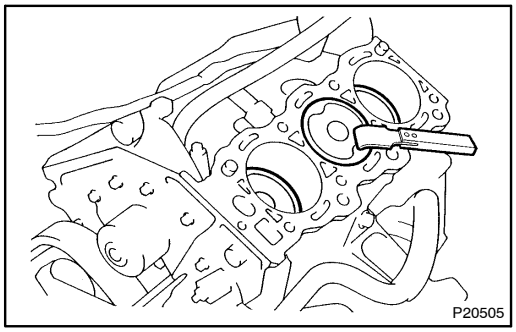
HINT:

Arrange the valves, valve springs, spring seats and spring retainers in the correct order.

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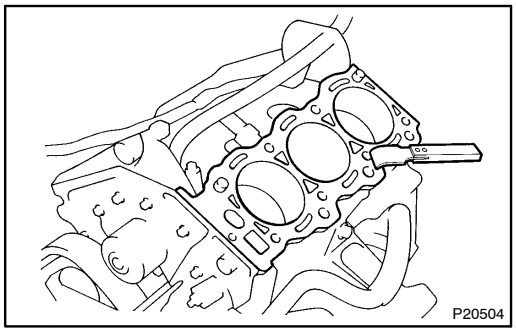
EM1OQ–01

INSPECTION


P20505

1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

(a) Turn the crankshaft and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surfaces.

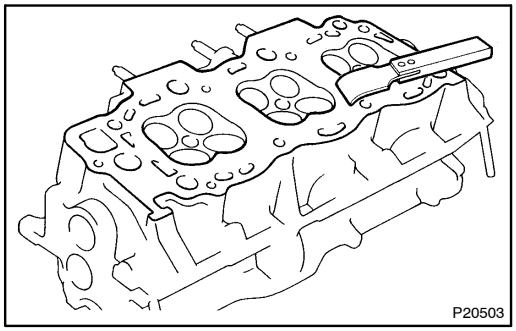

P20504

(b) Using a gasket scraper, remove all the gasket material from the cylinder block surfaces.

(c) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION:

Protect your eyes when using high–compressed air.

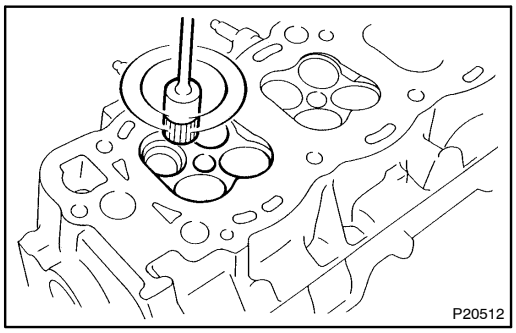

P20503

2. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all the gasket material from the cylinder block contact surface.

NOTICE:

Be careful not to scratch the cylinder block contact surfaces.

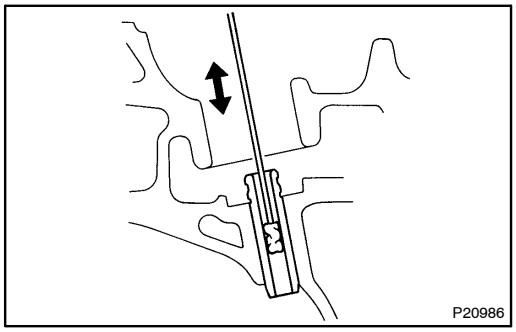

P20512

3. CLEAN COMBUSTION CHAMBERS

Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE:

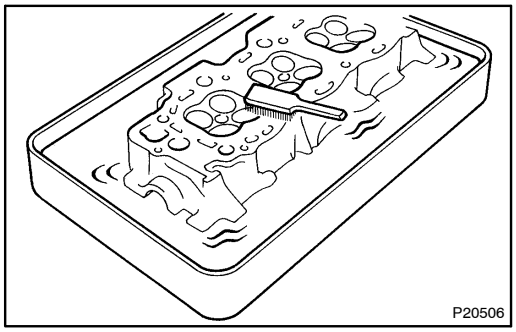
Be careful not to scratch the cylinder block contact surfaces.


P20986

4. CLEAN VALVE GUIDE BUSHINGS

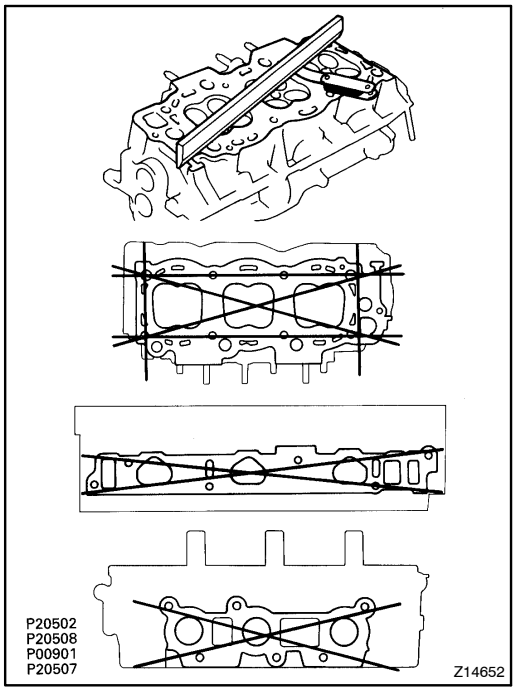
Using a valve guide bushing brush and solvent, clean all the guide bushings.

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5. CLEAN CYLINDER HEADS

Using a soft brush and solvent, thoroughly clean the cylinder heads.

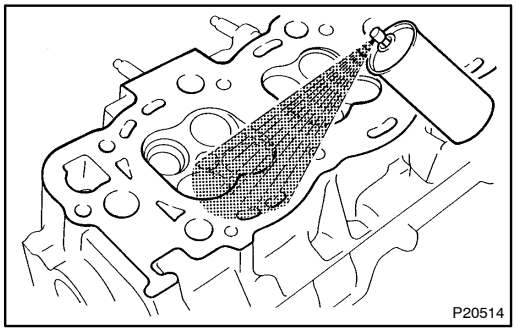


6. INSPECT FOR FLATNESS

Using precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block and manifolds for warpage.

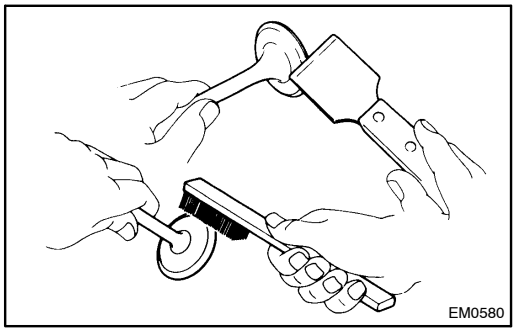
Maximum warpage:
0.10 mm (0.0039 in.)

If warpage is greater than maximum, replace the cylinder head.



7. INSPECT FOR CRACKS

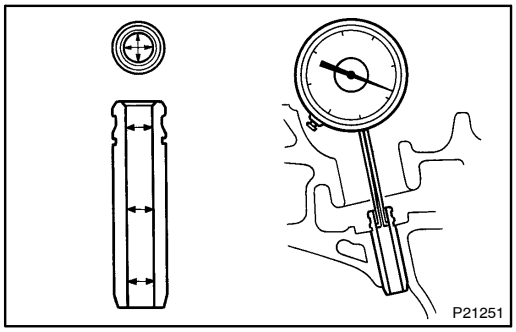
Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.
If cracked, replace the cylinder head.



8. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.
(b) Using a wire brush, thoroughly clean the valve.

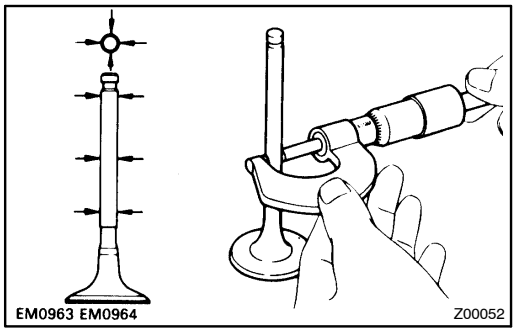
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9. INSPECT VALVE STEMS AND GUIDE BUSHINGS

(a) Using a caliper gauge, measure the inside diameter of the guide busing.

Bushing inside diameter:
6.010 – 6.030 mm (0.2366 – 0.2374 in.)



(b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

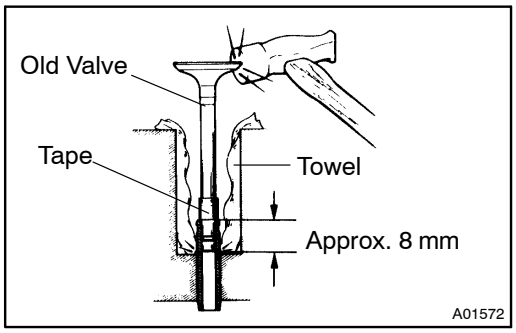
Intake	5.970 – 5.985 mm (0.2350 – 0.2356 in.)
Exhaust	5.965 – 5.980 mm (0.2348 – 0.2354 in.)

(c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

Oil clearance:

Standard	Intake	0.025 – 0.060 mm (0.0010 – 0.0024 in.)
	Exhaust	0.030 – 0.065 mm (0.0012 – 0.0026 in.)
Maximum	Intake	0.08 mm (0.0031 in.)
	Exhaust	0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing.



10. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

(a) w/ Snap ring:

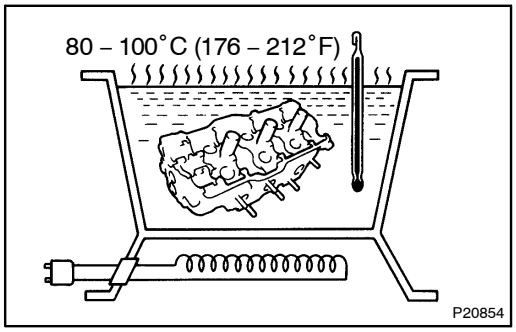
Insert an old valve wrapped with tape into the valve guide bushing, and break off the valve guide bushing by hitting it with a hammer. Remove the snap ring.

HINT:

Wrap the tape approx. 8 mm (0.31 in.) from the valve stem end.

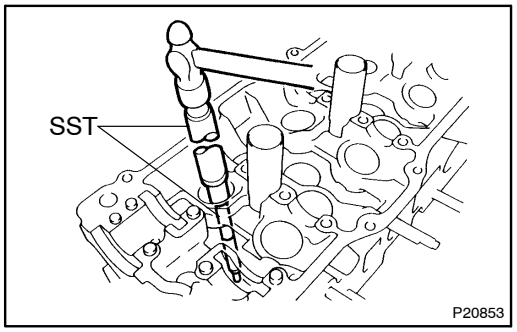
NOTICE:

Be careful not to damage the valve lifter hole.

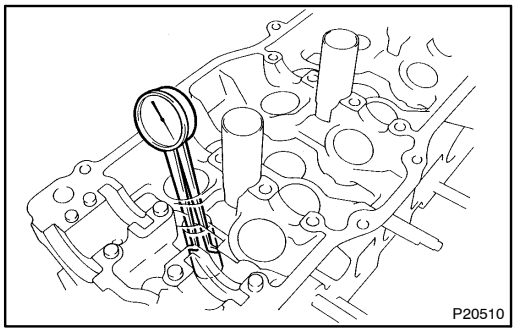


(b) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).

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(c) Using SST and a hammer, tap out the guide bushing.
SST 09201–10000 (09201–01060),
09950–70010 (09951–07150)



(d) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

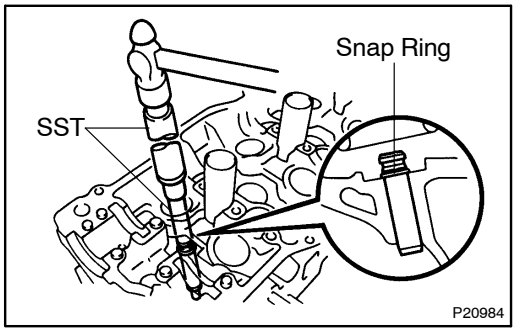
(e) Select a new guide bushing (STD size or O/S 0.05).
Both intake and exhaust

Bushing bore diameter mm (in.)	Bushing size
10.985 – 11.027 (0.4325 – 0.4341)	Use STD
11.050 – 11.077 (0.4350 – 0.4361)	Use O/S 0.05

If the bushing bore diameter of the cylinder head is greater than 11.027 mm (0.4341 in.), machine the bushing bore to these dimension:

11.050 – 11.077 mm (0.4350 – 0.4361 in.)

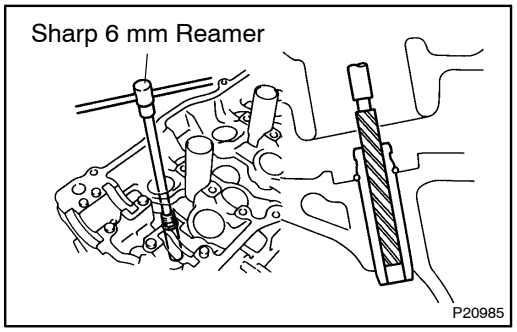
If the bushing bore diameter of the cylinder head is greater than 11.077 mm (0.4361 in.), replace the cylinder head.



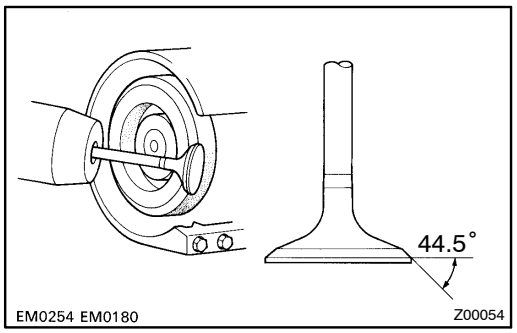
(f) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).

(g) Using SST and a hammer, tap in a new guide bushing until the snap ring makes contact with the cylinder head.
SST 09201–10000 (09201–01060),
09950–70010 (09951–07150)

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(h) Using a sharp 6 mm reamer, ream the guide bushing to obtain the standard specified clearance (See step 9) between the guide bushing and valve stem.

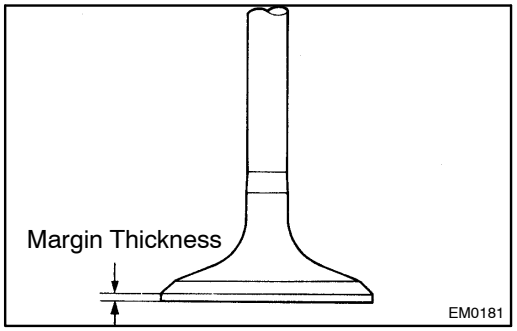


11. INSPECT AND GRIND VALVES

(a) Grind the valve enough to remove pits and carbon.

(b) Check that the valve is ground to the correct valve face angle.

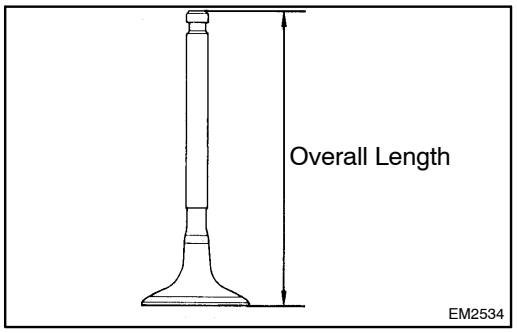
Valve face angle: 44.5°



(c) Check the valve head margin thickness.

Standard margin thickness:
1.0 mm (0.039 in.)
Minimum margin thickness:
0.5 mm (0.020 in.)

If the margin thickness is less than minimum, replace the valve.

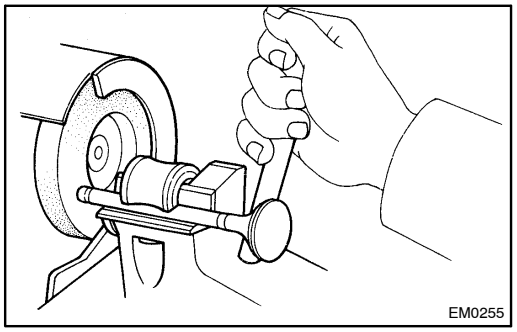


(d) Check the valve overall length.

Overall length:

Standard	Intake	95.15 mm (3.7461 in.)
	Exhaust	94.90 mm (3.7362 in.)
Minimum	Intake	94.60 mm (3.7244 in.)
	Exhaust	94.40 mm (3.7165 in.)

If the overall length is less than minimum, replace the valve.



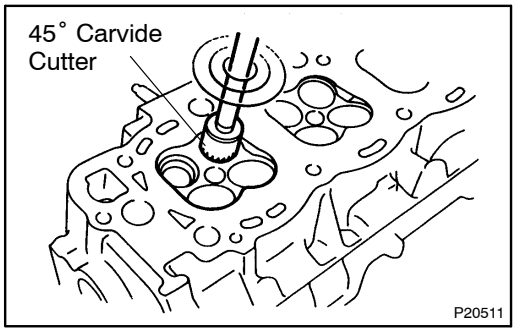
(e) Check the surface of the valve stem tip for wear.

If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

NOTICE:

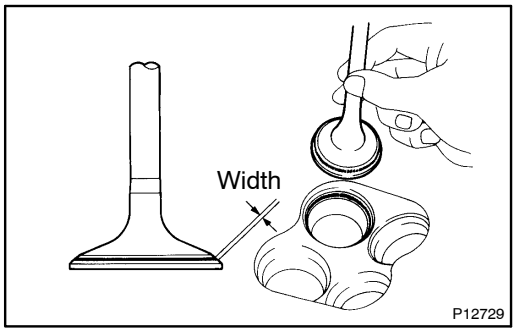
Do not grind off more than the minimum.

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12. INSPECT AND CLEAN VALVE SEATS

(a) Using a 45° carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.



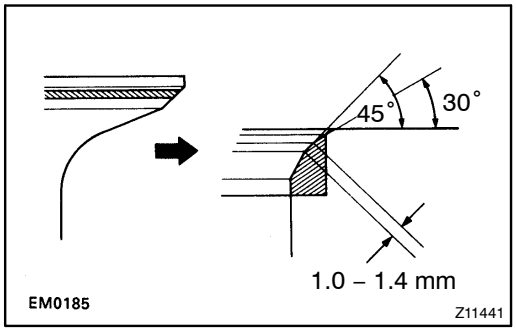
(b) Check the valve seating position.
Apply a thin coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate the valve.

(c) Check the valve face and seat for these:

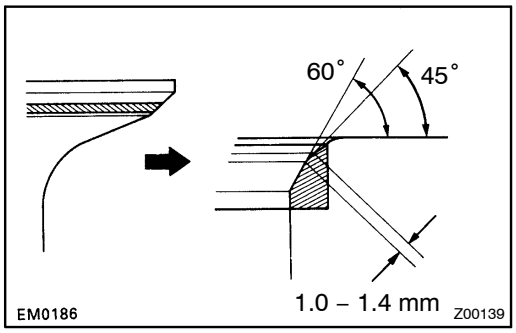
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with these width.

1.0 – 1.4 mm (0.039 – 0.055 in.)

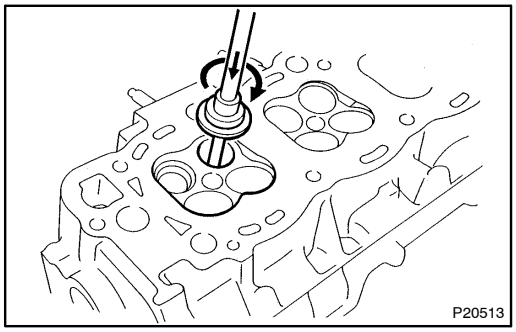
If not, correct the valve seats as follows:



(1) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.



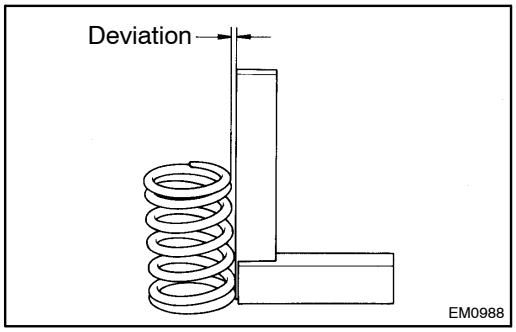
(2) If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.



(d) Hand–lap the valve and valve seat with an abrasive compound.

(e) After hand–lapping, clean the valve and valve seat.

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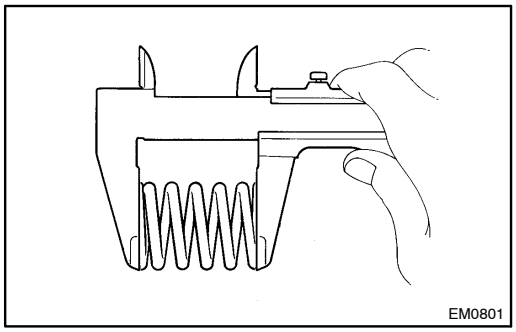


13. INSPECT VALVE SPRINGS

(a) Using a steel square, measure the squareness of the valve spring.

Maximum deviation:
2.0 mm (0.079 in.)

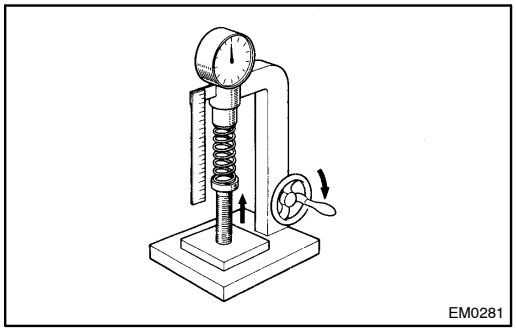
If deviation is greater than maximum, replace the valve spring.



(b) Using vernier calipers, measure the free length of the valve spring.

Free length:
44.78 mm (1.7630 in.)

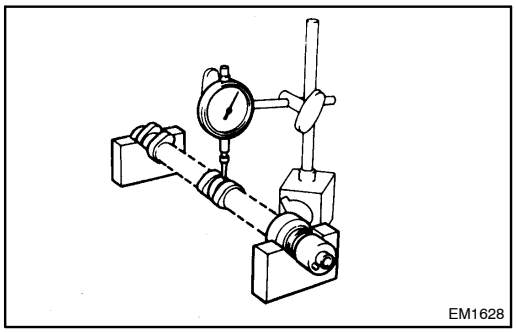
If the free length is not as specified, replace the valve spring.



(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:
186 – 206 N (19.0 – 21.0 kgf, 41.9 – 46.3 lbf)
at 33.3 mm (1.311 in.)

If the installed tension is not as specified, replace the valve spring.



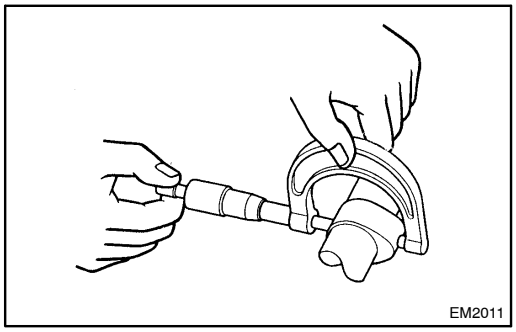
14. INSPECT CAMSHAFT FOR RUNOUT

(a) Place the camshaft on V–blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:
0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the camshaft.



15. INSPECT CAM LOBES

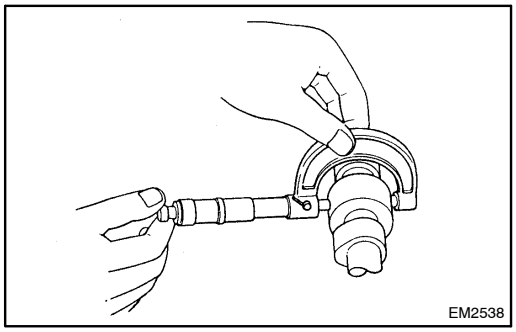
Using a micrometer, measure the cam lobe height.

Cam lobe height:

Standard	Intake	42.31 – 42.41 mm (1.6657 – 1.6697 in.)
	Exhaust	41.96 – 42.06 mm (1.6520 – 1.6559 in.)
Minimum	Intake	42.16 mm (1.6598 in.)
	Exhaust	41.81 mm (1.6461 in.)

If the cam lobe height is greater than maximum, replace the camshaft.

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EM2538

16. INSPECT CAMSHAFT JOURNALS

Using a micrometer, measure the journal diameter.

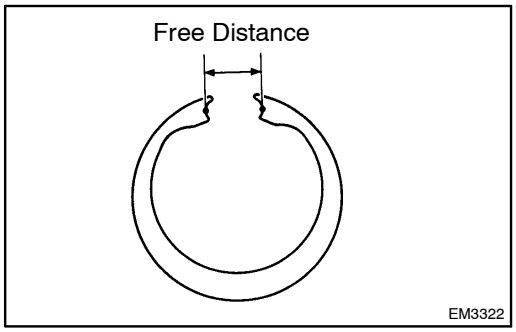
Journal diameter:
26.949 – 26.965 mm (1.0610 – 1.0616 in.)

If the journal diameter is not as specified, check the oil clearance.

17. INSPECT CAMSHAFT BEARINGS

Check the bearings for flaking and scoring.

If the bearings are damaged, replace the bearing caps and cylinder head as a set.



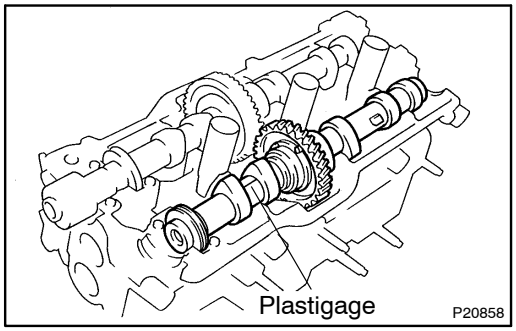
EM3322

18. INSPECT CAMSHAFT GEAR SPRING

Using vernier calipers, measure the free distance between the spring ends.

Free distance:
18.2 – 18.8 mm (0.712 – 0.740 in.)

If the free distance is not as specified, replace the gear spring.

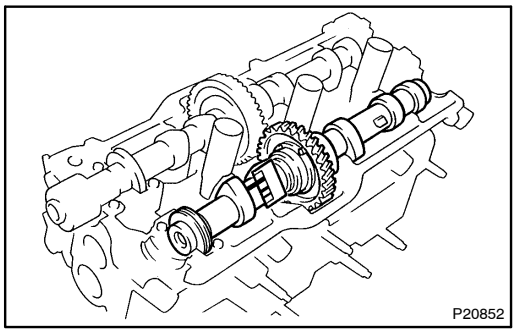


P20858

19. INSPECT CAMSHAFT JOURNAL OIL CLEARANCE

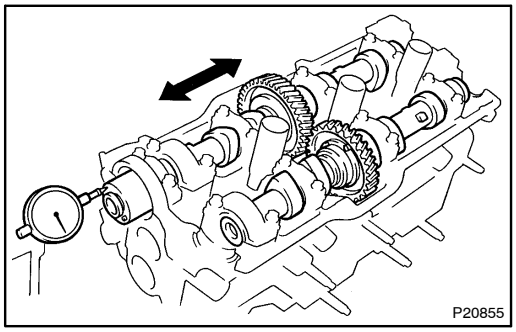
(a) Clean the bearing caps and camshaft journals.
(b) Place the camshafts on the cylinder head.
(c) Lay a strip of Plastigage across each of the camshaft journals.
(d) Install the bearing caps (See page EM–51).
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

NOTICE:
Do not turn the camshaft.


P20852

(e) Remove the bearing caps.
(f) Measure the Plastigage at its widest point.
Standard oil clearance:
0.035 – 0.072 mm (0.0014 – 0.0028 in.)
Maximum oil clearance:
0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.


P20855

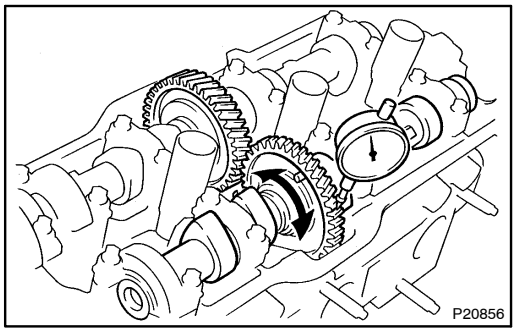
(g) Completely remove the plastigage.

20. INSPECT CAMSHAFT THRUST CLEARANCE

(a) Install the camshafts (See page EM–51).
(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.
Standard thrust clearance:
0.033 – 0.080 mm (0.0013 – 0.0031 in.)
Maximum thrust clearance:
0.12 mm (0.0047 in.)

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If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

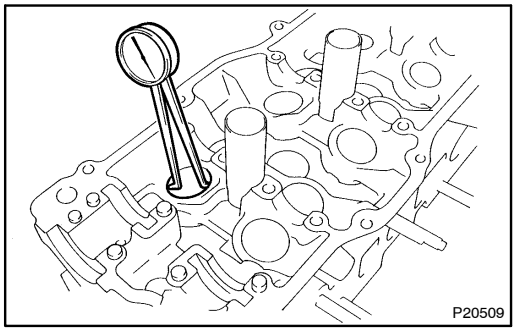


21. INSPECT CAMSHAFT GEAR BACKLASH

(a) Install the camshafts without installing the exhaust camshaft sub–gear (See page EM–51).

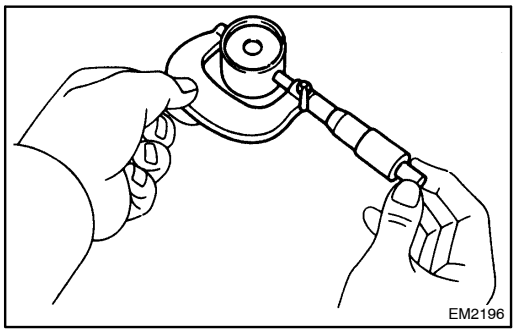
(b) Using a dial indicator, measure the backlash.
Standard backlash:
0.020 – 0.200 mm (0.0008 – 0.0079 in.)
Maximum backlash:
0.30 mm (0.0188 in.)

If the backlash is greater than maximum, replace the camshafts.



22. INSPECT VALVE LIFTERS AND LIFTER BORES

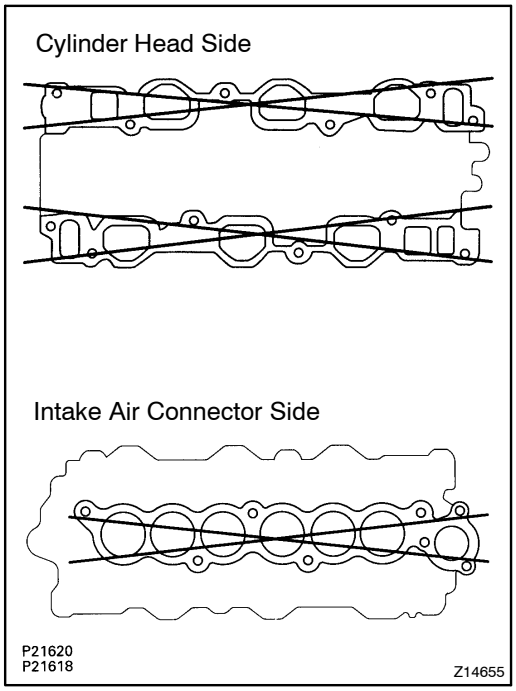
(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.
Lifter bore diameter:
31.000 – 31.018 mm (1.2205 – 1.2212 in.)



(b) Using a micrometer, measure the lifter diameter.
Lifter diameter:
30.966 – 30.976 mm (1.2191 – 1.2195 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.
Standard oil clearance:
0.024 – 0.052 mm (0.0009 – 0.0020 in.)
Maximum oil clearance:
0.08 mm (0.0031 in.)

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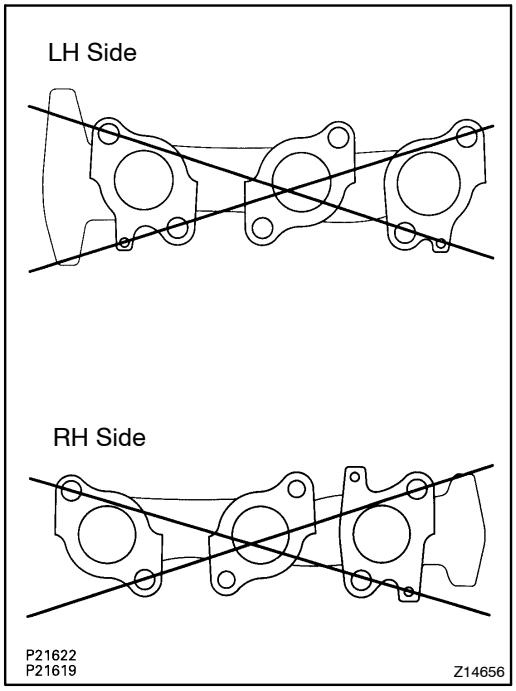


If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.

23. INSPECT INTAKE MANIFOLD, EXHAUST MANIFOLDS, AIR INTAKE CHAMBER AND INTAKE AIR CONNECTOR

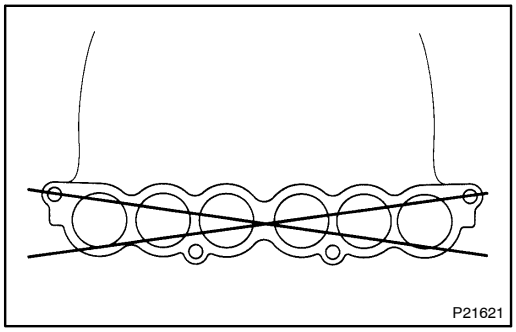
(a) Intake Manifold:
Using precision straight edge and thickness gauge, measure the surfaces contacting the cylinder head and intake air connector for warpage.
Maximum warpage:
0.10 mm (0.0039 in.)

If warpage is greater than maximum, replace the intake manifold.



(b) Exhaust Manifolds:
Measure the surfaces contacting the cylinder head for warpage.
Maximum warpage:
1.00 mm (0.0394 in.)

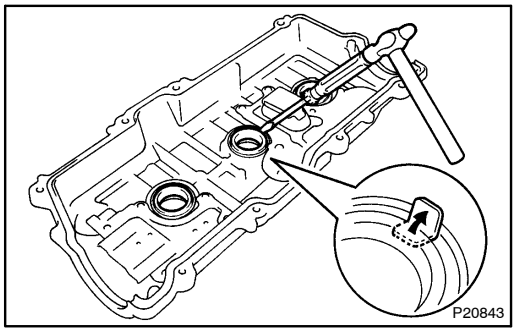
If warpage is greater than maximum, replace the exhaust manifold.



(c) Air Intake Chamber and intake air connector:
Measure the surfaces contacting the intake manifold and intake air connector for warpage.
Maximum warpage:
0.10 mm (0.0039 in.)

If warpage is greater than maximum, replace the air intake chamber or intake air connector.

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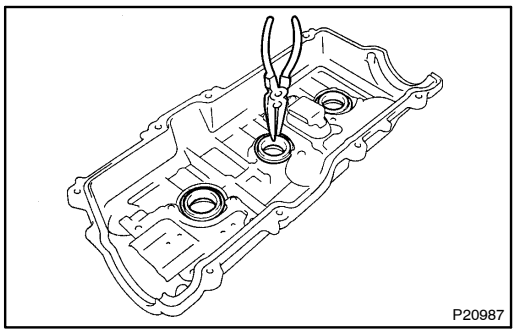
24. IF NECESSARY, REPLACE SPARK PLUG TUBE GASKETS

(a) Bend up the tab on the ventilation baffle plate which prevents the gasket from the slipping out.

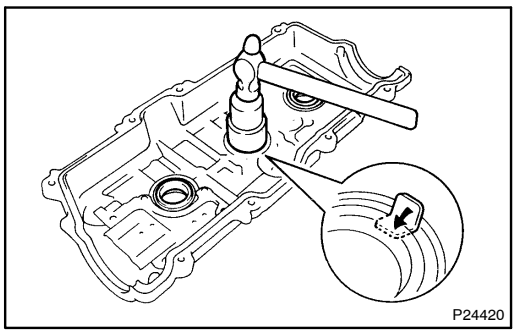
(b) Using a screwdriver and hammer, tap out the gasket.

NOTICE:

Do not scratch or damage the joint of the cylinder head cover.



(c) Using needle–nose pliers, pry out the gasket.



(d) Using a 32 mm socket wrench and hammer, tap in a new gasket until its surface is flush with the upper edge of the cylinder head cover.

(e) Apply a light coat of MP grease to the gasket lip.

(f) Return the ventilation plate tab to its original position.

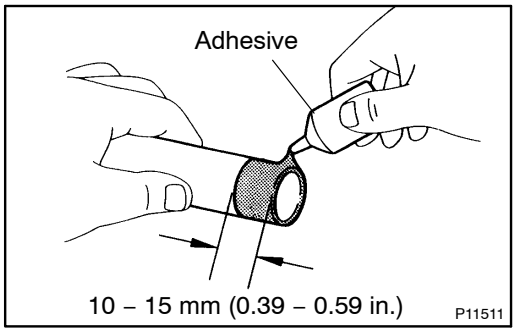
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EM06O–03

REASSEMBLY

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.



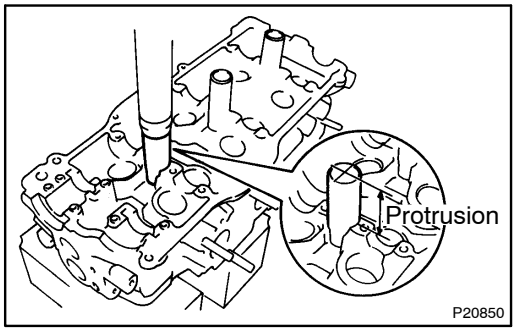
1. INSTALL SPARK PLUG TUBES

HINT:

When using a new cylinder head, spark plug tubes must be installed.

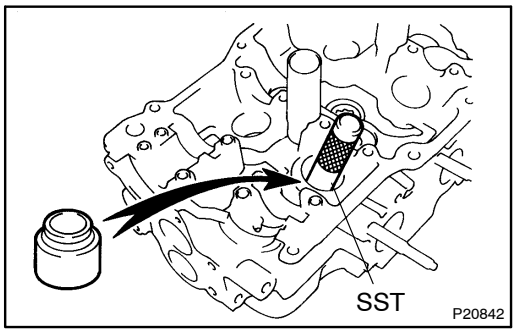
(a) Apply adhesive to the end of the spark plug tube.

Adhesive:
Part No. 08833–00070, THREE BOND 1324 or equivalent



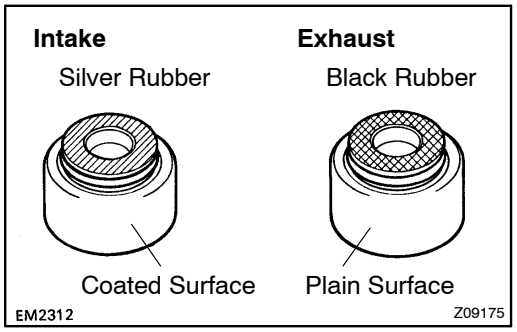
(b) Using a press, press in a new spark plug tube until there is 49.0 – 49.4 mm (1.929 – 1.945 in.) protruding from the camshaft bearing cap installation surface of the cylinder head.

NOTICE:
Avoid pressing a new spark plug tube in too far by measuring the amount of the protrusion while pressing.



2. INSTALL VALVES

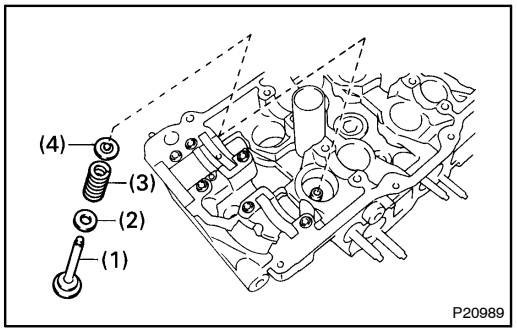
(a) Using SST, push in a new oil seal.
SST 09201–41020



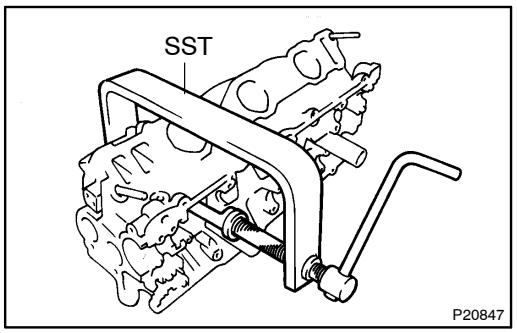
HINT:

The intake valve oil seal is silver and the exhaust valve oil seal is black.

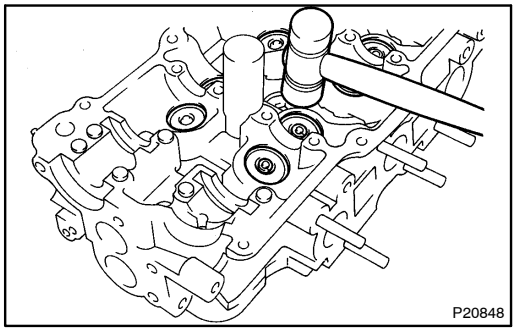
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(b) Install these parts:
(1) Valve
(2) Spring seat
(3) Valve spring
(4) Spring retainer



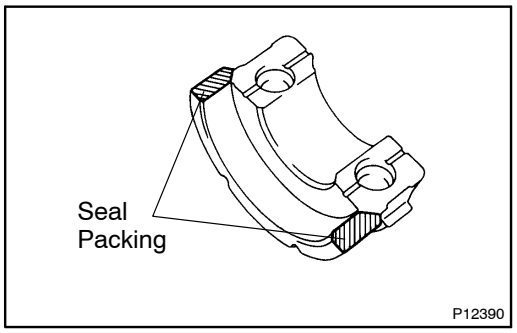
(c) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202–70020 (09202–00010)



(d) Using a plastic–faced hammer, lightly tap the valve stem tip to ensure a proper fit.

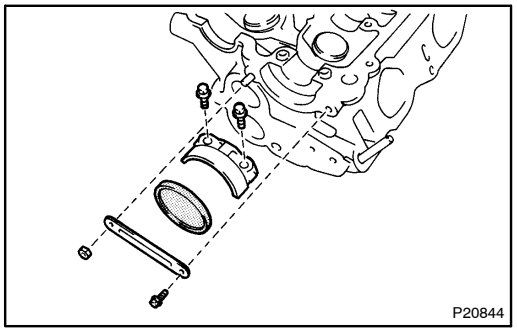
3. INSTALL VALVE LIFTERS AND SHIMS

(a) Install the valve lifter and shim.
(b) Check that the valve lifter rotates smoothly by hand.



4. INSTALL CAMSHAFT HOUSING PLUGS

(a) Remove any old packing (FIPG) material.
(b) Apply seal packing to the bearing cap as shown.
Seal packing:
Part No. 08826–00080 or equivalent



(c) Place a new housing plug in position on the cylinder head, facing the cap side inward.
(d) Install the camshaft bearing cap with the 2 bolts.
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)
(e) Install the cylinder head rear plate, ground strap with the bolt and nut.
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)

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EM1OR–01

INSTALLATION

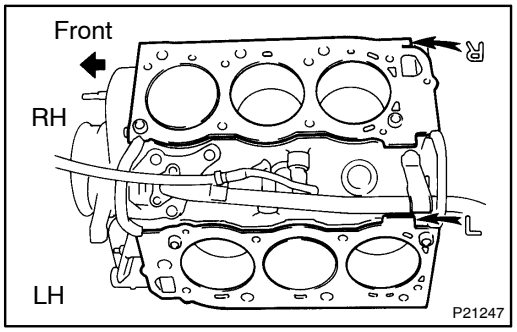
1. PLACE CYLINDER HEAD ON CYLINDER BLOCK

(a) Place 2 new cylinder head gaskets in position on the cylinder block.

NOTICE:

Be careful of the installation direction.

(b) Place the 2 cylinder heads in position on the cylinder head gaskets.



2. INSTALL 12 POINTED HEAD CYLINDER HEAD BOLTS

HINT:

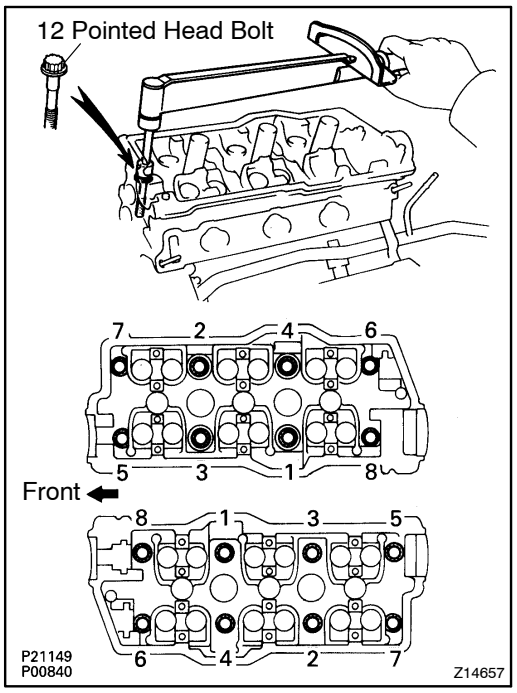
- The cylinder head bolts are tightened in 3 progressive steps (steps (b), (d) and (e)).
- If any bolt is broken or deformed, replace it.

(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

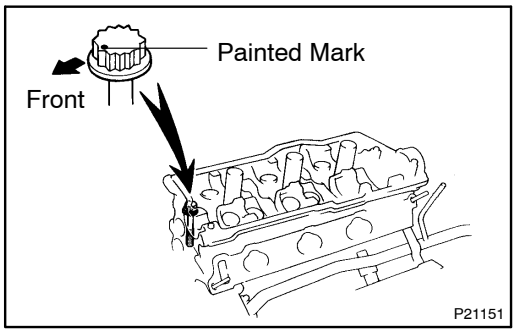
(b) Install and uniformly tighten the cylinder head bolts on each cylinder head, in several passes, in the sequence shown, then repeat for the other side, as shown.

Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)

If any of the cylinder head bolts does not meet the torque specification, replace the cylinder head bolt.



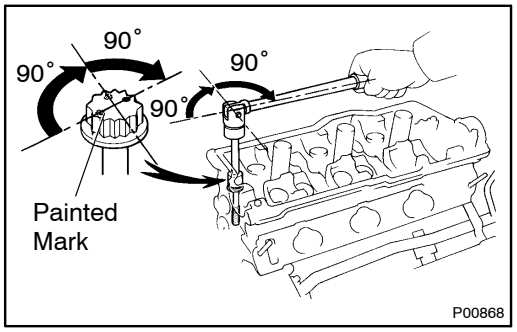
(c) Mark the front of the cylinder head bolt head with paint.



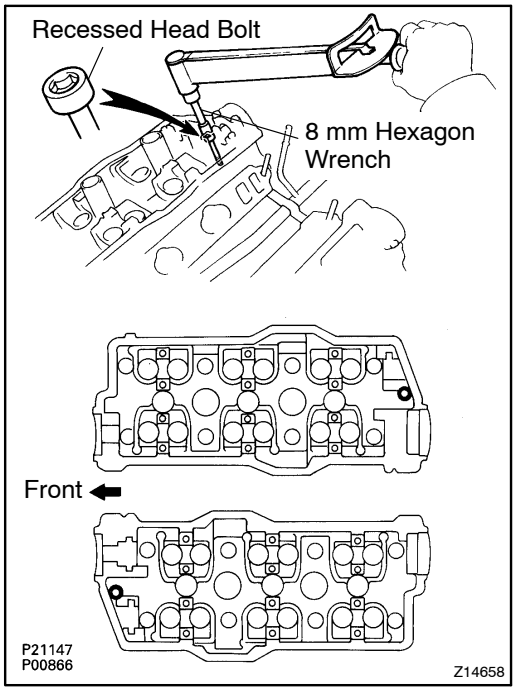
(d) Retighten the cylinder head bolts by 90° in the numerical order shown.

(e) Retighten the cylinder head bolts by an additional 90°.

(f) Check that the painted mark is now facing rearward.



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3. INSTALL RECESSED HEAD CYLINDER HEAD BOLTS

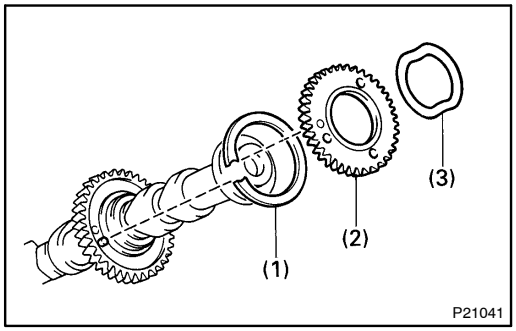
(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) Using an 8 mm hexagon wrench, install the cylinder head bolt on each cylinder head, then repeat for the other side, as shown.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

4. CONNECT GROUND STRAP

Install the bolt, and connect the ground strap.



5. ASSEMBLE EXHAUST CAMSHAFTS

(a) Mount the hexagonal wrench head portion of the camshaft in a vise.

NOTICE:

Be careful not to damage the camshaft.

(b) Install these parts:

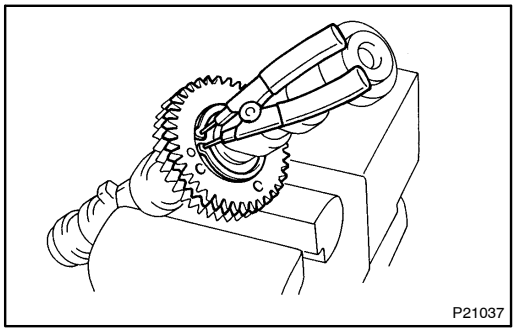
(1) Camshaft gear spring

(2) Camshaft sub–gear

HINT:

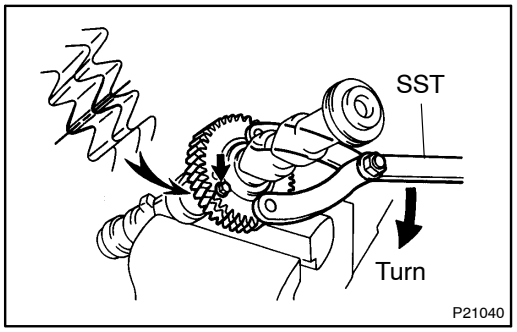
Attach the pins on the gears to the gear spring ends.

(3) Wave washer



(c) Using snap ring pliers, install the snap ring.

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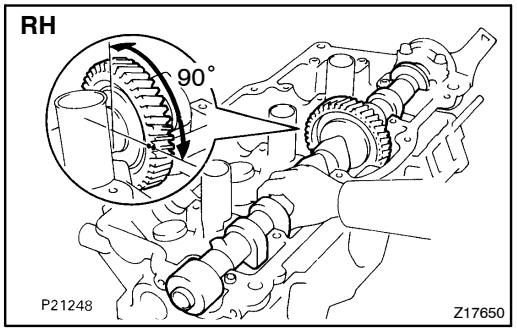
(d) Using SST, align the holes of the camshaft main gear and sub–gear by turning camshaft sub–gear clockwise, and temporarily install a service bolt.
SST 09960–10010 (09962–01000, 09963–00600)

(e) Align the gear teeth of the main gear and sub–gear, and tighten the service bolt.

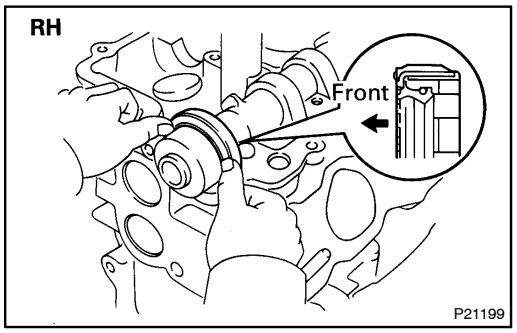
6. INSTALL CAMSHAFTS OF RH CYLINDER HEAD

NOTICE:

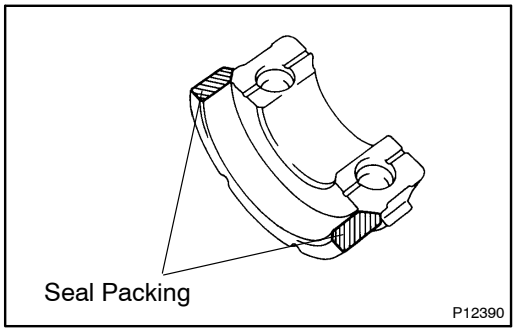
Since the thrust clearance of the camshaft is small, the camshaft must be held level while it is being installed. If the camshaft is not level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, these steps should be carried out.



(a) Install the intake camshaft.
(1) Apply new engine oil to the thrust portion and journal of the camshaft.
(2) Place the intake camshaft at 90° angle of timing mark (2 dot marks) on the cylinder head.

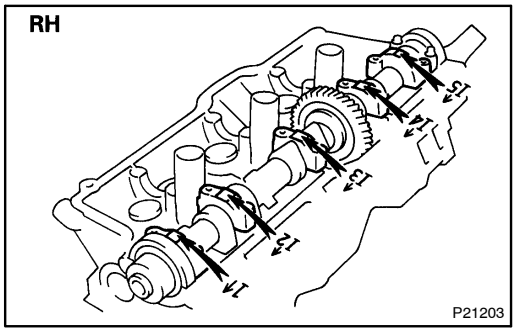


(b) Apply MP grease to a new oil seal lip.
(c) Install the oil seal to the camshaft.

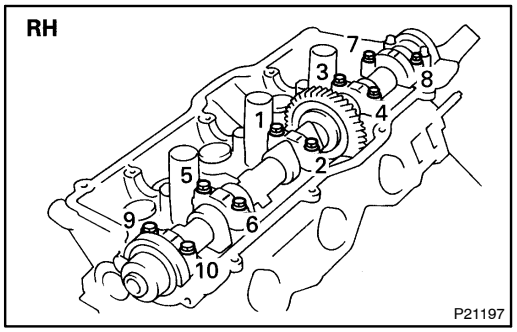


(d) Remove any old packing (FIPG) material.
(e) Apply seal packing to the No.1 bearing cap as shown.
Seal packing:
Part No. 08826–00080 or equivalent

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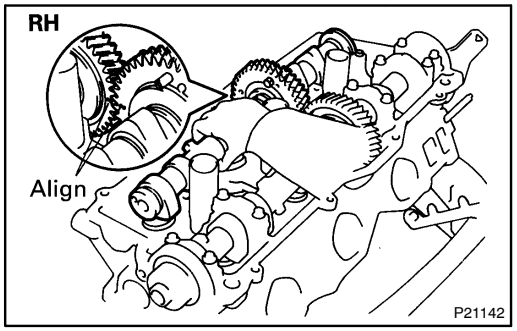


(f) Install the 5 bearing caps in their proper locations.



(g) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

(h) Install and uniformly tighten the 10 bearing cap bolts, in several passes, in the sequence shown.
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

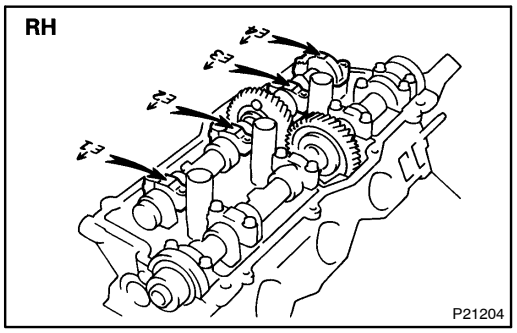


(i) Install the exhaust camshaft.

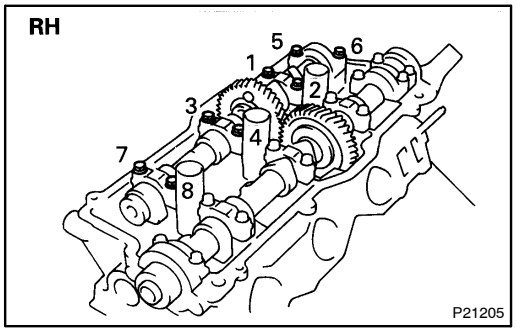
(j) Apply new engine oil to the thrust portion and journal of the camshaft.

(k) Align the timing marks (2 dot marks) of the camshaft drive and driven gears.

(l) Place the exhaust camshaft on the cylinder head.



(m) Install the 4 bearing caps in their proper locations.



(n) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

(o) Install and uniformly tighten the 8 bearing cap bolts, in several passes, in the sequence shown.
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

(p) Remove the service bolt.

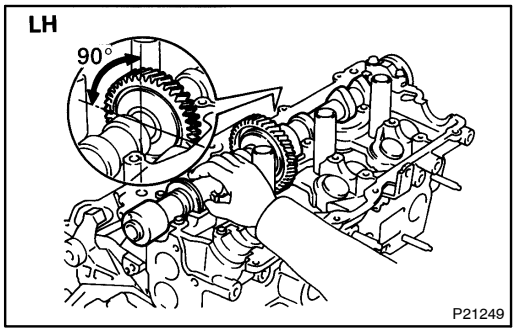
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7. Intake:

INSTALL CAMSHAFTS OF LH CYLINDER HEAD

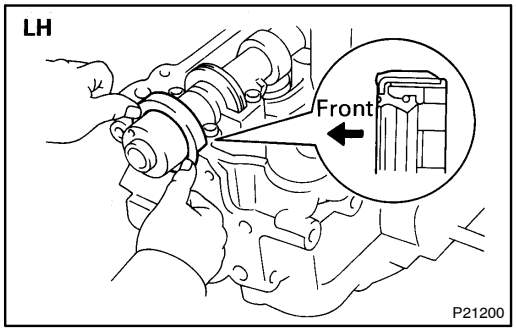
NOTICE:

Since the thrust clearance of the camshaft is small, the camshaft must be held level while it is being installed. If the camshaft is not level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, these steps should be carried out.



(a) Apply new engine oil to the thrust portion and journal of the camshaft.

(b) Place the intake camshaft at 90° angle of timing mark (1 dot mark) on the cylinder head.



(c) Apply MP grease to a new oil seal lip.

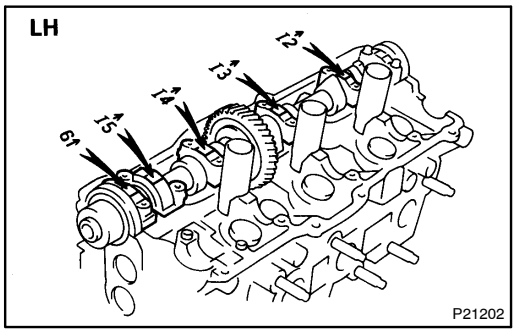
(d) Install the oil seal to the camshaft.

(e) Remove any old packing (FIPG) material.

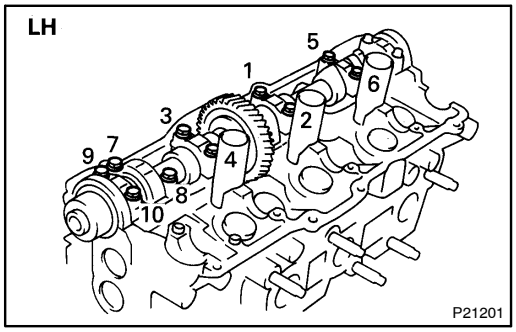
(f) Apply seal packing to the No.1 bearing cap.

Seal packing:

Part No. 08826–00080 or equivalent



(g) Install the 5 bearing caps in their proper locations.

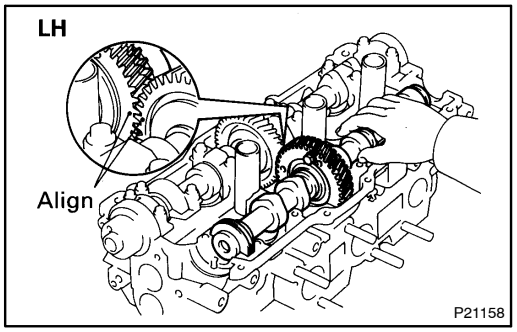


(h) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

(i) Install and uniformly tighten the 10 bearing cap bolts, in several passes, in the sequence shown.

Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

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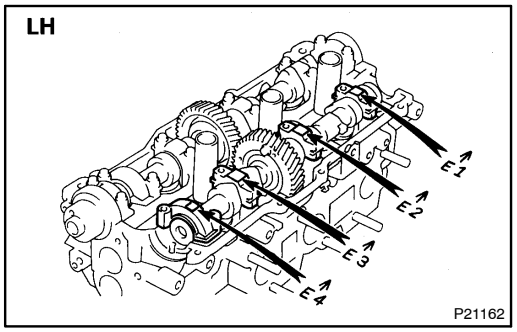


8. Exhaust:
INSTALL CAMSHAFTS OF LH CYLINDER HEAD

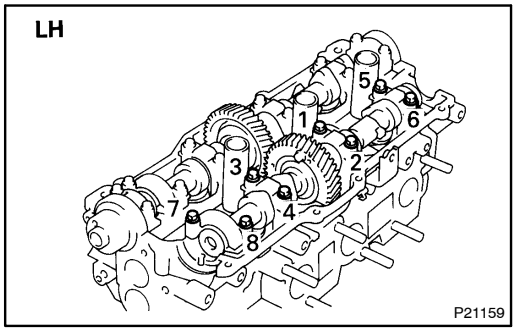
(a) Apply new engine oil to the thrust portion and journal of the camshaft.

(b) Align the timing marks (1 dot mark) of the camshaft drive and driven gears.

(c) Place the exhaust camshaft on the cylinder head.



(d) Install the 4 bearing caps in their proper locations.

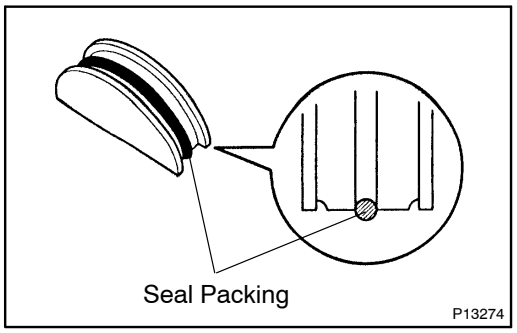


(e) Apply a light coat of engine oil on the threads and under the heads of bearing cap bolts.

(f) Install and uniformly tighten the 8 bearing cap bolts, in several passes, in the sequence shown.
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

(g) Remove the service bolt.

9. CHECK AND ADJUST VALVE CLEARANCE

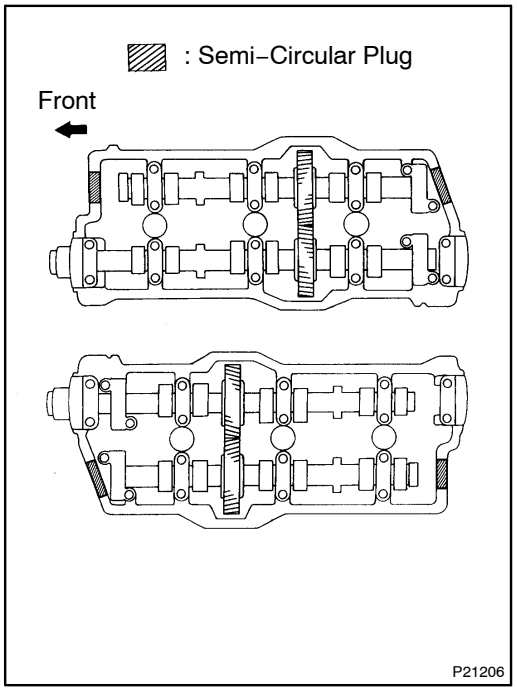


10. INSTALL SEMI–CIRCULAR PLUGS

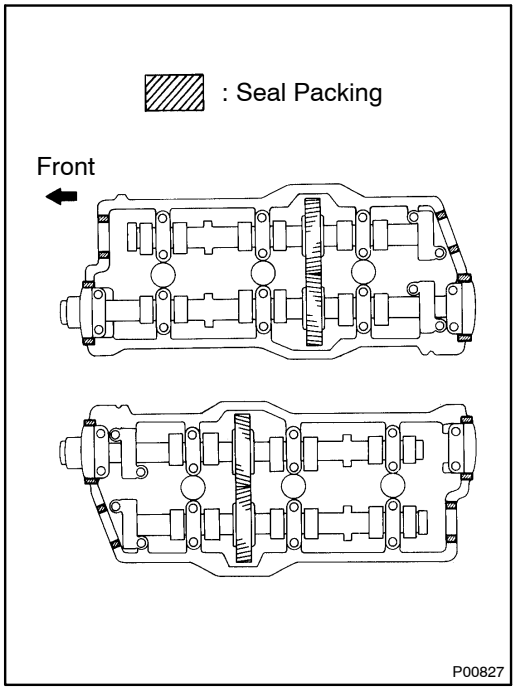
(a) Remove any old packing (FIPG) material.

(b) Apply seal packing to the semi–circular plug grooves.
Seal packing:
Part No. 08826–00080 or equivalent

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(c) Install the 4 semi–circular plugs to the cylinder heads.



11. INSTALL CYLINDER HEAD COVERS

(a) Apply seal packing to the cylinder heads as shown in the illustration.
Seal packing:
Part No. 08826–00080 or equivalent

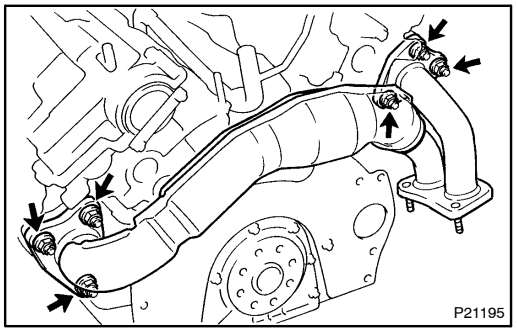
(b) Install the gasket to the cylinder head cover.

(c) Install the cylinder head cover with the 8 bolts. Uniformly tighten the bolts in several passes. Install the 2 cylinder head covers.
Torque: 6 N·m (60 kgf·cm, 53 in.·lbf)

12. INSTALL RH AND LH EXHAUST MANIFOLDS

(a) Install 2 new gaskets, the RH and LH exhaust manifolds with the 12 nuts.
Torque: 40 N·m (400 kgf·cm, 30 ft·lbf)

(b) Install the exhaust manifold heat insulators with the 6 nuts.
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)



13. INSTALL EXHAUST CROSSOVER PIPE

Install 2 new gaskets and the crossover pipe with the 6 nuts.
Torque: 45 N·m (450 kgf·cm, 33 ft·lbf)

14. INSTALL GENERATOR BRACKET
Torque: 18.5 N·m (185 kgf·cm, 13 ft·lbf)

15. INSTALL OIL DIPSTICK AND GUIDE

(a) Install a new O–ring to the dipstick guide.

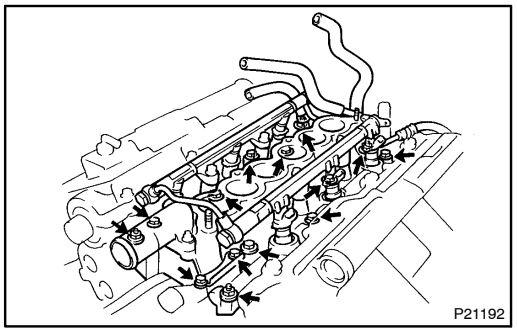
(b) Apply soapy water to the O–ring.

(c) Push in the dipstick guide end into the guide hole of the oil pan.

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(d) Install the dipstick guide with the 2 bolts.
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)
(e) Install the dipstick.

16. INSTALL PS PUMP BRACKET
Torque: 18.5 N·m (185 kgf·cm, 13 ft·lbf)


P21192

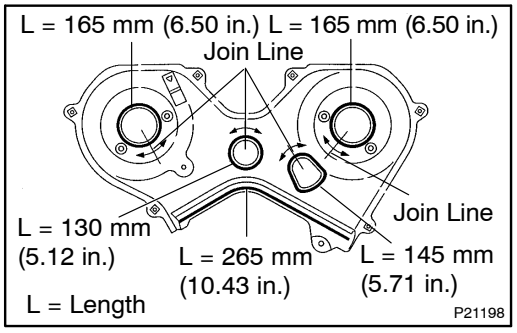
17. INSTALL INTAKE MANIFOLD ASSEMBLY
(a) Install 2 new gaskets and the intake manifold, delivery pipe and injectors assembly with the 8 bolts, 4 plate washers and 4 nuts.
Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)
(b) Install the intake manifold stay with the 2 bolts.
Torque: 18.5 N·m (185 kgf·cm, 13 ft·lbf)
(c) Connect the fuel inlet hose.

18. INSTALL FUEL PRESSURE REGULATOR
(See page SF–16)

19. INSTALL NO.3 TIMING BELT COVER
(a) Check that the timing belt cover gaskets have no cracks or peeling, etc.

If the gaskets do have cracks or peeling etc., replace them using these steps:

- Using a screwdriver and gasket scraper, remove all the old gasket material.
- Thoroughly clean all components to remove all the loose material.

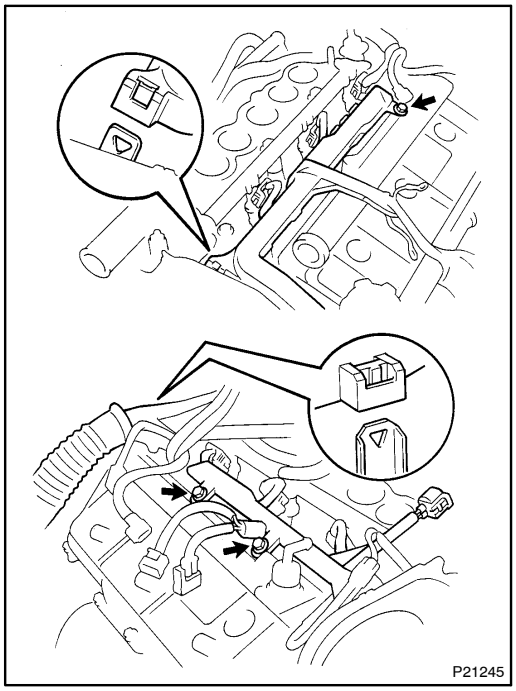


- Remove the backing paper from a new gasket and install the gasket evenly to the part of the timing belt cover shaded black in the illustration.

(b) Install the timing belt cover with the 6 bolts.
Torque: 9 N·m (90 kgf·cm, 80 in.·lbf)

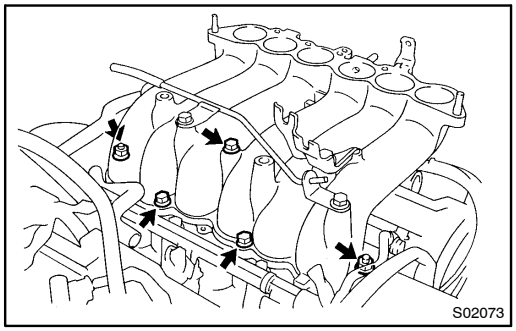
20. INSTALL CAMSHAFT POSITION SENSOR
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)

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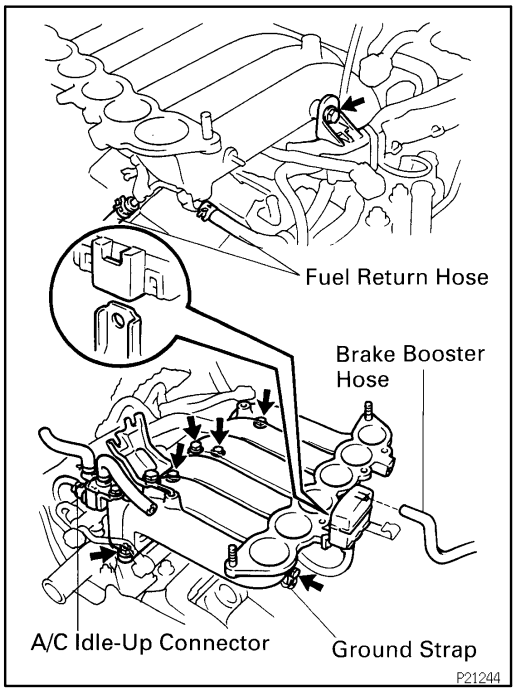
21. CONNECT ENGINE WIRE

(a) Install the engine wire with the 3 bolts.
(b) Connect the 3 engine wire clamps.
(c) Connect these connectors:
- Oil pressure sensor connector
- Crankshaft position sensor connector
- 6 Injector connectors
- ECT sender gauge connector
- ECT sensor connector
- Knock sensor connector
- Camshaft position sensor connector



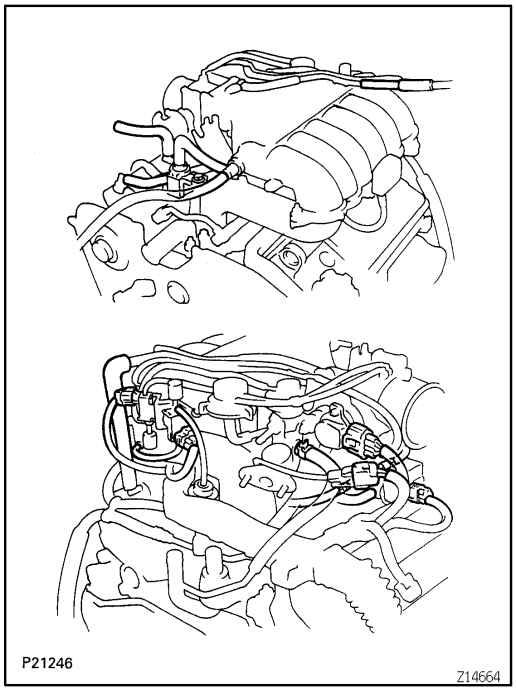
22. INSTALL INTAKE AIR CONNECTOR

(a) Install a new gasket and the intake air connector with the 3 bolts and 2 nuts.
Torque: 18.5 N·m (185 kgf·cm, 13 ft·lbf)



(b) Connect the DLC1 to the bracket.
(c) Install the bolt, and connect the ground strap to the intake air connector.
(d) Connect the brake booster vacuum hose to the intake air connector.
(e) Connect the 2 fuel return hoses.
(f) Install the engine wire with the bolt.
(g) w/ A/C
Connect the A/C idle–up valve connector.

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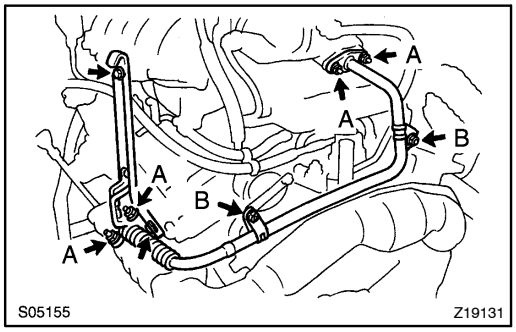


23. INSTALL AIR INTAKE CHAMBER ASSEMBLY

(a) Install a new gasket and the air intake chamber assembly with the 4 bolts and 2 nuts.
Torque: 18.5 N·m (185 kgf·cm, 13 ft·lbf)

(b) Connect these hoses:
- 2 PCV hoses
- 2 water bypass hoses
- Air assist hose to throttle body
- w/ EGR:
  Water bypass hose
- EVAP hose
- Air hose to PS pump
- w/ A/C
  Air hose to A/C idle–up valve

(c) Connect these connectors:
- VSV connector for fuel pressure control
- Throttle position sensor connector
- IAC valve connector
- w/ EGR:
  EGR gas temperature sensor connector
- VSV connector for EGR



24. INSTALL AIR INTAKE CHAMBER STAY

(a) Install the air intake chamber stay with the 2 bolts.
Torque:
14 mm head bolt: 40 N·m (400 kgf·cm, 30 ft·lbf)
12 mm head bolt: 18.5 N·m (185 kgf·cm, 13 ft·lbf)

(b) A/T:
Install a new O–ring to the oil filler tube.

(c) Apply soapy water to the O–ring.

(d) Push in the oil filler tube end into the tube hole of the oil pan.

(e) Install the oil filler tube and No.1 throttle cable clamp with the 2 nuts, bolt.

(f) Install the dipstick.

25. w/ EGR:
INSTALL EGR PIPE

Install 2 new gaskets and the EGR pipe with the 6 nuts.
Torque:
Nut A: 18.5 N·m (185 kgf·cm, 13 ft·lbf)
Nut B: 8 N·m (80 kgf·cm, 71 in.·lbf)

26. TEMPORARILY INSTALL GENERATOR

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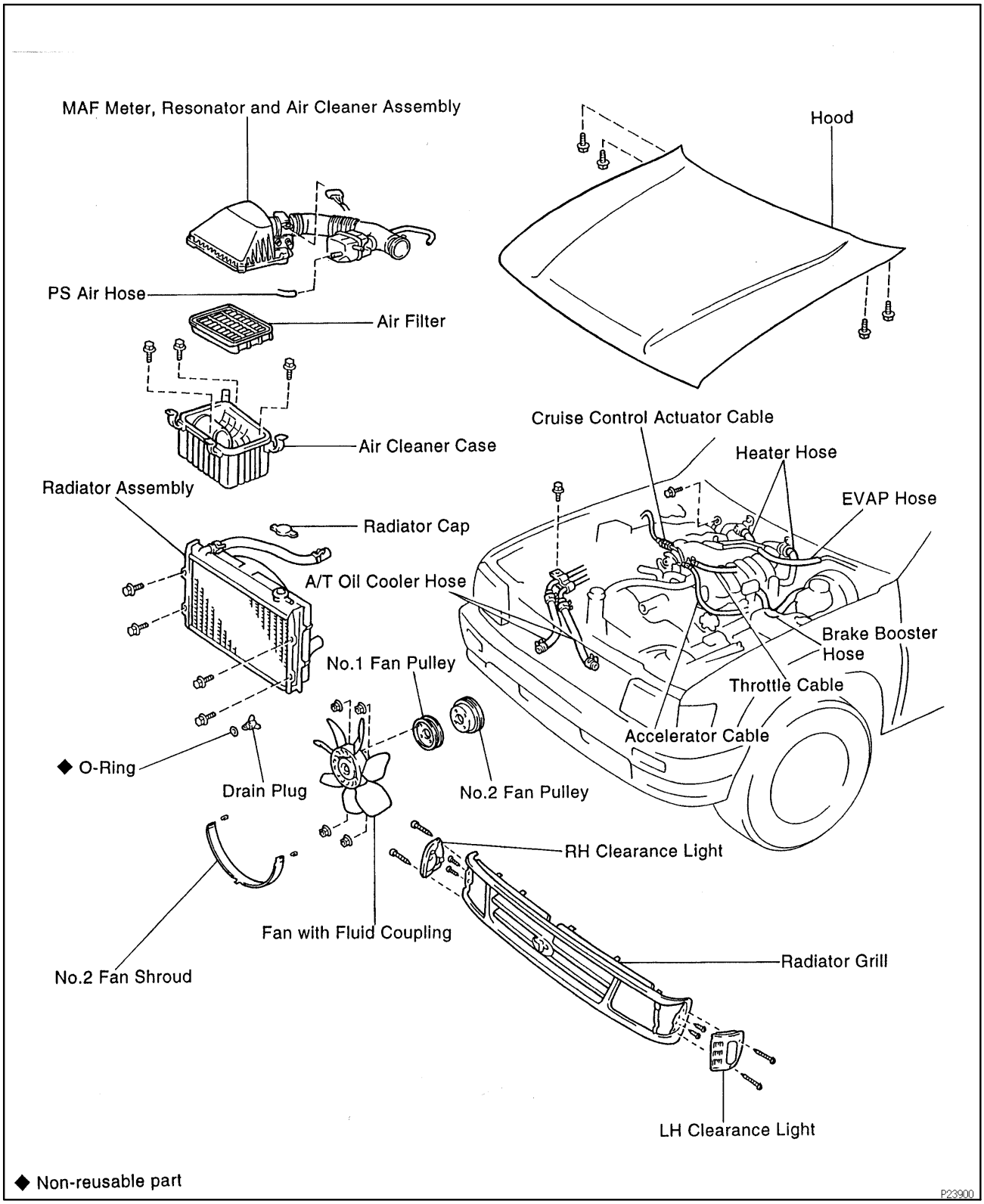
27. INSTALL TIMING BELT IDLER NO. 2 (See page EM–19)
28. INSTALL CAMSHAFT TIMING PULLEYS AND TIMING BELT (See page EM–19)
29. INSTALL SPARK PLUGS
30. INSTALL HIGH–TENSION CORDS WITH IGNITION COILS (See page IG–1)
31. w/ A/C:
INSTALL A/C COMPRESSOR BRACKET
32. w/ A/C:
CONNECT A/C COMPRESSOR
33. CONNECT PS PUMP
34. INSTALL FAN WITH FLUID COUPLING AND FAN PULLEYS
Torque: 5.4 N·m (54 kgf·cm, 48 in.·lbf)
35. INSTALL NO. 2 FAN SHROUD
36. INSTALL AND ADJUST DRIVE BELT FOR GENERATOR (See page CH–1)
37. w/ A/C:
INSTALL AND ADJUST DRIVE BELT FOR A/C COMPRESSOR
38. INSTALL AND ADJUST DRIVE BELT FOR PS PUMP
39. CONNECT HEATER HOSE AND UPPER RADIATOR HOSE
40. CONNECT THESE CABLES:
(a) A/T:
Throttle cable
(b) Accelerator cable
(c) w/ Cruise control:
Cruise control actuator cable
41. INSTALL MAF METER, RESONATOR AND AIR CLEANER CAP ASSEMBLY
42. INSTALL FRONT EXHAUST PIPE (See page EM–108)
43. FILL WITH ENGINE COOLANT
44. START ENGINE AND CHECK FOR LEAKS
45. CHECK IGNITION TIMING (See page EM–9)
46. 4WD:
INSTALL ENGINE UNDER COVER
47. ROAD TEST VEHICLE
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.
48. RECHECK ENGINE COOLANT LEVEL

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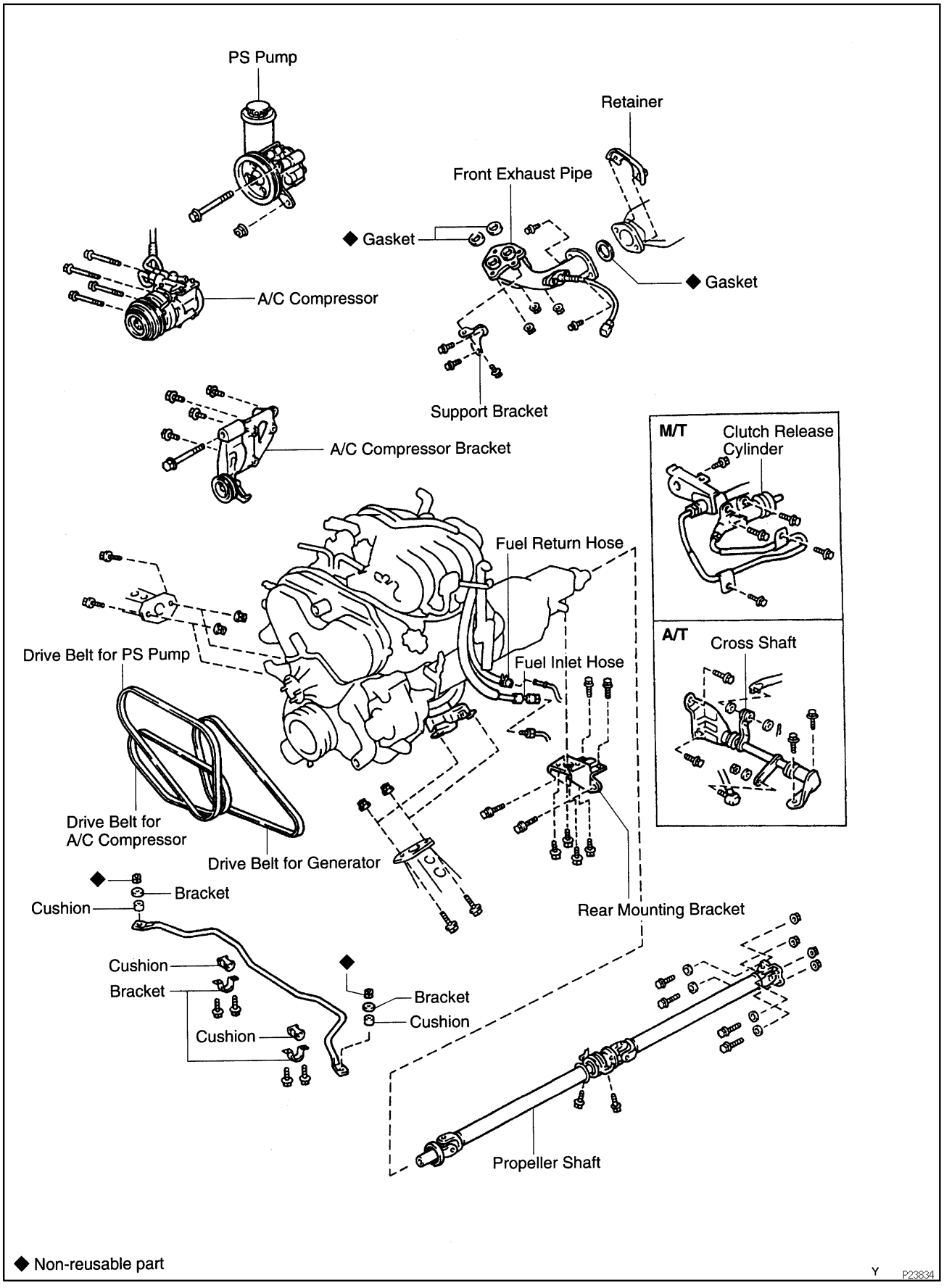
ENGINE UNIT (2WD)

COMPONENTS

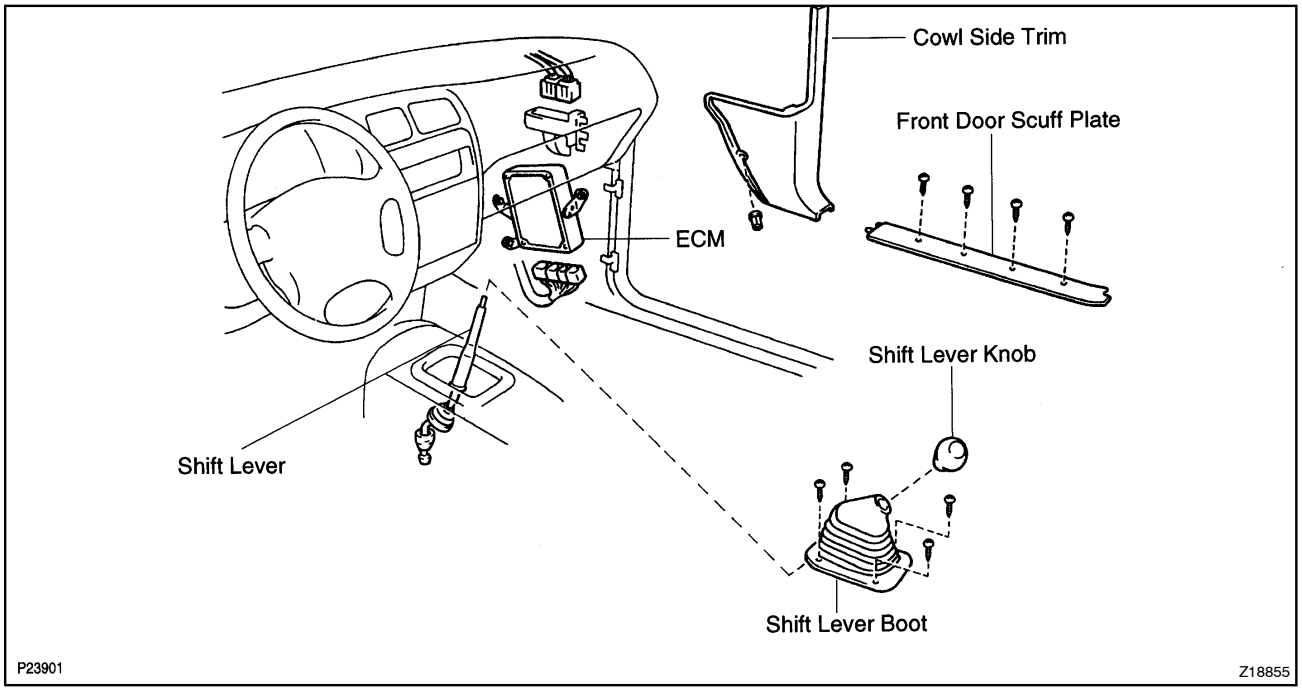
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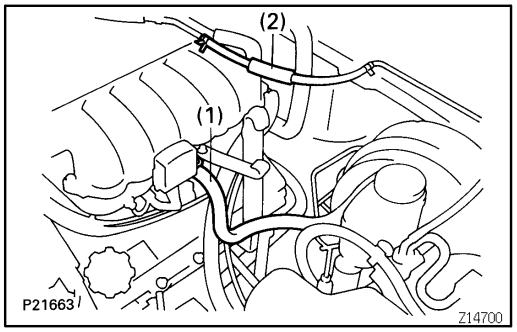


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EM06W–02

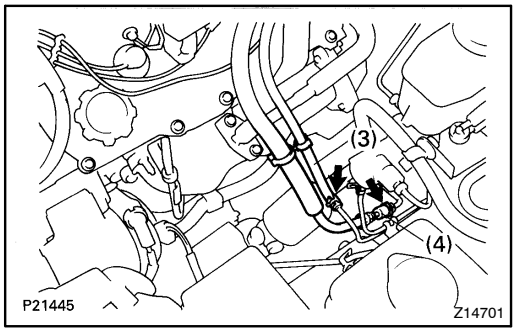
REMOVAL

1. DRAIN ENGINE COOLANT
2. DRAIN ENGINE OIL
3. DRAIN TRANSMISSION OIL
4. REMOVE HOOD
5. REMOVE RADIATOR ASSEMBLY
(See page CO–16)
6. REMOVE DRIVE BELT FOR PS PUMP
7. w/ A/C:
REMOVE DRIVE BELT FOR A/C COMPRESSOR
8. REMOVE DRIVE BELT FOR GENERATOR
9. REMOVE FAN WITH FLUID COUPLING AND FAN PULLEYS
(See page CO–5)
10. DISCONNECT PS PUMP FROM ENGINE
HINT:
Put aside the pump, and suspend it.
11. w/ A/C:
REMOVE A/C COMPRESSOR FROM ENGINE
HINT:
Put aside the compressor, and suspend it.
12. REMOVE AIR CLEANER CAP, MAF METER AND RESONATOR
13. REMOVE AIR CLEANER CASE AND FILTER
14. DISCONNECT THESE CABLES:
(a) w/ Cruise control:
Cruise control actuator cable
(b) Accelerator cable
(c) A/T:
Throttle cable
15. DISCONNECT HEATER HOSES

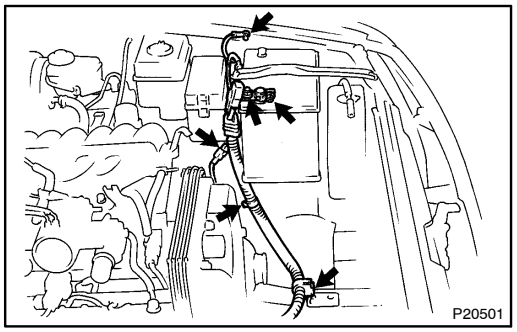


16. DISCONNECT HOSES
Disconnect these hoses:
(1) Brake booster vacuum hose
(2) EVAP hose

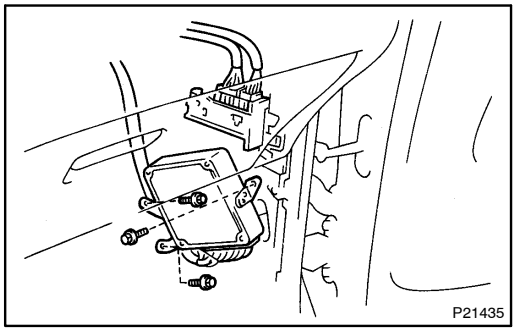
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(3) Fuel return hose
(4) Fuel inlet hose

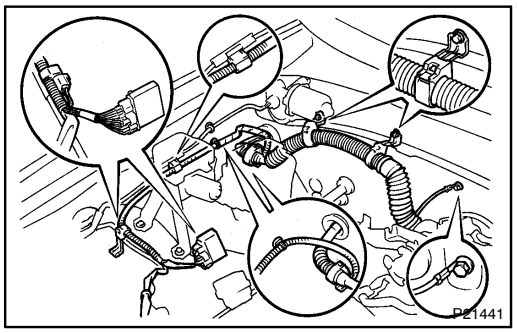


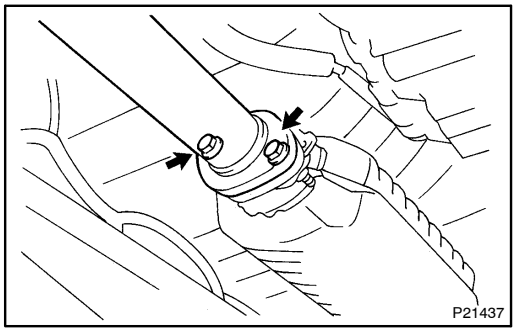
17. DISCONNECT STARTER WIRE AND CONNECTOR
(a) Remove the bolt, and disconnect the ground strap.
(b) Remove the 2 nuts, disconnect the positive (+) terminal cable from battery.
(c) Disconnect the 2 starter wire clamps and connector.
18. DISCONNECT GENERATOR WIRE
(a) Disconnect the generator connector.
(b) Remove the nut, and disconnect the generator wire and wire clip.
19. REMOVE FRONT DOOR SCUFF PLATE AND COWL SIDE TRIM
20. DISCONNECT ENGINE WIRE AND CONNECTORS
(a) Remove the 3 bolts and ECM.
(b) M/T:
Disconnect the 3 ECM connectors.
(c) A/T:
Disconnect the 4 ECM connectors.
(d) Disconnect the 2 connectors from the cowl wire.
(e) Disconnect these wires and connectors:



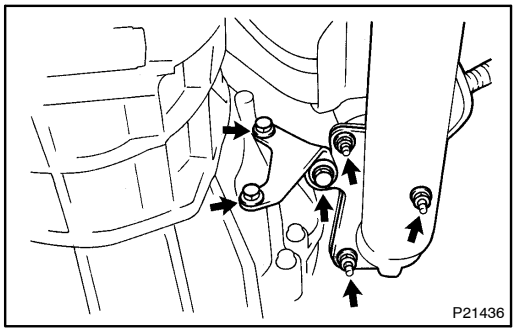
- Igniter connector
- Ground strap

(f) Disconnect the 6 engine wire clamps.
(g) Pull out the engine wire from the cabin.
21. M/T:
REMOVE SHIFT LEVER
(a) Remove the shift lever knob.
(b) Remove the 4 screws and shift lever boot.
(c) Remove the shift lever.
22. REMOVE STABILIZER BAR
(See page SA–16)
23. REMOVE PROPELLER SHAFT
(See page PR–3)
24. DISCONNECT SPEEDOMETER CABLE
NOTICE:
Do not lose the felt protector and washers.
25. REMOVE FRONT EXHAUST PIPE
(a) Disconnect the 2 heated oxygen sensor connectors.
(b) Remove the 2 bolts, and retainer holding the front exhaust pipe to the center exhaust pipe.





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(c) Remove the 3 bolts and support bracket.
(d) Remove the 3 nuts, front exhaust pipe and 3 gaskets.

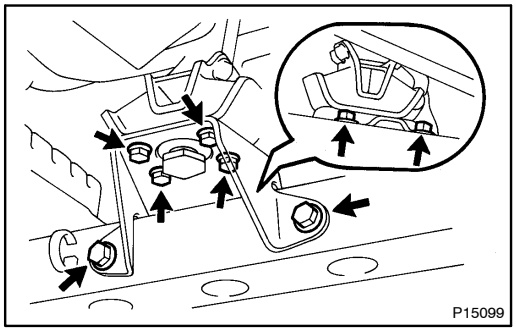
26. M/T:
REMOVE CLUTCH RELEASE CYLINDER
(a) Remove the 3 bolts and disconnect the clutch line.
(b) Remove the 2 bolts and disconnect the clutch release cylinder.

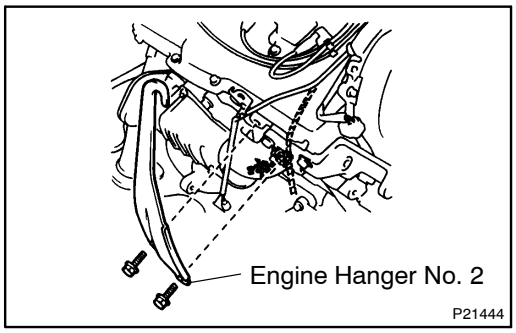
27. A/T:
REMOVE CROSS SHAFT
(a) Remove the clip and disconnect the shifting rod.
(b) Remove the nut, 4 bolts and the cross shaft.

28. PLACE JACK UNDER TRANSMISSION

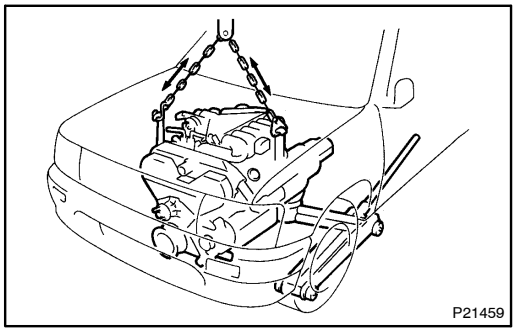
29. REMOVE ENGINE REAR MOUNTING BRACKET

Remove the 8 bolts holding the mounting bracket to the mounting insulator and cross member.



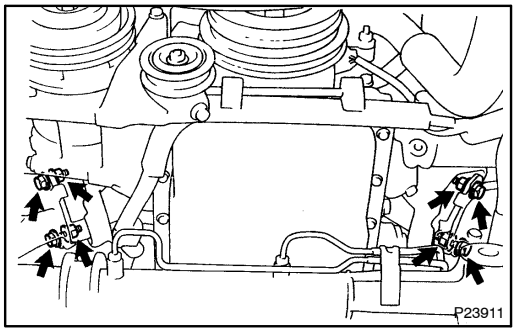


30. REMOVE ENGINE WITH TRANSMISSION
(a) w/ A/C:
Remove the bolt and disconnect the A/C compressor wire clamp.
(b) Install a engine hanger No.2 in the correct direction.
Part No.:
Engine hanger No.2 12282–62030
Bolt 91512–61020
Torque:40 N·m (400 kgf·cm, 30 ft·lbf)

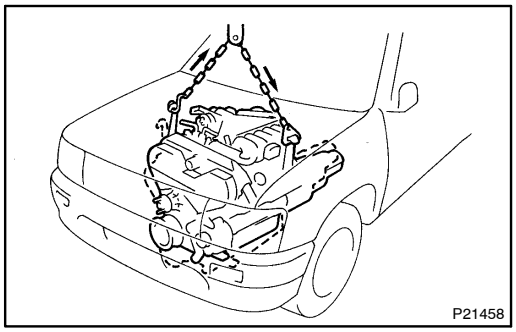


(c) Attach the engine hoist chain to the 2 engine hangers.

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(d) Remove the 4 bolts and nuts holding the engine front mounting insulators to the frame.



(e) Lift the engine with transmission out of the vehicle slowly and carefully.

NOTICE:

Make sure the engine is clear of all wiring and hoses.

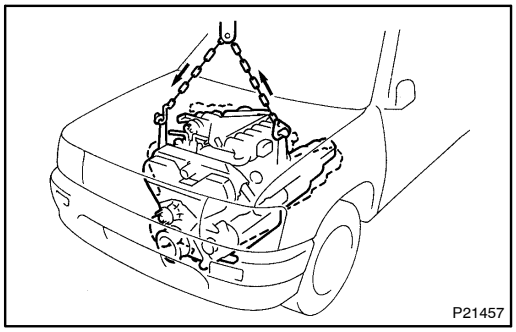
(f) Place the engine and transmission assembly onto the stand.

31. SEPARATE ENGINE AND TRANSMISSION

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EM1OS–01

INSTALLATION

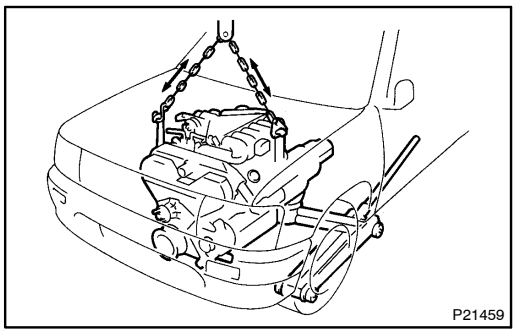

P21457

1. INSTALL TRANSMISSION TO ENGINE
(See page AT–26)

2. INSTALL ENGINE AND TRANSMISSION ASSEMBLY IN VEHICLE

(a) Attach the engine hoist chain to the engine hangers.

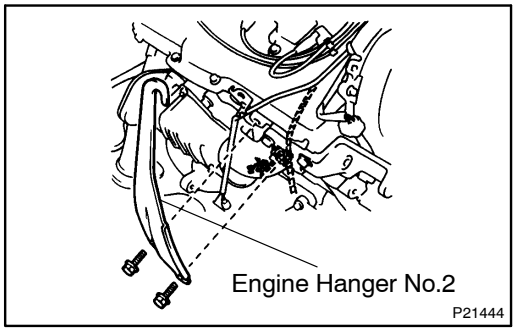
(b) Lower the engine and transmission assembly into the engine compartment.


P21459

(c) Keep the engine level, and align the RH and LH mountings and body mountings.

(d) Attach the RH and LH mounting insulators to the body mountings, and temporarily install the 4 bolts and nuts.

(e) Jack up and put the transmission onto the frame.

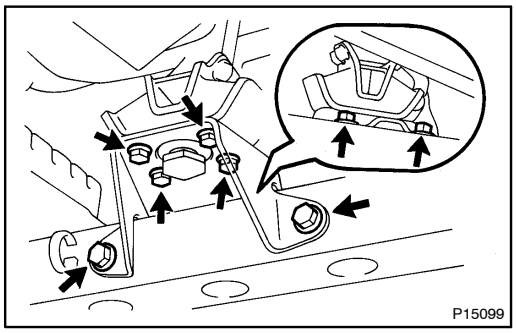


P21444

(f) Remove the engine chain hoist from the engine.

(g) Remove the 2 bolts and engine hanger No.2.

(h) w/ A/C:
Install the bolt, and connect the A/C compressor wire.


P15099

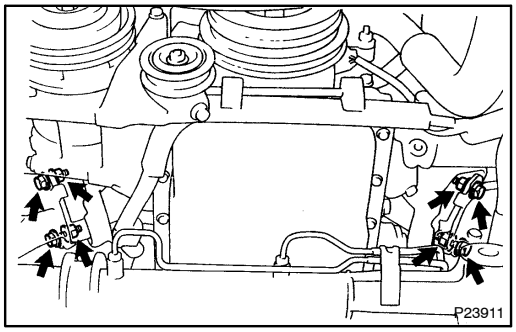
3. INSTALL ENGINE REAR MOUNTING BRACKET

(a) Raise the transmission slightly by raising the engine with a jack and a wooden block under the transmission.

(b) Install the engine rear mounting bracket to the frame.
Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)

(c) Lower the transmission and rest it on the extension housing.

(d) Install the mounting bracket to the mounting insulator.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)


P23911

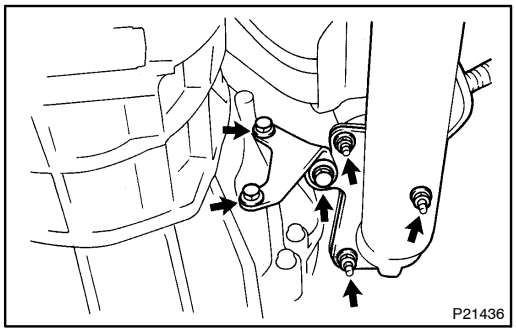
4. TIGHTEN RH AND LH ENGINE MOUNTING INSULATOR BOLTS AND NUTS

Tighten the 4 bolts and nuts holding the mounting insulators to the body mountings.
Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)

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5. A/T:
INSTALL CROSS SHAFT
(a) Install the cross shaft with the 4 bolts and nut.
(b) Connect the shifting rod with the clip.

6. M/T:
INSTALL CLUTCH RELEASE CYLINDER
(a) Install the clutch release cylinder with the 2 bolts.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)
(b) Connect the clutch line with the 3 bolts.


P21436

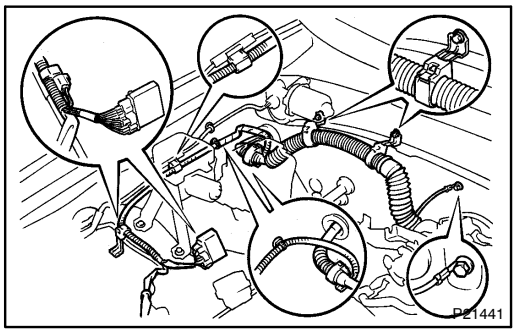
7. INSTALL FRONT EXHAUST PIPE
(a) Install 2 new gaskets and the front exhaust pipe assembly with new 3 nuts.
Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)
(b) Install the support bracket with the 3 bolts.
Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)
(c) Connect a new gasket and the front exhaust pipe assembly to the center exhaust pipe with the 2 bolts and retainer.
Torque: 48 N·m (490 kgf·cm, 35 ft·lbf)
(d) Connect the 2 heated oxygen sensor connectors.

8. CONNECT SPEEDOMETER CABLE

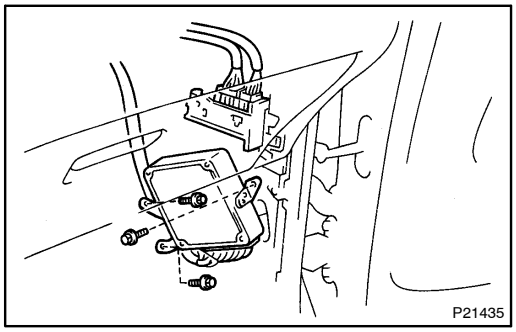
9. INSTALL PROPELLER SHAFT
(See page PR–9)

10. INSTALL STABILIZER BAR (See page SA–125)

11. M/T:
INSTALL SHIFT LEVER
(a) Install the shift lever.
(b) Install the shift lever boot with the 4 screws.
(c) Install the shift lever knob.


P21441

12. CONNECT ENGINE WIRE AND CONNECTORS
(a) Push in the engine wire through the cowl panel.
(b) Connect the 6 engine wire clamps
(c) Connect these wire and connectors:
- Ground strap
- Igniter connector


P21435

(d) Connect 2 connectors to cowl wire.
(e) M/T:
Connect 3 connectors to the ECM.
(f) A/T:
Connect 4 connectors to the ECM.
(g) Install the ECM with the 3 bolts.

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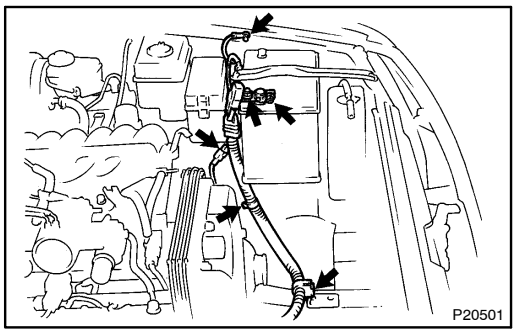
13. INSTALL FRONT DOOR SCUFF PLATE AND COWL SIDE TRIM

14. CONNECT GENERATOR WIRE

(a) Connect the generator connector.

(b) Connect the generator wire with the nut.

(c) Connect the wire harness clip to the generator.

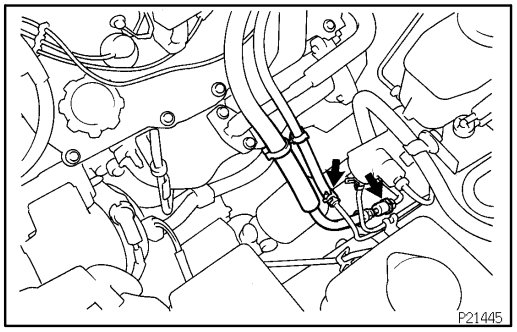


15. CONNECT STARTER WIRE AND CONNECTOR

(a) Connect the 2 starter wire clamps and connector.

(b) Install the 2 nuts, and connect the positive (+) terminal cable to battery.

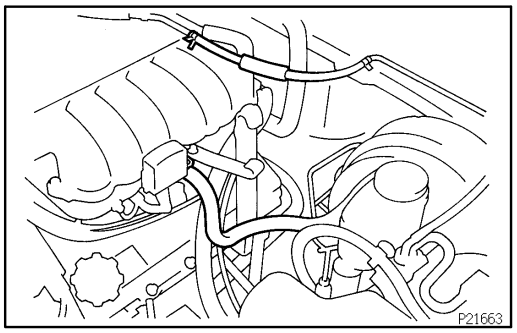
(c) Install the bolt, and connect the ground strap.



16. CONNECT HOSES

Connect these hoses:

- Fuel return hose
- Fuel inlet hose



- Brake booster vacuum hose
- EVAP hose
- A.D.D. Vacuum hose

17. CONNECT HEATER HOSES

18. CONNECT THESE CABLES:

(a) A/T:
Throttle cable

(b) Accelerator cable

(c) w/ Cruise control:
Cruise control actuator cable

19. INSTALL AIR CLEANER CASE AND AIR FILTER

20. INSTALL MAF METER, RESONATOR AND AIR CLEANER CAP

21. w/ A/C:
CONNECT A/C COMPRESSOR

22. CONNECT PS PUMP

23. INSTALL FAN WITH FLUID COUPLING AND FAN PULLEYS(See page EM–19)

24. INSTALL DRIVE BELT FOR GENERATOR (See page CH–1)

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25. w/ A/C:
    INSTALL DRIVE BELT FOR A/C COMPRESSOR
26. INSTALL DRIVE BELT FOR PS PUMP
27. INSTALL RADIATOR ASSEMBLY
    (See page CO–19)
28. FILL WITH ENGINE OIL
29. FILL WITH ENGINE COOLANT
30. FILL TRANSMISSION OIL
31. START ENGINE AND CHECK FOR LEAKS
32. CHECK IGNITION TIMING
    (See page EM–9)
33. INSTALL HOOD
34. ROAD TEST VEHICLE

Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

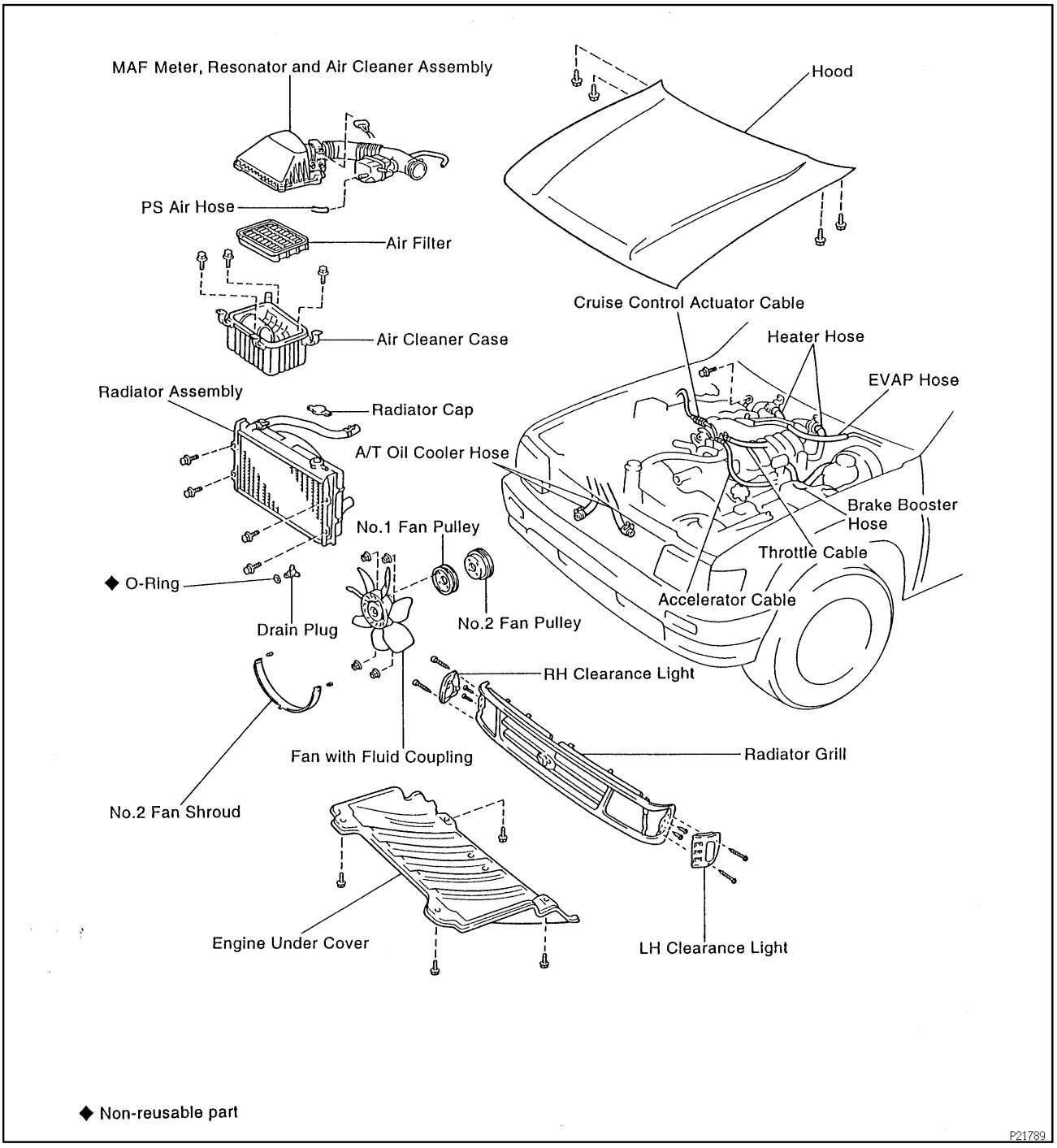
35. RECHECK ENGINE COOLANT AND OIL LEVELS

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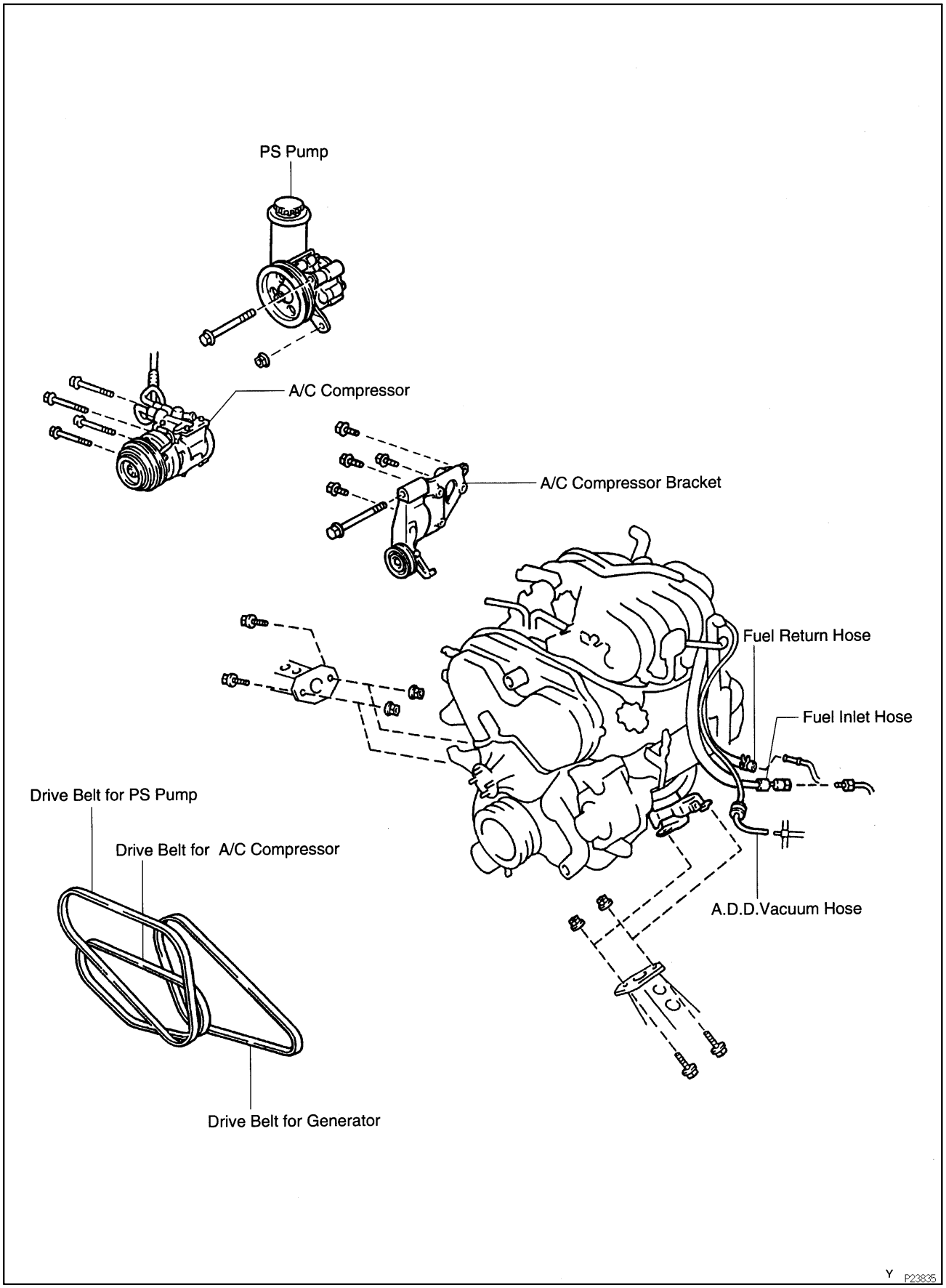
ENGINE UNIT (4WD)

COMPONENTS

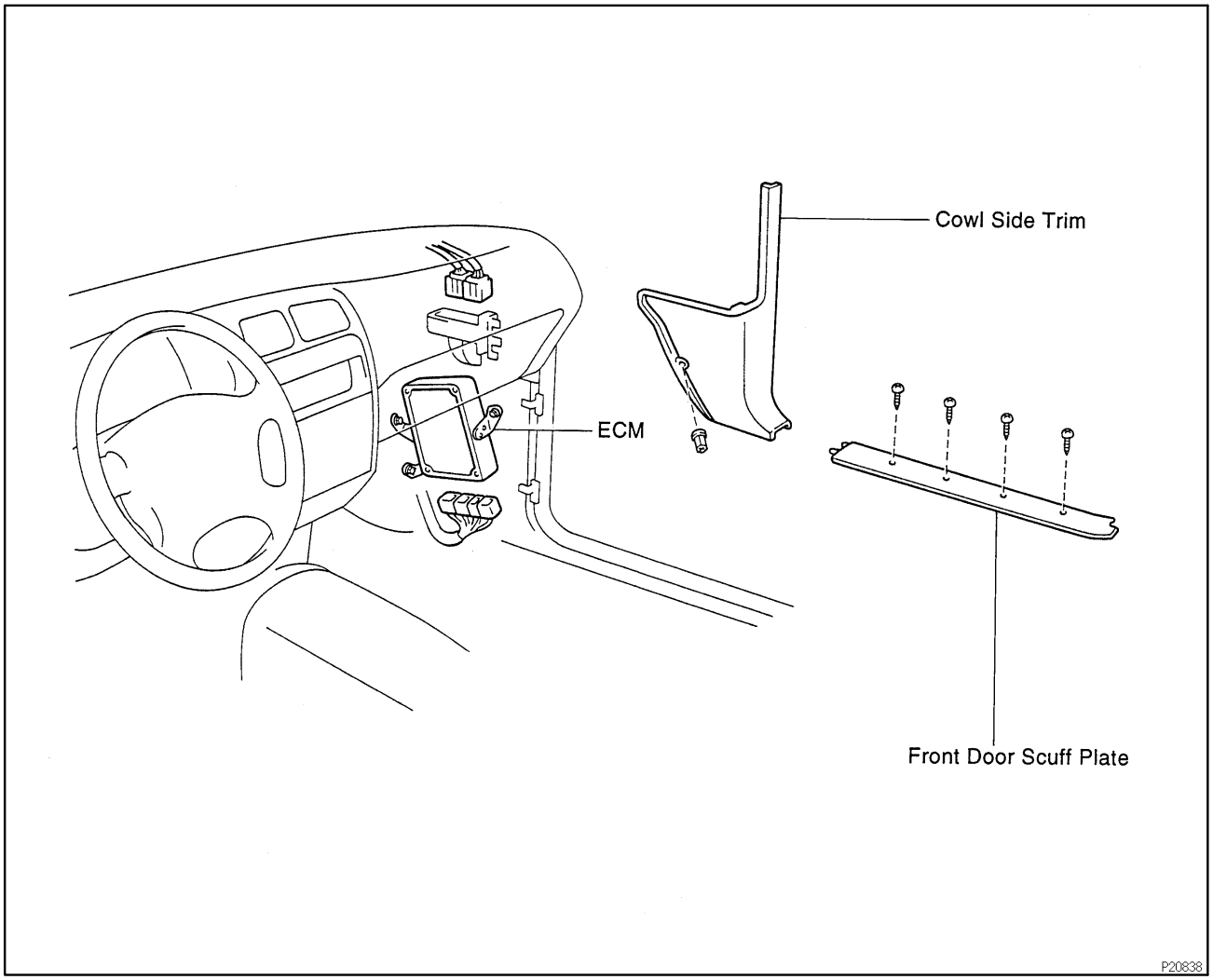
EM1OT–01



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EM1OU–01

REMOVAL

1. REMOVE ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. DRAIN ENGINE OIL
4. REMOVE HOOD
5. REMOVE RADIATOR ASSEMBLY
   (See page CO–16)
6. REMOVE DRIVE BELT FOR PS PUMP
7. w/ A/C:
   REMOVE DRIVE FOR A/C COMPRESSOR
8. REMOVE DRIVE BELT FOR GENERATOR
9. REMOVE FAN WITH FLUID COUPLING AND FAN PULLEYS (See page EM–13)
10. DISCONNECT PS PUMP FROM ENGINE

HINT:

Put aside the pump, and suspend it.

11. w/ A/C:
    DISCONNECT A/C COMPRESSOR

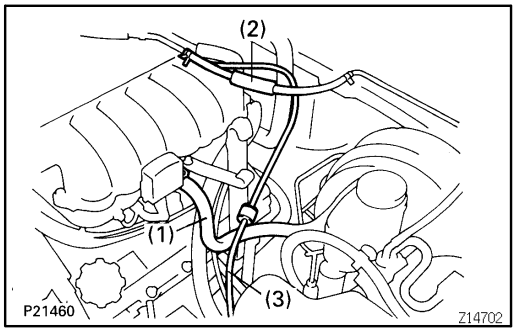
HINT:

Put aside the compressor, and suspend it.

12. REMOVE AIR CLEANER CAP, MAF METER AND RESONATOR
13. REMOVE AIR CLEANER CASE AND FILTER
14. DISCONNECT THESE CABLES:

(a) w/ Cruise control:
Cruise control actuator cable
(b) Accelerator cable
(c) A/T:
Throttle cable

15. DISCONNECT HEATER HOSES

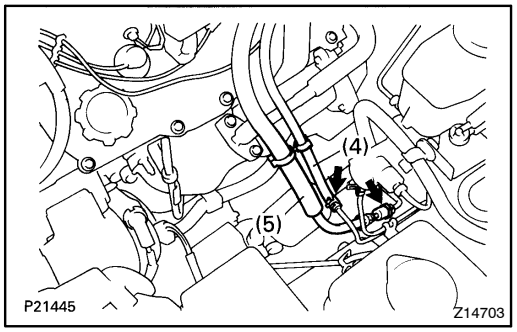


16. DISCONNECT HOSES

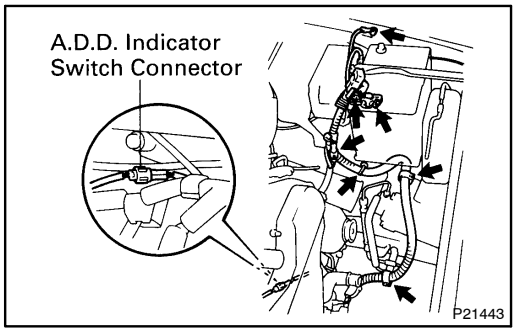
Disconnect these hoses:

(1) Brake booster vacuum hose
(2) EVAP hose
(3) A.D.D. vacuum hose

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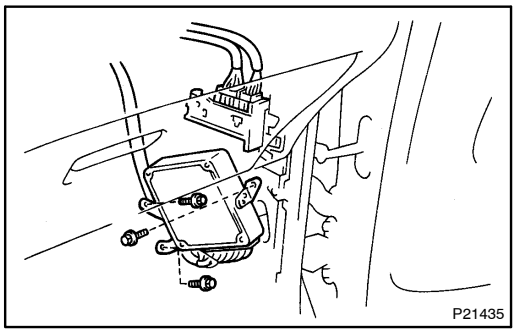
(4) Fuel return hose
(5) Fuel inlet hose



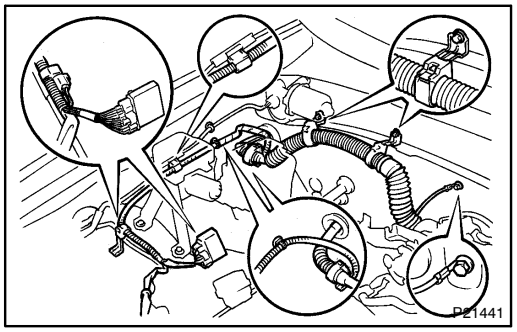
17. DISCONNECT STARTER WIRE AND CONNECTORS
(a) Remove the bolt, and disconnect the ground strap.
(b) Remove the 2 nut, and disconnect the positive (+) terminal cable from battery.
(c) Disconnect the 3 starter wire clamps and connector.
(d) Disconnect the A.D.D. indicator switch connector.

18. DISCONNECT GENERATOR WIRE
(a) Disconnect the generator connector.
(b) Remove the nut, and disconnect the generator wire and wire clip.

19. REMOVE FRONT DOOR SCUFF PLATE AND COWL SIDE TRIM



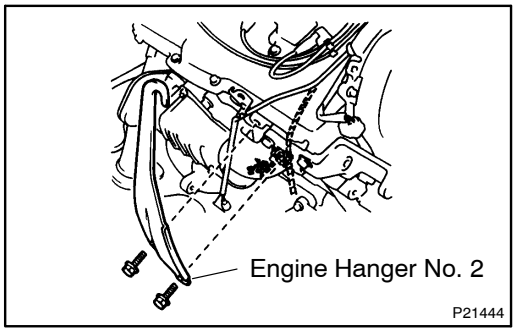
20. DISCONNECT ENGINE WIRE AND CONNECTORS
(a) Remove the 3 bolts and ECM.
(b) M/T:
Disconnect the 3 ECM connectors.
(c) A/T:
Disconnect the 4 ECM connectors.
(d) Disconnect the 2 connectors from the cowl wire.



(e) Disconnect these wires and connectors:
- Igniter connector
- Ground strap

(f) Disconnect the 6 engine wire clamps.
(g) Pull out the engine wire from the cabin.

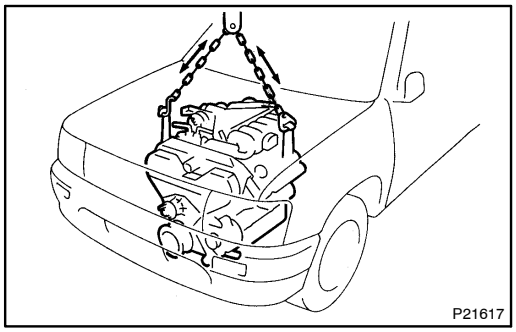
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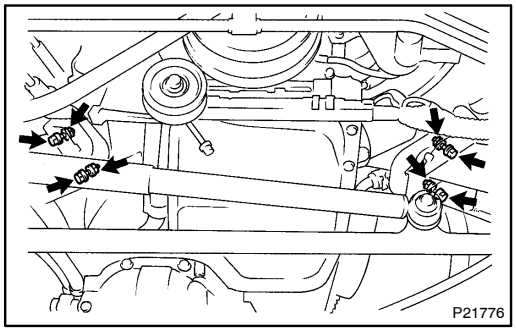
21. REMOVE ENGINE

(a) w/ A/C:
Remove the bolt and disconnect the A/C compressor wire clamp.

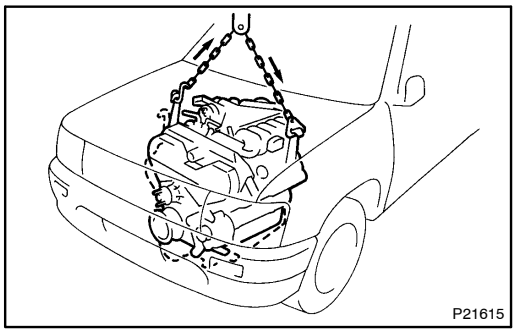
(b) Install a engine hanger No.2 in the correct direction.
Part No.:
Engine hanger No.2 12282–62030
Bolt 91512–61020
Torque: 40 N·m (400 kgf·cm, 30 ft·lbf)



(c) Attach the engine hoist chain to the 2 engine hangers.



(d) Remove the 4 bolts and nuts holding the engine front mounting insulators to the frame.



(e) Lift the engine out of the vehicle slowly and carefully.

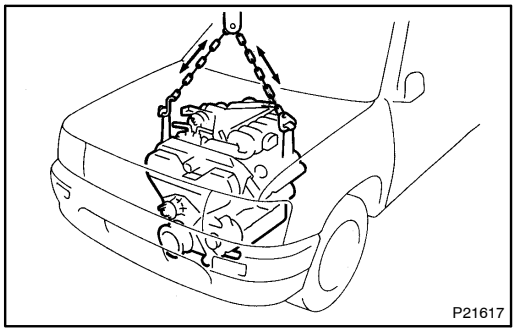
NOTICE:
Make sure the engine is clear of all wiring and hoses.

(f) Place the engine assembly onto the stand.

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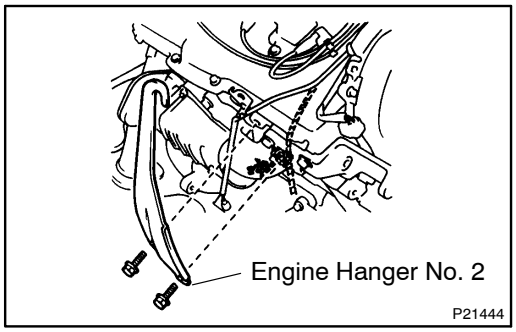
EM1OV–01

INSTALLATION

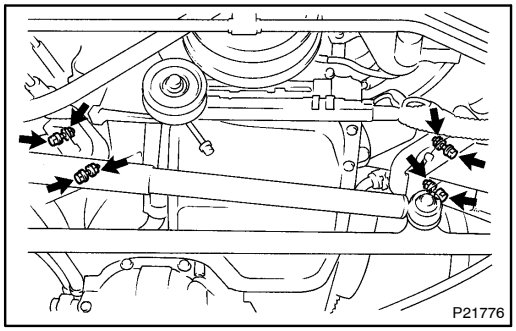


1. INSTALL ENGINE ASSEMBLY IN VEHICLE

(a) Attach the engine hoist chain to the engine hangers.
(b) Lower the engine assembly into the engine compartment.
(c) Keep the engine level, and align the RH and LH mountings and body mountings.
(d) Attach the RH and LH mounting insulators to the body mountings, and temporarily install the 4 bolts and nuts.
(e) Remove the engine chain hoist from the engine.



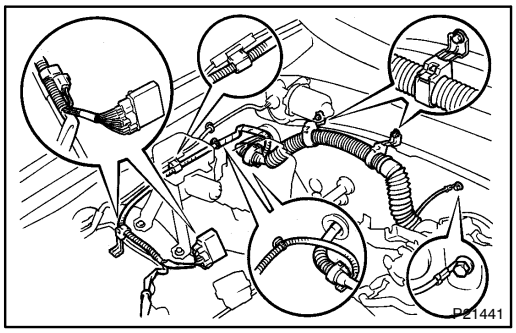
(f) Remove the 2 bolts and engine hanger No.2.
(g) w/ A/C:
Install the bolt, and connect the A/C compressor wire.



2. TIGHTEN RH AND LH ENGINE MOUNTING INSULATOR BOLTS AND NUTS

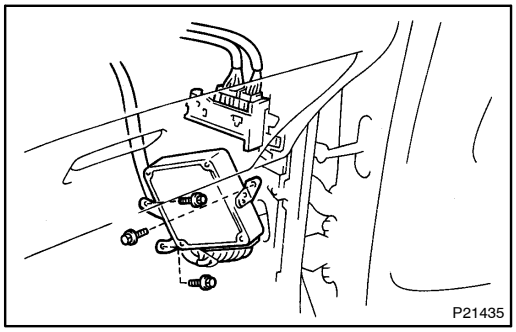
Tighten the 4 bolts and nuts holding the mounting insulators to the body mountings.

Torque: 38 N·m (385 kgf·cm, 28 ft·lbf)



3. CONNECT ENGINE WIRE AND CONNECTORS

(a) Push in the engine wire through the cowl panel.
(b) Connect the 6 engine wire clamps.
(c) Connect these wire and connectors:
- Ground strap
- Igniter connector



(d) Connect 2 connectors to cowl wire.
(e) M/T:
Connect 3 connectors to the ECM.
(f) A/T:
Connect 4 connectors to the ECM.
(g) Install the ECM with the 3 bolts.

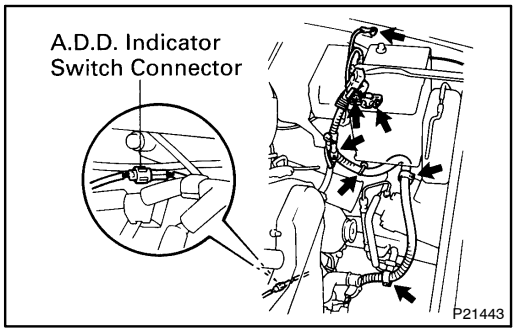
4. INSTALL FRONT DOOR SCUFF PLATE AND COWL SIDE TRIM

5. CONNECT GENERATOR WIRE

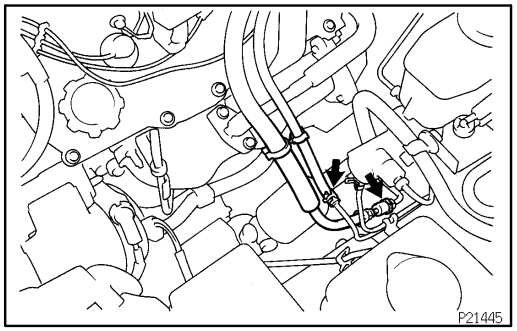
(a) Connect the generator connector.

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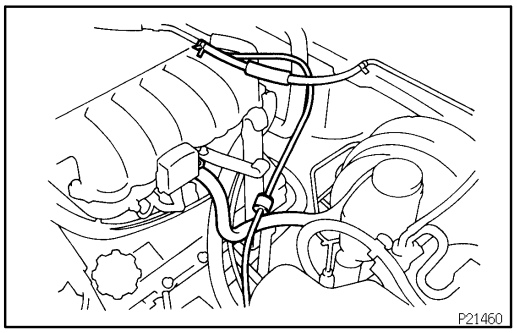
(b) Connect the generator wire with the nut.
(c) Connect the wire harness clip to the generator.



6. CONNECT STARTER WIRE AND CONNECTORS
(a) Connect the 3 starter wire clamps and connector.
(b) Install the 2 nuts, and connect the positive (+) terminal cable to battery.
(c) Connect the A.D.D. indicator switch connector.
(d) Install the bolt, and connect the ground strap.



7. CONNECT HOSES
Connect these hoses:
- Fuel return hose
- Fuel inlet hose



- Brake booster vacuum hose
- EVAP hose
- A.D.D. vacuum hose

8. CONNECT HEATER HOSES
9. CONNECT THESE CABLES:
(a) A/T:
Throttle cable
(b) Accelerator cable
(c) w/ Cruise control:
Cruise control actuator cable
10. INSTALL AIR CLEANER CASE AND AIR FILTER
11. INSTALL MAF METER, RESONATOR AND AIR CLEANER CAP
12. w/ A/C:
CONNECT A/C COMPRESSOR
13. CONNECT PS PUMP
14. INSTALL FAN WITH FLUID COUPLING AND FAN PULLEYS (See page EM–19)
15. INSTALL DRIVE BELT FOR GENERATOR (See page CH–1)

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16. w/ A/C:
    INSTALL DRIVE BELT FOR A/C COMPRESSOR
17. INSTALL DRIVE BELT FOR PS PUMP
18. INSTALL RADIATOR ASSEMBLY
    (See page CO–19)
19. FILL WITH ENGINE OIL
20. FILL WITH ENGINE COOLANT
21. INSTALL ENGINE UNDER COVER
22. INSTALL TRANSMISSION
    (See page MT–4)
23. INSTALL HOOD
24. PERFORM ROAD TEST

Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

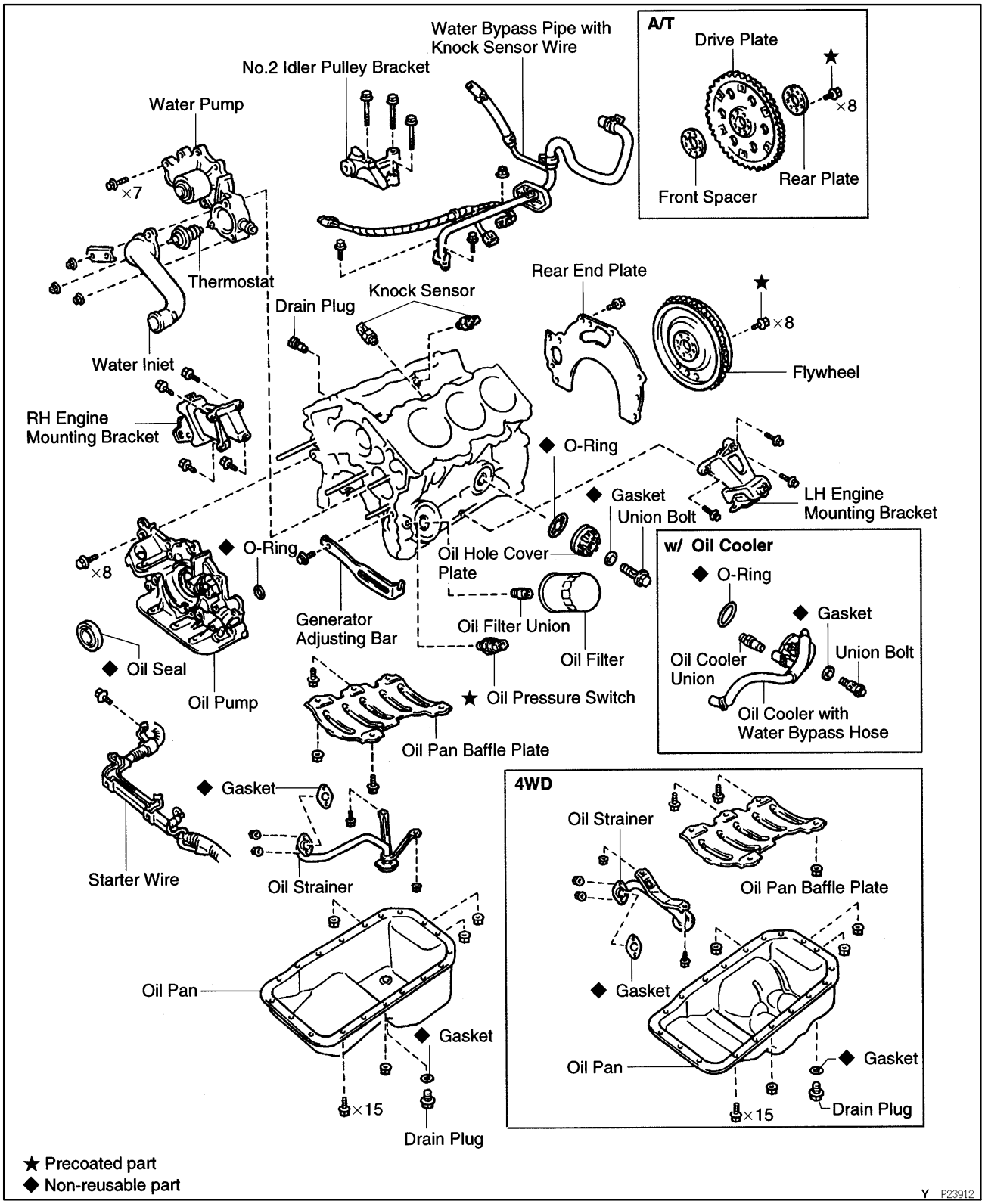
25. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS

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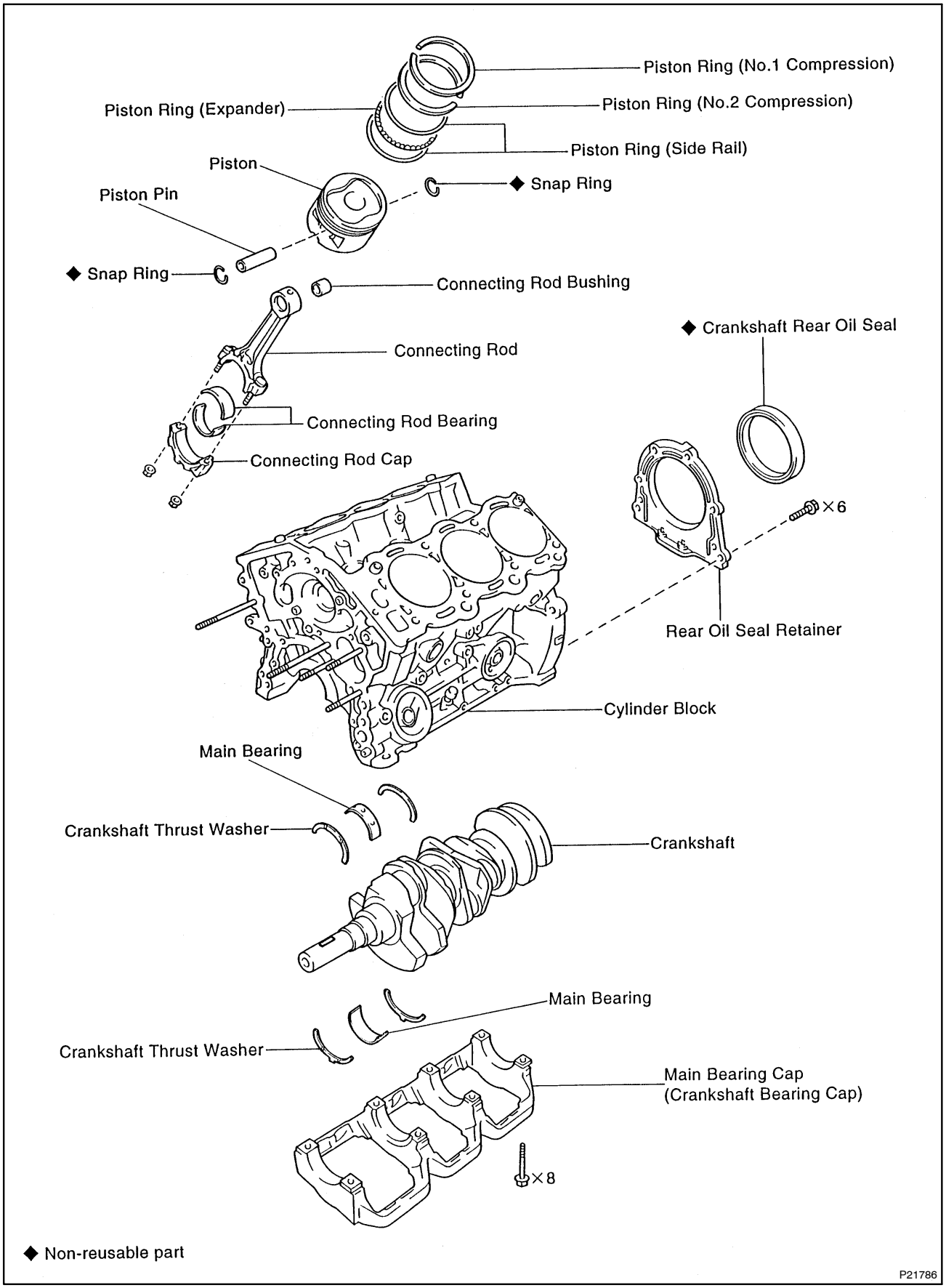
CYLINDER BLOCK

COMPONENTS

EM07T–02



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EM1OW–01

DISASSEMBLY

1. M/T:
REMOVE FLYWHEEL

2. A/T:
REMOVE DRIVE PLATE

3. REMOVE REAR END PLATE

Remove the bolt and end plate.

4. INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY

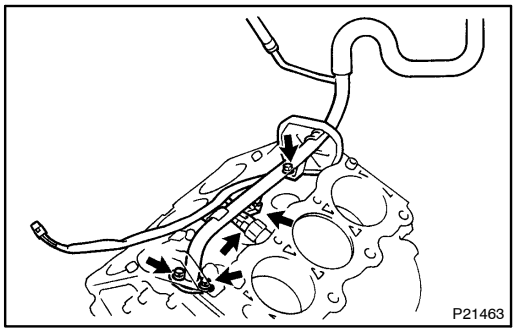
5. REMOVE TIMING BELT AND PULLEYS (See page EM–13)

6. REMOVE CYLINDER HEADS (See page EM–30)

7. REMOVE WATER BYPASS PIPE WITH KNOCK SENSOR WIRE

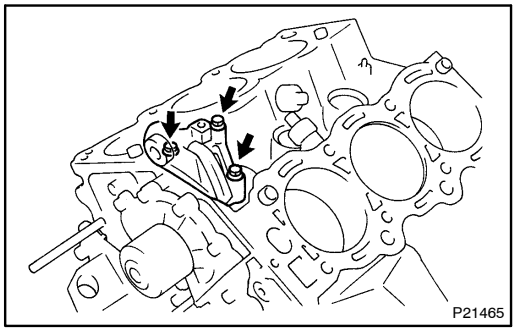
(a) Disconnect the 2 knock sensor connectors.

(b) Remove the 2 bolts, nut and water bypass pipe.



8. REMOVE NO.2 IDLER PULLEY BRACKET

Remove the 3 bolts and idler pulley bracket.



9. REMOVE KNOCK SENSORS

Using SST, remove the 2 knock sensors.

SST 09816–30010

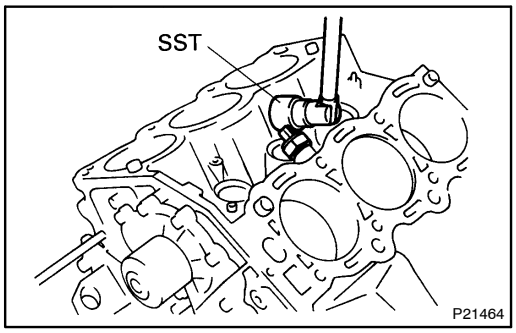
10. REMOVE WATER PUMP (See page CO–5)

11. REMOVE GENERATOR ADJUSTING BAR

12. REMOVE OIL PRESSURE SWITCH

Using SST, remove the oil pressure switch.

SST 09816–30010



13. REMOVE OIL FILTER AND OIL FILTER UNION

(a) Using SST, remove the oil filter.

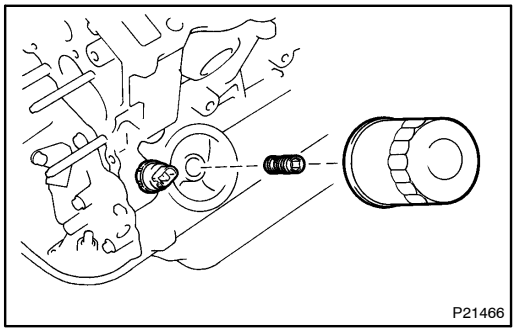
SST 09228–07501

(b) Using 12 mm hexagon wrench, remove the union.

14. REMOVE RH AND LH ENGINE MOUNTING BRACKET

15. REMOVE COOLANT DRAIN COCK

16. w/o OIL COOLER:
REMOVE OIL HOLE COVER PLATE



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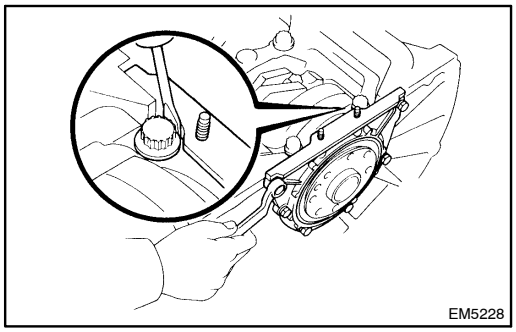
17. w/ OIL COOLER:
REMOVE OIL COOLER WITH WATER BYPASS HOSE AND OIL COOLER UNION (See page LU–18)

18. REMOVE OIL PAN (See page LU–9)

19. REMOVE OIL STRAINER (See page LU–9)

20. REMOVE OIL PAN BAFFLE PLATE (See page LU–9)

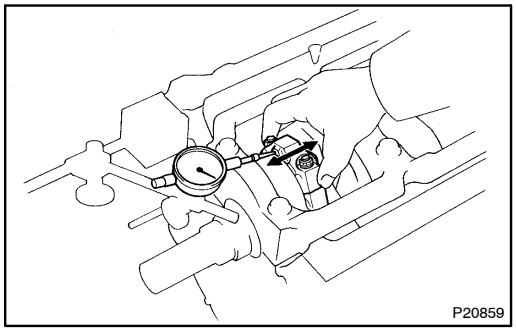
21. REMOVE OIL PUMP (See page LU–9)


EM5228

22. REMOVE REAR OIL SEAL RETAINER

(a) Remove the 6 bolts.

(b) Using a screwdriver, remove the oil seal retainer by prying the portions between the oil seal retainer and main bearing cap.

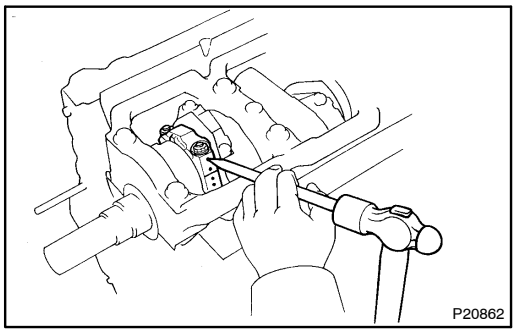

P20859

23. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:
0.150 – 0.330 mm (0.0059 – 0.0130 in.)
Maximum thrust clearance:
0.38 mm (0.0150 in.)

If the thrust clearance is greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.

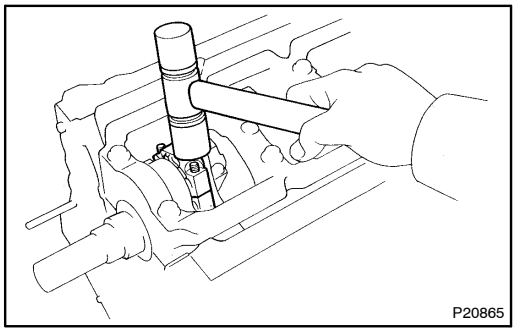

P20862

24. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Using a punch or numbering stamp, mark the connecting rod and cap to ensure correct reassembly.

(b) Remove the connecting rod cap nuts.

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P20865

(c) Using a plastic–faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.

HINT:

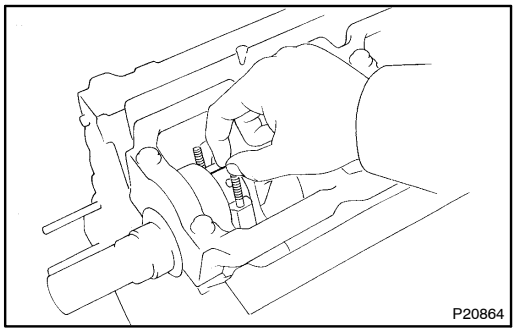
Keep the lower bearing inserted with the connecting rod cap.

(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.

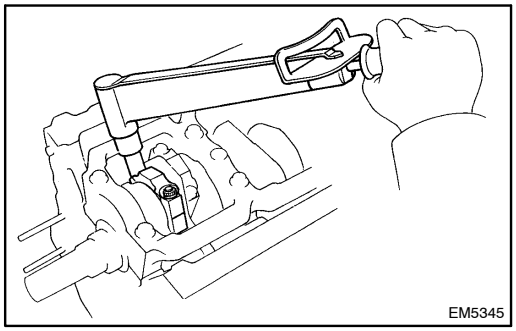
(e) Clean the crank pin and bearing.

(f) Check the crank pin and bearing for pitting and scratches.

If the crank pin or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.


P20864

(g) Lay a strip of Plastigage across the crank pin.


EM5345

(h) Install the connecting rod cap with the 2 nuts (See page EM–101).

Torque:

1st 25 N·m (250 kgf·cm, 18 ft·lbf)

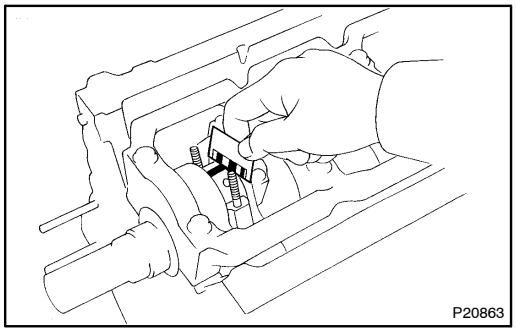
2nd Turn extra 90°

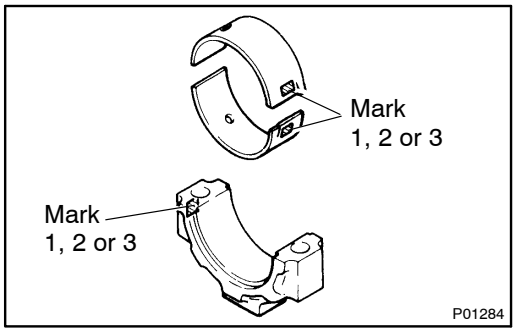
NOTICE:

Do not turn the crankshaft.

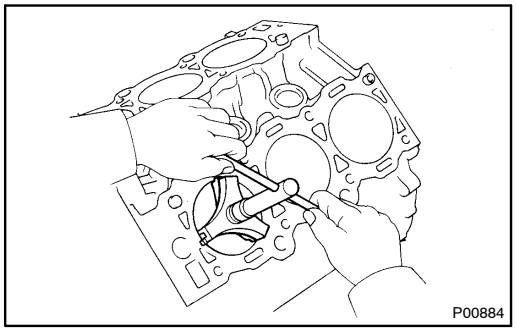
(i) Remove the 2 nuts and connecting rod cap (See procedure (b) and (c) above).

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P20863



P01284


P00884

(j) Measure the Plastigage at its widest point.

Standard oil clearance:

STD

0.024 – 0.053 mm (0.0009 – 0.0021 in.)

U/S 0.25

0.023 – 0.069 mm (0.0009 – 0.0027 in.)

Maximum oil clearance:

0.08 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.

HINT:

If using a standard bearing, replace with one having the same number marked on the connecting rod cap. There are 3 sizes of standard bearings, marked "1", "2" and "3" accordingly.

Reference:

Standard bearing center wall thickness

Mark "1"	1.484 – 1.488 mm (0.0584 – 0.0586 in.)
Mark "2"	1.488 – 1.492 mm (0.0586 – 0.0587 in.)
Mark "3"	1.492 – 1.496 mm (0.0587 – 0.0589 in.)

(k) Completely remove the Plastigage.

25. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

(a) Using a ridge reamer, remove the all carbon from the top of the cylinder.

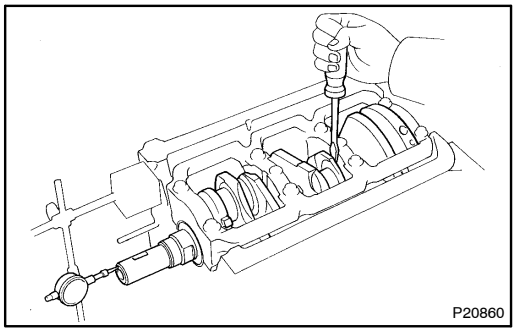
(b) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.

(c) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.

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P20860

26. CHECK CRANKSHAFT THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

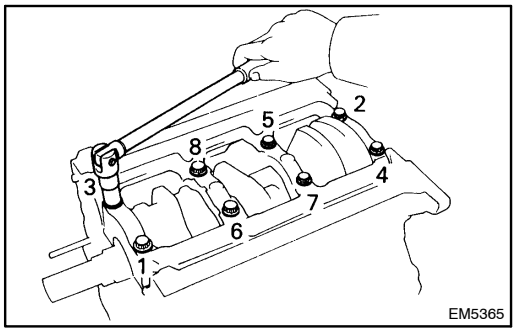
Standard thrust clearance:
0.020 – 0.220 mm (0.0008 – 0.0087 in.)
Maximum thrust clearance:
0.30 mm (0.0118 in.)

If the thrust clearance is greater than maximum, replace the thrust washers as a set.

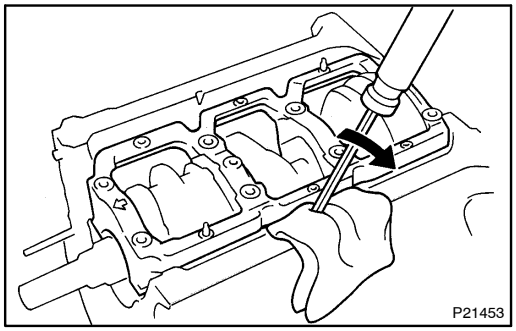
Thrust washer thickness:
2.440 – 2.490 mm (0.0961 – 0.0980 in.)

27. REMOVE MAIN BEARING CAP AND CHECK OIL CLEARANCE

(a) Uniformly loosen and remove the main bearing cap bolts, in several passes, in the sequence shown.



EM5365

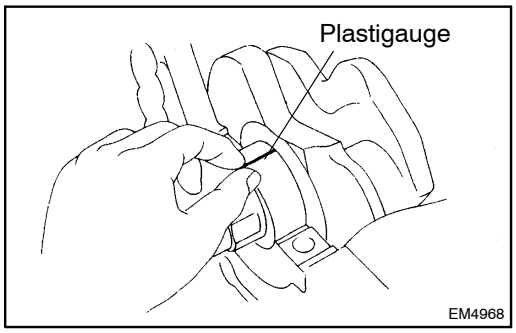

P21453

(b) Using a screwdriver, pry up the main bearing cap, and remove the main bearing cap, lower main bearings and lower thrust washers (No.2 journal position of main bearing cap only).

HINT:
Keep the lower main bearings and lower thrust washers together with the main bearing cap.

(c) Lift out the crankshaft.

HINT:
Keep the upper main bearings and upper thrust washers together with the cylinder block.



EM4968

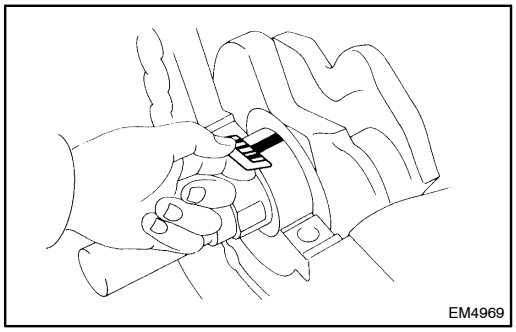
(d) Clean each main journal and bearing.
(e) Check each main journal and bearing for pitting and scratches.

If the journal or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.

(f) Place the crankshaft on the cylinder block.
(g) Lay a strip of Plastigage across each journal.
(h) Install the main bearing cap with the 8 bolts (See page EM–101).

Torque:
1st 61 N·m (625 kgf·cm, 45 ft·lbf)
2nd Turn extra 90°

NOTICE:
Do not turn the crankshaft.


EM4969

(i) Remove the 8 bolts and main bearing cap (See procedure (a) and (b) above).
(j) Measure the Plastigage at its widest point.

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Standard clearance:

No.1

STD	0.020 – 0.038 mm (0.0008 – 0.0015 in.)
U/S 0.25	0.019 – 0.059 mm (0.0007 – 0.0023 in.)

Others

STD	0.024 – 0.042 mm (0.0009 – 0.0017 in.)
U/S 0.25	0.023 – 0.063 mm (0.0009 – 0.0025 in.)

Maximum clearance:

0.08 mm (0.0031 in.)

HINT:

If replacing the cylinder block subassembly, the bearing standard clearance will be:

No.1

0.010 – 0.049 mm (0.0004 – 0.0020 in.)

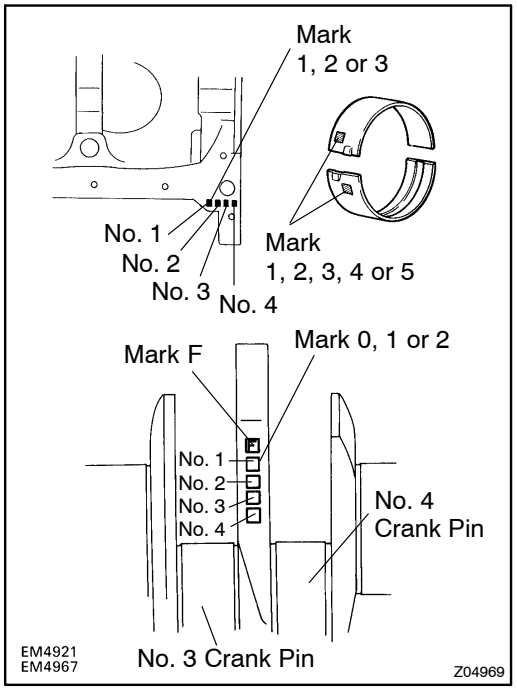
Others

0.014 – 0.053 mm (0.0006 – 0.0021 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.

HINT:

If using a standard bearing, replace with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then selecting the bearing with the same number as the total. There are 5 sizes of standard bearings, marked ”1”, ”2”, ”3”, ”4” and ”5” accordingly.



	Number marked								
Cylinder block	1			2			3		
Crankshaft	0	1	2	0	1	2	0	1	2
Use bearing	1	2	3	2	3	4	3	4	5

EXAMPLE: Cylinder block ”2” + Crankshaft ”1”
= Total number 3 (Use bearing ”3”)

Reference:

Standard sized bearing center wall thickness:

No.1

Mark ”1”	1.991 – 1.994 mm (0.0784 – 0.0785 in.)
Mark ”2”	1.994 – 1.997 mm (0.0785 – 0.0786 in.)
Mark ”3”	1.997 – 2.000 mm (0.0786 – 0.0787 in.)
Mark ”4”	2.000 – 2.003 mm (0.0787 – 0.0789 in.)
Mark ”5”	2.003 – 2.006 mm (0.0789 – 0.0790 in.)

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Others

Mark "1"	1.989 – 1.992 mm (0.0783 – 0.0784 in.)
Mark "2"	1.992 – 1.995 mm (0.0784 – 0.0785 in.)
Mark "3"	1.995 – 1.998 mm (0.0785 – 0.0787 in.)
Mark "4"	1.998 – 2.001 mm (0.0787 – 0.0788 in.)
Mark "5"	2.001 – 2.004 mm (0.0788 – 0.0789 in.)

Cylinder block main journal bore diameter:

Mark "1"	68.010 – 68.016 mm (2.6776 – 2.6778 in.)
Mark "2"	68.016 – 68.022 mm (2.6778 – 2.6780 in.)
Mark "3"	68.022 – 68.028 mm (2.6780 – 2.6783 in.)

Crankshaft main journal diameter:

Mark "0"	63.996 – 64.000 mm (2.5195 – 2.5197 in.)
Mark "1"	63.990 – 63.996 mm (2.5193 – 2.5195 in.)
Mark "2"	63.985 – 63.990 mm (2.5191 – 2.5193 in.)

(k) Completely remove the Plastigage.

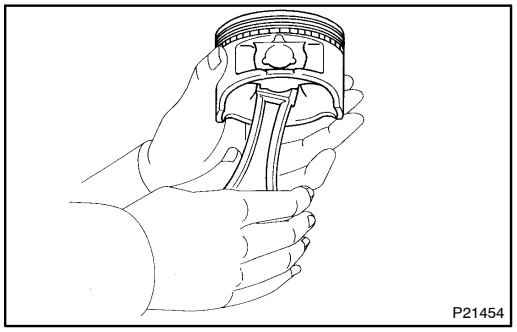
28. REMOVE CRANKSHAFT

(a) Lift out the crankshaft.

(b) Remove the upper main bearings and upper thrust washers from the cylinder block.

HINT:

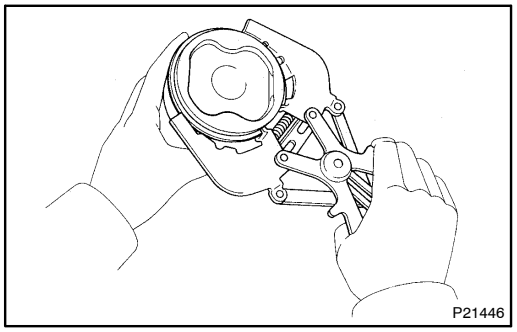
Arrange the main bearings and thrust washers in correct order.



29. CHECK FIT BETWEEN PISTON AND PISTON PIN

Try to move the piston back and forth on the piston pin.

If any movement is felt, replace the piston and pin as a set.



30. REMOVE PISTON RINGS

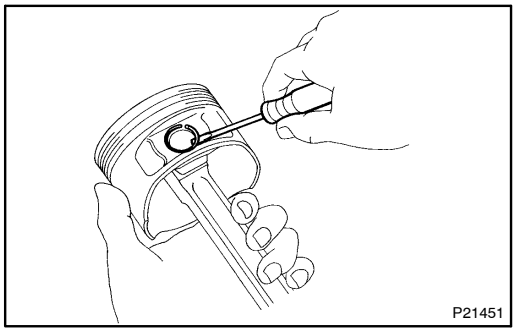
(a) Using a piston ring expander, remove the 2 compression rings.

(b) Remove the 2 side rails and oil ring by hand.

HINT:

Arrange the piston rings in the correct order only.

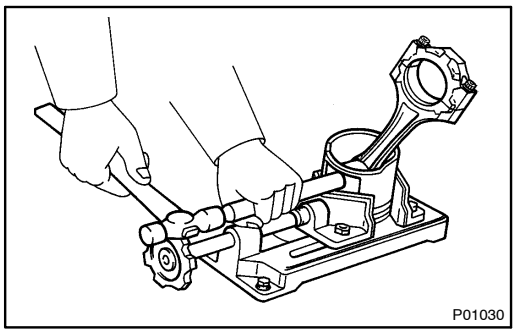
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31. DISCONNECT CONNECTING ROD FROM PISTON

(a) Using a small screwdriver, pry out the 2 snap rings.

(b) Gradually heat the piston to about 60°C (140°F).



(c) Using a plastic–faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

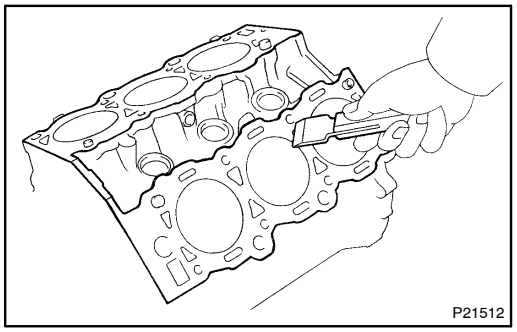
HINT:

- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in the correct order.

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EM07A–03

INSPECTION

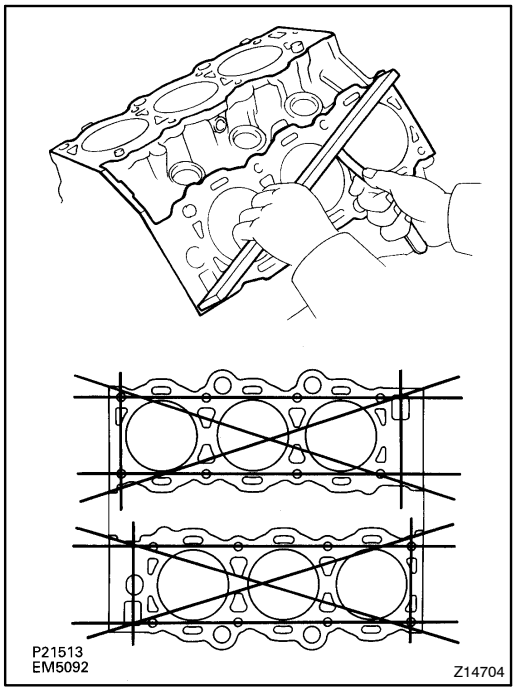


1. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

2. CLEAN CYLINDER BLOCK

Using a soft brush and solvent, thoroughly clean the cylinder block.

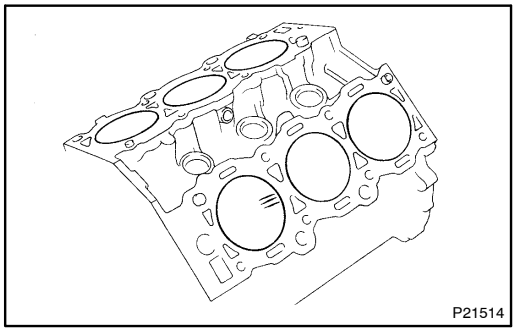


3. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head gasket for warpage.

Maximum warpage:
0.05 mm (0.0020 in.)

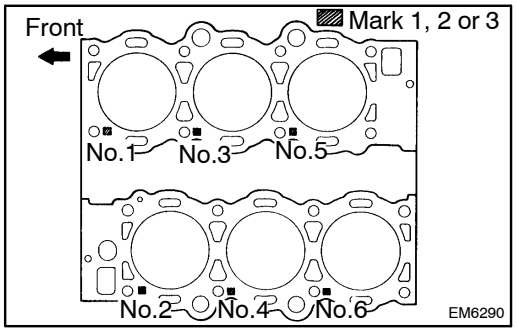
If warpage is greater than maximum, replace the cylinder block.



4. INSPECT CYLINDER FOR VERTICAL SCRATCHES

Visually check the cylinder for vertical scratches.

If deep scratches are present, rebore all the 6 cylinders. If necessary, replace the cylinder block.

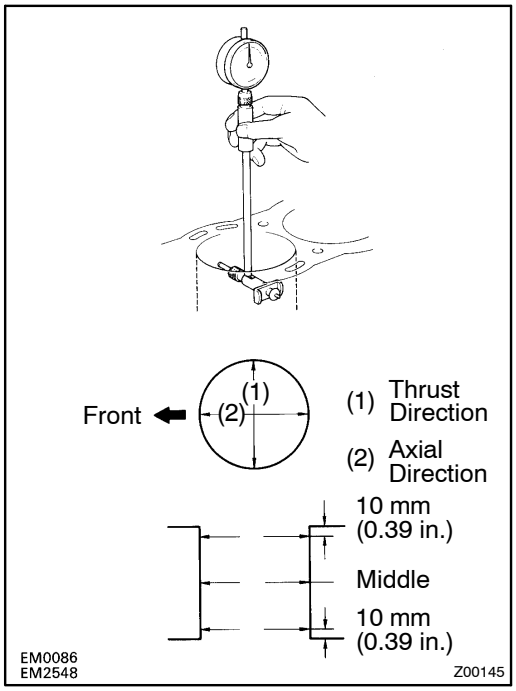


5. INSPECT CYLINDER BORE DIAMETER

HINT:

There are 3 sizes of the standard cylinder bore diameter, marked "1", "2" and "3" accordingly. The mark is stamped on the top of the cylinder block.

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Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

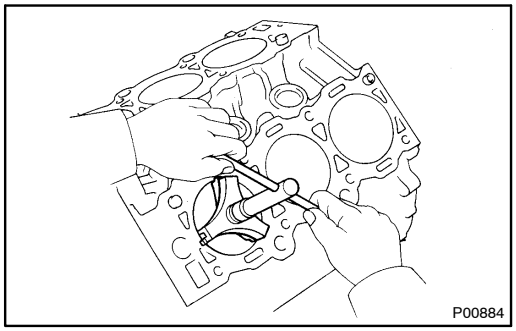
Standard diameter:

STD Mark "1"	93.500 – 93.510 mm (3.6811 – 3.6815 in.)
STD Mark "2"	93.510 – 93.520 mm (3.6815 – 3.6819 in.)
STD Mark "3"	93.520 – 93.530 mm (3.6819 – 3.6823 in.)

Maximum diameter:

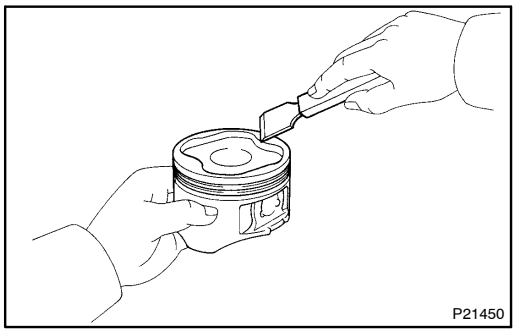
STD	93.730 mm (3.6902 in.)
O/S 0.50	94.230 mm (3.7098 in.)

If the diameter is greater than maximum, rebore all the 6 cylinders, If necessary, replace the cylinder block.



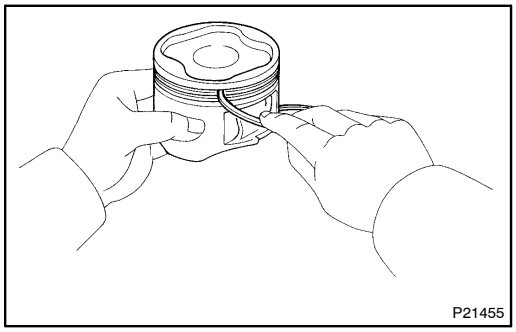
6. REMOVE CYLINDER RIDGE

If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.



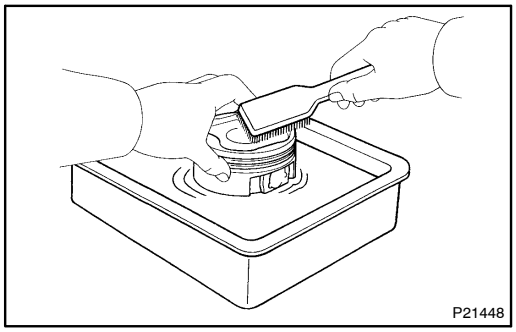
7. CLEAN PISTON

(a) Using a gasket scraper, remove the carbon from the piston top.



(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.

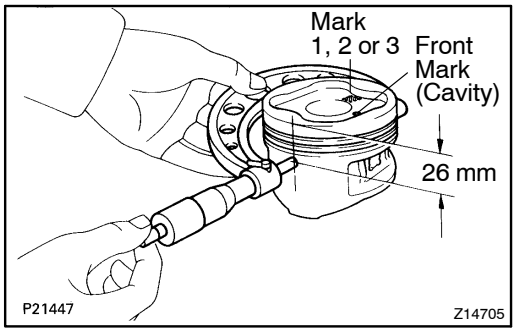
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(c) Using solvent and a brush, thoroughly clean the piston.

NOTICE:

Do not use a wire brush.



8. INSPECT PISTON OIL CLEARANCE

HINT:

There are 3 sizes of the standard piston diameter, marked "1", "2" and "3" accordingly. The mark is stamped on the piston top.

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 26 mm (1.02 in.) from the piston head.

Piston diameter:

STD Mark "1"	93.356 – 93.366 mm (3.6754 – 3.6758 in.)
STD Mark "2"	93.367 – 93.376 mm (3.6759 – 3.6762 in.)
STD Mark "3"	93.377 – 93.386 mm (3.6763 – 3.6766 in.)
O/S 0.50	93.856 – 93.886 mm (3.6951 – 3.6963 in.)

(b) Measure the cylinder bore diameter in the thrust directions (See step 5.).

(c) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

0.134 – 0.154 mm (0.0053 – 0.0060 in.)

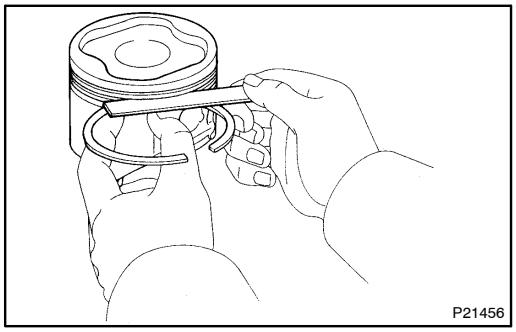
Maximum oil clearance:

0.174 mm (0.0069 in.)

If the oil clearance is greater than maximum, replace all the 6 pistons. If necessary, rebore all the 6 cylinders or replace the cylinder block.

HINT:

Use new cylinder block: Use a piston with the same number mark as the standard bore diameter marked on the cylinder block.



9. INSPECT PISTON RING GROOVE CLEARANCE

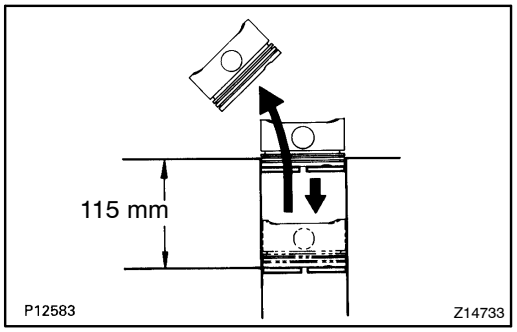
Using a feeler gauge, measure the clearance between new piston ring and the wall of the piston ring groove.

Standard ring groove clearance:

No.1	0.040 – 0.080 mm (0.0016 – 0.0031 in.)
No.2	0.030 – 0.070 mm (0.0012 – 0.0028 in.)

If the clearance not as specified, replace the piston.

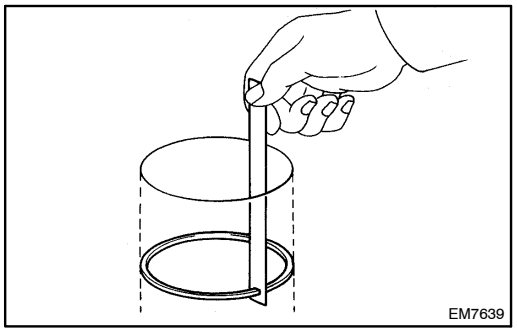
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10. INSPECT PISTON RING END GAP

(a) Insert the piston ring into the cylinder bore.

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 115 mm (4.53 in.) from the top of the cylinder block.



(c) Using a feeler gauge, measure the ring end gap.

Standard ring end gap:

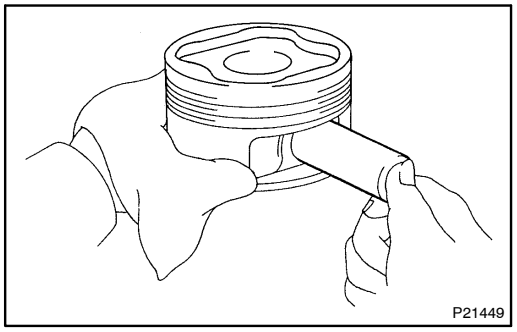
No.1	0.300 – 0.500 mm (0.0118 – 0.0197 in.)
No.2	0.400 – 0.600 mm (0.0157 – 0.0236 in.)
Oil (Side rail)	0.150 – 0.550 mm (0.0059 – 0.0217 in.)

Maximum ring end gap:

No.1	1.100 mm (0.0433 in.)
No.2	1.200 mm (0.0472 in.)
Oil (Side rail)	1.150 mm (0.0453 in.)

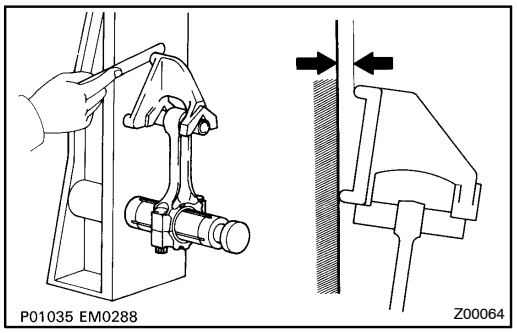
If the end gap is greater than maximum, replace the piston ring.

If the end gap is greater than maximum, even with a new piston ring, rebore all the 6 cylinders or replace the cylinder block.



11. INSPECT PISTON PIN FIT

At 60°C (140°F), you should be able to push the piston pin into the piston pin hole with your thumb.



12. INSPECT CONNECTING ROD ALIGNMENT

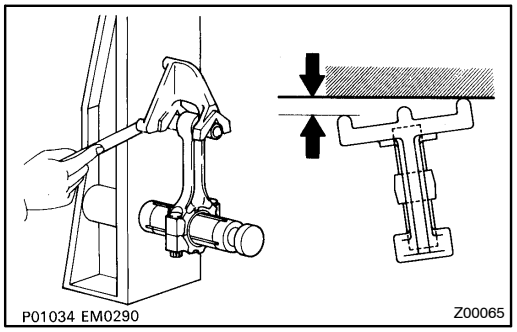
Using a rod aligner and feeler gauge, check the connecting rod alignment.

- Check for bend.

Maximum bend:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If bend is greater than maximum, replace the connecting rod assembly.



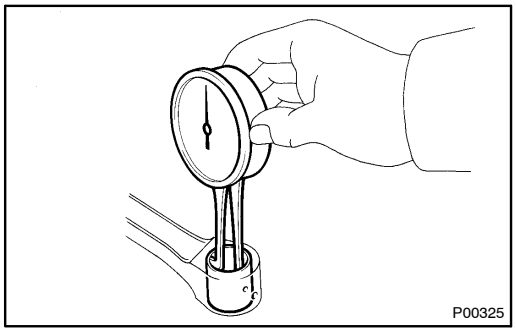
- Check for twist.

Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

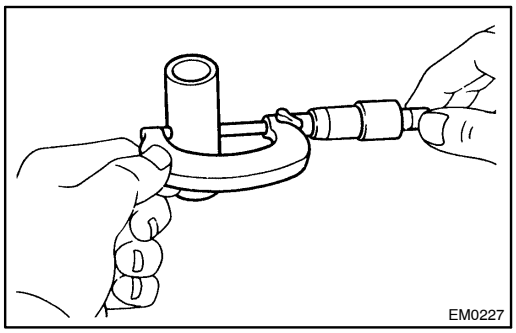
If twist is greater than maximum, replace the connecting rod assembly.

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13. INSPECT PISTON PIN OIL CLEARANCE

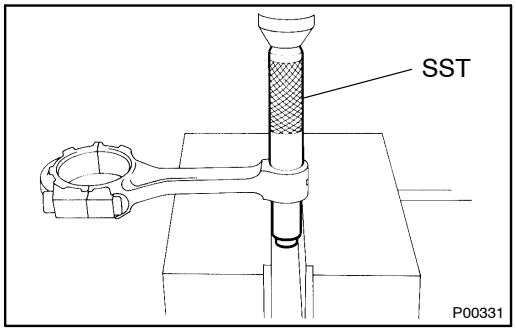
(a) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.
Bushing inside diameter:
22.005 – 22.017 mm (0.8663 – 0.8668 in.)



(b) Using a micrometer, measure the piston pin diameter.
Piston pin diameter:
21.997 – 22.009 mm (0.8660 – 0.8665 in.)

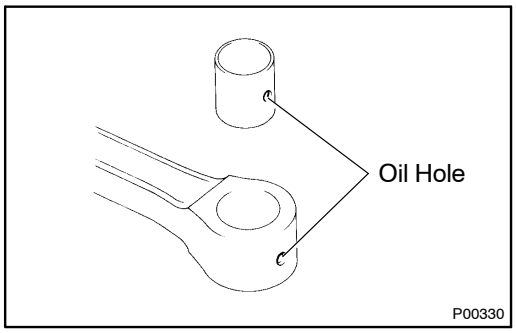
(c) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.
Standard oil clearance:
0.005 – 0.011 mm (0.0002 – 0.0004 in.)
Maximum oil clearance:0.05 mm (0.0020 in.)

If the oil clearance is greater than maximum, replace the bushing. If necessary, replace the piston and piston pin as a set.



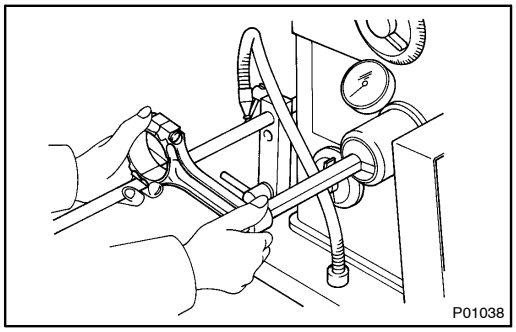
14. IF NECESSARY, REPLACE CONNECTING ROD BUSHING

(a) Using SST and a press, press out the bushing.
SST 09222–30010



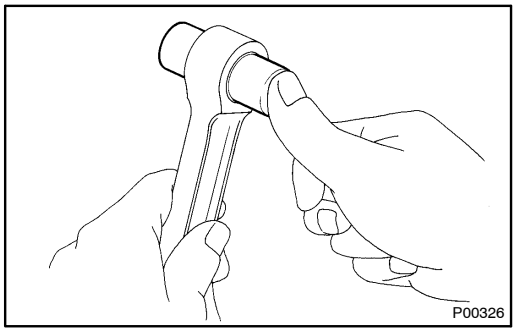
(b) Align the oil holes of a new bushing and the connecting rod.

(c) Using SST and a press, press in the bushing.
SST 09222–30010

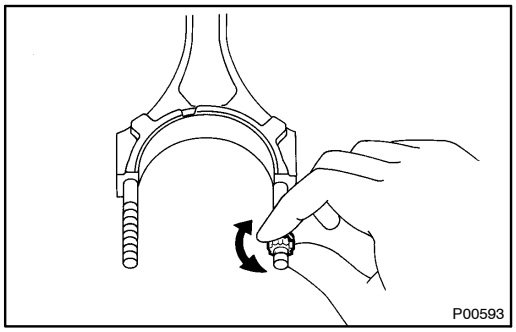


(d) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance (see step 13 above) between the bushing and piston pin.

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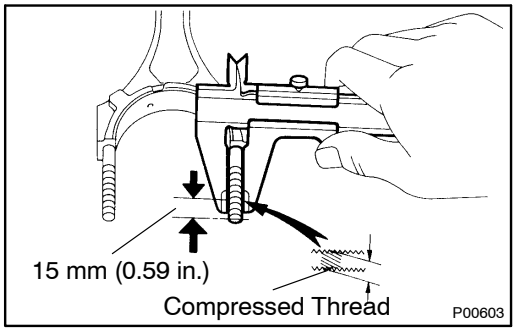


(e) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.



15. INSPECT CONNECTING ROD BOLTS

(a) Install the cap nut to the connecting rod bolt. Check that the rod cap nut can be turned easily by hand to the end of the thread.



(b) If the cap nut cannot be turned easily, measure the outer diameter of the compressed thread with vernier calipers.
Standard outer diameter:
7.860 – 8.000 mm (0.3094 – 0.3150 in.)
Minimum outer diameter: 7.600 mm (0.2992 in.)

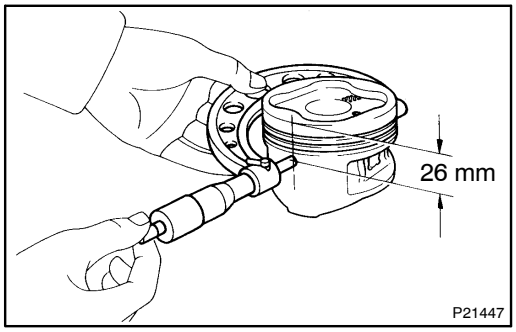
HINT:
If the location of this area cannot be judged by visual inspection, measure the outer diameter at the location shown in the illustration.
If the outer diameter is less than minimum, replace the connecting rod and rod cap nut as a set.

16. CYLINDER BORING

HINT:

- Bore all the 6 cylinders for the oversized piston outside diameter.
- Replace all the piston rings with ones to match the oversized pistons.

(a) Keep the oversized pistons.
Oversized piston diameter:
O/S 0.50: 93.856 – 93.886 mm (3.6951 – 3.6963 in.)



(b) Calculate amount to the bore cylinders.
(1) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 26 mm (1.02 in.) from the piston head.

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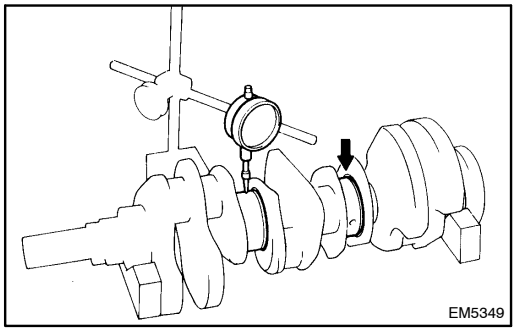
(2) Calculate the amount of each cylinder is to be rebored as follows:

Size to be rebored = P + C – H
P = Piston diameter
C = Piston oil clearance
0.134 – 0.154 mm (0.0053 – 0.0060 in.)
H = Allowance for honing
0.02 mm (0.0008 in.) or less

(3) C.Bore and hone cylinder to calculated dimensions

Maximum honing:
0.02 mm (0.0008 in.)

NOTICE:
Excess honing will destroy the finished roundness.



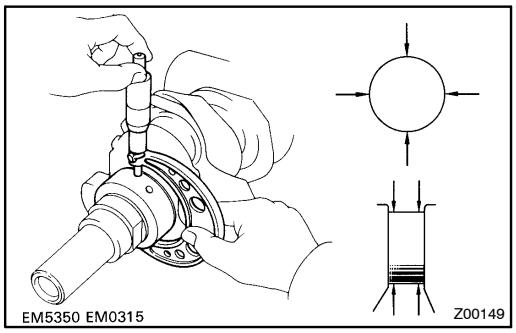
17. INSPECT CRANKSHAFT FOR RUNOUT

(a) Place the crankshaft on V–blocks.

(b) Using a dial indicator, measure the circle runout at the No.2 and No.3 journals.

Maximum circle runout:
0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the crankshaft.



18. INSPECT MAIN JOURNALS AND CRANK PINS

(a) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:

STD	63.985 – 64.000 mm (2.5191 – 2.5197 in.)
U/S 0.25	63.745 – 63.755 mm (2.5096 – 2.5100 in.)

Crank pin diameter:

STD	54.987 – 55.000 mm (2.1648 – 2.1654 in.)
U/S 0.25	54.745 – 54.755 mm (2.1553 – 2.1557 in.)

If the diameter is not as specified, check the oil clearance (See page EM–84).

(b) Check each main journal and crank pin for taper and out–of–round as shown.

Maximum taper and out–of–round:
0.02 mm (0.0008 in.)

If the taper or out–of–round is greater than maximum, grind or replace the crankshaft.

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19. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

(a) Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure step 18).

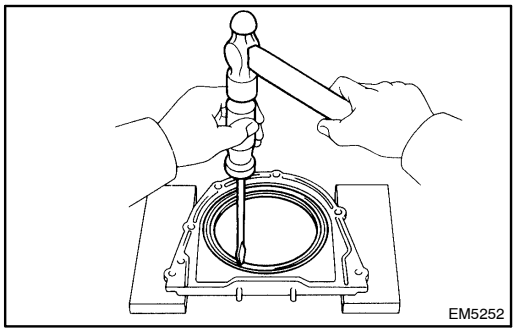
(b) Install new main journal and/or crank pin undersized bearings.

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EM07B–04

REPLACEMENT

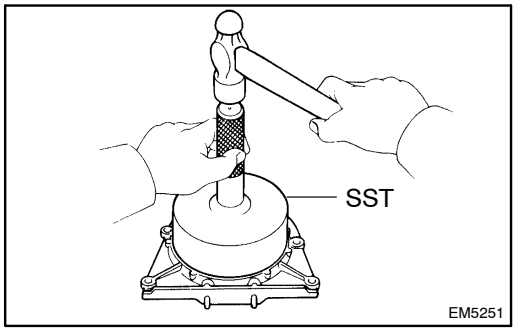
1. REPLACE CRANKSHAFT FRONT OIL SEAL
(See page EM–100)



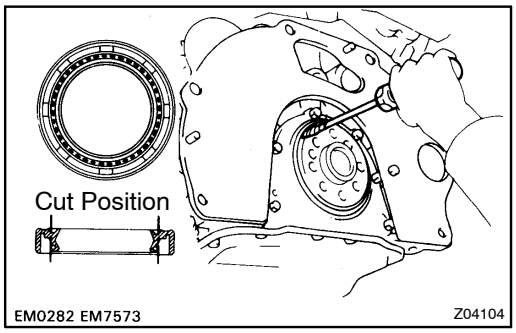
2. REPLACE CRANKSHAFT REAR OIL SEAL

HINT:
There are 2 methods (A and B) to replace the oil seal which are as follows:

(a) If rear oil seal retainer is removed from cylinder block.
  (1) Using a screwdriver and hammer, tap out the oil seal.

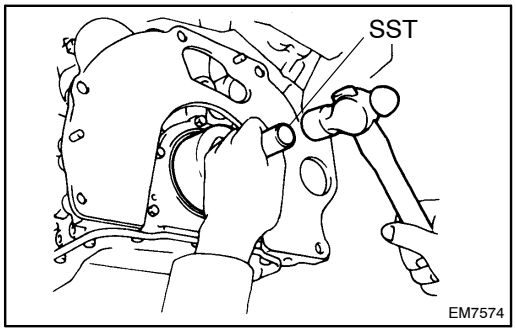


  (2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.
  SST 09223–15030, 09950–70010 (09951–07150)
  (3) Apply MP grease to the oil seal lip.



(b) If rear oil seal retainer is installed to cylinder block.
  (1) Using a knife, cut off the oil seal lip.
  (2) Using a screwdriver, pry out the oil seal.

NOTICE:
Be careful not to damage the crankshaft. Tape the screwdriver tip.



  (3) Apply MP grease to a new oil seal lip.
  (4) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
  SST 09223–15030, 09950–70010 (09951–07150)

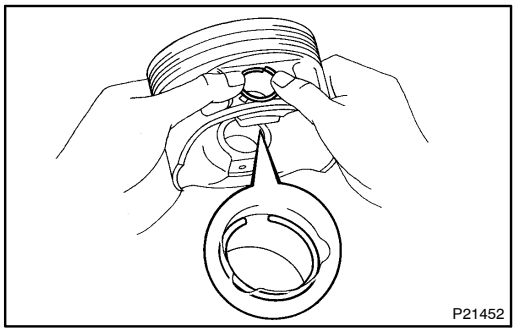
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EM1EK–02

INSTALLATION

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O–rings and oil seals with new parts.



1. ASSEMBLE PISTON AND CONNECTING ROD

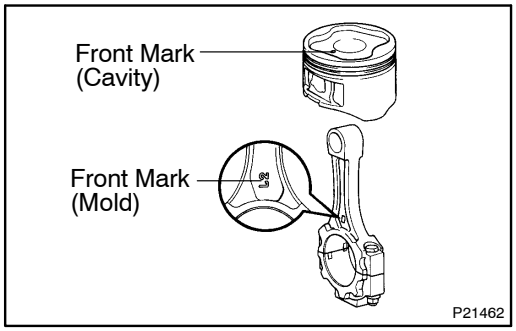
(a) Using a small screwdriver, install a new snap ring at one end of the piston pin hole.

HINT:

Be sure that end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.

(b) Gradually heat the piston to about 60˚C (140˚F).

(c) Coat the piston pin with engine oil.

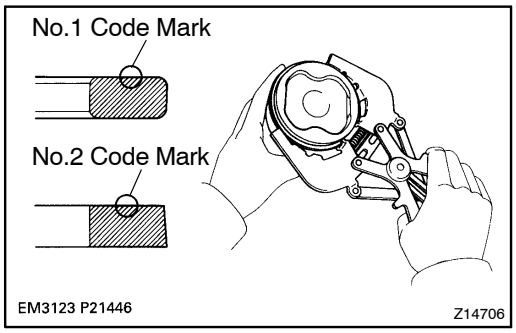


(d) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.

(e) Using a small screwdriver, install a new snap ring on the other end of the piston pin hole.

HINT:

Be sure that end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.

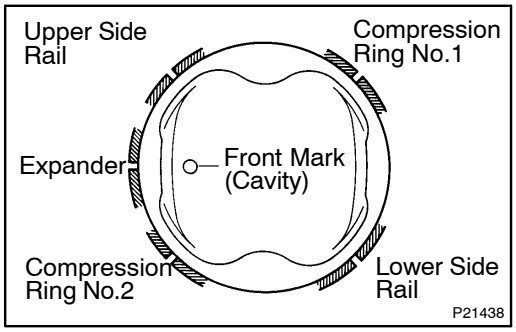


2. INSTALL PISTON RINGS

(a) Install the oil ring expander and 2 side rails by hand.

(b) Using a piston ring expander, install the 2 compression rings with the code mark facing upward.

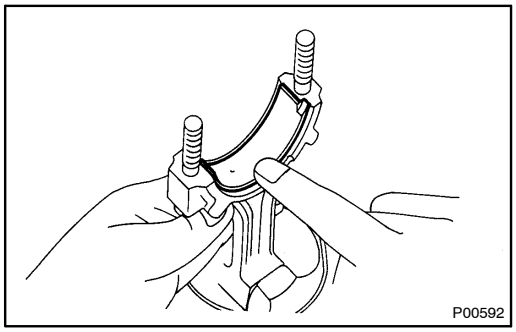
Code mark:
No.1: 1R or T
No.2: 2R or T



(c) Position the piston rings so that the ring ends are as shown.

NOTICE:
Do not align the ring ends.

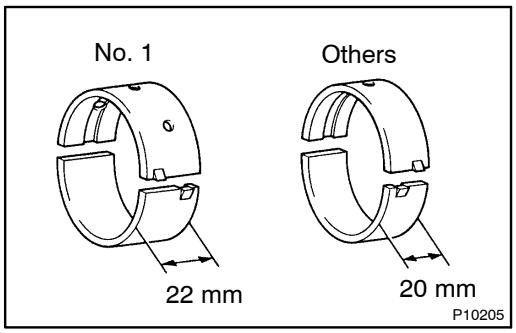
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3. INSTALL BEARINGS

(a) Align the bearing claw with the groove of the connecting rod or connecting cap.

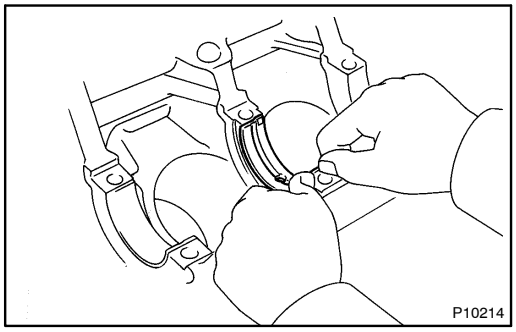
(b) Install the bearings in the connecting rod and connecting rod cap.



4. INSTALL MAIN BEARINGS

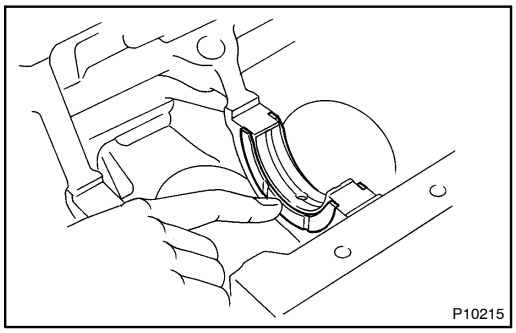
HINT:

- Main bearings come in widths of 20 mm (0.79 in.) and 22 mm (0.87 in.). Install the 22 mm (0.87 in.) bearings in the No.1 cylinder block journal position with the main bearing caps. Install the 20 mm (0.79 in.) bearings in the other positions.
- Upper bearings have an oil holes lower bearings do not.



(a) Align the bearing claw with the claw groove of the main bearing cap or cylinder block.

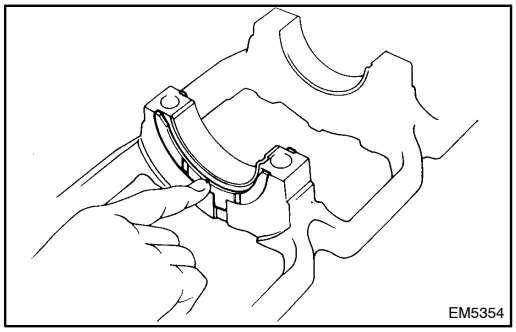
(b) Install the bearings in the cylinder block and main bearing cap.



5. INSTALL UPPER THRUST WASHERS

Install the thrust washers under the No.2 journal position of the cylinder block with the oil grooves facing outward.

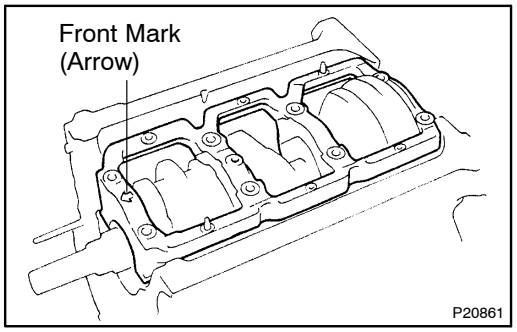
6. PLACE CRANKSHAFT ON CYLINDER BLOCK



7. PLACE MAIN BEARING CAP AND LOWER THRUST WASHERS ON CYLINDER BLOCK

(a) Install the thrust washers on the No.2 journal position of the bearing cap with the grooves facing outward.

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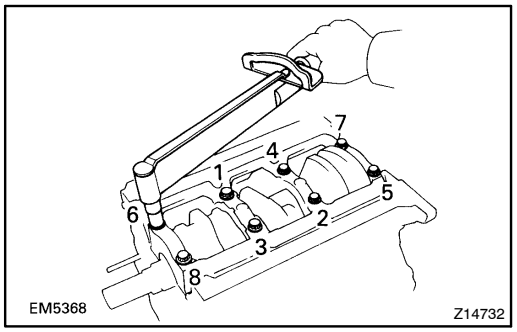


(b) Install the main bearing cap with the front mark facing forward.

8. INSTALL MAIN BEARING CAP BOLTS

HINT:

- The main bearing cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any main bearing cap bolt is broken or deformed, replace it.

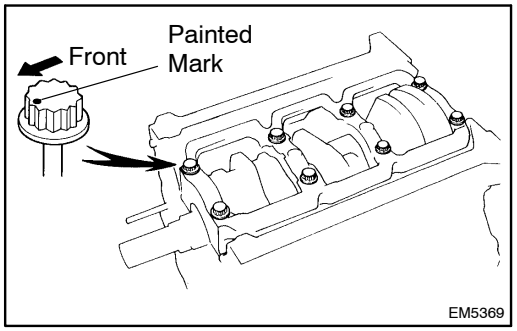


(a) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts.

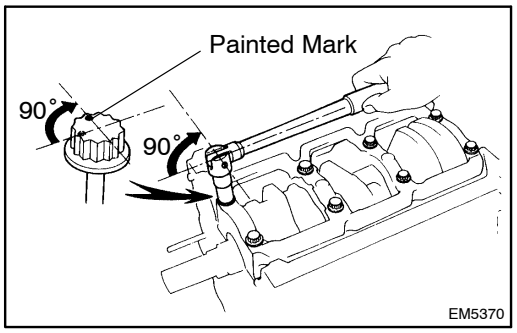
(b) Install and uniformly tighten the 8 main bearing cap bolts, in several passes, in the sequence shown.

Torque: 61 N·m (625 kgf·cm, 45 ft·lbf)

If any one of the main bearing cap bolts does not meet the torque specification, replace the cap bolt.



(c) Mark the front of the main bearing cap bolt with paint.

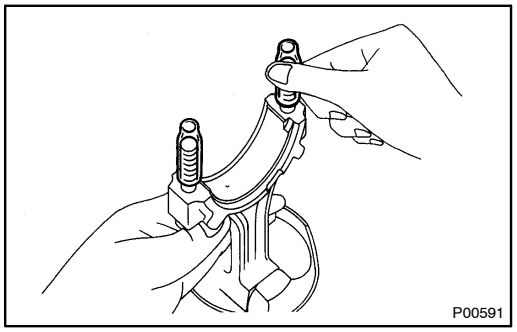


(d) Retighten the main bearing cap bolts by 90° in the numerical order shown.

(e) Check that the painted mark is now at a 90° angle to the front.

(f) Check that the crankshaft turns smoothly.

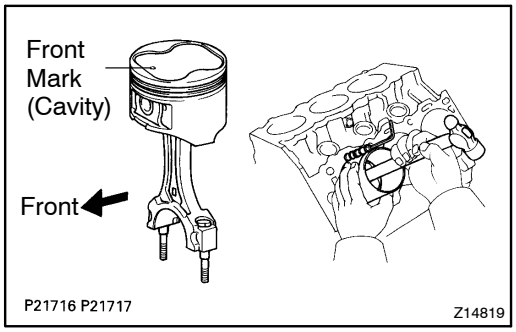
(g) Check the crankshaft thrust clearance (See page EM–92).



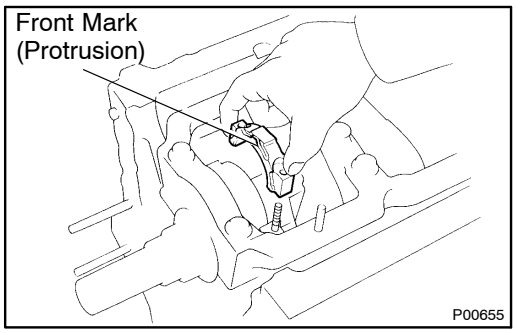
9. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.

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(b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.

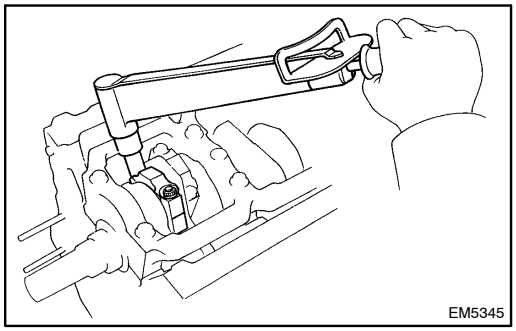


10. PLACE CONNECTING ROD CAP ON CONNECTING ROD

(a) Match the numbered connecting rod cap with the connecting rod.

(b) Install the connecting rod cap with the front mark facing forward.

11. INSTALL CONNECTING ROD CAP NUTS



HINT:

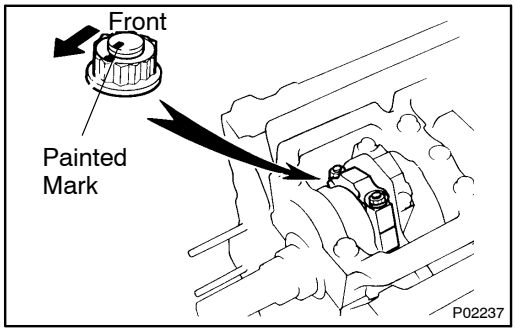
- The connecting rod cap nuts are tightened in 2 progressive steps (steps (b) and (d)).
- If any connecting rod bolt is broken or deformed, replace it.

(a) Apply a light of engine oil on the threads and under the nuts of the connecting rod cap.

(b) Install and alternately tighten the nuts of the connecting rod cap in several passes.

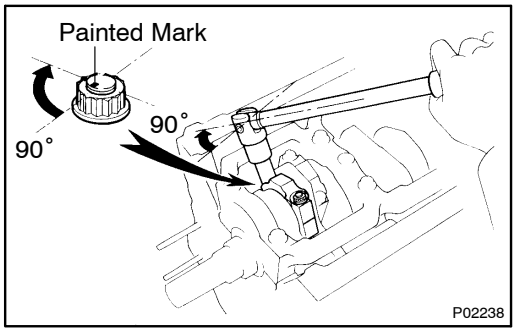
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

If any one of the connecting rod cap nuts does not meet the torque specification, replace the cap nut.

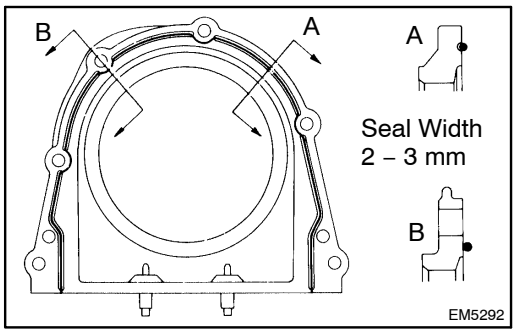


(c) Mark the front of the connecting rod cap nut and bolt with paint.

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(d) Retighten the connecting rod cap nuts 90° as shown.
(e) Check that the painted mark is now at a 90° angle to the front.
(f) Check that the crankshaft turns smoothly.
(g) Check the connecting rod thrust clearance (See page EM–92).



12. INSTALL REAR OIL SEAL RETAINER

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the retainer and cylinder block.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

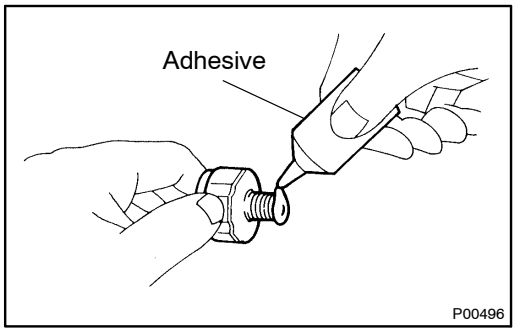
(b) Apply seal packing to the oil seal retainer as shown in the illustration.
Seal packing:
Part No.08826–00080 or equivalent
- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the oil seal retainer with the 6 bolts.
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)

13. INSTALL OIL PUMP (See page LU–14)
14. INSTALL OIL PAN BAFFLE PLATE
15. INSTALL OIL STRAINER (See page LU–14)
16. INSTALL OIL PAN (See page LU–14)
17. w/ OIL COOLER:
INSTALL OIL COOLER WITH WATER BYPASS HOSE AND OIL COOLER UNION (See page LU–20)
18. w/o OIL COOLER:
INSTALL OIL HOLE COVER PLATE
Torque: 60 N·m (600 kgf·cm, 44 ft·lbf)
19. INSTALL COOLANT DRAIN COCK
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
20. INSTALL RH AND LH ENGINE MOUNTING BRACKETS
Torque: 44 N·m (440 kgf·cm, 32 ft·lbf)
21. INSTALL OIL FILTER UNION
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

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22. INSTALL OIL FILTER (See page LU–3)



23. INSTALL OIL PRESSURE SWITCH

(a) Apply adhesive to 2 or 3 threads of the oil pressure switch.
Adhesive:
Part No. 08833 – 00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Using SST, install the oil pressure switch.
SST 09816–30010
Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)

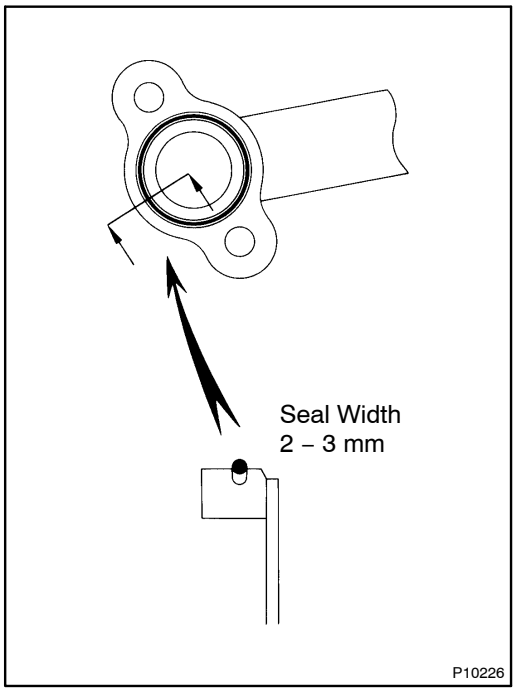
24. INSTALL GENERATOR ADJUSTING BAR
Torque: 42 N·m (420 kgf·cm, 31 ft·lbf)

25. INSTALL WATER PUMP (See page CO–7)

26. INSTALL KNOCK SENSORS

Using SST, install the 2 knock sensors.
SST 09816–30010
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

27. INSTALL NO.2 IDLER PULLEY BRACKET
Torque: 38 N·m (380 kgf·cm, 28 ft·lbf)



28. INSTALL WATER BYPASS PIPE WITH KNOCK SENSOR WIRE

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the bypass and cylinder block.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

(b) Apply seal packing to the groove of the bypass pipe.
Seal packing:
Part No. 08826 – 00100 or equivalent
- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.

HINT:
Avoid applying an excessive amount to the surface.

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- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the bypass pipe with the 2 bolts and nut.
Torque: 8.5 N·m (85 kgf·cm, 75 in.·lbf)

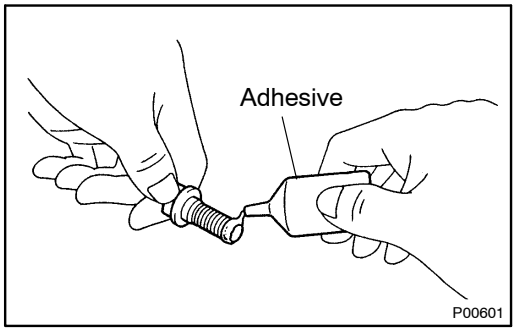
(d) Connect the 2 knock sensor connectors.

29. INSTALL CYLINDER HEADS

30. INSTALL PULLEYS AND TIMING BELT
(See page EM–19)

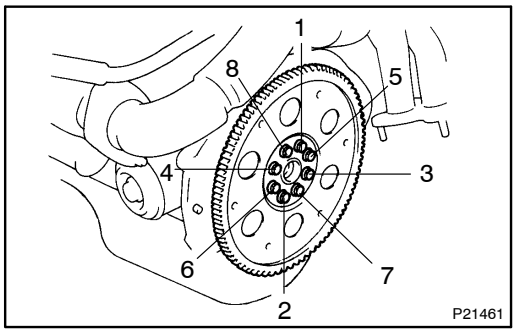
31. REMOVE ENGINE STAND

32. INSTALL REAR END PLATE
Torque: 7.5 N·m (75 kgf·cm, 66 in.·lbf)



33. A/T:
INSTALL DRIVE PLATE

(a) Apply adhesive to 2 or 3 threads of the mount bolt end.
Adhesive:
Part No. 08833 – 00070, THREE BOND 1324 or equivalent



(b) Install the drive plate on the crankshaft.

(c) Install and uniformly tighten the 8 mount bolts in several passes, in the sequence shown.
Torque: 85 N·m (850 kgf·cm, 63 ft·lbf)

34. M/T:
INSTALL FLYWHEEL

(a) Apply adhesive to 2 or 3 threads of the mount bolt end.
Adhesive:
Part No. 08833 – 00070, THREE BOND 1324 or equivalent

(b) Install the drive plate on the crankshaft.

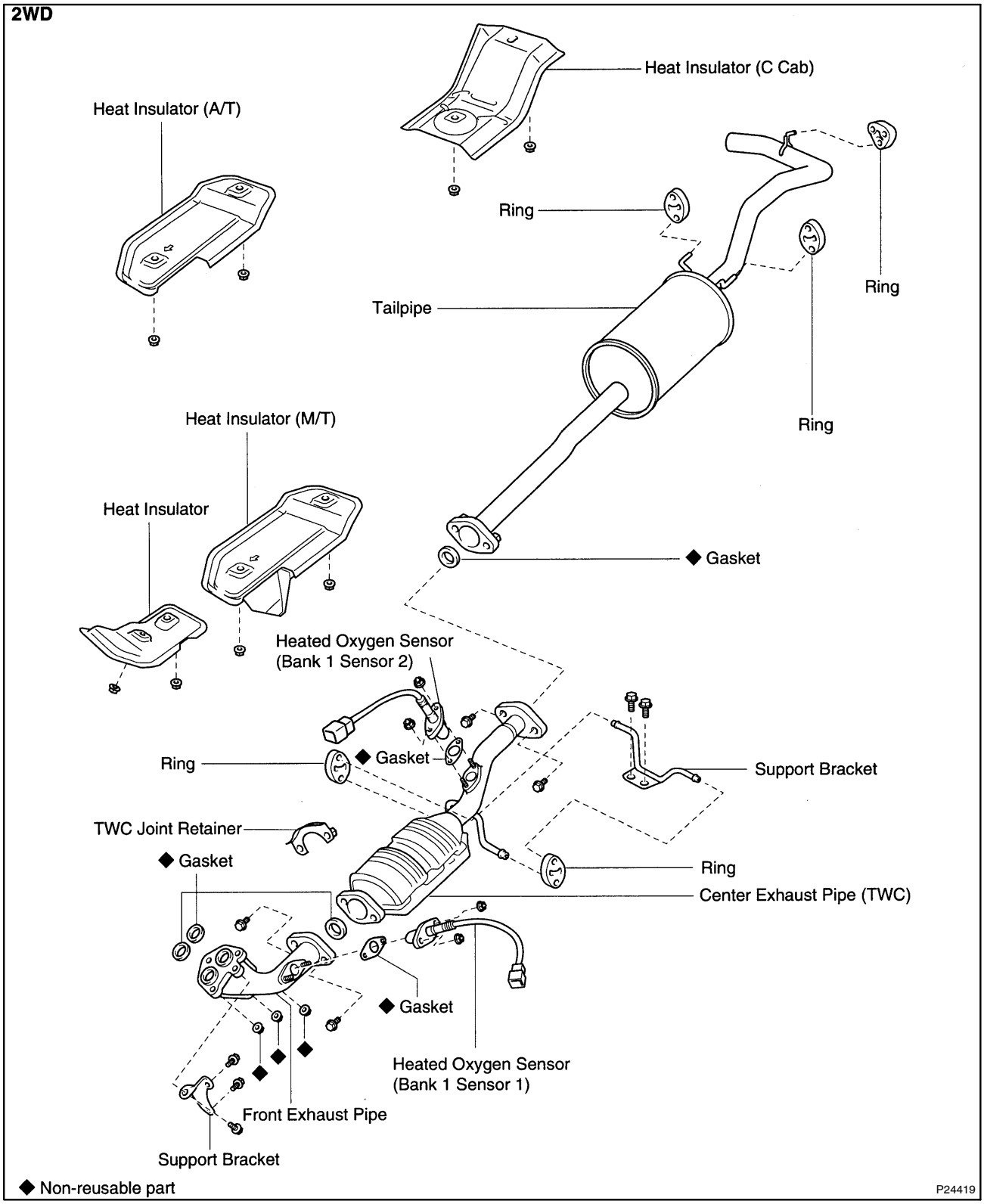
(c) Install and uniformly tighten the 8 mount bolts in several passes, in the sequence shown.
Torque: 85 N·m (850 kgf·cm, 63 ft·lbf)

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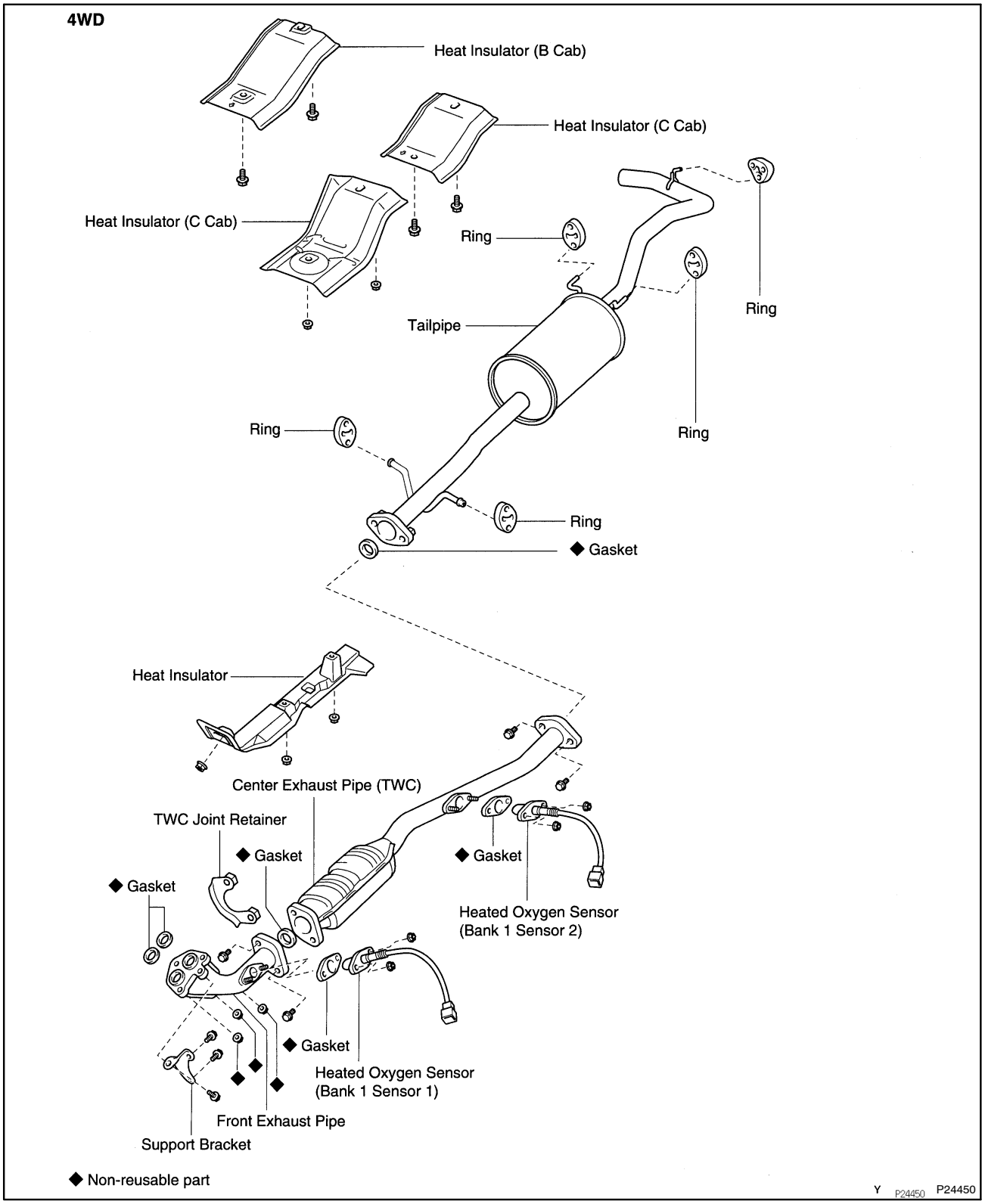
EXHAUST SYSTEM

COMPONENTS

EM07F–01



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EC – EMISSIONS CONTROL (3RZ-FE)

EMISSION CONTROL SYSTEM	EC-1
PARTS LAYOUT AND SCHEMATIC DRAWING	EC-2
POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM	EC-4
EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM	EC-5
EXHAUST GAS RECIRCULATION (EGR) SYSTEM	EC-7
THREE-WAY CATALYTIC CONVERTER (TWC) SYSTEM	EC-10

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EMISSION CONTROL SYSTEM

EC02N–02

PURPOSE

The emission control systems are installed to reduce the amount of CO, HC and NOx exhausted from the engine ((3), (4) and (5)), to prevent the atmospheric release of blow–by gas–containing HC (1) and evaporated fuel containing HC being released from the fuel tank (2).

The function of each system is shown in these table.

System	Abbreviation	Function
(1) Positive Crankcase Ventilation	PCV	Reduces HC
(2) Evaporative Emission Control	EVAP	Reduces evaporated HC
(3) Exhaust Gas Recirculation	EGR	Reduces NOx
(4) Three–Way Catalytic Converter	TWC	Reduces CO, HC and NOx
(5) Multiport Fuel Injection *	MFI	Injects a precisely timed, optimum amount of fuel for reduced exhaust emissions

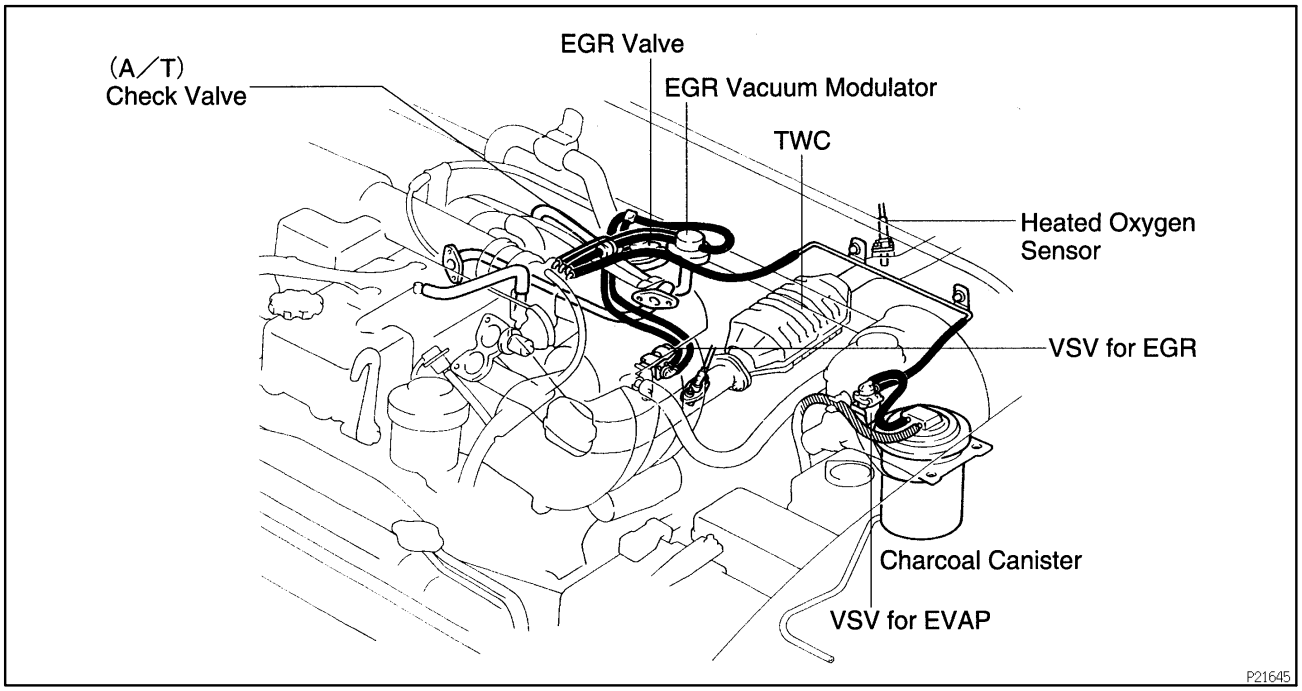
Remark: * For inspection and repair of the MFI system, refer to the MF section this manual.

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PARTS LAYOUT AND SCHEMATIC DRAWING

LOCATION

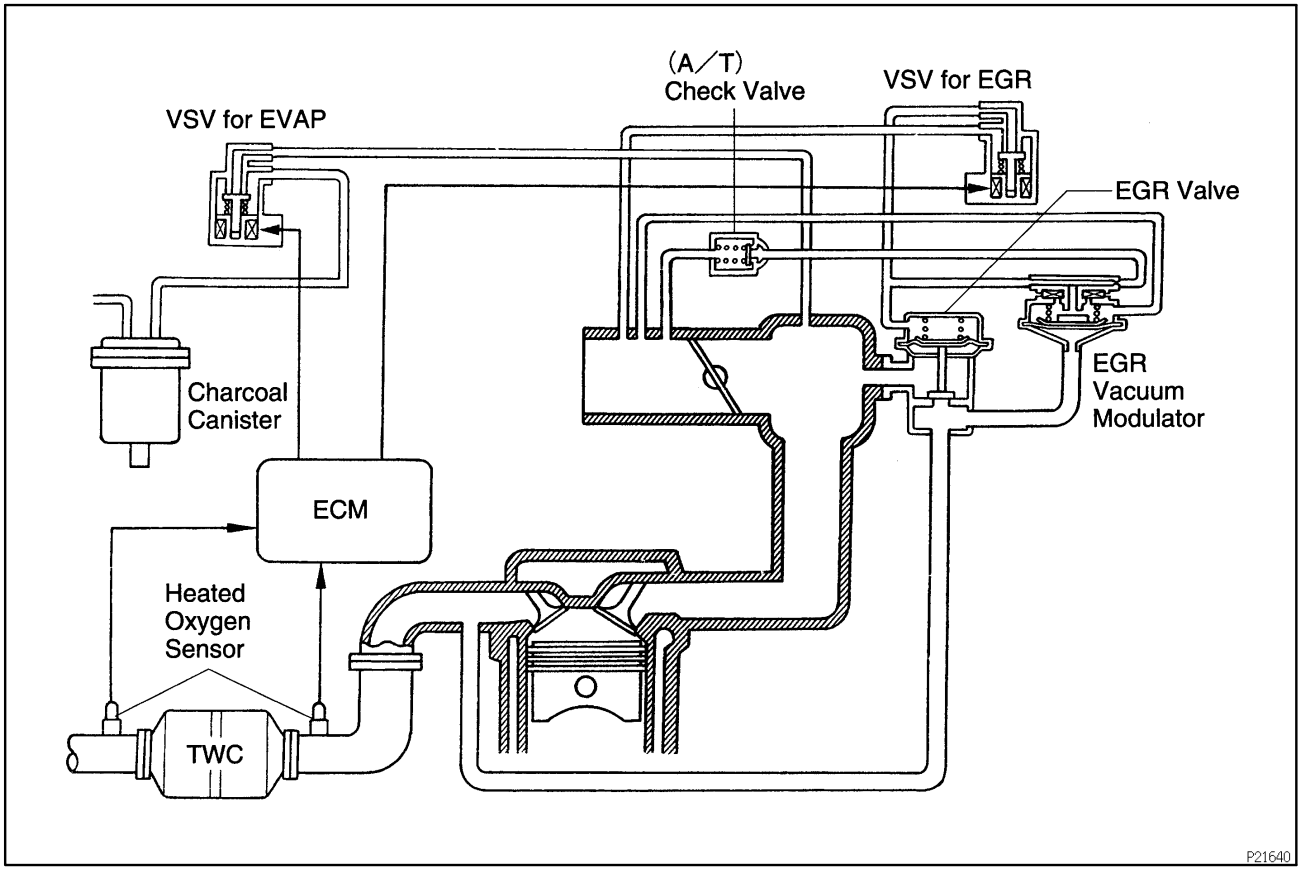
EC02O–02



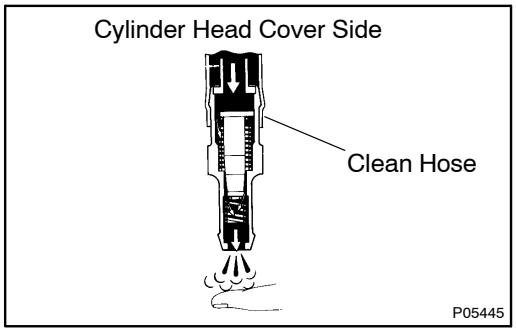
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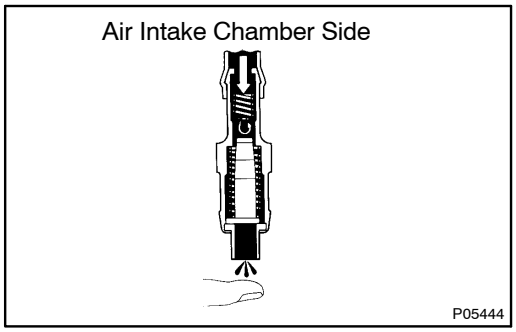
EC02P–02

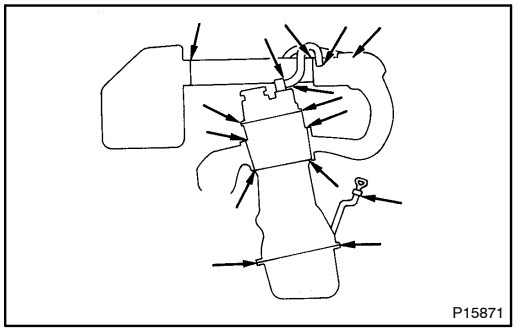
DRAWING



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POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

EC02Q–01

INSPECTION

1. REMOVE PCV VALVE

2. INSTALL CLEAN HOSE TO PCV VALVE

3. INSPECT PCV VALVE OPERATION

(a) Blow into the cylinder head cover side, and check that air passes through easily.

CAUTION:

Do not suck air through the valve. Petroleum substances inside the valve are harmful.

(b) Blow air into the air intake chamber side, and check that air passes through with difficulty.

If operation is not as specified, replace the PCV valve.

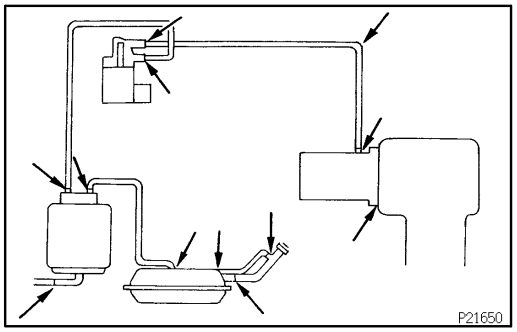
4. REMOVE CLEAN HOSE FROM PCV VALVE

5. REINSTALL PCV VALVE

6. VISUALLY INSPECT HOSES AND CONNECTIONS

Check for cracks, leaks or damage.

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EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

EC0GF–01

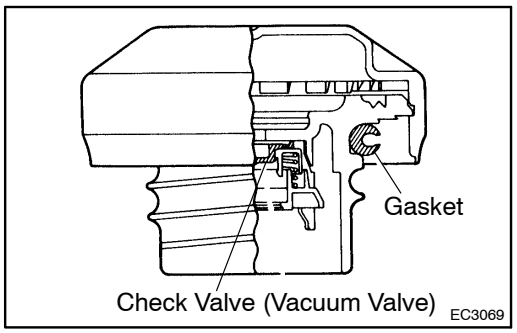
INSPECTION

1. VISUALLY INSPECT LINES AND CONNECTIONS

Look for loosen connections, sharp bends or damage.

2. VISUALLY INSPECT FUEL TANK

Look for deformation, cracks or fuel leakage.



3. VISUALLY INSPECT FUEL TANK CAP

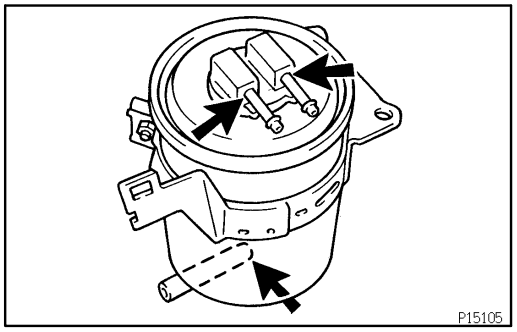
Check if the cap and/or gasket are deformed or damaged.
If necessary, repair or replace the cap.

4. REMOVE VSV

Remove the screw from the charcoal canister.

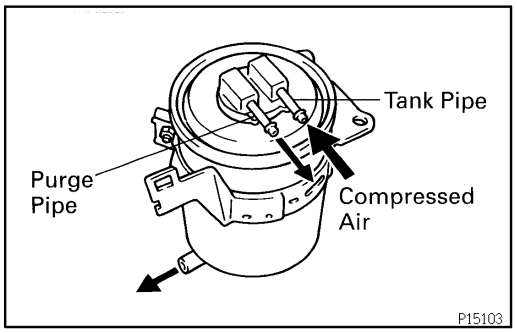
5. REMOVE CHARCOAL CANISTER

6. REMOVE CAP FROM CHARCOAL CANISTER



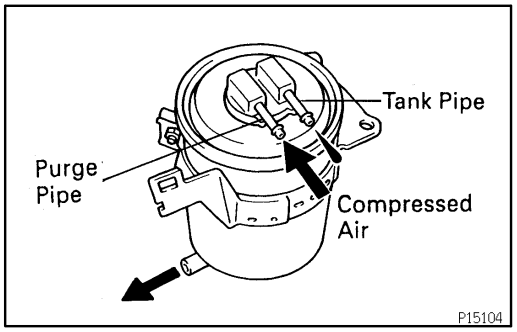
7. VISUALLY INSPECT CHARCOAL CANISTER

Look for cracks or damage.



8. INSPECT FOR CLOGGED FILTER AND STUCK CHECK VALVE

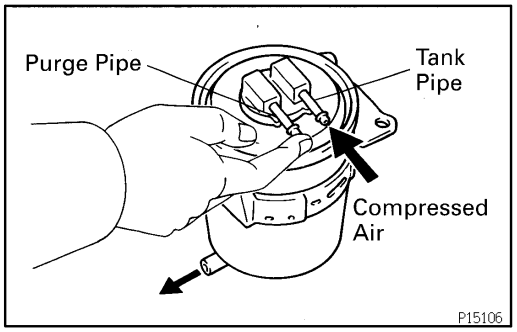
(a) Using low pressure compressed air (4.71 kPa, 48 gf/cm^2, 0.68 psi), blow into tank pipe and check that air flows without resistance from the other pipes.



(b) Blow air (4.71 kPa, 48 gf/cm^2, 0.68 psi) into purge pipe and check that air does not flow from the tank pipe and air flows without resistance from the other pipe.

If a problem is found, replace the charcoal canister.

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9. CLEAN FILTER IN CANISTER

Clean the filter by blowing 294 kPa (3 kgf·cm^2, 43 psi) of compressed air into tank pipe while holding purge pipe closed

NOTICE:

- **Do not attempt to wash the canister.**
- **No activated carbon should come out.**

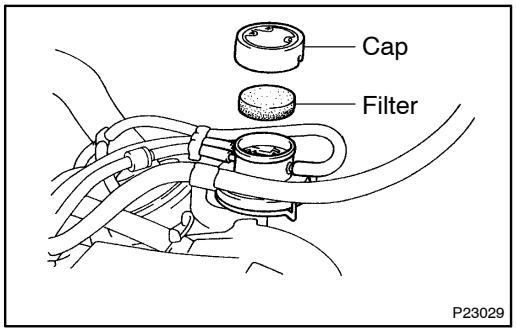
10. REINSTALL CAP TO CHARCOAL CANISTER

11. RECONNECT CHARCOAL CANISTER

Torque: 31 N·m (310 kgf·cm, 23 ft·lbf)

12. REINSTALL VSV

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EXHAUST GAS RECIRCULATION (EGR) SYSTEM

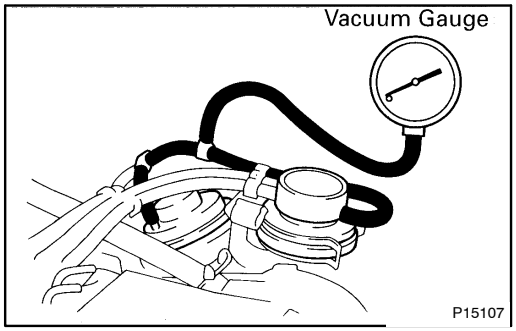
EC0JU–01

INSPECTION

1. INSPECT AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Remove the cap and filter.
(b) Check the filter for contamination or damage.
(c) Using compressed air, clean the filter.
(d) Install the filter and cap.

HINT:
Install the filter with the coarser surface facing the atmospheric side (outward).

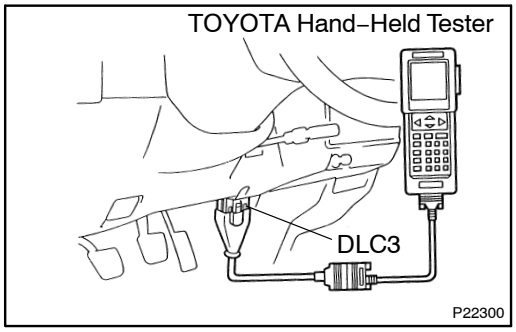


2. INSTALL VACUUM GAUGE

Using a 3–way connector, connect a vacuum gauge to the hose between the EGR valve and EGR vacuum modulator.

3. INSPECT SEATING OF EGR VALVE

Start the engine and check that the engine starts and runs at idle.



4. CONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL

(a) Connect the TOYOTA hand–held tester or OBDII scan tool to the DLC3.
(b) Please refer to the TOYOTA hand–held tester or OBDII scan tool operators manual for further details.

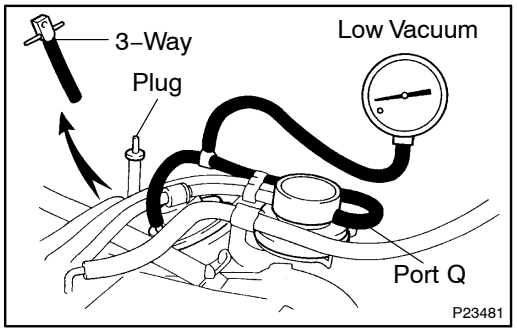
5. INSPECT VSV OPERATION WITH COLD ENGINE

(a) The engine coolant temperature should be below 50°C (122°F).
(b) Check that the vacuum gauge indicates zero at 3,500 rpm.
(c) Check that the EGR pipe is not hot.

6. INSPECT OPERATION OF VSV AND EGR VACUUM MODULATOR

(a) Select the active test mode on the TOYOTA hand–held tester (VSV is closed.).

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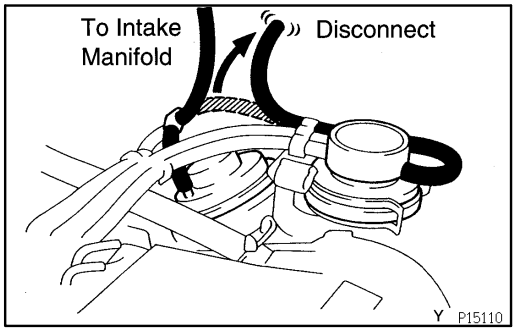


(b) If you have no TOYOTA hand–held tester, check these procedures:
  (1) Remove the 3–way connector with the vacuum hose.
  (2) Connect the vacuum hose (from port Q of EGR vacuum modulator) to the EGR valve.
  (3) Plug the vacuum hose (from VSV for EGR).
(c) Check that the vacuum gauge indicates low vacuum at 3,500 rpm.

7. DISCONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL

8. REMOVE VACUUM GAUGE

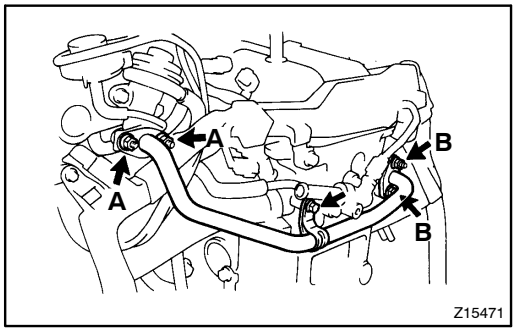
Remove the vacuum gauge, and reconnect the vacuum hoses to the proper locations.



9. INSPECT EGR VALVE

(a) Apply vacuum directly to the EGR valve with the engine idling.
(b) Check that the engine runs rough or dies.
(c) Reconnect the vacuum hoses to the proper locations.

If no problem is found with this inspection, system is normal; otherwise inspect each part.



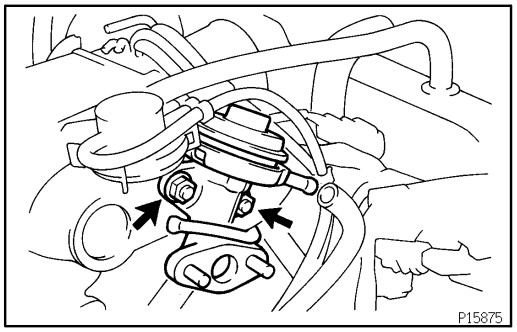
10. REMOVE EGR PIPE

Remove the bolt, 4 nuts, EGR pipe and 2 gaskets.

HINT:

Install 2 new gaskets.

Torque:
Bolt: 18 N·m (185 kgf·cm, 13 ft·lbf)
Nut A: 19 N·m (195 kgf·cm, 14 ft·lbf)
Nut B: 20 N·m (200 kgf·cm, 15 ft·lbf)

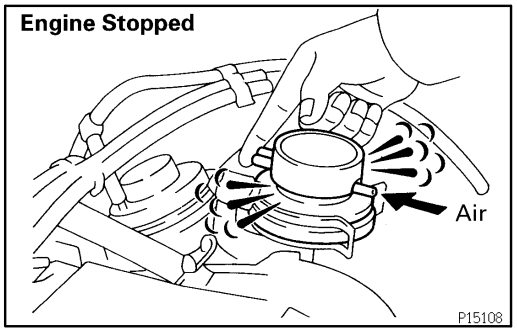


11. REMOVE EGR VALVE

(a) Disconnect these hoses:
- 2 Vacuum hoses
- 2 Water bypass hoses

(b) Remove the 2 nuts, EGR valve and gasket.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

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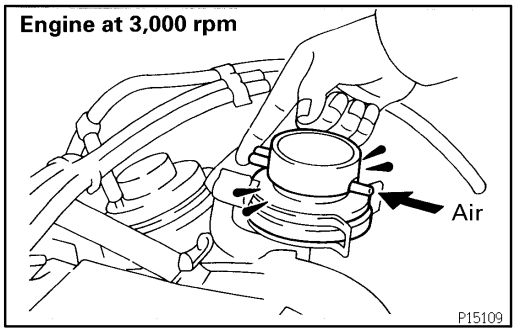


12. DISCONNECT VACUUM HOSES FROM EGR VACUUM MODULATOR

13. INSPECT EGR VACUUM MODULATOR OPERATION

(a) Block ports P and R with your finger.

(b) Blow air into port Q, and check that the air passes through to the air filter side freely.

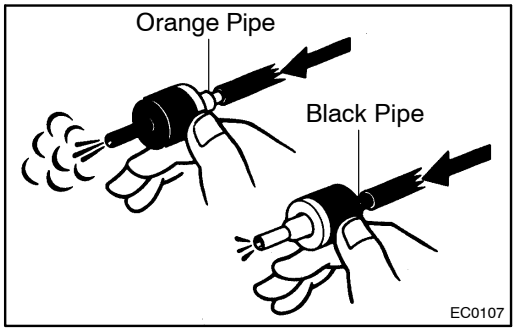


(c) Start the engine, and maintain speed at 3,500 rpm.

(d) Repeat the above test. Check that there is a strong resistance to air flow.

If operation is not as specified, replace the EGR vacuum modulator.

14. RECONNECT VACUUM HOSES TO EGR VACUUM MODULATOR



15. REMOVE CHECK VALVE

16. INSPECT CHECK VALVE

(a) Check that air flows from the orange pipe to the black pipe.

(b) Check that air does not flow from the black pipe to the orange pipe.

If operation is not as specified, replace the check valve.

17. INSTALL CHECK VALVE

HINT:

Install the check valve with the orange pipe facing the EGR vacuum modulator side.

18. INSPECT VSV FOR EGR (See page MF–44)

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THREE–WAY CATALYTIC CONVERTER (TWC) SYSTEM

EC02T–01

INSPECTION

1. CHECK TWC FOR DENTS OR DAMAGE

If any part of the protector is damaged or dented to the extent that it touches the three–way catalytic converter, repair or replace it.

2. CHECK EXHAUST PIPE CONNECTIONS FOR LOOSENESS OR DAMAGE

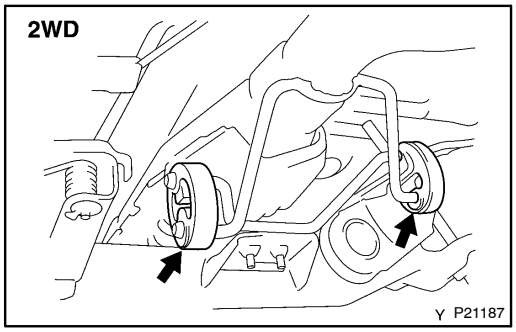
3. CHECK EXHAUST PIPE CLUMPS FOR WEAKNESS,CRACKS OR DAMAGE

4. CHECK HEAT INSULATOR FOR DAMAGE

5. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR

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EC02U–03



REPLACEMENT

1. REMOVE CENTER EXHAUST PIPE

(a) Disconnect the 2 rings from the support bracket.

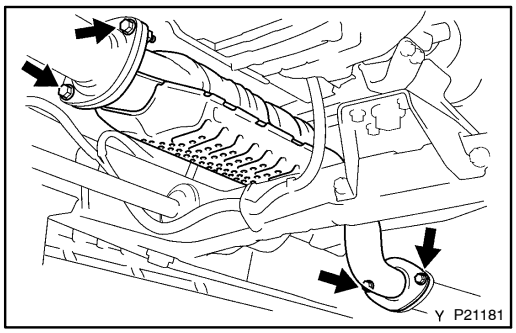
(b) Remove the 2 nuts and gasket, and disconnect the heated oxygen sensor (bank 1 sensor 2).

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

HINT:

At the time of assembly please refer to the following item.

Install the heated oxygen sensor with a new gasket.



(c) Remove the 4 bolts, TWC joint retainer, center exhaust pipe and 2 gasket.

Torque: 48 N·m (490 kgf·cm, 35 ft·lbf)

HINT:

At the time of assembly please refer to the following item.

Place 2 new gaskets on the front exhaust and tail pipes, and temporarily install the center exhaust pipe.

2. REINSTALL CENTER EXHAUST PIPE

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EC – EMISSIONS CONTROL (5VZ-FE)

EMISSION CONTROL SYSTEM	EC-1
PARTS LAYOUT AND SCHEMATIC DRAWING	EC-2
POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM	EC-4
EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM	EC-5
EXHAUST GAS RECIRCULATION (EGR) SYSTEM	EC-7
THREE-WAY CATALYTIC CONVERTER (TWC) SYSTEM	EC-12

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EMISSION CONTROL SYSTEM

EC032–03

PURPOSE

The emission control systems are installed to reduce the amount of CO, HC and NOx exhausted from the engine ((3) and (4)), to prevent the atmospheric release of blow–by gas–containing HC (1) and evaporated fuel containing HC being released from the fuel tank (2).
The function of each system is shown in these table.

System	Abbreviation	Function
(1) Positive Crankcase Ventilation	PCV	Reduces crankcase blow–by gas (HC)
(2) Evaporative Emission Control	EVAP	Reduces evaporated HC
(3) Exhaust Gas Recirculation	EGR	Reduces NOx
(4) Three–Way Catalytic Converter	TWC	Reduces CO, HC and NOx
(5) Sequential Multiport Fuel Injection *	SFI	Injects a precisely timed, optimum amount of fuel for reduced exhaust emissions

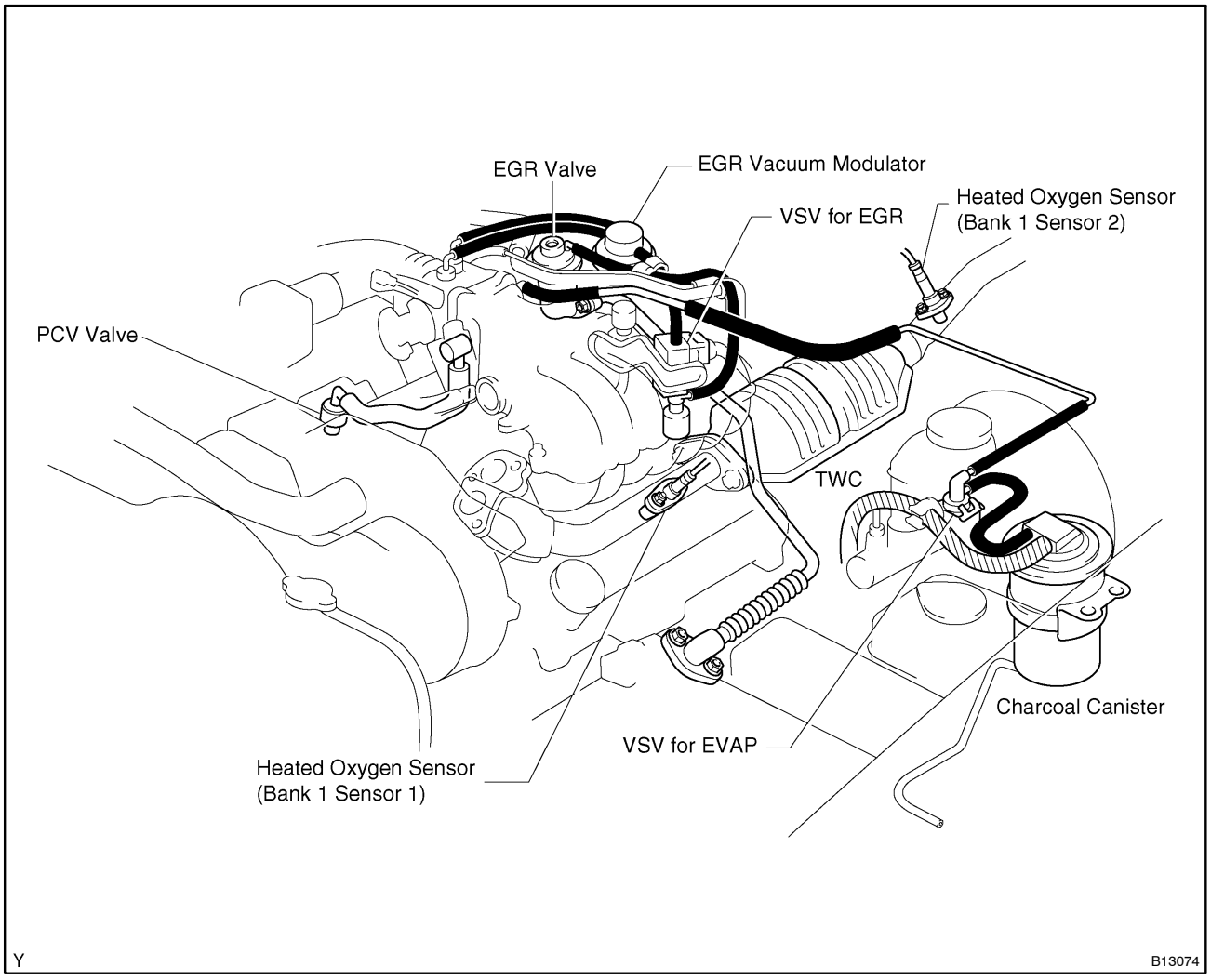
Remark: * For inspection and repair of the SFI system, refer to the SF section of this manual.

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PARTS LAYOUT AND SCHEMATIC DRAWING

LOCATION

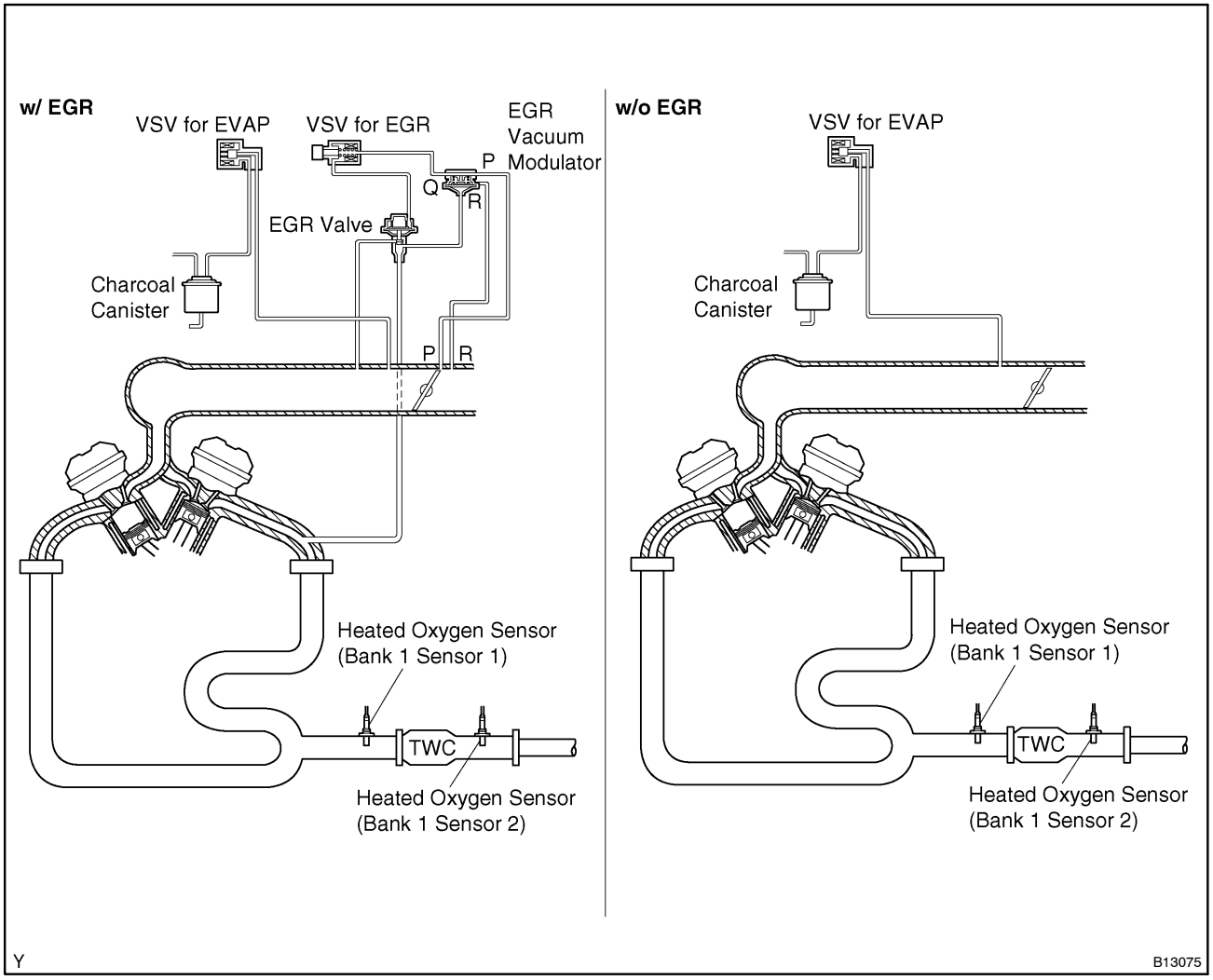
EC033–03



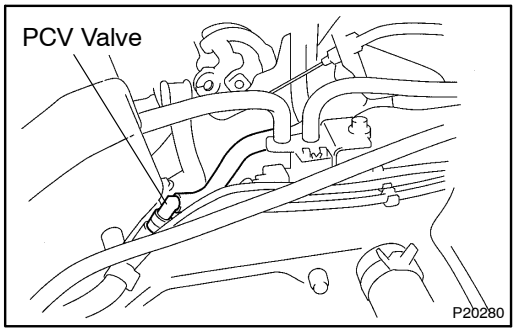
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EC034–03

DRAWING



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POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

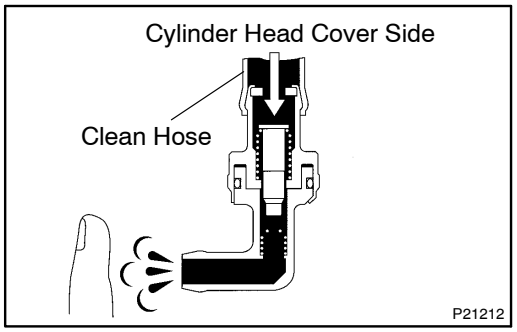
EC035–04

INSPECTION

1. REMOVE PCV VALVE

(a) Disconnect the PCV hose from the PCV valve.

(b) Remove the PCV valve.



2. INSTALL CLEAN HOSE TO PCV VALVE

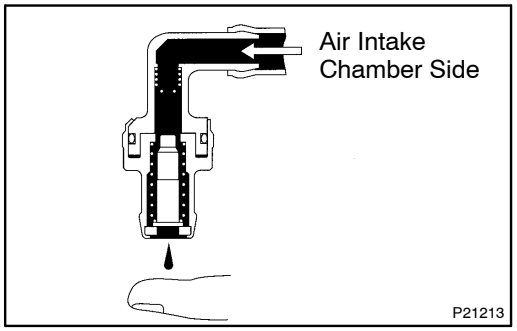
3. INSPECT PCV VALVE OPERATION

(a) Blow air into the cylinder head cover side, and check that air passes through easily.

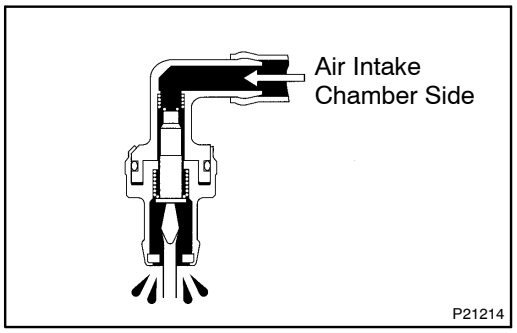
CAUTION:

Do not suck air through the valve.

Petroleum substances inside the valve are harmful.



(b) Blow air into the air intake chamber side, and check that air passes through with difficulty.

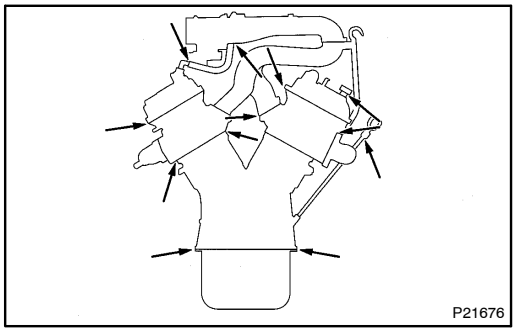


(c) Blow air into the air intake chamber side when lift up the inside valve, and check that there is a strong resistance to air flow.

If operation is not as specified, replace the PCV valve.

4. REMOVE CLEAN HOSE FROM PCV VALVE

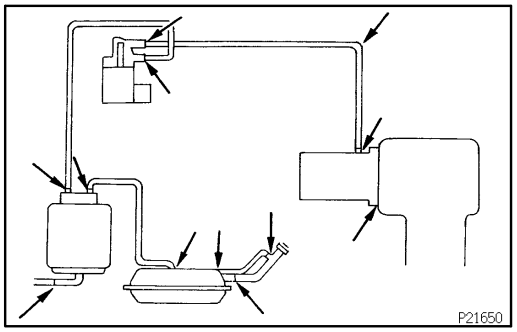
5. REINSTALL PCV VALVE



6. VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

Check for cracks, leaks or damage.

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EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

EC0JV–01

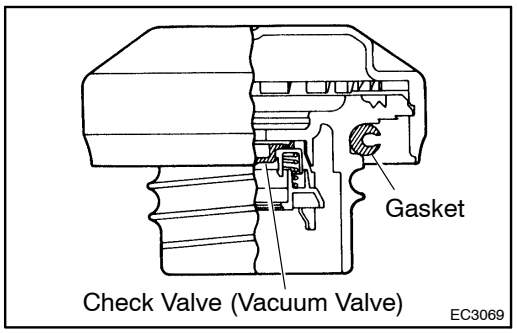
INSPECTION

1. VISUALLY INSPECT LINES AND CONNECTIONS

Look for loose connections, sharp bends or damage.

2. VISUALLY INSPECT FUEL TANK

Look for deformation, cracks or fuel leakage.

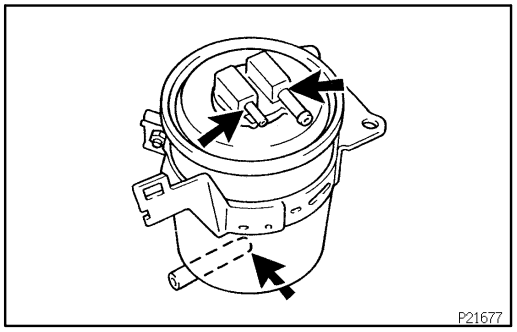


3. VISUALLY INSPECT FUEL TANK CAP

Check if the cap and/or gasket are deformed or damaged. If necessary, repair or replace the cap.

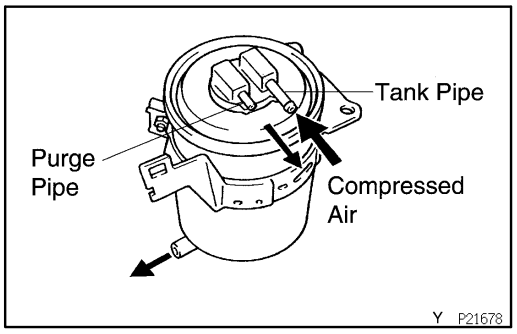
4. REMOVE VSV

5. REMOVE CHARCOAL CANISTER



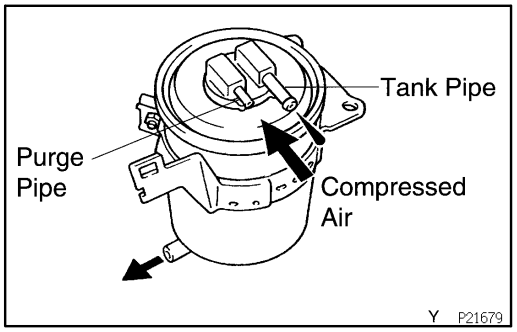
6. VISUALLY INSPECT CHARCOAL CANISTER

Look for cracks or damage.



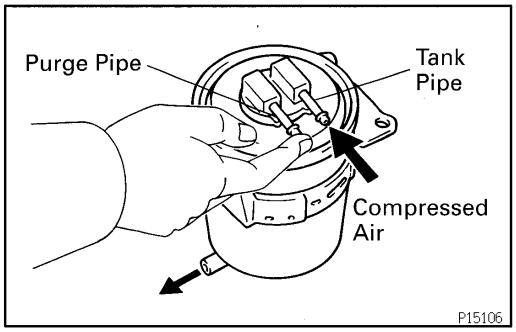
7. CHECK FOR CLOGGED FILTER, AND STUCK CHECK VALVE

(a) Using low pressure compressed air (4.71 kPa, 48 gf/cm^2, 0.68 psi), blow into tank pipe and check that air flows without resistance from the other pipes.



(b) Blow low pressure compressed air (4.71 kPa, 48 gf/cm^2, 0.68 psi) into purge pipe and check that air does not flow from the tank pipe.
But the air flows without resistance from the other pipe.
If a problem is found, replace the charcoal canister.

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8. CLEAN FILTER IN CANISTER

Clean the filter by blowing 294 kPa (3 gf/cm^2, 43 psi) of compressed air into tank pipe while holding purge pipe closed.

NOTICE:

- **Do not attempt to wash the canister.**
- **No activated carbon should come out.**

9. INSPECT VSV FOR EVAP
(See page SF–50)

10. REINSTALL VSV

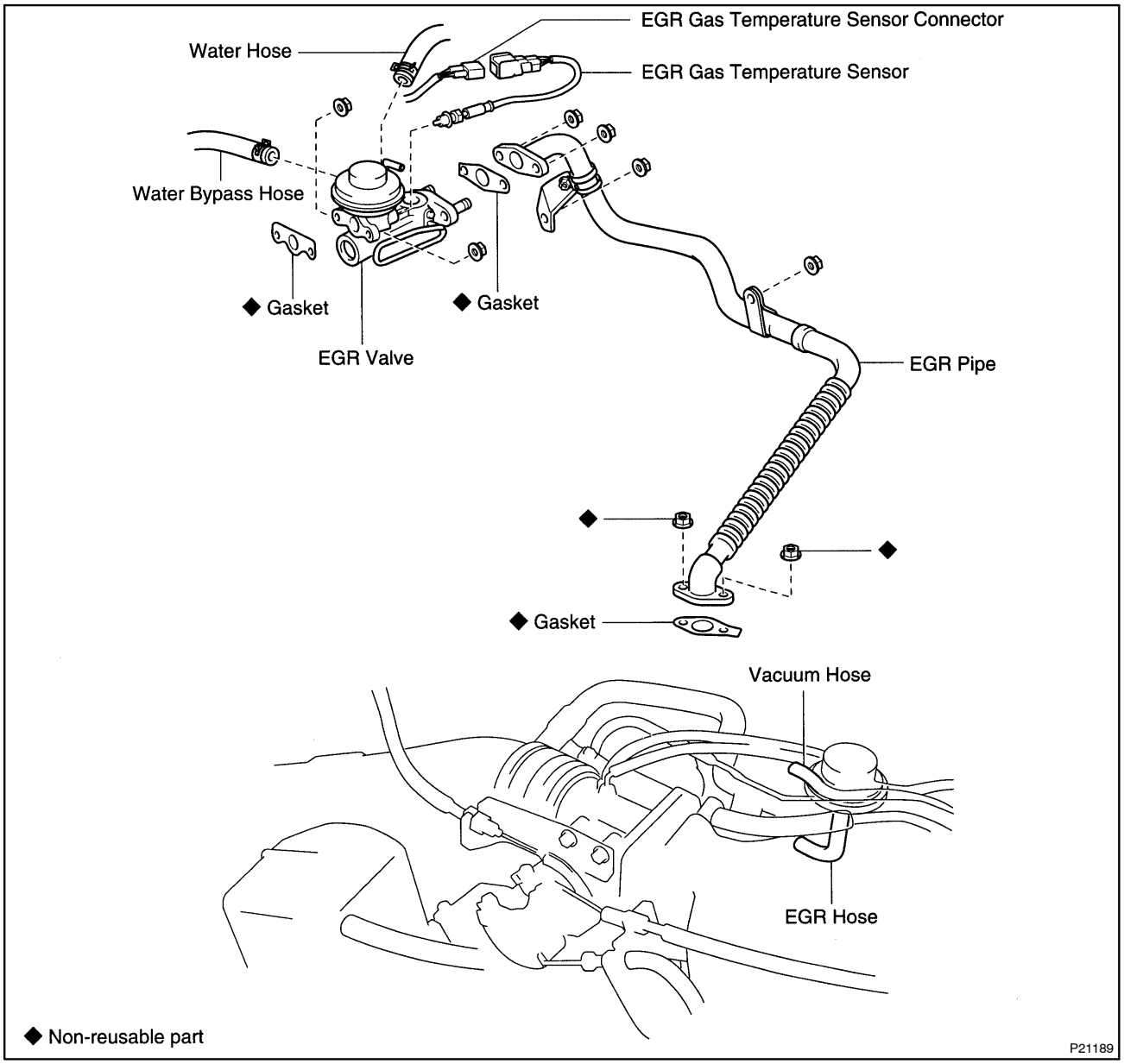
11. REINSTALL CHARCOAL CANISTER

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EXHAUST GAS RECIRCULATION (EGR) SYSTEM

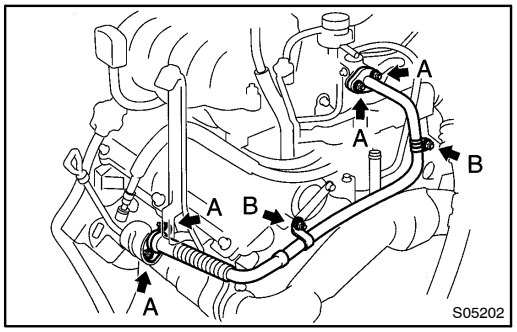
COMPONENTS

EC02V–02



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EC02Z–03



REMOVAL

1. DRAIN ENGINE COOLANT

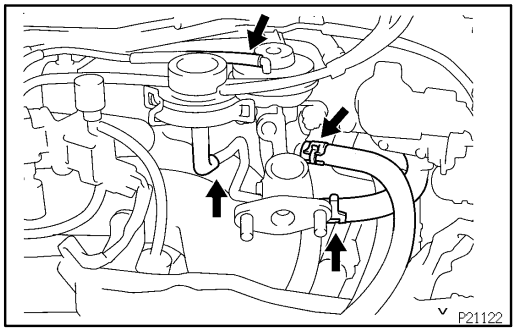
2. REMOVE EGR PIPE

Remove the 6 nuts, EGR pipe and 2 gaskets.

HINT:

At the time of installation, please refer to the following item.Install 2 new gaskets.

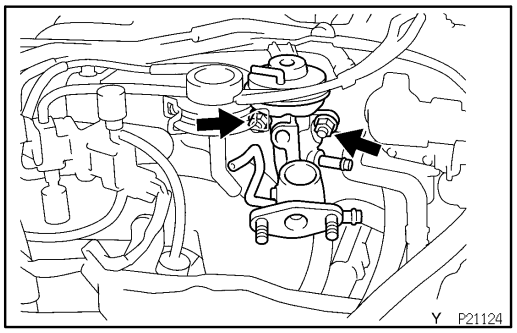
Torque:
Nut A: 18.5 N·m (185 kgf·cm, 14 ft·lbf)
Nut B: 8.0 N·m (80 kgf·cm, 71 in.·lbf)



3. REMOVE EGR GAS TEMPERATURE SENSOR

4. REMOVE EGR VALVE

(a) Disconnect these hoses from the EGR valve:
- Vacuum hose (from VSV for EGR)
- EGR hose (from EGR vacuum modulator)
- Water hose (from water bypass pipe)
- Water bypass hose (from IAC valve)



(b) Remove the 2 nuts, EGR valve and gasket.
Torque: 18.5 N·m (185 kgf·cm, 14 ft·lbf)

HINT:

Use a new gasket.

At the time of installation, please refer to the following item.

(c) Check for sticking and heavy carbon deposits. If problem is found, replace the EGR valve.

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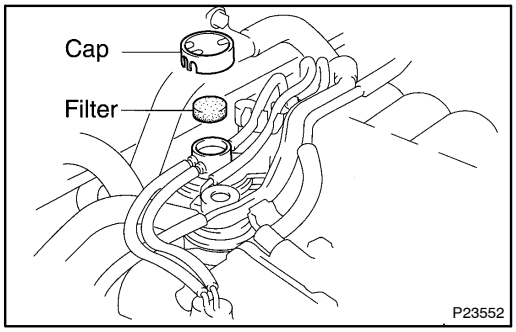
EC02W–02

INSPECTION

1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

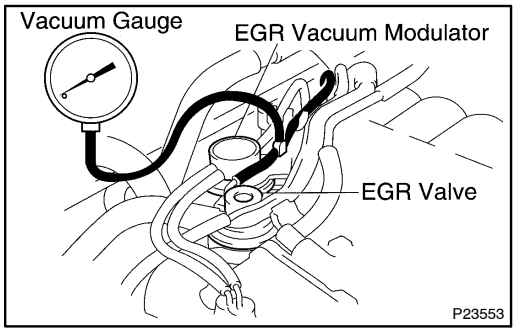
(a) Remove the cap and filter.
(b) Check the filter for contamination or damage.
(c) Using compressed air, clean the filter.
(d) Reinstall the filter and cap.

HINT:
Install the filter with the coarser surface facing out to the atmospheric side.



2. INSTALL VACUUM GAUGE

Using a 3–way connector, connect a vacuum gauge to the hose between the EGR valve and VSV.

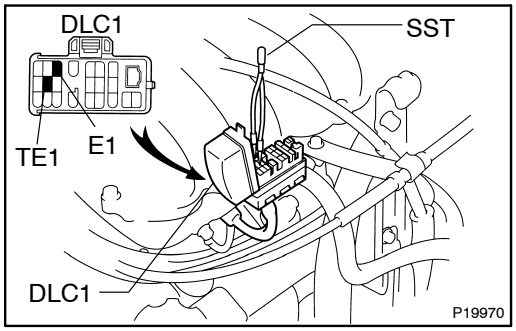


3. INSPECT SEATING OF EGR VALVE

Check that the engine starts and runs at idle.

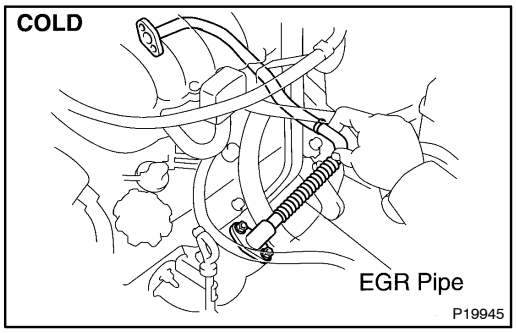
4. CONNECT TERMINALS TE1 AND E1

Using SST, connect terminals TE1 and E1 of the DLC1.
SST 09843–18020



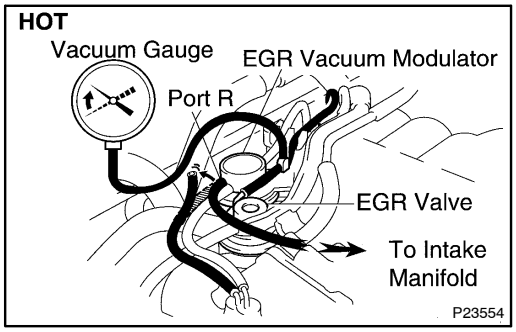
5. INSPECT VSV OPERATION WITH COLD ENGINE

(a) The engine coolant temperature should be below 45°C (113°F).
(b) Check that the vacuum gauge indicates zero at 2,800 rpm.
(c) Check that the EGR pipe is not hot.



6. INSPECT OPERATION OF VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine to above 80°C (176°F).
(b) Check that the vacuum gauge indicates low vacuum at 2,800 rpm.
(c) Disconnect the vacuum hose from port R of the EGR vacuum modulator and connect port R directly to the intake manifold with another hose.



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(d) Check that the vacuum gauge indicates high vacuum at 3,500 rpm.

HINT:

As exhaust gas is increasingly recirculated, the engine will start to misfire.

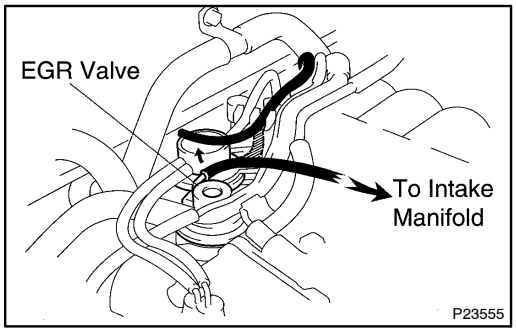
7. DISCONNECT TERMINALS TE1 AND E1

Remove the SST from the DLC1.

SST 09843–18020

8. REMOVE VACUUM GAUGE

Remove the vacuum gauge, and reconnect the vacuum hoses to their proper locations.



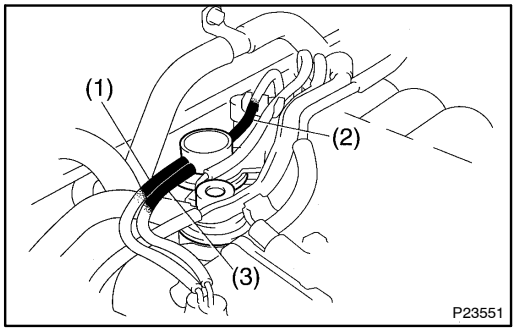
9. INSPECT EGR VALVE

(a) Apply vacuum directly to the EGR valve with the engine idle.

(b) Check that the engine runs rough or dies.

(c) Reconnect the vacuum hoses to their proper locations.

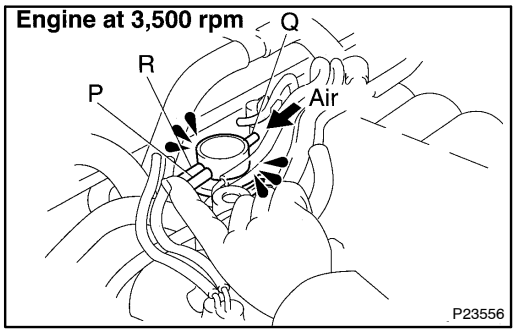
If no problem is found during this inspection, system is normal; otherwise inspect each part.



10. DISCONNECT VACUUM HOSES FROM EGR VACUUM MODULATOR

Disconnect these vacuum hoses:

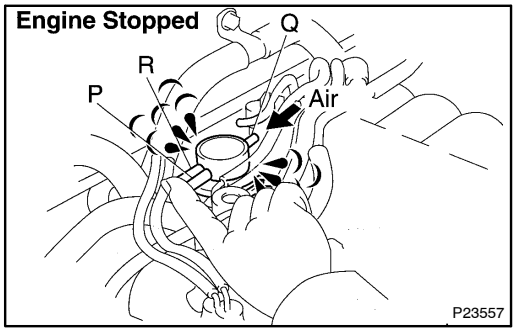
(1) Vacuum hose from R port
(2) Vacuum hose from Q port
(3) Vacuum hose from P port



11. INSPECT EGR VACUUM MODULATOR OPERATION

(a) Block ports P and R with your finger.

(b) Blow air into port Q, and check that the air passes through to the air filter side freely.



(c) Start the engine, and maintain speed at 3,500 rpm.

(d) Repeat the above test. Check that there is a strong resistance to air flow.

12. RECONNECT VACUUM HOSES TO EGR VACUUM MODULATOR

Connect these vacuum hoses:

(1) Vacuum hose to R port
(2) Vacuum hose to Q port
(3) Vacuum hose to P port

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EC02X–02

INSTALLATION

Installation is in the reverse order of removal (See page EC–8).

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THREE–WAY CATALYTIC CONVERTER (TWC) SYSTEM

EC030–01

INSPECTION

1. CHECK TWC FOR DENTS OR DAMAGE

If any part of the protector is damaged or dented to the extent that it contacts the three–way catalytic converter, repair or replace it.

2. CHECK CONNECTIONS EXHAUST PIPE FOR LOOSENESS OR DAMAGE

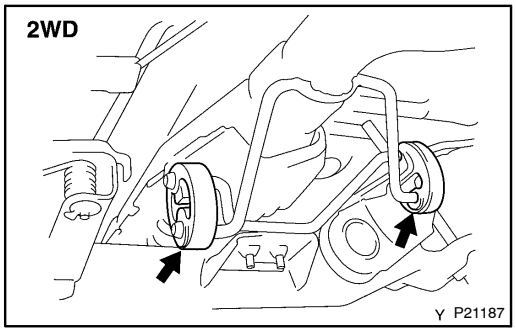
3. CHECK EXHAUST PIPE CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE

4. CHECK HEAT INSULATOR FOR DAMAGE

5. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR

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EC031–04



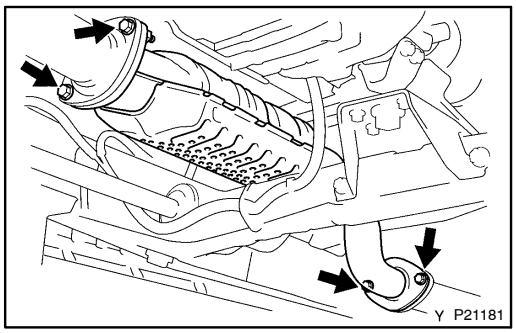
REPLACEMENT

1. REMOVE CENTER EXHAUST PIPE

(a) 2WD:
Disconnect the 2 rings from the support bracket.

(b) Remove the 2 nuts and gasket, and disconnect the heated oxygen sensor (bank 1 sensor 2).
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

HINT:
Use a new gasket.



(c) Remove the 4 bolts, TWC joint retainer, center exhaust pipe and 2 gasket.
Torque: 48 N·m (490 kgf·cm, 35 ft·lbf)

2. REINSTALL CENTER EXHAUST PIPE

HINT:
Place 2 new gaskets on the front exhaust and tail pipes, and temporarily install the center exhaust pipe.

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MF – MFI SYSTEM (3RZ-FE)

MFI SYSTEM	MF-1
FUEL PUMP	MF-5
FUEL PRESSURE REGULATOR	MF-13
INJECTOR	MF-16
FUEL TANK AND LINE	MF-23
THROTTLE BODY	MF-25
IDLE AIR CONTROL (IAC) VALVE	MF-31
MASS AIR FLOW (MAF) METER	MF-36
EFI MAIN RELAY	MF-40
CIRCUIT OPENING RELAY	MF-41
VSV FOR EVAPORATIVE EMISSION (EVAP)	MF-43
VSV FOR EXHAUST GAS RECIRCULATION (EGR)	MF-44
ENGINE COOLANT TEMPERATURE (ECT) SENSOR	MF-45
INTAKE AIR TEMPERATURE (IAT) SENSOR	MF-46
KNOCK SENSOR	MF-47
EXHAUST GAS RECIRCULATION (EGR) GAS TEMPERATURE SENSOR	MF-48
HEATED OXYGEN SENSOR	MF-49
ENGINE CONTROL MODULE (ECM)	MF-50
FUEL CUT RPM	MF-54

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MFI SYSTEM

PRECAUTION

SF0AF–04

1. BEFORE WORKING ON FUEL SYSTEM, DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

HINT:

Any diagnostic trouble code retained by the ECM will be erased when the battery negative (–) terminal cable is removed from the battery.

Therefore, if necessary, read the diagnostic trouble code(s) before removing the negative (–) terminal cable from the battery.

2. DO NOT SMOKE OR WORK NEAR AN OPEN FLAME WHEN WORKING ON FUEL SYSTEM

3. KEEP GASOLINE AWAY FROM RUBBER OR LEATHER PARTS

4. MAINTENANCE PRECAUTIONS

(a) Precaution when the connecting gauge.
Use battery as the power source for the timing light, etc.

(b) In the event of engine misfire, these precautions should be taken.
  (1) Check proper connection of battery terminals, etc.
  (2) Handle high–tension cords carefully.
  (3) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely.
  (4) When cleaning the engine compartment, be especially careful to protect the electrical system from water.

(c) Precautions when the handling heated oxygen sensors.
  (1) Do not allow oxygen sensor to drop or hit against an object.
  (2) Do not allow the sensor to come into contact with water.

If Vehicle is Equipped with Mobile Radio System (ham, cb, etc.)
If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

5. AIR INDUCTION SYSTEM

(a) Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.

(b) Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will cause air suction and cause the engine to run out of tune.

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6. ELECTRONIC CONTROL SYSTEM

(a) Before removing SFI wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch to LOCK or disconnecting the negative (–) terminal cable from the battery.

HINT:

Always check the diagnostic trouble code before disconnecting the battery terminal cable.

(b) When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (–) cable terminals.

(c) Do not permit parts to receive a severe impact during removal or installation. Handle all SFI parts carefully, especially the ECM.

(d) Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can further troubles.

(e) Do not open the ECM cover.

(f) When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the SFI parts and wiring connectors.

(g) Parts should be replaced as an assembly.

(h) Care is required when pulling out and inserting wiring connectors.

(1) Release the lock and pull out the connector, pulling on the connectors.

(2) Fully insert the connector and check that it is locked.

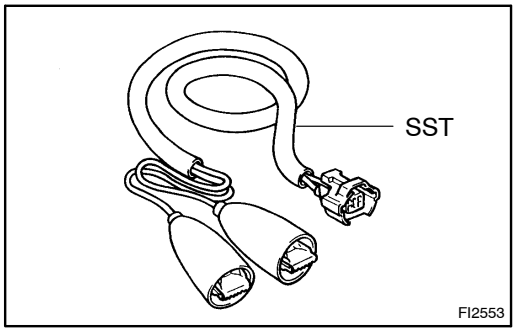
(i) When inspecting a connector with a volt/ohmmeter.

(1) Carefully take out the water–proofing rubber if it is a water–proof type connector.

(2) Insert the test probe into the connector from wiring side when checking the continuity, amperage or voltage.

(3) Do not apply unnecessary force to the terminal.

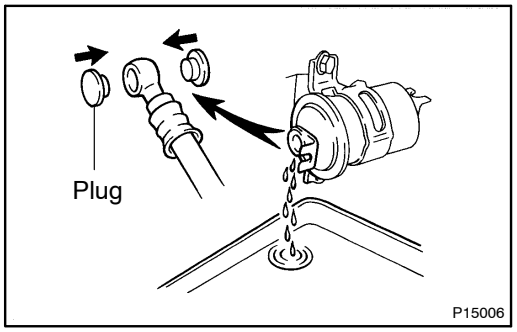
(4) After checking, install the water–proofing rubber on the connector securely.



(5) Use SST for inspection or test of the injector or its wiring connector.

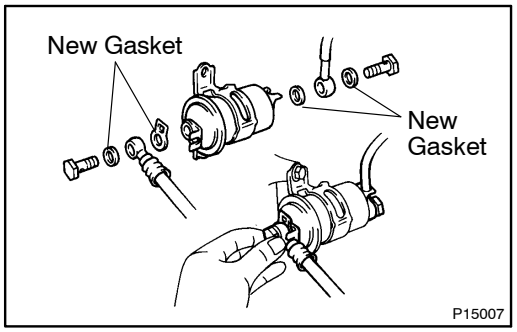
SST 09842–30070

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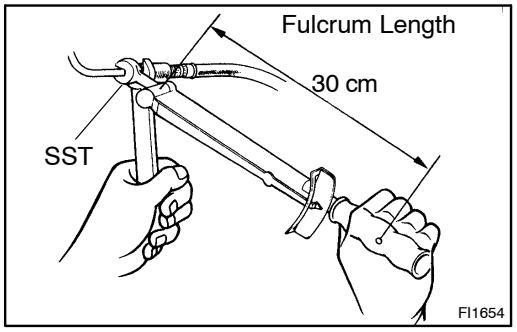


7. FUEL SYSTEM

(a) When disconnecting the high pressure fuel line, a large amount of gasoline will spill out, so observe these procedures:
(1) Put a container under the connection.
(2) Slowly loosen the connection.
(3) Disconnect the connection.
(4) Plug the connection with a rubber plug.

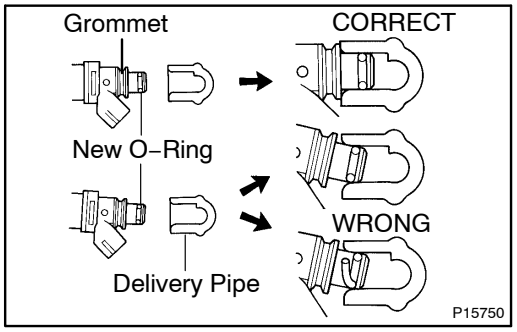


(b) When connecting the flare nut or union bolt on the high pressure pipe union, observe these procedures:
(1) (Union Bolt Type)
Always use a new gasket.
(2) (Union Bolt Type)
Tighten the union bolt by hand.
(3) (Union Bolt Type)
Tighten the union bolt to the specified torque.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

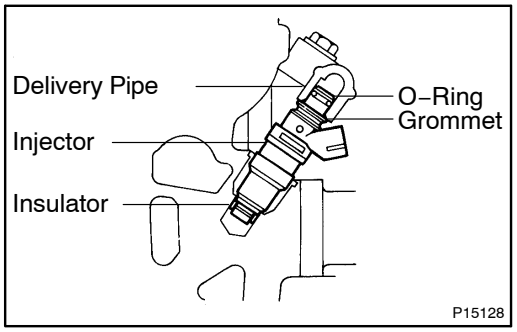


(4) (Flare Nut Type)
Apply a light coat of engine oil to the flare and tighten the flare nut by hand.
(5) (Flare Nut Type)
Using SST, tighten the flare nut to the specified torque.
SST 09631–22020
Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)

HINT:
Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).

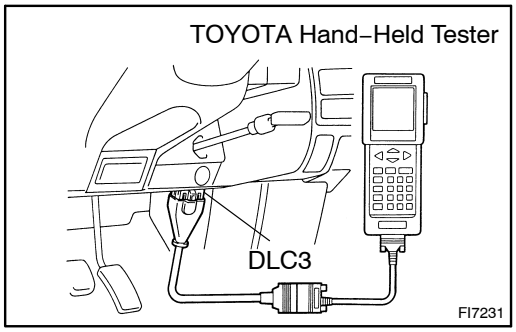


(c) Observe these precautions when removing and installing the injectors.
(1) Never reuse the O–ring.
(2) When placing a new O–ring on the injector, take care not to damage it in any way.
(3) Coat a new O–ring with spindle oil or gasoline before installing–never use engine, gear or brake oil.



(d) Install the injector to the delivery pipe and cylinder head as shown in the illustration.

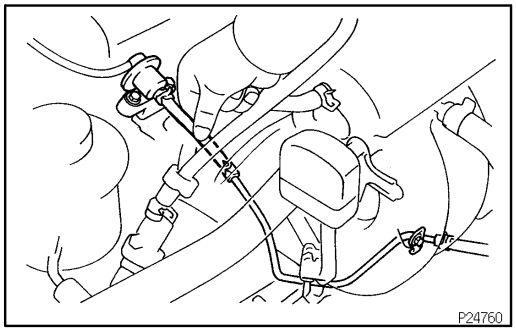
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(e) Check that there are no fuel leaks after doing maintenance anywhere on the fuel system.
(1) Connect the TOYOTA hand–held tester to the DLC3.
(2) Turn ignition switch ON and TOYOTA hand–held tester main switch ON.

NOTICE:
Do not start the engine

(3) Select the active test mode on the TOYOTA hand–held tester.
(4) Please refer to the TOYOTA hand–held tester operator's manual for further details.

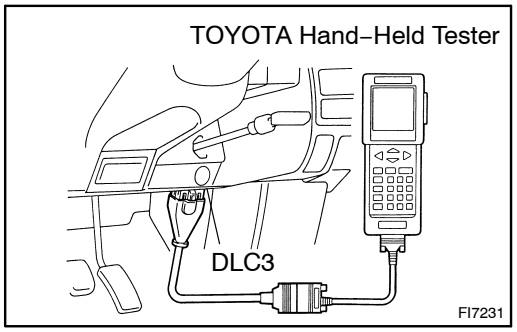


(5) If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector.
(See page MF–10)
(6) Pinch the fuel return hose. The pressure in high pressure line will rise to approx. 400 kPa (4 kgf/cm^2, 57 psi). In this state, check to see that there are no leaks from any part of the fuel system.

NOTICE:
Always pinch the hose. Avoid bending as it may cause to hose to crack.

(7) Turn the ignition switch to LOCK.
(8) Disconnect the TOYOTA hand–held tester from the DLC3.

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FUEL PUMP

SF0AG–03

ON–VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

(a) Connect the TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

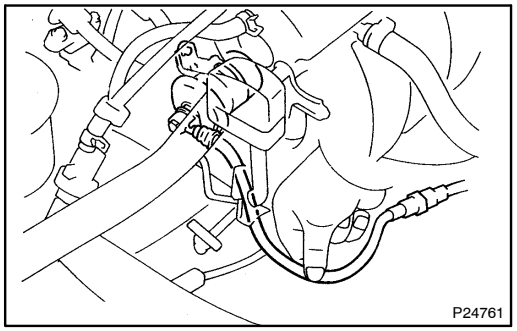
NOTICE:

Do not start the engine.

(c) Select the active test mode on the TOYOTA hand–held tester.

(d) Please refer to the TOYOTA hand–held tester operator's manual for further details.

(e) If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector.
(See page MF–10)



(f) Check that there is pressure in the hose from the fuel filter.

HINT:

At this time, you will hear fuel return noise.

If there is no pressure, check these parts:

- Fusible links (AM1 40A, AM2 30A, ALT 80A)
- Fuses (EFI 15A, IGN 7.5A)
- EFI main relay
- Fuel pump
- ECM
- Wiring connections

(g) Turn the ignition switch to LOCK.

(h) Remove the TOYOTA hand–held tester.

2. CHECK FUEL PRESSURE

(a) Check that the battery voltage is above 12 volts.

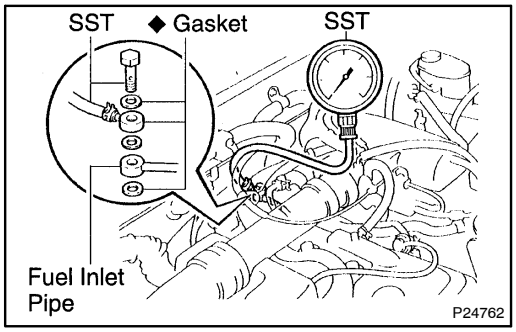
(b) Disconnect the negative (–) terminal cable from the battery.

(c) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet pipe from the delivery pipe.

HINT:

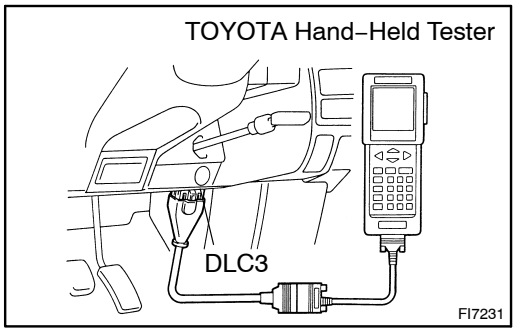
- Put a suitable container or shop rag under the delivery pipe.
- Slowly loosen the union bolt.

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(d) Install the fuel inlet pipe and SST (pressure gauge) to the delivery pipe with 3 gaskets and SST (union bolt).
SST 09268–45012
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

(e) Wipe off any splattered gasoline.



(f) Connect the TOYOTA hand–held tester to the DLC3.

(g) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.

NOTICE:
Do not start the engine.

(h) Select the active test mode on the TOYOTA hand–held tester.

(i) Please refer to the TOYOTA hand–held tester operator's manual for further details.

(j) If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector.
(See page MF–10)

(k) Reconnect the negative (–) terminal cable to the battery.

(l) Turn the ignition switch ON.

(m) Measure the fuel pressure.
Fuel pressure:
265 – 304 kPa (2.7 – 3.1 kgf/cm^2, 38 – 44 psi)

If pressure is high, replace the fuel pressure regulator.

If pressure is low, check these parts:
- Fuel hoses and connections
- Fuel pump
- Fuel filter
- Fuel pressure regulator
- Injectors

(n) Remove the TOYOTA hand–held tester.

(o) Start the engine.

(p) Disconnect the vacuum sensing hose from the fuel pressure regulator, and plug the hose end.

(q) Measure the fuel pressure at idle.
Fuel pressure:
265 – 304 kPa (2.7 – 3.1 kgf/cm^2, 38 – 44 psi)

(r) Reconnect the vacuum sensing hose to the fuel pressure regulator.

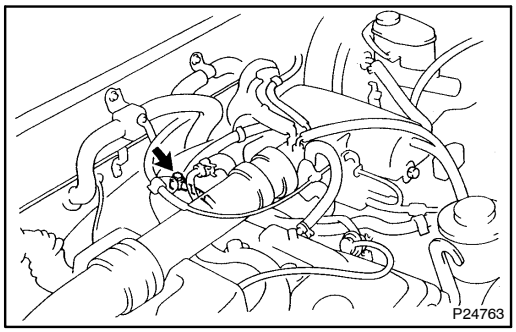
(s) Measure the fuel pressure at idle.
Fuel pressure:
206 – 255 kPa (2.1 – 2.6 kgf/cm^2, 31 – 37 psi)

If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.

(t) Stop the engine.

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(u) Check that the fuel pressure remains as specified for 5 minutes after the engine has stopped.
Fuel pressure:
147 kPa (1.5 kgf/cm^2, 21 psi) or more
If pressure is not as specified, check the fuel pump, pressure regulator and/or injector.

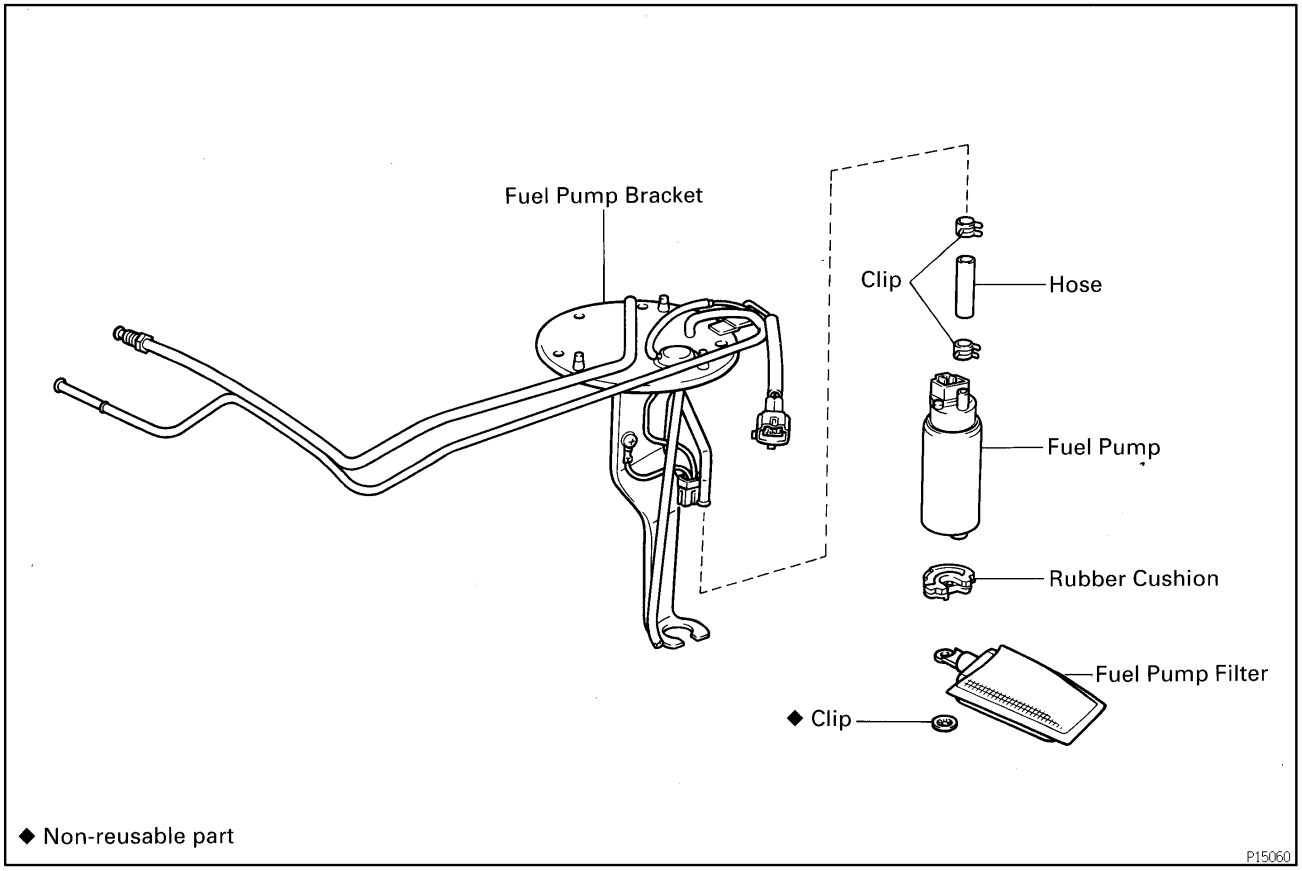


(v) After checking fuel pressure, disconnect the negative (–) terminal cable from the battery and carefully remove SST to prevent gasoline from splashing.
SST 09268–45012
(w) Reconnect the fuel inlet pipe to the delivery pipe with 2 new gaskets and the union bolt.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)
(x) Reconnect the negative (–) terminal cable to the battery.
(y) Check for fuel leakage.

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SF0AH–03

COMPONENTS



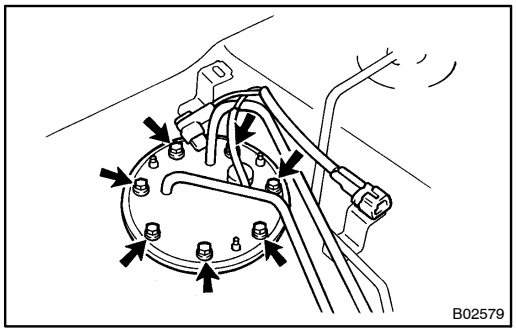
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SF0AI–02

REMOVAL

CAUTION:
Do not smoke or work near an open flame when working on the fuel pump.

1. REMOVE FUEL TANK
(See page MF–23)



2. REMOVE FUEL PUMP BRACKET ASSEMBLY FROM FUEL TANK

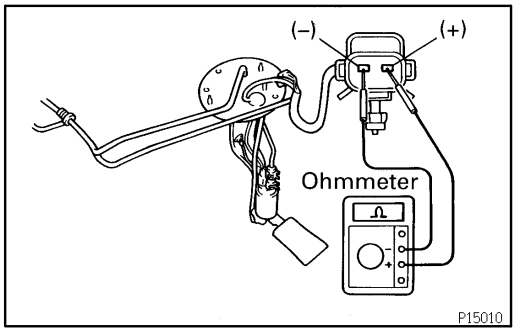
(a) Disconnect the fuel pump connector from the clamp.
(b) Remove the 7 bolts.
Torque: 3.9 N·m (40 kgf·cm, 35 in.·lbf)
(c) Pull out the pump bracket assembly.
(d) Remove the gasket from the pump bracket.

HINT:
At the time assembly please refer to the following items.
Install the fuel pump bracket with a new gasket.

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SF0AJ–03

DISASSEMBLY

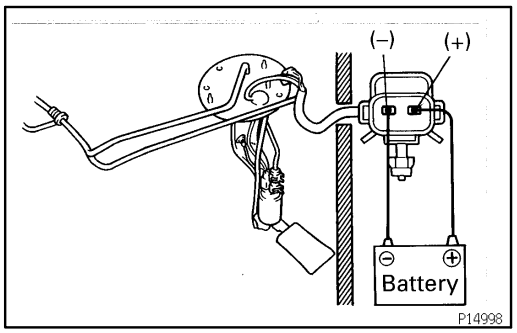


1. INSPECT FUEL PUMP RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

Resistance: 0.2 – 3.0 Ω at 20°C (68°F)

If the resistance is not as specified, replace the fuel pump and/or set plate.



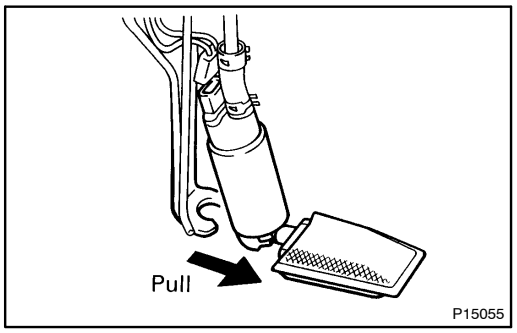
2. INSPECT FUEL PUMP OPERATION

Connect the positive (+) lead from the battery to terminal 1 of the connector, and the negative (–) lead to terminal 2. Check that the fuel pump operates.

NOTICE:

These tests must be done quickly (within 10 seconds) to prevent the coil from burning out. Keep the fuel pump as far away from the battery as possible. Always do the switching at the battery side.

If operation is not as specified, replace the fuel pump and/or plate.



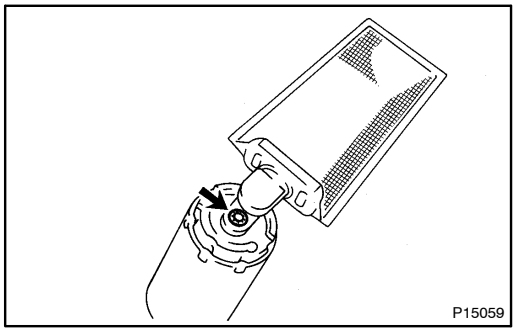
3. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET

(a) Disconnect the fuel pump connector.

(b) Pull off the lower side of the fuel pump from the pump bracket.

(c) Disconnect the fuel hose from the fuel pump, and remove the fuel pump.

(d) Remove the rubber cushion from the fuel pump.



4. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

(a) Using a small screwdriver, remove the clip.

(b) Pull out the pump filter.

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SF0AK–02

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page MF–10).

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SF0AL–03

INSTALLATION

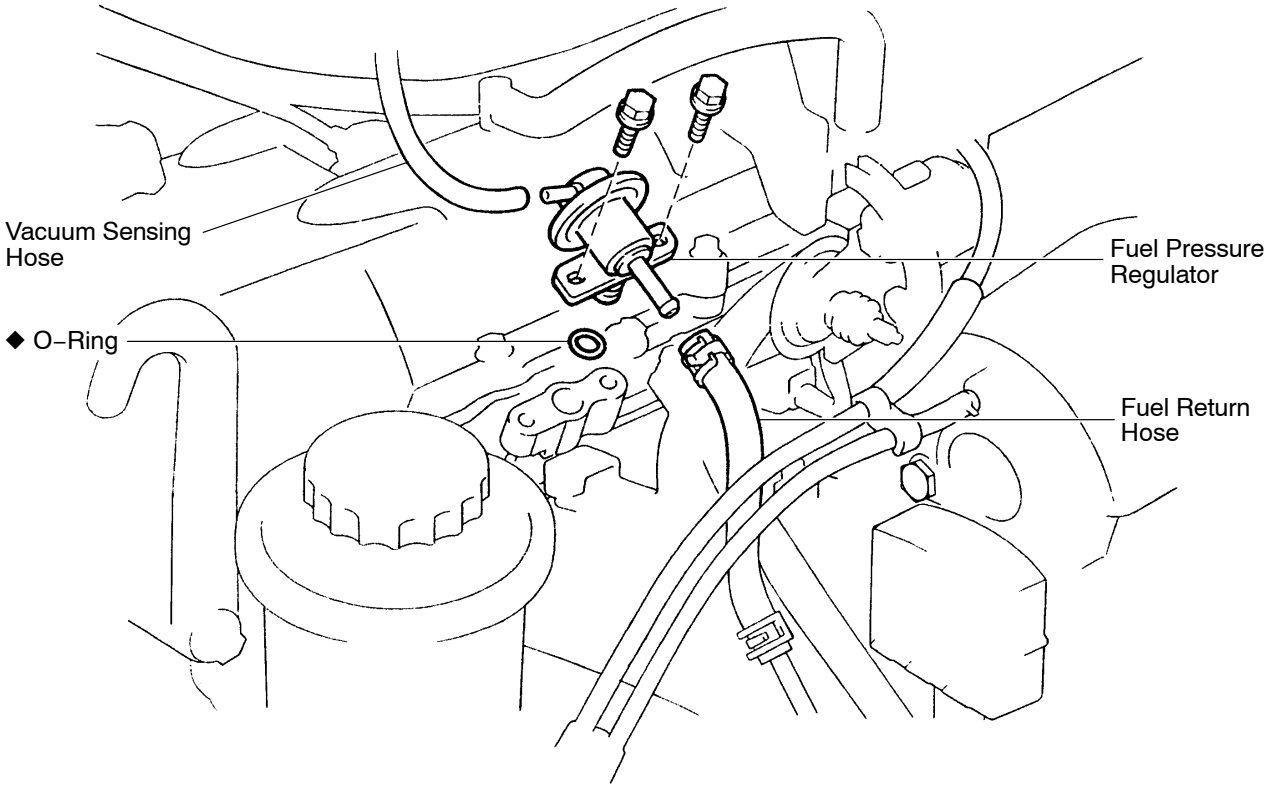
Installation is in the reverse order of removal (See page MF–9).

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FUEL PRESSURE REGULATOR

COMPONENTS

SF0AM–02



◆ Non–reusable part

P25123

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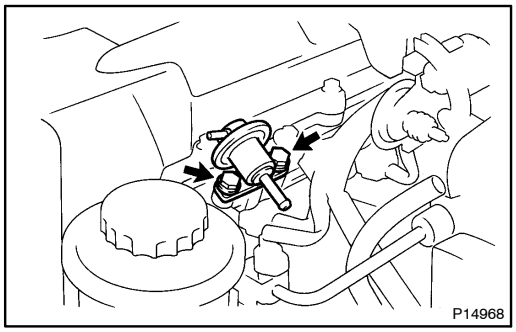
SF0AN–03

REMOVAL

1. **DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR**
2. **DISCONNECT FUEL RETURN HOSE FROM FUEL PRESSURE REGULATOR**

HINT:

Put a suitable container or shop towel under the pressure regulator.



3. **REMOVE FUEL PRESSURE REGULATOR**

(a) Remove the 2 bolts and the fuel pressure regulator.
Torque: 8.8 N·m (90 kgf·cm, 78 in.·lbf)

(b) Remove the O–ring.

HINT:

At the time of installation please refer to the following items.
Install the pressure regulator with a new O–ring.

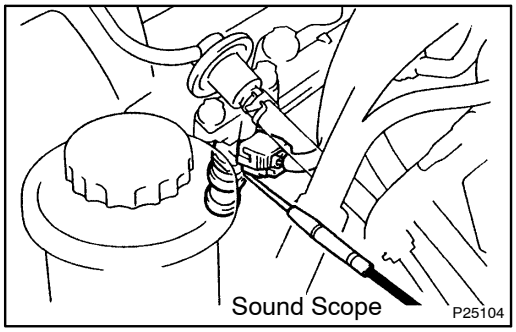
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SF0AO–03

INSTALLATION

Installation is in the reverse order of removal (See page MF–14).

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INJECTOR

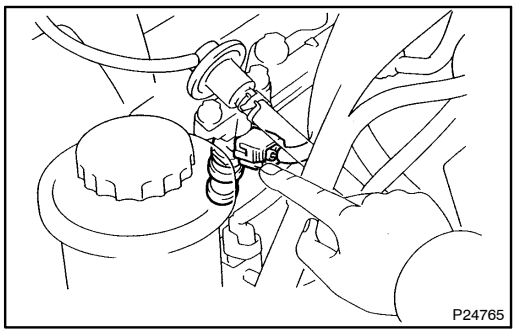
SF0AP–03

ON–VEHICLE INSPECTION

1. INSPECT INJECTOR OPERATION

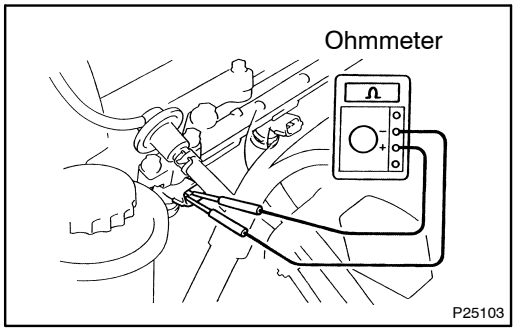
Check operation sound from each injector.

(1) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine speed.



(2) If you have no sound scope, you can check the injector transmission operation with your finger.

If no sound or unusual sound is heard, check the wiring connector, injector or injection signal from the ECM.



2. INSPECT INJECTOR RESISTANCE

(a) Remove the throttle body.
(See page MF–28)

(b) Disconnect the injector connectors.

(c) Using an ohmmeter, measure the resistance between the terminals.

Resistance:
12 – 16 Ω at 20°C (68°F)

If the resistance is not as specified, replace the injector.

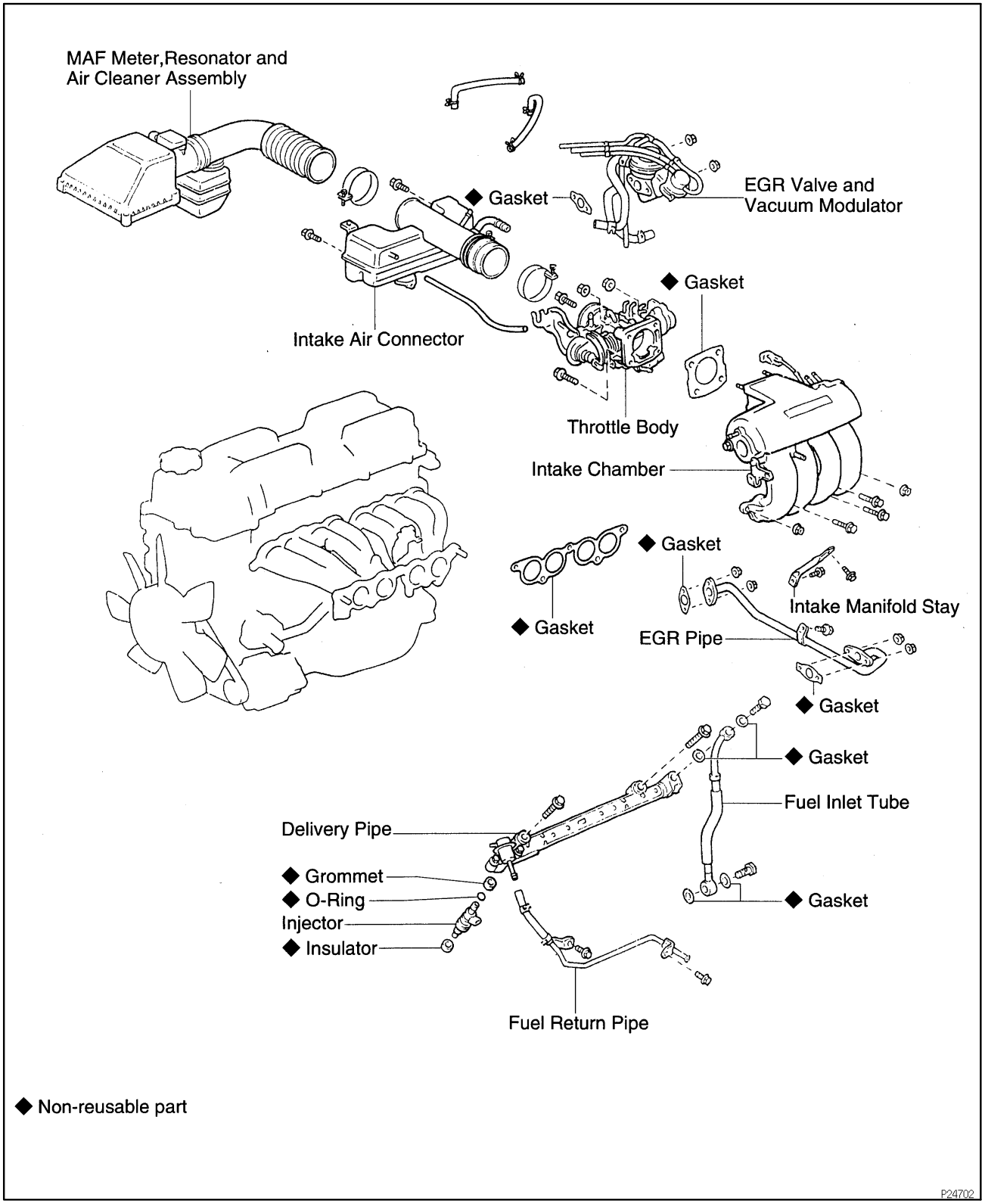
(d) Reconnect the injector connectors.

(e) Reinstall the throttle body.
(See page MF–30)

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SF0AQ–02

COMPONENTS

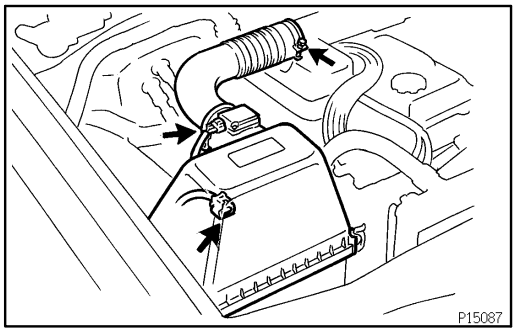


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SF1QI–01

REMOVAL

1. DRAIN ENGINE COOLANT



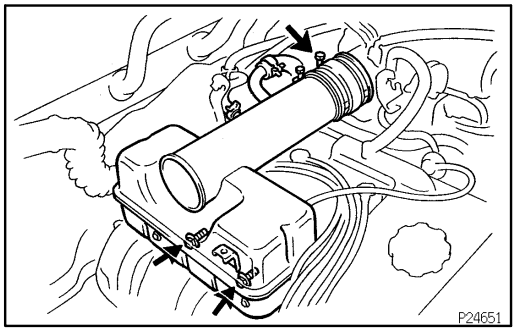
2. REMOVE AIR CLEANER CAP, MAF METER AND RESONATOR

(a) Disconnect the MAF meter connector, IAT sensor connector and wire clamp.

(b) Loosen the air cleaner hose clamp.

(c) Loosen the 4 clips, and remove the air cleaner cap, MAF meter and resonator.

3. M/T:
DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY



4. A/T:
DISCONNECT THROTTLE AND ACCELERATOR CABLES FROM THROTTLE BODY

5. REMOVE INTAKE AIR CONNECTOR

(a) Disconnect the 2 air hoses.

(b) Remove the 2 bolts, hose clamp and intake air connector.

6. REMOVE NO. 1 AND NO. 2 PCV HOSES

7. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS

NOTICE:

Pulling on or bending the cords may damage the conductor inside.

Disconnect the distributor connector.

8. REMOVE THROTTLE BODY (See page MF–28)

9. REMOVE DELIVERY PIPE AND INJECTORS

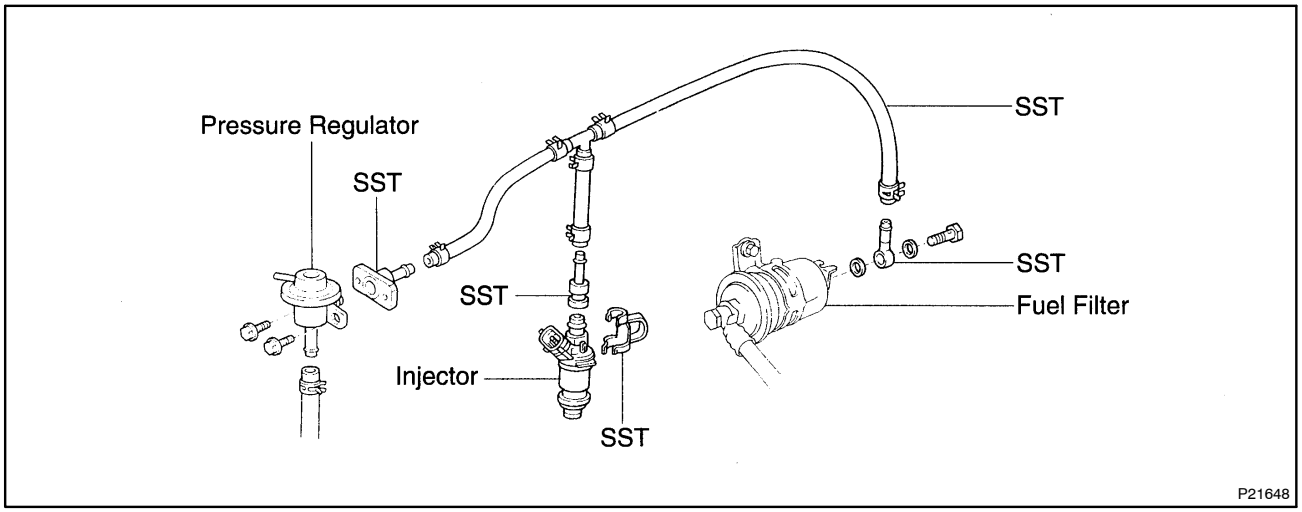
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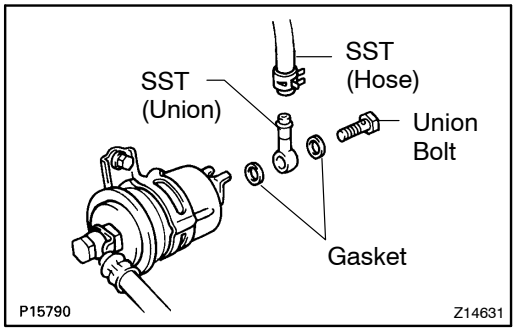
SF0AS–03

INSPECTION

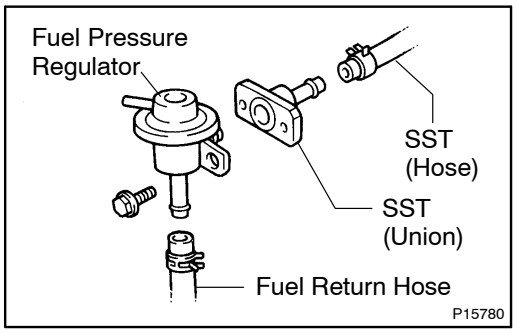
1. INSPECT INJECTOR INJECTION

CAUTION:
Keep injector clean of sparks during the test.

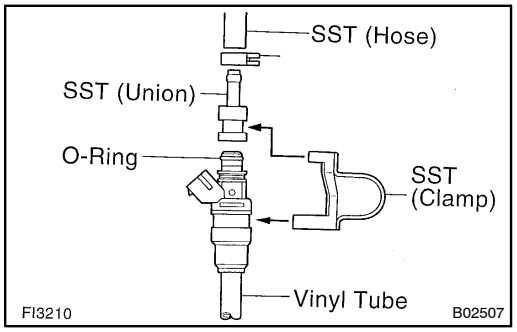




(a) Connect SST (union and hose) to the fuel filter outlet with 2 gaskets and the union bolt.
SST 09268–41046 (90405–09015)
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

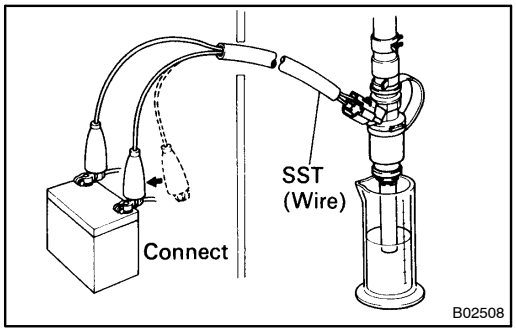


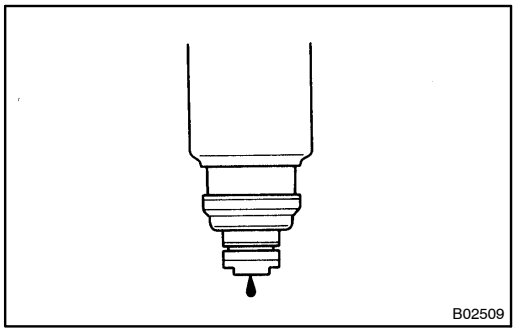
(b) Remove the fuel pressure regulator.
(c) Install the O–ring to the fuel inlet of pressure regulator.
(d) Connect SST (hose) to the fuel inlet of the pressure regulator with SST (union) and the 2 bolts.
SST 09268–41046 (09268–41091)
(e) Connect the fuel return hose to the fuel outlet of the pressure regulator.



(f) Install the grommet and O–ring to the injector.
(g) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp).
SST 09268–41046
(h) Put the injector into a graduated cylinder.
HINT:
Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.
(i) Connect the TOYOTA hand–held tester to the DLC3.
(See page MF–5)

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(j) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector 2 or 3 times.
SST 09842–30070
Volume:
69 – 88 cm^3 (4.2 – 5.3 cu in.) per 15 seconds
Difference between each injector:
5 cm^3 (0.3 cu in.) or less

If the injection volume is not as specified, replace the injector.

2. INSPECT LEAKAGE

(a) In the condition above, disconnect the test probes of SST (wire) from the battery and check the fuel leakage from the injector.
SST 09842–30070
Fuel drop:
1 drop or less per 3 minutes

(b) Turn the ignition switch to LOCK.

(c) Disconnect the negative (–) terminal cable from battery.

(d) Remove SST and TOYOTA hand–held tester.
SST 09268–41046

(e) Reinstall the fuel pressure regulator to the delivery pipe.

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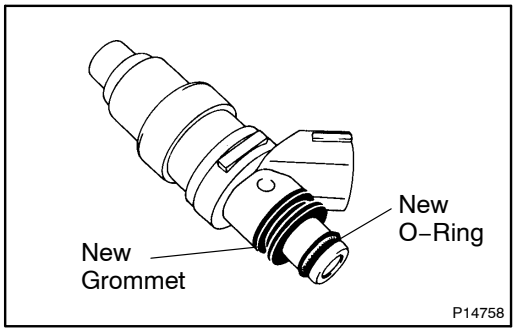
SF0AT–03

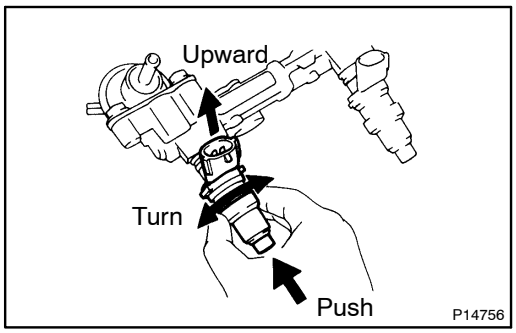
INSTALLATION

1. INSTALL INJECTORS TO DELIVERY PIPE

(a) Install a new grommet to the injector.

(b) Apply a light coat of gasoline to a new O–ring and install it to the injector.





(c) While turning the injector left and right, install it to the delivery pipe. Install the 4 injectors.

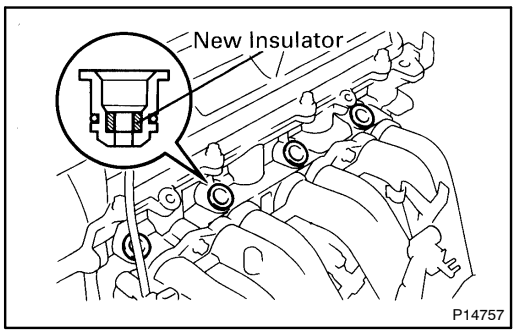
(d) Position the injector connector upward.

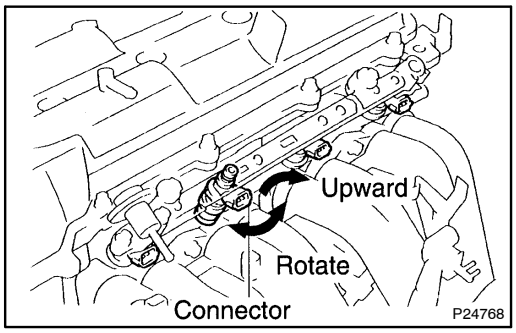
2. INSTALL INJECTORS AND DELIVERY PIPE

(a) Place the 4 new insulators and in position on the spacers.

(b) Place the 4 injectors together with the delivery pipe in position on the cylinder head.

(c) Temporarily install the 2 bolts holding the delivery pipe to the cylinder head.





(d) Check that the injectors rotate smoothly.

HINT:

If injectors do not rotate smoothly, the probable cause is incorrect installation of O–rings. Replace the O–rings.

(e) Position the injector connector upward.

(f) Tighten the 2 bolts holding the delivery pipe to the cylinder head.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

3. INSTALL THROTTLE BODY (See page MF–30)

4. REINSTALL HIGH–TENSION CORDS TO SPARK PLUGS

5. INSTALL NO.1 AND NO.2 PCV HOSES

6. INSTALL AIR INTAKE CONNECTOR

7. M/T:
CONNECT ACCELERATOR CABLE TO THROTTLE BODY

8. A/T:
CONNECT THROTTLE AND ACCELERATOR CABLES TO THROTTLE BODY

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9. INSTALL MAF METER, RESONATOR AND AIR CLEANER CAP
10. FILL WITH ENGINE COOLANT
11. RECHECK ENGINE COOLANT LEVEL

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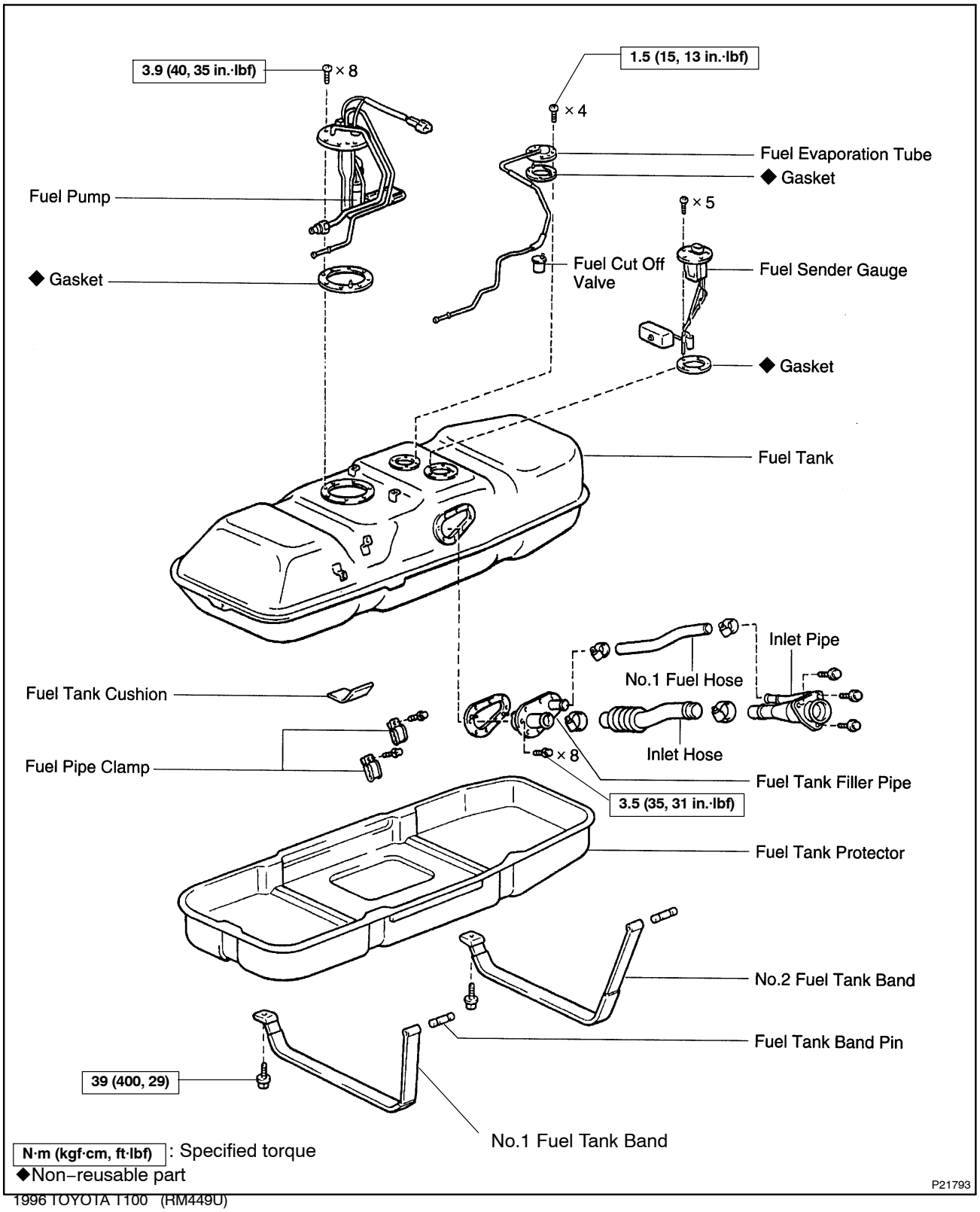
FUEL TANK AND LINE

COMPONENTS

SF0AU–02

CAUTION:

- **Always use new gaskets when replacing the fuel tank or component parts.**
- **Apply the proper torque to all parts tightened.**



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SF0AV–02

INSPECTION

INSPECT FUEL TANK AND LINE

(a) Check the fuel lines for cracks or leakage, and all connections for deformation.

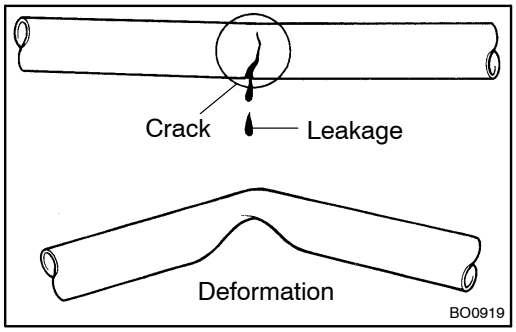
(b) Check the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.

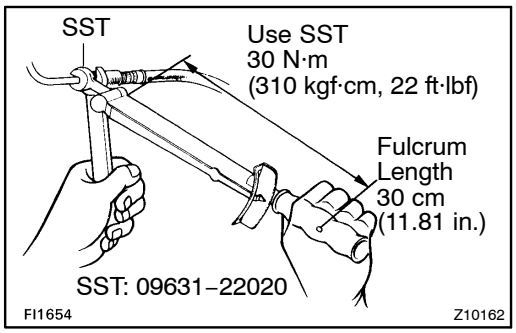
(c) Check the fuel tank for deformation, cracks, fuel leakage or tank band looseness.

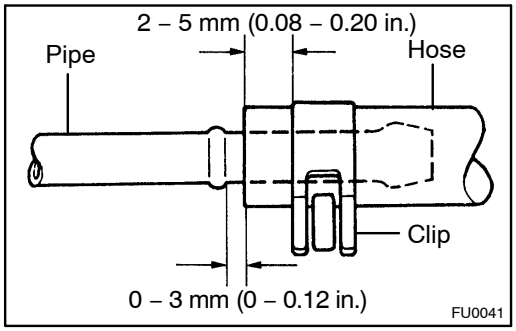
(d) Check the filler neck for damage or fuel leakage.

(e) Hose and tube connections are as shown in the illustration.

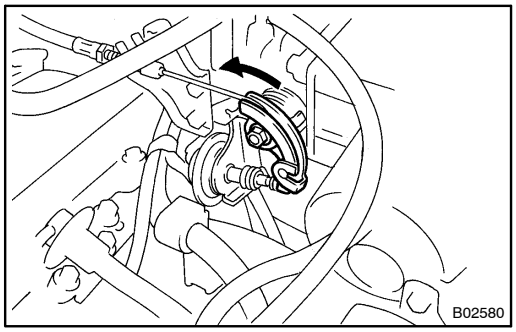
If a problem is found, repair or replace the part as necessary.







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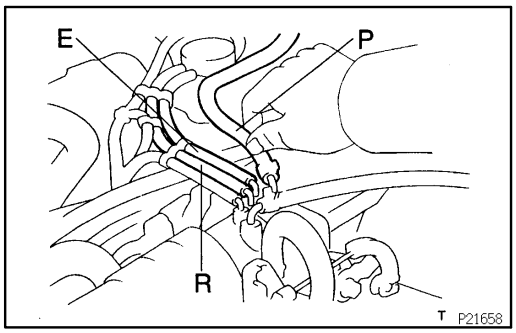
THROTTLE BODY

SF1QK–01

ON–VEHICLE INSPECTION

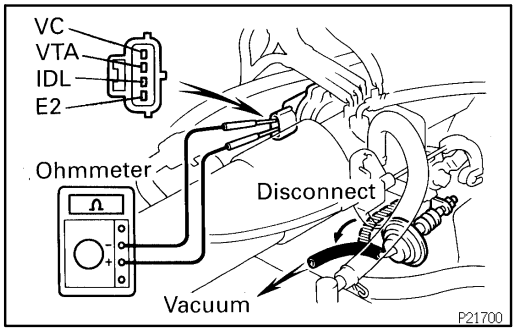
1. INSPECT THROTTLE BODY

(a) Check that the throttle linkage moves smoothly.



(b) Check the vacuum at each port.
  (1) Start the engine.
  (2) Check the vacuum with your finger.

Port name	At idle	At 3,500 rpm
P	No vacuum	Vacuum
E	No vacuum	Vacuum
R	No vacuum	Vacuum



2. INSPECT THROTTLE POSITION SENSOR

(a) Disconnect the sensor connector.
(b) Apply vacuum to the throttle opener.
(c) Using an ohmmeter, measure the resistance between each terminal.

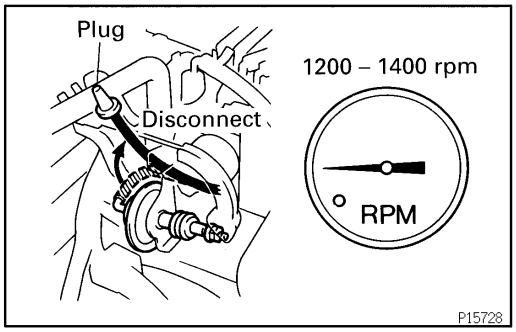
Throttle valve condition	Between terminals	Resistance
Fully closed	VTA – E2	0.2 – 5.7 kΩ
Fully closed	IDL – E2	2.3 kΩ or less
Open	IDL – E2	Infinity
Fully open	VTA – E2	2.0 – 10.2 kΩ
–	VC – E2	2.5 – 5.9 kΩ

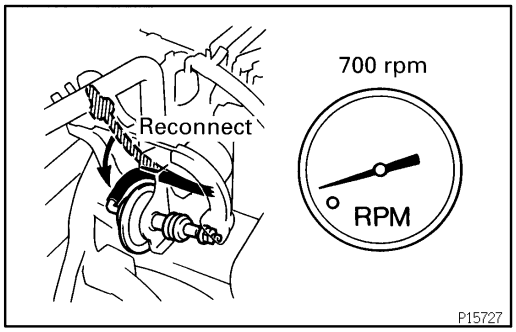
(d) Connect the sensor connector.

3. INSPECT THROTTLE OPENER

(a) Warm up engine
Allow the engine to warm up to normal operating temperature.
(b) Connect TOYOTA hand–held tester or OBD II scan tool.
(c) Check idle speed
Idle speed: 700 rpm
(d) Disconnect the vacuum hose from the throttle opener, and plug the hose end.

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(e) Check the throttle opener setting speed.

Throttle opener setting speed: 1,200 – 1,400 rpm

If the throttle opener setting is not as specified, replace the throttle body.

(f) Stop the engine.

(g) Connect the vacuum hose to the throttle opener.

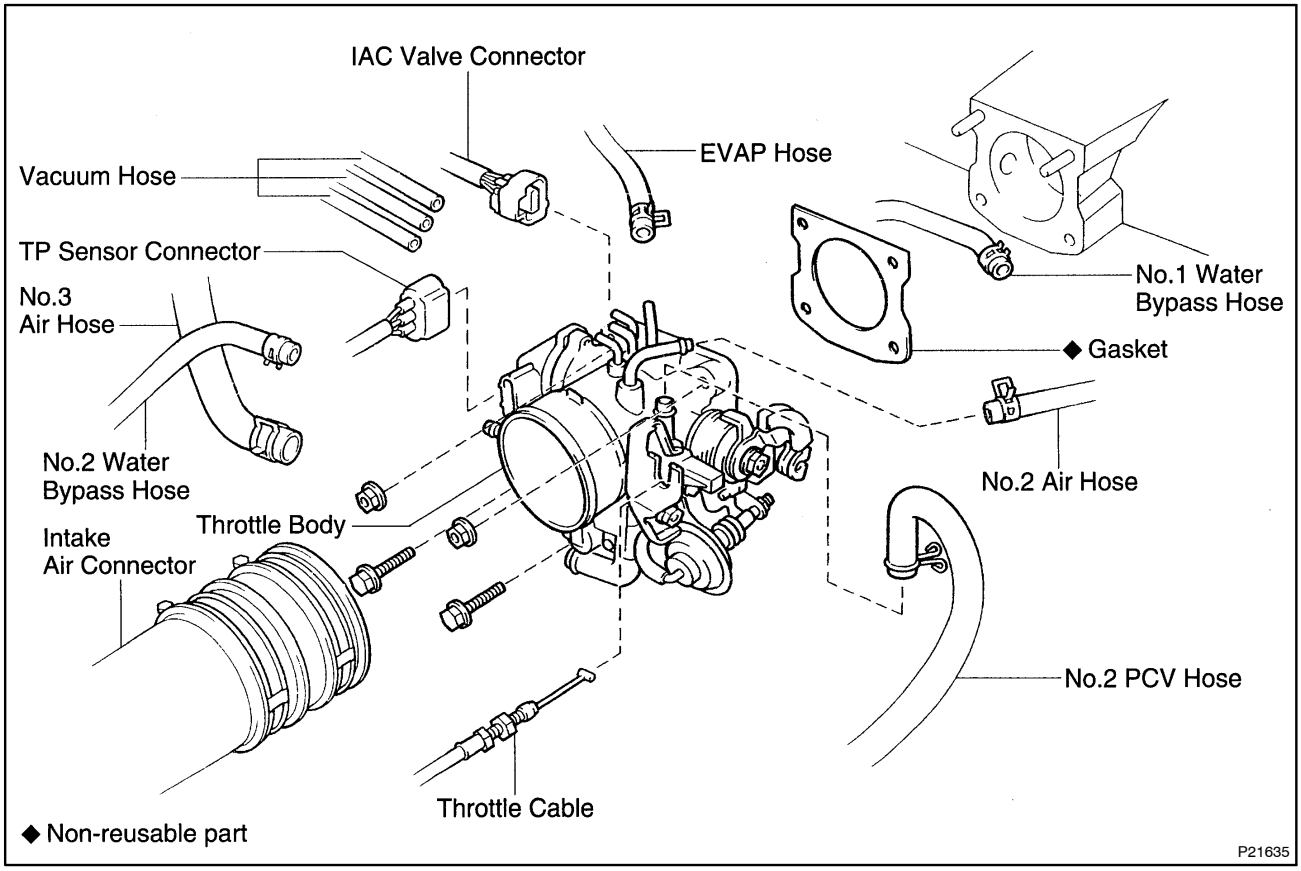
(h) Start the engine, and check that the idle speed returns to the correct speed.

(i) Disconnect TOYOTA hand–held tester or OBDII scan tool.

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SF0B1–02

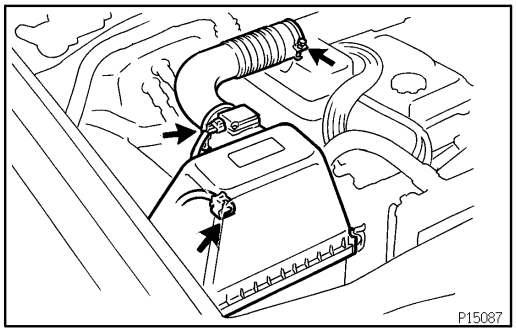
COMPONENTS



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SF0B2–02

REMOVAL



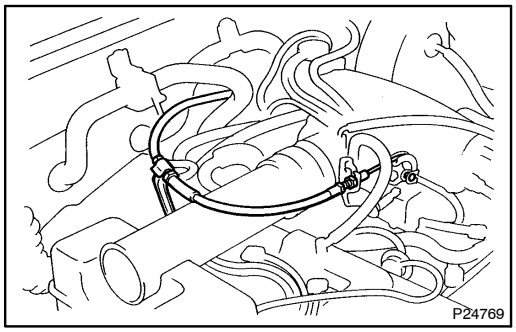
1. DRAIN ENGINE COOLANT

2. REMOVE AIR CLEANER CAP, MAF METER AND RESONATOR

(a) Disconnect the MAF meter connector, IAT sensor connector and wire clamp.

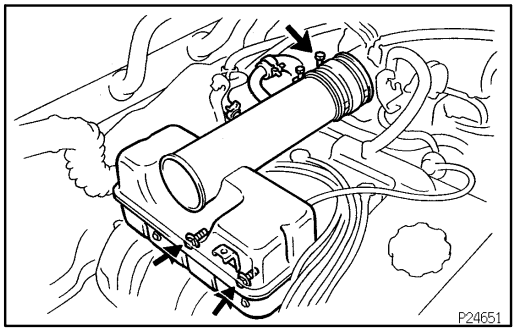
(b) Loosen the air cleaner hose clamp.

(c) Loosen the 4 clips, and remove the air cleaner cap, MAF meter and resonator.



3. M/T:
DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

4. A/T:
DISCONNECT ACCELERATOR AND THROTTLE CABLES FROM THROTTLE BODY

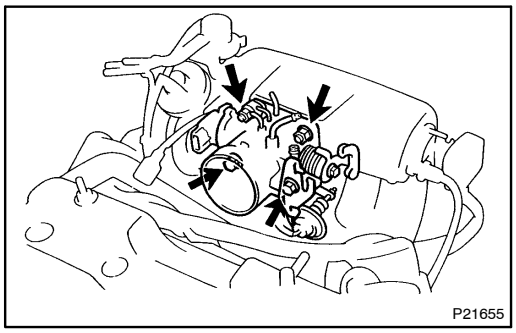


5. REMOVE INTAKE AIR CONNECTOR

(a) Disconnect the 2 air hoses.

(b) Remove the 2 bolts, hose clamp and intake air connector.

6. REMOVE NO.1 AND NO.2 PCV HOSES



7. REMOVE THROTTLE BODY

(a) Disconnect the throttle position sensor connector.

(b) Disconnect the IAC valve connector.

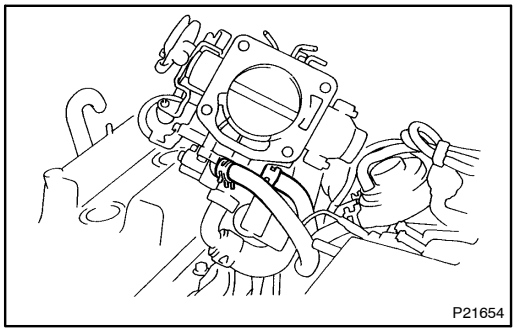
(c) Disconnect the EVAP hose.

(d) Disconnect the 3 vacuum hoses.

(e) Remove the 2 bolts, 2 nuts and disconnect the throttle body from the air intake chamber.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

(f) Remove the throttle body gasket.

HINT:
At the time assembly please refer to the following items.
Install the throttle body with a new gasket.



(g) Disconnect the No.1 and No.2 water bypass hoses from the throttle body, and remove the throttle body.

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SF0B3–03

INSPECTION

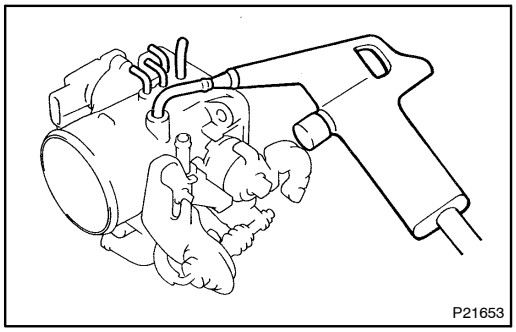
1. CLEAN THROTTLE BODY

(a) Using a soft brush and carburetor cleaner, clean the cast parts.

(b) Using compressed air, clean all the passages and apertures.

NOTICE:

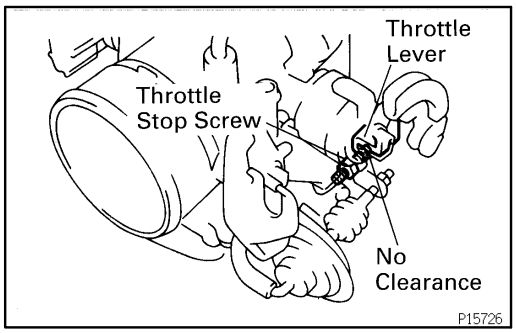
To prevent deterioration, do not clean the throttle position sensor and IAC valve.



2. INSPECT THROTTLE VALVE

(a) Apply vacuum to the throttle opener.

(b) Check that there is no clearance between the throttle stop screw and throttle lever when the closed throttle position.

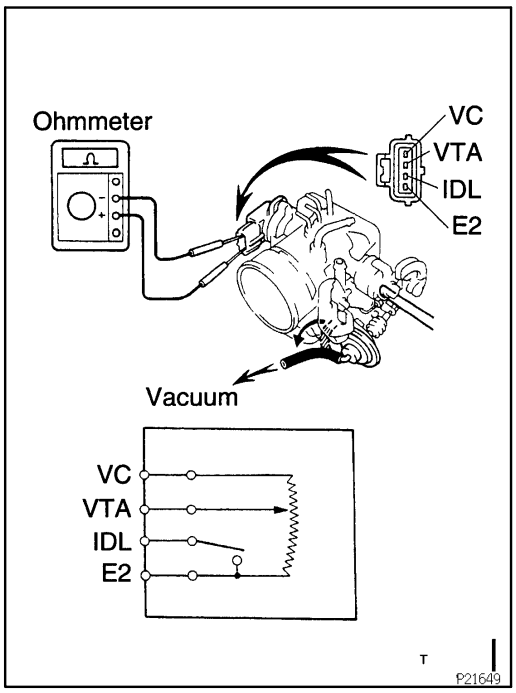


3. INSPECT THROTTLE POSITION SENSOR

(a) Apply vacuum to the throttle opener.

(b) Insert a thickness gauge between the throttle stop screw and stop lever.

(c) Using an ohmmeter, measure the resistance between each terminal.



Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA – E2	0.2 – 5.7 kΩ
0.50 mm (0.020 in.)	IDL – E2	2.3 kΩ or less
0.75 mm (0.030 in.)	IDL – E2	Infinity
Throttle valve fully open	VTA – E2	2.0 – 10.2 kΩ
–	VC – E2	2.5 – 5.9 kΩ

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SF0B4–03

INSTALLATION

Installation is in the reverse order of removal (See page MF–28).

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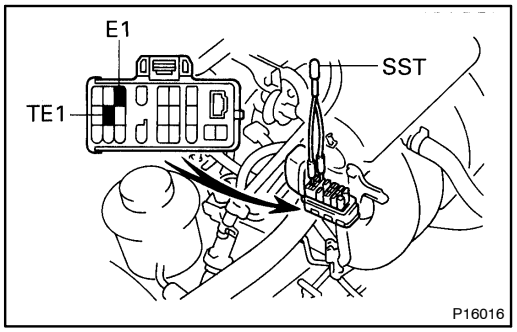
IDLE AIR CONTROL (IAC) VALVE

SF0B5–02

ON–VEHICLE INSPECTION

1. INSPECT IAC VALVE OPERATION

(a) Initial conditions:
- Engine at normal operating temperature
- Idle speed set correctly
- Transmission in neutral range

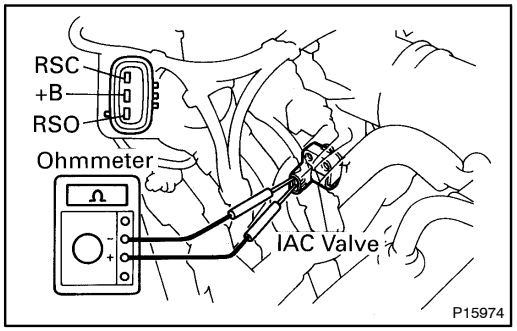


(b) Using SST, connect terminals TE1 and E1 of the DLC1.
SST 09843–18020

(c) After engine rpm are kept at 1,000 – 1,500 rpm for 5 seconds, check that they return to idle speed.

If the rpm operation is not as specified, check the IAC valve, wiring and ECU.

(d) Remove SST.
SST 09843–18020



2. INSPECT IAC VALVE RESISTANCE

NOTICE:

"Cold" and "Hot" in the following sentences express the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

(a) Disconnect the IAC valve connector.

(b) Using an ohmmeter, measure the resistance between terminal +B and other terminals (RSC, RSO).

Resistance:
Cold: 21.5 – 28.5Ω
Hot: 17.0 – 24.5Ω

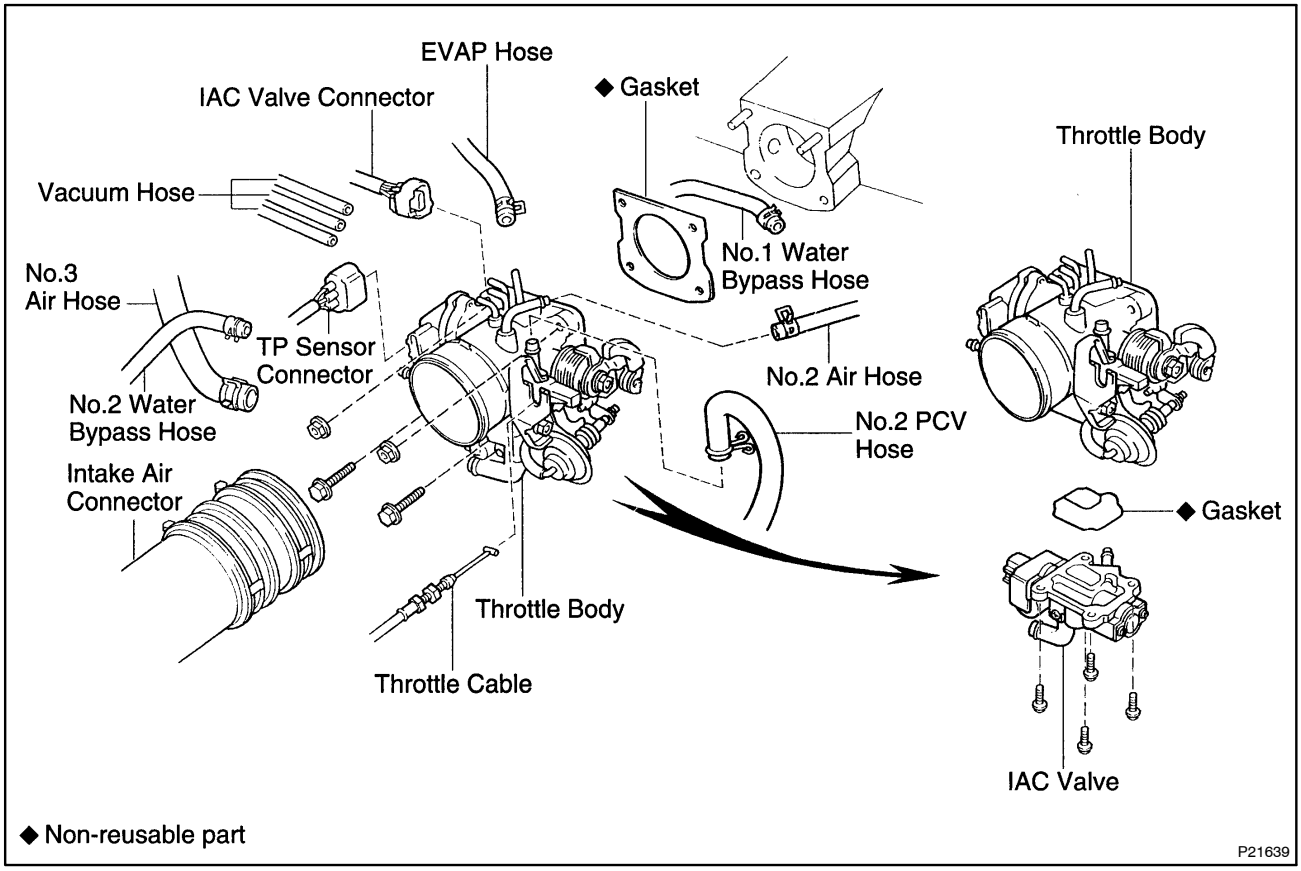
If resistance is not as specified, replace the IAC valve.

(c) Reconnect the IAC valve connector.

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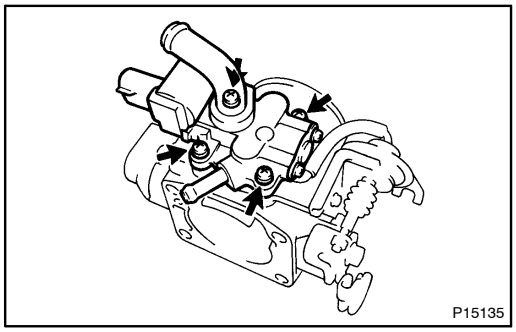
SF0B6–02

COMPONENTS



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SF0B7–02



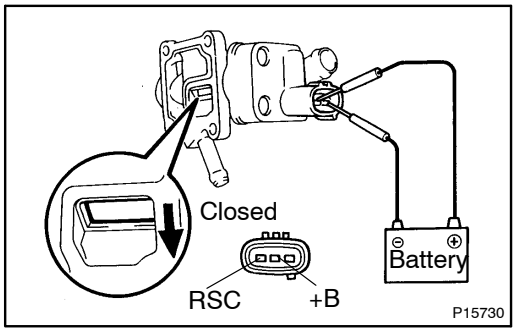
REMOVAL

1. **REMOVE THROTTLE BODY**
   (See page MF–28)
2. **REMOVE IAC VALVE**

Remove the 4 screws, IAC valve and gasket.

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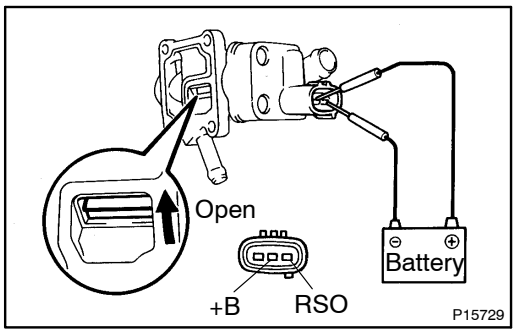
SF0B8–01



INSPECTION

INSPECT IAC VALVE OPERATION

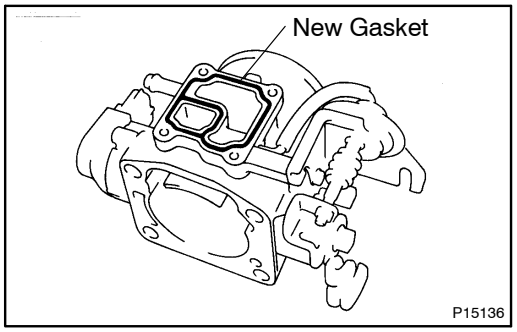
(a) Connect the positive (+) lead from the battery to terminal +B and negative (–) lead to terminal RSC, and check that the valve is closed.



(b) Connect the positive (+) lead from the battery to terminal +B and negative (–) lead to terminal RSO, and check that the valve is open.

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SF0B9–02



INSTALLATION

1. INSTALL IAC VALVE

(a) Place a new gasket on the throttle body.

(b) Install the IAC valve with the 4 screws.

2. INSTALL THROTTLE BODY

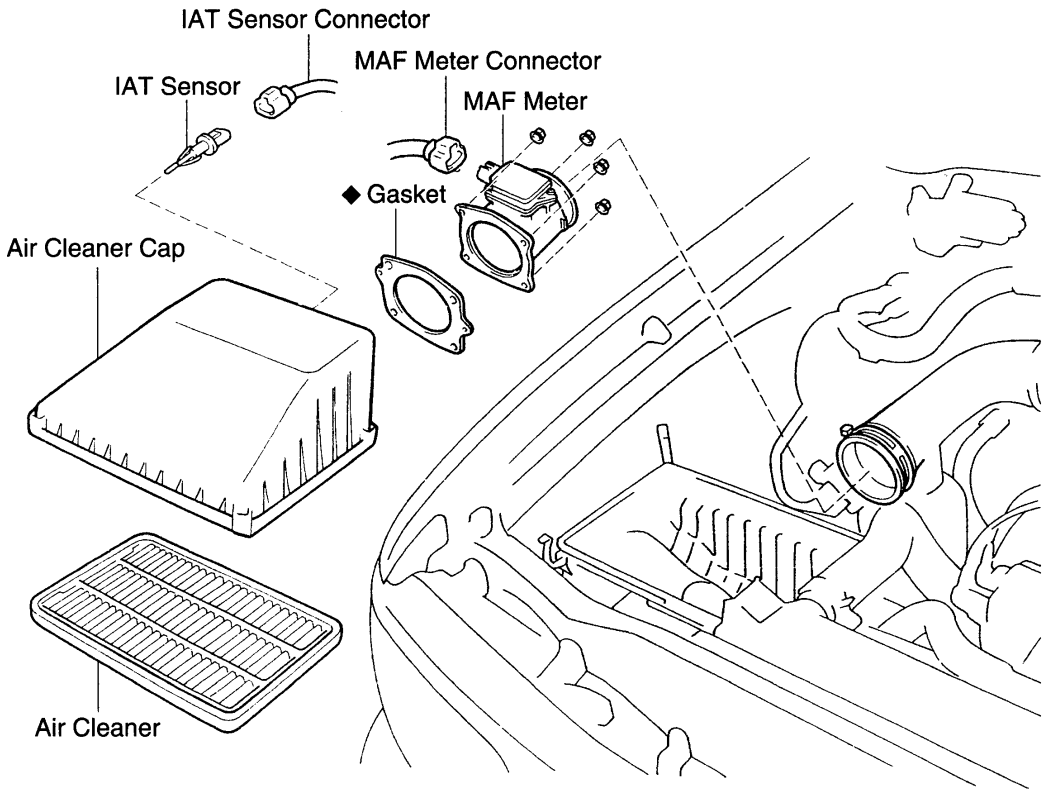
(See page MF–30)

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MASS AIR FLOW (MAF) METER

COMPONENTS

SF0AW–03



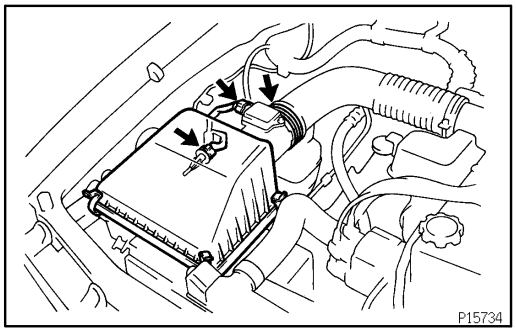
◆ Non-reusable part

P21638

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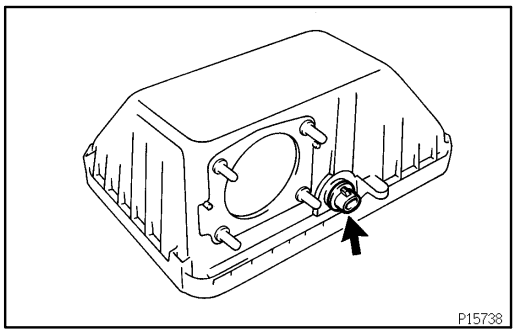
SF1QJ–01

REMOVAL



1. REMOVE AIR CLEANER CAP AND MAF METER

(a) Disconnect the MAF meter connector, IAT sensor connector and wire clamp.
(b) Loosen the air cleaner hose clamp.
(c) Loosen the 4 clips, and remove the air cleaner cap and MAF meter.

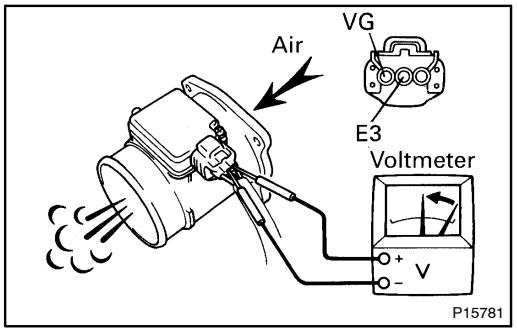


2. REMOVE MAF METER FROM AIR CLEANER CAP

(a) Remove the 4 nuts, MAF meter and gasket.
(b) Remove the IAT sensor from air cleaner cap.

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SF1GL–01



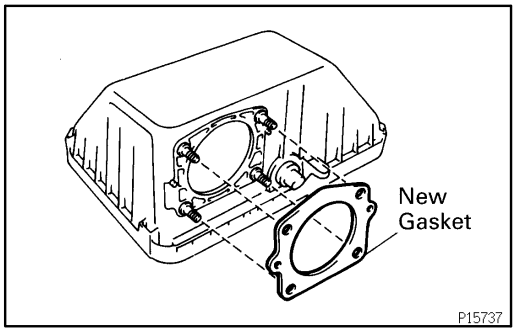
INSPECTION

INSPECT MAF METER OPERATION

(a) Connect negative (–) terminal cable to battery.
(b) Turn the ignition switch ON.
(c) Connect the MAF meter connector.
(d) Using a voltmeter, connect the positive (+) tester probe to terminal VG, and negative (–) tester probe to terminal E3.
(e) Blow air into the MAF meter, and check that the voltage fluctuates.
If operation is not as specified, replace the MAF meter.
(f) Turn the ignition switch OFF.
(g) Disconnect negative (–) terminal cable from battery.
(h) Disconnect the MAF meter connector.

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SF0AZ–02



INSTALLATION

1. INSTALL MAF METER TO AIR CLEANER CAP

(a) Install the IAT sensor to the air cleaner cap.

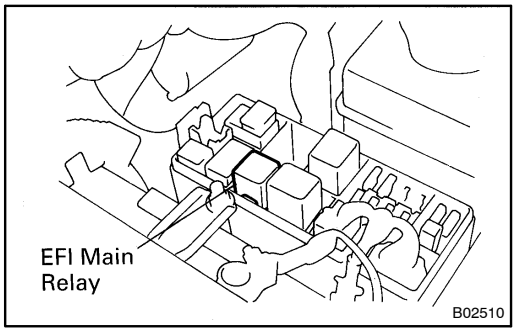
(b) Place a new gasket on the air cleaner cap.

(c) Install the MAF meter with the 4 nuts.

Torque: 8.5 N·m (87 kgf·cm, 75 in.·lbf)

2. INSTALL MAF METER AND AIR CLEANER CAP

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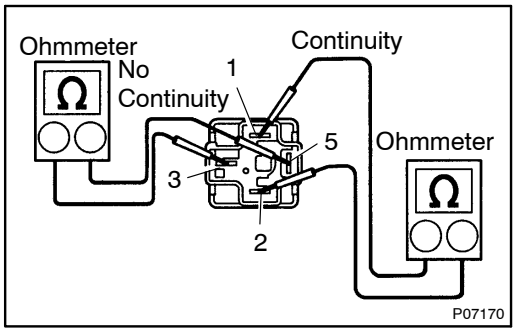


EFI MAIN RELAY

SF0BA–03

INSPECTION

1. REMOVE EFI MAIN RELAY (Marking: EFI)



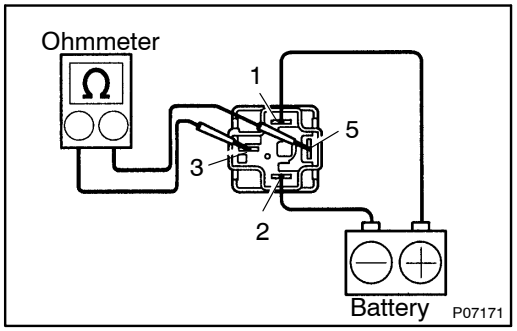
2. INSPECT EFI MAIN RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

(b) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.



3. INSPECT EFI MAIN RELAY OPERATION

(a) Apply battery voltage across terminals 1 and 2.

(b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

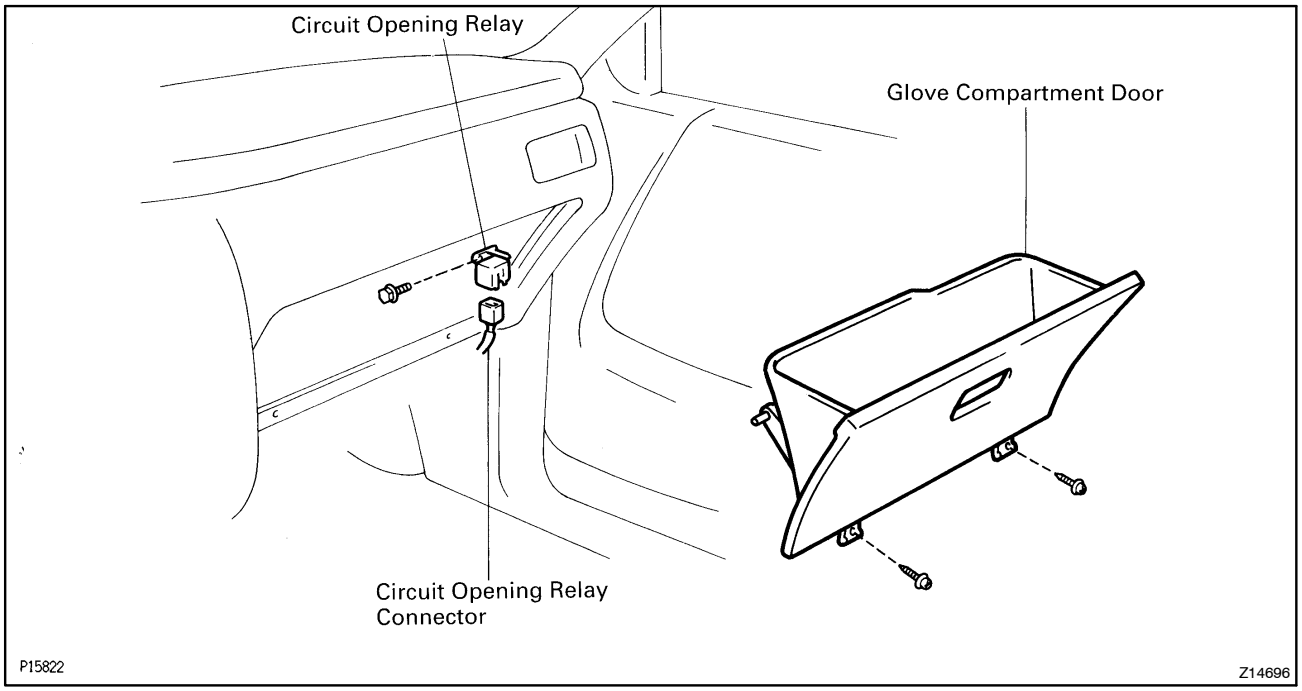
4. REINSTALL EFI MAIN RELAY

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CIRCUIT OPENING RELAY

COMPONENTS

SF0BB–02

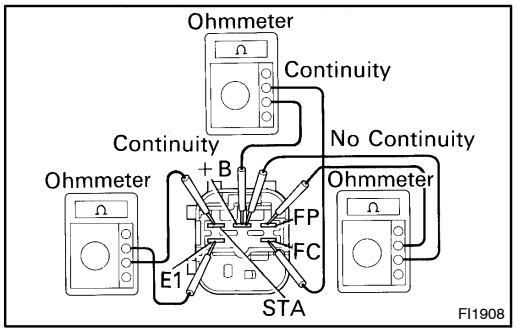


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SF0BC–02

INSPECTION

1. REMOVE GLOVE COMPARTMENT DOOR
2. REMOVE CIRCUIT OPENING RELAY



3. INSPECT CIRCUIT OPENING RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals STA and E1.

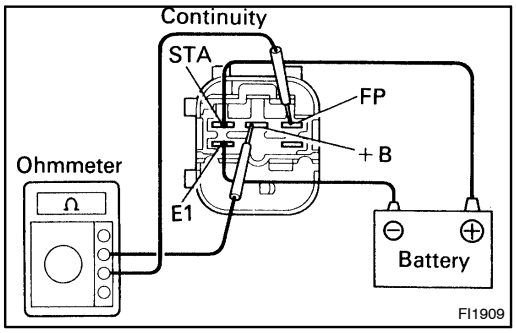
If there is no continuity, replace the relay.

(b) Check that there is continuity between terminals +B and FC.

If there is no continuity, replace the relay.

(c) Check that there is no continuity between terminals +B and FP.

If there is continuity, replace the relay.



4. INSPECT CIRCUIT OPENING RELAY OPERATION

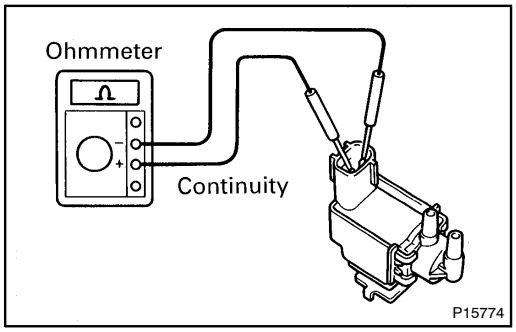
(a) Apply battery voltage across terminals STA and E1.

(b) Using an ohmmeter, check that there is continuity between terminals +B and FP.

If there is no continuity, replace the relay.

5. REINSTALL CIRCUIT OPENING RELAY
6. REINSTALL GLOVE COMPARTMENT DOOR

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VSV FOR EVAPORATIVE EMISSION (EVAP)

SF0BE–01

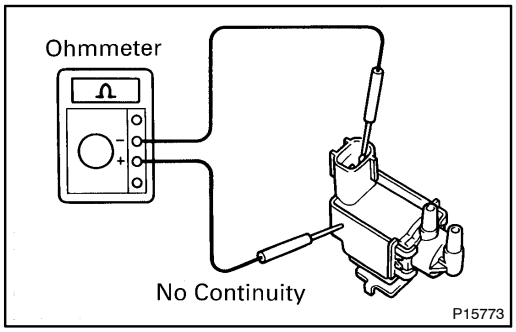
INSPECTION

1. INSPECT VSV FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the terminals.

Resistance: 30 – 34 Ω at 20°C (68°F)

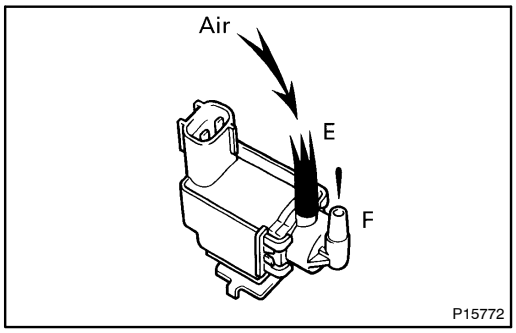
If there is no continuity, replace the VSV.



2. INSPECT VSV FOR GROUND

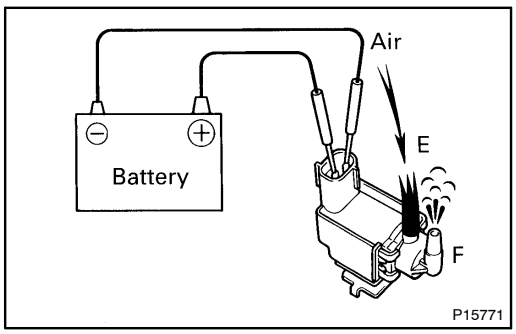
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



3. INSPECT VSV OPERATION

(a) Check that air does not flow from pipe E to pipe F.

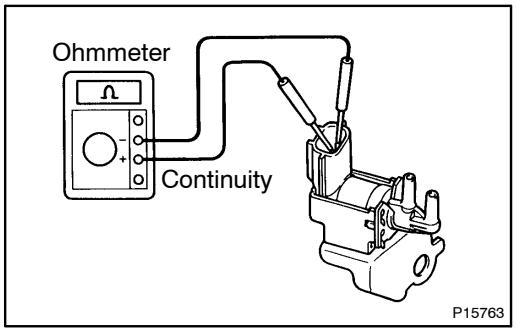


(b) Apply battery voltage across the terminals.

(c) Check that air flows from pipe E to pipe F.

If operation is not as specified, replace the VSV.

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VSV FOR EXHAUST GAS RECIRCULATION (EGR)

SF0BD–01

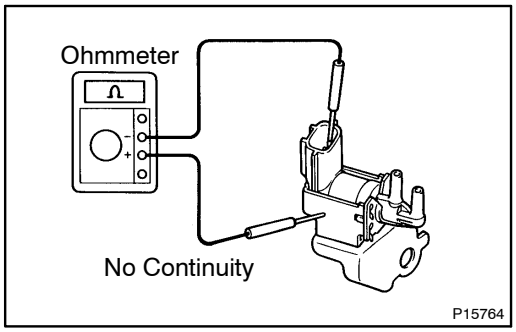
INSPECTION

1. INSPECT VSV FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the terminals.

Resistance: 33 – 39 Ω at 20°C (68°F)

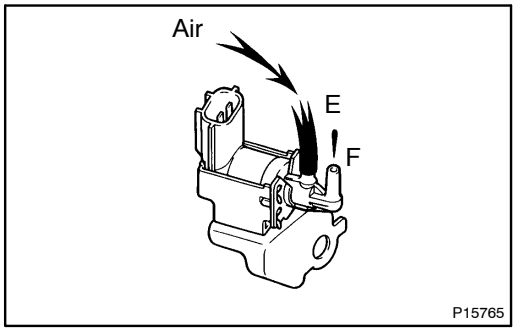
If there is no continuity, replace the VSV.



2. INSPECT VSV FOR GROUND

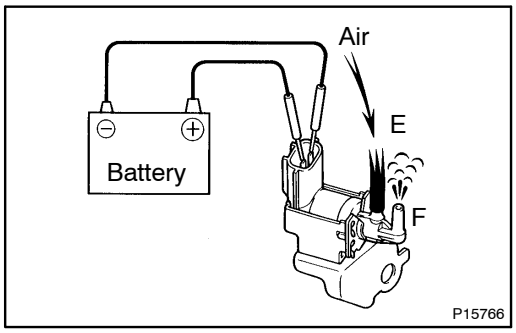
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



3. INSPECT VSV OPERATION

(a) Check that air does not flow from pipe E to pipe F.

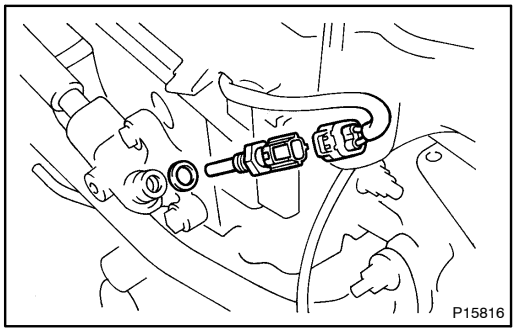


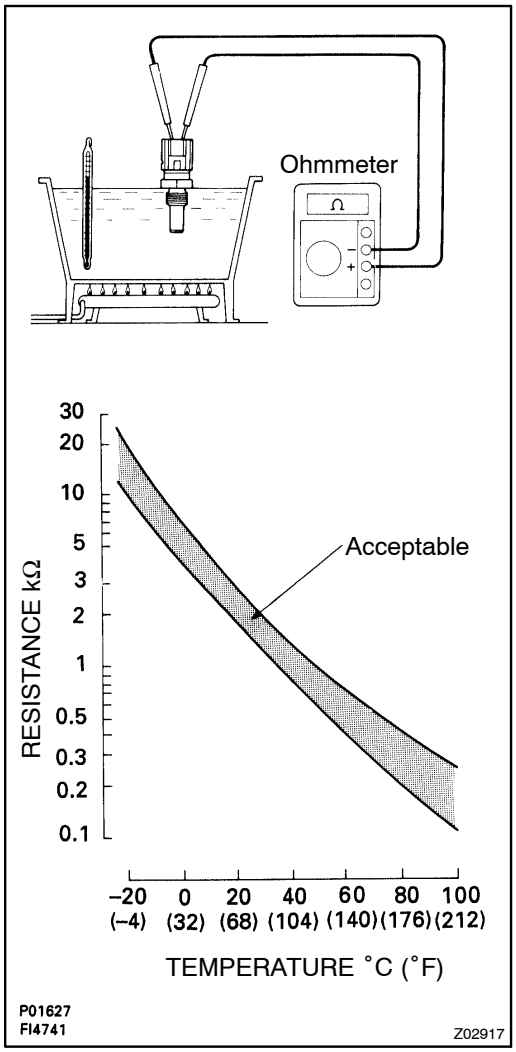
(b) Apply battery voltage across the terminals.

(c) Check that air flows from pipe E to pipe F.

If operation is not as specified, replace the VSV.

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ENGINE COOLANT TEMPERATURE (ECT) SENSOR

SF0BG–02

INSPECTION

1. DRAIN ENGINE COOLANT

2. REMOVE ENGINE COOLANT TEMPERATURE SENSOR

(a) Disconnect the ECT sensor connector.

(b) Using a 19 mm deep socket wrench, remove the ECT sensor and gasket.

3. INSPECT ENGINE COOLANT TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance: Refer to the chart graph

If the resistance is not as specified, replace the ECT sensor.

4. REINSTALL ENGINE COOLANT TEMPERATURE SENSOR

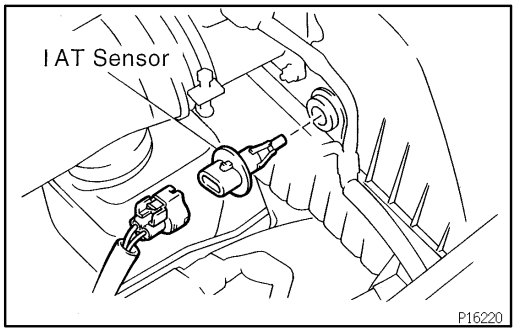
(a) Using a 19 mm deep socket wrench, install the ECT sensor and gasket.

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

(b) Connect the ECT sensor connector.

5. REFILL ENGINE COOLANT

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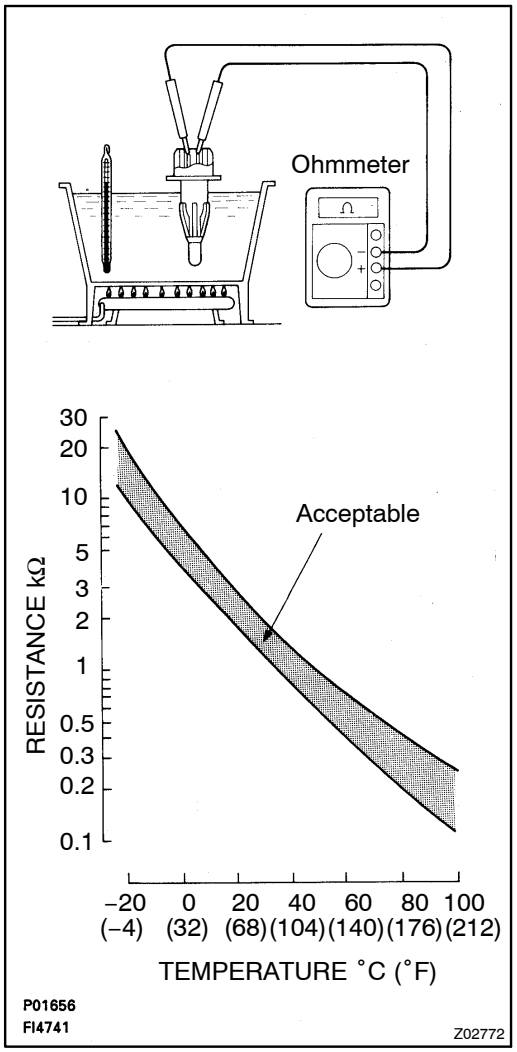


INTAKE AIR TEMPERATURE (IAT) SENSOR

SF1QL–01

INSPECTION

1. REMOVE IAT SENSOR



2. INSPECT IAT SENSOR

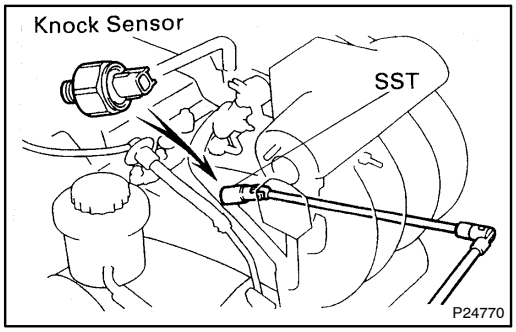
Using an ohmmeter, measure the resistance between the terminals.

Resistance: Refer to the chart graph

If the resistance is not as specified, replace the IAT sensor.

3. REINSTALL IAT SENSOR

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KNOCK SENSOR

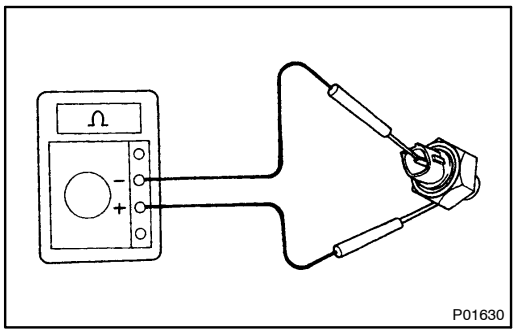
SF0BI–03

INSPECTION

1. REMOVE KNOCK SENSOR

(a) Disconnect the knock sensor connector.

(b) Using SST, remove the knock sensor.
SST 09816–30010



2. INSPECT KNOCK SENSOR

Using an ohmmeter, check that there is no continuity between the terminal and body.

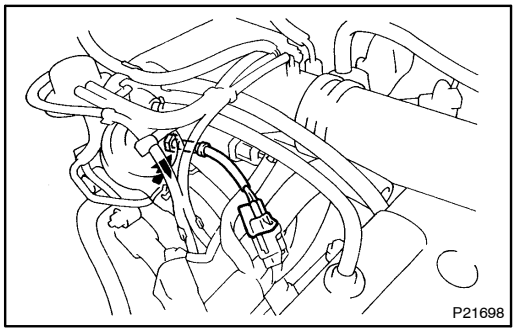
If there is continuity, replace the sensor.

3. REINSTALL KNOCK SENSOR

(a) Using SST, install the knock sensor.
SST 09816–30010
Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

(b) Connect the knock sensor connector.

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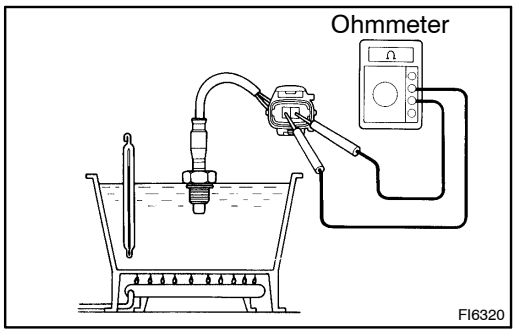

P21698

EXHAUST GAS RECIRCULATION (EGR) GAS TEMPERATURE SENSOR

SF0BK–02

INSPECTION

1. REMOVE EGR GAS TEMPERATURE SENSOR



FI6320

2. INSPECT EGR GAS TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

64 – 97 kΩ at 50˚C (122˚F)

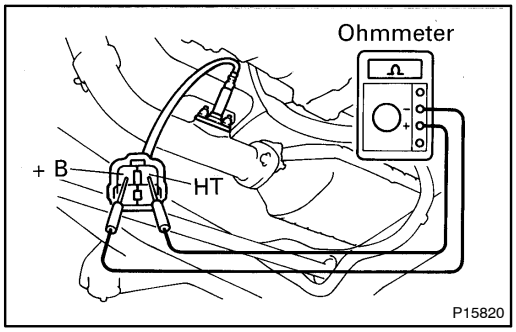
11 – 16 kΩ at 100˚C (212˚F)

2 – 4 kΩ at 150˚C (302˚F)

If the resistance is not as specified, replace the sensor.

3. REINSTALL EGR GAS TEMPERATURE SENSOR

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HEATED OXYGEN SENSOR

SF0BL–02

INSPECTION

INSPECT HEATER RESISTANCE OF HEATED OXYGEN SENSORS

(a) Disconnect the heated oxygen sensor connectors.

(b) Using an ohmmeter, measure the resistance between terminals +B and HT.

Resistance:

Bank 1 Sensor 1: 5 – 7 Ω at 20°C (68°F)

Bank 1 Sensor 2: 11 – 16 Ω at 20°C (68°F)

If resistance is not as specified, replace the heated oxygen sensors.

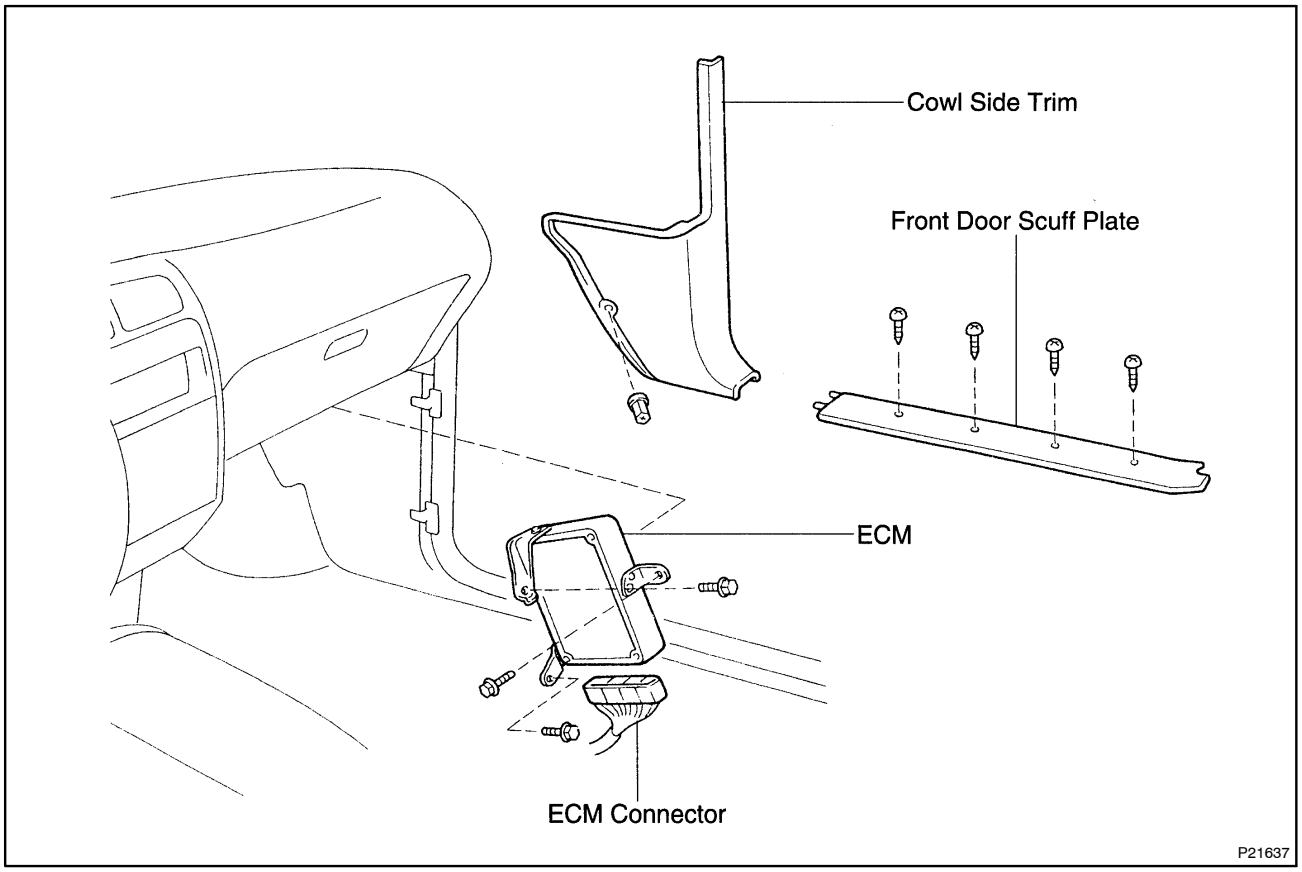
(c) Reconnect the heated oxygen sensor connectors.

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ENGINE CONTROL MODULE (ECM)

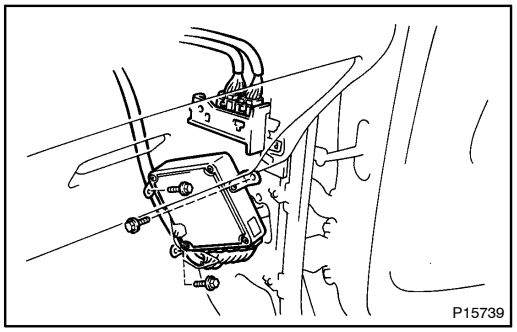
COMPONENTS

SF0BM–02



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SF0BN–01



REMOVAL

1. REMOVE FRONT DOOR SCUFF PLATE

Remove the 4 screws and front scuff plate.

2. REMOVE COWL SIDE TRIM

Remove the clip and cowl side trim.

3. REMOVE ECM

(a) Disconnect the 4 ECM connectors.

(b) Remove the 3 bolts and ECM.

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SF0BO–01

INSPECTION

(See page DI–17)

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SF0BP–02

INSTALLATION

Installation is in the reverse order of removal (See page MF–51).

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FUEL CUT RPM

SF0BQ–03

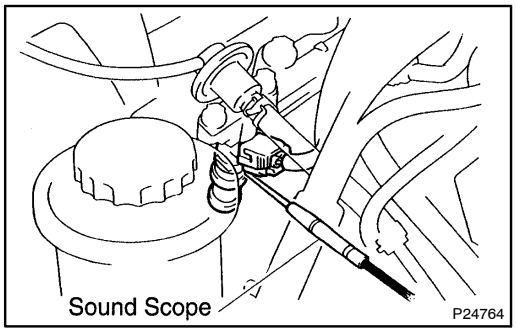
INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

2. CONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL

(See page MF–5)



3. INSPECT FUEL CUT OFF RPM

(a) Increase the engine speed to at least 3,000 rpm.

(b) Using a sound scope, check for injector operating noise.

(c) Check that when the throttle lever is released, injector operation noise stops momentarily and then resumes.

HINT:

Measure with the A/C OFF.

Fuel return rpm:
M/T: 1,400 rpm
A/T: 1,500 rpm

4. DISCONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL

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SF – SFI SYSTEM (5VZ-FE)

SFI SYSTEM	SF-1
FUEL PUMP	SF-5
FUEL PRESSURE REGULATOR	SF-14
INJECTOR	SF-18
FUEL TANK AND LINE	SF-25
MASS AIR FLOW (MAF) METER	SF-28
THROTTLE BODY	SF-31
IDLE AIR CONTROL (IAC) VALVE	SF-39
EFI MAIN RELAY	SF-45
CIRCUIT OPENING RELAY	SF-46
VSV FOR FUEL PRESSURE CONTROL	SF-47
VSV FOR EXHAUST GAS CONTROL VALVE	SF-49
VSV FOR EVAPORATIVE EMISSION (EVAP)	SF-50
ENGINE COOLANT TEMPERATURE (ECT) SENSOR	SF-51
KNOCK SENSOR	SF-54
EXHAUST GAS RECIRCULATION (EGR) GAS TEMPERATURE SENSOR	SF-59
HEATED OXYGEN SENSOR	SF-60
ENGINE CONTROL MODULE (ECM)	SF-61
FUEL CUT RPM	SF-63

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SFI SYSTEM

PRECAUTION

SF1QM–01

1. BEFORE WORKING ON FUEL SYSTEM, DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

HINT:

Any diagnostic trouble code retained by the computer will be erased when the negative (–) terminal cable is removed from the battery.

Therefore, if necessary, read the diagnosis before removing the negative (–) terminal cable from the battery.

2. DO NOT SMOKE OR WORK NEAR AN OPEN FLAME WHEN WORKING ON FUEL SYSTEM

3. KEEP GASOLINE AWAY FROM RUBBER OR LEATHER PARTS

4. MAINTENANCE PRECAUTIONS

(a) In the event of engine misfire, these precautions should be taken.
  (1) Check proper connection to battery terminals, etc.
  (2) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely.
  (3) When cleaning the engine compartment, be especially careful to protect the electrical system from water.

(b) Precautions when the handling heated oxygen sensors.
  (1) Do not allow the oxygen sensor to drop or hit against an object.
  (2) Do not allow the sensor to come into contact with water.

If Vehicle is Equipped with Mobile Radio System (ham, cb, etc.)

If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

5. AIR INDUCTION SYSTEM

(a) Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.

(b) Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will allow air suction and cause the engine to run out of tune.

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6. ELECTRONIC CONTROL SYSTEM

(a) Before removing SFI wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch OFF or disconnecting the negative (–) terminal cable from the battery.

HINT:

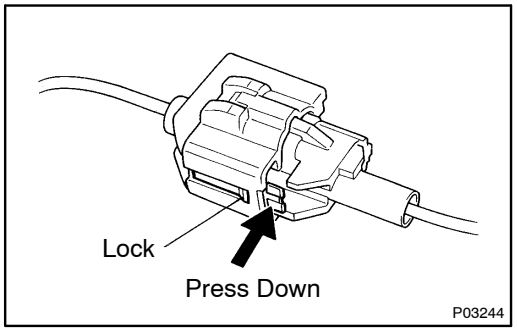
Always check the diagnostic trouble code before disconnecting the negative (–) terminal cable from the battery.

(b) When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (–) cables.

(c) Do not permit parts to receive a severe impact during removal or installation. Handle all SFI parts carefully, especially the ECM.

(d) Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can further troubles.

(e) Do not open the ECM cover.



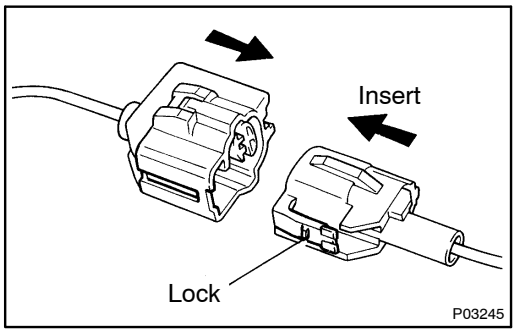
(f) When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the SFI parts and wiring connectors.

(g) Parts should be replaced as an assembly.

(h) Care is required when pulling out and inserting wiring connectors.

(1) Release the lock and pull out the connector, pulling on the connectors.

(2) Fully insert the connector and check that it is locked.



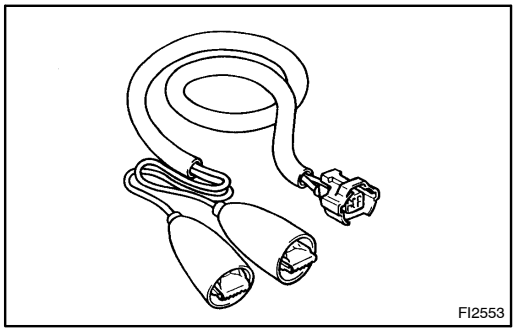
(i) When inspecting a connector with a volt/ohmmeter

(1) Carefully take out the water–proofing rubber if it is a water–proof type connector.

(2) Insert the test probe into the connector from the wiring side when checking the continuity, amperage or voltage.

(3) Do not apply unnecessary force to the terminal.

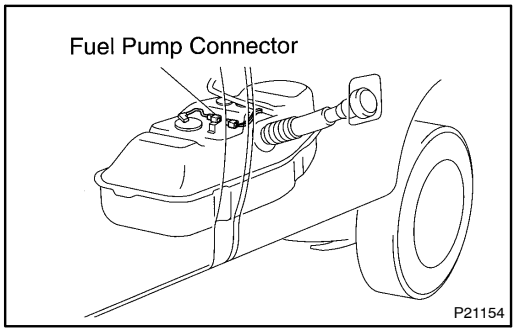
(4) After checking, install the water–proofing rubber on the connector securely.



(5) Use SST for inspection or test of the injector or its wiring connector.

SST 09842–30070

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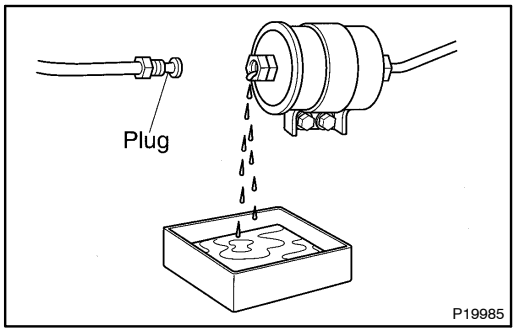


7. FUEL SYSTEM

(a) When disconnecting the high fuel pressure line, a large amount of gasoline will spill out, so observe these procedures:

(1) Disconnect the fuel pump connector.

(2) Start the engine. After the engine has stopped on its own, turn the ignition switch to LOCK.

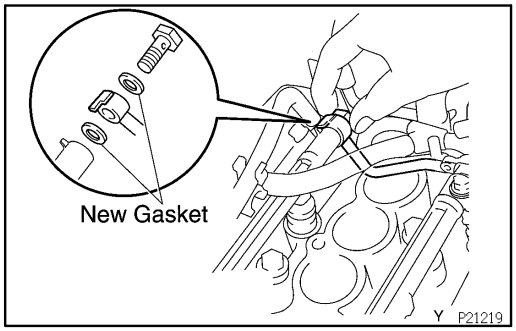


(3) Put a container under the connection.

(4) Slowly loosen the connection.

(5) Disconnect the connection.

(6) Plug the connection with a rubber plug.



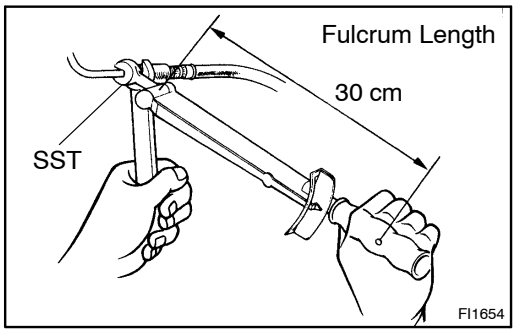
(b) When connecting the flare nut or union bolt on the high pressure pipe union, observe these procedures:

(1) Union Bolt Type:
Always use 2 new gaskets.

(2) Union Bolt Type:
Tighten the union bolt by hand.

(3) Union Bolt Type:
Tighten the union bolt to the specified torque.

Torque: 34.3 N·m (350 kgf·cm, 25 ft·lbf)



(4) Flare Nut Type:
Apply a light coat of engine oil to the flare nut, and tighten the flare nut by hand.

(5) Flare Nut Type:
Using SST, tighten the flare nut to specified torque.

SST 09631–22020

NOTICE:

Do not rotate the fuel pipe, when tightening the flare nut.

Torque:

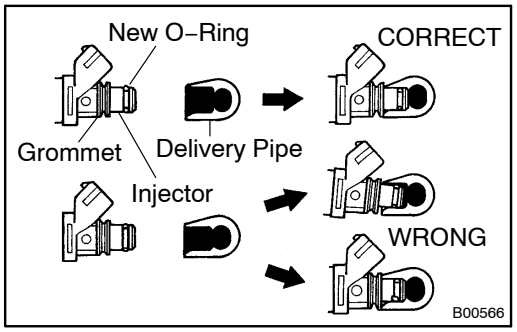
34.3 N·m (350 kgf·cm, 25 ft·lbf)

28 N·m (285 kgf·cm, 21 ft·lbf) for using SST

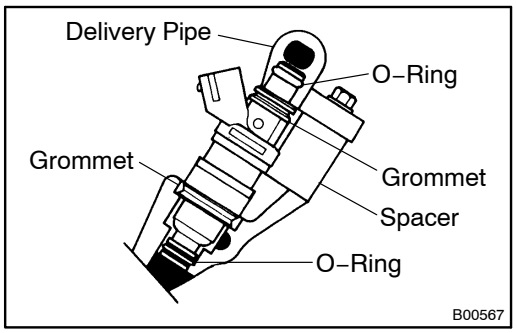
HINT:

Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).

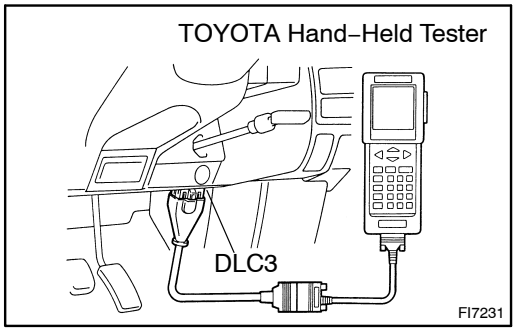
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(c) Observe these precautions when removing and installing the injectors.
(1) Never reuse the O–ring.
(2) When placing a new O–ring on the injector, take care not to damage it in any way.
(3) Coat a new O–ring with spindle oil or gasoline before installing–never use engine, gear or brake oil.



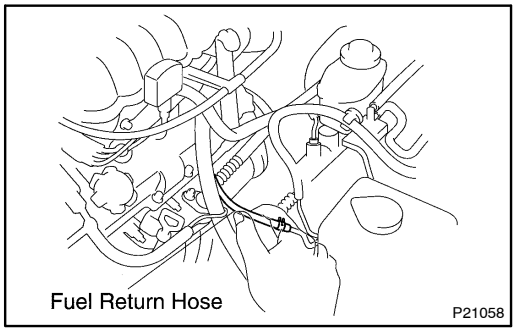
(d) Install the injector to the delivery pipe and intake manifold as shown in the illustration.



(e) Check that there are no fuel leaks after doing maintenance anywhere on the fuel system.
(1) Connect the TOYOTA hand–held tester to the DLC3.
(2) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.

NOTICE:
Do not start the engine.

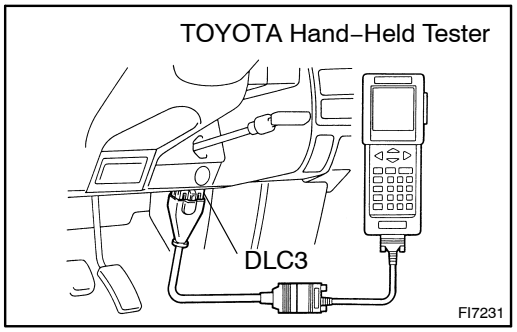
(3) Select the active test mode on the TOYOTA hand–held tester.
(4) Please refer to the TOYOTA hand–held tester operator's manual for further details.
(5) If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector.
(See page SF–10)
(6) Pinch the fuel return hose.
The pressure in the high pressure line will rise to approx. 400 kPa (4 kgf/cm^2, 57 psi). In this state, check to see that there are no leaks from any part of the fuel system.

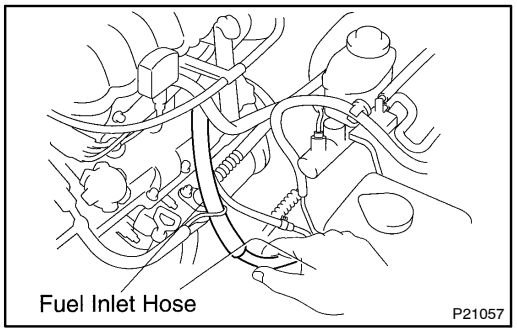


NOTICE:
Always pinch the hose. Avoid bending as it may cause the hose to crack.

(7) Turn the ignition switch to LOCK.
(8) Disconnect the TOYOTA hand–held tester from the DLC3.

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FUEL PUMP

SF0BT–02

ON–VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

(a) Connect the TOYOTA hand–held tester to the DLC3.

(b) Turn the ignition switch ON and push the TOYOTA hand–held tester main switch ON.

NOTICE:

Do not start the engine.

(c) Select the active test mode on the TOYOTA hand–held tester.

(d) Please refer to the TOYOTA hand–held tester operator's manual for further details.

(e) If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector.

(f) Check that there is pressure in the fuel inlet hose from the fuel filter.

HINT:

If there is fuel pressure, you will hear the sound of fuel flowing.

If there is no pressure, check these parts:

- H–fuse (ALT 80A)
- M–fuses (AM1 40A, AM2 30A)
- Fuses (EFI 15A, IGN 7.5A)
- EFI main relay
- Circuit opening relay
- Fuel pump
- ECM
- Wiring connections

(g) Turn the ignition switch to LOCK.

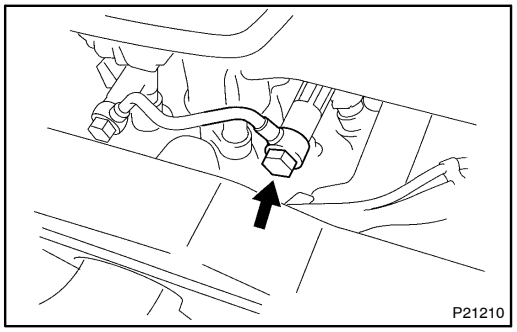
(h) Disconnect the TOYOTA hand–held tester from the DLC3.

2. CHECK FUEL PRESSURE

(a) Check the battery positive voltage is above 12 V.

(b) Disconnect the negative (–) terminal cable from the battery.

(c) Remove the 6 bolts, and disconnect the No.2 timing belt cover.

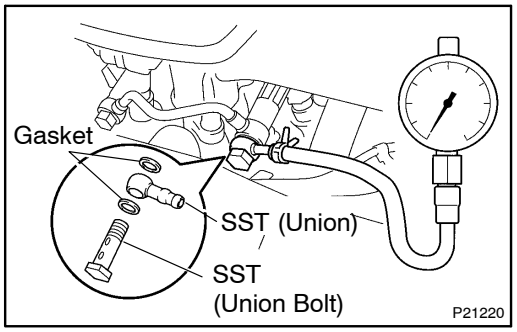


(d) Remove the union bolt holding the fuel pipe to the delivery pipe and gasket.

CAUTION:

Put a shop towel under the delivery pipe. Slowly loosen the union bolt.

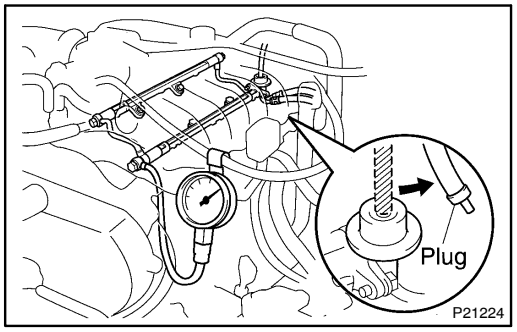
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(e) Install SST (pressure gauge) to the delivery pipe with the 2 gaskets and SST (union and union bolt).
SST 09268–45012
Torque:34.3 N·m (350 kgf·cm, 25 ft·lbf)
(f) Wipe off any splattered gasoline.
(g) Connect the TOYOTA hand–held tester to the DLC3. (See on–vehicle inspection in fuel pump)
(h) Reconnect the negative (–) terminal cable to the battery.
(i) Turn the ignition switch ON.
(j) Measure the fuel pressure.
Fuel pressure:
265 – 304 kPa (2.7 – 3.1 kgf/cm^2, 38 – 44 psi)

If pressure is high, replace the fuel pressure regulator.
If pressure is low, check these parts:

- Fuel hoses and connections
- Fuel pump
- Fuel filter
- Fuel pressure regulator
- VSV for fuel pressure control



(k) Disconnect the TOYOTA hand–held tester from the DLC3.
(l) Reinstall the No.2 timing belt cover with the 6 bolts.
(m) Start the engine.
(n) Disconnect the vacuum sensing hose from the fuel pressure regulator, and plug the hose end.
(o) Measure the fuel pressure at idle.
Fuel pressure:
265 – 304 kPa (2.7 – 3.1 kgf/cm^2, 38 – 44 psi)
(p) Reconnect the vacuum sensing hose to the fuel pressure regulator.
(q) Measure the fuel pressure at idle.
Fuel pressure:
226 – 265 kPa (2.3 – 2.7 kgf/cm^2, 33 – 38 psi)

If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.
(r) Stop the engine.
(s) Check that the fuel pressure remains as specified for 5 minutes after the engine has stopped.
Fuel pressure:
147 kPa (1.5 kgf/cm^2, 21 psi) or more

If pressure is not as specified, check the fuel pump, pressure regulator and/or injectors.
(t) After checking fuel pressure, disconnect the negative (–) terminal cable from the battery and carefully remove the SST to prevent gasoline from splashing.
SST 09268–45012
(u) Remove the other union bolt, 3 gaskets and fuel pipe from the delivery pipes.

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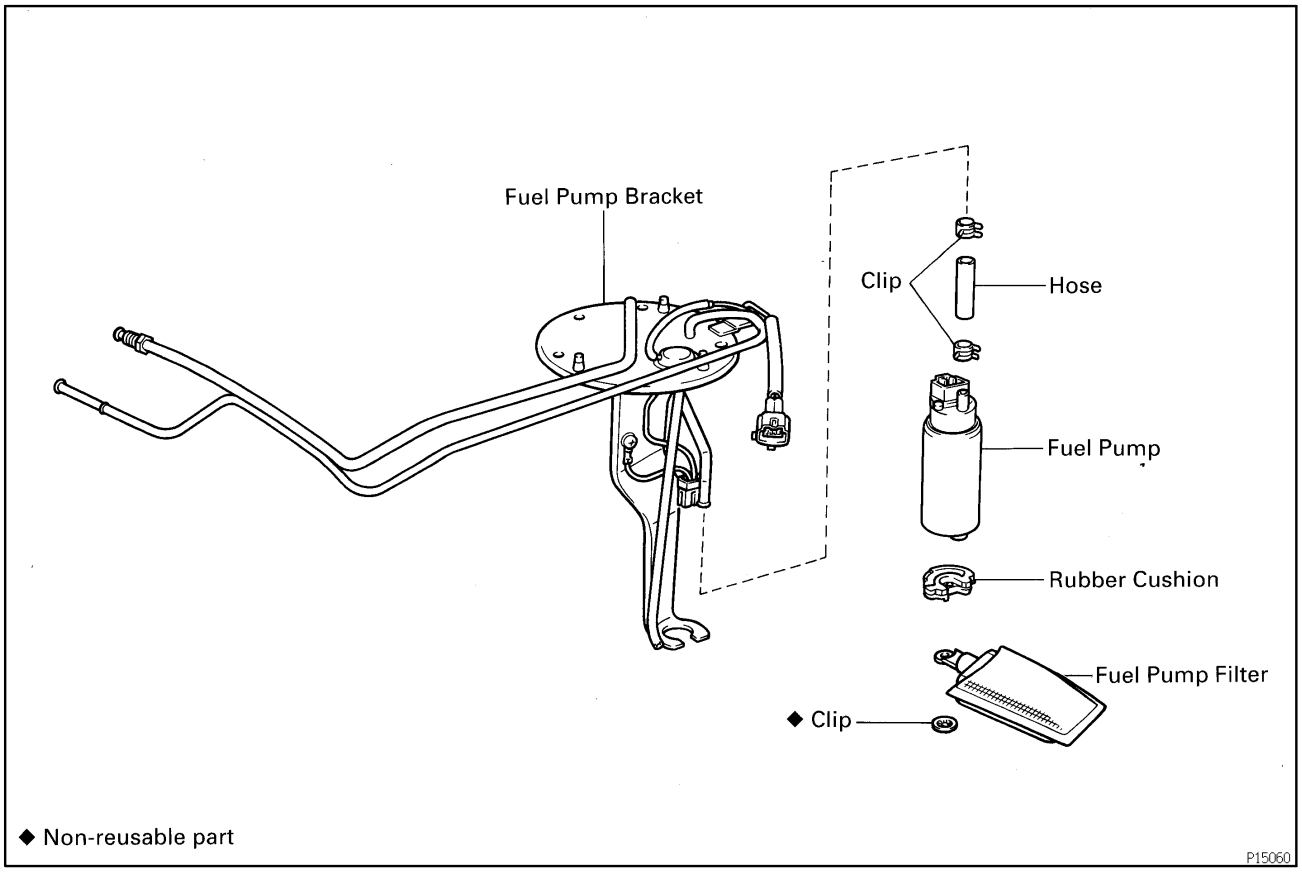
(v) Reinstall the fuel pipe with 4 new gaskets and the 2 union bolts.
Torque:34.3 N·m (350 kgf·cm, 25 ft·lbf)
(w) Reconnect the negative (–) terminal cable to the battery.
(x) Check for fuel leakage.

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FUEL PUMP

COMPONENTS

SF0BU–02



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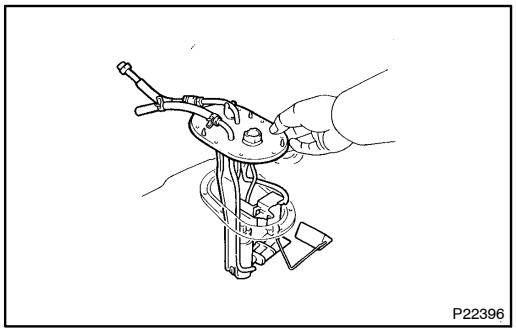
SF0BV–02

REMOVAL

CAUTION:
Do not smoke or work near an open flame when working on the fuel pump.

1. REMOVE FUEL TANK

HINT:
Check for fuel leakage.


P22396

2. REMOVE FUEL PUMP BRACKET ASSEMBLY FROM FUEL TANK

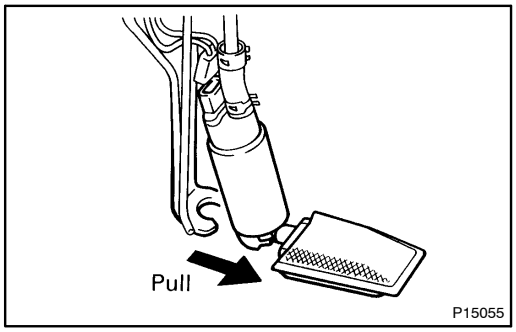
(a) Disconnect the fuel pump connector from the clamp.
(b) Remove the 7 bolts.
Torque: 3.9 N·m (40 kgf·cm, 35 in.·lbf)
(c) Pull out the pump bracket assembly.
(d) Remove the gasket from the pump bracket.

HINT:
Install a new gasket to the pump bracket.

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SF0BW–01

DISASSEMBLY



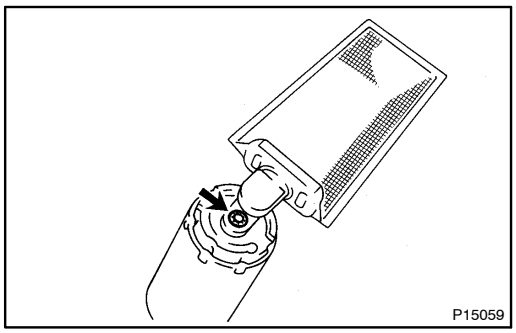
1. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET

(a) Disconnect the fuel pump connector.

(b) Pull off the lower side of the fuel pump from the pump bracket.

(c) Disconnect the fuel hose from the fuel pump, and remove the fuel pump.

(d) Remove the rubber cushion from the fuel pump.



2. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

(a) Using a small screwdriver, remove the clip.

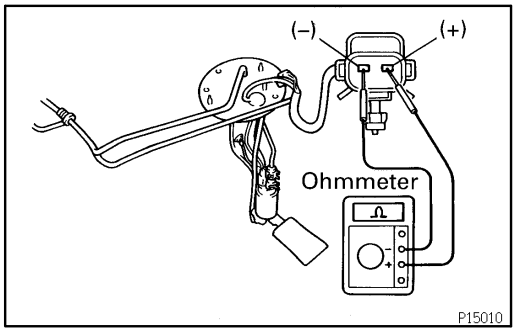
HINT:

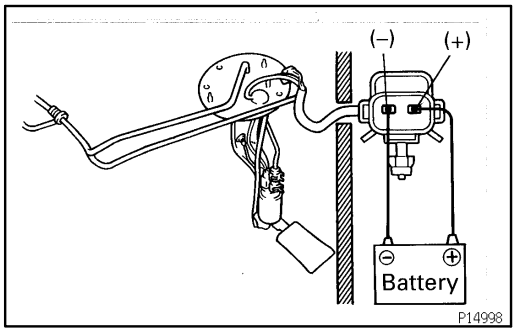
Install the pump filter with a new clip.

(b) Pull out the pump filter.

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SF0BX–03





INSPECTION

1. INSPECT FUEL PUMP RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

Resistance: 0.2 – 3.0 Ω at 20˚C (68˚F)

If the resistance is not as specified, replace the fuel pump and/or set plate.

2. INSPECT FUEL PUMP OPERATION

Connect the positive (+) lead from the battery to terminal 1 of the connector, and the negative (–) lead to terminal 2. Check that the fuel pump operates.

NOTICE:

These tests must be done quickly (within 10 seconds) to prevent the coil from burning out.Keep the fuel pump as far away from the battery as possible.Always do switching at the battery side.

If operation is not as specified, replace the fuel pump and/or plate.

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SF0BY–01

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page SF–10).

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SF0BZ–01

INSTALLATION

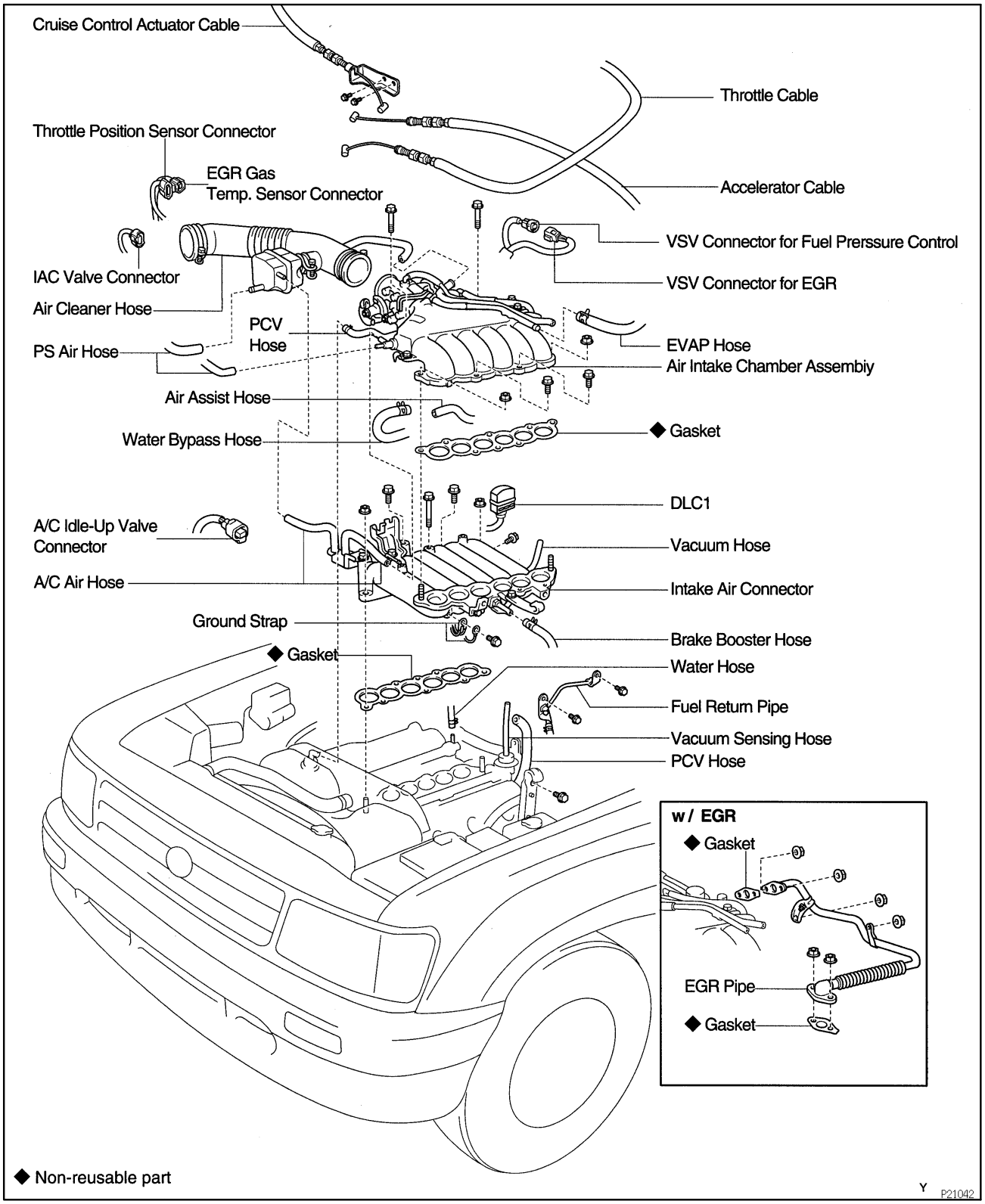
Installation is in the reverse order of removal (See page SF–9).

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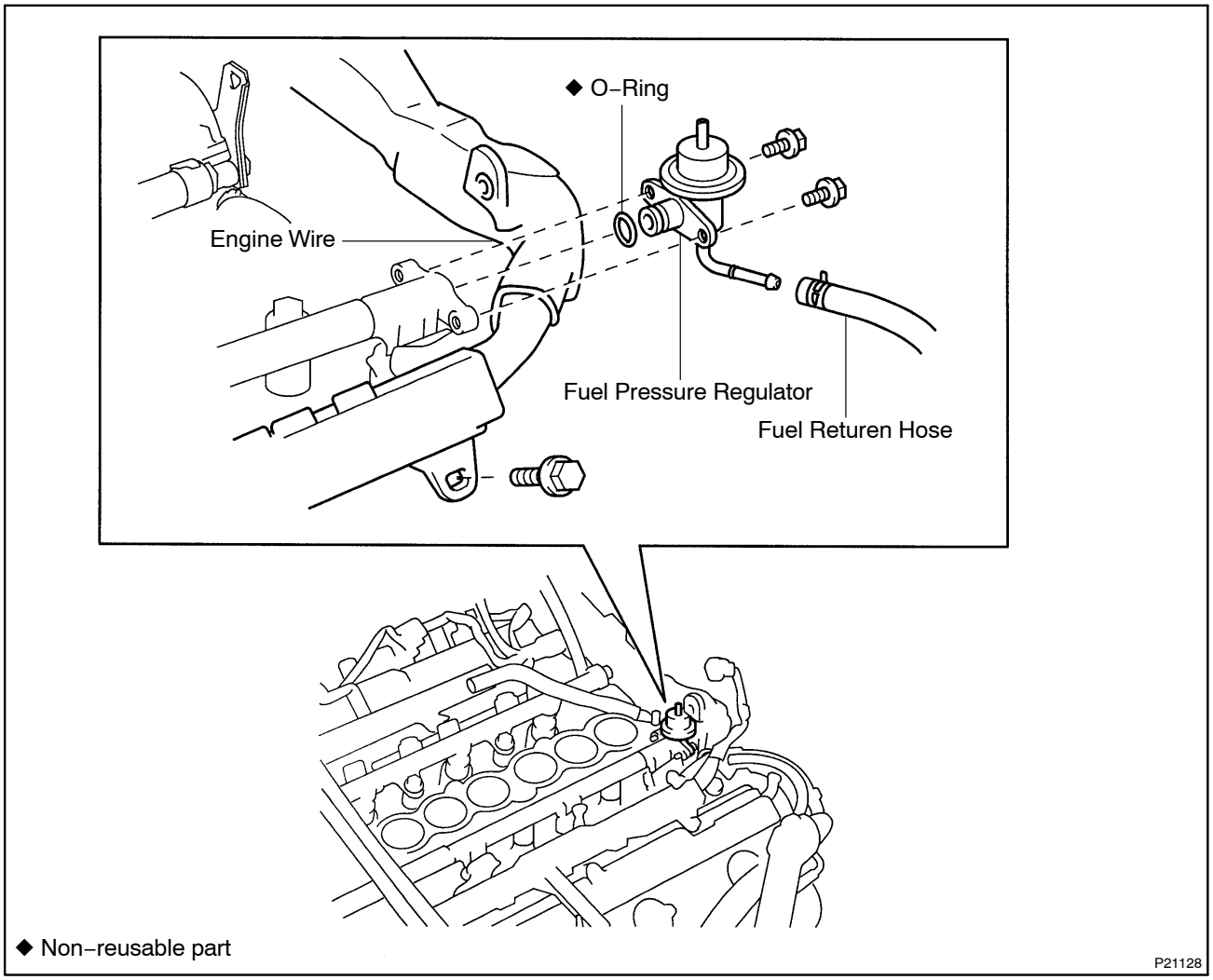
FUEL PRESSURE REGULATOR

COMPONENTS

SF0C0–04



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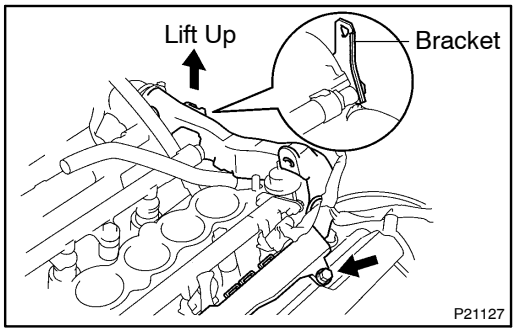
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SF0C1–03

REMOVAL

1. **REMOVE AIR CLEANER HOSE**
2. **REMOVE INTAKE AIR CONNECTOR**
   (See page EM–30)
3. **DISCONNECT FUEL RETURN HOSE FROM FUEL PRESSURE REGULATOR**

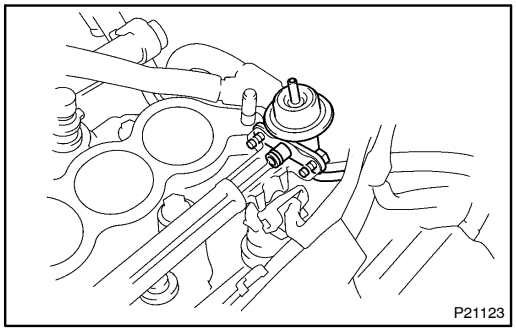
CAUTION:
Put a shop rag under the pressure regulator.



4. **REMOVE FUEL PRESSURE REGULATOR**

(a) Remove the bolt holding the engine wire to the LH cylinder head cover.

(b) Disconnect the protector from the bracket on the RH cylinder head cover, and lift up the engine wire.



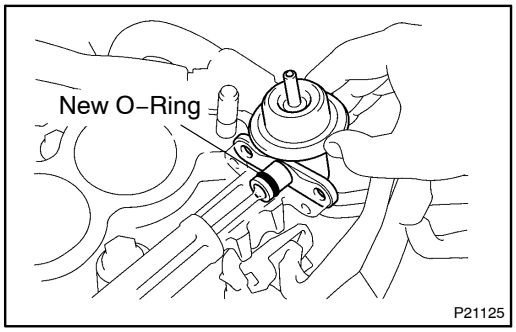
(c) Remove the 2 bolts, and pull out the pressure regulator.

(d) Remove the O–ring from the pressure regulator.

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SF0C2–03

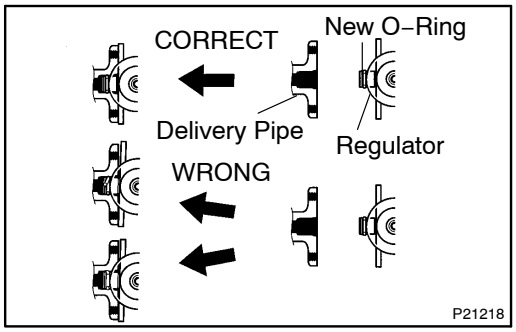
INSTALLATION



1. INSTALL FUEL PRESSURE REGULATOR

(a) Apply a light coat of gasoline to a new O–ring, and install it to the pressure regulator.

(b) Attach the pressure regulator to the LH delivery pipe.



(c) Check that the pressure regulator rotates smoothly.

NOTICE:

If it does not rotate smoothly, the O–ring may be pinched, so remove the pressure regulator and repeat steps (a) to (c) above.

(d) Install the pressure regulator with the 2 bolts.
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)

(e) Install the engine wire with the bolt.

2. CONNECT FUEL RETURN HOSE TO FUEL PRESSURE REGULATOR

NOTICE:

Be sure to insert the hose up to the stopper and clip it.

3. INSTALL INTAKE AIR CONNECTOR
(See page EM–69)

4. INSTALL AIR CLEANER HOSE

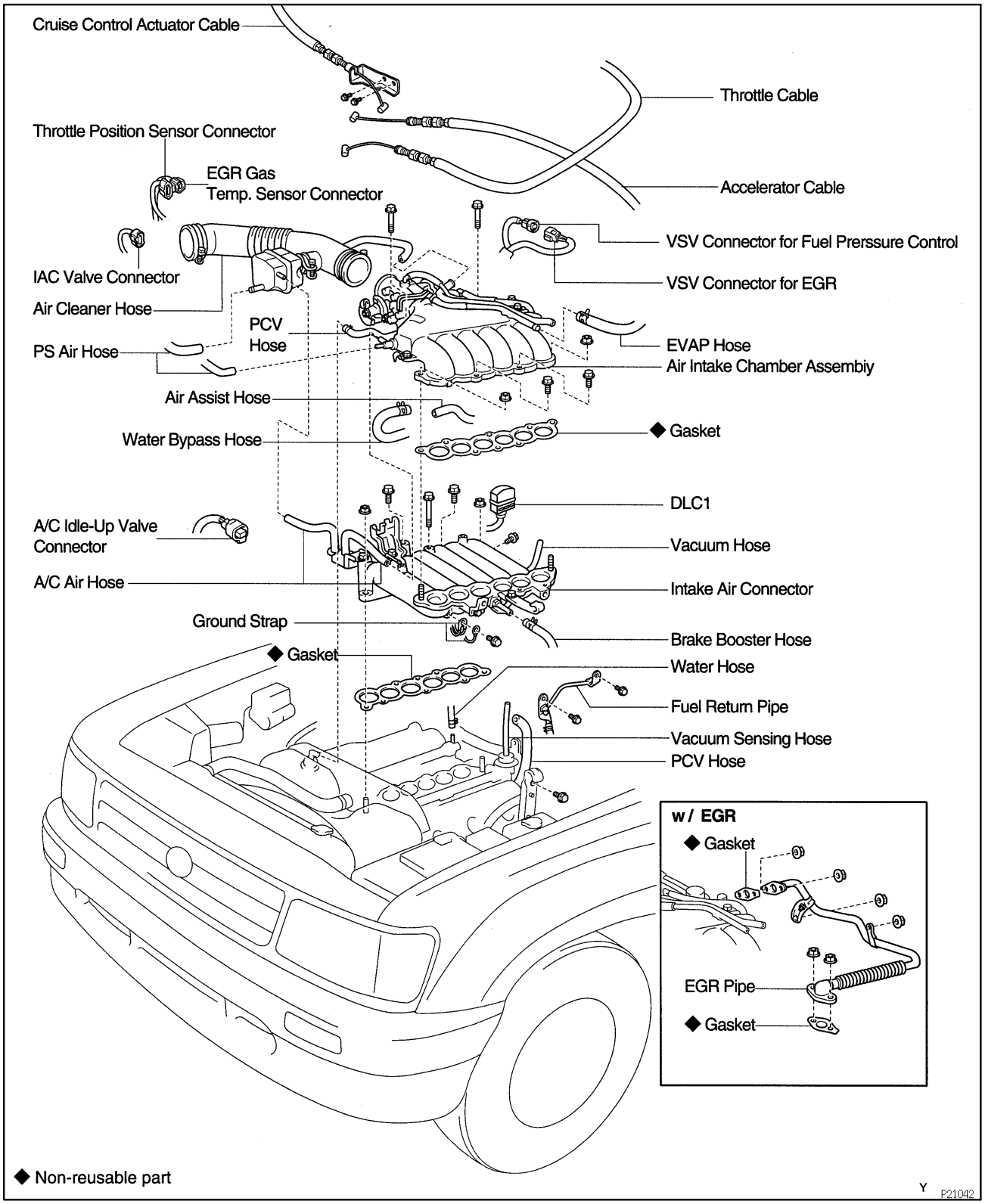
5. CHECK FOR FUEL LEAKS

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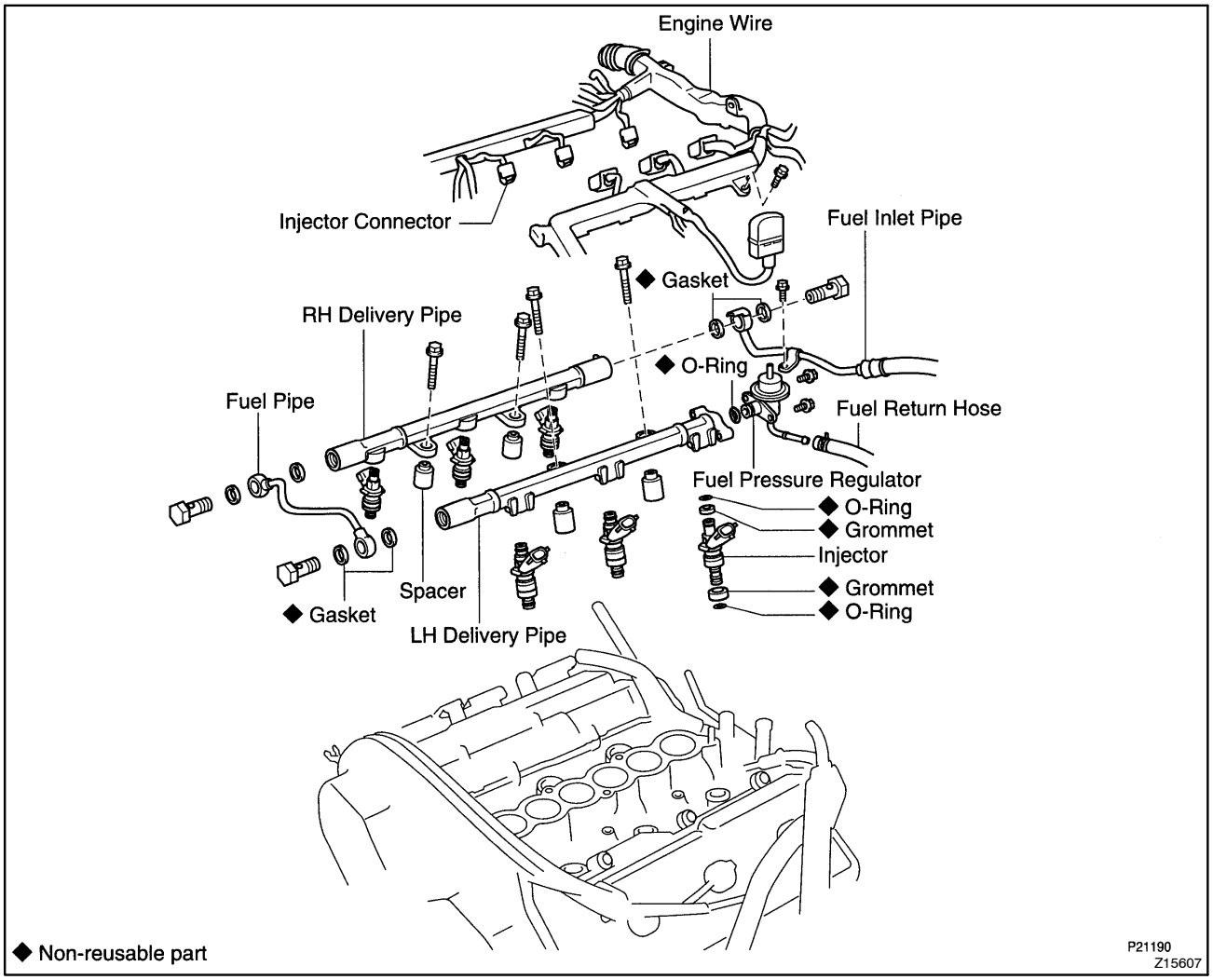
INJECTOR

COMPONENTS

SF0C3–04

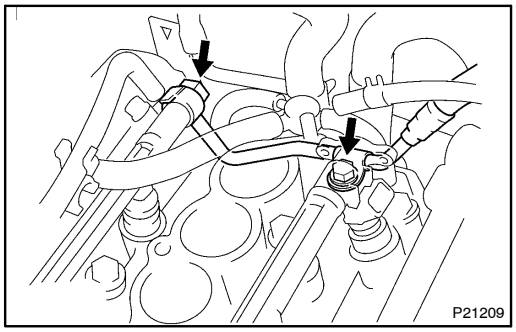


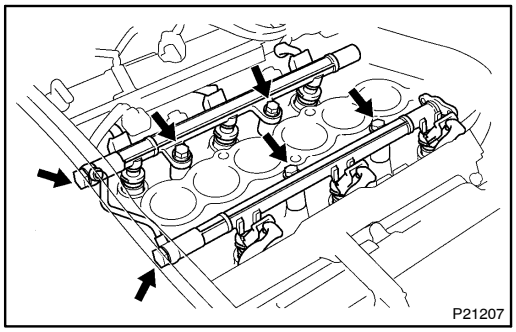
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SF0C4–01





REMOVAL

1. REMOVE AIR CLEANER HOSE

2. REMOVE INTAKE AIR CONNECTOR
(See page EM–65)

3. REMOVE FUEL PRESSURE REGULATOR
(See page SF–16)

4. DISCONNECT FUEL INLET PIPE

CAUTION:
Catch leaking fuel in a container.

5. REMOVE FUEL PIPE

6. DISCONNECT INJECTOR CONNECTORS

7. REMOVE DELIVERY PIPES AND INJECTORS

NOTICE:
Be careful not to drop the injectors when removing the delivery pipes.

(a) Remove the 4 bolts and delivery pipes together with the 6 injectors

(b) Remove the 4 spacers from the intake manifold.

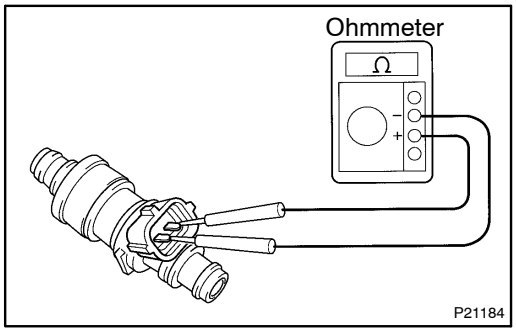
(c) Pull out the 6 injectors from the delivery pipes.

(d) Remove the 2 O–rings and 2 grommets from each injector.

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SF0C5–03

INSPECTION

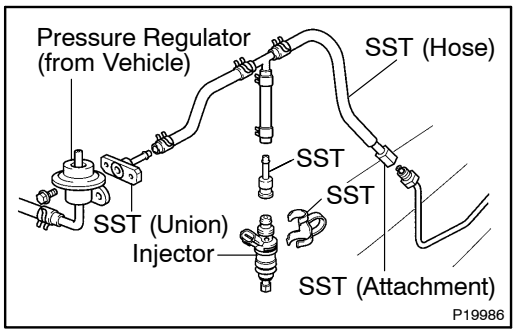


1. INSPECT INJECTOR RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

Resistance:
Approx. 13.8 Ω at 20°C (68°F)

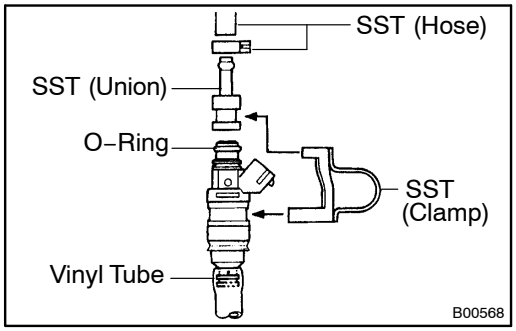
If the resistance is not as specified, replace the injector.



2. INSPECT INJECTOR INJECTION

CAUTION:
Keep injector clear of sparks during the test.

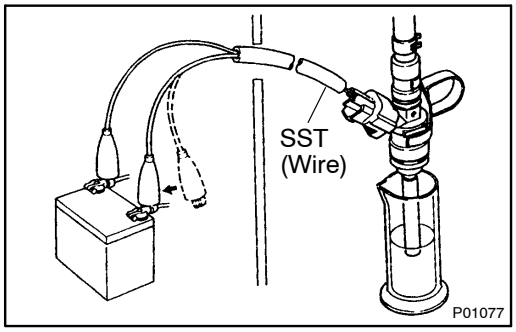
(a) Disconnect the fuel inlet pipe from the fuel tube.
(b) Connect SST (attachment and hose) to the fuel tube.
SST 09268–41046 (09268–52011)
(c) Connect the fuel return hose, SST (union) and SST (hose) to the fuel pressure regulator.
SST 09268–41046 (09268–41091)



(d) Install the O–ring to the injector.
(e) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp).
SST 09268–41046
(f) Put the injector into the graduated cylinder.

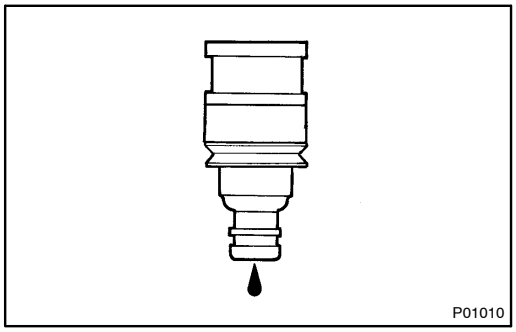
HINT:
Install a suitable vinyl tube onto the injector to prevent gasoline from splashing out.

(g) Connect the TOYOTA hand–held tester to the DLC3.
(See on–vehicle inspection in fuel pump)
(h) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector 2 or 3 times.
SST 09842–30070
Volume:
56 – 69 cm^3 (3.4 – 4.2 cu in.) per 15 sec.
Difference between each injector:
6 cm^3 (0.4 cu in.) or less



If the injection volume is not as specified, replace the injector.

3. INSPECT LEAKAGE



(a) In the condition above, disconnect the test probes of SST (wire) from the battery and check the fuel leakage from the injector.
SST 09842–30070
Fuel drop:
1 drop or less per minute
(b) Turn the ignition switch to LOCK.
(c) Disconnect the negative (–) terminal cable from the battery.

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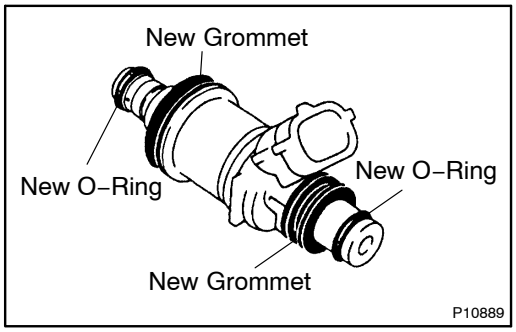
(d) Remove SST.
SST 09268–41046

(e) Disconnect the TOYOTA hand–held tester from the DLC3.

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SF0C6–03

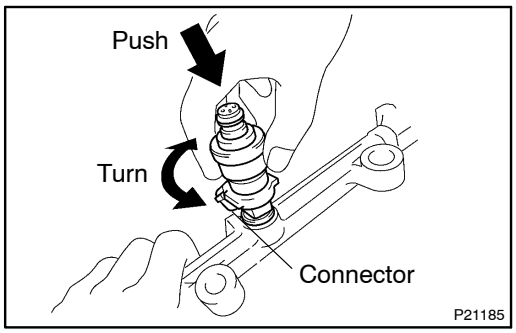
INSTALLATION



1. TEMPORARILY INSTALL INJECTORS AND DELIVERY PIPES

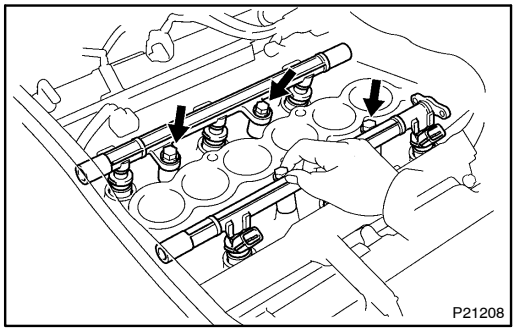
(a) Install 2 new grommets to each injector.

(b) Apply a light coat of spindle oil or gasoline to 2 new O–rings and install them to each injector.



(c) While turning the injector clockwise and counterclockwise, push it to the delivery pipes. Install the 6 injectors.

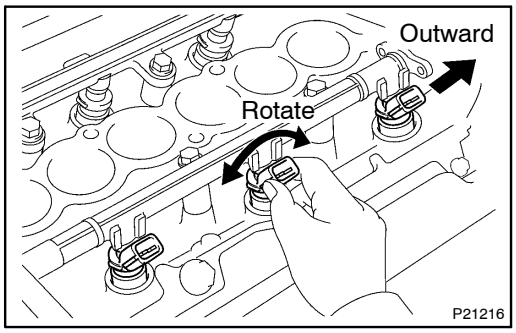
(d) Position the injector connector outward.



(e) Place the 4 spacers in position on the intake manifold.

(f) Place the delivery pipes with the 6 injectors in position on the intake manifold.

(g) Temporarily install the 4 bolts holding the delivery pipes to the intake manifold.

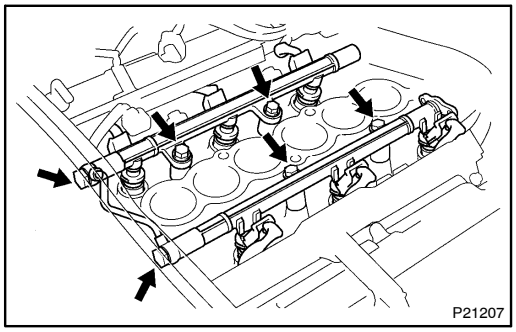


(h) Check that the injectors rotate smoothly.

HINT:

If injectors do not rotate smoothly, the probable cause is incorrect installation of O–rings. Replace the O–rings.

(i) Position the injector connector outward.



2. CONNECT INJECTOR CONNECTORS

3. INSTALL FUEL PIPE AND TIGHTENING DELIVERY PIPE HOLDING BOLTS

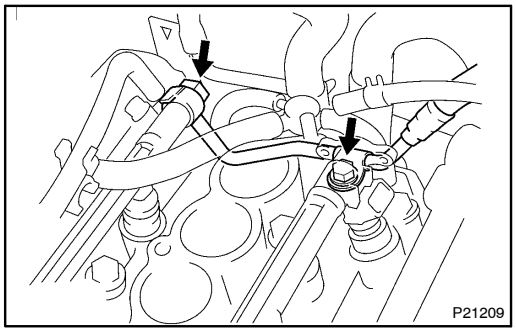
(a) Install the fuel pipe with 4 new gaskets and the 2 union bolts.

Torque: 34.3 N·m (350 kgf·cm, 25 ft·lbf)

(b) Tighten the 4 bolts holding the delivery pipes to the intake manifold.

Torque: 13 N·m (130 kgf·cm, 10 ft·lbf)

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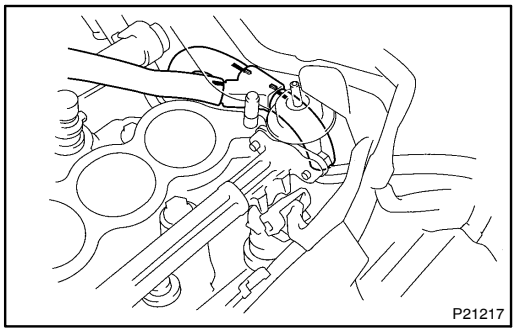
4. CONNECT FUEL INLET PIPE

(a) Temporarily install the union and 2 new gaskets, and connect the fuel pipe.

(b) Install the clamp bolt.
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)

(c) Tighten the union bolt.
Torque: 34.3 N·m (350 kgf·cm, 25 ft·lbf)

5. INSTALL FUEL PRESSURE REGULATOR
(See page SF–17)



6. VISUALLY INSPECT AIR ASSIST LINES AND CONNECTIONS

Look for loose connections, sharp bends or damage.

7. INSTALL INTAKE AIR CONNECTOR
(See page EM–69)

8. INSTALL AIR CLEANER HOSE

9. CHECK FOR FUEL LEAKS

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FUEL TANK AND LINE

SF0CA–01

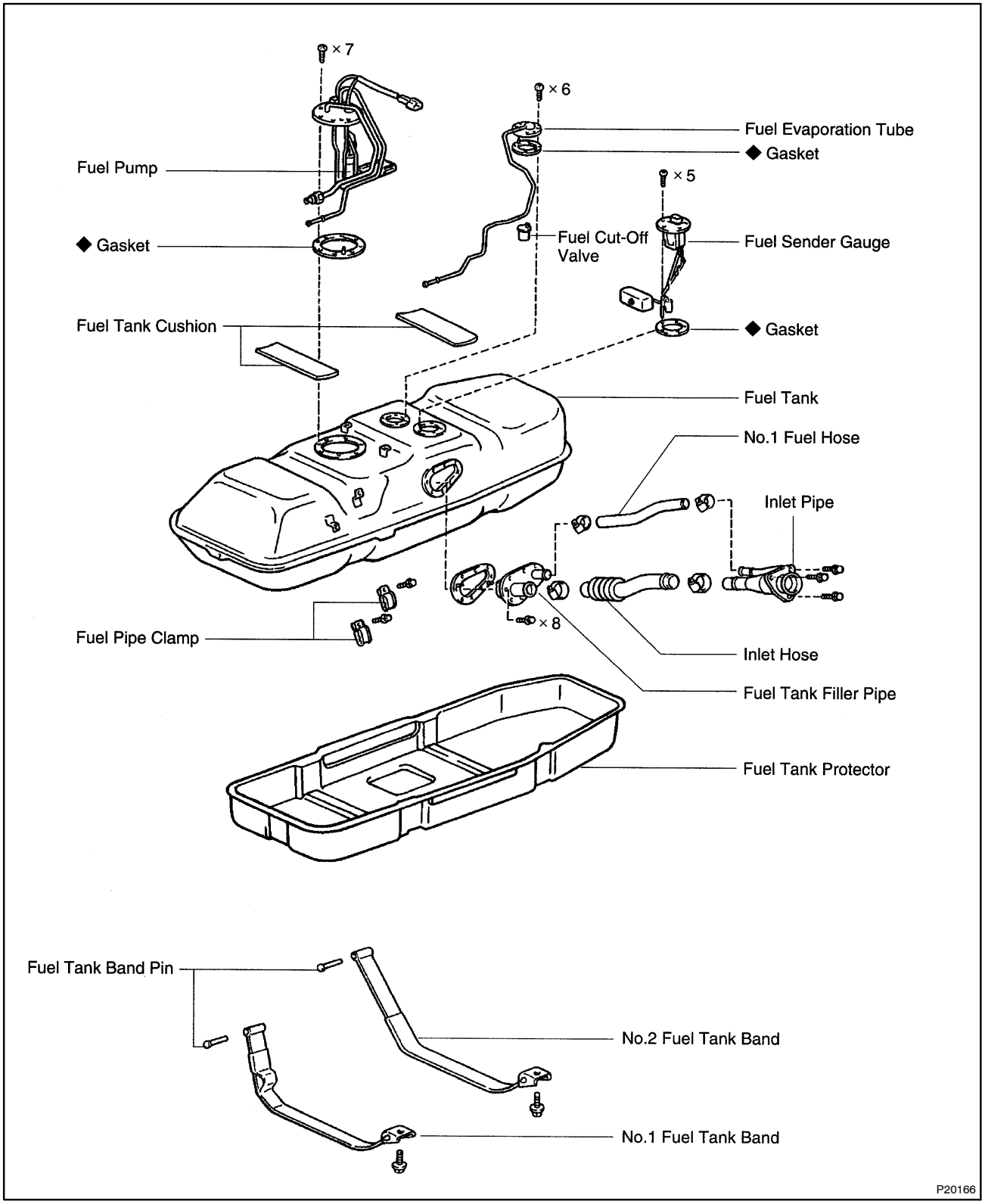
PRECAUTION

- **Always use new gaskets when replacing the fuel tank or component parts.**
- **Apply the proper torque to all parts tightened.**

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SF0CB–01

COMPONENTS



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SF0D2–01

INSPECTION

INSPECT FUEL TANK AND LINE

(a) Check the fuel lines for cracks or leakage, and all connections for deformation.

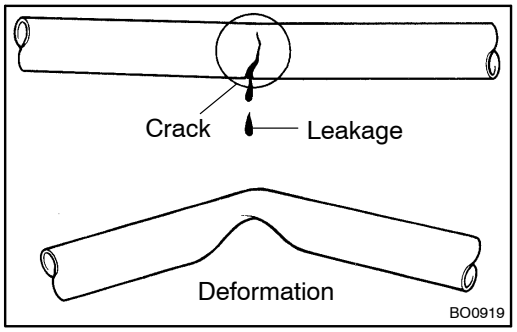
(b) Check the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.

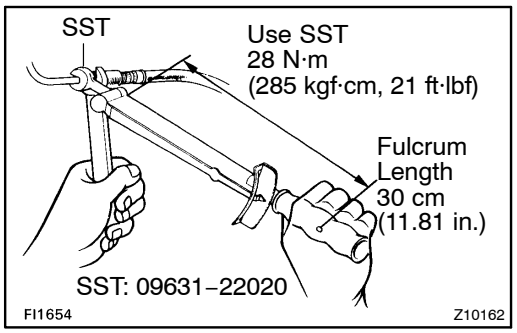
(c) Check the fuel tank for deformation, cracks, fuel leakage or tank band looseness.

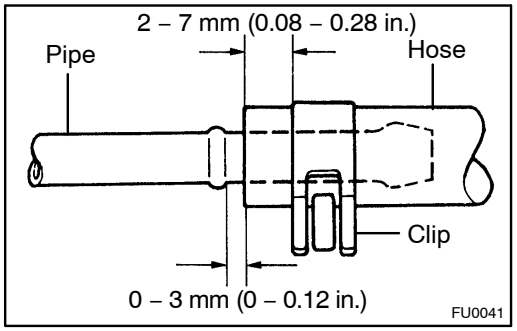
(d) Check the filler neck for damage or fuel leakage.

(e) Hose and pipe connections are as shown in the illustration.

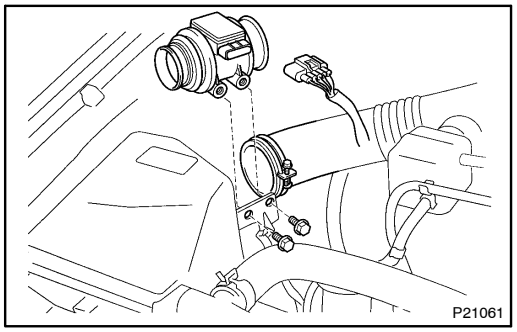
If a problem is found, repair or replace the parts as necessary.







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MASS AIR FLOW (MAF) METER

SF0C7–03

REMOVAL

1. DISCONNECT AIR CLEANER CAP FROM MAF METER

2. REMOVE MAF METER

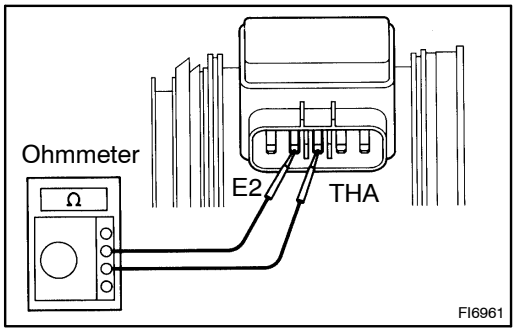
(a) Disconnect the MAF meter connector.

(b) Remove the 2 bolts and MAF meter.

Torque: 6.9 N·m (72 kgf·cm, 61 in.·lbf)

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SF0C8–04



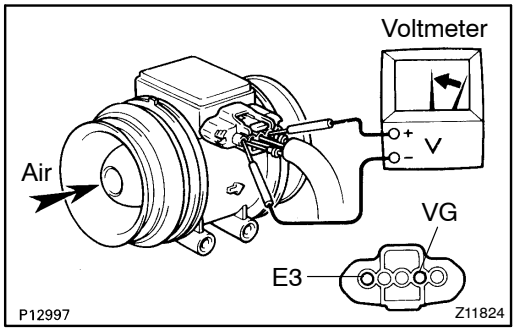
INSPECTION

1. INSPECT MAF METER RESISTANCE

Using an ohmmeter, measure the resistance between terminals THA and E2.

Between terminals	Resistance	Temperature
THA – E2	10 – 20 kΩ	–20°C (–4°F)
THA – E2	4 – 7 kΩ	0°C (32°F)
THA – E2	2 – 3 kΩ	20°C (68°F)
THA – E2	0.9 – 1.3 kΩ	40°C (104°F)
THA – E2	0.4 – 0.7 kΩ	60°C (140°F)
THA – E2	0.2 – 0.4 kΩ	80°C (176°F)

If the resistance is not as specified, replace the MAF meter.



2. INSPECT MAF METER OPERATION

(a) Connect the MAF meter connector.

(b) Using a voltmeter, connect the positive (+) tester probe to terminal VG, and negative (–) tester probe to terminal E3.

(c) Blow air into the MAF meter, and check that the voltage fluctuates.

If operation is not as specified, replace the MAF meter.

(d) Disconnect the MAF meter connector.

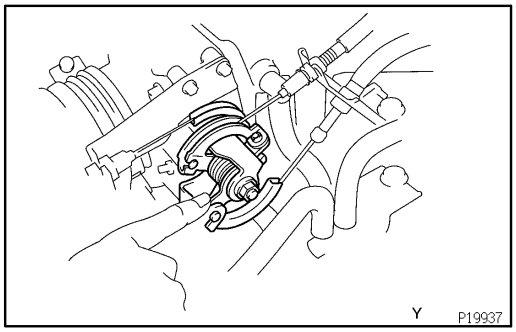
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SF0C9–02

INSTALLATION

Installation is in the reverse order of removal (See page SF–28).

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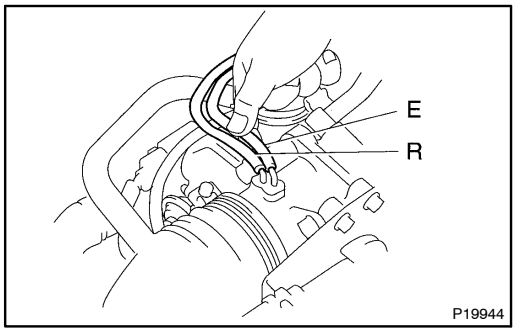
THROTTLE BODY

SF1QN–01

ON–VEHICLE INSPECTION

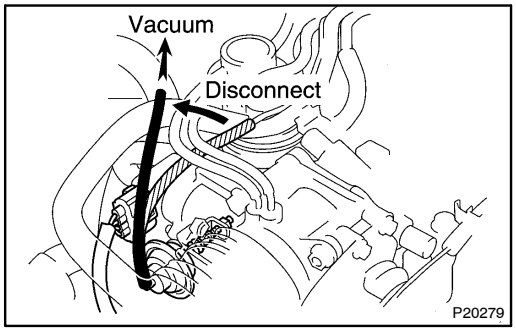
1. INSPECT THROTTLE BODY

(a) Check that the throttle linkage moves smoothly.



(b) w/ EGR:
Check the vacuum at each port.
- Start the engine.
- Check the vacuum with your finger.

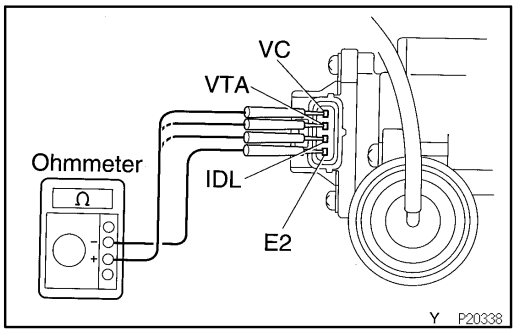
Port name	At idle	3,500 rpm or more
E	No vacuum	Vacuum
R	No vacuum	Vacuum



2. INSPECT THROTTLE POSITION SENSOR

(a) Apply vacuum to the throttle opener.

(b) Disconnect the sensor connector.

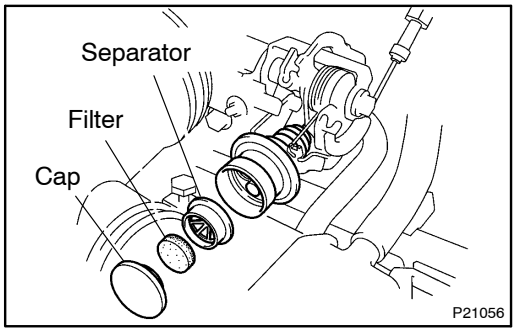


(c) Using an ohmmeter, measure the resistance between each terminal.

Throttle valve condition	Between terminals	Resistance
Fully closed	VTA – E2	0.28 – 6.4 kΩ
Fully closed	IDL – E2	0.5 kΩ or less
Open	IDL – E2	Infinity
Fully open	VTA – E2	2.0 – 11.6 kΩ
–	VC – E2	2.7 – 7.7 kΩ

(d) Reconnect the sensor connector.

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3. M/T:

INSPECT DASHPOT (DP)

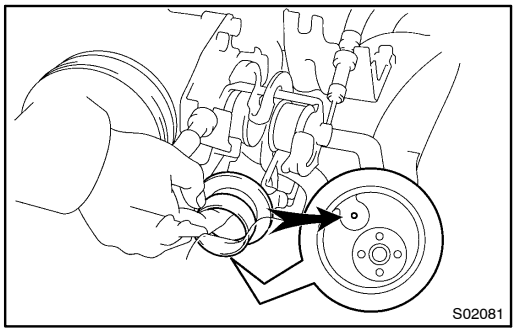
(a) Allow the engine to warm up to normal operating temperature.

(b) Check the idle speed.

Idle speed:

700 ± 50 rpm

(c) Remove the cap, filter and separator from the DP.



(d) Maintain engine speed at 2,500 rpm or more.

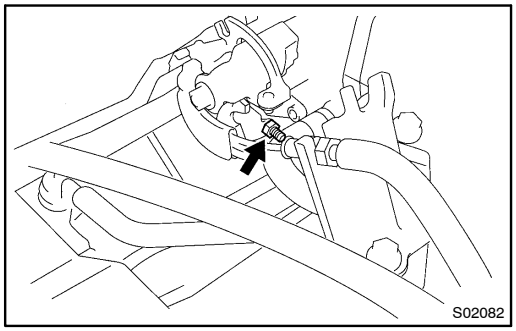
(e) Plug the VTV hole with your finger.

(f) Release the throttle valve.

(g) Check the DP is set.

DP setting speed:

1,800 – 2,200 rpm



(h) If not as specified, adjust with the DP adjusting screw.

(i) Remove your finger from the hole and check that the engine returns to idle speed in approx. 1 second.

(j) Reinstall the DP separator, filter and cap.

HINT:

Install the filter with the coarser surface facing the atmospheric side (outward).

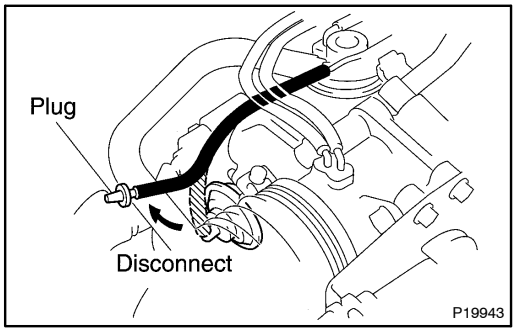
4. INSPECT THROTTLE OPENER

(a) Allow the engine to warm up to normal operating temperature.

(b) Check the idle speed.

Idle speed:

700 ± 50 rpm



(c) Disconnect the vacuum hose from the throttle opener, and plug the hose end.

(d) Check the throttle opener setting speed.

Throttle opener setting speed:

900 – 1,950 rpm

If the throttle opener setting is not as specified, replace the throttle body.

(e) Stop the engine.

(f) Reconnect the vacuum hose to the throttle opener.

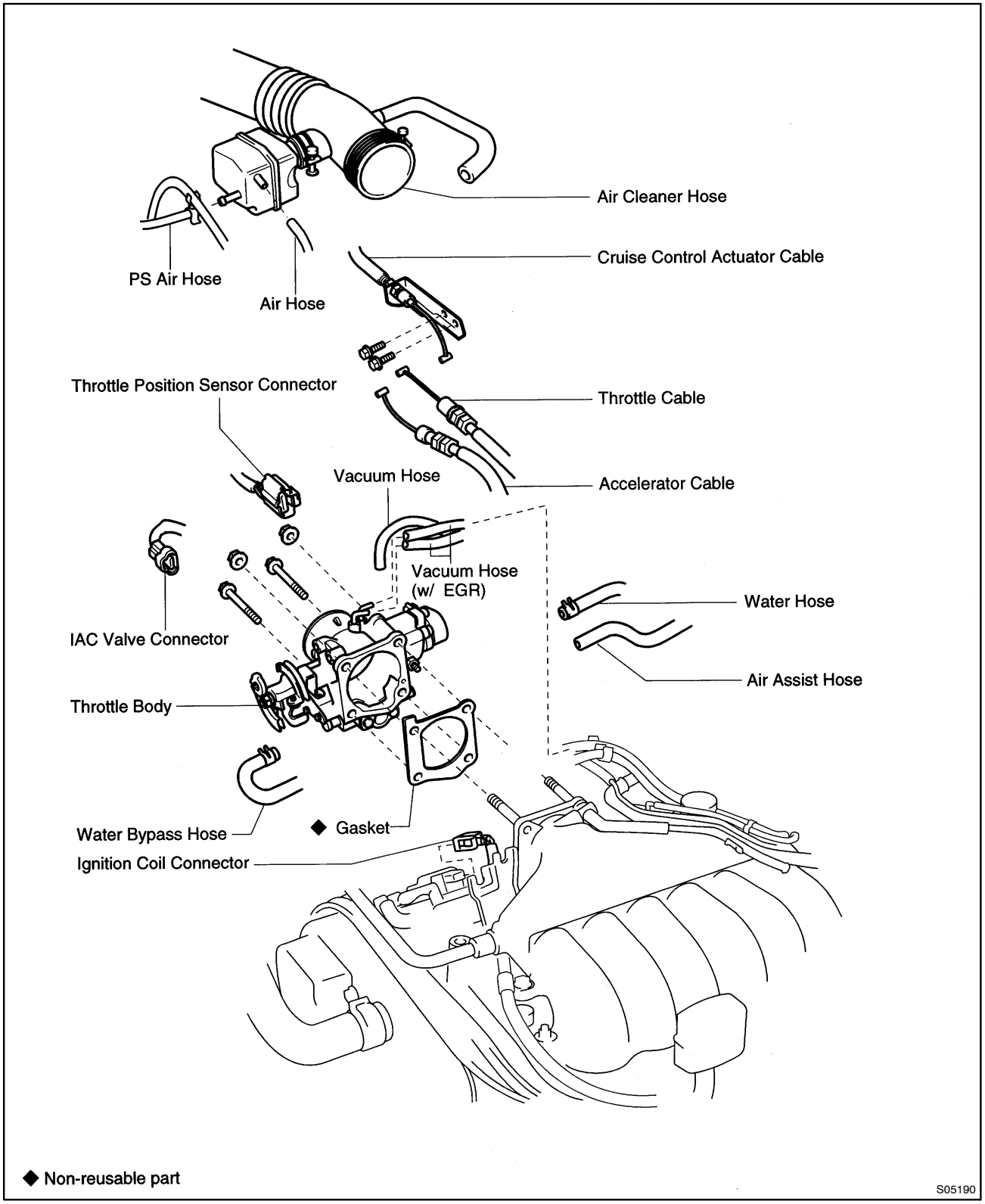
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(g) Start the engine and check that the idle speed returns to the correct speed.

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SF0CE–03

COMPONENTS



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SF1QO-01

REMOVAL

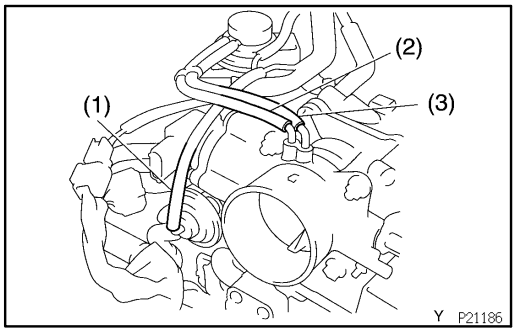
1. **DRAIN ENGINE COOLANT**
2. **DISCONNECT THESE CABLES:**

(a) w/ Cruise control:
Cruise control actuator cable

(b) Accelerator cable

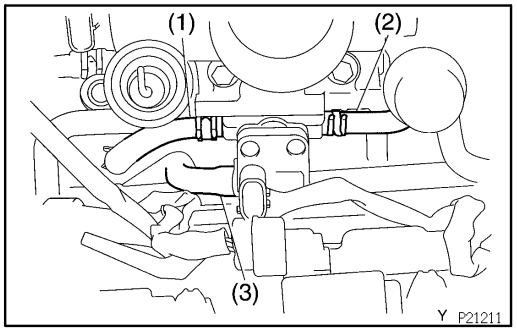
(c) A/T:
Throttle cable

3. **REMOVE AIR CLEANER HOSE**



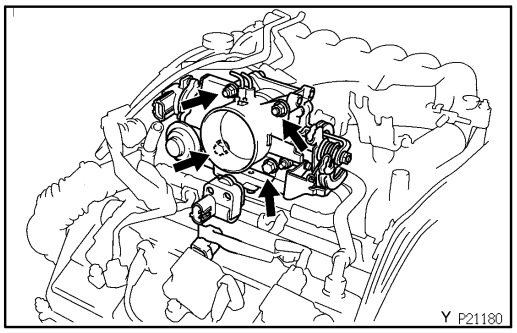
4. **DISCONNECT THROTTLE POSITION SENSOR CONNECTOR**
5. **DISCONNECT IAC VALVE CONNECTOR**
6. **REMOVE THROTTLE BODY**

(a) Disconnect these vacuum hoses from the throttle body:
(1) Vacuum hose of throttle opener
(2) w/ EGR:
Vacuum hose (from port R of EGR vacuum modulator)



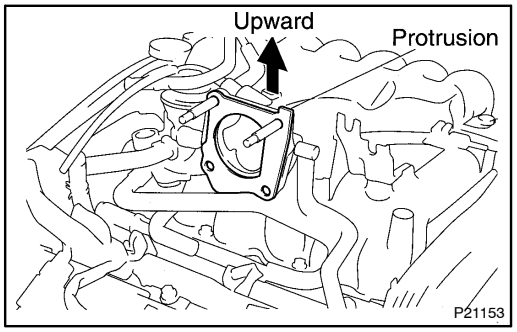
(3) w/ EGR:
Vacuum hose (from port E of EGR vacuum modulator)

(b) Disconnect these hoses from the IAC valve:
(1) Water bypass hose
(w/ EGR: from EGR valve)
(w/o EGR: from water bypass pipe)
(2) Water hose (from intake manifold)
(3) Air assist hose



(c) Disconnect the ignition coil connector.

(d) Remove the 2 bolts, 2 nuts, throttle body and gasket.



HINT:
Place a new gasket on the air intake chamber, the facing the protrusion upward.

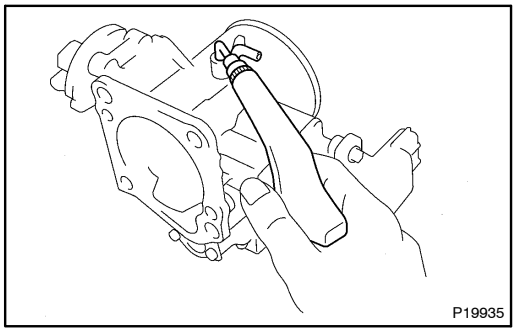
Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

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SF1QP–01

INSPECTION

1. CLEAN THROTTLE BODY



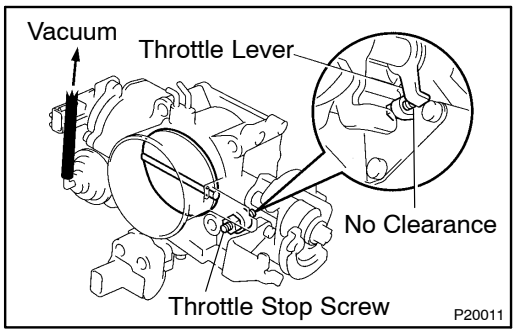
(a) Using a soft brush and carburetor cleaner, clean the cast parts.

(b) Using compressed air, clean all the passages and apertures.

NOTICE:

To prevent deterioration, do not clean the throttle position sensor and IAC valve.

2. INSPECT THROTTLE VALVE

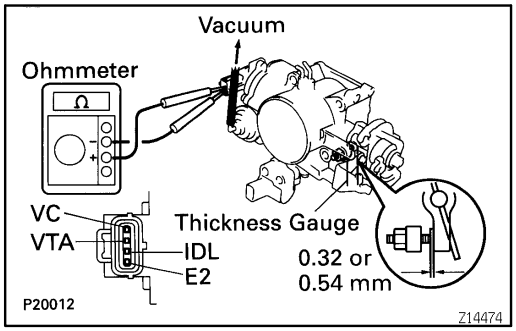


(a) Apply vacuum to the throttle opener.

(b) Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.

Throttle valve fully closed angle: 10°

3. INSPECT THROTTLE POSITION SENSOR



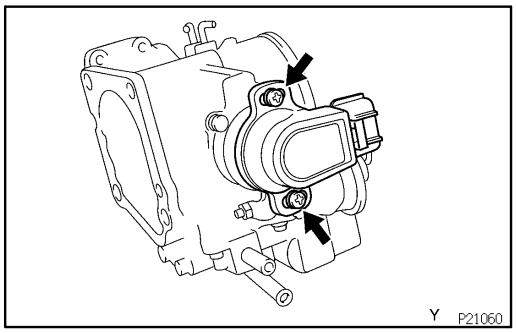
(a) Apply vacuum to the throttle opener.

(b) Insert a thickness gauge between the throttle stop screw and stop lever.

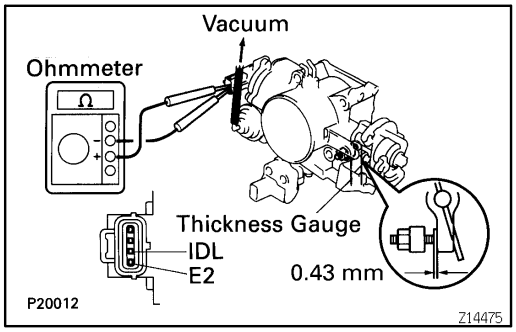
(c) Using an ohmmeter, measure the resistance between each terminal.

Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA – E2	0.28 – 6.4 kΩ
0.32 mm (0.013 in.)	IDL – E2	0.5 kΩ or less
0.54 mm (0.021 in.)	IDL – E2	Infinity
Throttle valve fully open	VTA – E2	2.0 – 11.6 kΩ
–	VC – E2	2.7 – 7.7 kΩ

4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR



(a) Loosen the 2 set screws of the sensor.



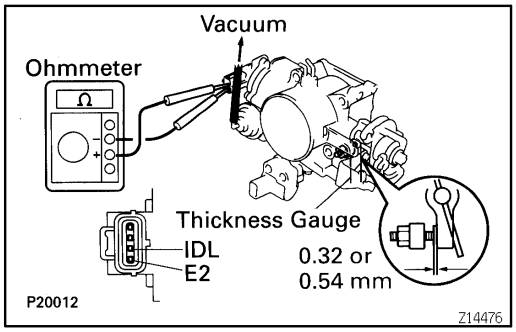
(b) Apply vacuum to the throttle opener.

(c) Insert a 0.43 mm (0.017 in.) thickness gauge, between the throttle stop screw and stop lever.

(d) Connect the test probe of an ohmmeter to the terminals IDL and E2 of the sensor.

(e) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the 2 set screws.

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(f) Recheck the continuity between terminals IDL and E2.

Clearance between lever and stop screw	Continuity (IDL – E2)
0.32 mm (0.013 in.)	Continuity
0.54 mm (0.021 in.)	No continuity

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SF0CH–02

INSTALLATION

Installation is in the reverse order of removal (See page SF–35).

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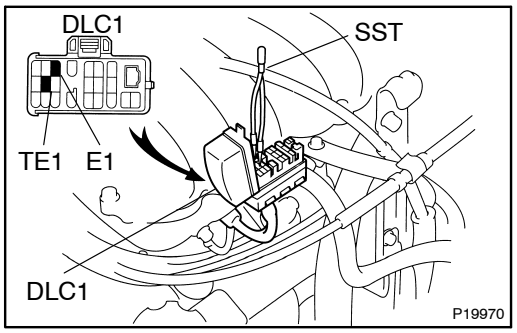
IDLE AIR CONTROL (IAC) VALVE

SF0CI–03

ON–VEHICLE INSPECTION

1. INSPECT IAC VALVE OPERATION

(a) Initial conditions:
- Engine at normal operating temperature
- Idle speed check correctly
- Transmission in neutral position
- A/C switch OFF

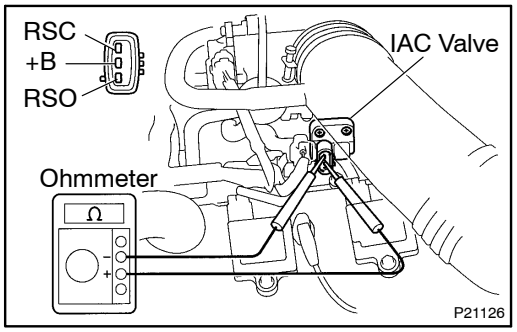


(b) Using SST, connect terminals TE1 and E1 of the DLC1.
SST 09843–18020

(c) After engine speed is kept at approx. 1,000 rpm for 5 seconds, check that it returns to idle speed.

If the engine speed operation is not as specified, check the IAC valve, wiring and ECM.

(d) Remove the SST from the DLC1.
SST 09843–18020



2. INSPECT IAC VALVE RESISTANCE

NOTICE:

"Cold" and "Hot" in the following sentences express the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

(a) Disconnect the IAC valve connector.

(b) Using an ohmmeter, measure the resistance between terminal +B and other terminals (RSC, RSO).
Resistance:
Cold: 17.0 – 24.5 Ω
Hot: 21.5 – 28.5 Ω

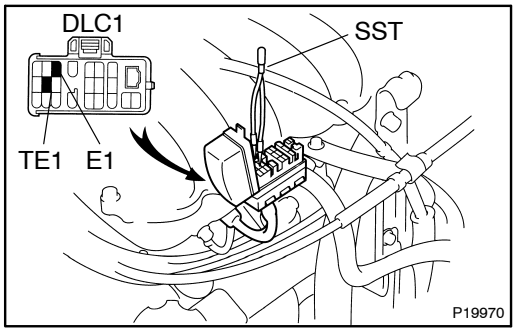
If resistance is not as specified, replace the IAC valve.

(c) Reconnect the IAC valve connector.

3. INSPECT AIR ASSIST SYSTEM

(a) Initial conditions:
- Engine at normal operating temperature
- Idle speed check correctly
- Transmission in neutral position
- A/C switch OFF

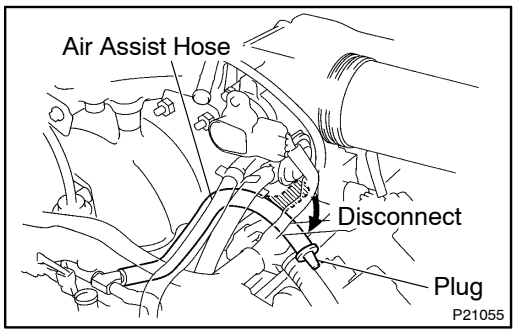
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(b) Using SST, connect terminals TE1 and E1 of the DLC1.
SST 09843–18020

(c) After engine speed is kept at 900 – 1,300 rpm for 10 seconds, check that it returns to idle speed.

(d) Stop the engine.



(e) Disconnect the air assist hose from the IAC valve, and plug it.

(f) Start the engine and check that the idle speed reaches 500 rpm or below (the engine may stall).
If the idle does not reach 500 rpm or below, check for a leak between the air assist hoses, pipe and injectors.

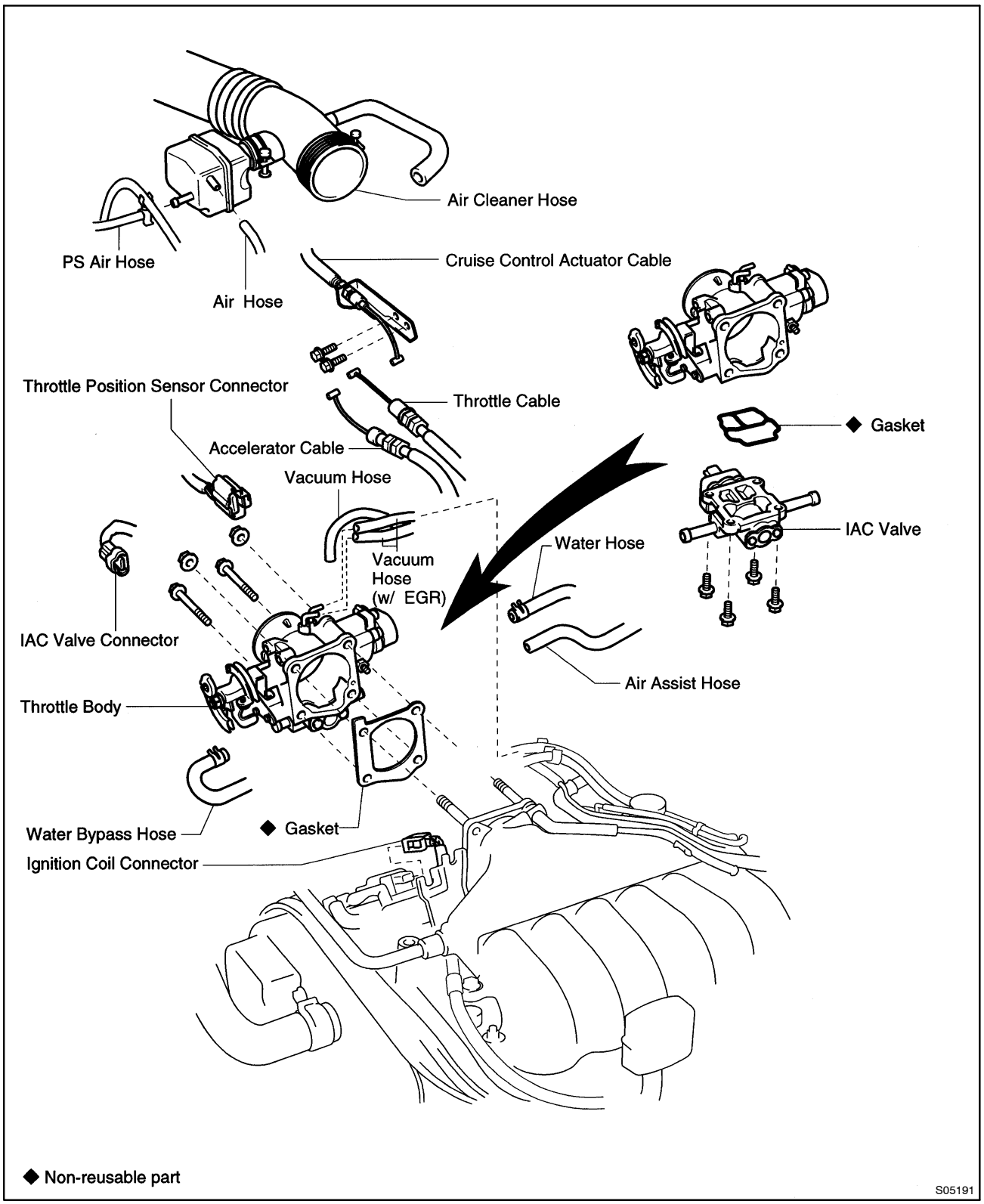
(g) Remove the SST from the DLC1.
SST 09843–18020

(h) Reconnect the air assist hose to the IAC valve.

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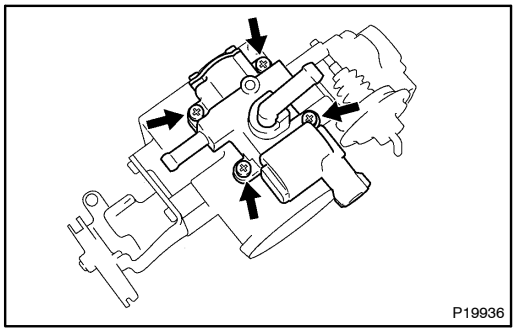
SF0CJ–01

COMPONENTS



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SF0CK–01



REMOVAL

1. REMOVE THROTTLE BODY
(See page SF–35)

2. REMOVE IAC VALVE

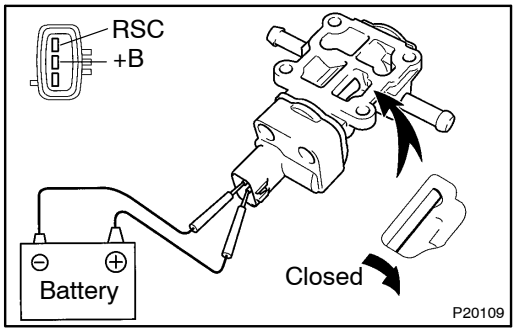
Remove the 4 screws, IAC valve and gasket.

HINT:

Place a new gasket on the throttle body.

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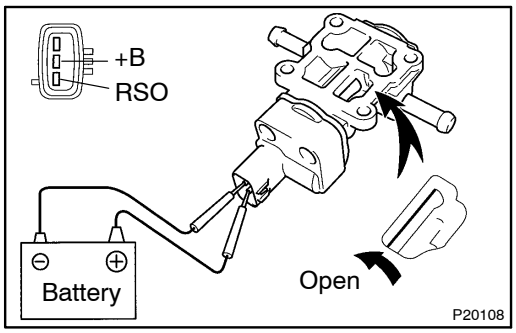
SF0CL–01



INSPECTION

INSPECT IAC VALVE OPERATION

(a) Connect the positive (+) lead from the battery to terminal +B and negative (–) lead to terminal RSC, and check that the valve is closed.



(b) Connect the positive (+) lead from the battery to terminal +B and negative (–) lead to terminal RSO, and check that the valve is open.

If operation is not as specified, replace the IAC valve.

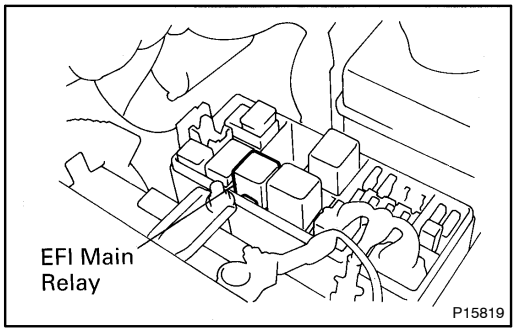
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SF0CM–01

INSTALLATION

Installation is in the reverse order of removal (See page SF–42).

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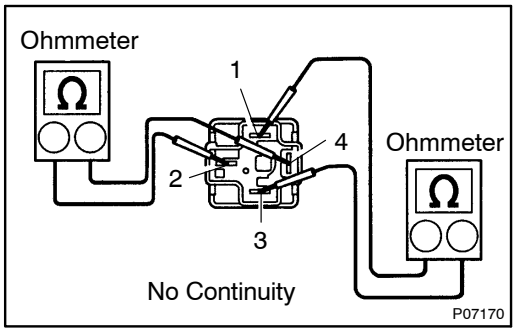


EFI MAIN RELAY

SF0CN–04

INSPECTION

1. REMOVE EFI MAIN RELAY (Marking: EFI)



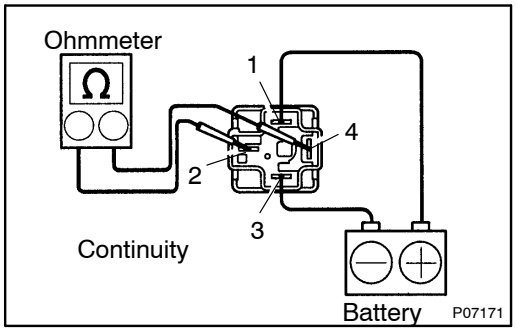
2. INSPECT EFI MAIN RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

(b) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.



3. INSPECT EFI MAIN RELAY OPERATION

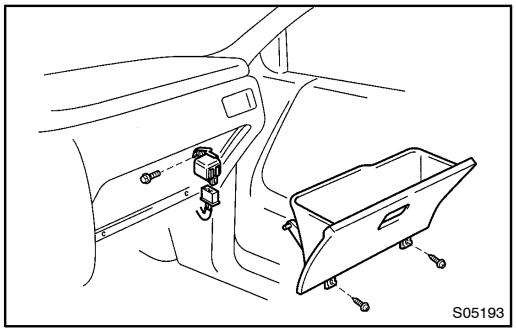
(a) Apply battery positive voltage across terminals 1 and 2.

(b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

4. REINSTALL EFI MAIN RELAY

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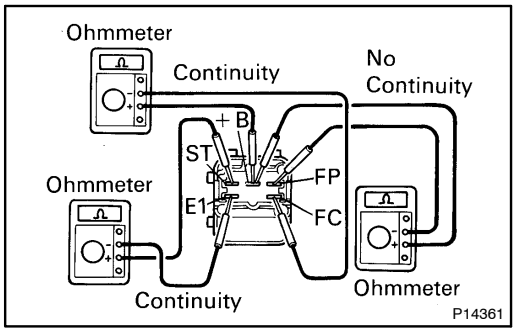


CIRCUIT OPENING RELAY

SF0D3–01

INSPECTION

1. REMOVE CIRCUIT OPENING RELAY



2. INSPECT CIRCUIT OPENING RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals ST and E1.

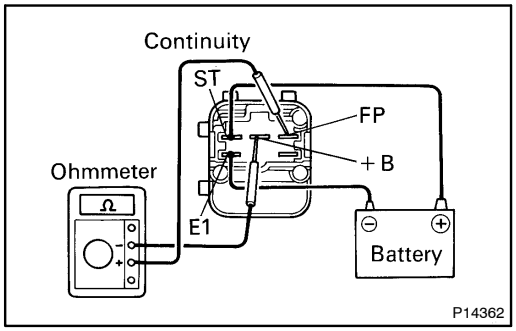
If there is no continuity, replace the relay.

(b) Check that there is continuity between terminals +B and FC.

If there is no continuity, replace the relay.

(c) Check that there is no continuity between terminals +B and FP.

If there is continuity, replace the relay.



3. INSPECT CIRCUIT OPENING RELAY OPERATION

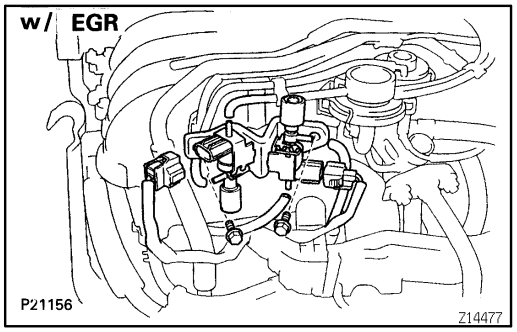
(a) Apply battery positive voltage across terminals ST and E1.

(b) Using an ohmmeter, check that there is continuity between terminals +B and FP.

If there is no continuity, replace the relay.

4. REINSTALL CIRCUIT OPENING RELAY

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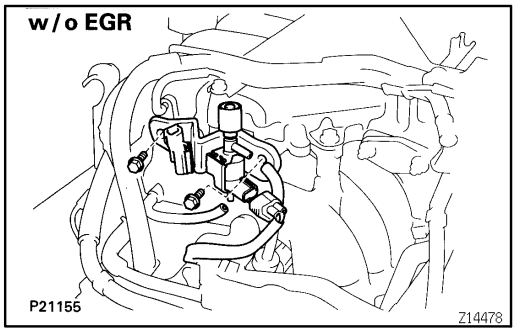
VSV FOR FUEL PRESSURE CONTROL

SF1QQ–01

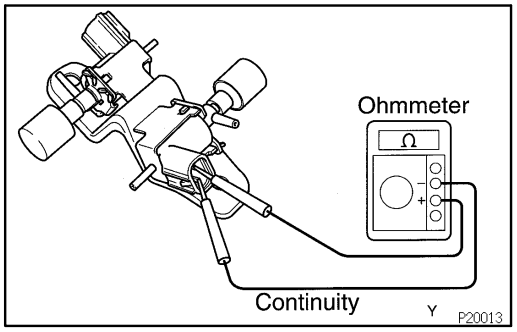
INSPECTION

1. REMOVE VSV

(a) w/ EGR:
Disconnect the 2 connectors and 4 vacuum hoses, and remove the 2 bolts and VSV.



(b) w/o EGR:
Disconnect the connector and 2 vacuum hoses, and remove the 2 bolts and VSV.

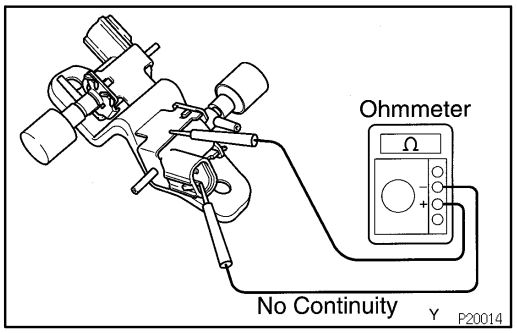


2. INSPECT VSV FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the terminals.

Resistance: 33 – 39 Ω at 20 °C(69 °F)

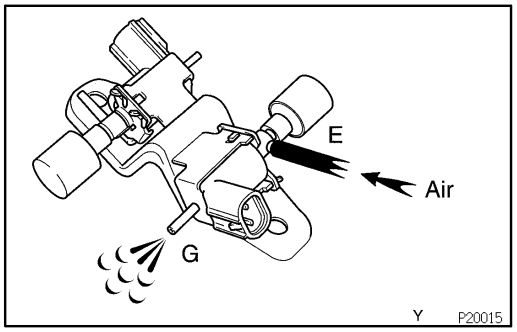
If there is no continuity, replace the VSV.



3. INSPECT VSV FOR GROUND

Using an ohmmeter, check that there is no continuity between each terminal and the body.

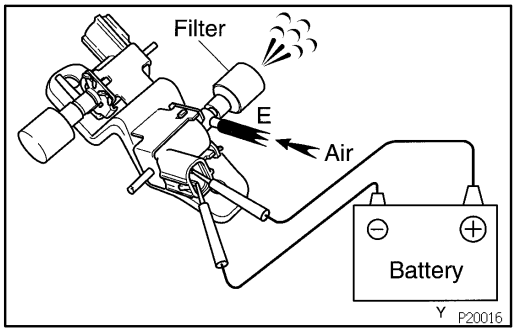
If there is continuity, replace the VSV.



4. INSPECT VSV FOR OPERATION

(a) Check that air flows from port E to port G.

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(b) Apply battery positive voltage across the terminals.

(c) Check that air flows from port E to the filter.

If operation is not as specified, replace the VSV.

5. REINSTALL VSV

(a) Install the VSV with the 2 bolts.

Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)

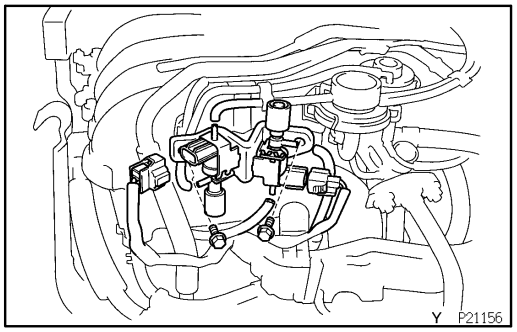
(b) w/ EGR:

Connect the 2 connectors and 4 vacuum hoses to the 2 VSV.

(c) w/o EGR:

Connect the connector and 2 vacuum hoses to the VSV.

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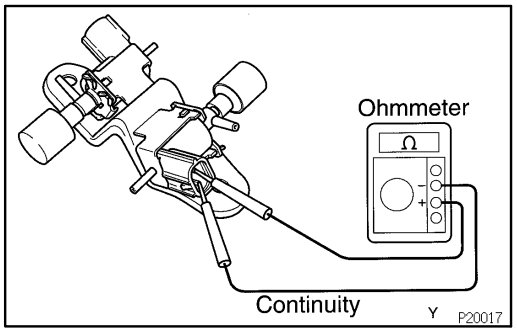
VSV FOR EXHAUST GAS CONTROL VALVE

SF0D0–02

INSPECTION

1. REMOVE VSV

Disconnect the 2 connectors and 4 vacuum hoses, and remove the 2 bolts and VSV.

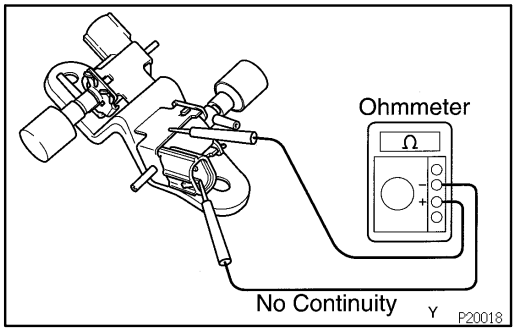


2. INSPECT VSV FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the terminals.

Resistance: 33 – 39 Ω at 20 °C (68 °F)

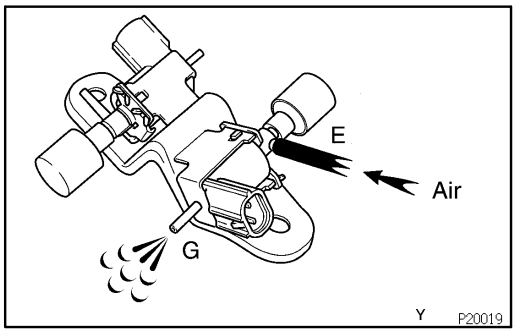
If there is no continuity, replace the VSV.



3. INSPECT VSV FOR GROUND

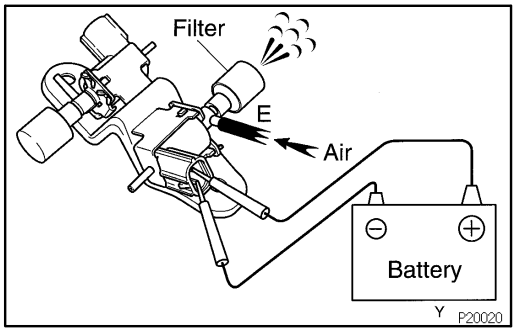
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



4. INSPECT VSV OPERATION

(a) Check that air flows from port E to port G.



(b) Apply battery positive voltage across the terminals.

(c) Check that air flows from port E to the filter.

If operation is not as specified, replace the VSV.

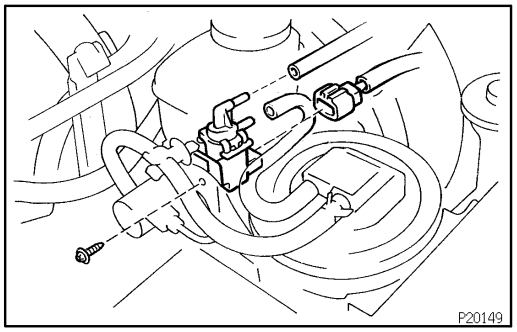
5. REINSTALL VSV

(a) Install the VSV with the 2 bolts.

Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)

(b) Connect the 2 connectors and 4 vacuum hoses to the 2 VSV.

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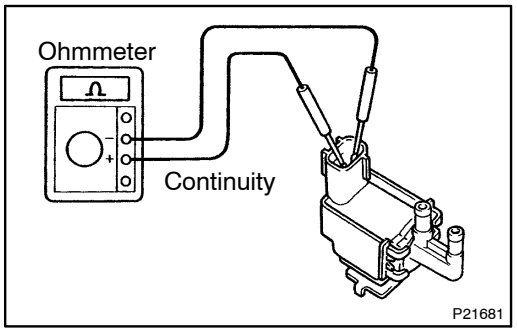
VSV FOR EVAPORATIVE EMISSION (EVAP)

SF0CP–03

INSPECTION

1. REMOVE VSV

Disconnect the connector and 2 EVAP hoses, and remove the screw and VSV.



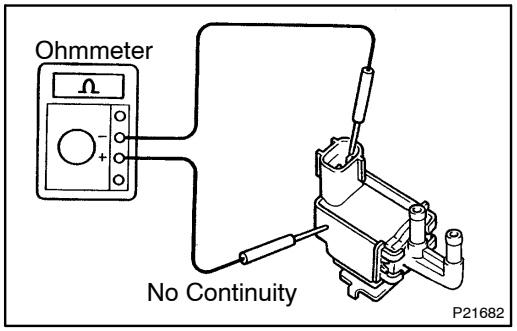
2. INSPECT VSV FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

29 – 33 Ω at 20°C (68°F)

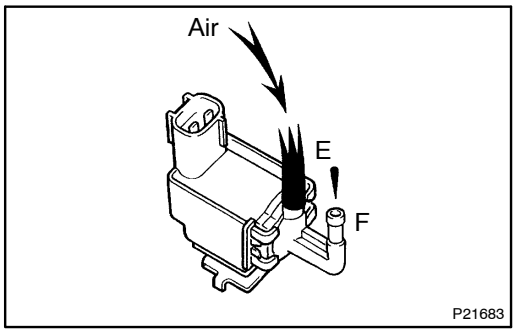
If resistance is not as specified, replace the VSV.



3. INSPECT VSV FOR GROUND

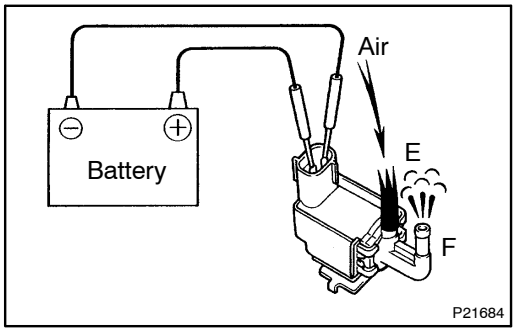
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



4. INSPECT VSV OPERATION

(a) Check that air flows difficulty from port E to port F.



(b) Apply battery positive voltage across the terminals.

(c) Check that air flows from port E to port F.

If operation is not as specified, replace the VSV.

5. REINSTALL VSV

(a) Install the VSV with the screw.

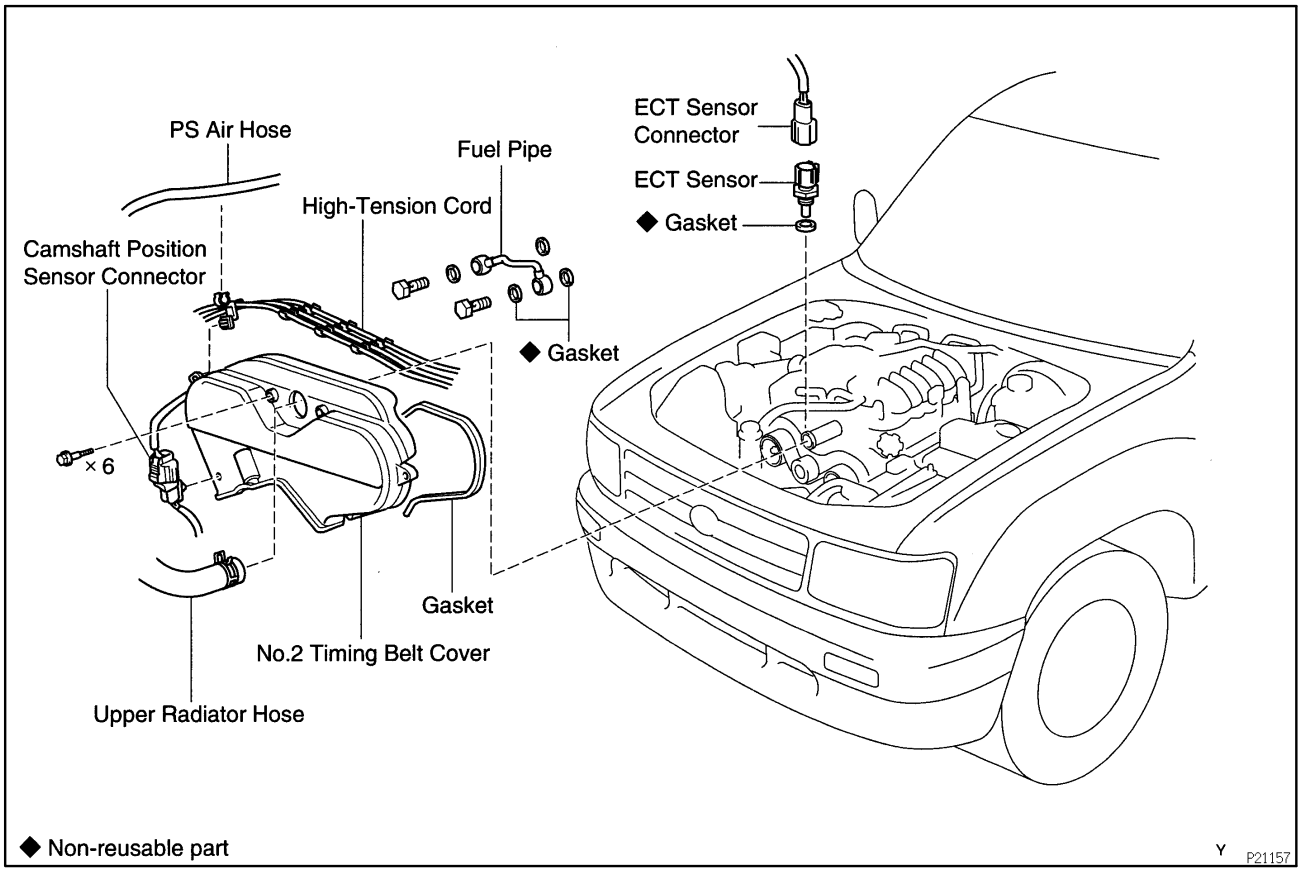
(b) Connect the connector and 2 EVAP hoses to the VSV.

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ENGINE COOLANT TEMPERATURE (ECT) SENSOR

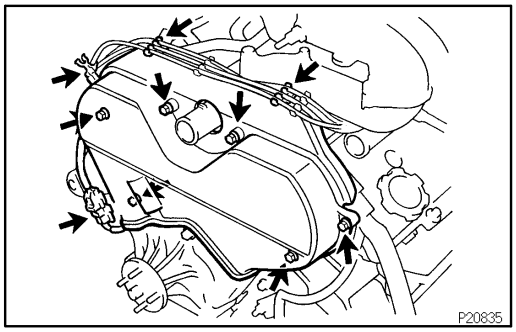
COMPONENTS

SF0CR–03



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SF0CS–03



INSPECTION

1. DRAIN ENGINE COOLANT

2. DISCONNECT UPPER RADIATOR HOSE FROM WATER OUTLET

3. REMOVE NO. 2 TIMING BELT COVER

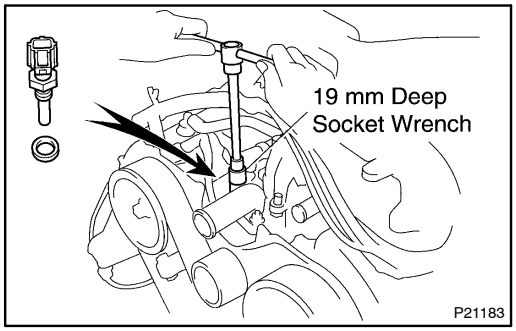
(a) Disconnect the PS air hose from the clamp.

(b) Disconnect the 3 cord clamps of the high–tension cords from the belt cover.

(c) Remove the 6 bolts, timing belt cover and gasket.

(d) Disconnect the camshaft position sensor connector.

4. REMOVE FUEL PIPE

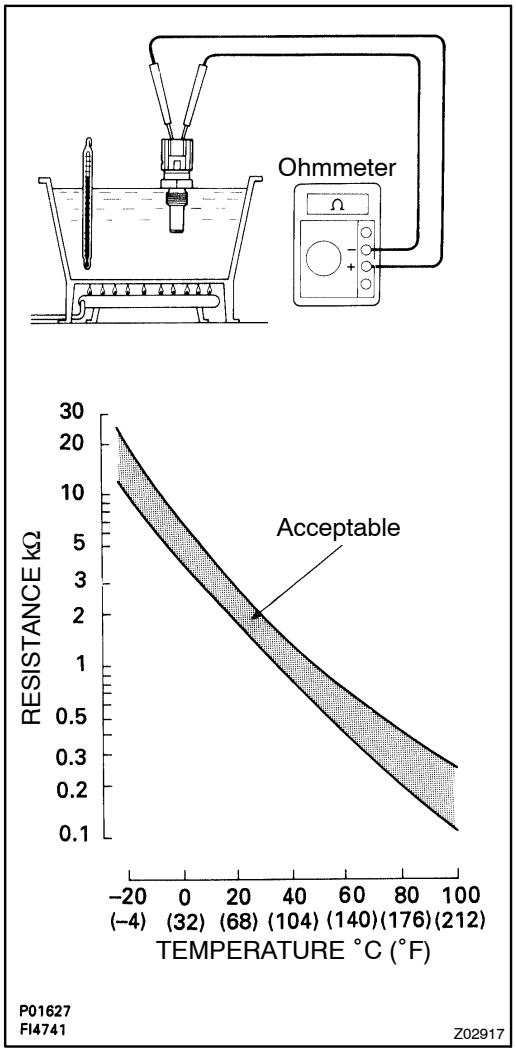


5. REMOVE ECT SENSOR

(a) Disconnect the ECT sensor connector.

(b) Using a 19 mm deep socket wrench, remove the ECT sensor and gasket.

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6. INSPECT ECT SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance:
Refer to the graph

If the resistance is not as specified, replace the ECT sensor.

7. REINSTALL ECT SENSOR

(a) Install a new gasket to the ECT sensor.

(b) Using a 19 mm deep socket, install the ECT sensor.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

(c) Connect the ECT sensor connector.

8. REINSTALL FUEL PIPE

Install the fuel pipe with 4 new gaskets and the 2 union bolts.
Torque: 34.3 N·m (350 kgf·cm, 25 ft·lbf)

9. REINSTALL NO.2 TIMING BELT COVER
Torque: 9 N·m (90 kgf·cm, 80 in.·lbf)

10. RECONNECT UPPER RADIATOR HOSE TO WATER OUTLET

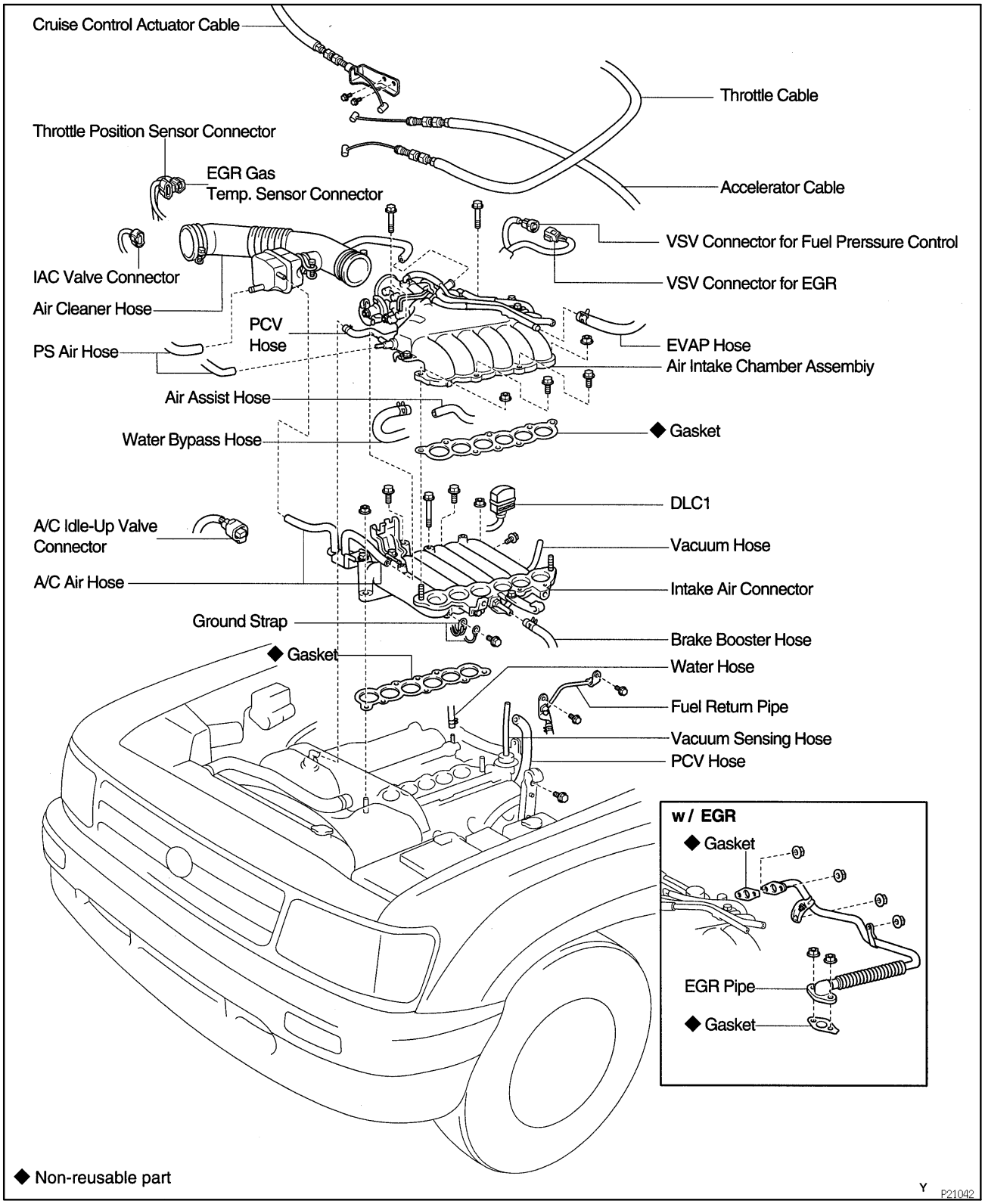
11. REFILL WITH ENGINE COOLANT

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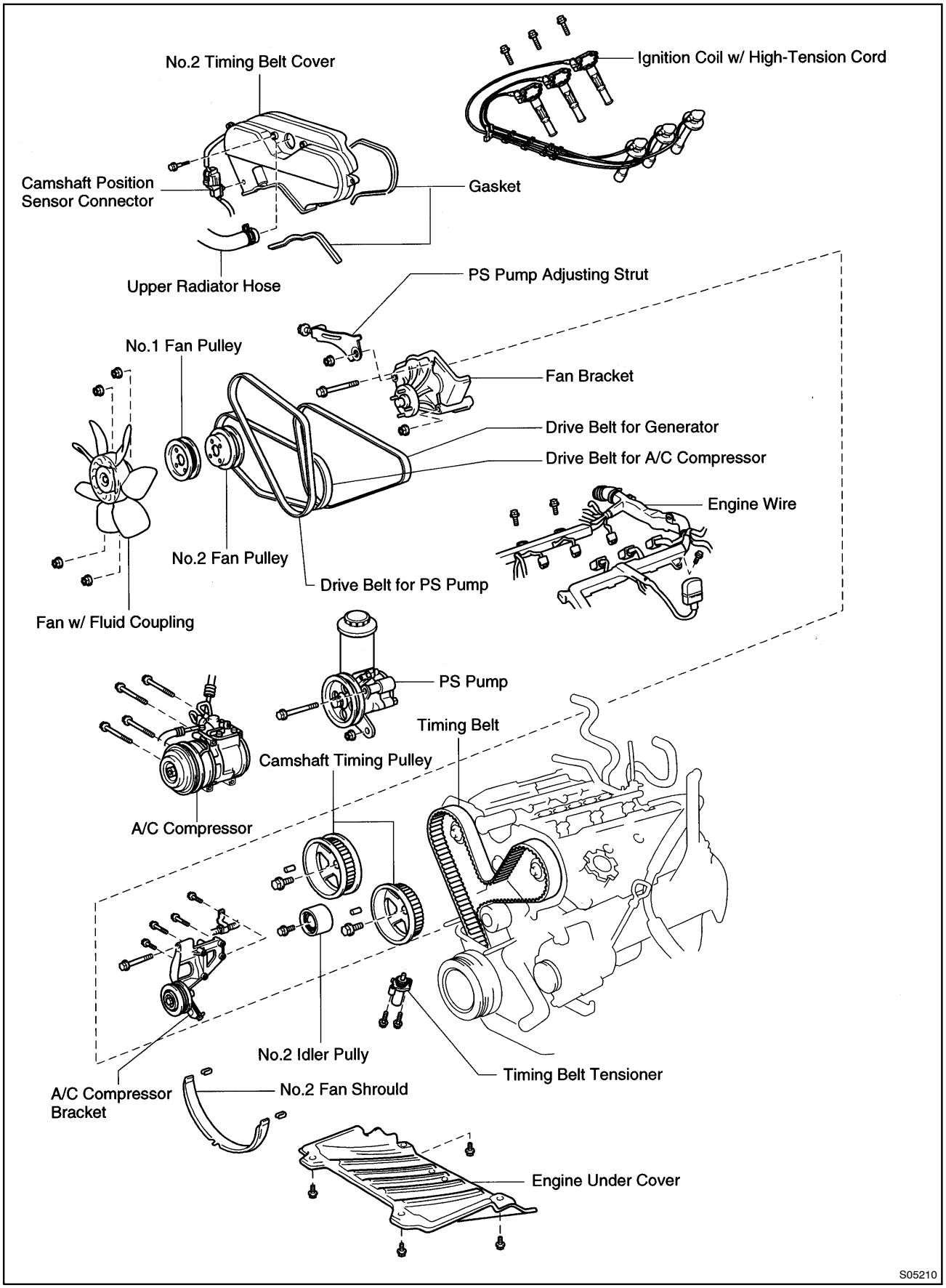
KNOCK SENSOR

COMPONENTS

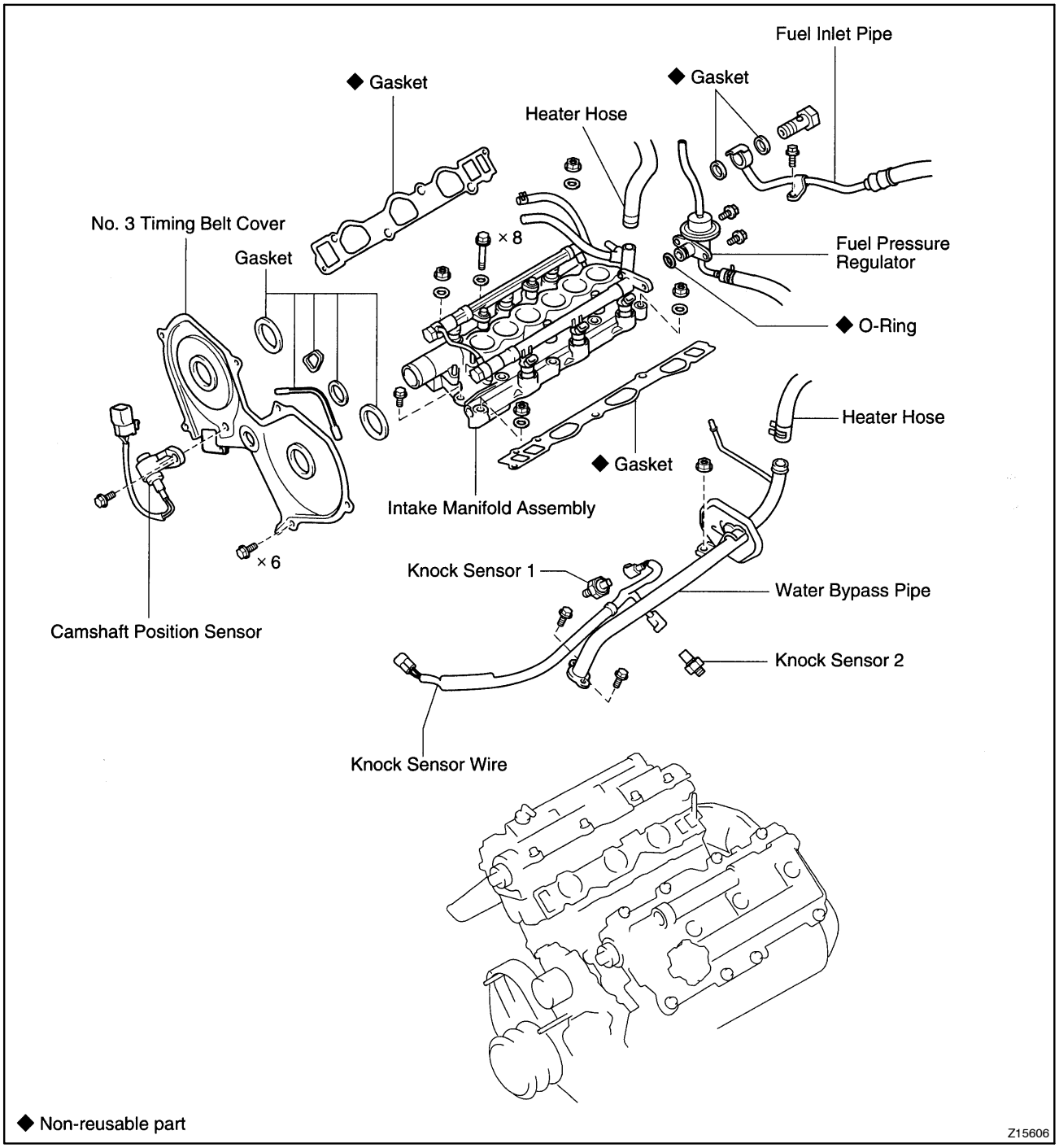
SF0CU–02



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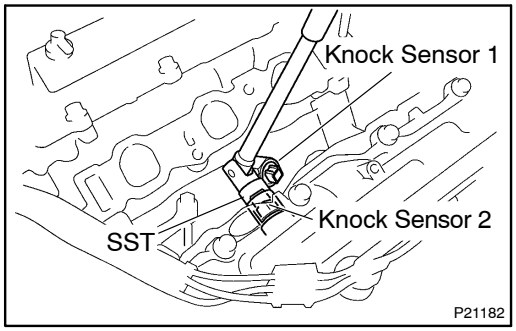


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SF0CV–04

INSPECTION

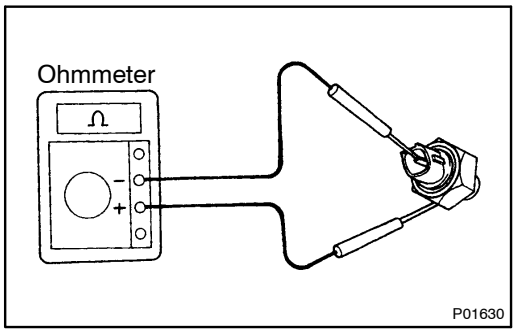
1. DRAIN ENGINE COOLANT
2. REMOVE AIR CLEANER HOSE
3. REMOVE INTAKE AIR CONNECTOR (See page EM–30)
4. REMOVE HIGH–TENSION CORDS WITH IGNITION COILS (See page IG–7)
5. REMOVE TIMING BELT AND CAMSHAFT TIMING PULLEYS (See page EM–13)
6. REMOVE TIMING BELT IDLER NO. 2
7. REMOVE FUEL PRESSURE REGULATOR (See page SF–16)
8. REMOVE INTAKE MANIFOLD ASSEMBLY (See page EM–30)
9. REMOVE WATER BYPASS PIPE AND KNOCK SENSOR WIRE (See page EM–84)



10. REMOVE KNOCK SENSORS

Using SST, remove the knock sensor.

SST 09816–30010



11. INSPECT KNOCK SENSORS

Using an ohmmeter, check that there is no continuity between the terminal and body.

If there is continuity, replace the sensor.

12. INSTALL KNOCK SENSORS

Using SST, install the knock sensor.

SST 09816–30010

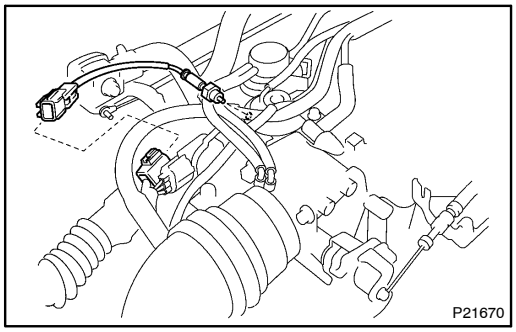
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

13. INSTALL WATER BYPASS PIPE AND KNOCK SENSOR WIRE (See page CO–5)
14. INSTALL INTAKE MANIFOLD ASSEMBLY (See page EM–51)
15. INSTALL FUEL PRESSURE REGULATOR (See page SF–17)
16. INSTALL TIMING BELT IDLER NO. 2 (See page EM–19)
17. INSTALL CAMSHAFT TIMING PULLEYS AND TIMING BELT (See page EM–19)
18. INSTALL HIGH–TENSION CORDS WITH IGNITION COILS (See page IG–8)

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19. INSTALL INTAKE AIR CONNECTOR (See page EM–51)
20. INSTALL AIR CLEANER HOSE
21. FILL WITH ENGINE COOLANT
22. CHECK ENGINE COOLANT LEVEL

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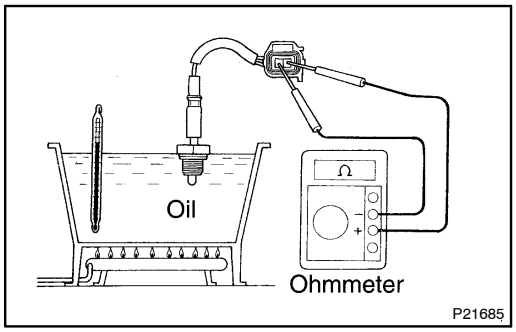


EXHAUST GAS RECIRCULATION (EGR) GAS TEMPERATURE SENSOR

SF0D1–02

INSPECTION

1. REMOVE EGR GAS TEMPERATURE SENSOR



2. INSPECT EGR GAS TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

64 – 97 kΩ at 50°C (122°F)

11 – 16 kΩ at 100°C (212°F)

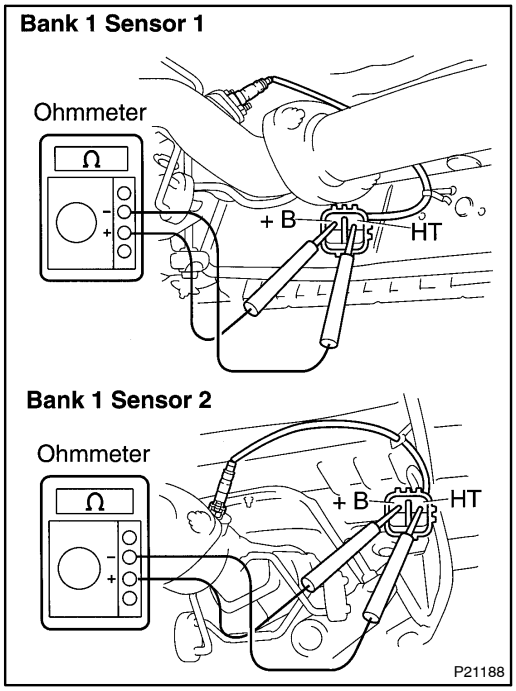
2 – 4 kΩ at 150°C (302°F)

If the resistance is not as specified, replace the sensor.

3. REINSTALL EGR GAS TEMPERATURE SENSOR

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

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HEATED OXYGEN SENSOR

SF0CW–04

INSPECTION

INSPECT HEATER RESISTANCE OF HEATED OXYGEN SENSORS

(a) Disconnect the oxygen sensor connector.

(b) Using an ohmmeter, measure the resistance between the terminals +B and HT.

Resistance:

M/T Bank 1 Sensor 1:

5 – 7 Ω at 20°C (68°F)

Others:

11 – 16 Ω at 20°C (68°F)

If the resistance is not as specified, replace the sensor.

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

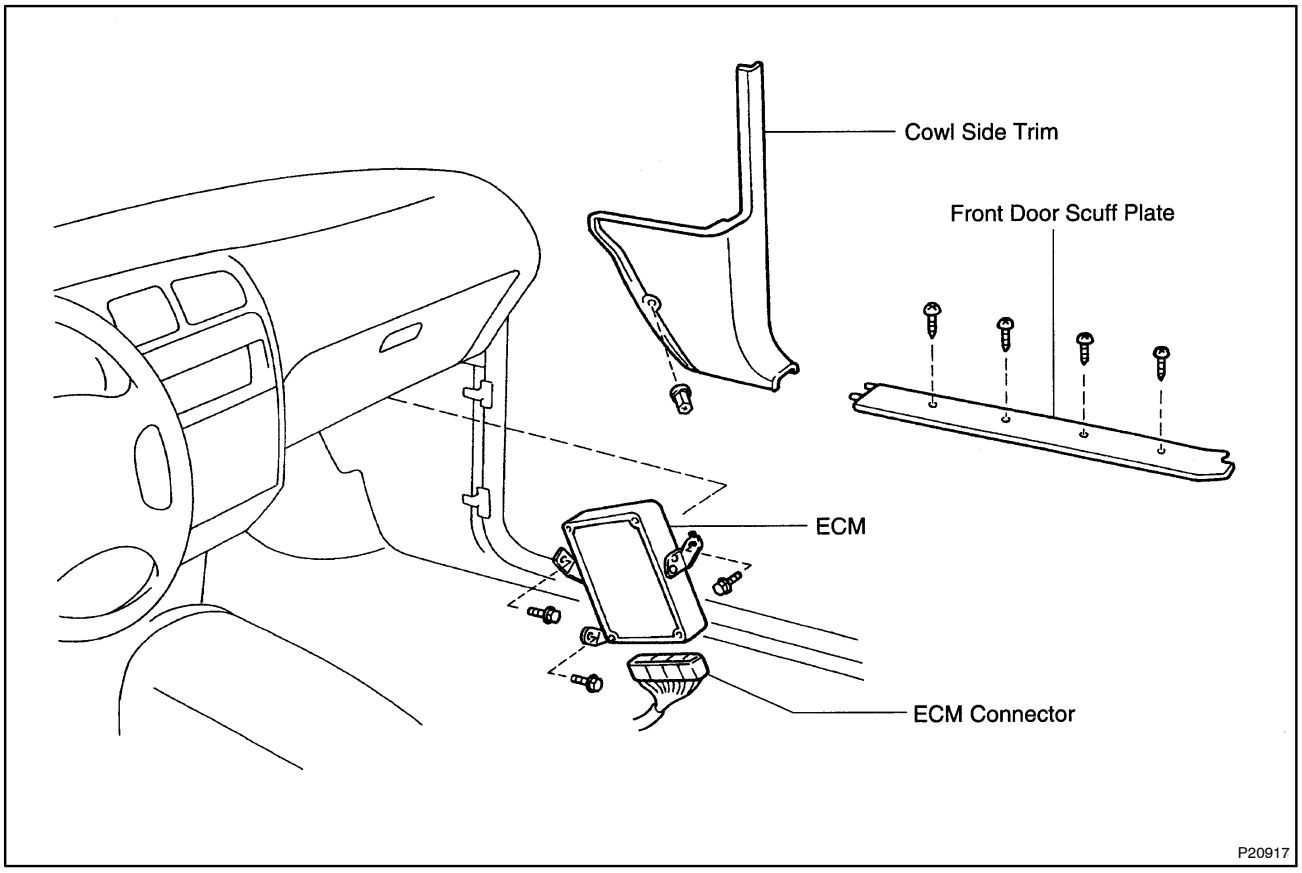
(c) Reconnect the oxygen sensor connector.

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ENGINE CONTROL MODULE (ECM)

COMPONENTS

SF0CX–01



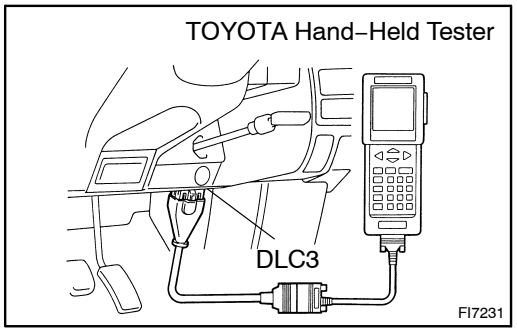
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SF0CY–02

INSPECTION

1. REMOVE ECM
2. INSPECT ECM
   (See page DI–144)
3. REINSTALL ECM

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FUEL CUT RPM

SF0CZ–03

INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

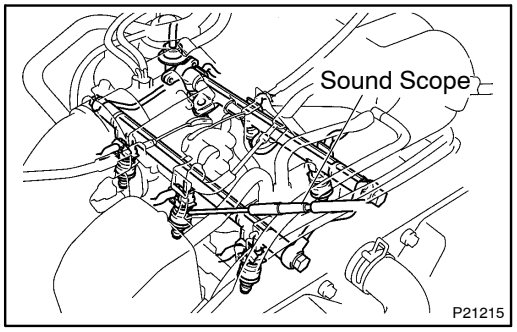
2. CONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL

(a) Connect the TOYOTA hand–held tester or OBDII scan tool to the DLC3.

(b) Please refer to the TOYOTA hand–held tester or OBDII scan tool operator's manual for further details.

3. INSPECT FUEL CUT OFF PRM

(a) Increase the engine speed to at least 3,500 rpm.



(b) Use a sound scope to check for injector operating noise.

(c) Check that when the throttle lever is released, injector operation noise stops momentarily and then resumes.

HINT:

Measure with the A/C OFF.

Fuel return rpm:
M/T: 1,000 rpm
A/T: 1,200 rpm

4. DISCONNECT TOYOTA HAND–HELD TESTER OR OBDII SCAN TOOL

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CO – COOLING (3RZ-FE)

COOLANT	CO-1
WATER PUMP	CO-3
THERMOSTAT	CO-7
RADIATOR	CO-11

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COOLANT

CO056–02

INSPECTION

1. CHECK ENGINE COOLANT LEVEL AT RESERVOIR TANK

The coolant level should be between the ”LOW” and ”FULL” lines.

If low, check for leaks and add coolant up to the ”FULL” line.

2. CHECK ENGINE COOLANT QUALITY

(a) Remove the radiator cap.

CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

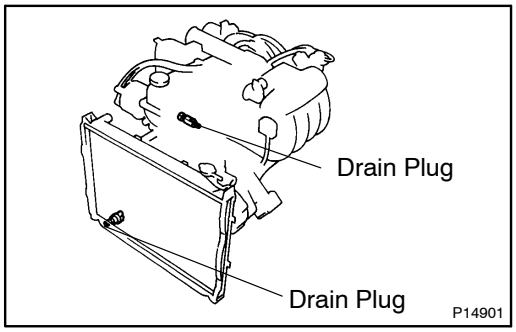
(b) There should not be any excessive deposits of rust or scale around the radiator cap or radiator filler hole, and the coolant should be free from oil.

If excessively dirty, replace the coolant.

(c) Reinstall the radiator cap.

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CO057–03



REPLACEMENT

1. REPLACE ENGINE COOLANT

(a) Remove the radiator cap.

CAUTION:

To avoid the danger of being burned, do not remove it while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

(b) Drain the coolant from the radiator drain plug and engine drain plug. (Engine drain plug at the right of engine block.)

(c) Close the drain cock plug.

Torque:Torque (Engine drain plug):
24 N·m (250 kgf·cm, 18 ft·lbf)

2. FILL ENGINE COOLANT

(a) Slowly fill the system with coolant.

- Use a good brand of ethylene–glycol base coolant and mix it according to the manufacturer's directions.
- Using coolant which includes more than 50 % ethylene–glycol (but not more than 70 %) is recommended.

NOTICE:

Do not use an alcohol type coolant. The coolant should be mixed with demineralized water or distilled water.

Capacity (w/ Heater):
8.7 liters (9.2 US qts, 7.7 Imp. qts)

(b) Reinstall the radiator cap.

(c) Warm up the engine and check for leaks.

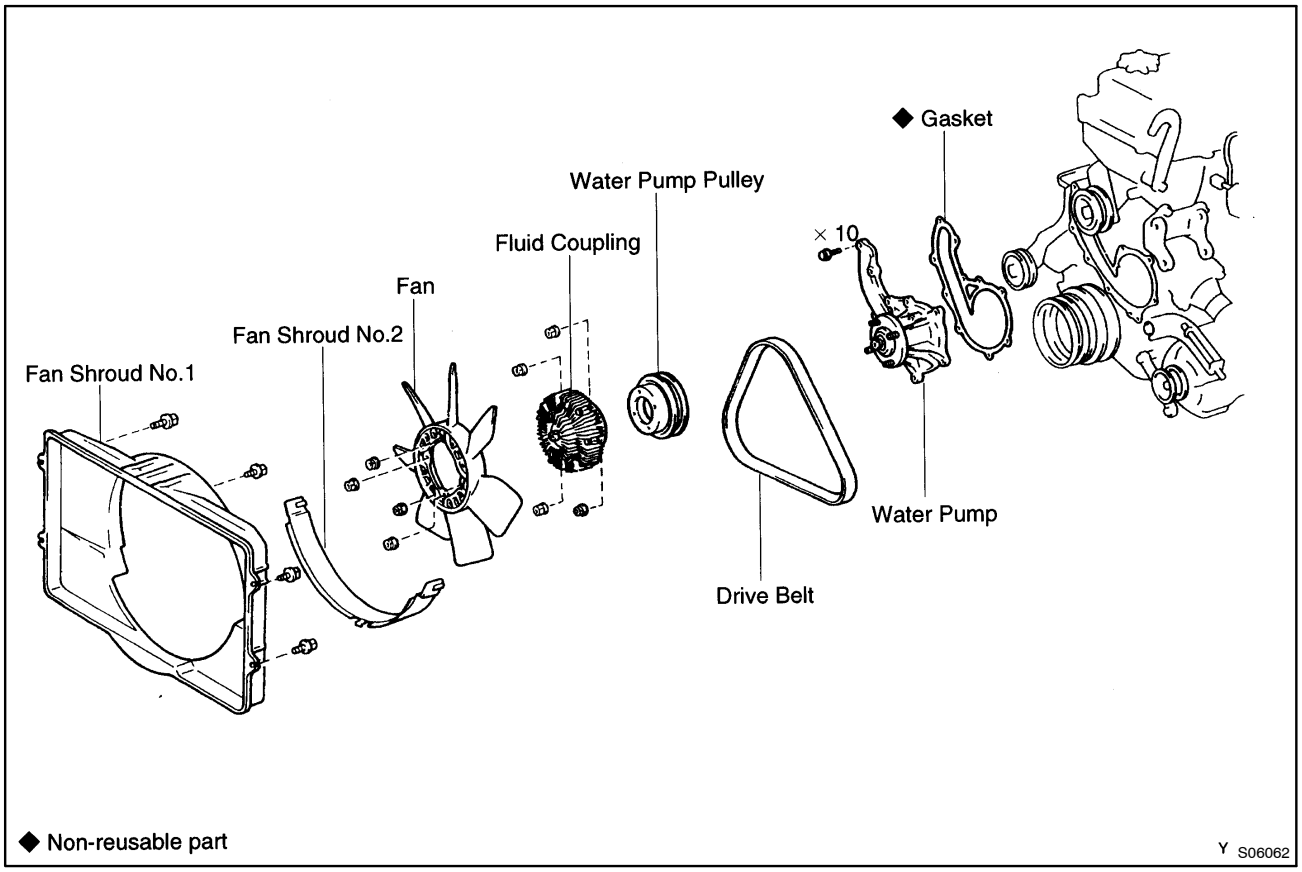
(d) Recheck the coolant level and refill as necessary.

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WATER PUMP

COMPONENTS

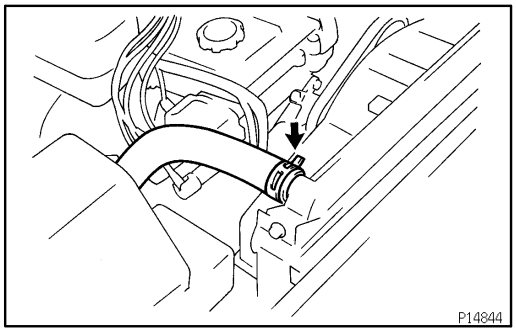
CO058–02



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CO059–03

REMOVAL



1. DRAIN ENGINE COOLANT

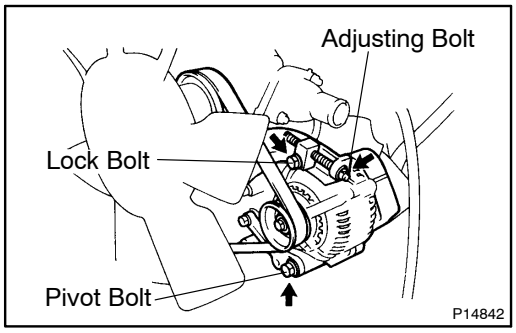
2. DISCONNECT RADIATOR INLET HOSE

3. REMOVE PS DRIVE BELT

Loosen the lock bolt and adjusting bolt, and remove the drive belt.

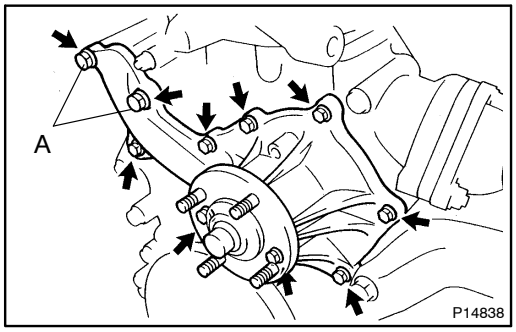
4. w/ A/C:
REMOVE A/C DRIVE BELT

Loosen the idler pulley nut and adjusting bolt, and remove the drive belt.



5. REMOVE DRIVE BELT, FAN WITH FLUID COUPLING, WATER PUMP PULLEY AND FAN SHROUD

(a) Stretch the belt and loosen the water pump pulley nuts.
(b) Loosen the lock, pivot and adjusting bolts of the generator, and remove the drive belt.
(c) Remove the 4 water pump pulley nuts.
Torque: 21 N·m (210 kgf·cm, 16 ft·lbf)
(d) Pull out the fan with fluid coupling and water pump pulley.
(e) Remove the No.2 fan shroud.
(f) Remove the 4 bolts and No.1 fan shroud.



6. REMOVE WATER PUMP

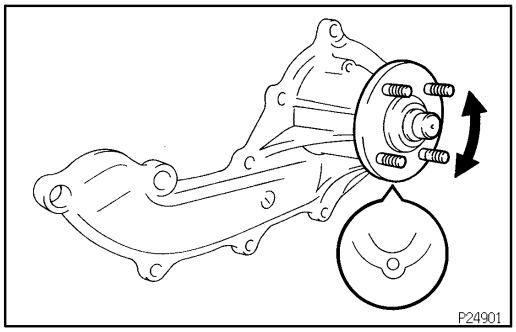
Remove the 10 bolts, water pump and gasket.

Torque:
8.9 N·m (90 kgf·cm, 78 in.·lbf) except bolt A
24.5 N·m (250 kgf·cm, 18 ft·lbf) for bolt A

HINT:
Use a new gasket.

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CO05A–03



INSPECTION

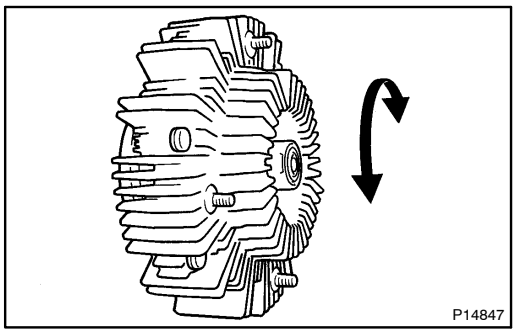
1. INSPECT WATER PUMP

(a) Visually check the water hole for coolant leakage.

If leakage is found, replace the water pump.

(b) Turn the pulley, and check that the water pump bearing moves smoothly and quietly.

If necessary, replace the water pump.



2. INSPECT FLUID COUPLING

Check the fluid coupling for damage and silicon oil leakage.

If necessary, replace the fluid coupling.

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CO05B–02

INSTALLATION

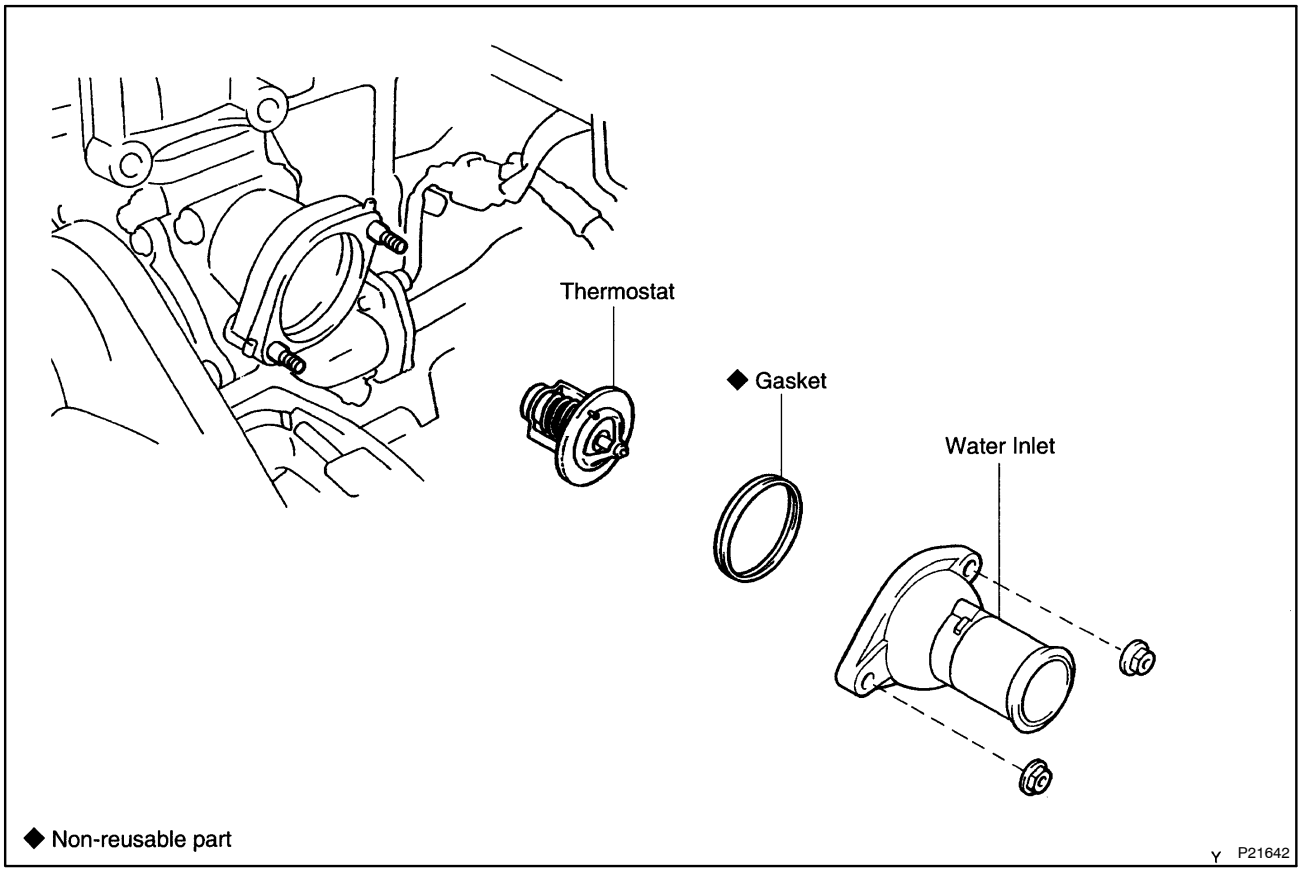
Installation is in the reverse order of removal (See page CO–4).

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THERMOSTAT

COMPONENTS

CO05C–02



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CO05D–01

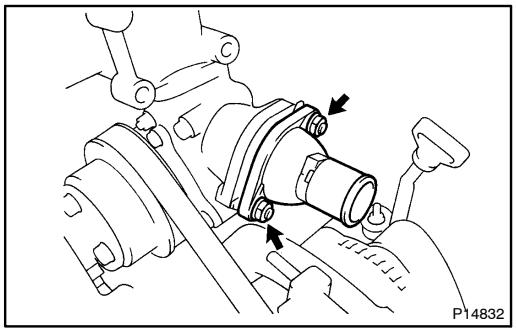
REMOVAL

HINT:

Removal of the thermostat would have an adverse effect, causing a lowering of cooling efficiency. Do not remove the thermostat, even if the engine tends to overheat.

1. DRAIN ENGINE COOLANT

2. DISCONNECT RADIATOR OUTLET HOSE



3. REMOVE WATER INLET AND THERMOSTAT

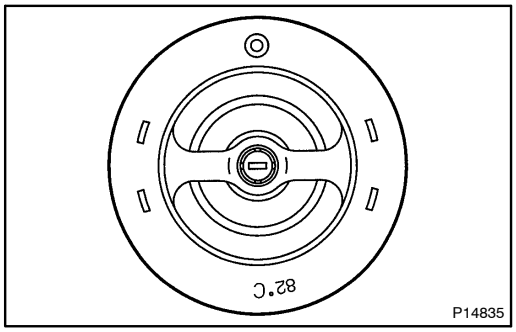
(a) Remove the 2 nuts holding the water inlet to the inlet housing, and disconnect the water inlet from the inlet housing.

(b) Remove the thermostat.

(c) Remove the gasket from the thermostat.

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CO05E–02



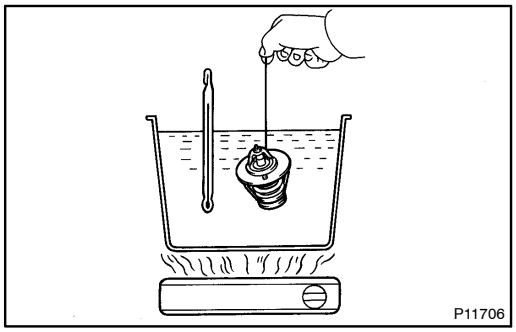
P14835

INSPECTION

INSPECT THERMOSTAT

HINT:

The thermostat is numbered with the valve opening temperature.


P11706

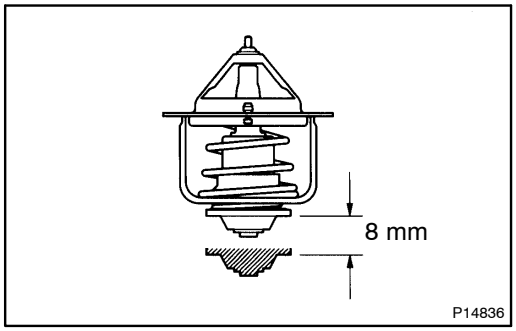
(a) Immerse the thermostat in water and gradually heat the water.

(b) Check the valve opening temperature.

Valve opening temperature:

80 – 84°C (176 – 183°F)

If the valve opening temperature is not as specified, replace the thermostat.



P14836

(c) Check the valve lift.

Valve lift:

8 mm (0.31 in.) or more at 95°C (203°C)

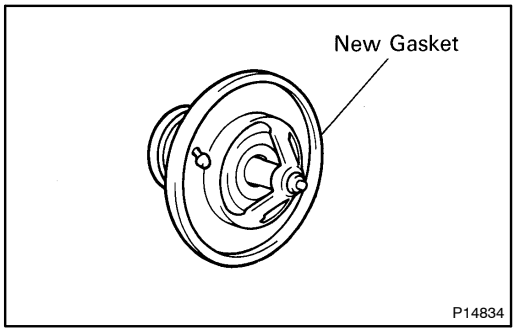
If the valve lift is not as specified, replace the thermostat.

(d) Check that the valve spring is tight when the thermostat is at low temperatures (below 40°C (104°F)).

If not closed, replace the thermostat.

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CO05F–01

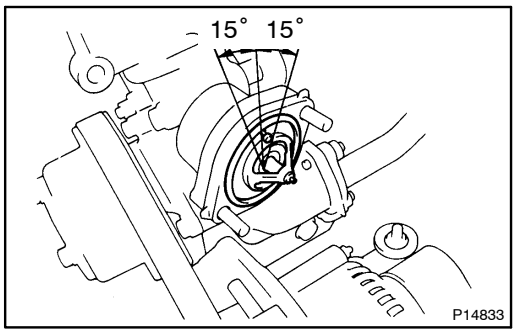


INSTALLATION

1. PLACE THERMOSTAT IN WATER INLET HOUSING

(a) Install a new gasket onto the thermostat.

(b) Align the thermostat jiggle valve with the protrusion of the water inlet housing, and insert the thermostat in the water inlet housing.



HINT:

The jiggle valve may be set within 15° of either side of the prescribed position.

2. INSTALL WATER INLET

Install the water inlet with the 2 nuts.

Torque:20 N·m (200 kgf·cm, 15 ft·lbf)

3. CONNECT RADIATOR OUTLET HOSE

4. FILL WITH ENGINE COOLANT

5. START ENGINE AND CHECK FOR LEAKS

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RADIATOR

CO05G–02

ON–VEHICLE CLEANING

Using water or a steam cleaner, remove any mud or dirt from the radiator core.

NOTICE:

If using a high pressure type cleaner, be careful not to deform the fins of the radiator core (i.e. Maintain a distance between the cleaner nozzle and radiator core).

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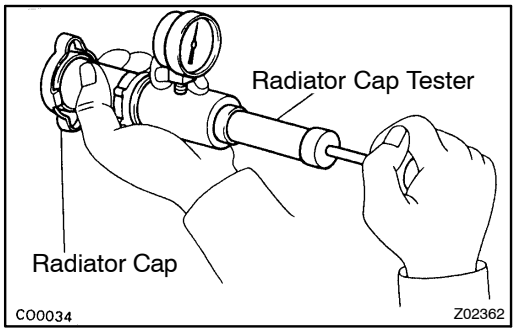
CO05H–02

ON–VEHICLE INSPECTION

1. REMOVE RADIATOR CAP

CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.



2. INSPECT RADIATOR CAP

NOTICE:

If the radiator cap has contaminations,always rinse it with water.

Using a radiator cap tester, pump the tester and measure the relief valve opening pressure.

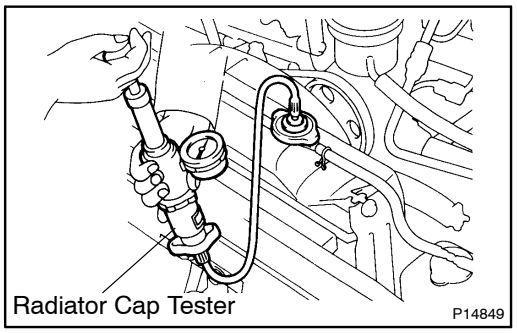
Standard opening pressure:

74 – 103 kPa (0.75 – 1.05 kgf/cm^2, 10.7 – 14.9 psi)

HINT:

Use the tester's maximum reading as the opening pressure.

If the opening pressure is less than standard, replace the radiator cap.



3. INSPECT COOLING SYSTEM FOR LEAKS

(a) Fill the radiator with coolant and attach a radiator cap tester.

(b) Warm up the engine.

(c) Pump it to 118 kPa (1.2 kgf/cm^2, 17.1 psi), and check that the pressure does not drop.

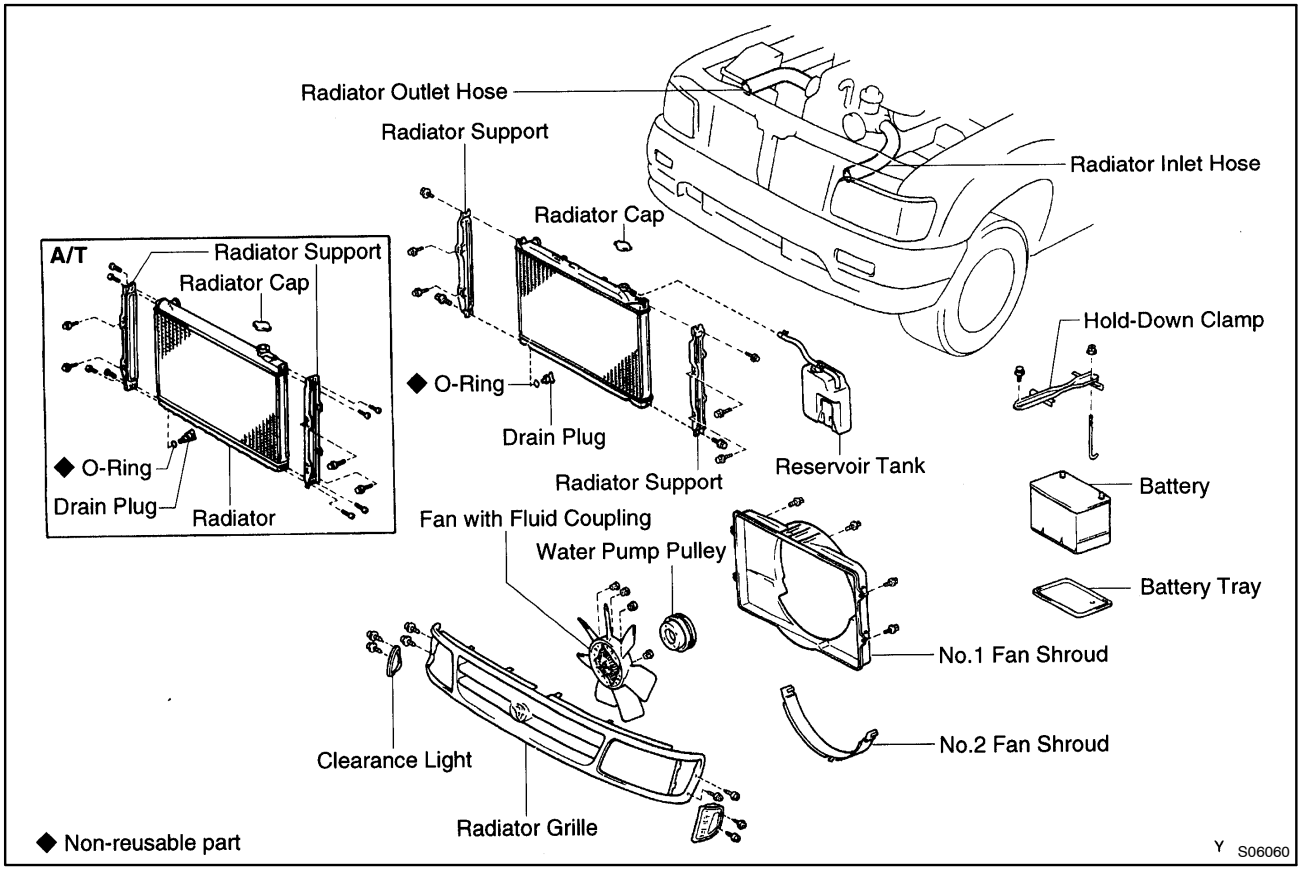
If the pressure drops, check the hoses, radiator or water pump for leaks. If no external leaks are found, check the heater core, cylinder block and head.

4. REINSTALL RADIATOR CAP

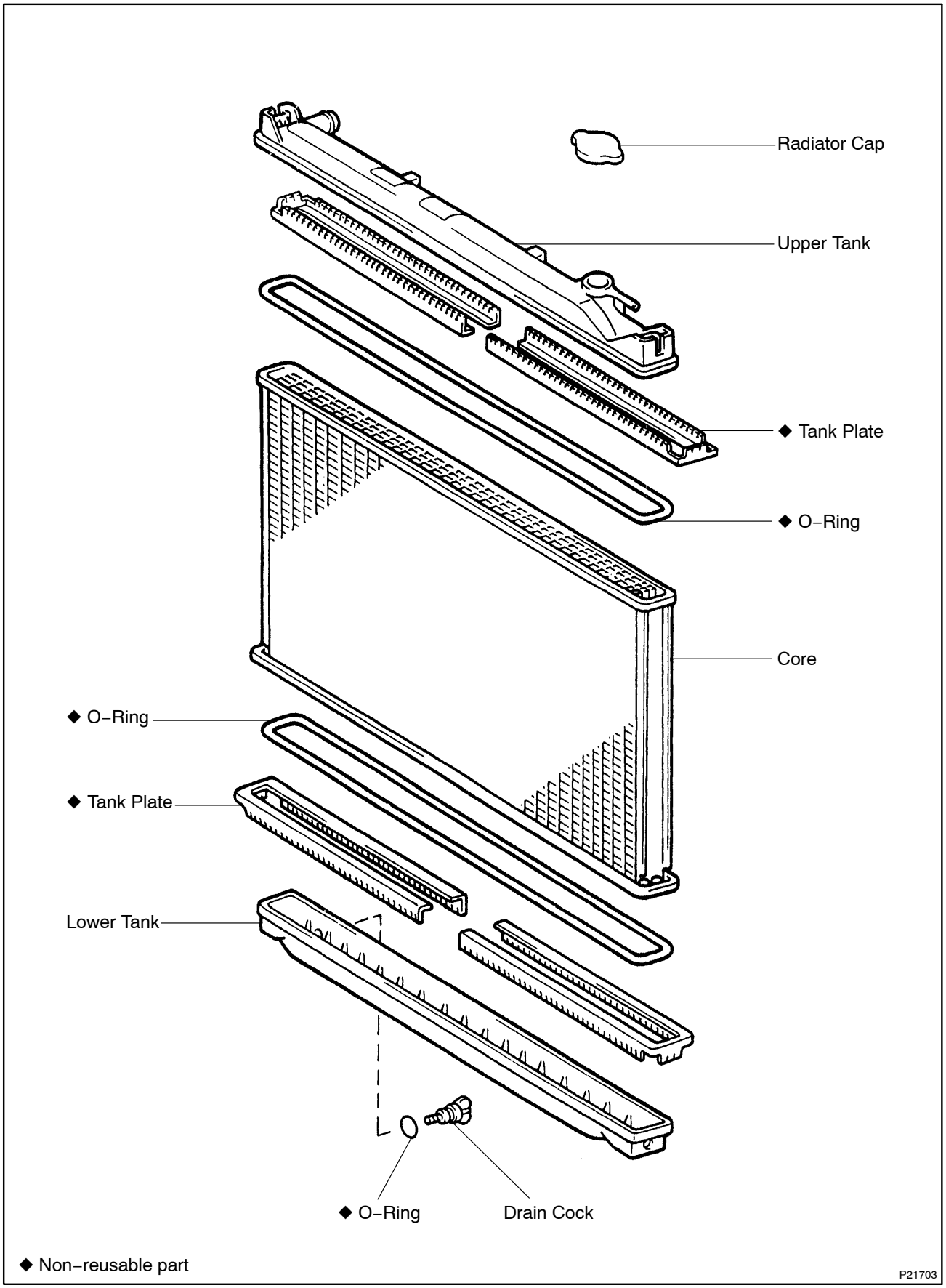
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CO05I–01

COMPONENTS



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CO18O–01

REMOVAL

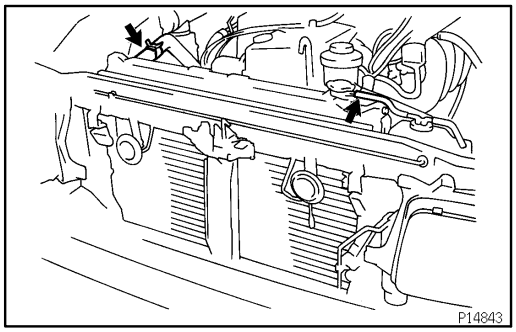
1. DRAIN ENGINE COOLANT

2. REMOVE BATTERY

3. REMOVE RADIATOR GRILLE

(a) Remove the 4 screws, and clearance lights.

(b) Remove the 4 screws, 11 clips and radiator grille.



4. DISCONNECT RADIATOR INLET HOSE

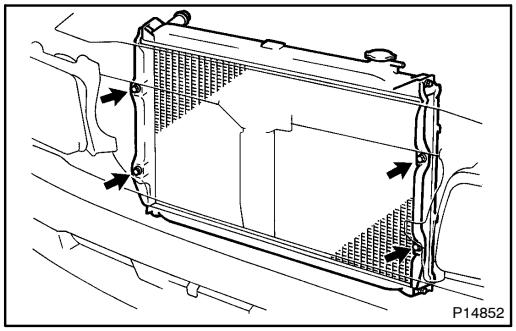
5. DISCONNECT RADIATOR RESERVOIR HOSE

6. REMOVE PS DRIVE BELT

Loosen the lock bolt and adjusting bolt, and remove the drive belt.

7. w/ A/C:
REMOVE A/C DRIVE BELT

Loosen the idler pulley nut and adjusting bolt, and remove the drive belt.



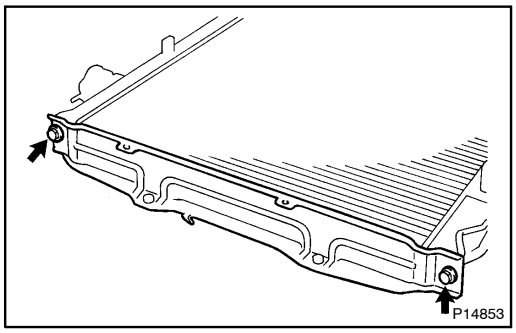
8. REMOVE DRIVE BELT, FAN WITH FLUID COUPLING, WATER PUMP PULLEY AND FAN SHROUD (See page CO–4)

9. A/T:
DISCONNECT OIL COOLER HOSES

10. DISCONNECT RADIATOR OUTLET HOSE

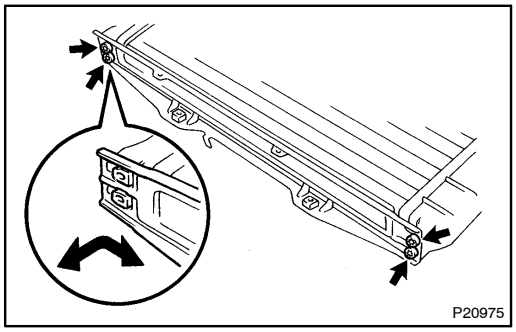
11. REMOVE RADIATOR

Remove the 4 bolts and radiator.



12. REMOVE RADIATOR SUPPORTS

- M/T:
  Remove the 4 bolts and 2 radiator supports.



- A/T:
  Remove the 8 bolts and 2 radiator supports.

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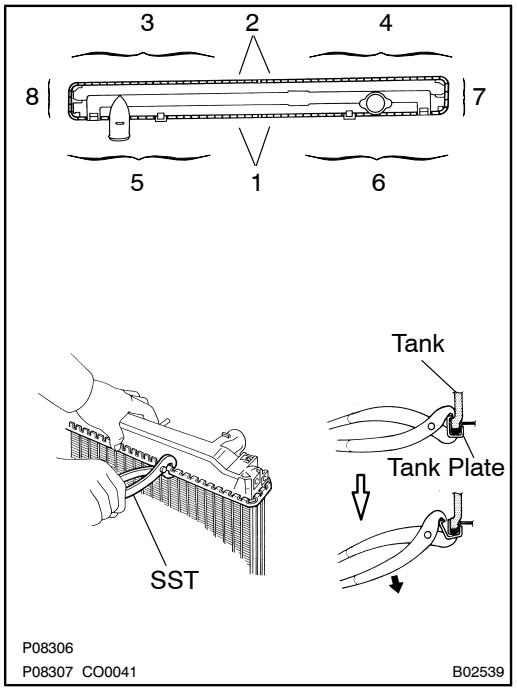
CO05K–02

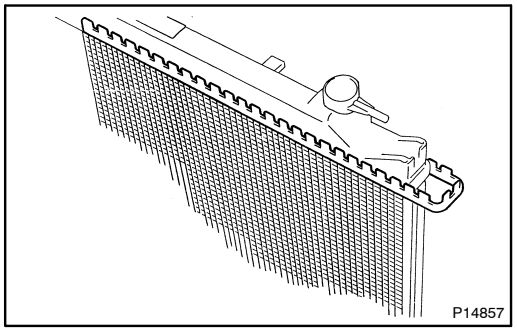
DISASSEMBLY

1. M/T:
REMOVE TANK PLATE

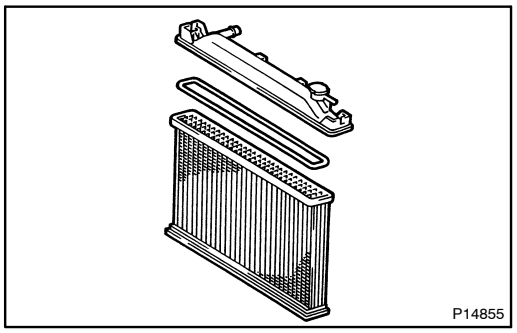
(a) Raise the claws of the tank plates with SST in the numerical order shown in the illustration.
SST 09230 – 00010 (09231 – 00010, 09231 – 00020, 09231 – 00030 09231 – 00040, 09231 – 00050)

NOTICE:
Be careful not to damage the core plate.





(b) Pull the tank plates outward.



2. M/T:
REMOVE TANK

(a) Pull the tank upward.
(b) Remove the O–ring.

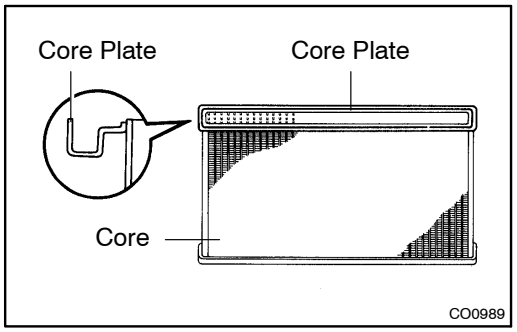
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CO05L–02

REASSEMBLY

1. M/T:
INSTALL OIL COOLER TO LOWER TANK

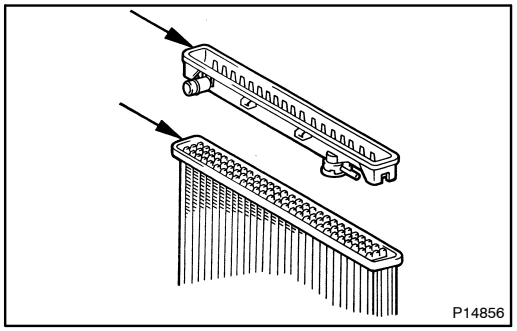
Clean the O–ring contact surface of the lower tank.



2. M/T:
CHECK CORE PLATE FOR DAMAGE

HINT:

- If the sides of the core plate groove are deformed, reassembly of the tank will be impossible. Therefore, first correct any deformation with pliers.
- Water leakage will result if the bottom of the core plate groove is damaged or dented. Therefore, repair or replace if necessary.

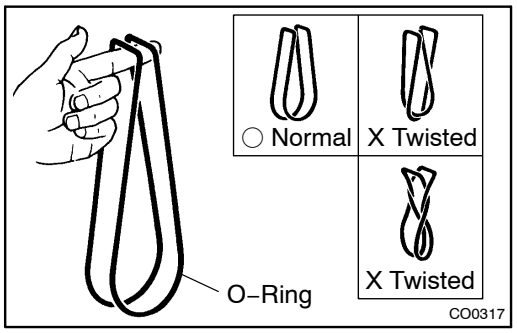


3. M/T:
INSTALL TANK

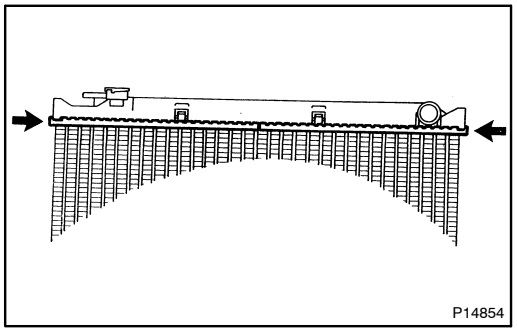
Install a new O–ring and the tank.

HINT:

- Clean the tank and core plate.



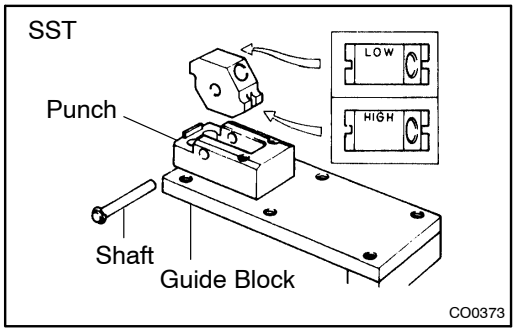
- Take out any twists.



4. M/T:
INSTALL TANK PLATE

Insert new tank plates from both ends in the direction of the arrows. Firmly set the tank plates in the core plate.

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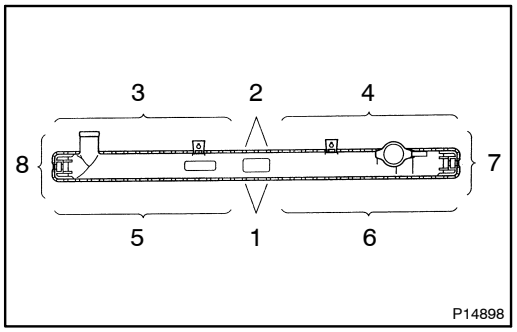


5. M/T:

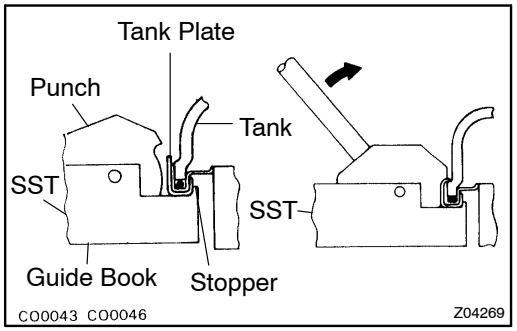
STAKE CLAWS OF TANK PLATES

(a) Set the punch of SST to "LOW".

SST 09230 – 00010 (09231 – 00010, 09231 – 00020, 09231 – 00030, 09231 – 00040, 09231 – 00050)

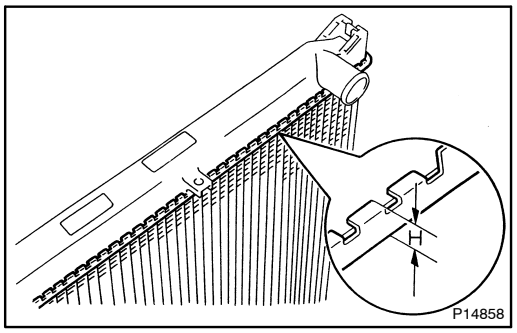


(b) Stake the claws of the tank plates with SST in the numerical order shown in the illustration.



NOTICE:

If the bottom of the core plate is staked with the SST on the guide block stopper, it may result in water leakage.

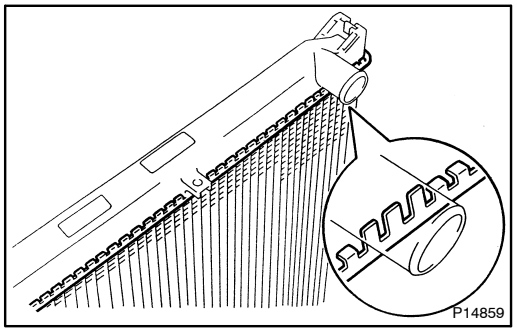


HINT:

- Stake with just enough pressure to leave a mark on the claw. The staked plate height (H) should be as follows.

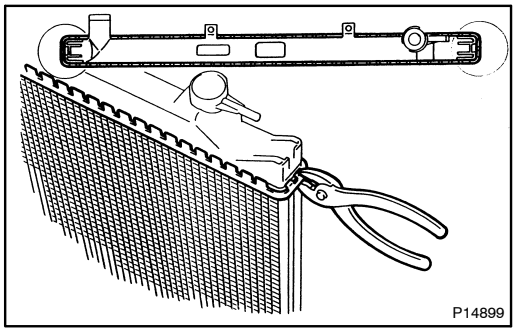
  Plate height (H):

  9.2 – 9.6 mm (0.362 – 0.378 in.)

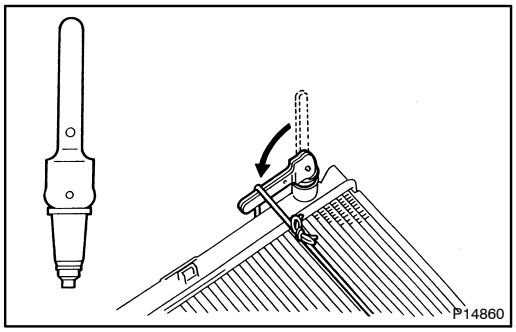


- Do not stake the are as protruding around the pipes.

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- The points shown in the illustration cannot be staked with the SST. Use pliers and be careful not to damage the core plates.

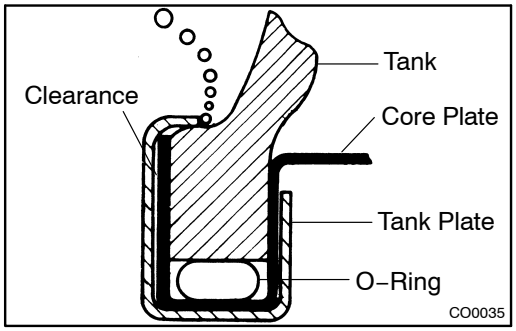


6. M/T:
CHECK FOR WATER LEAKS

(a) Tighten the drain plug.

(b) Plug the inlet and outlet pipes of the radiator with SST
SST 09230 – 01010 (09231 – 00060, 09231 – 01010, 09231 – 01020, 09231 – 01030)

(c) Using a radiator cap tester, apply pressure to the radiator.
Test pressure:
147 kPa (1.5 kgf/cm^2, 21 psi)



(d) Check for water leaks.

HINT:
On radiators with resin tanks, these is a clearance between the core plate and tank plate where a minute amount of air will remain, giving the appearance of an air leak when the radiator is submerged in water. Therefore, before performing the water leak test, first swirl the water around in the radiator until all air bubbles disappear.

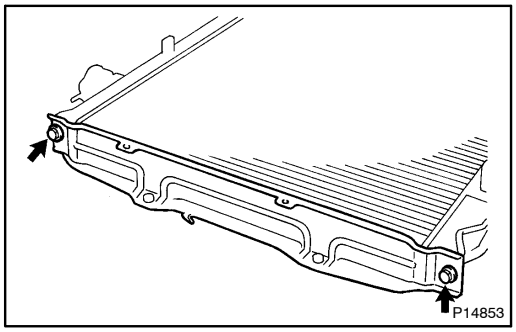
7. M/T:
PAINT TANK PLATE

HINT:
If the water leak test checks out okay, allow the radiator to dry completely and then paint the tank plate.

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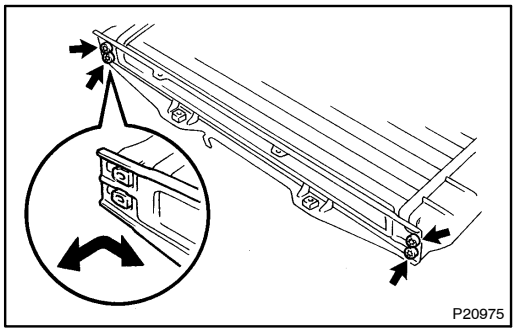
CO18P–01

INSTALLATION

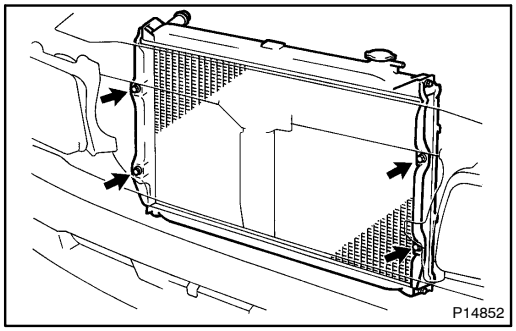


1. INSTALL SUPPORTS

- M/T:
  Install the supports with the 4 bolts.
  Torque:13 N·m (130 kgf·cm,9 ft·lbf)



- A/T:
  Install the supports with the 8 bolts.



2. INSTALL RADIATOR

(a) Insert the tabs of the radiator support through the radiator service holes.

(b) Install the radiator with the 4 bolts.
Torque:31 N·m (310 kgf·cm, 23 ft·lbf)

3. CONNECT RADIATOR OUTLET HOSE

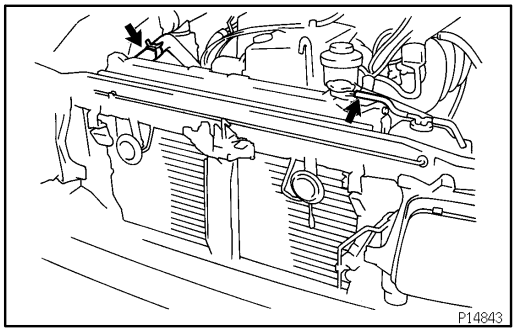
4. INSTALL WATER PUMP PULLEY, FAN SHROUD, FAN WITH FLUID COUPLING AND DRIVE BELT (See page CO–6)

5. w/ A/C:
INSTALL A/C COMPRESSOR DRIVE BELT

Install and adjust the A/C compressor drive belt (See page AC–16).

6. INSTALL PS PUMP DRIVE BELT

Install and adjust the PS pump drive belt (See page SR–3).



7. CONNECT RADIATOR RESERVOIR HOSE

8. CONNECT RADIATOR INLET HOSE

9. INSTALL RADIATOR GRILLE

(a) Install the 4 screws, 11 clips and radiator grille.

(b) Install the 4 screws and clearance lights.

10. FILL WITH ENGINE COOLANT

11. START ENGINE AND CHECK FOR LEAKS

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CO – COOLING (5VZ-FE)

COOLANT	CO-1
WATER PUMP	CO-3
THERMOSTAT	CO-8
RADIATOR	CO-12

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COOLANT

CO05O–01

INSPECTION

1. CHECK ENGINE COOLANT LEVEL AT RESERVOIR TANK

The engine coolant level should be between the ”LOW” and ”FULL” lines, when the engine is cold.

If low, check for leaks and add engine coolant up to the ”FULL” line.

2. CHECK ENGINE COOLANT QUALITY

(a) Remove the radiator cap from the water outlet.

CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

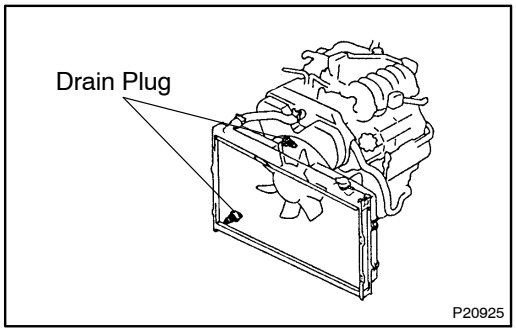
(b) There should not be any excessive deposits of rust or scale around the radiator cap or radiator filler hole, and the coolant should be free from oil.

If excessively dirty, clean the coolant passages and replace the coolant.

(c) Reinstall the radiator cap.

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CO05P–04



REPLACEMENT

1. DRAIN ENGINE COOLANT

(a) Remove the radiator cap.

CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

(b) Loosen the drain plugs, and drain the engine coolant.

(c) Close the drain plugs.

2. FILL ENGINE COOLANT

(a) Slowly fill the system with engine coolant.

- Use a good brand of ethylene–glycol base engine coolant and mix it according to the manufacturer's directions.
- Using engine coolant which includes more than 50 % ethylene–glycol (but not more than 70 %) is recommended.

NOTICE:

Do not use an alcohol type engine coolant.The engine coolant should be mixed with demineralized water or distilled water.

Capacity:
2WD
M/T 10.0 liters (10.6 US qts, 8.8 lmp. qts)
A/T 9.9 liters (10.5 US qts, 8.7 lmp. qts)
4WD
M/T 10.0 liters (10.6 US qts, 8.8 lmp. qts)
A/T 10.2 liters (10.8 US qts, 9.0 lmp. qts)

(b) Install the radiator cap.

(c) Start the engine, and bleed the cooling system.

(d) If necessary, refill engine coolant into the reservoir tank until it is "FULL" line.

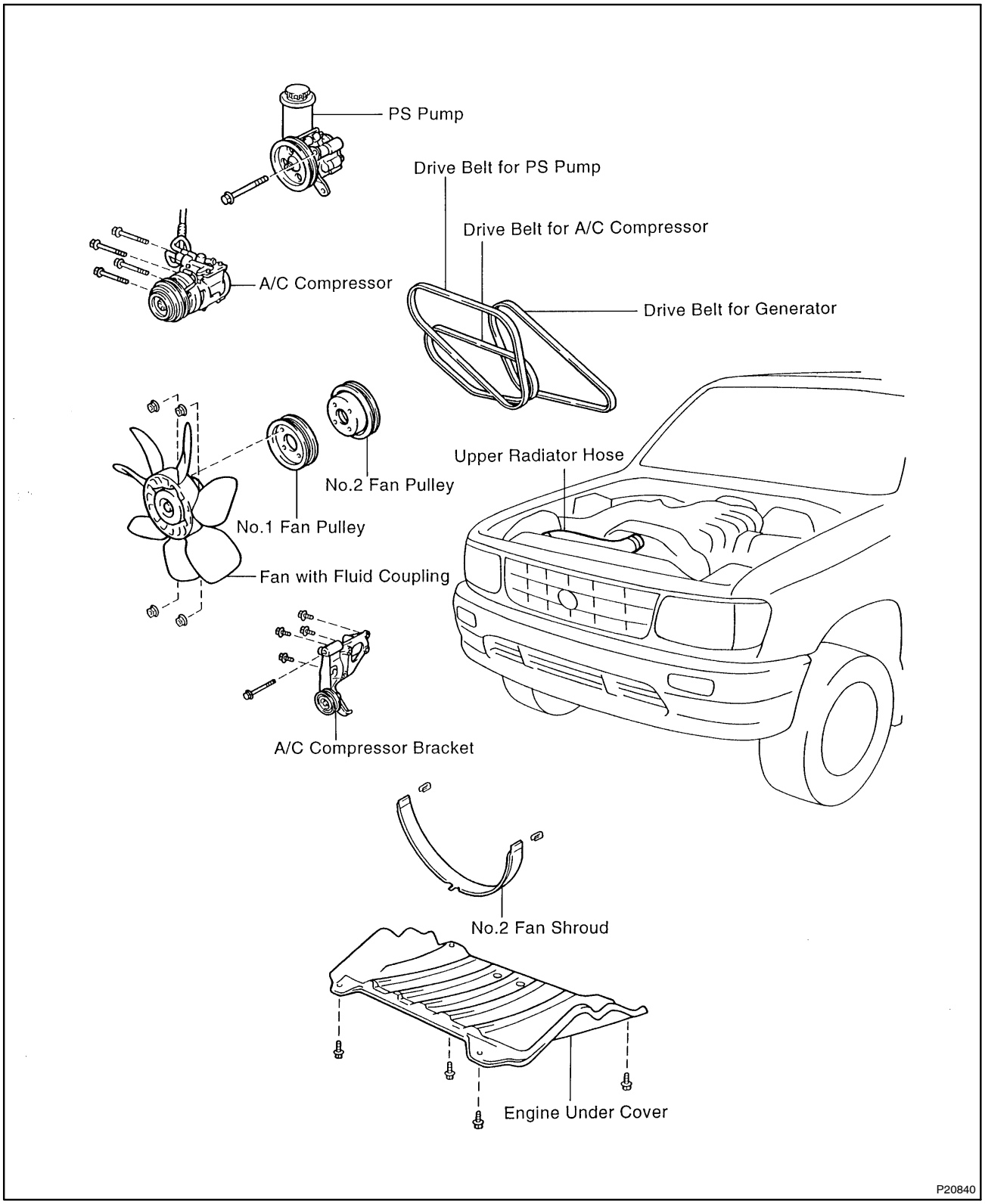
3. CHECK ENGINE COOLANT FOR LEAKS

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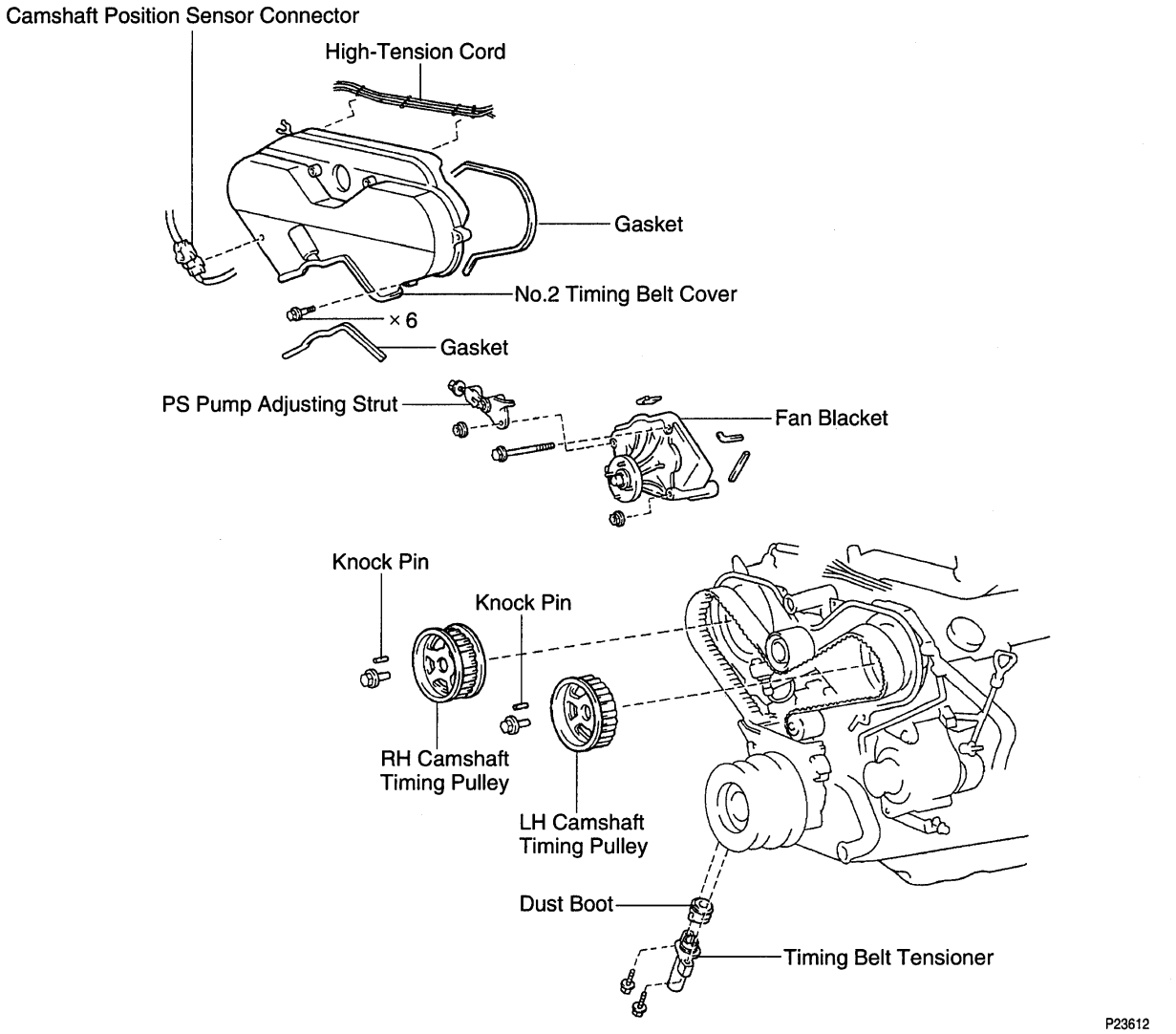
WATER PUMP

COMPONENTS

CO05Q–02

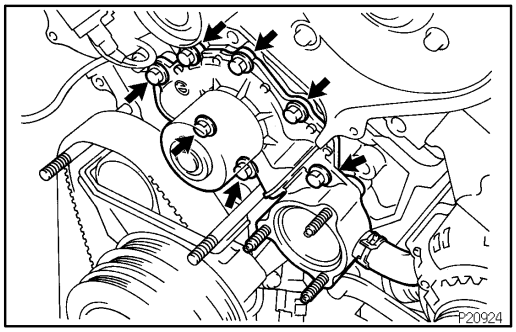


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CO05R–03



REMOVAL

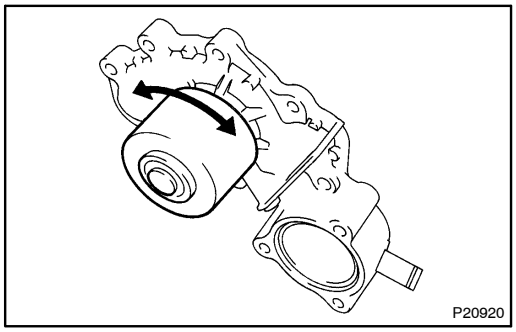
1. **REMOVE TIMING BELT**
   (See page EM–13)
2. **REMOVE WATER INLET AND THERMOSTAT**
3. **w/ Oil Cooler:**
   DISCONNECT NO.2 OIL COOLER HOSE FROM WATER PUMP
4. **REMOVE WATER PUMP**

Remove the 7 bolts and water pump.

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CO05S–01

INSPECTION


P20920

1. INSPECT WATER PUMP

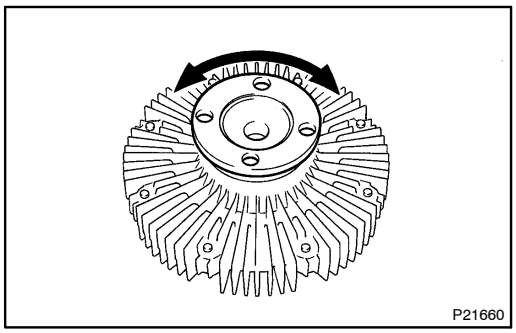
(a) Visually check the air hole and water hole for coolant leakage.

If leakage is found, replace the water pump.

If engine coolant has leaked onto the timing belt, replace the timing belt.

(b) Turn the pulley, and check that the water pump bearing moves smoothly and quietly.

If necessary, replace the water pump.

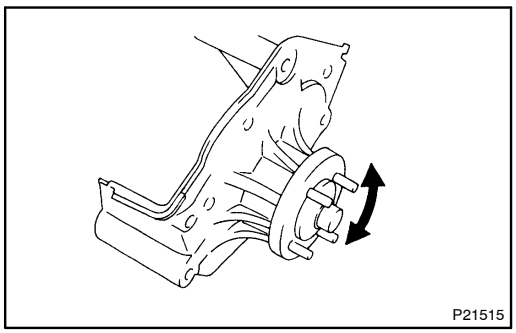

P21660

2. INSPECT FLUID COUPLING

(a) Remove the 4 nuts and fan from the fluid coupling.

(b) Check that the fluid coupling is not damaged and that no silicon oil leaks.

If necessary, replace the fluid coupling.


P21515

3. INSPECT FAN PULLEY BRACKET

(a) Check the turning smoothness of the fan pulley.
If necessary, replace the pulley bracket.

(b) Reinstall the fan to the fluid coupling with the 4 nuts.
Torque:5.4 N·m (75 kgf·cm, 48 in.·lbf)

4. INSPECT TIMING BELT
(See page EM–17)

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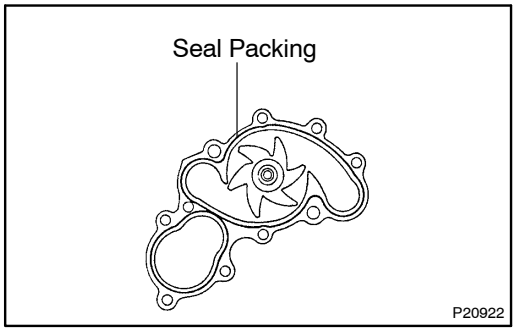
CO05T–02

INSTALLATION

1. INSTALL WATER PUMP

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the water pump and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.



(b) Apply seal packing to the water pump groove.
Seal packing:
Part No. 08826–00100 or equivalent

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.

HINT:
Avoid applying an excessive amount to the surface.

- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the water pump with the 7 bolts.
Torque:20 N·m (200 kgf·cm, 14 ft·lbf)

2. w/ OIL COOLER:
CONNECT NO.2 OIL COOLER HOSE

3. INSTALL THERMOSTAT
(See page CO–11)

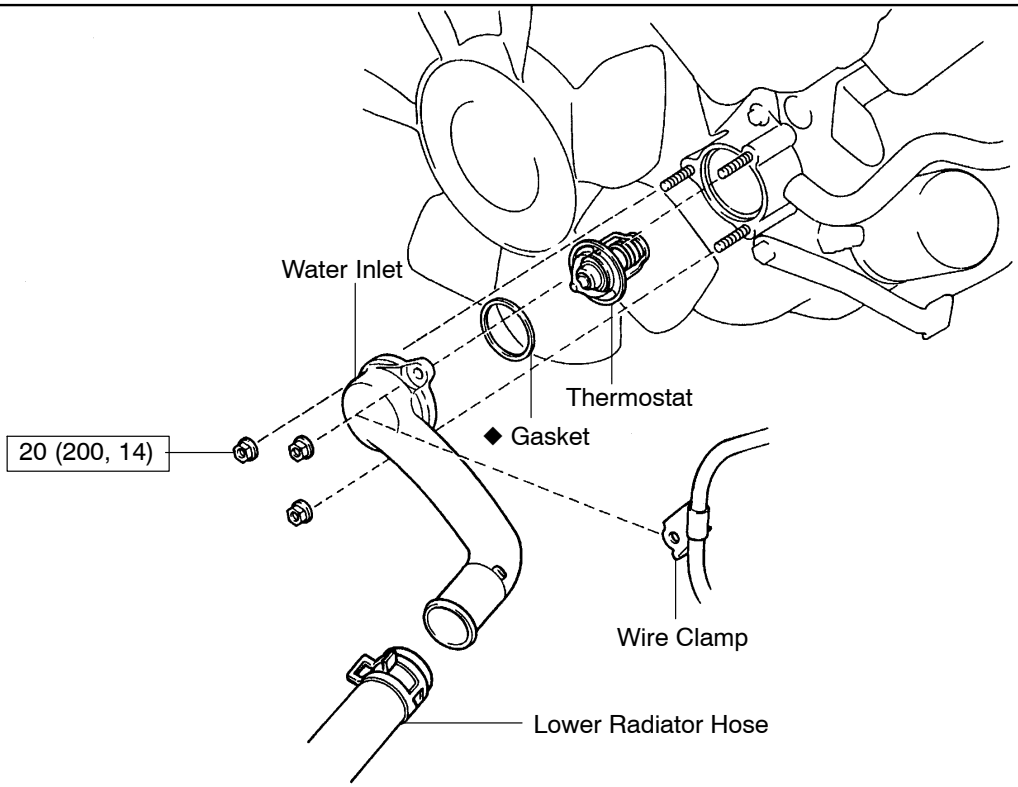
4. INSTALL TIMING BELT
(See page EM–19)

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THERMOSTAT

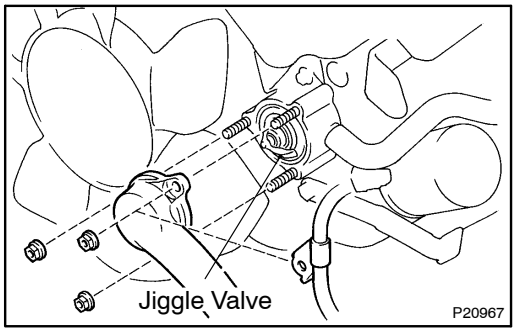
COMPONENTS

CO05U–01



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CO05V–03



REMOVAL

1. DRAIN ENGINE COOLANT

2. DISCONNECT LOWER RADIATOR HOSE

3. REMOVE THERMOSTAT

(a) Remove the 3 nuts, water inlet and thermostat with gasket from the water pump.

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

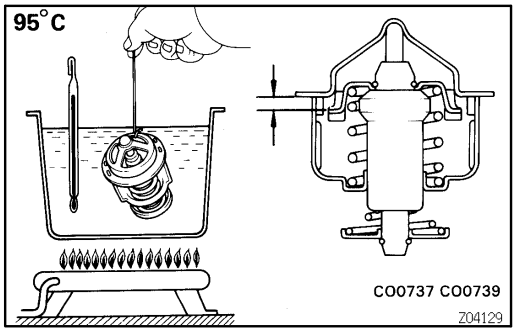
(b) Remove the gasket from the thermostat.

HINT:

Use a new gasket.

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CO05W–03



INSPECTION

INSPECT THERMOSTAT

HINT:

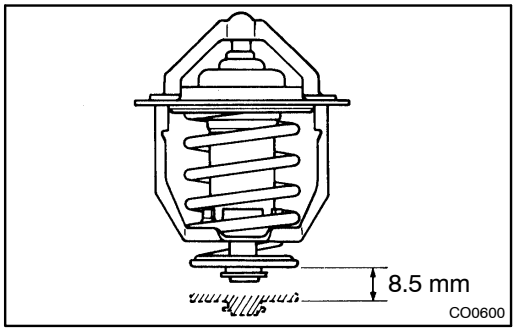
Thermostat is numbered according to the valve opening temperature.

(a) Immerse the thermostat in water and heat the water gradually.

(b) Check the valve opening temperature and valve lift.

Valve opening temperature:
80 – 84°C (176 – 183°F)
Valve lift: At 95°C (203°F): 8.5 mm (0.335 in.) or more

If the valve opening temperature and valve lift are not within specifications, replace the thermostat.

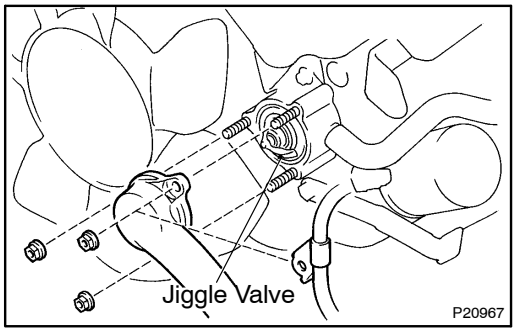


(c) Check that the valve is fully closed when the thermostat is at low temperatures (below 40°C (104°F)).

If not closed, replace the thermostat.

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CO05X–01



INSTALLATION

1. INSTALL THERMOSTAT

(a) Place a new gasket to the thermostat.

(b) Install the thermostat with the jiggle valve downward.

(c) Install the water inlet with the 3 bolts.

Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

2. CONNECT LOWER RADIATOR HOSE

3. FILL WITH ENGINE COOLANT

4. START ENGINE AND CHECK FOR LEAKS

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RADIATOR

CO05Y–01

ON–VEHICLE CLEANING

Using water or a steam cleaner, remove any mud or dirt from the radiator core.

NOTICE:

If using a high pressure type cleaner, be careful not to deform the fins of the radiator core. (i.e. Maintain a distance between the cleaner nozzle and radiator core.)

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CO05Z–03

ON–VEHICLE INSPECTION

1. REMOVE RADIATOR CAP

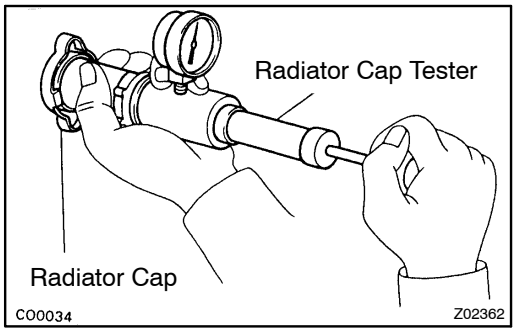
CAUTION:

To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

2. INSPECT RADIATOR CAP

NOTICE:

If the radiator cap has contaminations, always rinse it with water.



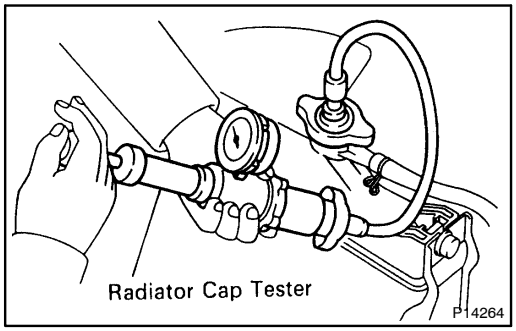
Using a radiator cap tester, pump the tester and measure the relief valve opening pressure.

Standard opening pressure:
74 – 103 kPa
(0.75 – 1.05 kgf/cm^2, 10.7 – 14.9 psi)
Minimum opening pressure:
59 kPa (0.6 kgf/cm^2, 8.5 psi)

HINT:

Use the tester's maximum reading as the opening pressure.

If the opening pressure is less than minimum, replace the radiator cap.



3. INSPECT COOLING SYSTEM FOR LEAKS

(a) Fill the radiator with coolant and attach a radiator cap tester.

(b) Warm up the engine.

(c) Pump it to 118 kPa (1.2 kgf/cm^2, 17.1 psi), and check that the pressure does not drop.

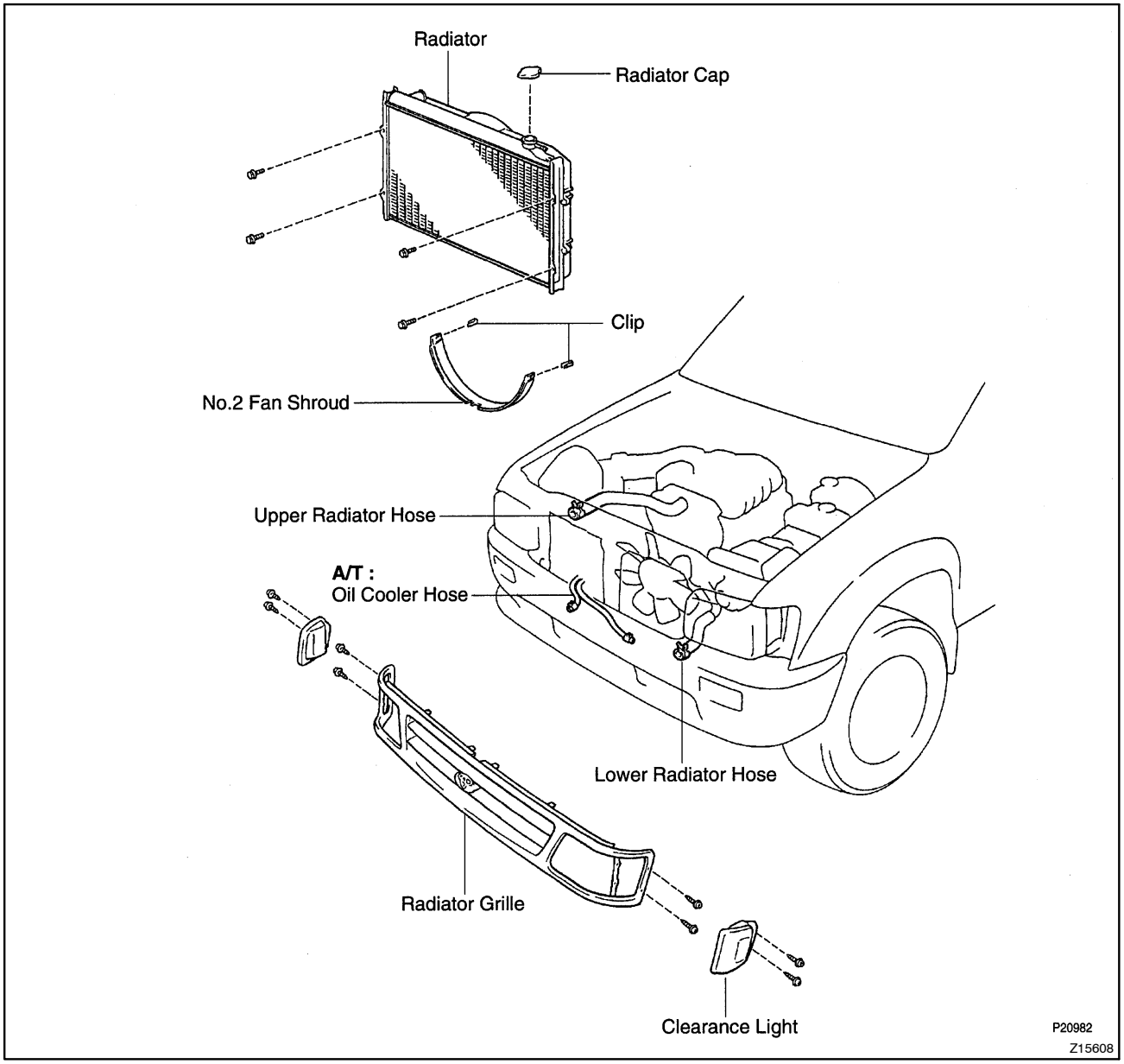
If the pressure drops, check the hoses, radiator or water pump for leaks. If no external leaks are found, check the heater core, cylinder block and head.

4. REINSTALL RADIATOR CAP

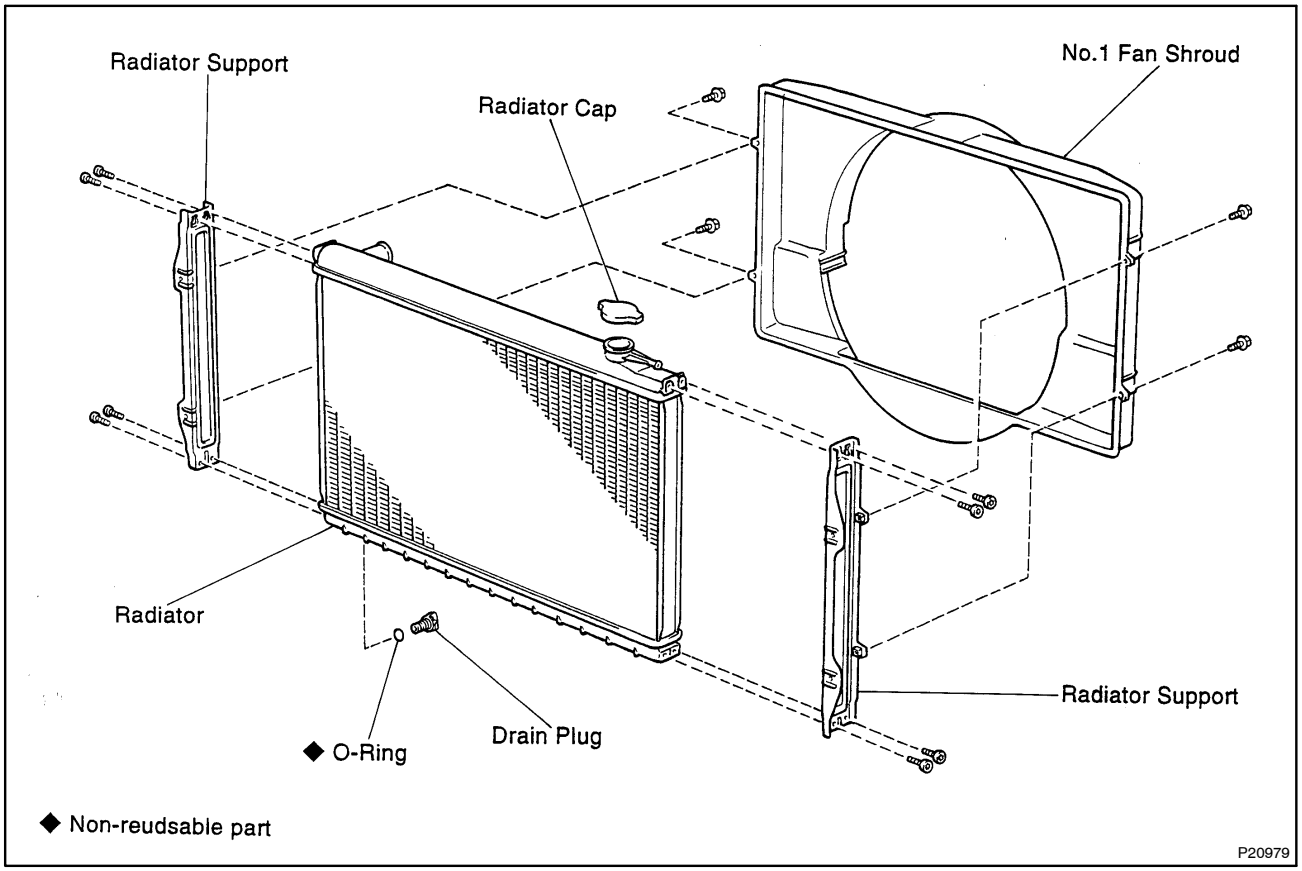
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CO060–01

COMPONENTS



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CO061–01

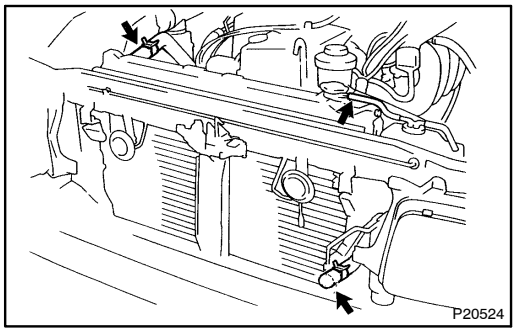
REMOVAL

1. DRAIN ENGINE COOLANT

2. REMOVE RADIATOR GRILLE

(a) Remove the 4 screws, and clearance lights.

(b) Remove the 4 screws, 11 clips and radiator grille.



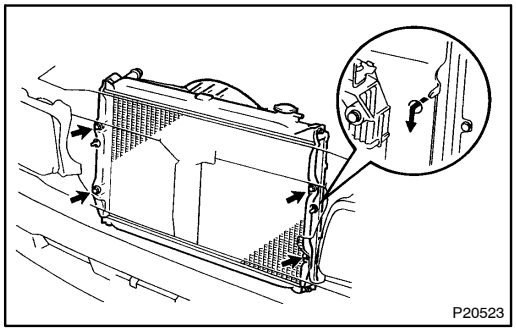
3. DISCONNECT UPPER RADIATOR HOSE

4. DISCONNECT RADIATOR RESERVOIR HOSE

5. DISCONNECT LOWER RADIATOR HOSE

6. REMOVE RADIATOR NO.2 FAN SHROUD

7. A/T:
DISCONNECT OIL COOLER HOSES



8. REMOVE RADIATOR

Remove the 4 bolts and radiator.

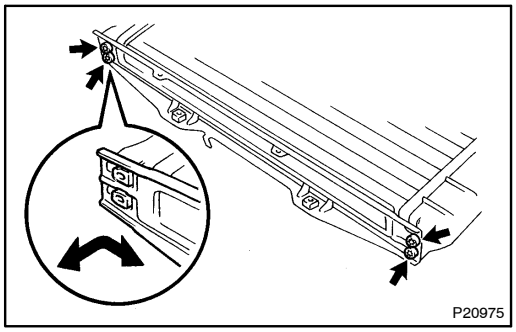
Torque:12 N·m (120 kgf·cm, 8.7 ft·lbf)

HINT:

Insert the tabs of the radiator support through the radiator service holes.

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CO062–01



DISASSEMBLY

1. REMOVE NO.1 FAN SHROUD.

Remove the 4 bolts and No.1 fan shroud.

2. REMOVE RADIATOR SUPPORTS

Using a torx wrench, remove the 8 torx screws and the 2 radiator supports.

Torx wrench: T30 (Part No. 09042–00010 or locally manufactured tool)

HINT:

Insert the tabs the radiator upper tank through the radiator support holes.

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CO063–01

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page CO–17).

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CO064–01

INSTALLATION

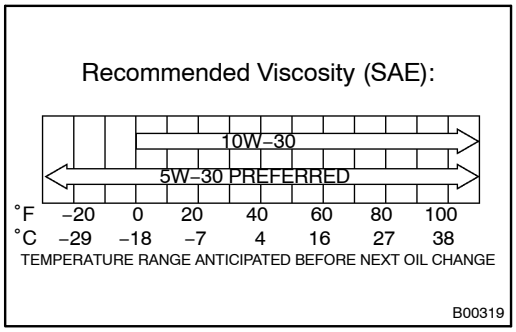
Installation is in the reverse order of removal (See page CO–16).

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LU – LUBRICATION (3RZ-FE)

OIL AND FILTER	LU-1
OIL PUMP	LU-5

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OIL AND FILTER

INSPECTION

LU0O7–01

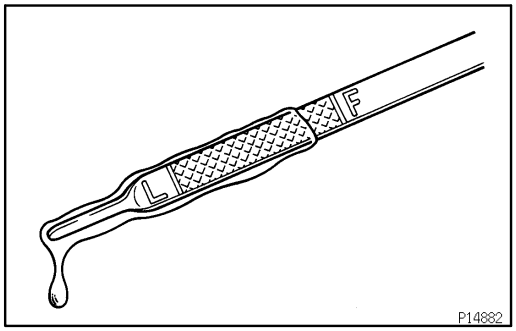
1. CHECK ENGINE OIL QUALITY

Check the oil for deterioration, entry of water, discoloring or thinning.

If the quality is visibly poor, replace the oil.

Oil grade:

API grade SH Energy–Conserving II or SJ, Energy–Conserving or ILSAC multigrade engine oil. SAE 5W–30 is the bset choise for your vehicle, for good fuel economy, and good starting in cold weather.



2. CHECK ENGINE OIL LEVEL

The oil level should be between the ”L” and ”F” marks on the dipstick.

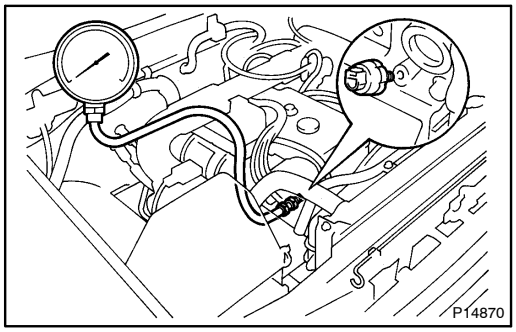
If low, check for leakage and add oil up to ”F” mark.

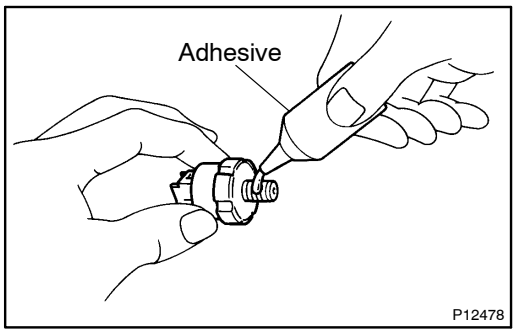
NOTICE:

- **Do not fill with engine oil above the ”F” mark.**
- **When inserting the dipstick, insert the curved tip of the dipstick facing the same direction as the curve of the guide.**
- **If the dipstick gets caught while inserting it, do not force it in. Reconfirm the direction of the dipstick.**

3. REMOVE ENGINE UNDER COVER

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4. REMOVE OIL PRESSURE SWITCH, AND INSTALL OIL PRESSURE GAUGE

5. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

6. CHECK OIL PRESSURE

Oil pressure:
At idle
29 kPa (0.3 kgf/cm^2, 4.3 psi) or more
At 3,000 rpm
245 – 490 kPa (2.5 – 5.0 kgf/cm^2, 36 – 71 psi)

7. REMOVE OIL PRESSURE GAUGE AND REINSTALL OIL PRESSURE SWITCH

(a) Remove the oil pressure gauge.

(b) Apply adhesive to 2 or 3 threads of the oil pressure switch.
Adhesive:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Reinstall the oil pressure switch.

8. START ENGINE AND CHECK FOR LEAKS

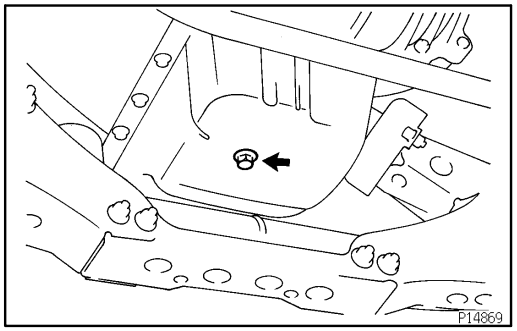
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LU0O8–01

REPLACEMENT

CAUTION:

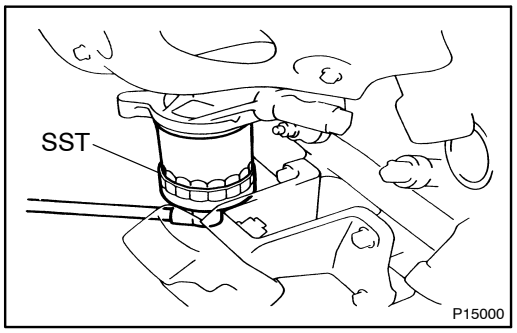
Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Care should be taken, therefore, when changing engine, oil to minimize the frequency and length of time your skin is exposed to used engine oil. Protective clothing and gloves that cannot be penetrated by oil should be worn. The skin should be thoroughly washed with soap and water, or use water–less hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents. In order to preserve the environment, used oil and used oil filters must be disposed of only at designated disposal sites.



1. DRAIN ENGINE OIL

(a) Remove the oil filler cap.

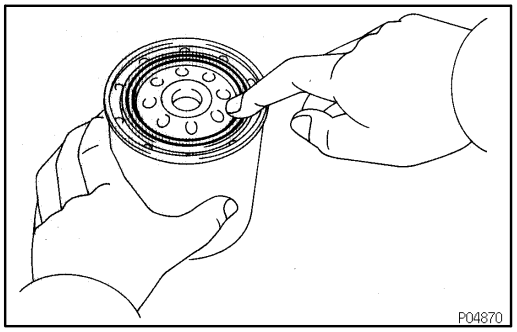
(b) Remove the oil drain plug, and drain the oil into a container.



2. REPLACE OIL FILTER

(a) Using SST, remove the oil filter.
SST 09228–07501

(b) Check and clean the oil filter installation surface.



(c) Apply clean engine oil to the gasket of a new oil filter.

(d) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.

(e) Using SST, tighten it an additional 3/4 turn.
SST 09228–07501

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3. REFILL WITH ENGINE OIL

(a) Clean and install the oil drain plug with a new gasket.
Torque:25 N·m (250 kgf·cm, 18 ft·lbf)

(b) Fill with fresh engine oil.
Oil capacity
Drain and refill
w/ Oil filter change
5.3 liters (5.6 US qts, 4.7 Imp. qts)
w/o Oil filter change
5.0 liters (5.3 US qts, 4.4 Imp. qts)
Dry fill
6.0 liters (6.3 US qts, 5.3 Imp. qts)

(c) Reinstall the oil filler cap.

4. START ENGINE AND CHECK FOR LEAKS

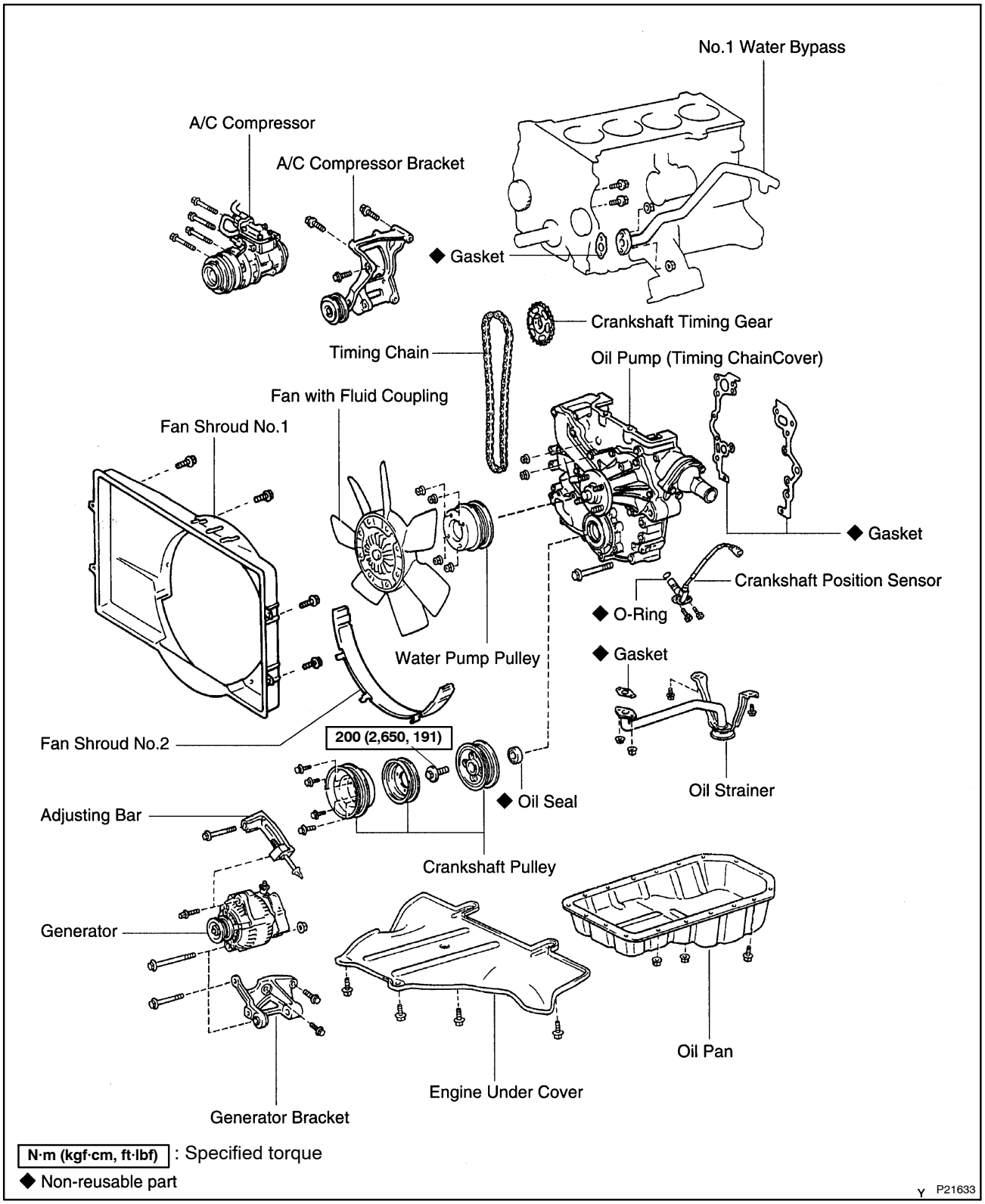
5. RECHECK ENGINE OIL LEVEL

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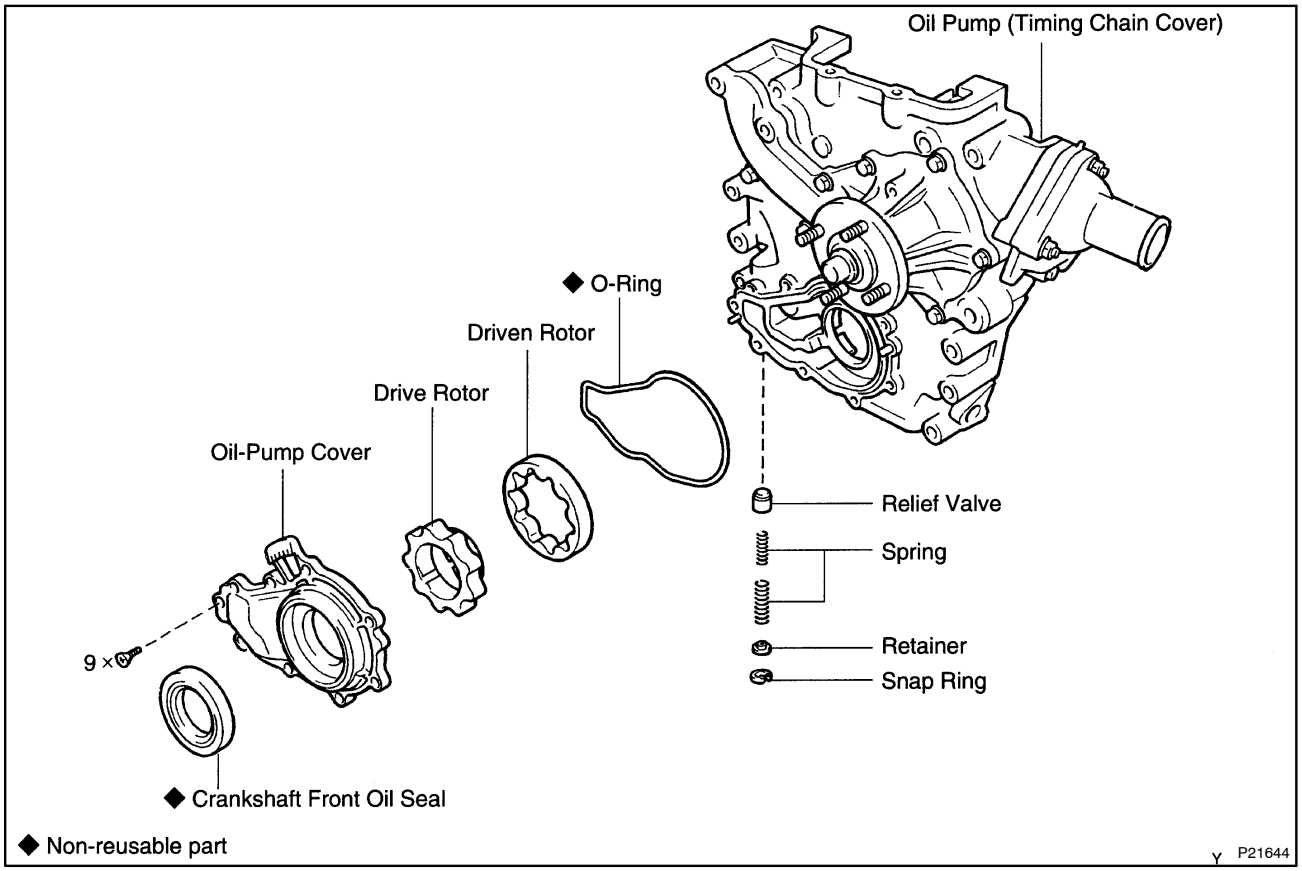
OIL PUMP

COMPONENTS

LU02V–02



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LU02W–01

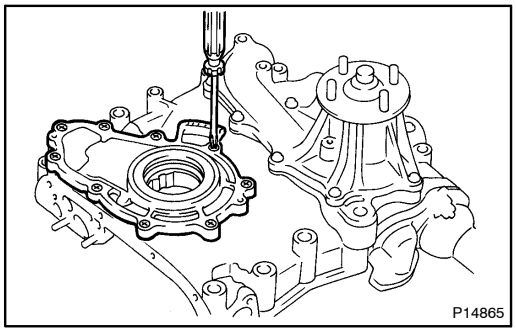
REMOVAL

1. REMOVE TIMING CHAIN COVER
   (See page EM–14)
2. REMOVE NO.1 TIMING CHAIN AND CAMSHAFT TIMING GEAR
   (See page EM–14)

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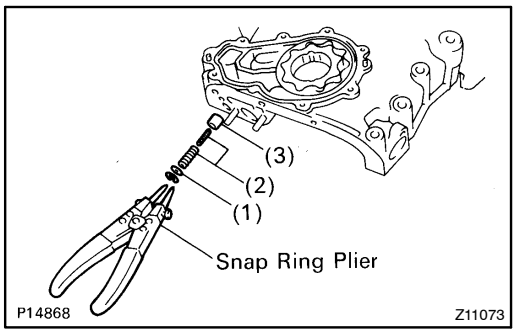
LU02X–02

DISASSEMBLY



1. REMOVE DRIVE AND DRIVEN ROTORS

Remove the 9 screws, pump cover, drive rotor, driven rotor and O–ring.

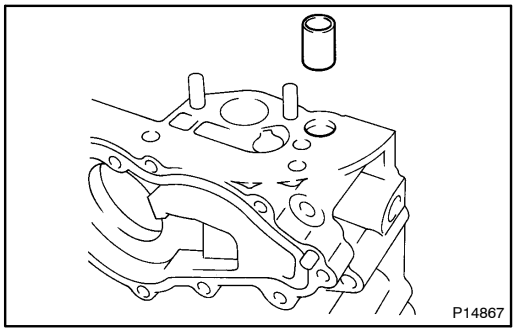


2. REMOVE RELIEF VALVE

(a) Using snap ring pliers, remove the snap ring.
(b) Remove the these parts:
  (1) Retainer
  (2) Spring
  (3) Relief valve

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LU02Y–02

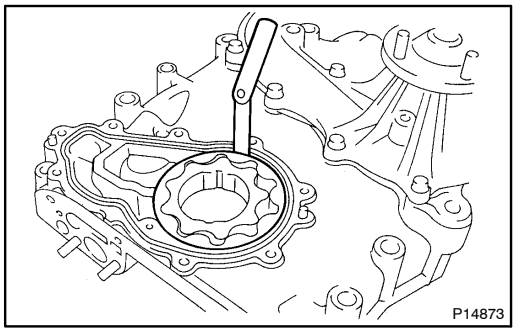


INSPECTION

1. INSPECT RELIEF VALVE

Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If it does not, replace the relief valve. If necessary, replace the oil pump assembly.

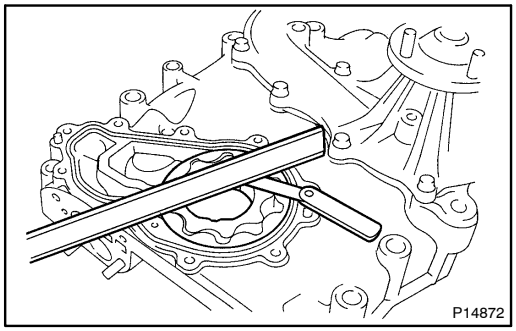


2. INSPECT ROTOR BODY CLEARANCE

Using a thickness gauge, measure the clearance between the driven rotor and body.

Standard body clearance:
0.100 – 0.175 mm (0.0039 – 0.0069 in.)
Maximum body clearance:
0.30 mm (0.0118 in.)

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.

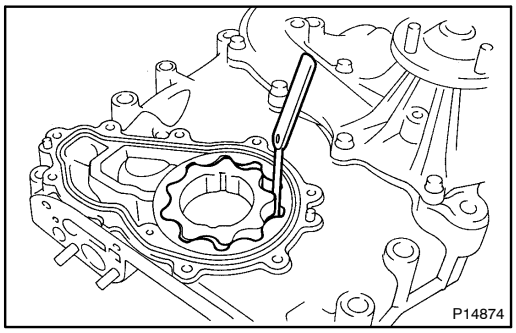


3. INSPECT ROTOR SIDE CLEARANCE

Using a thickness gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

Standard side clearance:
0.030 – 0.090 mm (0.0012 – 0.0035 in.)
Maximum side clearance:
0.15 mm (0.0059 in.)

If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.



4. INSPECT ROTOR TIP CLEARANCE

Using a thickness gauge, measure the clearance between the drive and driven rotor tips.

Standard tip clearance:
0.110 – 0.240 mm (0.0043 – 0.0094 in.)
Maximum tip clearance:
0.25 mm (0.0098 in.)

If the tip clearance is greater than maximum, replace the rotors as a set.

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LU02Z–02

REPLACEMENT

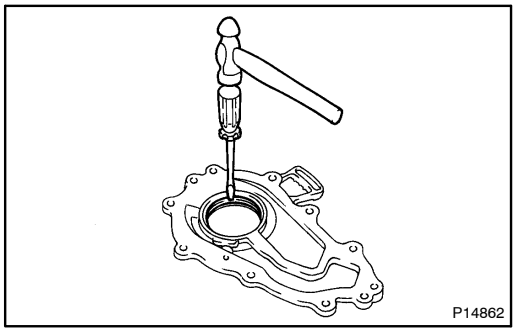
REPLACE CRANKSHAFT FRONT OIL SEAL

HINT:

There are 2 methods (A and B) to replace the oil seal which are as follows:

(a) If oil pump is removed from cylinder block.

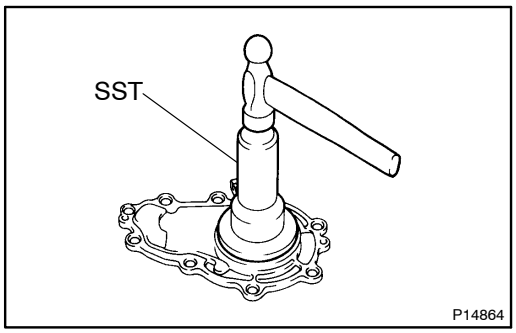
(1) Using a screwdriver and a hammer, tap out the oil seal.



(2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump case edge.

SST 09223–50010

(3) Apply MP grease to the oil seal lip.

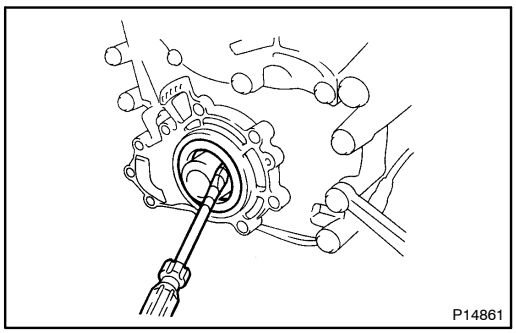


(b) If oil pump is installed to cylinder block.

(1) Using a screwdriver, pry out the oil seal.

NOTICE:

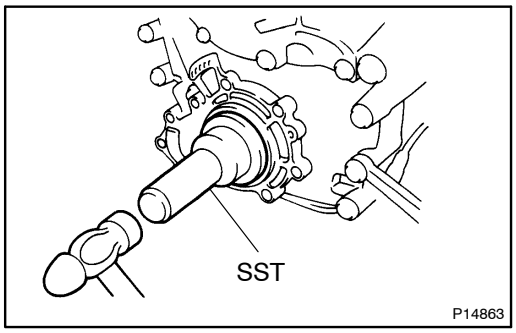
Be careful not to damage the crankshaft. Tape the screwdriver tip.



(2) Apply MP grease to a new oil seal lip.

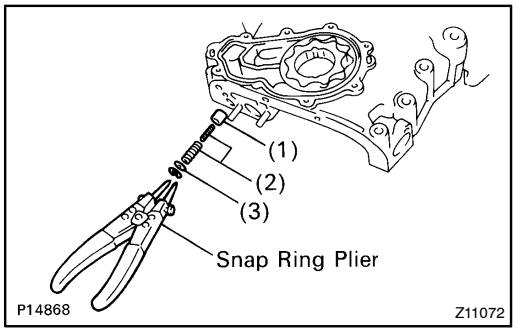
(3) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump case edge.

SST 09223–50010



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LU030–02

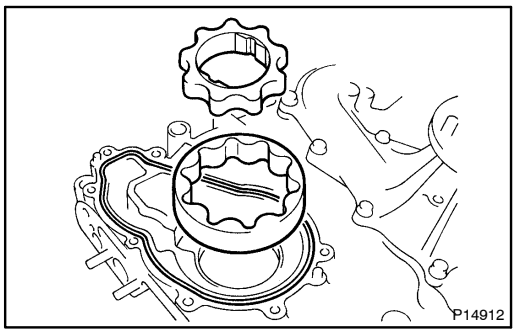


REASSEMBLY

1. INSTALL RELIEF VALVE

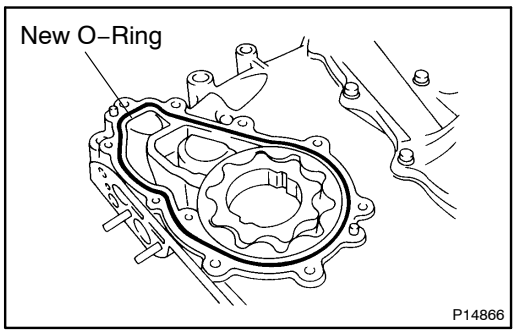
(a) Install these parts:
  (1) Relief valve
  (2) Spring(s)
  (3) Retainer

(b) Using snap ring pliers, install the snap ring.



2. INSTALL DRIVE AND DRIVEN ROTORS

(a) Place the drive and driven rotors into the pump body.



(b) Place a new O–ring to the pump body.

(c) Install the pump cover with the 9 screws.

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LU031–01

INSTALLATION

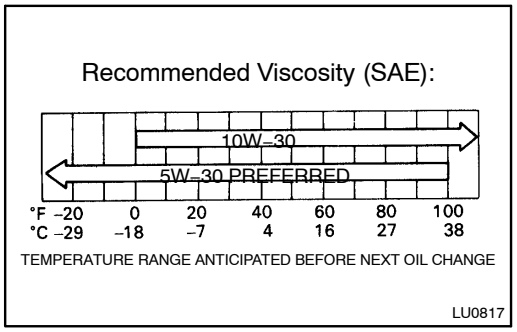
1. INSTALL NO.1 TIMING CHAIN AND CAMSHAFT TIMING GEAR
   (See page EM–20)
2. INSTALL TIMING CHAIN COVER
   (See page EM–20)

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LU – LUBRICATION (5VZ-FE)

OIL AND FILTER	LU-1
OIL PUMP	LU-5
OIL COOLER	LU-17

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OIL AND FILTER

LU033–04

INSPECTION

1. CHECK ENGINE OIL QUALITY

Check the oil for deterioration, entry of water, discoloring or thinning.

If oil quality is visibly poor, replace it.

Oil grade:

API grade SH Energy–Conserving II or ILSAC multigrade engine oil.

SAE 5W–30 is the bset choise for your vehicle, for good fuel economy, and good starting in cold weather.

2. CHECK ENGINE OIL LEVEL

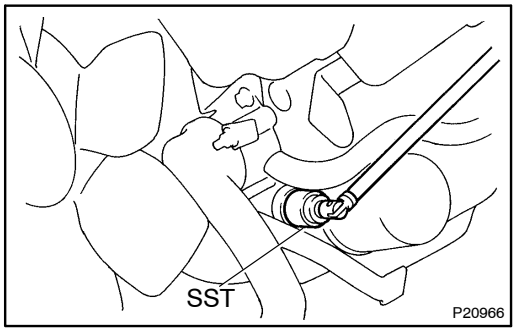
The oil level should be between the ”L” and ”F” marks on the dipstick.

3. CHECK OIL LEVEL

The oil level should be between the ”L” and ”F” marks on the level gauge. If low, check for leakage and add oil up to the ”F” mark.

If low, check for leakage and add oil up to the ”F” mark.

When inserting the oil dipstick, insert the curved tip of the dipstick facing the same direction as the curve of the guide.If the dipstick gets caught while inserting it, do not force it in. Reconfirm the direction of the dipstick.



4. REMOVE OIL PRESSURE SWITCH

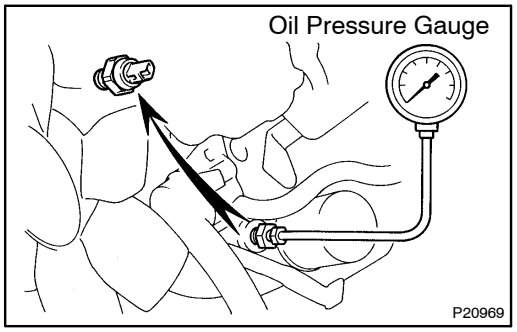
Using SST, remove the oil pressure switch.

SST 09816–30010

5. INSTALL OIL PRESSURE GAUGE

6. START ENGINE

Start the engine and warm it up to normal operating temperature.



7. CHECK OIL PRESSURE

Oil pressure:

At idle speed

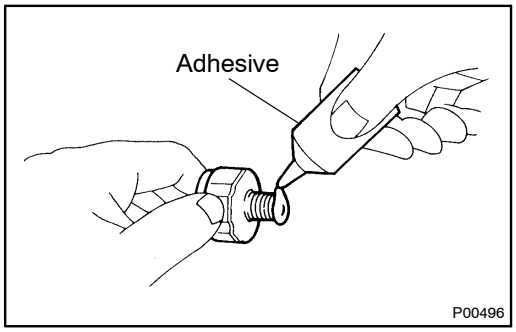
29 kPa (0.3 kgf/cm^2, 4.3 psi) or more

At 3,000 rpm

245 – 520 kPa (2.5 – 5.3 kgf/cm^2, 36 – 75 psi)

8. REMOVE OIL PRESSURE GAUGE

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9. INSTALL OIL PRESSURE SWITCH

(a) Apply adhesive to 2 or 3 threads.
Adhesive:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Using SST, install the oil pressure switch.
SST 09816–30010
Torque:15 N·m (150 kgf·cm, 11 ft·lbf)

10. START ENGINE AND CHECK FOR LEAKS

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LU034–03

REPLACEMENT

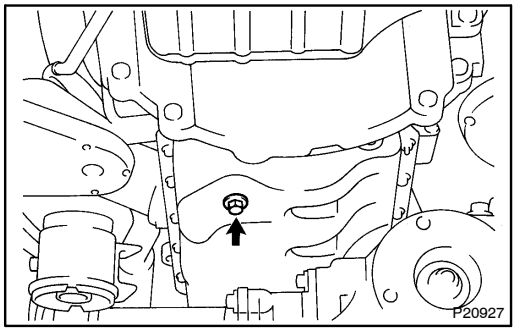
CAUTION:

Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis.In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.

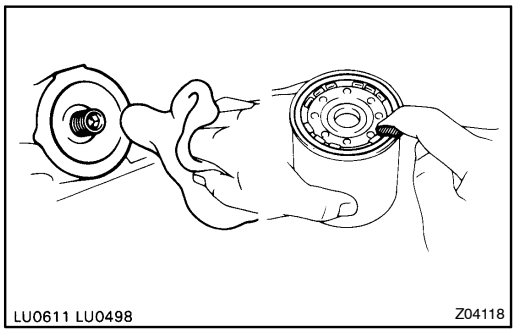
Adequate means of skin protection and washing facilities should be provided.Care should be taken, therefore, when changing engine oil, to minimize the frequency and length of time your skin is exposed to used engine oil.

Protective clothing and gloves, that cannot be penetrated by oil, should be worn. The skin should be thoroughly washed with soap and water, or use water–less hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.In order to preserve the environment, used oil and used oil filters must be disposed of only at designated disposal sites.

1. DRAIN ENGINE OIL

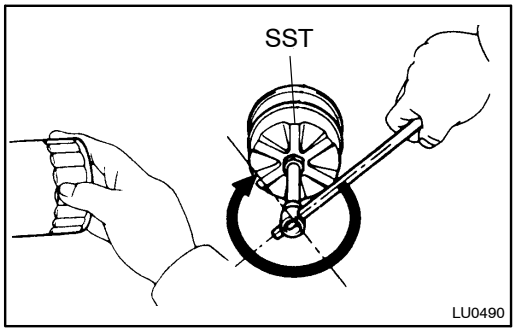


(a) Remove the oil filler cap.
(b) Remove the oil dipstick.
(c) Remove the oil drain plug and gasket, and drain the oil into a container.



2. REPLACE OIL FILTER

(a) Using SST, remove the oil filter (located on left side of the cylinder block).
SST 09228–07501
(b) Clean the filter contact surface on the filter mounting.
(c) Apply clean engine oil to the gasket of a new oil filter.



(d) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
(e) Using SST, tighten it an additional 3/4 turn.
SST 09228–07501

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3. FILL WITH ENGINE OIL

(a) Clean and install the oil drain plug with a new gasket.

(b) Fill the engine with new oil.

Oil capacity

Item		Capacity liters (US qts, Imp. qts)
Drain and refill		
w/ Oil filter change	2WD	5.2 (5.5, 4.6)
	4WD	4.7 (5.0, 4.1)
w/o Oil filter change	2WD	4.9 (5.2, 4.3)
	4WD	4.4 (4.7, 3.9)
Dry fill	2WD	5.9 (6.2, 5.2)
	4WD	5.5 (5.8, 4.8)

(c) Reinstall the oil filler cap.

4. START ENGINE AND CHECK FOR LEAKS

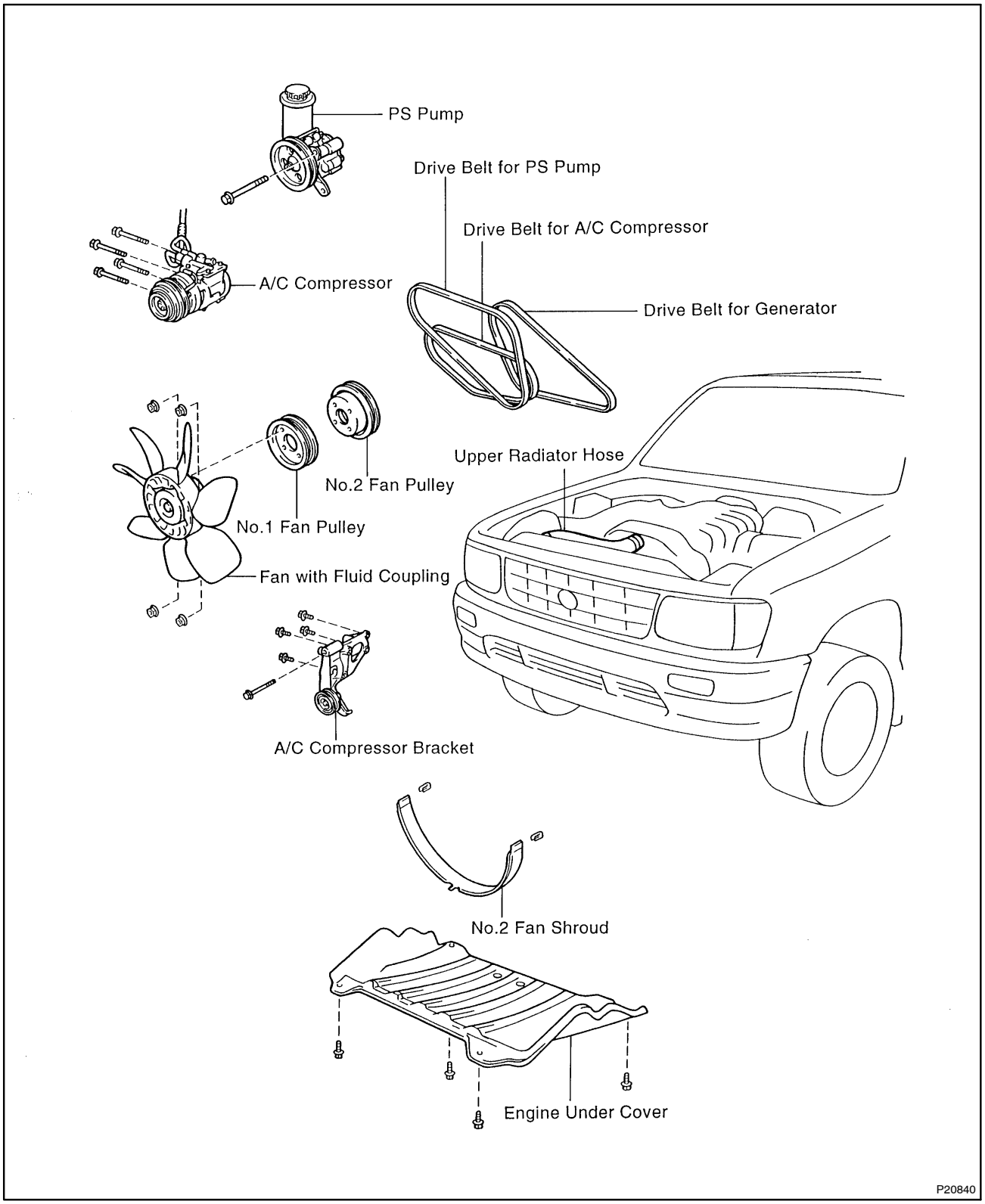
5. RECHECK ENGINE LEVEL

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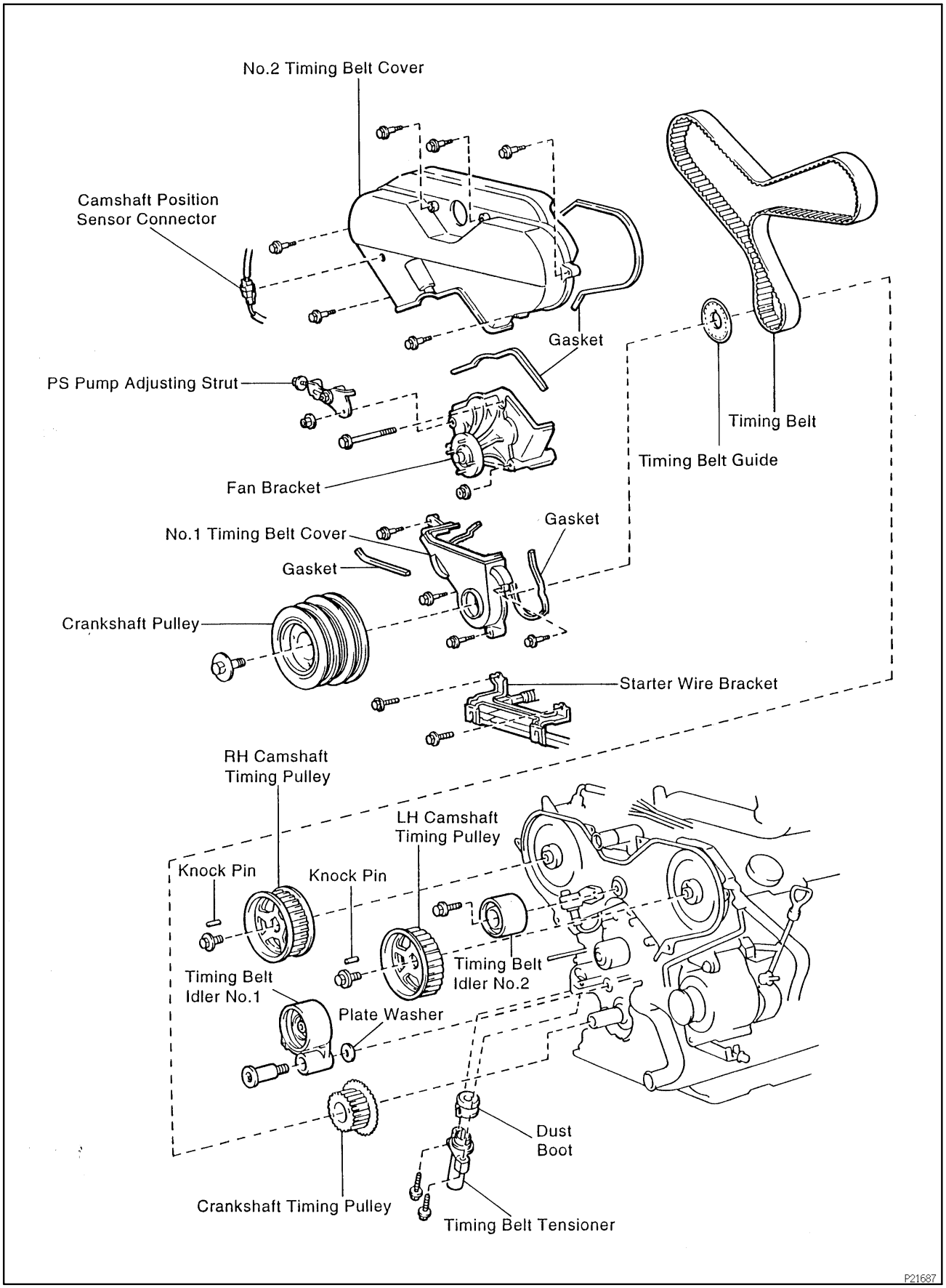
OIL PUMP

COMPONENTS

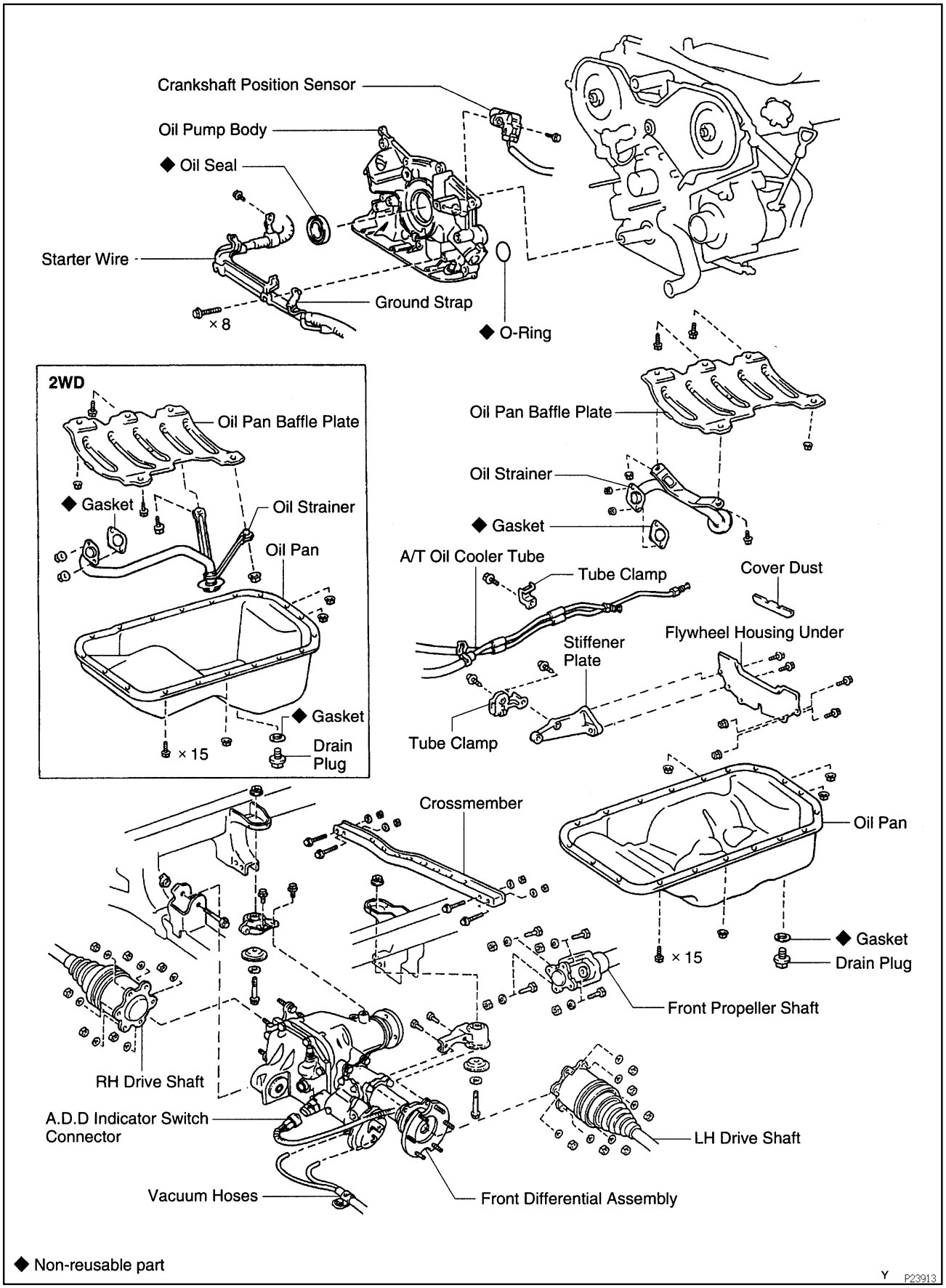
LU035–03



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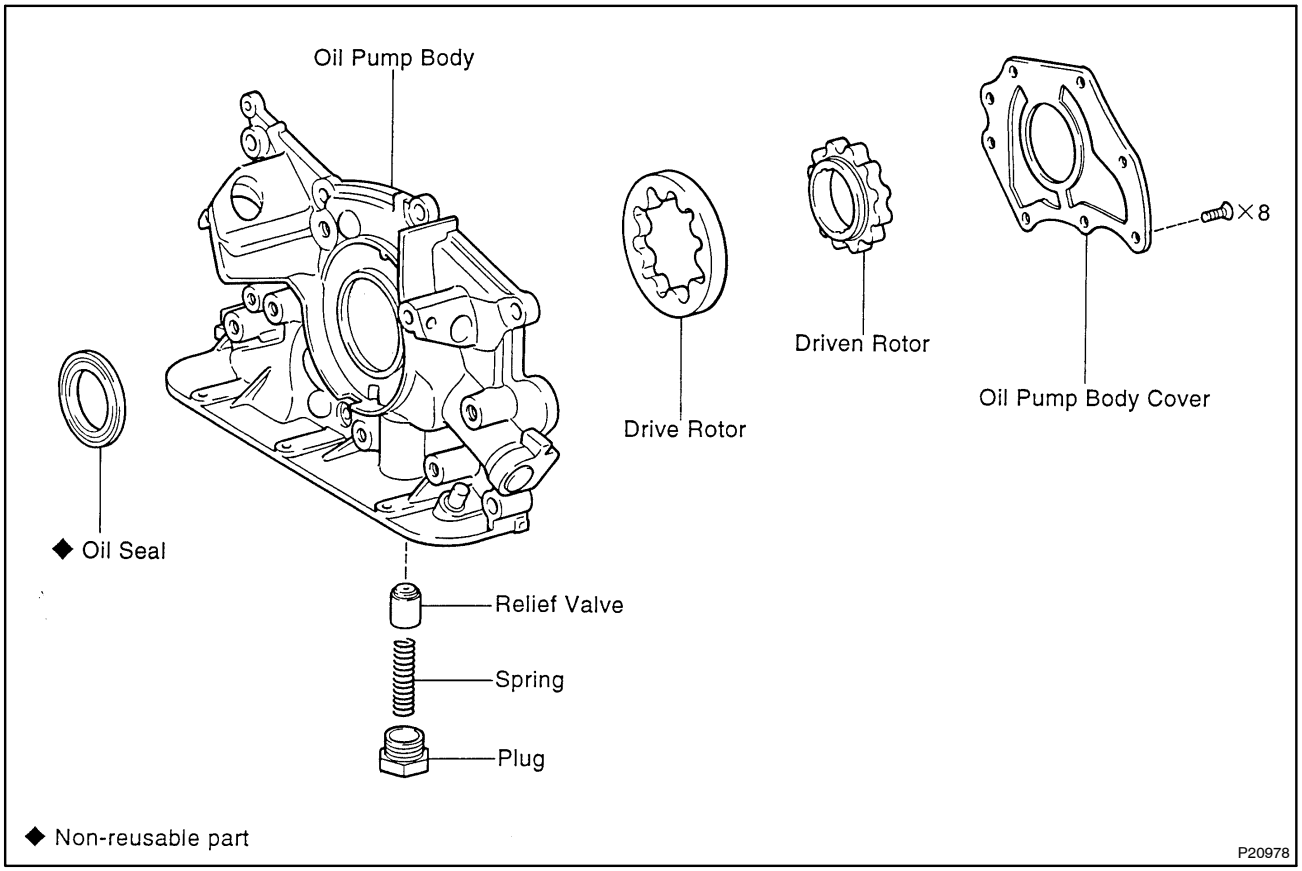


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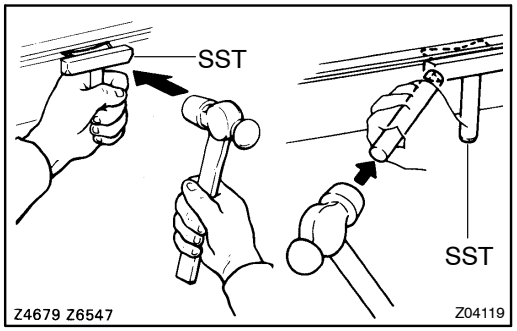
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LU036–03

REMOVAL

HINT:
When repairing the oil pump, the oil pan and strainer should be removed and cleaned.

1. **REMOVE CRANKSHAFT TIMING PULLEY**
   (See page EM–13)
2. **4WD:**
   REMOVE FRONT DIFFERENTIAL
3. **DRAIN ENGINE OIL**
4. **A/T:**
   REMOVE OIL COOLER TUBE AND CLAMP
   (See page AT–28)
5. **REMOVE STIFFENER PLATE**
6. **REMOVE FLYWHEEL HOUSING UNDER AND COVER DUST**
7. **DISCONNECT STARTER WIRE CLAMP**
8. **REMOVE CRANKSHAFT POSITION SENSOR**

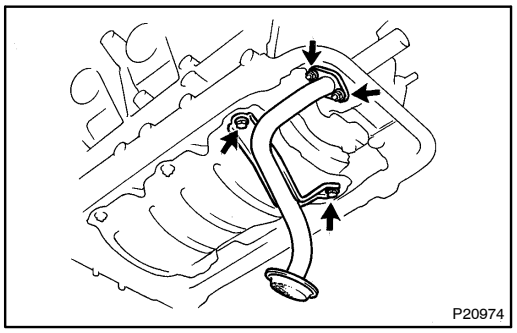


9. REMOVE OIL PAN

(a) Remove the 15 bolts and 4 nuts.

(b) Using SST and a brass bar, separate the oil pan from the cylinder block.
SST 09032–00100

HINT:
When removing the oil pan, be careful not to damage the oil pan flange.

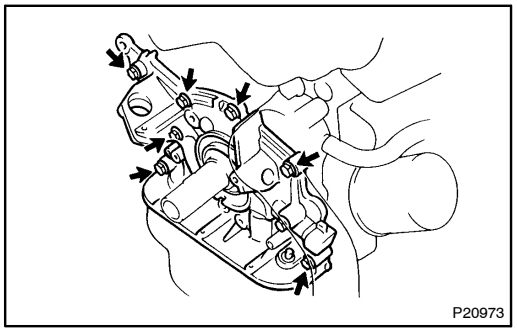


10. REMOVE OIL STRAINER

Remove the 2 bolts, 2 nuts and oil strainer and gasket.

11. REMOVE OIL PAN BAFFLE PLATE

Remove the 2 bolt, nut and oil pan baffle plate.



12. REMOVE OIL PUMP

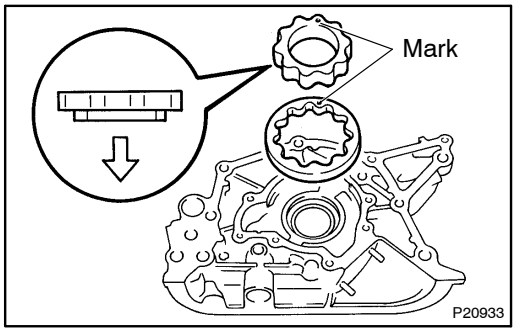
(a) Remove the 8 bolts, ground strap and oil pump.

(b) Using a plastic–faced hammer, carefully tap the oil pump body.

(c) Remove the O–ring from the cylinder block.

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LU037–03



DISASSEMBLY

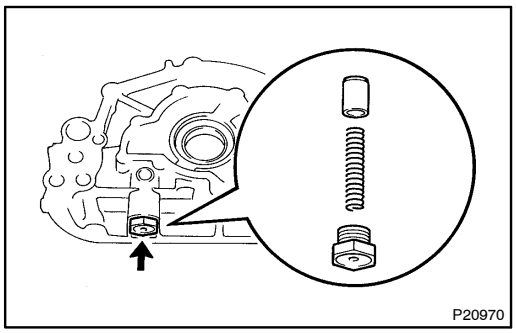
1. REMOVE DRIVEN AND DRIVE ROTORS

(a) Remove the 8 screws and pump body cover.
Torque:10 N·m (105 kgf·cm, 8 ft·lbf)

(b) Remove the drive and driven rotors.

HINT:

Place the drive and driven rotor into pump body with the marks facing the pump body cover side.



2. REMOVE RELIEF VALVE

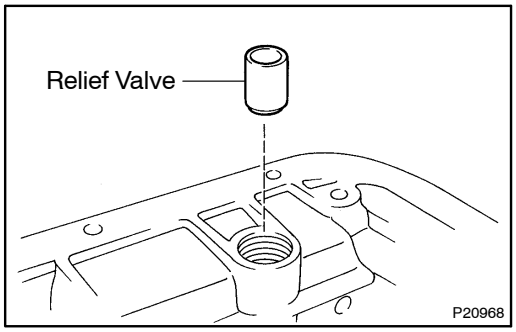
(a) Unscrew the relief valve plug and gasket.

(b) Remove the spring and relief valve.

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LU038–01

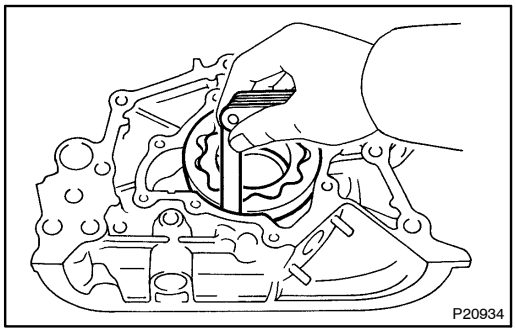
INSPECTION



1. INSPECT RELIEF VALVE

Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If the valve does not fall smoothly, replace the valve. If necessary, replace the oil pump assembly.

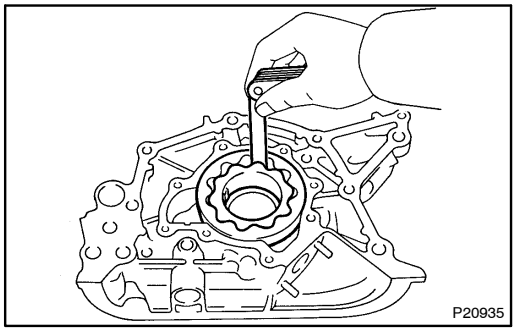


2. INSPECT ROTOR BODY CIEARANCE

Using a thickness gauge, measure the clearance between the driven rotor and pump body.

Standard body clearance:
0.10 – 0.18 mm (0.0039 – 0.0069 in.)
Maximum body clearance:
0.30 mm (0.0118 in.)

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.

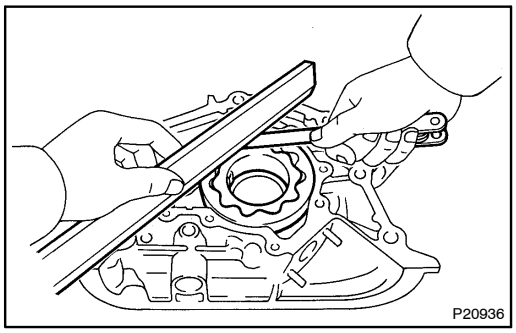


3. INSPECT ROTOR TIP CLEARANCE

Using a thickness gauge, measure the clearance between the drive and driven rotor tips.

Standard tip clearance:
0.11 – 0.24 mm (0.0043 – 0.0094 in.)
Maximum tip clearance:
0.35 mm (0.0138 in.)

If the tip clearance is greater than maximum, replace the rotors as a set.



4. INSPECT ROTOR SIDE CLEARANCE

Using a thickness gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

Standard side clearance:
0.03 – 0.09 mm (0.0012 – 0.0035 in.)
Maximum side clearance:
0.15 mm (0.0059 in.)

If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.

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LU039–03

REPLACEMENT

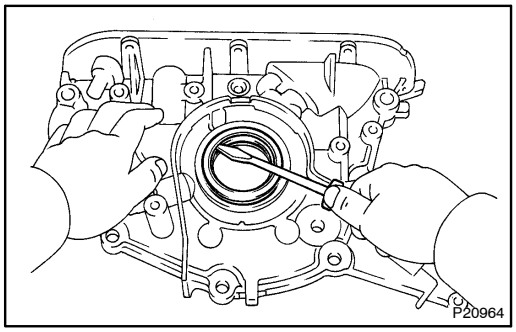
REPLACE CRANKSHAFT FRONT OIL SEAL

HINT:

There are 2 methods (A and B) to replace the oil seal, which are as follows:

(a) If oil pump is removed from cylinder block.

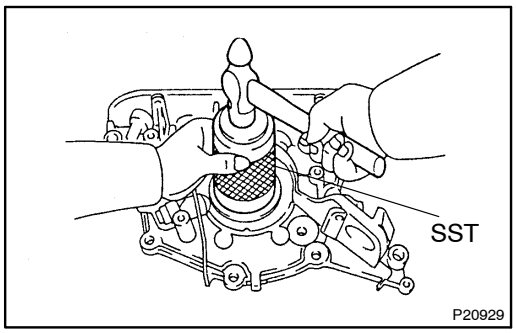
(1) Using a screwdriver, pry out the oil seal.



(2) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump body edge.

SST 09309–37010

(3) Apply MP grease to the oil seal lip.



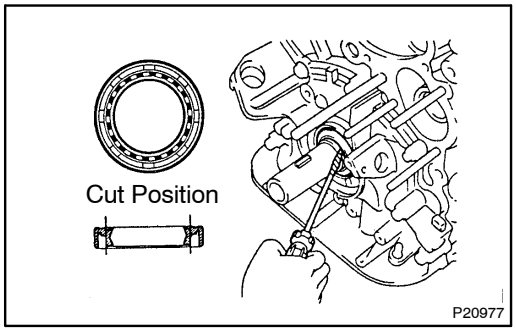
(b) If oil pump is installed to the cylinder block.

(1) Using a knife, cut off the oil seal lip.

(2) Using a screwdriver, pry out the oil seal.

NOTICE:

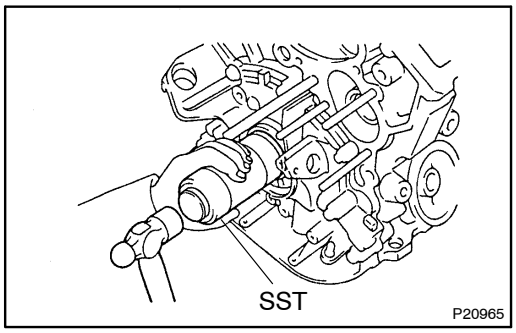
Be careful not to damage the crankshaft. Tape the screwdriver tip.



(3) Apply MP grease to a new oil seal lip.

(4) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump body edge.

SST 09306–37010



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LU03A–01

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page LU–10).

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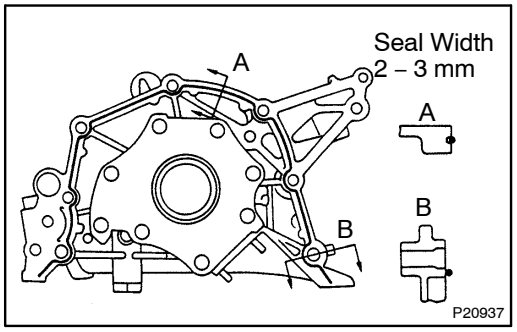
LU03B–04

INSTALLATION

1. INSTALL OIL PUMP

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pump and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.



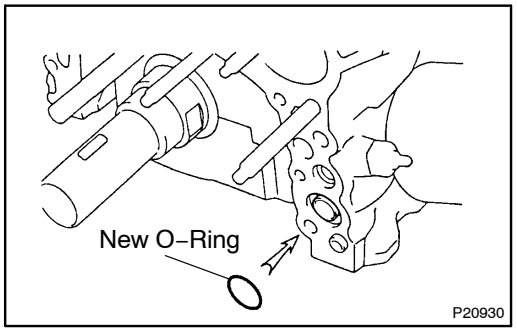
(b) Apply seal packing to the oil pump, as shown in the illustration.

Seal packing:
Part No. 08826–00080 or equivalent

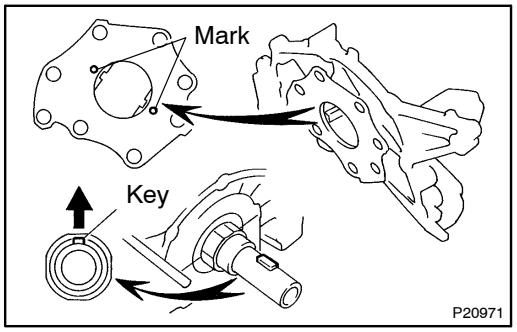
- Install nozzle that has been cut out to a 2 – 3 mm (0.08 – 0.12 in.) opening.

HINT:
Avoid applying an excessive amount to the surface.

- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

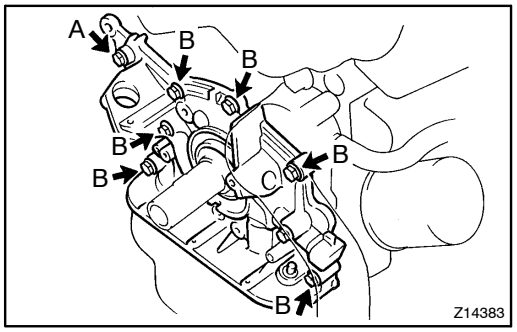


(c) Place a new O–ring into the groove of the cylinder block.



(d) Install the oil pump to the crankshaft with the spline teeth of the drive rotor engaged with the large teeth of the crankshaft.

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(e) Install the oil pump with the 8 bolts, and ground strap.
Torque:
Bolt A: 20 N·m (200 kgf·cm, 15 ft·lbf)
Bolt B: 42 N·m (420 kgf·cm, 31 ft·lbf)

2. INSTALL CRANK SHAFT POSITION SENSOR

3. INSTALL OIL PAN BAFFLE PLATE

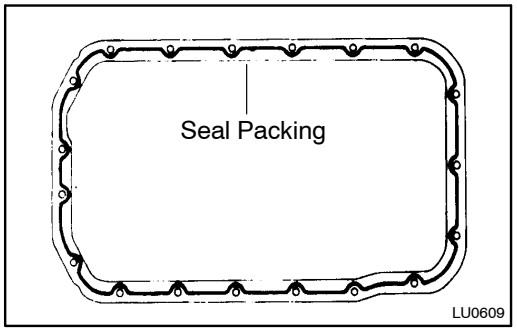
4. INSTALL OIL STRAINER

Place a new gasket and install the oil strainer.
Torque:7.5 N·m (76 kgf·cm, 66 in.·lbf)

5. CLEAN OIL PAN

Remove any old packing (FIPG) material and be careful not to drop any oil on the contacting surfaces of the, oil pan, cylinder block and sealing grooves.

- Using a razor blade and gasket scraper, remove all the remaining seal packing (FIPG) material from the gasket surfaces.
- Thoroughly clean all components to remove all the loose material.



- Clean both sealing surfaces with a non–residue solvent.

NOTICE:
Do not use a solvent which will affect the painted surfaces.

6. INSTALL OIL PAN

(a) Apply seal packing to the oil pan, as shown in the illustration.
Seal packing:
Part No. 08826–00080 or equivalent

- Install a nozzle that has been cut to a 3 – 4 mm (0.12 – 0.16 in.) opening.

HINT:
Avoid applying an excess amount to the surface.

- If parts are not assembled within 5 minutes of applying the seal packing, the effectiveness of the seal packing is lost and the seal packing must be removed and reapplied.
- Immediately remove the nozzle from the tube and reinstall the cap after using the seal packing.

(b) Install the oil pan with the 4 nuts and 15 bolts.
Torque:7.6 N·m (78 kgf·cm, 67 in.·lbf)

7. INSTALL FLYWHEEL HOUSING UNDER AND COVER DUST

8. INSTALL STIFFENER PLATE

9. CONNECT STARTER WIRE CLAMP

10. A/T:
INSTALL OIL COOLER TUBE AND CLAMP

11. INSTALL CRANKSHAFT TIMING PULLEY
(See page EM–19)

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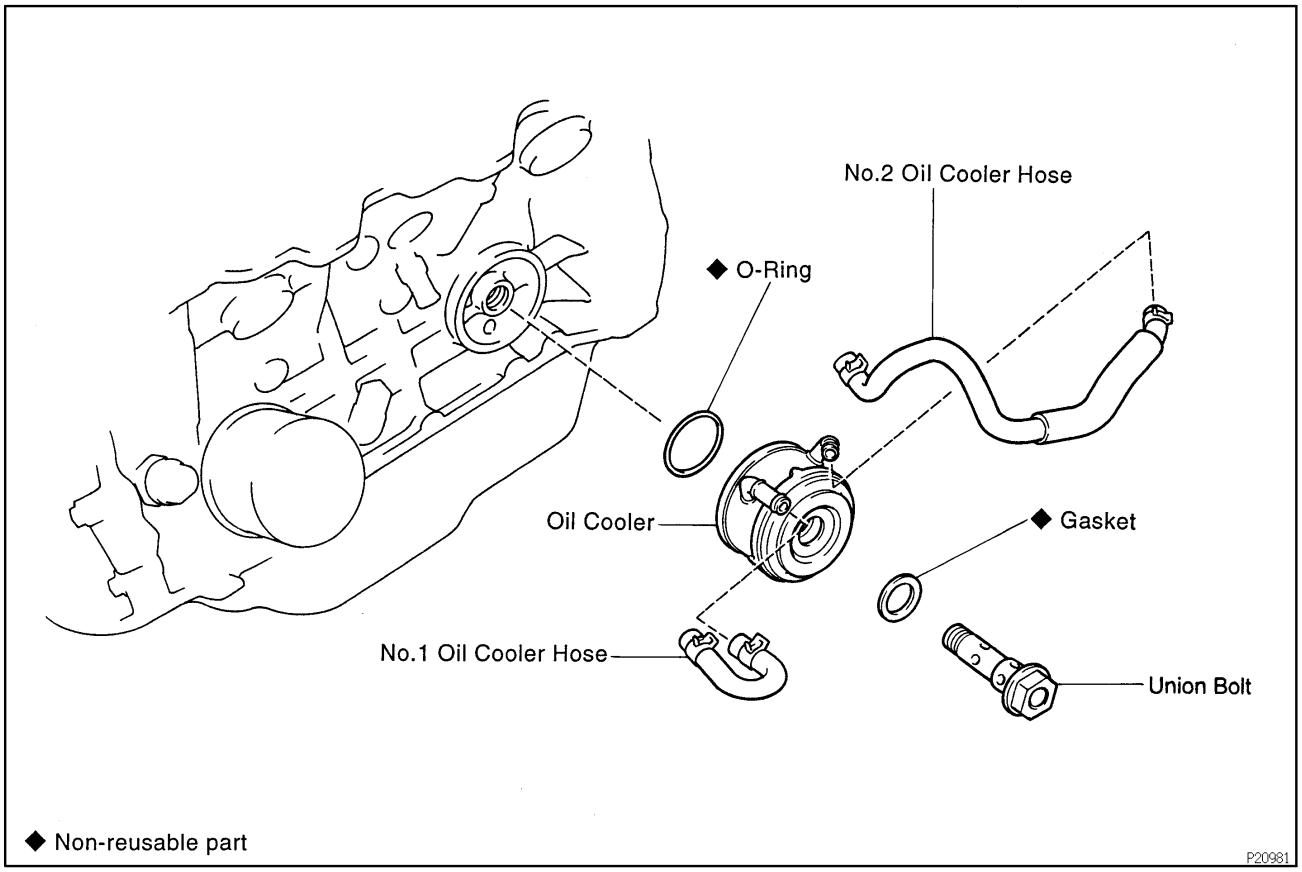
12. 4WD:
INSTALL FRONT DIFFERENTIAL
(See page SA–68)
13. FILL WITH ENGINE OIL
14. START ENGINE AND CHECK FOR LEAKS
15. INSTALL ENGINE UNDER COVER
16. RECHECK ENGINE OIL LEVEL

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OIL COOLER

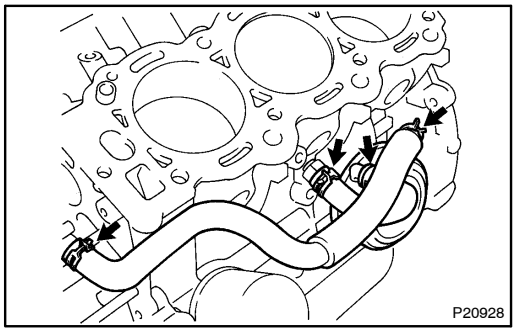
COMPONENTS

LU03C–03



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LU03D–03

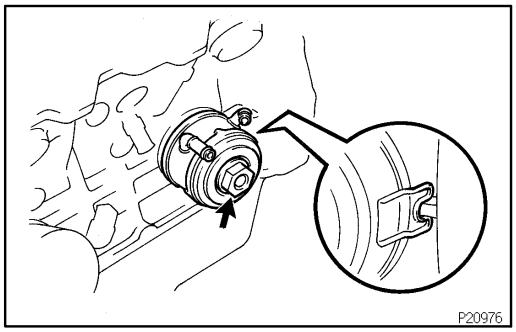


REMOVAL

1. DRAIN ENGINE COOLANT

2. DISCONNECT OIL COOLER HOSES

Disconnect the No.1 and No.2 oil cooler hoses.



3. REMOVE OIL COOLER

Remove the bolt, relief valve, gaskets and oil cooler.

Torque:59 N·m (600 kgf·cm, 43 ft·lbf)

HINT:

- Replace the O–ring with a new part.
- Use a new gasket to the relief valve.

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LU03E–03

INSPECTION

INSPECT OIL COOLER

Check the oil cooler for damage or clogging.
If necessary, replace the oil cooler.

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LU03F–02

INSTALLATION

Installation is in the reverse order of removal (See page LU–18).

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IG – IGNITION (3RZ-FE)

IGNITION SYSTEM	IG-1
DISTRIBUTOR	IG-6
CRANKSHAFT POSITION SENSOR	IG-13

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IGNITION SYSTEM

ON–VEHICLE INSPECTION

IG0L9–01

NOTICE:

"Cold" and "Hot" in the following sentences express the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

1. INSPECT IGNITOR AND SPARK TEST

Check that the spark occurs.

(1) Disconnect the high–tension cords from the spark plugs.
(2) Remove the spark plugs.
(3) Install the spark plugs to each high–tension cord.
(4) Ground the spark plug.
(5) Check if spark occurs while engine is being cranked.

NOTICE:

To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1 – 2 seconds at a time.

If the spark does not occur, perform the test as follows:

SPARK TEST
↓ NO
CHECK CONNECTION OF IGNITION COIL AND IGNITER AND DISTRIBUTOR CONNECTOR → BAD → Connect securely.
↓ OK
CHECK RESISTANCE OF HIGH–TENSION CORD (See step 2.)
Maximum resistance; 25 kΩ per cord → BAD → Replace the cord(s).
↓ OK
CHECK POWER SUPPLY TO IGNITION COIL AND IGNITER
1. Turn ignition switch to ON.
2. Check that there is battery voltage at ignition coil positive (+) terminal. → BAD → Check wiring between ignition switch to ignition coil and igniter.
↓ OK
CHECK RESISTANCE OF IGNITION COIL (See step 4)

Resistance:	Cold	Hot
Primary	0.36 – 0.55 Ω	0.45 – 0.65 Ω
Secondary	9.0 – 15.4 kΩ	11.4 – 18.1 kΩ

→ BAD → Replace the ignition coil.
↓ OK
CHECK RESISTANCE OF SIGNAL GENERATOR (PICKUP COIL) (See step 5)

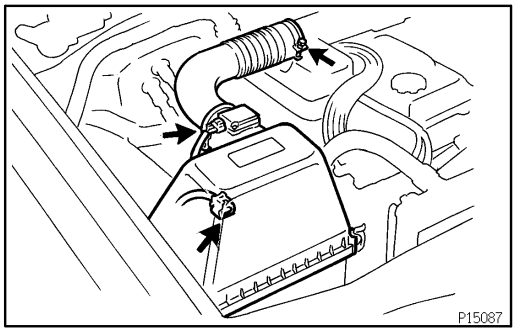
Resistance:	Cold	Hot
G⊕ and G⊖	185 – 275 Ω	240 – 325 Ω

→ BAD → Replace the distributor housing assembly.
↓ OK
CHECK RESISTANCE OF CRANKSHAFT POSITION SENSOR (See page IG–14)

Resistance:	Cold	Hot
NE⊕ and NE⊖	1,630 – 2,740 Ω	2,065 – 3,225 Ω

→ BAD → Replace the crankshaft position sensor.
↓ OK
CHECK AIR GAP OF DISTRIBUTOR (See page DI–103)
Air gap: 0.2 – 0.4 mm (0.008 – 0.016 in.) → BAD → Replace the distributor housing assembly.
↓ OK
CHECK IGT SIGNAL FROM ECM (See page DI–103) → BAD → Check wiring between ECM, distributor and igniter, and then try another ECM.
↓
TRY ANOTHER IGNITER

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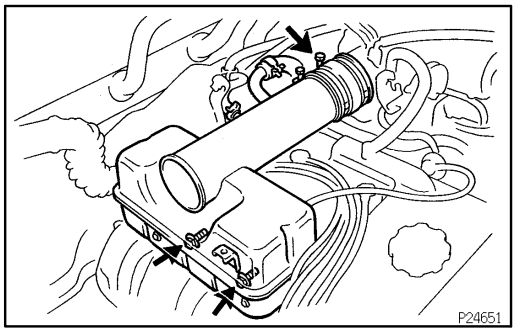


2. INSPECT HIGH–TENSION CORDS

(a) Disconnect the MAF meter connector and IAT sensor connector.

(b) Loosen the hose clamp, disconnect the air cleaner hose from the intake air connector.

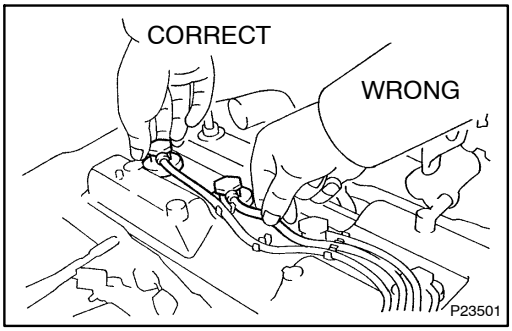
(c) Remove the air cleaner cap and MAF meter assembly.



(d) Disconnect the air hose (for IAC) from the air connector.

(e) Remove the 2 bolts.

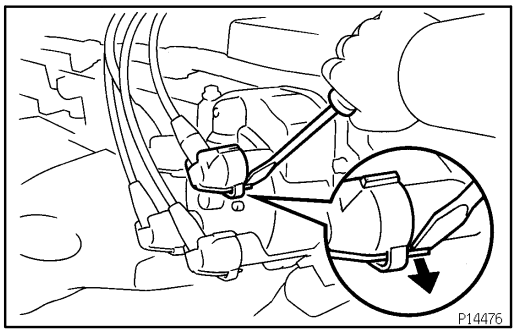
(f) Loosen the hose clamp, disconnect the intake air connector from the throttle body.



(g) Disconnect the high–tension cords from the spark plugs.

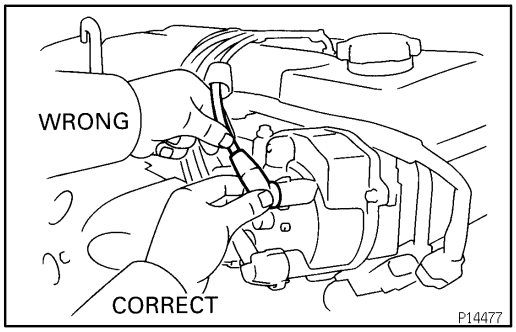
NOTICE:

Pulling on or bending the cords may damage the conductor inside.



(h) Disconnect the high–tension cords from the ignition coils.

(1) Using a screwdriver, lift up the lock claw and disconnect the holder from the distributor cap.

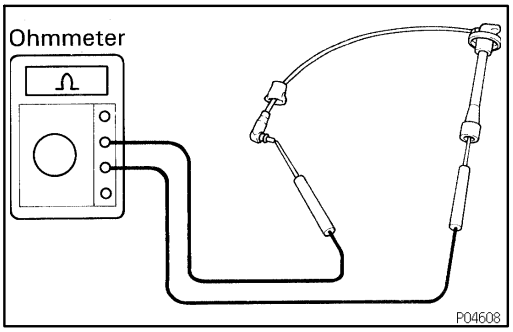


(2) Disconnect the high–tension cord at the grommet.

NOTICE:

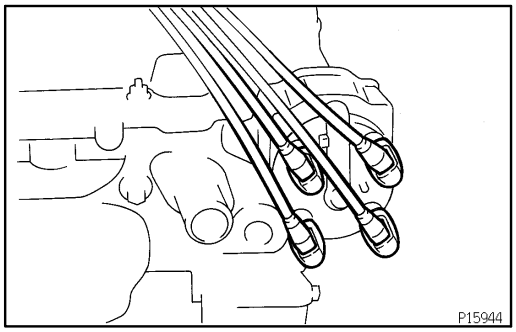
- **Pulling on or bending the cords may damage the conductor inside.**
- **Do not wipe any of the oil from the grommet after the high–tension cord is disconnected.**

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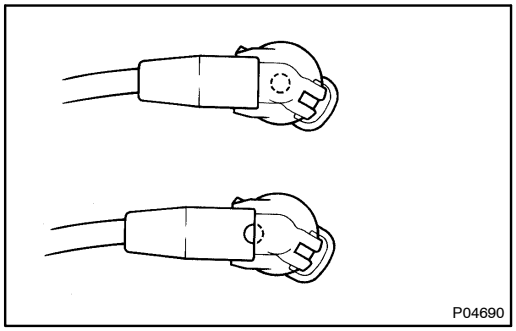
(i) Using an ohmmeter, measure the resistance.
Maximum resistance: 25 kΩ per cord

If the resistance is greater than the maximum, check the terminals.
If necessary, replace the high–tension cord.



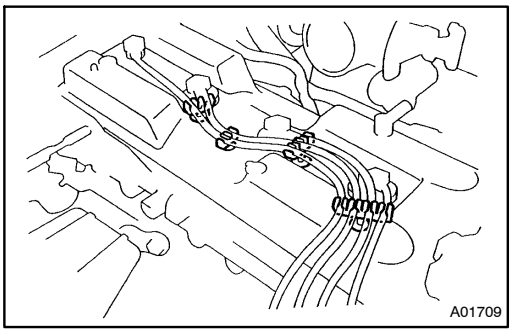
(j) Connect the high–tension cords to the distributor cap. Assemble the holder and grommet.

HINT:
Connect the high–tension cords to the distributor cap as shown in the illustration.

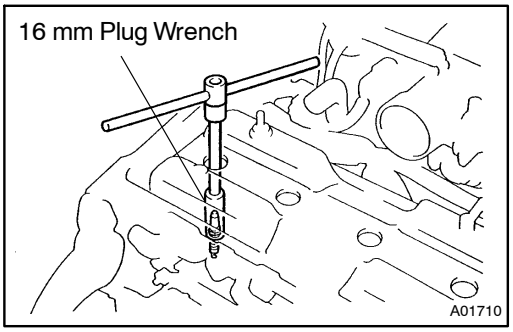


NOTICE:
Check that the holder is correctly installed to the grommet and distributor cap as shown in the illustration.

(k) Check that the lock claw of the holder is engaged by lightly pulling the holder.



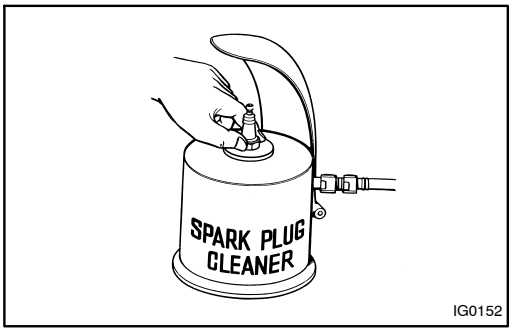
(l) Connect the high–tension cords to the spark plugs. Secure the high–tension cords with the clamps as shown in the illustration.
(m) Install the intake air connector.
(n) Install the air cleaner cap and MAF meter assembly.



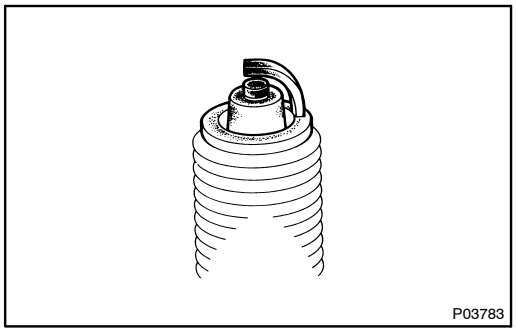
3. INSPECT SPARK PLUGS

(a) Disconnect the high–tension cords from the spark plugs.
(b) Using a 16 mm plug wrench, remove the spark plug.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

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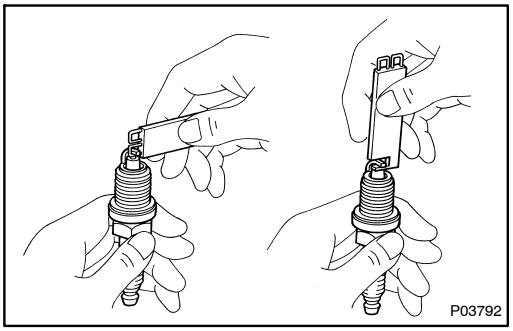
(c) Using a spark plug cleaner or wire brush, clean the spark plug.



(d) Check the spark plug for electrode wear, threads damage and insulator damage.

If abnormal, replace the plugs.

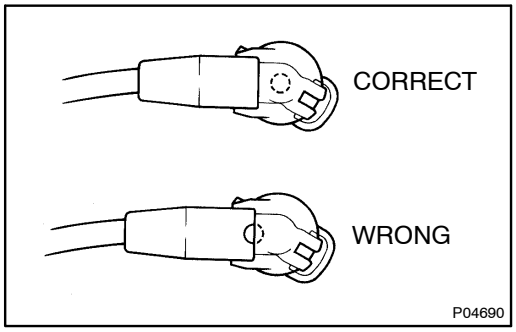
Recommended spark plugs:
ND: K16R–U
NGK: BKR5EYA



(e) Carefully bend the outer electrode to obtain the correct electrode gap.
Correct electrode gap: 0.8 mm (0.031 in.)

(f) Using a 16 mm plug wrench, install the spark plug.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

(g) Connect the high–tension cords to the spark plugs.



NOTICE:
Check that the holder is correctly installed to the grommet and ignition coil as shown in the illustration.

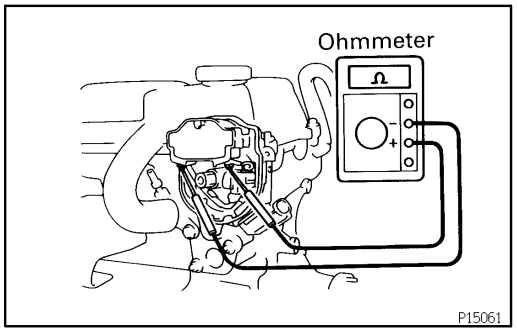
(h) Check that the lock claw of the holder is engaged by lightly pulling the holder.

4. INSPECT IGNITION COIL

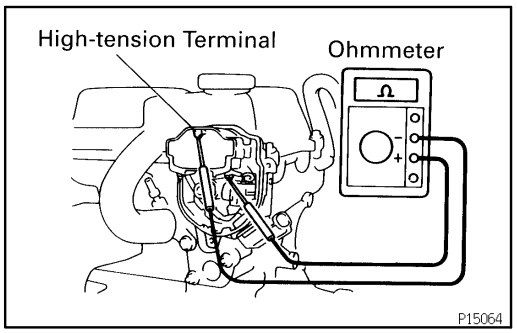
NOTICE:
"Cold" and "Hot" in these sentences express the temperature of the coils them selves.
"Cold" is from – 10 °C (14 °F) to 50 °C (104 °F) and "Hot" is from 50 °C (104 °F) to 100 °C (212 °F)

(a) Disconnect the distributor connctor.
(b) Remove the distributor cap.
(c) Remove the rotor.
(d) Remove the ignition coil dust cover.

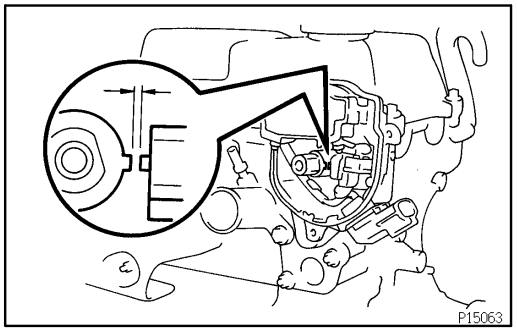
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(e) Inspect primary coil resistace.
Using an ohmmeter, measure resistance between the positive (+) and negative (–)terminals.
Primary coil resistance:
Cold: 0.36 – 0.55 kΩ
Hot: 0.45 – 0.65 kΩ
If the resistance is not as specified, replace the ignition coil.

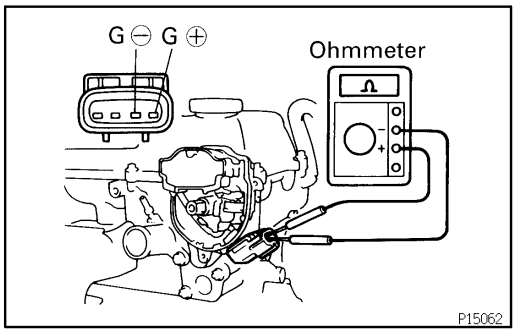


(f) Inspect secondary coil resistance.
Usibg anohmmeter, measure resistance between positive (+) and high–tension terminals.
Secondary coil resistance:
Cold: 9.0 – 15.4 kΩ
Hot: 11.4 – 18.1 kΩ
If the resistance is not as specified, replace the ignition coil.



5. INSPECT DISTRIBUTOR

(a) Inspect the air gap.
Using a feeler gange, measure the air gap between the signal rotor and pickup coil projection.
Air gap: 0.2 – 0.4 mm (0.008 – 0.016 in.)
If the air gap is not as specified, replace the distributor housing assembly.



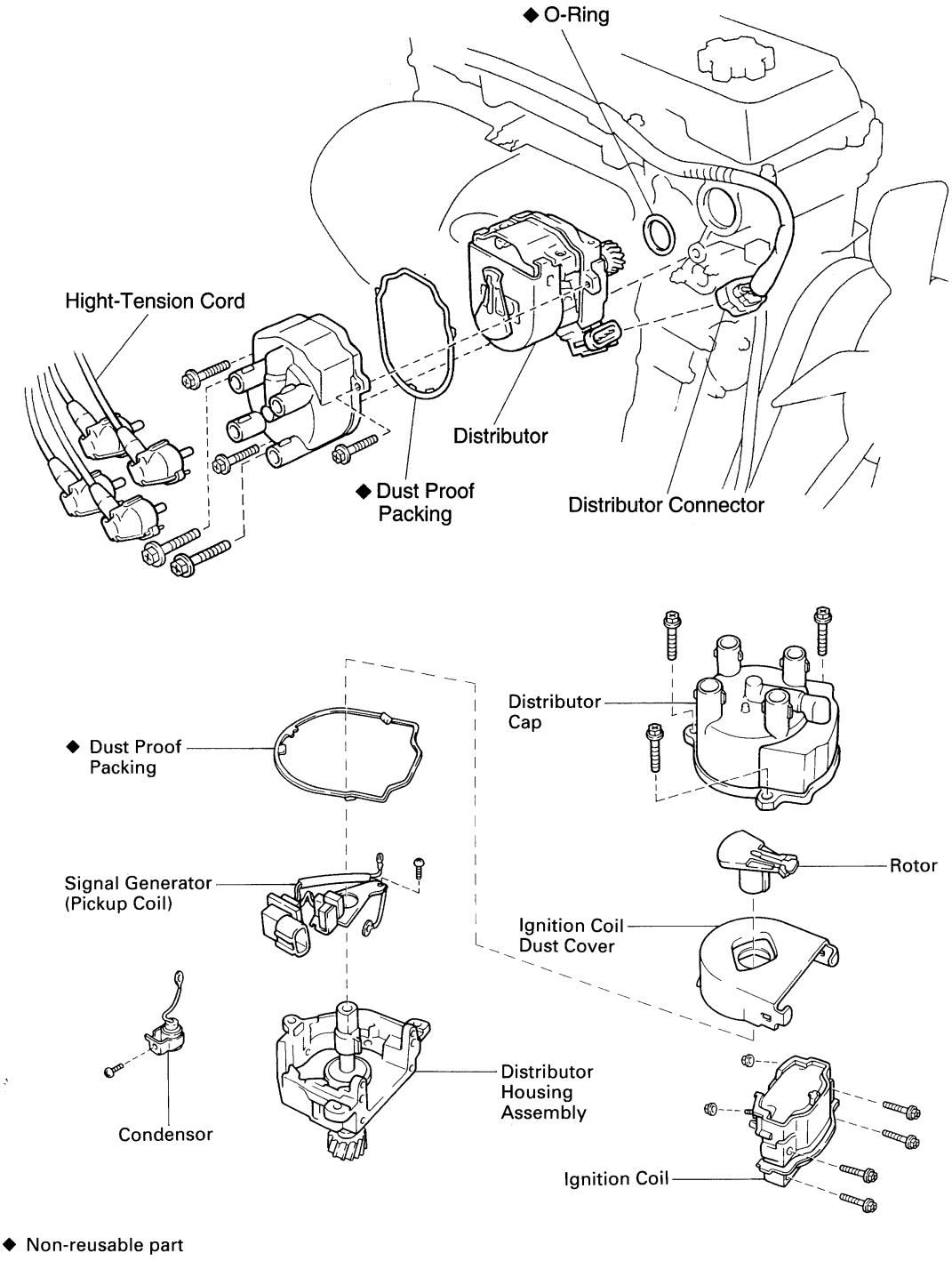
(b) Inspect signal generator (pickup coil) resistance. .
Using an ohmmeter, measure resistance between terminals
Pickup coil resistance:
Cold: G (+) and G (–): 185 – 275 Ω
Hot: G (+) and G (–): 240 – 325 Ω
If the resistance is not as specified, replace the distributor housing assembly.

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DISTRIBUTOR

COMPONENTS

IG0IW–02



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IG0IX–01

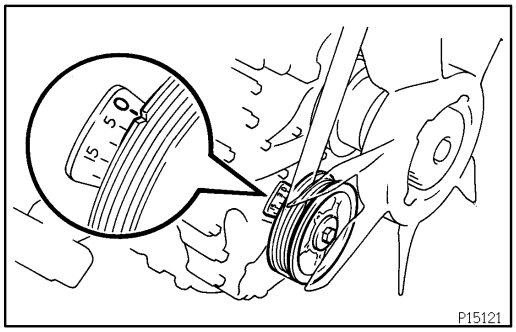
REMOVAL

1. DISCONNECT DISTRIBUTOR CONNECTOR

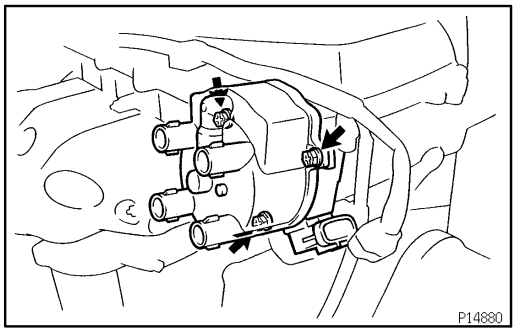
2. DISCONNECT HIGH–TENSION CORDS FROM DISTRIBUTOR CAP (See page IG–1)

3. SET NO. 1 CYLINDER TO TDC/COMPRESSION

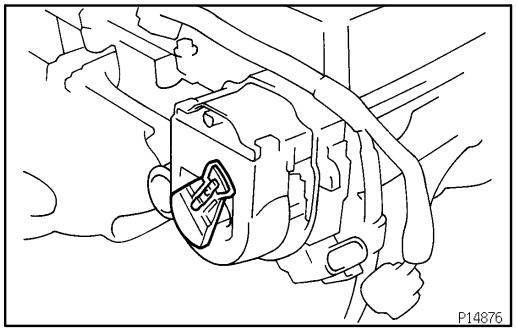
(a) Turn the crankshaft pulley clockwise until the timing mark is aligned with ”0” mark on the oil pump cover.



(b) Remove the 3 bolts and distributor cap.



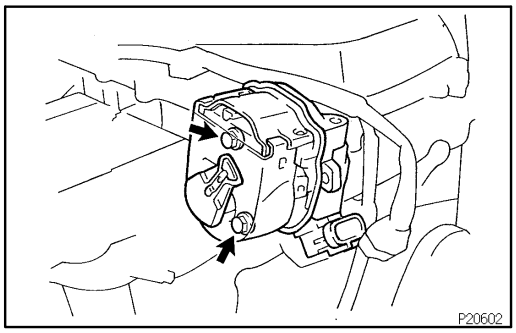
(c) Check that distributor rotor direction is as shown. If not, turn the crankshaft pulley one complete revolution.



4. REMOVE DISTRIBUTOR

(a) Remove the 2 mounting bolts, and pull out the distributor.

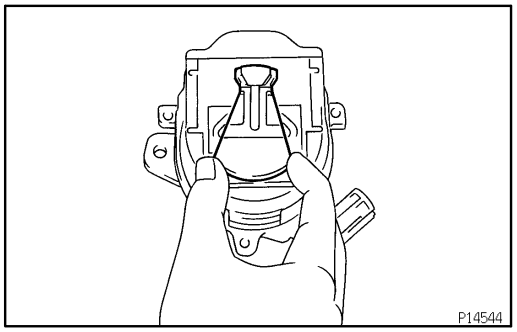
(b) Remove the O–ring from the distributor housing.



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IG0LA–01

DISASSEMBLY



1. REMOVE ROTOR

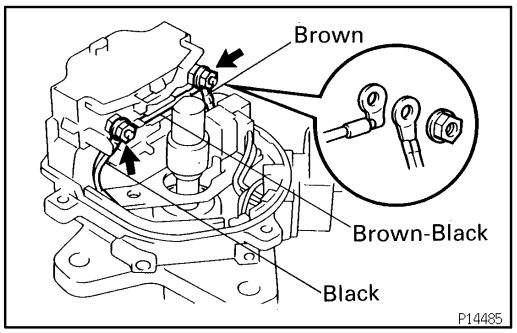
2. REMOVE IGNITION COIL DUST COVER

(a) Remove the dust cover.

(b) Remove the dust proof packing.

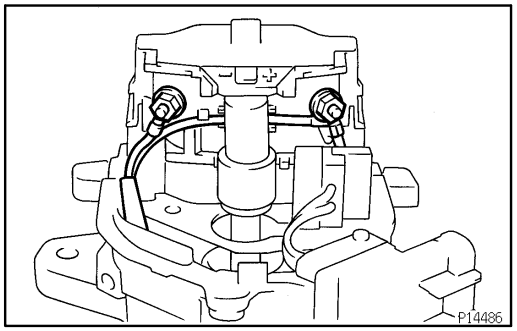
HINT:

At the time of reassembly, please refer to the following item. Use new dust proof packing.



3. REMOVE IGNITION COIL

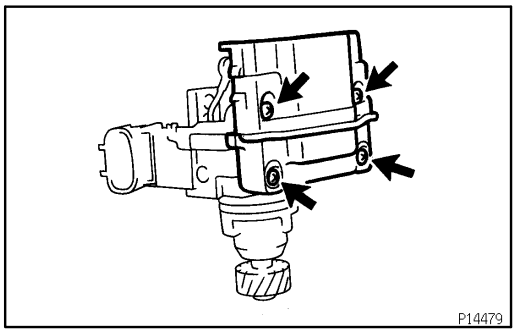
(a) Remove the 2 nuts, and disconnect the 3 wires from the ignition coil terminals.



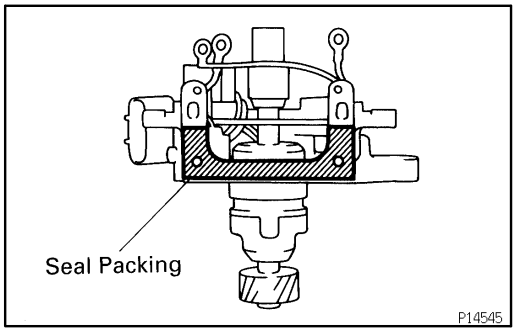
NOTICE:

At the time of reassembly, please refer to the following items.

- **When connecting the wires to the ignition coil, insert the properly into the groove found on the side of the ignition coil.**
- **Be sure the wire do not contact with signal rotor or distributor housing.**



(b) Remove the 4 screws and ignition coil.



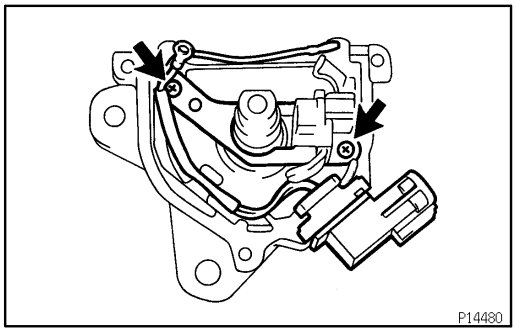
NOTICE:

At the time of reassembly, please refer to the following items.

Apply seal packing to the ignition coil installing serface of the housing, as shown in the illustration.

Seal packing: Part No. 08826 – 00080 or equivalent

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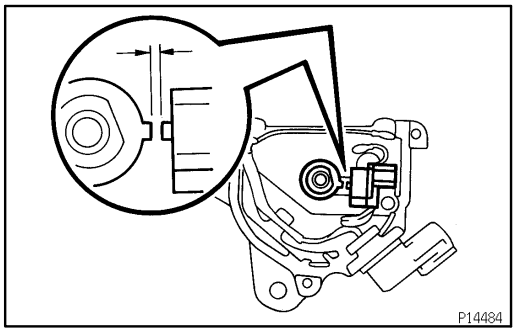
4. REMOVE SIGNAL GENERATOR (PICKUP COIL)

(a) Remove the 2 screws.

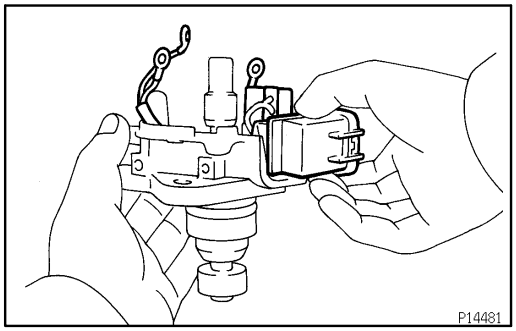
NOTICE:

At the time of reassembly, please refer to the following items.

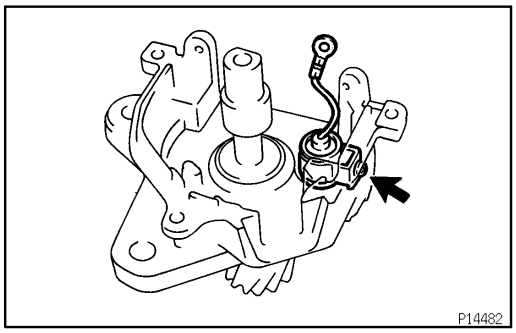
- **Be sure that the wires do not contact with the signal rotor.**



- **Align the rotor tooth with the pickup coil.**
- **Using a thickness gauge, set the air gap and tighten the 2 screws.**
  Air gap: 0.2 – 0.4 mm (0.008 – 0.016 in.)



(b) Remove the signal generator (pickup coil) from the distributor housing.

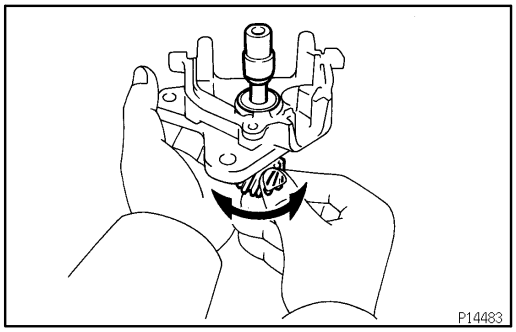


5. REMOVE CONDENSER

Remove the screw and condenser.

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IG0IZ–01



INSPECTION

INSPECT SHAFT

Turn the shaft and check that it is not rough or worn.

If it feels rough or worn, replace the distributor housing assembly.

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IG0J0–01

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page IG–8)

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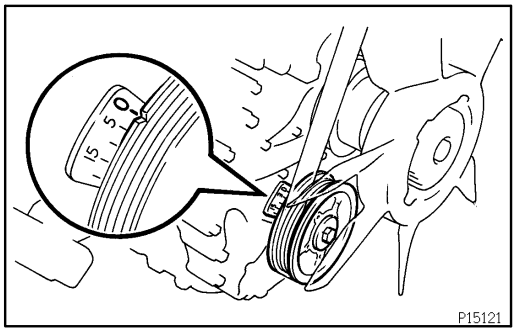
IG0LB–01

INSTALLATION

1. CHECK NO. 1 CYLINDER TO TDC/COMPORESSION

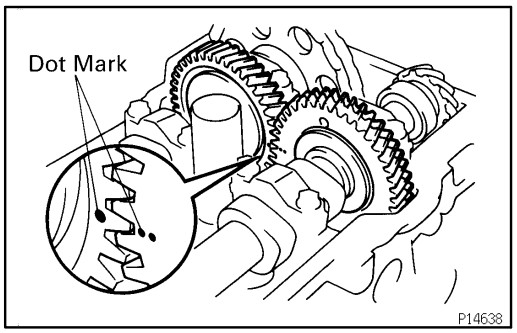
If necessary, remove the cylinder head cover, and check these conditions:

- Turn the crankshaft pulley clockwise and align its groove with the timing mark ”0” of the oil pump cover.



- Verify that the timing marks with 1 and 2 dots are in straight line on the cylinder head surface as shown in the illustration.

If not, turn the crankshaft 1 revolition (360 °) and align the mark as above.

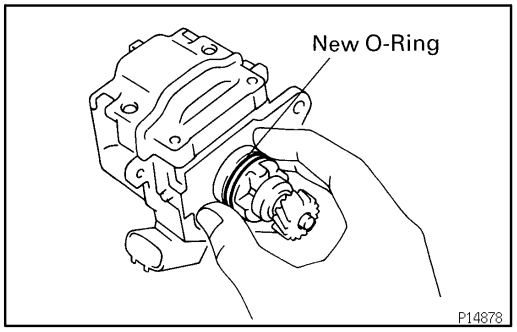


2. INSTALL DISTRIBUTOR

(a) Install a new O–ring to the distributor.

HINT:

Always use a new O–ring when installing the distributor.

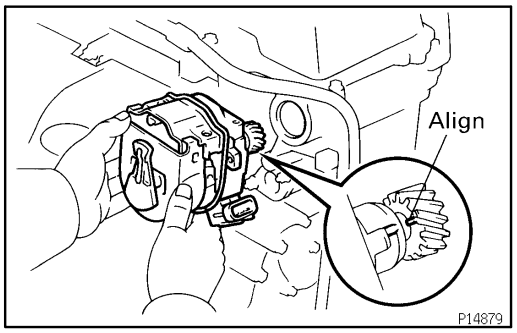


(b) Align the protrusion of the distributor housing with the groove on the driven gear.

(c) Apply a light coat of engine oil on the O–ring.

(d) Install the distributor with the 2 bolts.

Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)



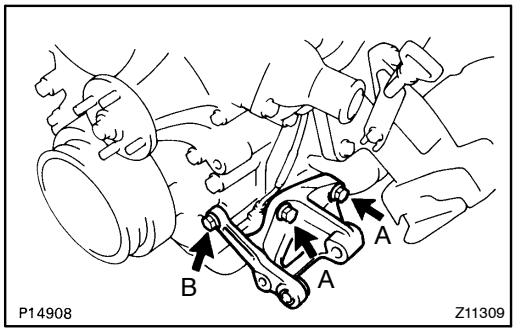
3. INSTALL DISTRIBUTOR CAP

4. RECONECT HIGH–TENSION CORDS TO DISTRIBUTOR CAP

5. CONNECT DISTRIBUTOR CONNECTOR

6. CHECK IGNITION TIMING (See page EM–11)

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CRANKSHAFT POSITION SENSOR

IG03K–03

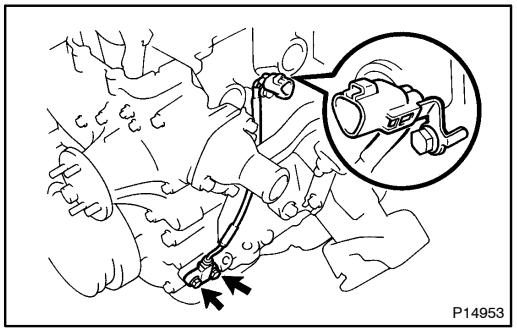
REMOVAL

1. **REMOVE ENGINE UNDER COVER**
2. **REMOVE GENERATOR**
   (See page CH–7)
3. **REMOVE GENERATOR BRACKET**

Remove the 3 bolts and bracket.

Torque:
Bolt A: 74.5 N·m (760 kgf·cm, 55 ft·lbf)
Bolt B: 18 N·m (180 kgf·cm, 13 ft·lbf)

4. **DISCONNECT CRANKSHAFT POSITION SENSOR CONNECTOR**



5. **REMOVE CRANKSHAFT POSITION SENSOR**

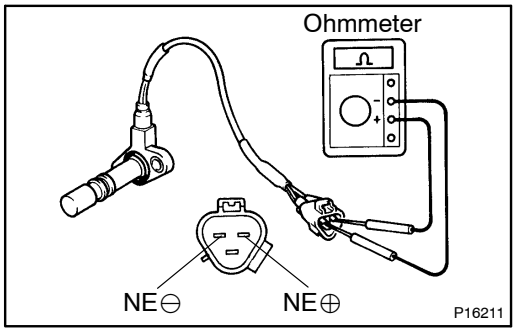
(a) Remove the 2 bolts and crankshaft position sensor.
Torque: 8.5 N·m (85 kgf·cm, 74 in.·lbf)

(b) Remove the O–ring.

HINT:

- At the time assembly, please refer to the following items.
- Install the crankshaft position sensor with a new gasket.
- Always use a new O–ring when installing the crankshaft position sensor.
- Apply a light coat of engine oil the O–ring.

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IG03L–02

INSPECTION

NOTICE:

"Cold" and "Hot" in these sentences express the temperature of the sensors themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot is from 50°C (122°F) to 100°C (212°F).

INSPECT CRANKSHAFT POSITION SENSOR RESISTANCE

Using an ohmmeter, measure the resistance between terminals.

Resistance (NE⊕ and NE⊖):
Cold: 1,630 – 2,740 Ω
Hot: 2,065 – 3,225 Ω

If the resistance is not as specified, replace the crankshaft position sensor.

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IG03M–01

INSTALLATION

Installation is in the reverse order of removal (See page IG–13).

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IG – IGNITION (5VZ-FE)

IGNITION SYSTEM	IG-1
IGNITION COIL	IG-6
CAMSHAFT POSITION SENSOR	IG-9
CRANKSHAFT POSITION SENSOR	IG-12

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IGNITION SYSTEM

IG03Z–04

ON–VEHICLE INSPECTION

NOTICE:

"Cold" and "Hot" in the following sentences express the temperature of the coils themselves. "Cold" is from –10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

1. INSPECT SPARK TEST

Check that the spark occurs.

(1) Disconnect the high–tension cords from the spark plug.
(2) Remove the spark plug.
(3) Install the spark plug to each high–tension cord.
(4) Ground the spark plug.
(5) Check if spark occurs while engine is being cranked.

NOTICE:

To prevent excess fuel being injected from the injectors during this test, do not crank the engine for more 1 – 2 seconds at a time.

If the spark does not occur, perform the test as follows:

SPARK TEST
↓ NO
CHECK CONNECTION OF IGNITION COIL AND IGNITER — BAD → Connect securely.
↓ OK
CHECK RESISTANCE OF HIGH–TENSION CORD (See step 2.)
Maximum resistance; 25 kΩ per cord — BAD → Replace the cord(s).
↓ OK
CHECK POWER SUPPLY TO IGNITION COIL AND IGNITER
1. Turn ignition switch to ON.
2. Check that there is battery voltage at ignition coil positive (+) terminal. — BAD → Check wiring between ignition switch to ignition coil and igniter.
↓ OK
CHECK RESISTANSE OF IGNITION COIL (See step 4.)

Resistance:	Cold	Hot
Primary	0.67 – 1.05 Ω	0.85 – 1.23 Ω
Secondary	9.3 – 16.0 kΩ	11.7 – 18.8 kΩ

BAD → Replace the ignition coil.
↓ OK
CHECK RESISTANSE OF CAMSHAFT POSITION SENSOR (See step 5)

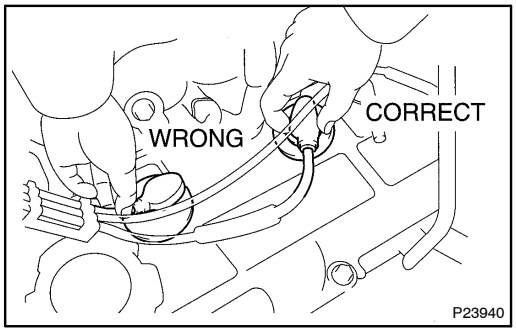
Resistance:	Cold	Hot
G⊕ and G⊖	835 – 1,400 Ω	1,060 – 1,645 Ω

BAD → Replace the camshaft position sensor.
↓ OK
CHECK RESISTANSE OF CRANKSHAFT POSITION SENSOR (See page IG–13)

Resistance:	Cold	Hot
NE⊕ and NE⊖	1,630 – 2,740 Ω	2,065 – 3,225 Ω

BAD → Replace the crankshaft position sensor.
↓ OK
CHECK IGT SIGNAL FROM ECM (See page DI–144) — BAD → Check wiring between ECM, distributor and igniter, and then try another ECM.
↓
TRY ANOTHER IGNITER

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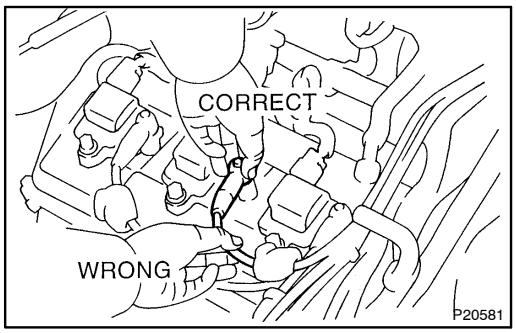
2. INSPECT HIGH–TENSION CORDS

(a) Remove the air cleaner cap and MAF meter assembly.

(b) Disconnect the high–tension cords from the spark plugs.
Disconnect the high–tension cords at the rubber boot.
DO NOT pull on the cords.

NOTICE:

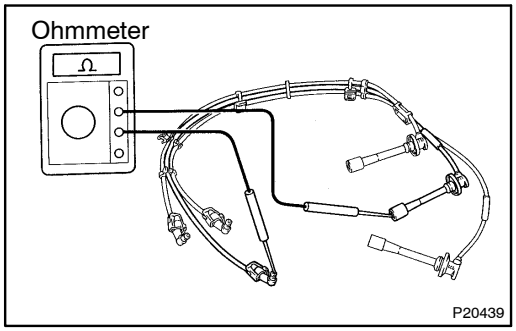
Pulling on or bending the cords may damage the conductor inside.



(c) Disconnect the high–tension cords from the ignition coils.
(1) Using a screwdriver, lift up the lock claw and disconnect the holder from the ignition coils.
(2) Disconnect the high–tension cord at the grommet.
DO NOT pull on the cord.

NOTICE:

Pulling on or bending the cords may damage the conductor inside.Do not wipe any of the oil from the grommet after the high–tension cord is disconnected.

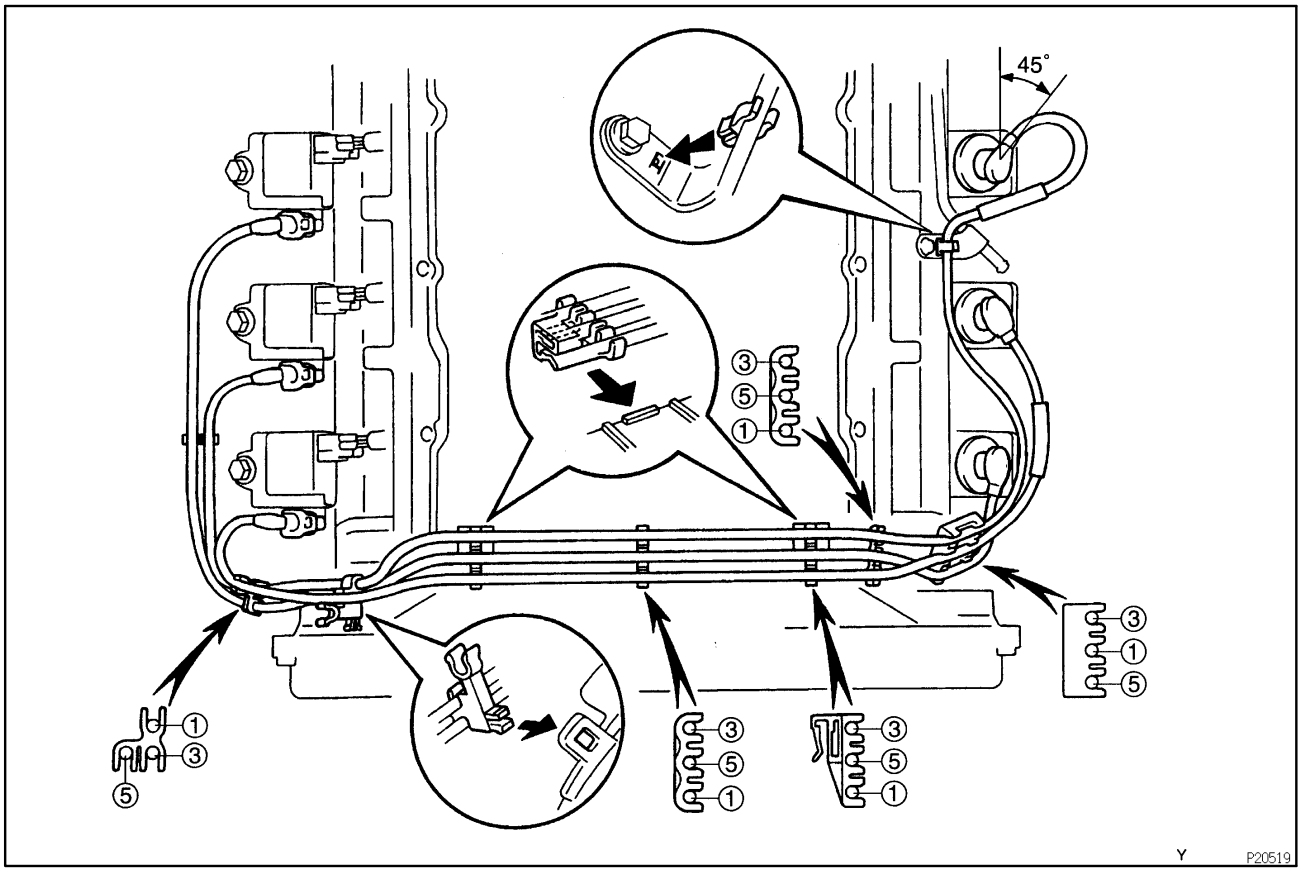


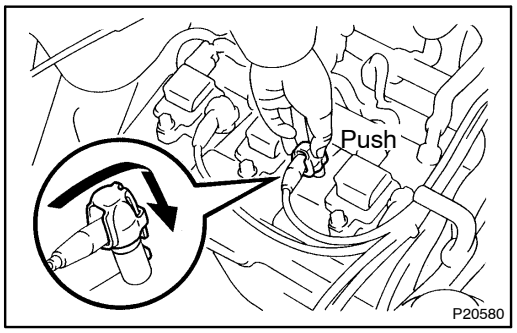
(d) Inspect the high–tension cord resistance.
Using an ohmmeter, measure the resistance.
Maximum resistance:
25 kΩ per cord

If the resistance is greater than maximum, check the terminals.
If necessary, replace the high–tension cord.

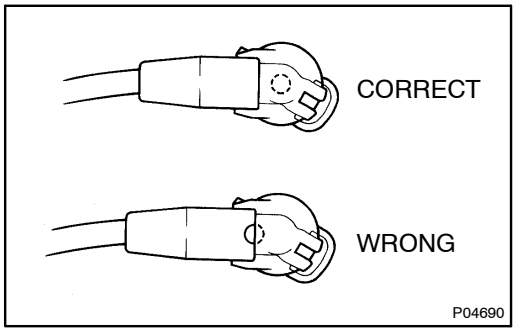
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(e) Reconnect the high–tension cords to ignition coils.





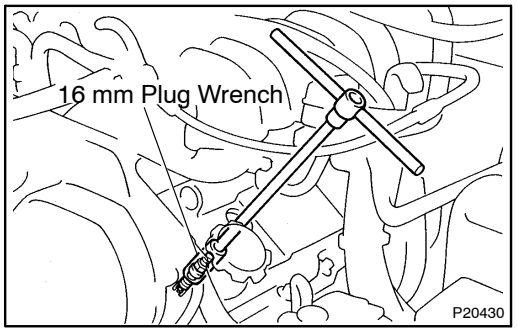
(1) Assemble the holder and grommet.
(2) Align the spline of the ignition coil with the spline of the holder, and push in the cord.



NOTICE:
Check that the holder is correctly installed to the grommet and distributor cap as shown in the illustration.

(3) Check that the lock claw of the holder is engaged by lightly pulling the holder.
(f) Reconnect the high–tension cords to spark plugs.
(g) Reinstall the air cleaner cap and MAF meter assembly.

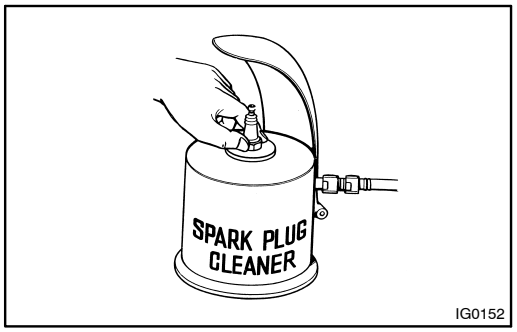
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3. INSPECT SPARK PLUGS

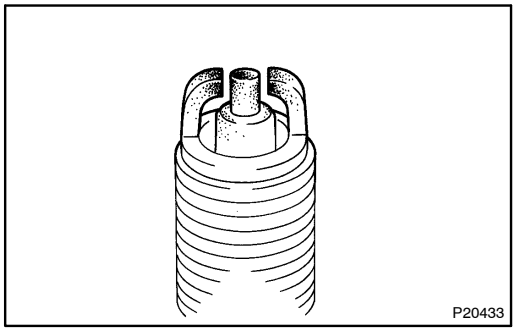
(a) Remove the high–tension cords and ignition coils.

(b) Remove the spark plugs.
Using a 16 mm plug wrench, remove the 6 spark plugs from the RH and LH cylinder heads.



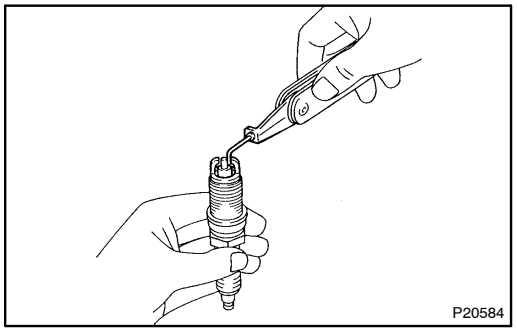
(c) Clean the spark plugs.
If the electrode has traces of wet carbon, allow it to dry and then clean with a spark plug cleaner.
Air pressure:
Below 588 kPa (6 kgf/cm^2, 85 psi)
Duration:
20 seconds or less

HINT:
If there are traces of oil, remove it with gasoline before using the spark plug cleaner.



(d) Visually inspect the spark plugs.
Check the spark plug for thread damage and insulator damage.

If abnormal, replace the spark plug.
Recommended spark plug:
ND: K16TR11
NGK: BKR5EKB–11



(e) Adjust the electrode gap.
Carefully bend the outer electrode to obtain the correct electrode gap.
Correct electrode gap:
1.1 mm (0.043 in.)

(f) Reinstall the spark plugs.
Torque:18 N·m (180 kgf·cm, 13 ft·lbf)

(g) Reinstall the ignition coils. (See page IG–8)

(h) Reconnect the high–tension cords.

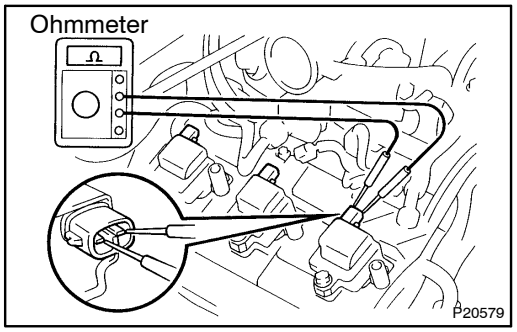
4. INSPECT IGNITION COIL

(a) Remove the air cleaner cap and MAF meter assembly.

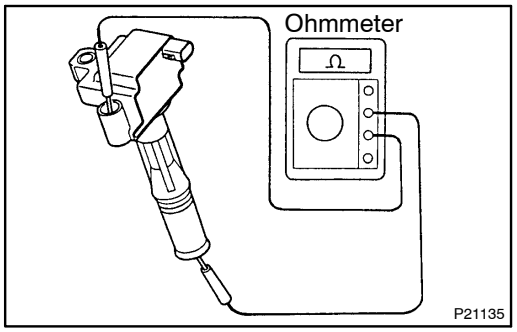
(b) Disconnect the high–tension cords from the ignition coils.

(c) Disconnect the ignition coil connectors.

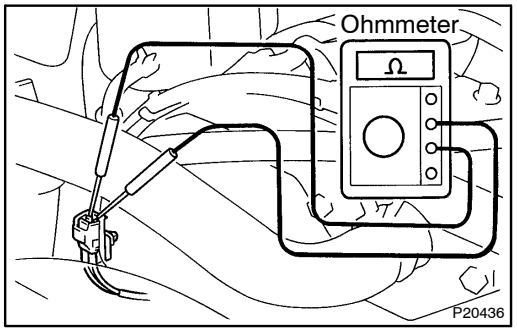
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(d) Inspect the primary coil resistance.
Using an ohmmeter, measure the resistance between the positive (+) and negative (–) terminals.
Primary coil resistance :
Cold: 0.67 – 1.05 Ω
Hot: 0.85 – 1.23 Ω
If the resistance is not as specified, replace the ignition coil.



(e) Remove the ignition coils.
(f) Inspect the secondary coil resistance.
Using an ohmmeter, measure the resistance between the positive (+) and high–tension terminals.
Secondary coil resistance:
Cold: 9.3 – 16.0 kΩ
Hot: 11.7–18.8 kΩ
If the resistance is not as specified, replace the ignition coil.
(g) Reinstall the ignition coils.
(h) Reconnect the ignition coil connectors and high–tension cors.
(i) Reinstall the air cleaner cap and MAF meter assembly.



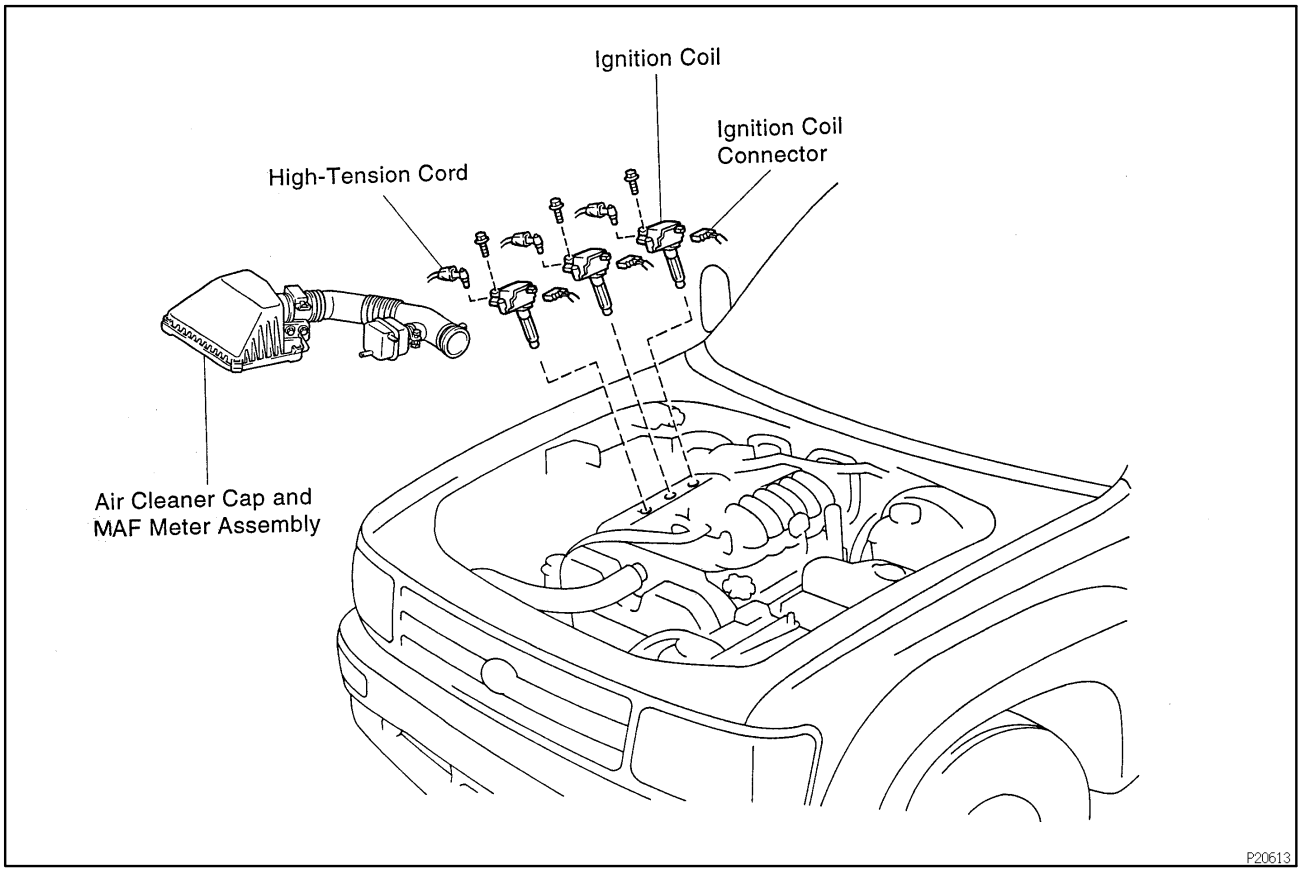
5. INSPECTION CAMSHAFT POSITION SENSOR
(a) Disconnect the camshaft position sensor connectors.
(b) Inspect the camshaft position sensor resistance.
Using an ohmmeter, measure the resistance between terminals.
Resistance:
Cold: 835 – 1,400Ω
Hot: 1,060 – 1,645 Ω
If the resistance is not as specified, replace the camshaft position sensor.
(c) Reconnect the camshaft position sensor connector.
6. INSPECT IGNITER (See page IG–1)

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IGNITION COIL

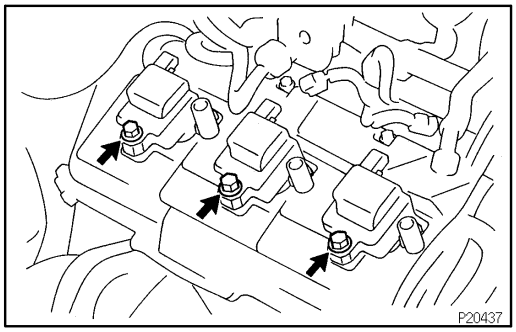
COMPONENTS

IG03P–03



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IG03Q–03



REMOVAL

1. **REMOVE AIR CLEANER CAP AND MAF METER ASSEMBLY**
2. **DISCONNECT HIGH–TENSION CORDS FROM IGNITION COILS**
   (See page IG–1)
3. **REMOVE IGNITION COILS**

(a) Disconnect the 3 connectors from the ignition coils.

(b) Remove the 3 bolts and 3 ignition coils from the LH cylinder head.
Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

HINT:
Arrange the ignition coils in correct order.

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IG03R–01

INSTALLATION

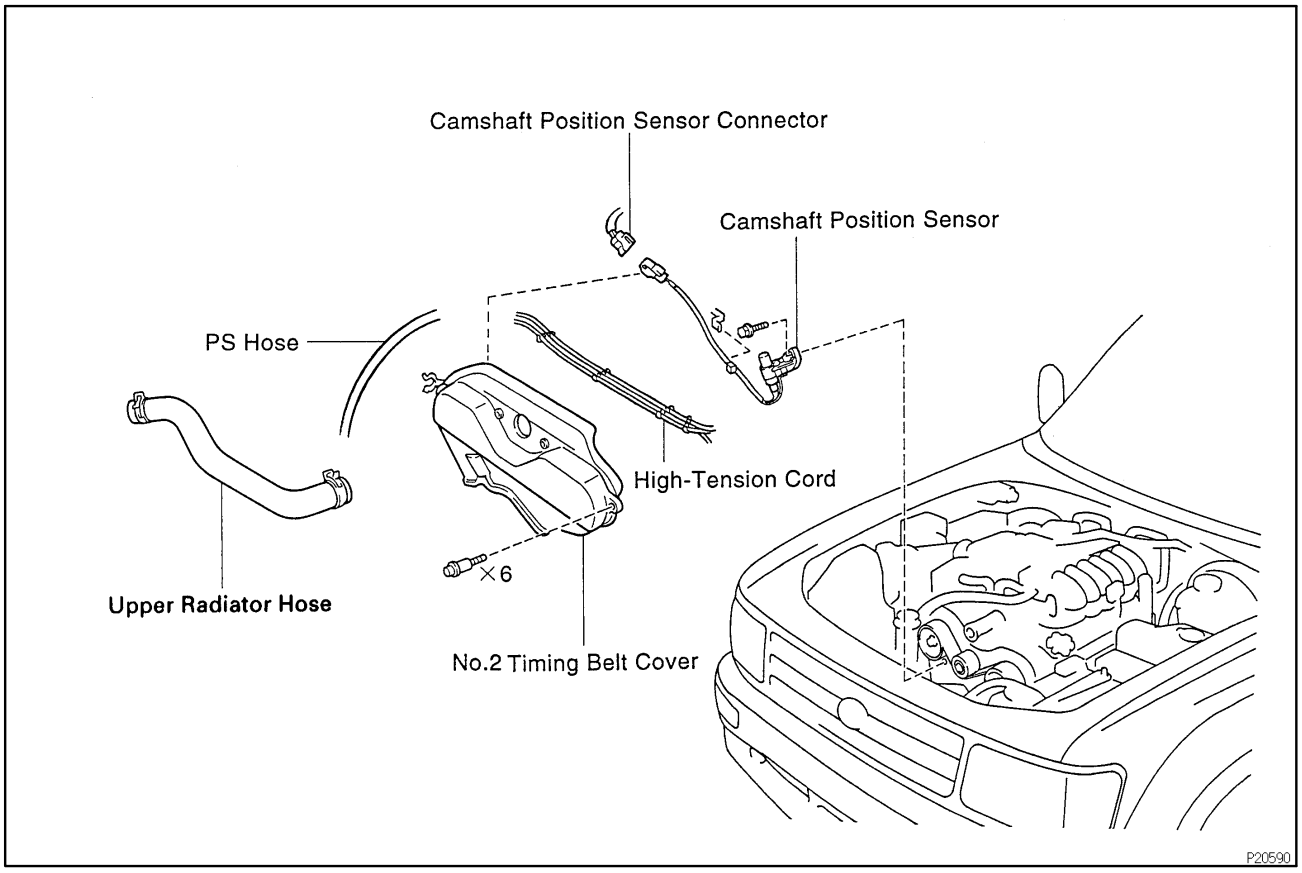
Installation is in the reverse order of removal (See page IG–7).

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CAMSHAFT POSITION SENSOR

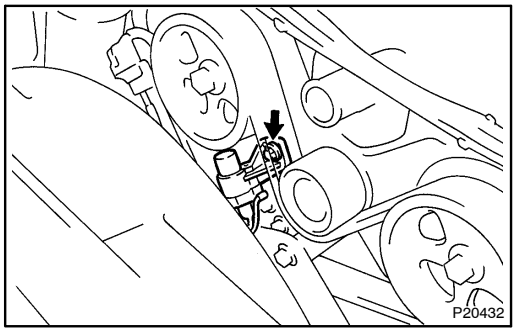
COMPONENTS

IG03S–03



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IG03T–03



REMOVAL

1. REMOVE UPPER RADIATOR HOSE

2. REMOVE NO. 2 TIMING BELT COVER

(a) Remove the high–tension cord clamps from the No. 2 timing belt cover.

(b) Remove the PS pump hose from the No. 2 timing belt cover clamp.

(c) Remove the 6 bolts and No. 2 timing belt cover.

3. REMOVE CAMSHAFT POSITION SENSOR

(a) Disconnect the camshaft position sensor connector.

(b) Remove the bolts and camshaft position sensor.
Torque:7.8 N·m (80 kgf·cm, 69 in.·lbf)

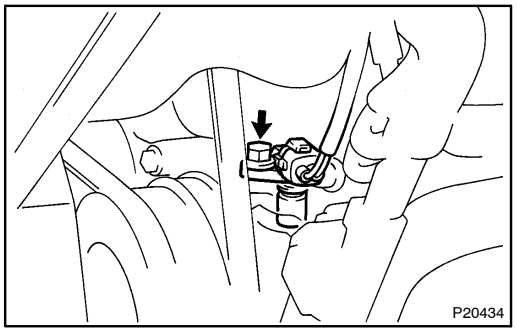
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IG03U–02

INSTALLATION

Installation is in the reverse order of removal (See page IG–10).

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CRANKSHAFT POSITION SENSOR

IG03V–03

REMOVAL

1. REMOVE ENGINE UNDER COVER

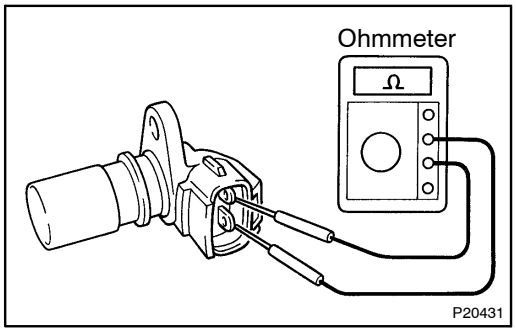
2. REMOVE CRANKSHAFT POSITION SENSOR

(a) Disconnect the crankshaft position sensor connector.

(b) Remove the bolt crankshaft position sensor.
Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

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IG03W–01



INSPECTION

NOTICE:

”Cold” and ”Hot” in the following sentences express the temperature of the sensor itself. ”Cold” is from –10˚C (14˚F) to 50˚C (122˚F) and ”Hot” is from 50˚C (122˚F) to 100˚C (212˚F).

INSPECT CRANKSHAFT POSITION SENSOR RESISTANCE

Using an ohmmeter, measure the resistance between terminals.

Resistance:

Cold: 1,630 – 2,740 Ω

Hot: 2,065 – 3,225 Ω

If the resistance is not as specified, replace the crankshaft position sensor.

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IG03X–02

INSTALLATION

Installation is in the reverse order of removal (See page IG–12).

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ST – STARTING (3RZ-FE)

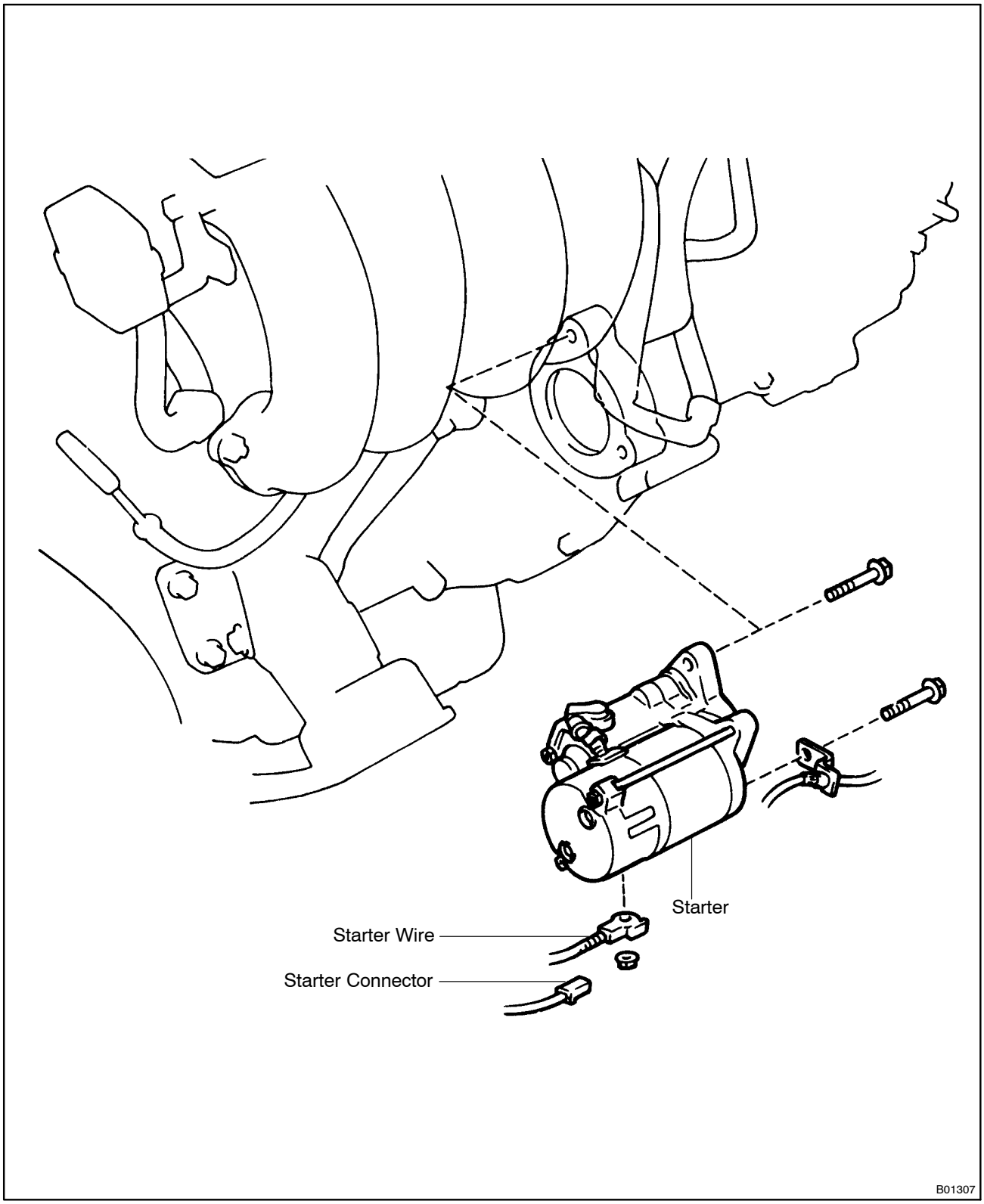
STARTER	ST-1
STARTER RELAY	ST-17

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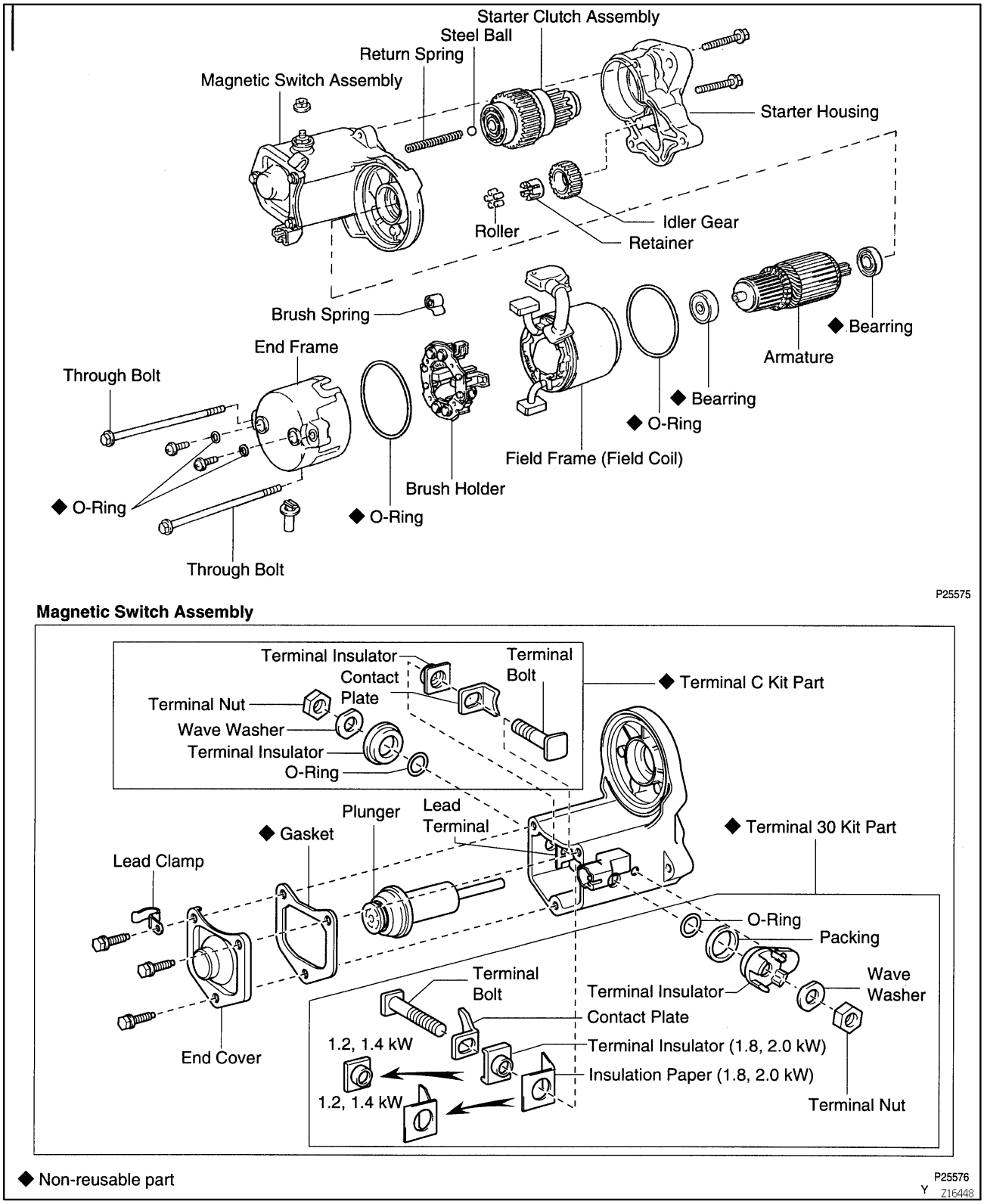
STARTER

COMPONENTS

ST02W–03

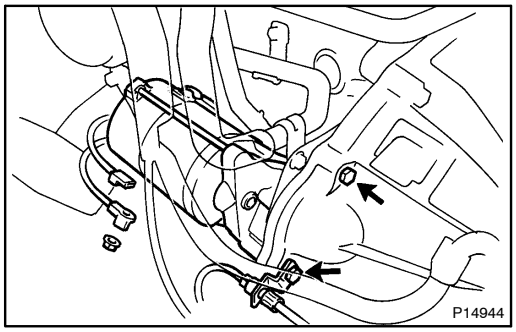


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ST02X–02



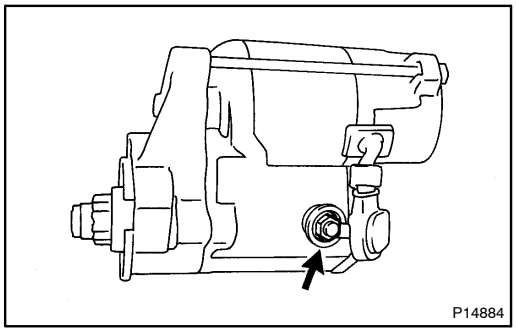
REMOVAL

1. **DISCONNECT STARTER CONNECTOR**
2. **REMOVE NUT, AND DISCONNECT STARTER WIRE**
   Torque: 8.8 N·m (90 kgf·cm, 70 in.·lbf)
3. **REMOVE 2 BOLTS AND STARTER**
   Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

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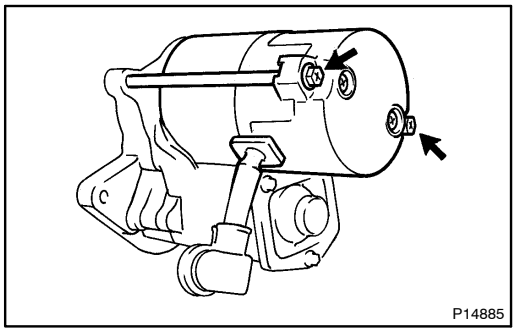
ST02Y–03

DISASSEMBLY

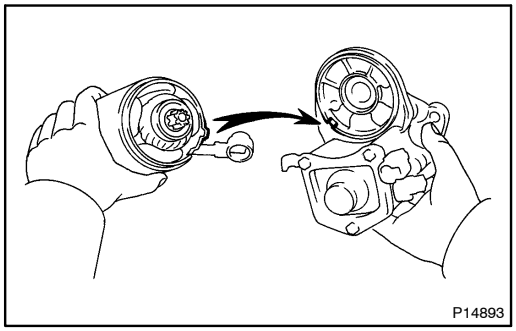


1. REMOVE FIELD FRAME AND ARMATURE

(a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.
Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)



(b) Remove the 2 through bolts.
Torque:
1.2 kW, 1.4 kW type: 5.9 N·m (60 kgf·cm, 52 in.·lbf)
1.8 kW, 2.0 kW type: 9.3 N·m (95 kgf·cm, 82 in.·lbf)

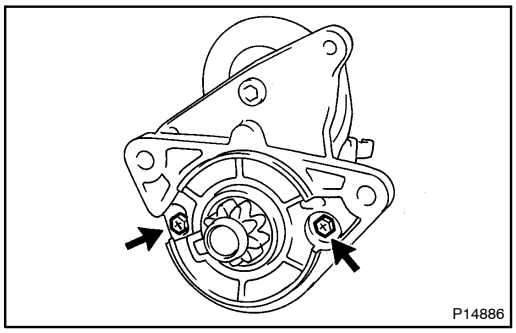


(c) Pull out the field frame with the armature from the magnetic switch assembly.

NOTICE:
At the time of notice, please refer to the following items.
Align the protrusion of the field frame with cutout of the magnetic switch.

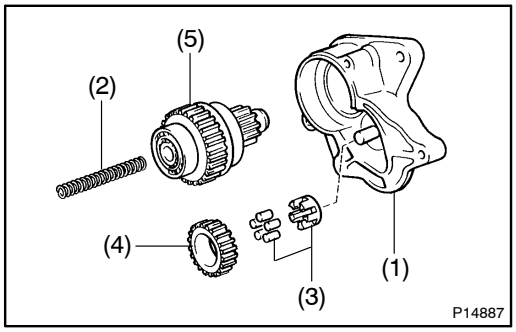
(d) Remove the O–ring.

HINT:
At the time of assembly, please refer to the following items.
Use a new O–ring.



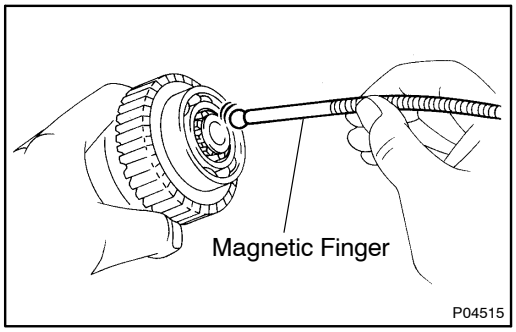
2. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

(a) Remove the 2 screws.
Torque:
1.2 kW, 1.4 kW type: 5.9 N·m (60 kgf·cm, 52 in.·lbf)
1.8 kW, 2.0 kW type: 9.3 N·m (95 kgf·cm, 82 in.·lbf)



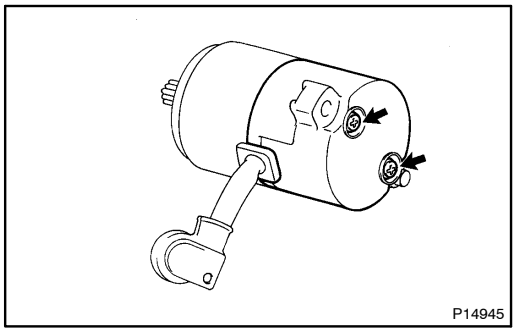
(b) Remove these parts from the magnetic switch assembly:
(1) Starter housing
(2) Return spring
(3) Bearing
(4) Idler Gear
(5) Clutch assembly

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3. REMOVE STEEL BALL

Using a magnetic finger, remove the steel ball from the clutch shaft hole.



4. REMOVE BRUSH HOLDER

(a) Remove the 2 screws, 2 O–rings and end cover from the field frame.

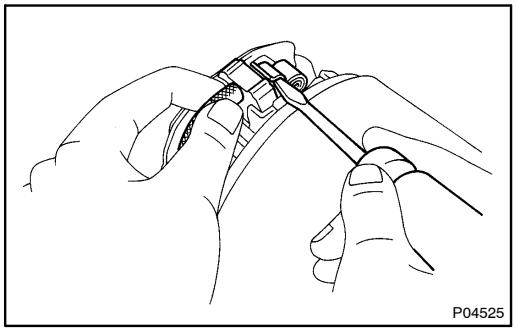
Torque:
1.2 kW, 1.4 kW type: 1.5 N·m (15 kgf·cm, 13 in.·lbf)
1.8 kW, 2.0 kW type: 3.8 N·m (39 kgf·cm, 34 in.·lbf)

(b) Remove the O–ring from the field frame.

HINT:

At the time of assembly, please refer to the following items.

Use a new O–ring.



(c) Using a screwdriver hold the spring back and disconnect the brush from the brush holder.

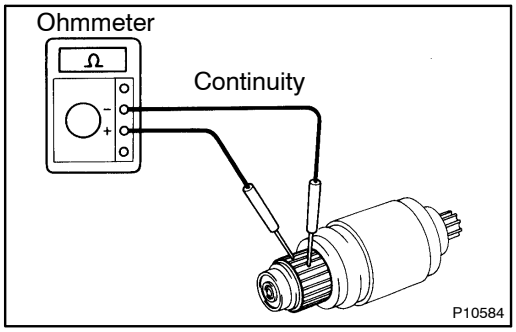
Disconnect the 4 brushes, and remove the brush holder.

5. REMOVE ARMATURE FROM FIELD FRAME

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ST0NJ–01

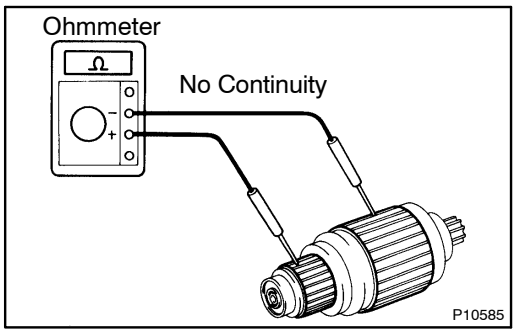
INSPECTION



1. INSPECT COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the segments of the commutator.

If there is no continuity between any segment, replace the armature.



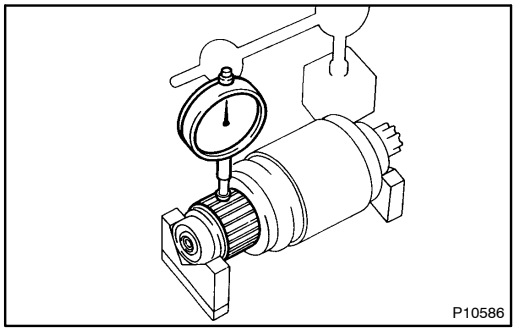
2. INSPECT COMMUTATOR FOR GROUNDED

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

If there is continuity, replace the armature.

3. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

If the surface is dirty or burnt, clean it with sandpaper (No.400) or on a lathe.



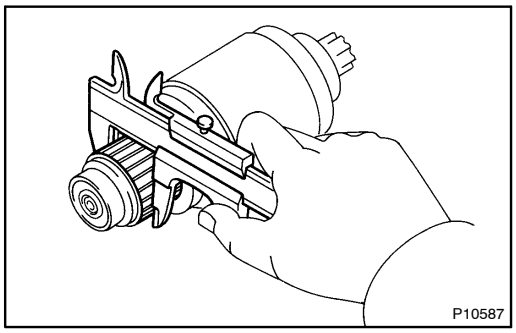
4. INSPECT COMMUTATOR CIRCLE RUNOUT

(a) Place the commutator on V–blocks.

(b) Using a dial indicator, measure the circle runout.

Maximum circle runout:
0.05 mm (0.0020 in.)

If the circle runout is greater than maximum, correct it on a lathe.

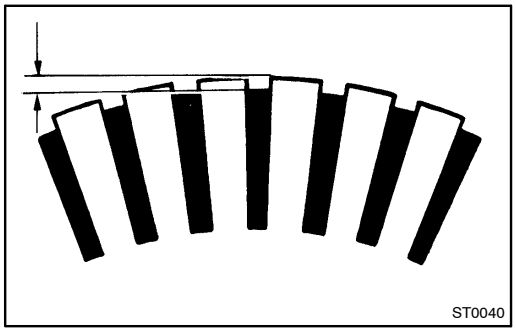


5. INSPECT COMMUTATOR DIAMETER

Using vernier calipers, measure the commutator diameter.

Standard diameter:
1.2 kW, 1.4 kW type: 30 mm (1.18 in.)
1.8 kW, 2.0 kW type: 35 mm (1.38 in.)
Minimum diameter:
1.2 kW, 1.4 kW type: 29 mm (1.14 in.)
1.8 kW, 2.0 kW type: 34 mm (1.34 in.)

If the diameter is less than minimum, replace the armature.



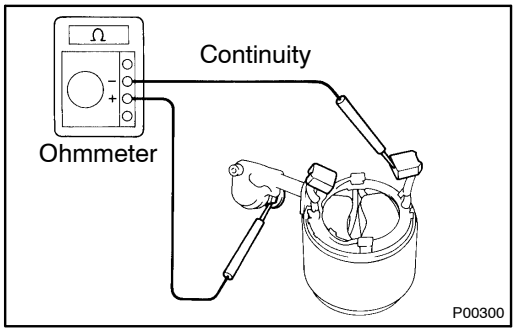
6. INSPECT UNDERCUT DEPTH OF SEGMENT

Check that the undercut depth is clean and free of foreign material. Smooth out the edge.

Standard undercut depth:
1.2 kW, 1.4 kW type: 0.6 mm (0.024 in.)
1.8 kW, 2.0 kW type: 0.7 mm (0.028 in.)
Minimum undercut depth:
0.2 mm (0.008 in.)

If the undercut depth is less than minimum, correct it with a hacksaw blade.

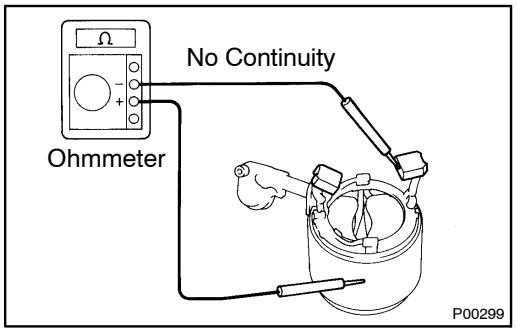
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7. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.

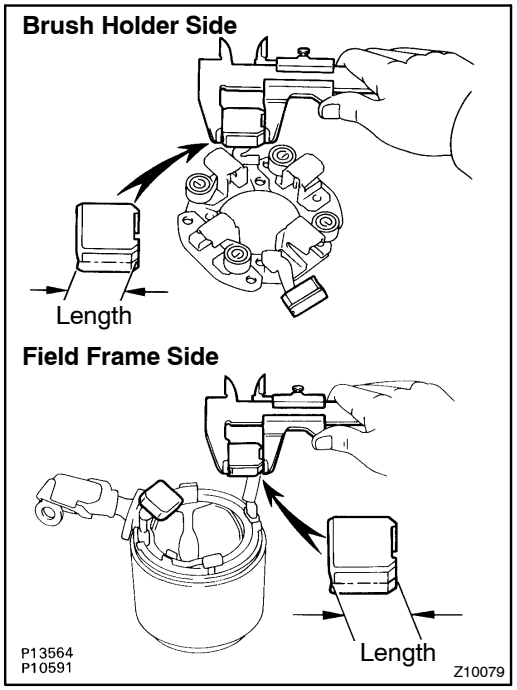
If there is no continuity, replace the field frame.



8. INSPECT THAT FIELD COIL IS NOT GROUNDED

Using an ohmmeter, check that there is no continuity between the field coil end and field frame.

If there is continuity, repair or replace the field frame.



9. INSPECT BRUSH LENGTH

Using vernier calipers, measure the brush length.

Standard length:

1.2 kW, 1.4 kW type: 15.5 mm (0.610 in.)

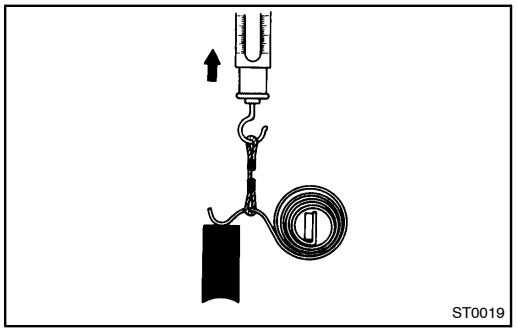
1.8 kW, 2.0 kW type: 15.0 mm (0.591 in.)

Minimum length:

1.2 kW, 1.4 kW type: 10.0 mm (0.394 in.)

1.8 kW, 2.0 kW type: 9.0 mm (0.354 in.)

If the length is less than minimum, replace the brush holder and field frame.



10. INSPECT BRUSH SPRING LOAD

Take the pull scale reading the instant the brush spring separates from the brush.

Standard installed load:

1.2 kW type

13.7 – 19.6 N (1.40 – 2.00 kgf, 3.1 – 4.4 lbf)

1.4 kW type

17.6 – 23.5 N (1.80 – 2.40 kgf, 4.0 – 5.3 lbf)

1.8 kW, 2.0 kW type

21.5 – 27.5 N (2.20 – 2.80 kgf, 4.9 – 6.2 lbf)

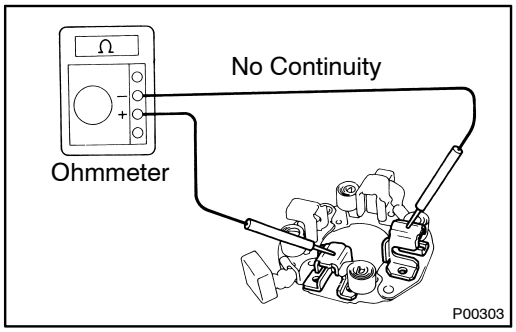
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Minimum installed load:
1.2 kW type: 9.8 N (1.00 kgf, 2.2 lbf)
1.4 kW type: 11.8 N (1.20 kgf, 2.6 lbf)
1.8 kW, 2.0 kW type: 12.7 N (1.30 kgf, 2.7 lbf)

If the installed load is less than minimum, replace the brush springs.

HINT:

Take the pull scale reading the instant the brush spring separates from the brush.



11. INSPECT INSULATION OF BRUSH HOLDER

Using an ohmmeter, check that there is no continuity between the positive (+) and negative (–) brush holders.

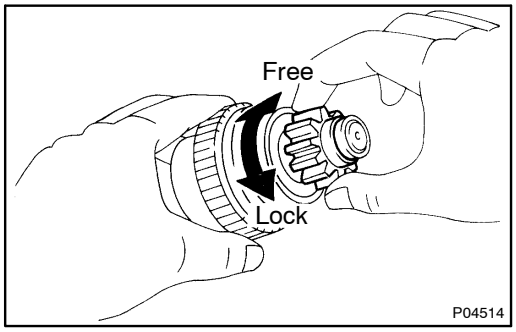
If there is continuity, repair or replace the brush holder.

12. INSPECT GEAR TEETH

Check the gear teeth on the pinion gear, idler gear and clutch assembly for wear or damage.

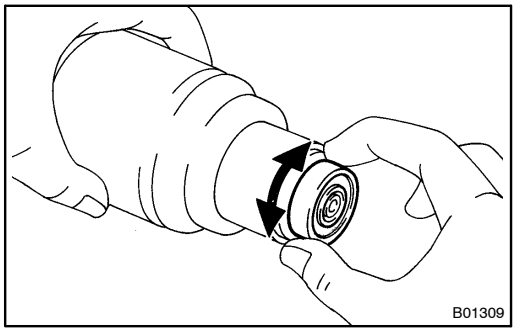
If damaged, replace the gear or clutch assembly.

If damaged, also check the flywheel or drive plate ring gear for wear or damage.



13. INSPECT CLUTCH

Hold the starter clutch and rotate the clutch pinion gear clockwise and check that it turns freely. Try to rotate the clutch pinion counterclockwise and check that it locks. If necessary, replace the clutch assembly.

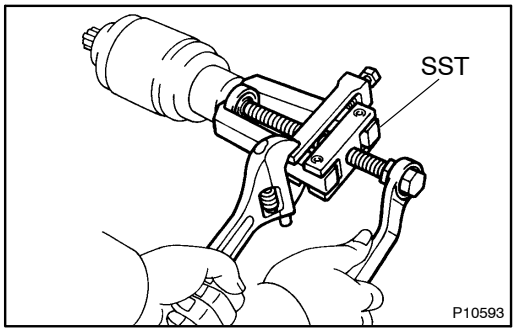


14. INSPECT REAR BEARING

Turn the bearing by hand while applying inward force.

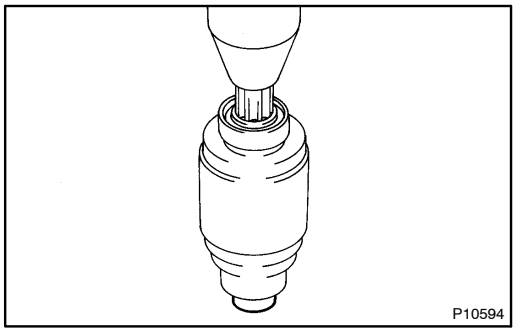
If the resistance is felt or if the bearing sticks, replace the bearing.

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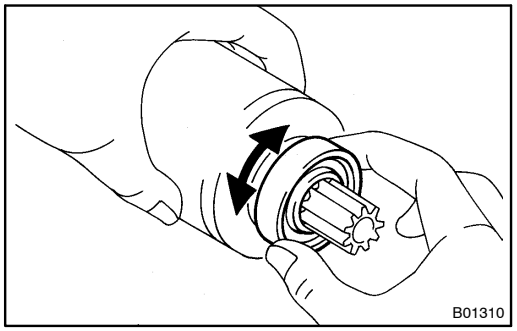


15. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the bearing.
SST 09286–46011

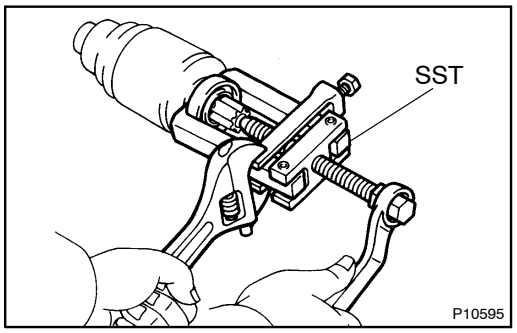


(b) Press in a new bearing.



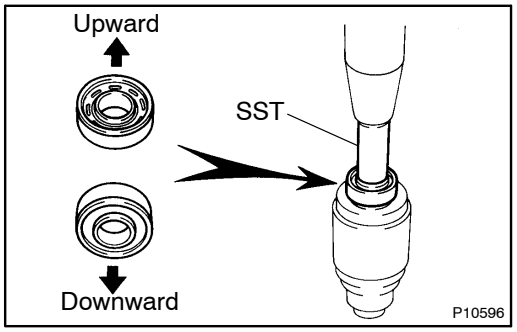
16. INSPECT FRONT BEARING

Turn the bearing by hand while applying inward force.
If the resistance is felt or if the bearing sticks, replace the bearing.



17. IF NECESSARY, REPLACE FRONT BEARING

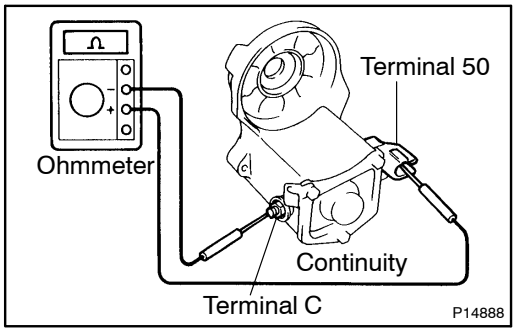
(a) Using SST, remove the bearing.
SST 09286–46011



(b) Using SST and a press, press in a new bearing.
SST 09820–00030

NOTICE:
Be careful of the bearing installation direction.

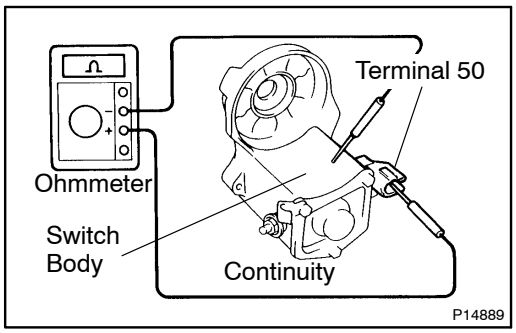
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18. DO PULL–IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminals 50 and C.

If there is no continuity, check and replace the magnetic switch.



19. DO HOLD–IN COIL CIRCUIT TEST

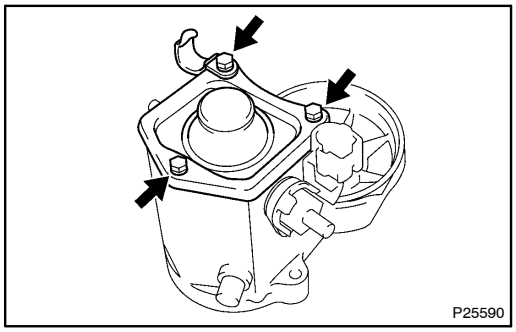
Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

If there is no continuity, replace the magnetic switch assembly.

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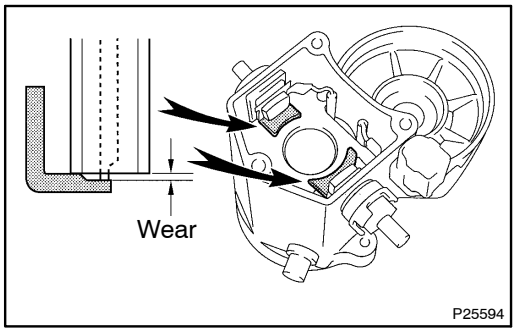
ST0KU–02

REPLACEMENT



1. REMOVE MAGNETIC SWITCH END COVER

Remove the 3 bolts, lead clamp, end cover, gasket and plunger.

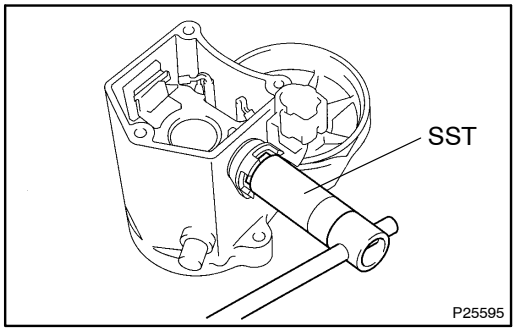


2. INSPECT CONTACT PLATE FOR WEAR

Using vernier calipers, measure the contact plate for depth of wear.

Maximum wear:
0.9 mm (0.035 in.)

If the depth of wear is greater than the maximum, replace the contact plate.

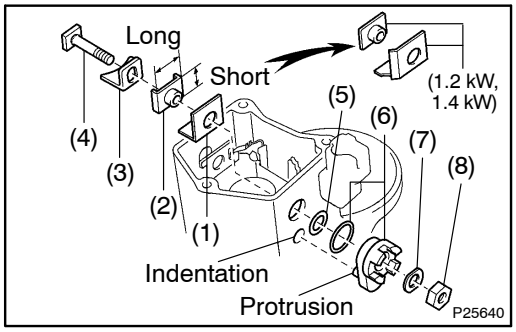


3. REMOVE TERMINAL KIT PARTS

(a) Using SST, loosen the terminal nuts.
SST 09810–38140

(b) Terminal C:
Remove the terminal nut, wave washer, terminal insulator (outside), O–ring, terminal bolt, contact plate and terminal insulator (inside).

(c) Terminal 30:
Remove the terminal nut, wave washer, terminal insulator (outside), packing, O–ring, terminal bolt, contact plate, terminal insulator (inside) and insulation paper.



4. REINSTALL TERMINAL KIT PARTS

(a) Terminal 30:
Install these new parts:
(1) Insulation paper
(2) Terminal insulator (inside)

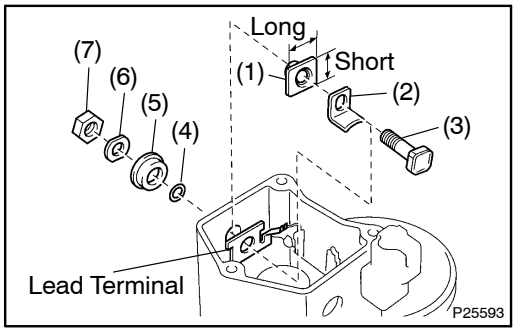
NOTICE:
Be careful to install the terminal insulator in the correct direction.

(3) Contact plate
(4) Terminal bolt
(5) O–ring
(6) Packing and terminal insulator (outside):
Install the packing to the terminal insulator, and install them.

HINT:
Match the protrusion of the insulator with the indentation of the housing.

(7) Wave washer
(8) Terminal nut

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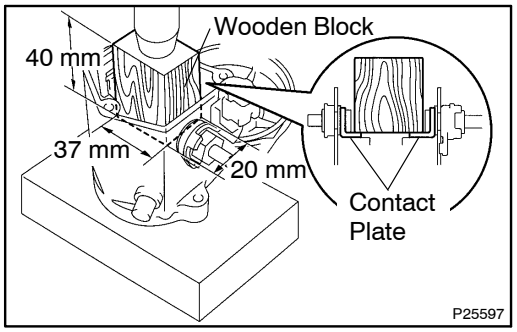
(b) Terminal C:
Install these new parts:
(1) Terminal insulator (inside)
(2) Contact plate
(3) Terminal bolt
(4) O–ring
(5) Terminal insulator (outside)
(6) Wave washer
(7) Terminal nut

NOTICE:
Be careful to install the terminal insulator (inside) in the correct direction.

(c) Temporarily tighten the terminal nuts.

5. TIGHTEN TERMINAL NUT

(a) Put a wooden block on the contact plate and press it down with a hand press.
Dimensions of wooden block:
20 x 37 x 40 mm (0.79 x 1.46 x 1.57 in.)
Press force:
981 N (100 kgf, 221 lbf)



NOTICE:

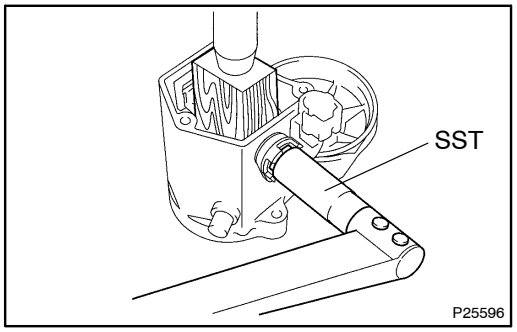
- **Check the diameter of the hand press ram. Then calculate the gauge pressure of the press when 981 N (100 kgf, 221 lbf) of force is applied.**
Gauge pressure:

$$(\text{kgf/cm}^2) = \frac{100\ \text{kgf}}{\left(\frac{\text{Ram diameter (cm)}}{2}\right)^2 \times 3.14\ (\pi)}$$

$$(\text{psi}) = \frac{221\ \text{lbf}}{\left(\frac{\text{Ram diameter (in.)}}{2}\right)^2 \times 3.14\ (\pi)}$$

(kPa) = (kgf/cm^2) x 98.1
(kPa) = (psi) x 6.9

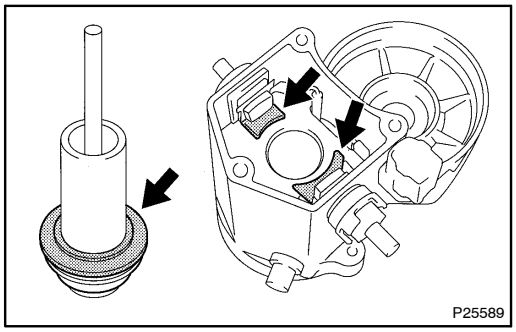
- **If the contact plate is not pressed down with the specified pressure, the contact plate may tilt due to coil deformation or the tightening of the nut.**



(b) Using SST, tighten the nuts to the specified torque.
SST 09810–38140
Torque: 17 N·m (173 kgf·cm, 12 ft·lbf)

NOTICE:
If the nut is over tightened, it may cause cracks on the inside of the insulator.

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6. CLEAN CONTACT SURFACES OF CONTACT PLATE AND PLUNGER

Clean the contact surfaces of the remaining contact plate and plunger with a dry shop rag.

7. REINSTALL MAGNETIC SWITCH END COVER

Install the plunger, new gasket, end cover and lead clamp with the 3 bolts.

Torque:
1.2 kW, 1.4 kW type: 2.5 N·m (25 kgf·cm, 22 in.·lbf)
1.8 kW, 2.0 kW type: 3.6 N·m (35 kgf·cm, 30 in.·lbf)

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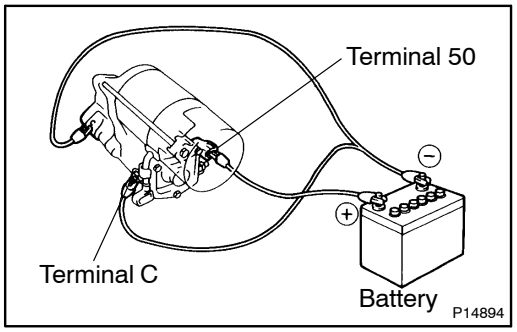
ST031–02

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page ST–4).

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ST032–02



TEST

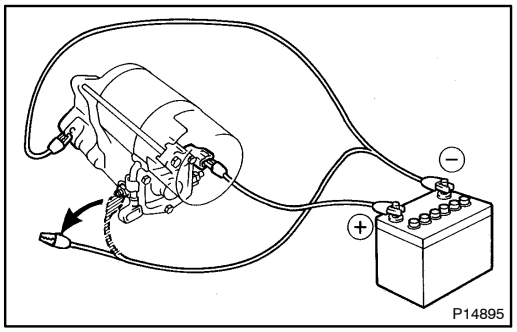
NOTICE:

These tests must be done within 3 to 5 seconds to avoid burning out the coil.

1. DO PULL–IN TEST

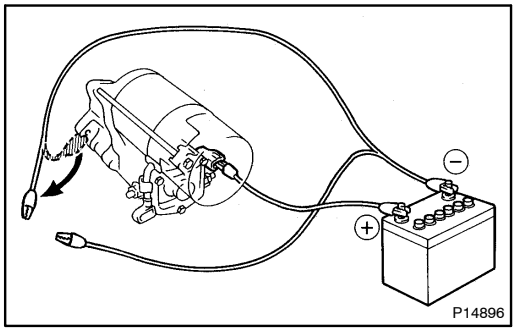
(a) Disconnect the field coil lead wire from terminal C.

(b) Connect the battery to the magnetic switch as shown. Check that the clutch pinion gear moves outward.



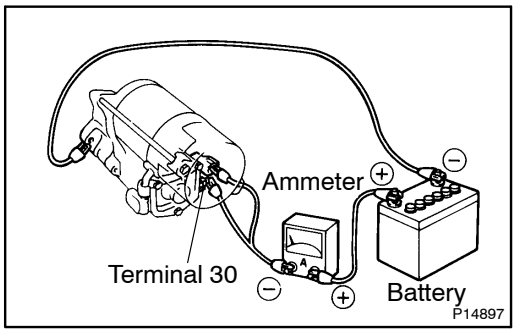
2. DO HOLD–IN TEST

With battery connected as above with the clutch pinion gear out, disconnect the negative (–) lead from terminal C. Check that the pinion gear remains out.



3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (–) lead from the switch body. Check that the clutch pinion gear returns inward.



4. DO NO–LOAD PERFORMANCE TEST

(a) Connect the battery and ammeter to the starter as shown.

(b) Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check that the ammeter reads the specified current.

Specified current:

1.2 kW, 1.4 kW type

90 A or less at 11.5 V

1.8 kW, 2.0 kW type

100 A or less at 11.5 V

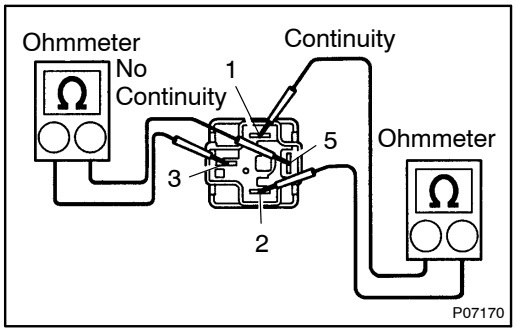
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ST033–02

INSTALLATION

Installation is in the reverse order of removal (See page ST–3).

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STARTER RELAY

ST034–02

INSPECTION

1. REMOVE STARTER RELAY (Marking: ST)

HINT:

The relay is located in the No. 1 junction block on the driver's side.

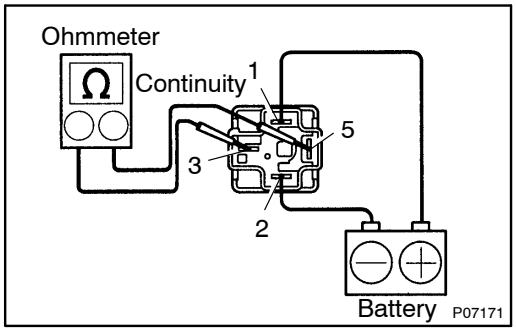
2. INSPECT STARTER RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

(b) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.



3. INSPECT STARTER RELAY OPERATION

(a) Apply battery voltage across terminals 1 and 2.

(b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

4. REINSTALL STARTER RELAY

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ST – STARTING (5VZ-FE)

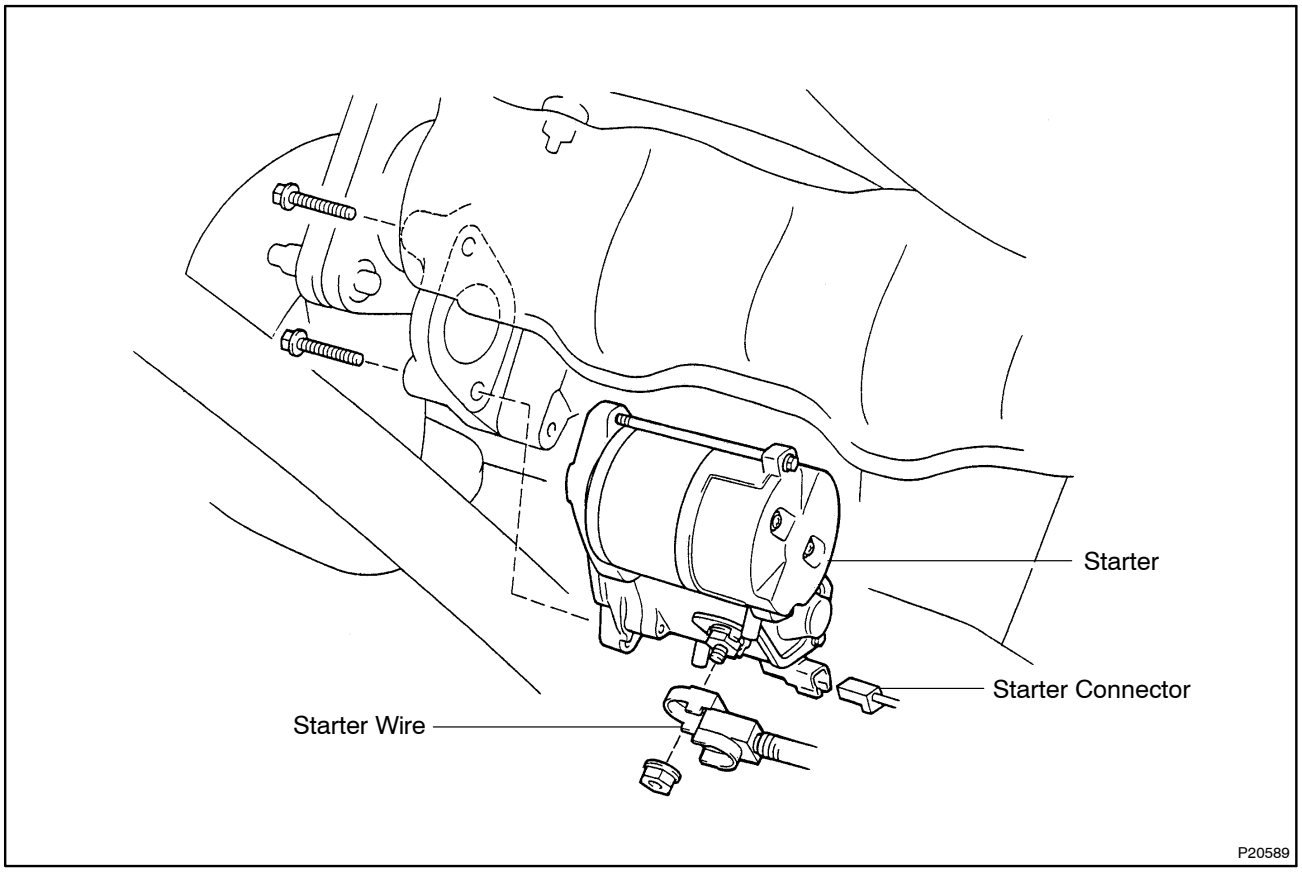
STARTER	ST-1
STARTER RELAY	ST-16

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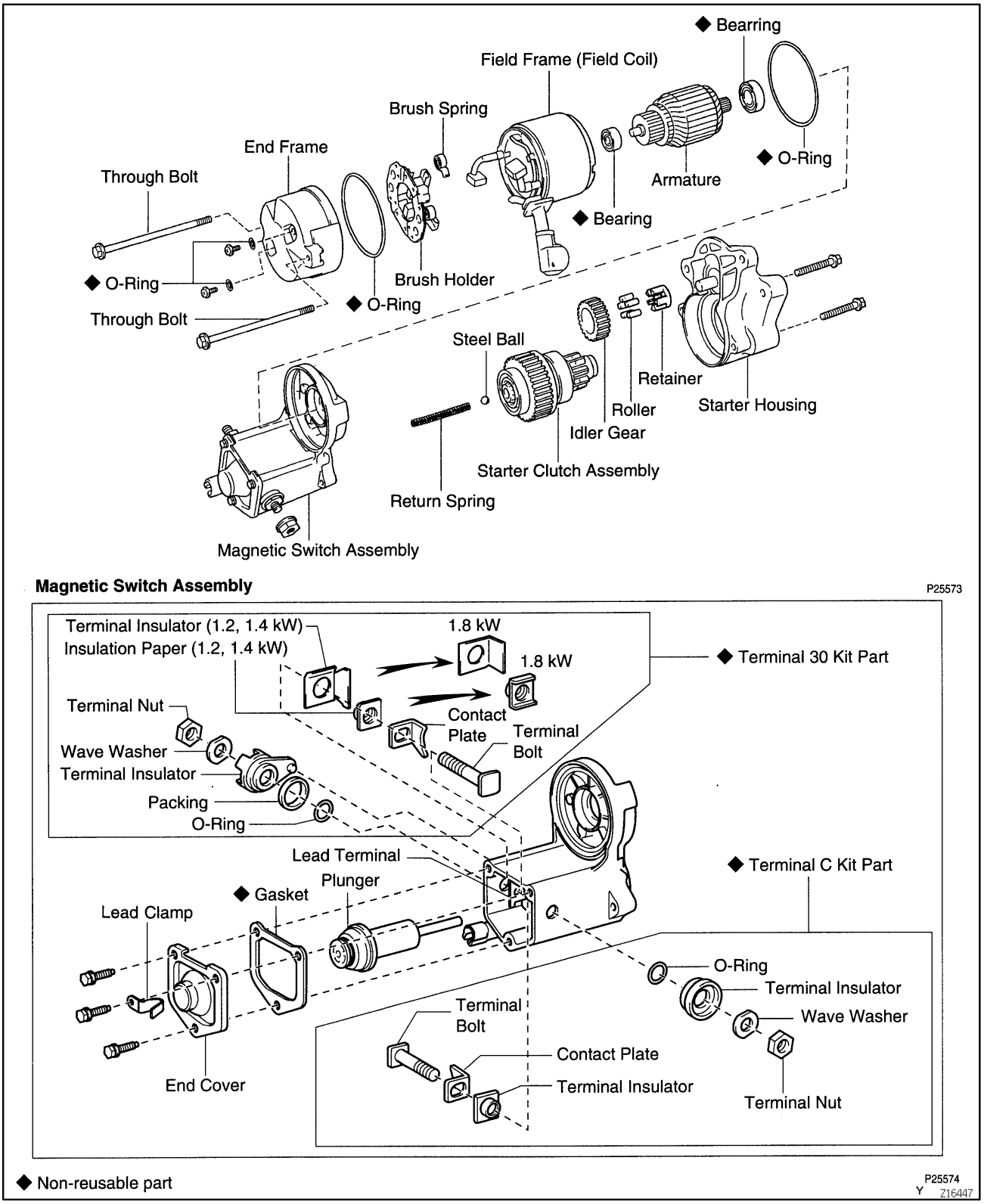
STARTER

COMPONENTS

ST036–04

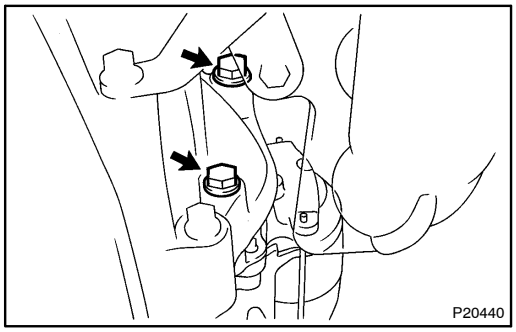


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ST037–04



REMOVAL

REMOVE STARTER

(a) Disconnect the starter connector.

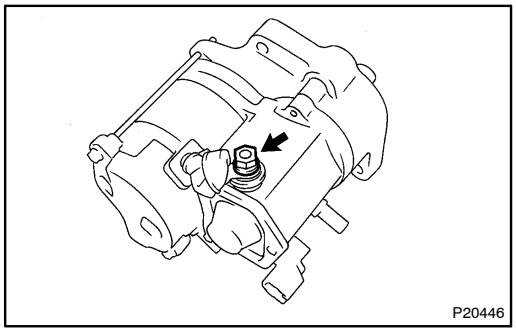
(b) Remove the nut, and disconnect the starter wire.
Torque: 8.8 N·m (90 kgf·cm, 78 in.·lbf)

(c) Remove the 2 bolts and starter.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

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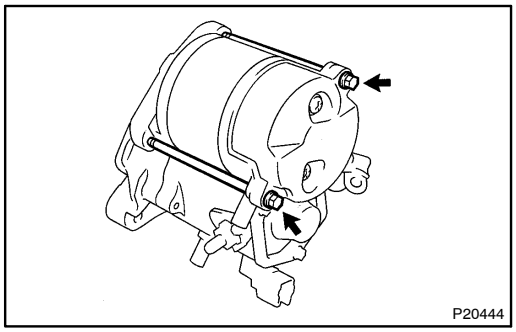
ST038–04

DISASSEMBLY

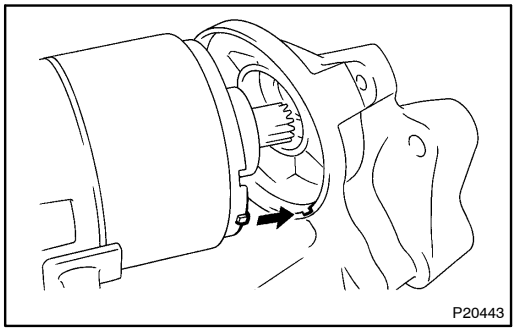

P20446

1. REMOVE FIELD FRAME AND ARMATURE

(a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.
Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)


P20444

(b) Remove the 2 through bolts.
Torque:
1.2 kW, 1.4 kW type: 5.9 N·m (60 kgf·cm, 52 in.·lbf)
1.8 kW type: 9.3 N·m (95 kgf·cm, 82 in.·lbf)

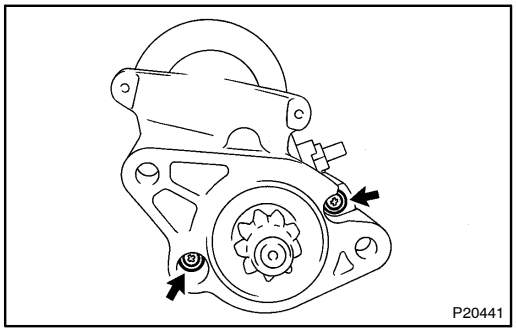

P20443

(c) Pull out the field frame with the armature from the magnetic switch assembly.

NOTICE:
At the time of reassembly, please refer to the following item.
Align the protrusion of the field frame with cutout of the magnetic switch.

(d) Remove the O–ring.

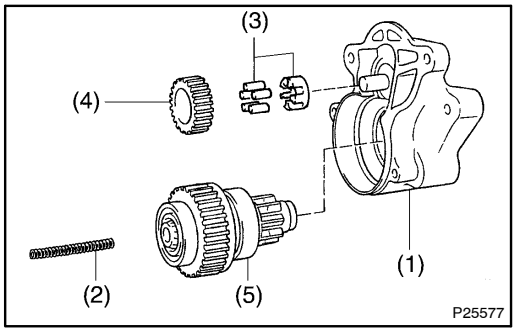
HINT:
At the ime of reassembly, please refer to the following item.
Use a new O–ring.


P20441

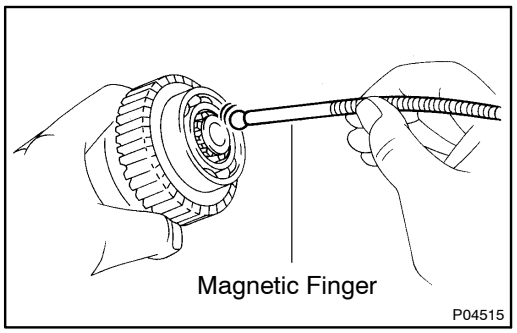
2. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

(a) Remove the 2 screws.
Torque:
1.2 kW, 1.4 kW type: 5.9 N·m (60 kgf·cm, 52 in.·lbf)
1.8 kW type: 9.3 N·m (95 kgf·cm, 82 in.·lbf)

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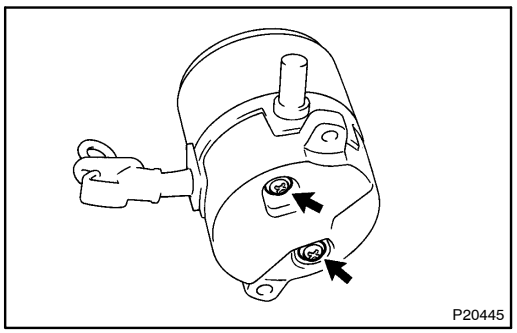


(b) Remove these parts from the magnetic switch assembly:
(1) Starter housing
(2) Return spring
(3) Bearing
(4) Idler Gear
(5) Clutch assembly



3. REMOVE STEEL BALL

Using a magnetic finger, remove the steel ball from the clutch shaft hole.



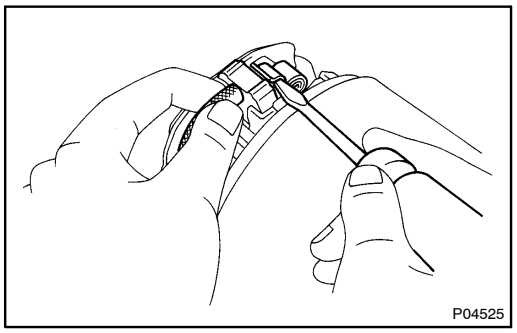
4. REMOVE BRUSH HOLDER

(a) Remove the 2 screws, 2 O–rings and end cover from the field frame.

Torque:
1.2 kW, 1.4 kW type: 1.5 N·m (15 kgf·cm, 13 in.·lbf)
1.8 kW type: 3.8 N·m (38 kgf·cm, 34 in.·lbf)

(b) Remove the O–ring from the field frame.

HINT:
Use a new O–ring.



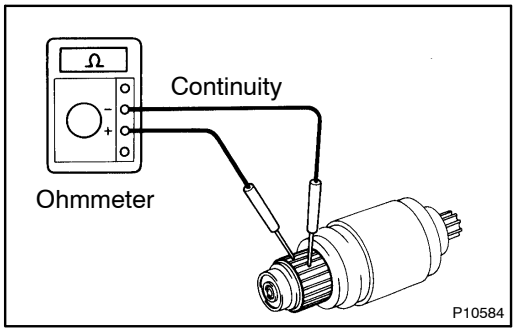
(c) Using a screwdriver hold the spring back and disconnect the brush from the brush holder.
Disconnect the 4 brushes, and remove the brush holder.

5. REMOVE ARMATURE FROM FIELD FRAME

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ST0NK–01

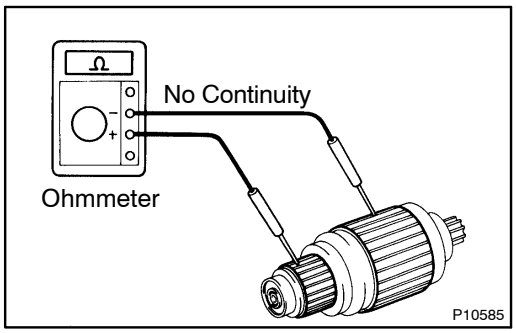
INSPECTION



1. INSPECT COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the segments of the commutator.

If there is no continuity between any segment, replace the armature.



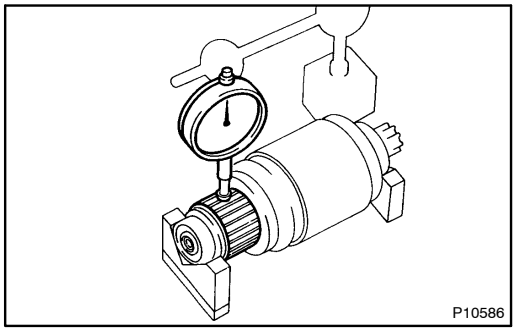
2. INSPECT COMMUTATOR FOR GROUNDED

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

If there is continuity, replace the armature.

3. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

If the surface is dirty or burnt, clean it with sandpaper (No.400) or on a lathe.



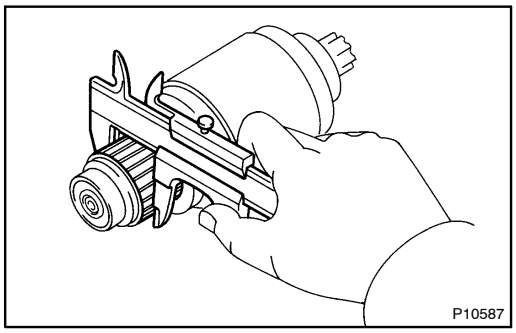
4. INSPECT COMMUTATOR CIRCLE RUNOUT

(a) Place the commutator on V–blocks.

(b) Using a dial indicator, measure the circle runout.

Maximum circle runout:
0.05 mm (0.0020 in.)

If the circle runout is greater than maximum, correct it on a lathe.

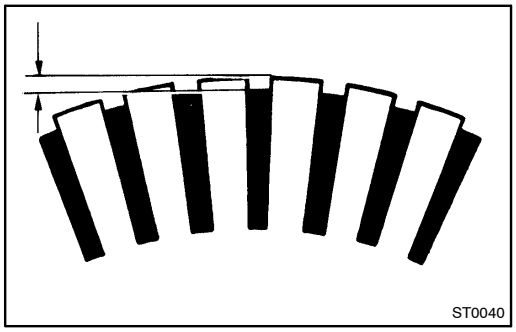


5. INSPECT COMMUTATOR DIAMETER

Using vernier calipers, measure the commutator diameter.

Standard diameter:
1.2 kW, 1.4 kW type: 30 mm (1.18 in.)
1.8 kW type: 35 mm (1.38 in.)
Minimum diameter:
1.2 kW, 1.4 kW type: 29 mm (1.14 in.)
1.8 kW type: 34 mm (1.34 in.)

If the diameter is less than minimum, replace the armature.



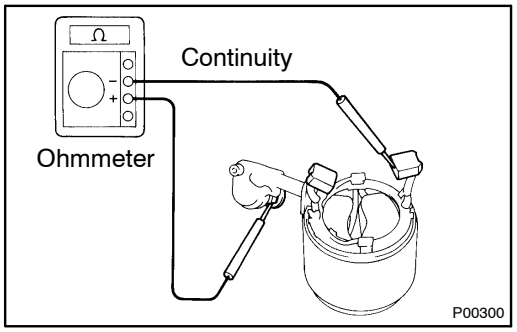
6. INSPECT UNDERCUT DEPTH OF SEGMENT

Check that the undercut depth is clean and free of foreign material. Smooth out the edge.

Standard undercut depth:
1.2 kW, 1.4 kW type: 0.6 mm (0.024 in.)
1.8 kW type: 0.7 mm (0.028 in.)
Minimum undercut depth: 0.2 mm (0.008 in.)

If the undercut depth is less than minimum, correct it with a hacksaw blade.

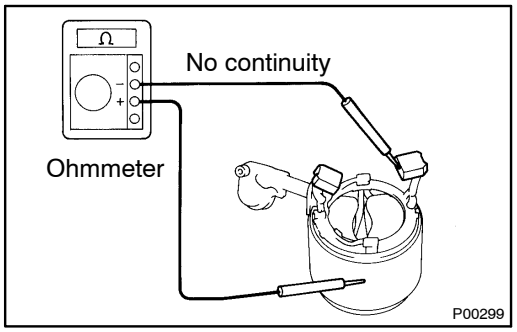
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7. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.

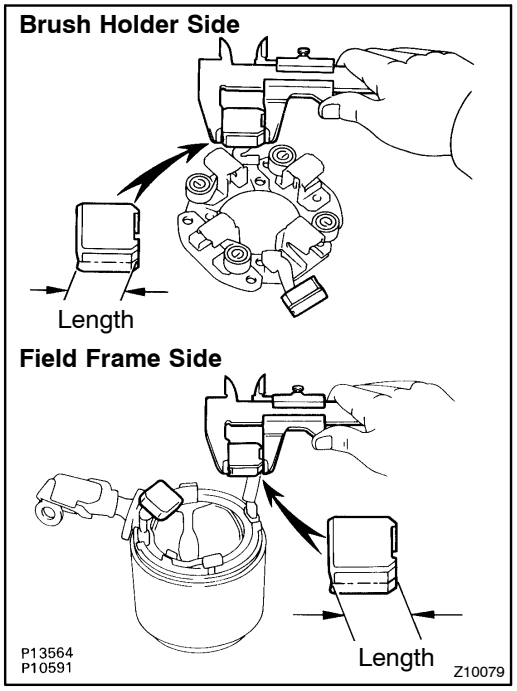
If there is no continuity, replace the field frame.



8. INSPECT THAT FIELD COIL IS NOT GROUNDED

Using an ohmmeter, check that there is no continuity between the field coil end and field frame.

If there is continuity, repair or replace the field frame.

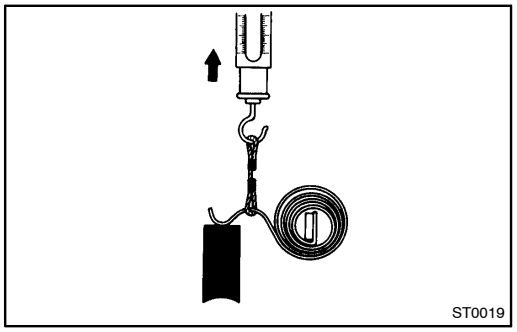


9. INSPECT BRUSH LENGTH

Using vernier calipers, measure the brush length.

Standard length:
1.2 kW, 1.4 kW type: 15.5 mm (0.610 in.)
1.8 kW type: 15.0 mm (0.591 in.)
Minimum length:
1.2 kW, 1.4 kW type: 10.0 mm (0.394 in.)
1.8 kW type: 9.0 mm (0.354 in.)

If the length is less than minimum, replace the brush holder and field frame.



10. INSPECT BRUSH SPRING LOAD

Take the pull scale reading the instant the brush spring separates from the brush.

Standard installed load:
1.2 kW type
13.7 – 19.6 N (1.40 – 2.00 kgf, 3.1 – 4.4 lbf)
1.4 kW type
17.6 – 23.5 N (1.80 – 2.40 kgf, 4.0 – 5.3 lbf)
1.8 kW type
21.5 – 27.5 N (2.20 – 2.80 kgf, 4.9 – 6.2 lbf)

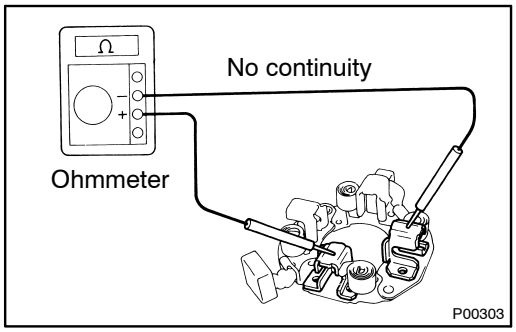
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Minimum installed load:
1.2 kw type: 9.8 N (1.00 kgf, 2.2 lbf)
1.4 kw type: 11.8 N (1.20 kgf, 2.6 lbf)
1.8 kw type: 12.7 N (1.30 kgf, 2.7 lbf)

If the installed load is less than minimum, replace the brush springs.

HINT:

Take the pull scale reading the instant the brush spring separates from the brush.



11. INSPECT INSULATION OF BRUSH HOLDER

Using an ohmmeter, check that there is no continuity between the positive (+) and negative (–) brush holders.

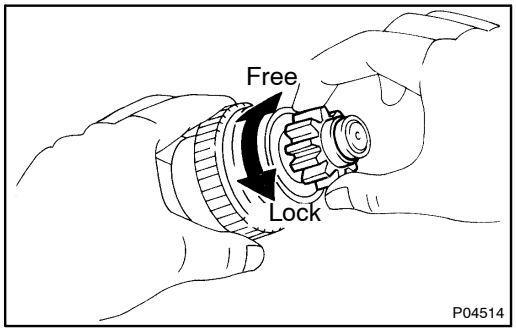
If there is continuity, repair or replace the brush holder.

12. INSPECT GEAR TEETH

Check the gear teeth on the pinion gear, idler gear and clutch assembly for wear or damage.

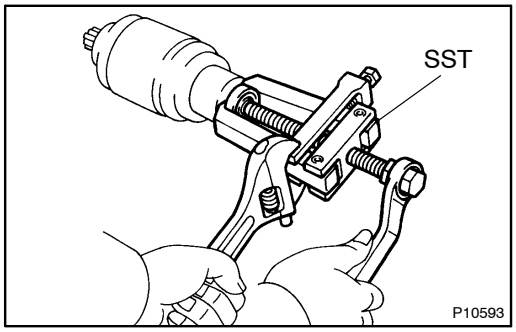
If damaged, replace the gear or clutch assembly.

If damaged, also check the flywheel or drive plate ring gear for wear or damage.



13. INSPECT CLUTCH

Hold the starter clutch and rotate the clutch pinion gear clockwise and check that it turns freely. Try to rotate the clutch pinion counterclockwise and check that it locks. If necessary, replace the clutch assembly.



14. INSPECT REAR BEARING

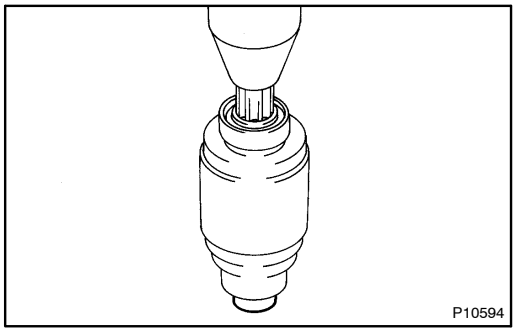
Turn the bearing by hand while applying inward force.

If the resistance is felt or if the bearing sticks, replace the bearing.

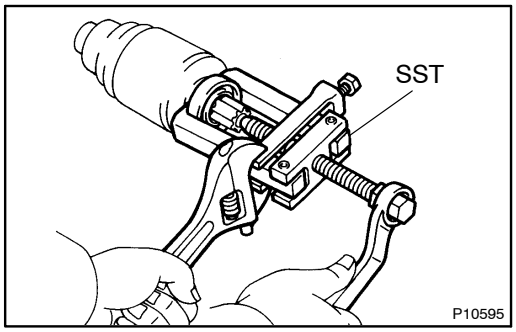
15. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the bearing.
SST 09286–46011

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(b) Press in a new bearing.

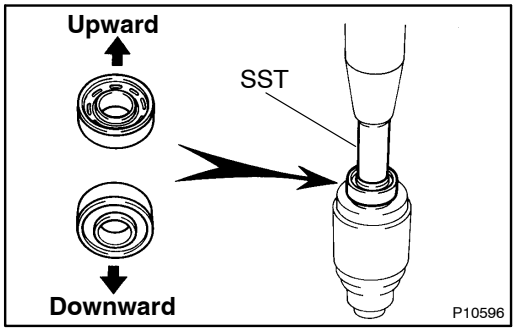


16. INSPECT FRONT BEARING

Turn the bearing by hand while applying inward force.
If the resistance is felt or if the bearing sticks, replace the bearing.

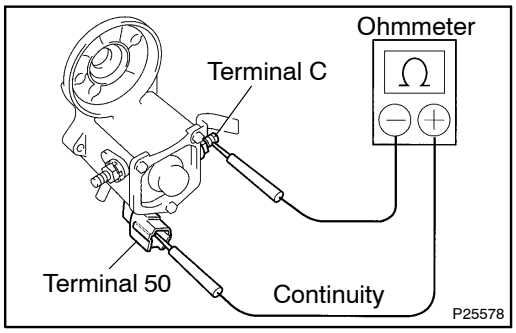
17. IF NECESSARY, REPLACE FRONT BEARING

(a) Using SST, remove the bearing.
SST 09286–46011



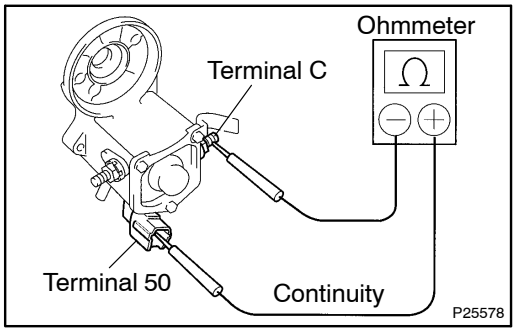
(b) Using SST and a press, press in a new bearing.
SST 09820–00030

NOTICE:
Be careful of the bearing installation direction.



18. DO PULL–IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminals 50 and C.
If there is no continuity, check and replace the magnetic switch.



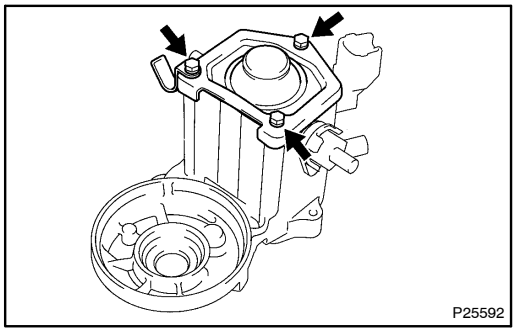
19. DO HOLD–IN COIL CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.
If there is no continuity, replace the magnetic switch assembly.

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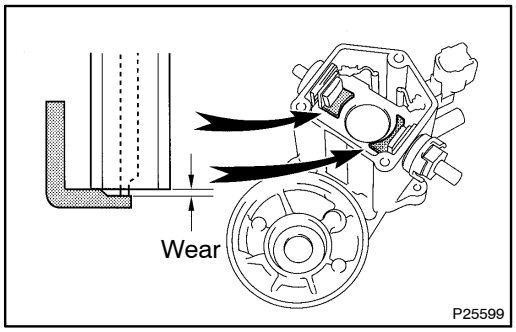
ST0KV–02

REPLACEMENT



1. REMOVE MAGNETIC SWITCH END COVER

Remove the 3 bolts, lead clamp, end cover, gasket and plunger.

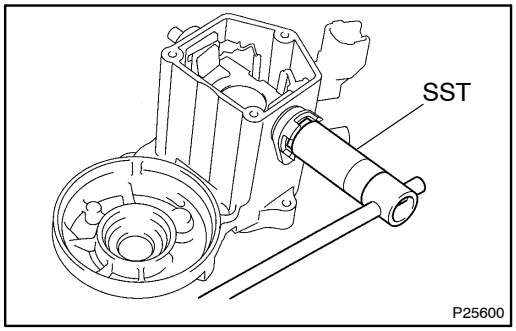


2. INSPECT CONTACT PLATE FOR WEAR

Using vernier calipers, measure the contact plate for depth of wear.

Maximum wear:
0.9 mm (0.035 in.)

If the depth of wear is greater than the maximum, replace the contact plate.



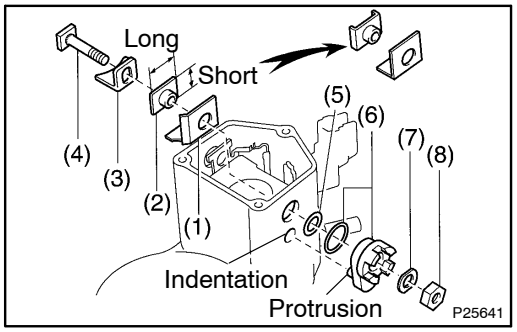
3. REMOVE TERMINAL KIT PARTS

(a) Using SST, loosen the terminal nuts.
SST 09810–38140

(b) Terminal C:
Remove the terminal nut, wave washer, terminal insulator (outside), O–ring, terminal bolt, contact plate and terminal insulator (inside).

(c) Terminal 30:
Remove the terminal nut, wave washer, terminal insulator (outside), packing, O–ring, terminal bolt, contact plate, terminal insulator (inside) and insulation paper.

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4. REINSTALL TERMINAL KIT PARTS

(a) Terminal 30:

Install these new parts:

(1) Insulation paper

(2) Terminal insulator (inside)

NOTICE:

Be careful to install the terminal insulator in the correct direction.

(3) Contact plate

(4) Terminal bolt

(5) O–ring

(6) Packing and terminal insulator (outside)

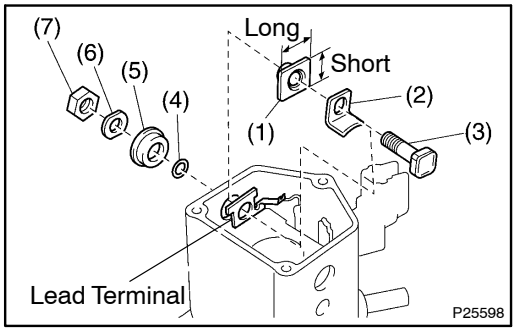
Install the packing to the terminal insulator, and install them.

HINT:

Match the protrusion of the insulator with the indentation of the housing.

(7) Wave washer

(8) Terminal nut



(b) Terminal C:

Install these new parts:

(1) Terminal insulator (inside)

(2) Contact plate

(3) Terminal bolt

(4) O–ring

(5) Terminal insulator (outside)

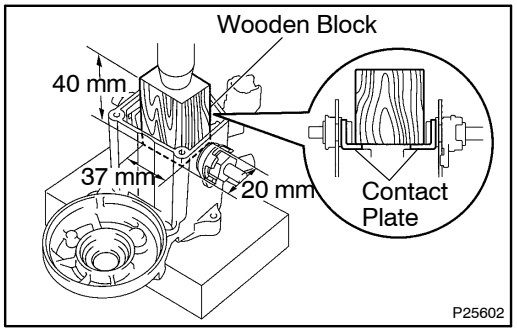
(6) Wave washer

(7) Terminal nut

NOTICE:

Be careful to install the terminal insulator (inside) in the correct direction.

(c) Temporarily tighten the terminal nuts.



5. TIGHTEN TERMINAL NUT

(a) Put a wooden block on the contact plate and press it down with a hand press.

Dimensions of wooden block:

20 x 37 x 40 mm (0.79 x 1.46 x 1.57 in.)

Press force:

981 N (100 kgf, 221 lbf)

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NOTICE:
Check the diameter of the hand press ram. Then calculate the gauge pressure of the press when 981 N (100 kgf, 221 lbf) of force is applied.

Gauge pressure:

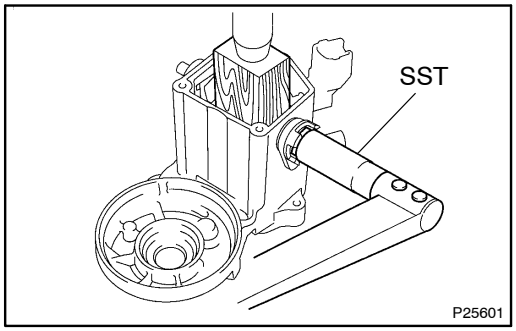
$$(kgf/cm^2) = \frac{100\ kgf}{\left(\frac{\text{Ram diameter (cm)}}{2}\right)^2 \times 3.14\ (\pi)}$$

$$(psi) = \frac{221\ lbf}{\left(\frac{\text{Ram diameter (in.)}}{2}\right)^2 \times 3.14\ (\pi)}$$

(kPa) = (kgf/cm^2) x 98.1

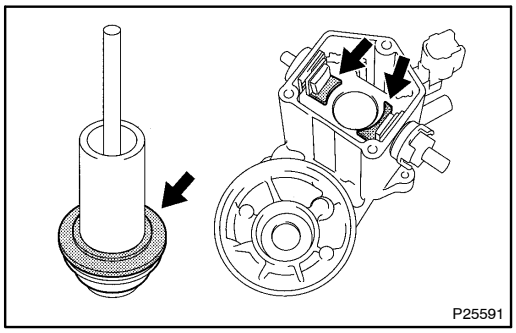
(kPa) = (psi) x 6.9

If the contact plate is not pressed down with the specified pressure, the contact plate may tilt due to coil deformation or the tightening of the nut.



(b) Using SST, tighten the nuts to the specified torque.
SST 09810–38140
Torque: 17 N·m (173 kgf·cm, 12 ft·lbf)

NOTICE:
If the nut is over tightened, it may cause cracks on the inside of the insulator.



6. CLEAN CONTACT SURFACES OF CONTACT PLATE AND PLUNGER

Clean the contact surfaces of the remaining contact plate and plunger with a dry shop rag.

7. REINSTALL MAGNETIC SWITCH END COVER

Install the plunger, new gasket, end cover and lead clamp (1.8 kW type) with the 3 bolts.

Torque:
1.2 kW, 1.4 kW type: 2.5 N·m (25 kgf·cm, 22 in.·lbf)
1.8 kW type: 3.6 N·m (35 kgf·cm, 30 in.·lbf)

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ST03B–03

REASSEMBLY

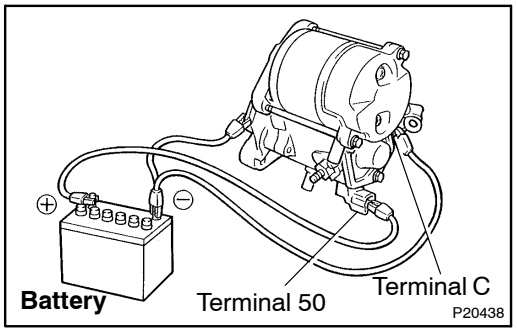
Reassembly is in the reverse order of disassembly (See page ST–4).

HINT:

Use high–temperature grease to lubricate the bearings, gears, return spring and steel ball when assembling the starter.

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ST03C–03



TEST

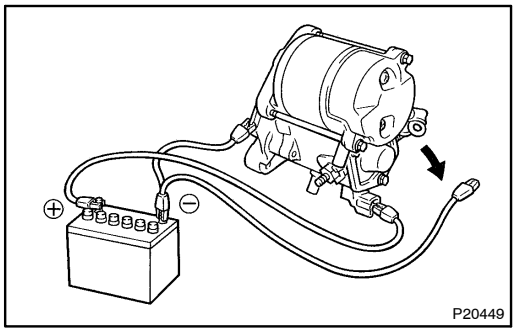
NOTICE:

These tests must be done within 3 to 5 seconds to avoid burning out the coil.

1. DO PULL–IN TEST

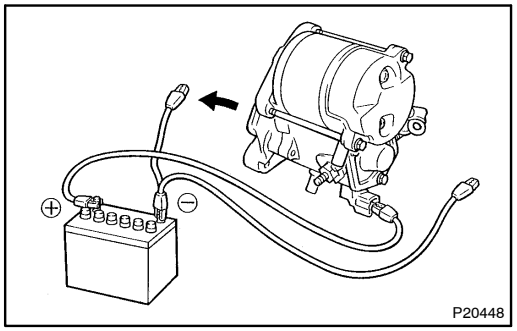
(a) Disconnect the field coil lead wire from terminal C.

(b) Connect the battery to the magnetic switch as shown. Check that the clutch pinion gear moves outward.



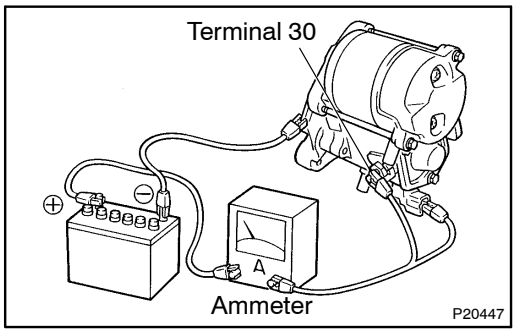
2. DO HOLD–IN TEST

With battery connected as above with the clutch pinion gear out, disconnect the negative (–) lead from terminal C. Check that the pinion gear remains out.



3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (–) lead from the switch body. Check that the clutch pinion gear returns inward.



4. DO NO–LOAD PERFORMANCE TEST

(a) Connect the battery and ammeter to the starter as shown.

(b) Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check that the ammeter reads the specified current.

Specified current:

1.2 kW, 1.4 kW type

90 A or less at 11.5 V

1.8 kW type

100 A or less at 11.5 V

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ST03D–02

INSTALLATION

Installation is in the reverse order of removal (See page ST–3).

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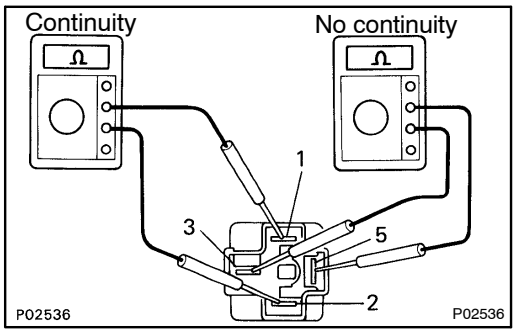
STARTER RELAY

ST03E–03

INSPECTION

1. REMOVE STARTER RELAY (Marking: "ST")

LOCATION: The relay is located in the No.1 junction block on the driver's side.



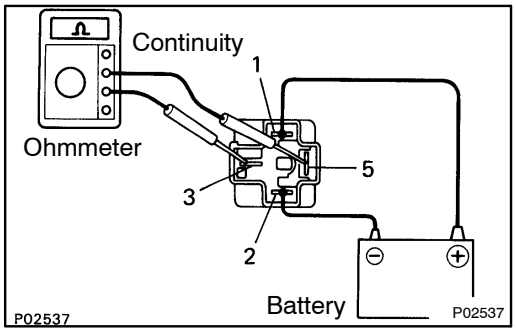
2. INSPECT STARTER RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

If there is no continuity, replace the relay.

(b) Check that there is no continuity between terminals 3 and 5.

If there is continuity, replace the relay.



3. INSPECT STARTER RELAY OPERATION

(a) Apply battery voltage across terminals 1 and 2.

(b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If there is no continuity, replace the relay.

4. REINSTALL STARTER RELAY

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CH – CHARGING (3RZ-FE)

CHARGING SYSTEM	CH-1
GENERATOR	CH-6

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CHARGING SYSTEM

CH02A–01

PRECAUTION

- **Check that the battery cables are connected to the correct terminals.**
- **Disconnect the battery cables when the battery is given a quick charge.**
- **Do not perform tests with a high voltage insulation resistance tester.**
- **Never disconnect the battery while the engine is running.**

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CH02B–03

ON–VEHICLE INSPECTION

1. CHECK BATTERY ELECTROLYTE LEVEL

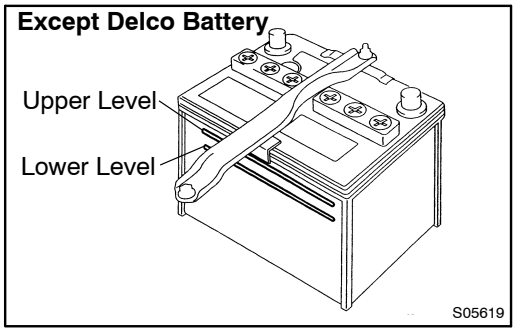
Check the electrolyte quantity of each cell.

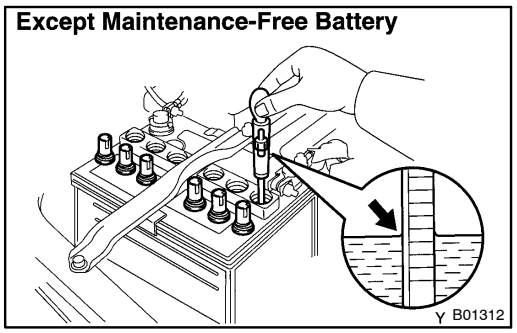
Maintenance–Free Battery:

If under the lower level, replace the battery (or add distilled water if possible). Check the charging system.

Except Maintenance–Free Battery:

If under the lower level, add distilled water.





2. Except Maintenance–Free Battery: CHECK BATTERY SPECIFIC GRAVITY

Check the specific gravity of each cell.

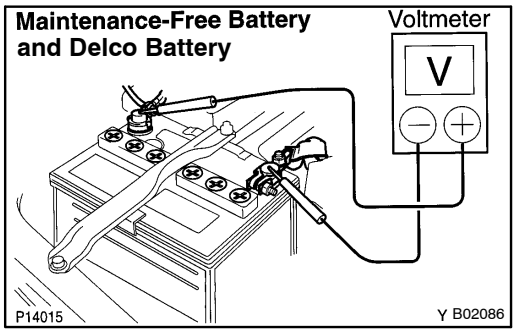
Standard specific gravity:
1.25 – 1.29 at 20˚C (68˚F)

If the specific gravity is less than specification, charge the battery.

3. Maintenance–Free Battery: CHECK BATTERY VOLTAGE

(a) After having driven the vehicle and in the case that 20 minutes have not passed after having stopped the engine, turn the ignition switch ON and turn on the electrical system (headlight, blower motor, rear defogger etc.) for 60 seconds to remove the surface charge.

(b) Turn the ignition switch OFF and turn off the electrical systems.



(c) Measure the battery voltage between the negative (–) and positive (+) terminals of the battery.

Standard voltage:
12.7 – 12.9 V at 20˚C (68˚F)

HINT:

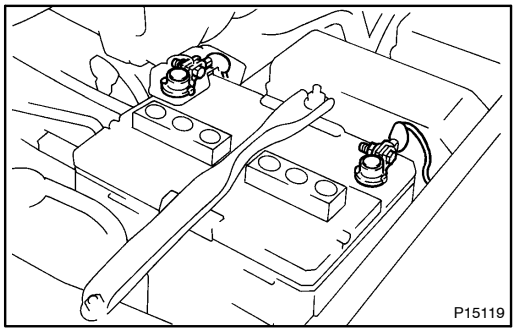
- Before measuring the voltage, turn the ignition switch OFF and turn off the electrical systems (headlight, blower motor, rear defogger etc.) for 60 seconds to remove the surface charge.
- If the vehicle has been running, wait 20 minutes or more after the vehicle stops before measuring the battery voltage.

If the voltage is less than specification, charge the battery.

HINT:

Check the indicator as shown in illustration.

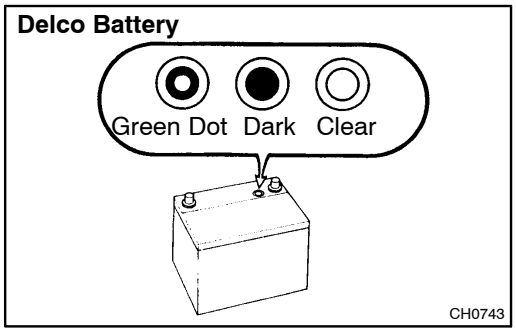
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4. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

(a) Check that the battery terminals are not loose or corroded.

(b) Check the fusible link and fuses for continuity.



5. Delco Battery:

CHECK HYDROMETER

Green Dot visible:

Battery is adequately charged.

Dark (Green Dot not visible):

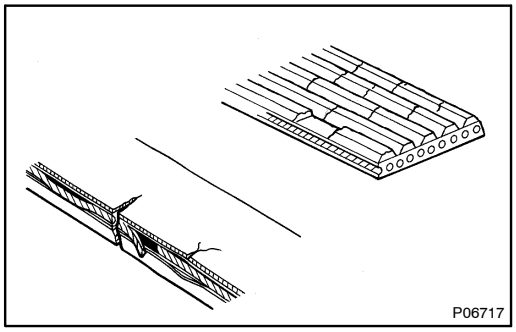
Battery must be charged.

Clear or Light Yellow:

Replace battery.

HINT:

There is no need to add water during the entire service life of the battery.



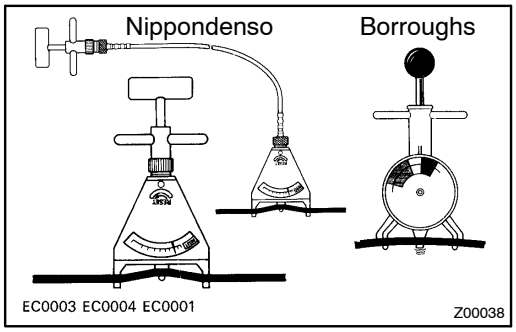
6. INSPECT DRIVE BELT

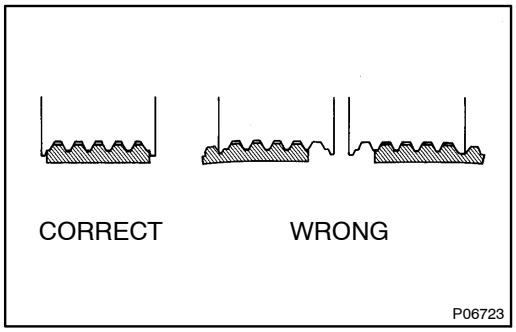
(a) Visually check the belt for excessive wear, frayed cords etc.

HINT:

Cracks on the ribbed side of the belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.

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(b) Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:
Nippondenso BTG 20 (95506–00020) or
Borroughs No. BT–33–73F
Drive belt tension:
New belt
175 ± 5 lbf
Used belt
115 ± 20 lbf

If necessary, adjust the drive belt tension.

HINT:

- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly in the ribbed grooves. Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the crank pulley.
- After installing a new belt, run the engine for approx. 5 minutes and then recheck the tension.

7. VISUALLY CHECK GENERATOR WIRING AND LISTEN FOR ABNORMAL NOISES

(a) Check that the wiring is in good condition.

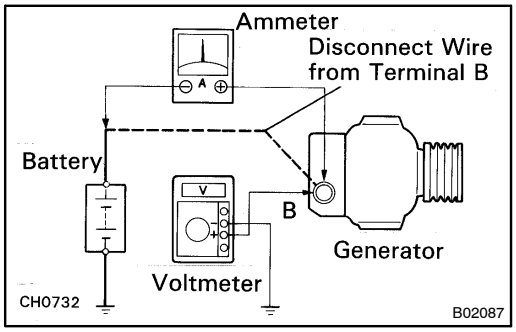
(b) Check that there is no abnormal noise from the generator while the engine is running.

8. INSPECT DISCHARGE WARNING LIGHT CIRCUIT

(a) Turn the ignition switch ON. Check that the discharge warning light comes on.

(b) Start the engine. Check that the light goes off.

If the light does not operate as specified, troubleshoot the discharge warning light circuit.



9. CHECK CHARGING CIRCUIT WITHOUT LOAD

HINT:

If a battery/generator tester is available, connect the tester to the charging circuit according to the manufacturers instructions.

(a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:

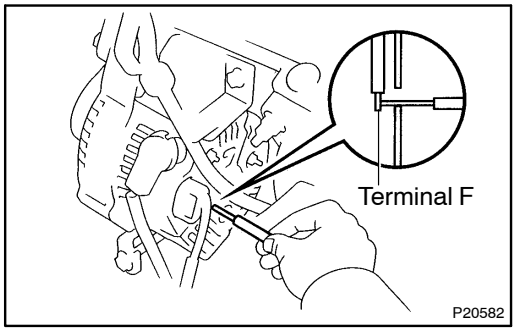
- Disconnect the wire from terminal B of the generator and connect the wire to the negative (–) terminal of the ammeter.

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- Connect the test lead from the positive (+) terminal of the ammeter to terminal B of the generator.
- Connect the positive (+) lead of the voltmeter to terminal B of the generator.
- Ground the negative (–) lead of the voltmeter.

(b) Check the charging circuit as follows:
With the engine running from idling to 2,000 rpm, check the reading on the ammeter and voltmeter.
Standard amperage:
10 A or less
Standard voltage:
At 25 °C (77°F): 14.0 – 15.0 V
At 115 °C(239 °F): 13.5 – 14.3 V

If the voltage reading is greater than standard voltage, replace the voltage regulator.
If the voltage reading is less than standard voltage, check the voltage regulator and generator as follows:



- With terminal F grounded, start the engine and check the voltage reading of terminal B.
- If the voltage reading is higher than standard voltage, replace the voltage regulator.
- If the voltage reading is less than standard voltage, repair the generator.

10. INSPECT CHARGING CIRCUIT WITH LOAD

(a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater fan control switch to HI.

(b) Check the reading on the ammeter.
Standard amperage:
30 A or more

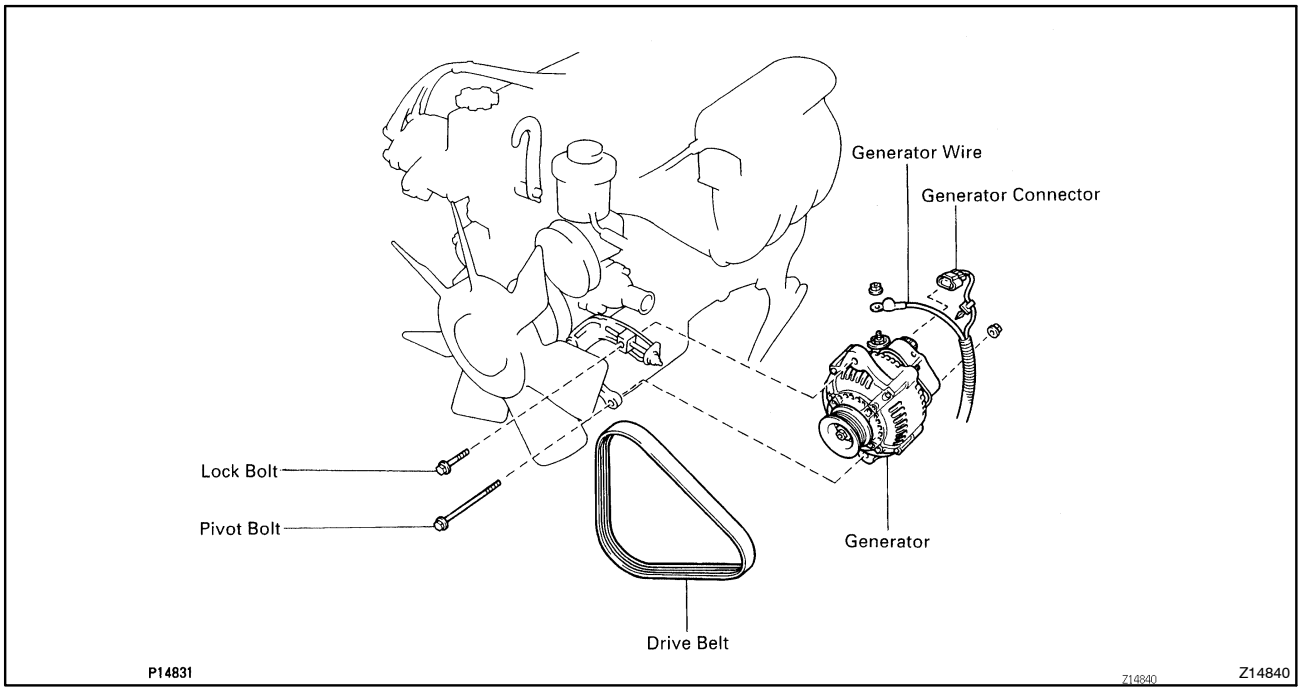
If the ammeter reading is less than standard amperage, repair the generator.
HINT:
If the battery is fully charged, the indication will sometimes be less than standard amperage.

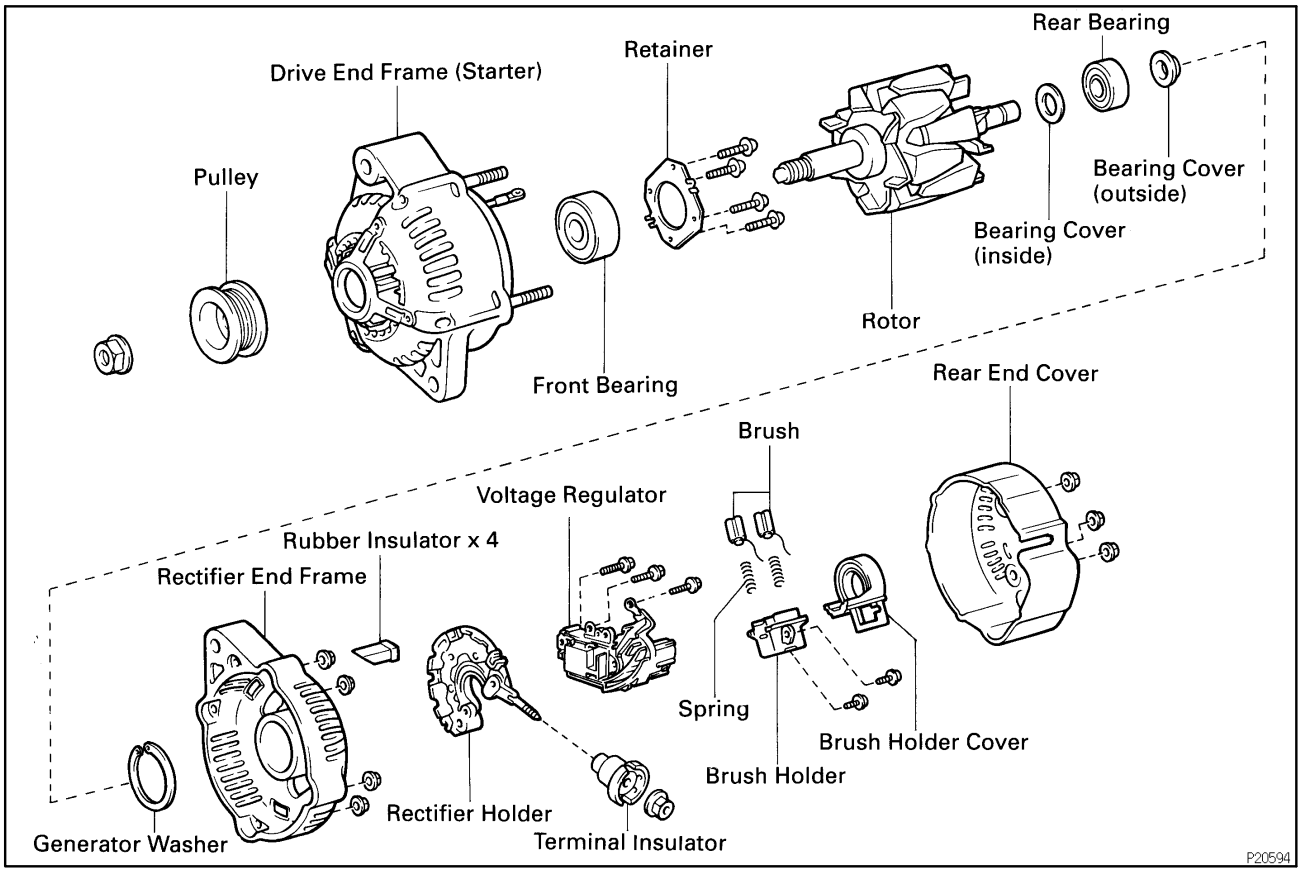
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GENERATOR

COMPONENTS

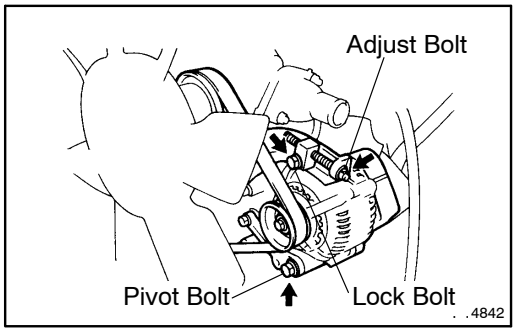
CH02C–03





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CH02D–03



REMOVAL

1. REMOVE DRIVE BELT

(a) Loosen the lock bolt, pivot bolt, nut and adjusting bolt.

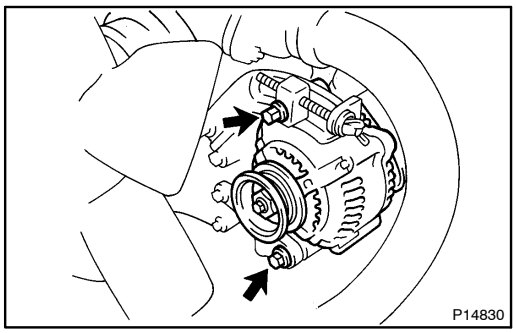
(b) Remove the drive belt.

2. REMOVE GENERATOR

(a) Disconnect the generator connector.

(b) Remove the nut, and disconnect the generator wire.

(c) Disconnect the wire harness with the clip.



(d) Remove the lock bolt, pivot bolt, nut and generator.

Torque:

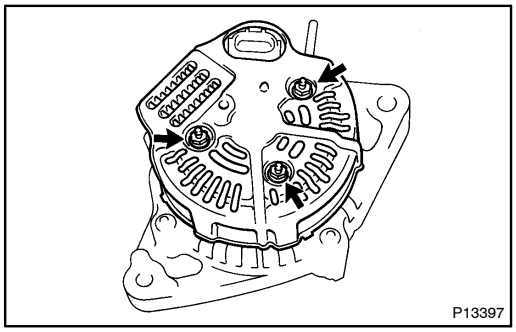
Pivot bolt: 59 N·m (600 kgf·cm, 43 ft·lbf)

Lock bolt: 29 N·m (300 kgf·cm, 21 ft·lbf)

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CH0ES–02

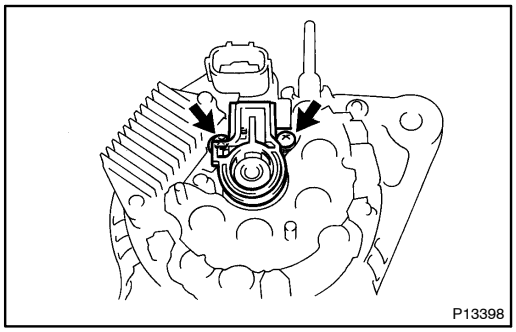
DISASSEMBLY



1. REMOVE REAR END COVER

(a) Remove the nut and terminal insulator.

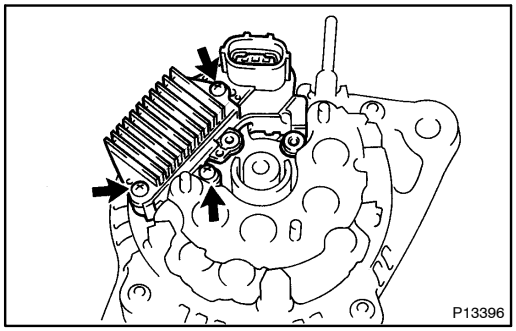
(b) Remove the 3 nuts and end cover.



2. REMOVE BRUSH HOLDER

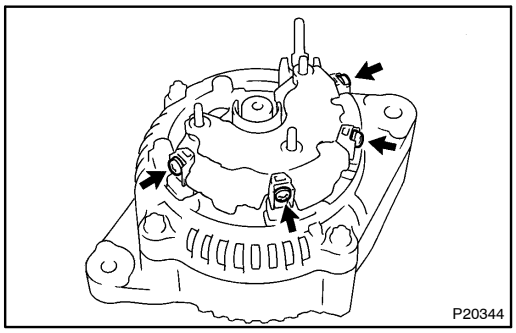
(a) Remove the 2 screws, brush holder and cover.

(b) Remove the brush holder cover from the brush holder.



3. REMOVE VOLTAGE REGULATOR

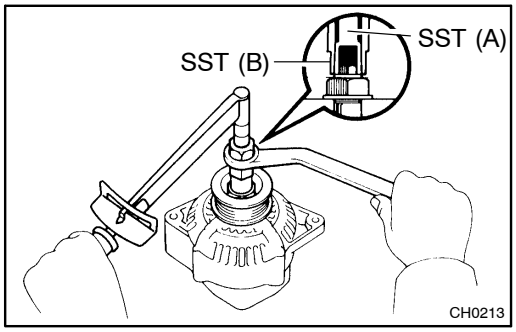
Remove the 3 screws and voltage regulator.



4. REMOVE RECTIFIER HOLDER

(a) Remove the 4 screws and rectifier holder.

(b) Remove the 4 rubber insulators.



5. REMOVE PULLEY

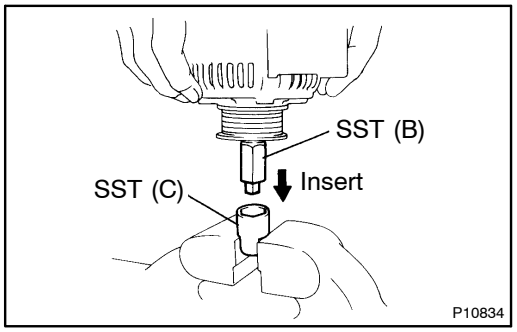
(a) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.

SST 09820–63010

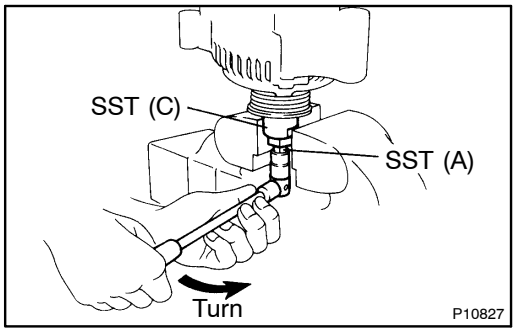
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Check that SST (A) is secured to the rotor shaft.

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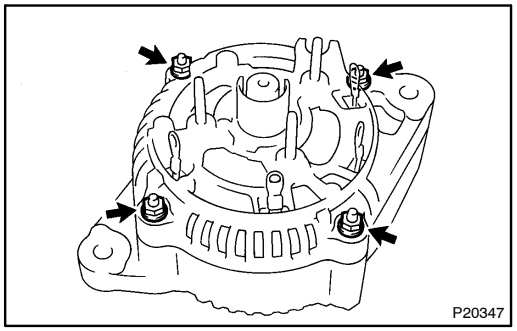
(c) Mount SST (C) in a vise.
(d) Insert SST (B) into SST (C), and attach the pulley nut to SST (C).



(e) To loosen the pulley nut, turn SST (A) in the direction shown in the illustration.

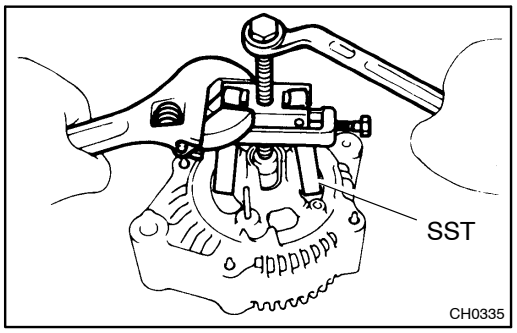
NOTICE:
To prevent damage to the rotor shaft, do not loosen the pulley nut more than one–half of a turn.

(f) Remove the generator from SST (C).
(g) Turn SST (B) and remove SST (A and B).
(h) Remove the pulley nut and pulley.



6. REMOVE RECTIFIER END FRAME

(a) Remove the 4 nuts.



(b) Using SST, remove the rectifier end frame.
SST 09286–46011
(c) Using snap ring pliers, the generator washer from the rectifier end frame.

7. REMOVE ROTOR FROM DRIVE END FRAME

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CH0HW–01

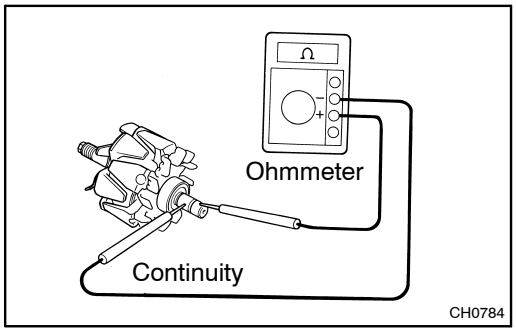
INSPECTION

1. INSPECT ROTOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance:
2.8 – 3.0 Ω at 20 °C (68 °F)

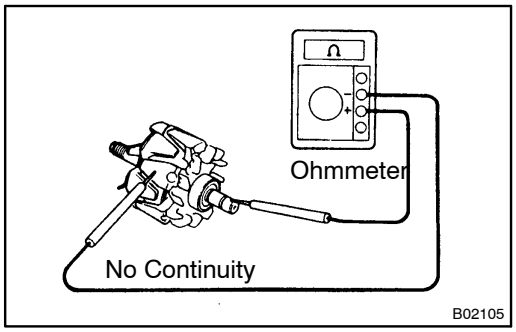
If there is no continuity, replace the rotor.



2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.



3. INSPECT SLIP RINGS

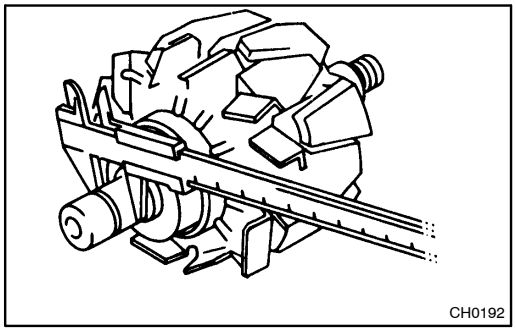
(a) Check that the slip rings are not rough or scored.

If rough or scored, replace the rotor.

(b) Using a vernier caliper, measure the slip ring diameter.

Standard diameter: 14.2 – 14.4 mm (0.559 – 0.567 in.)
Minimum diameter: 12.8 mm (0.504 in.)

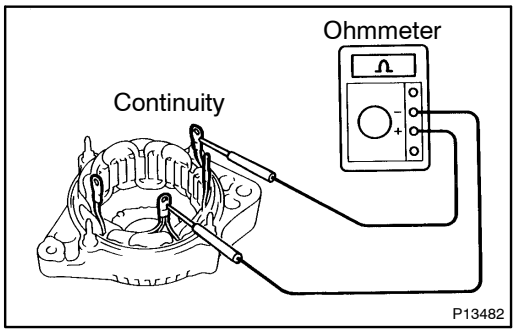
If the diameter is less than minimum, replace the rotor.



4. INSPECT STATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the coil leads.

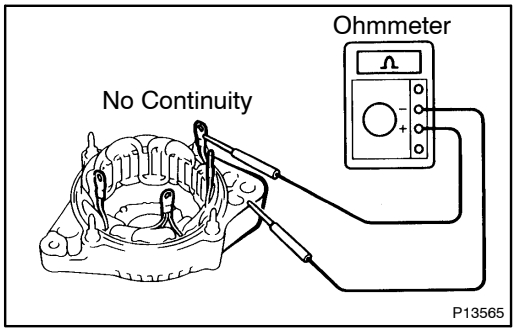
If there is no continuity, replace the drive end frame assembly.



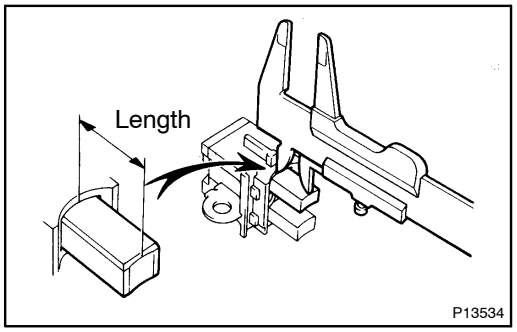
5. INSPECT STATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the coil lead and drive end frame.

If there is continuity, replace the drive end frame assembly.



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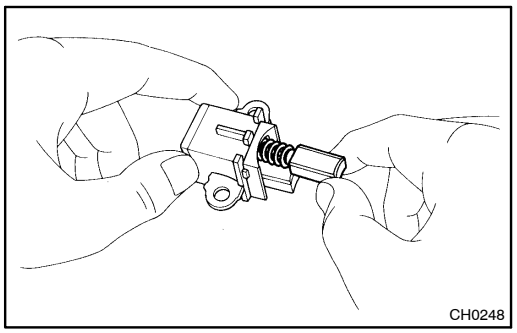


6. INSPECT EXPOSED BRUSH LENGTH

Using vernier calipers, measure the exposed brush length.

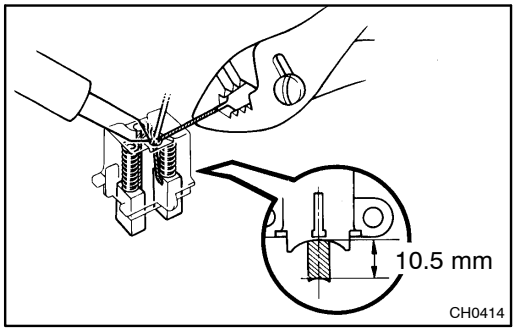
Standard exposed length:
10.5 mm (0.413 in.)
Minimum exposed length:
1.5 mm (0.059 in.)

If the exposed length is less than minimum, replace the brushes.

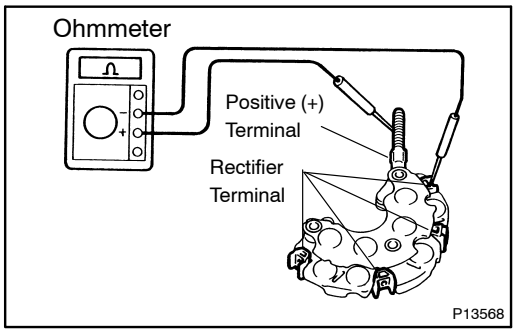


7. IF NECESSARY, REPLACE BRUSHES

(a) Unsolder and remove the brush and spring.
(b) Run the wire of the brush through the hole in the brush holder, and insert the spring and brush into the brush holder.



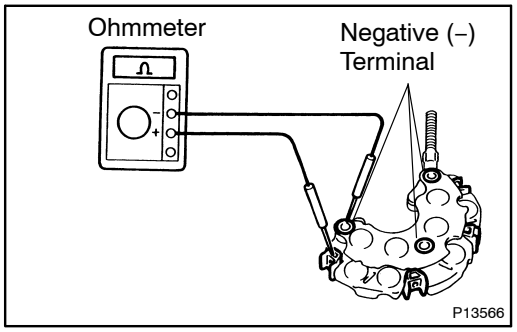
(c) Solder the brush wire to the brush holder at exposed length.
Exposed length:
10.5 mm (0.413 in.)
(d) Check that the brush moves smoothly in the brush holder.
(e) Cut off the excess wire.
(f) Apply insulation paint to the soldered point.



8. INSPECT POSITIVE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to the positive (+) terminal and the other to each rectifier terminal.
(b) Reverse the polarity of the tester probes and repeat step (a).
(c) Check that one shows continuity and the other shows no continuity.

If continuity is not as specified, replace the rectifier holder.

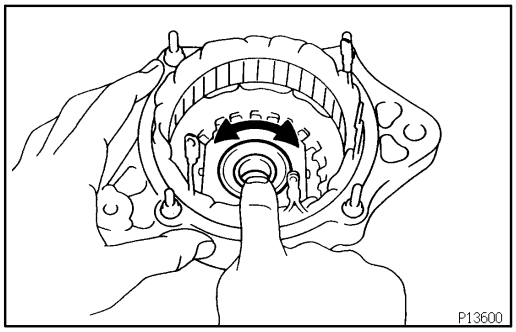


9. INSPECT NEGATIVE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to each negative (–) terminal and the other to each rectifier terminal.
(b) Reverse the polarity of the tester probes and repeat step (a).
(c) Check that one shows continuity and the other shows no continuity.

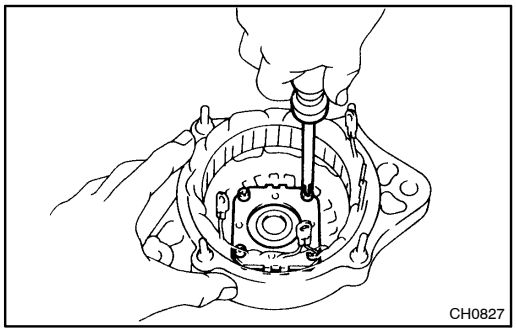
If continuity is not as specified, replace the rectifier holder.

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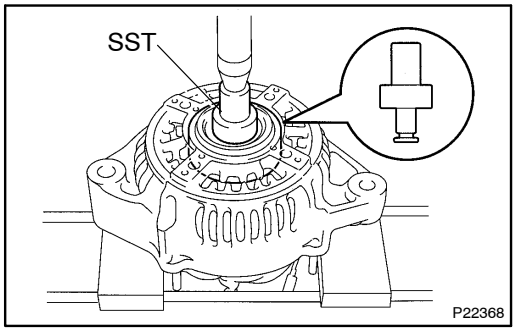
10. INSPECT FRONT BEARING

Check that the bearing is not rough or worn.

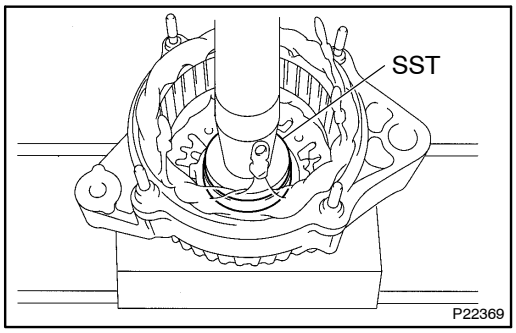


11. IF NECESSARY, REPLACE FRONT BEARING

(a) Remove the 4 screws and bearing retainer.

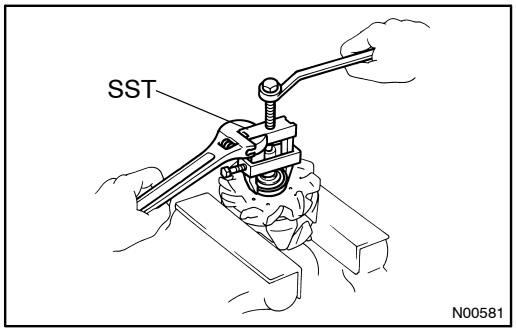


(b) Using SST and a press, press out the bearing.
SST 09950–60010 (09951–00260, 09952–06010)



(c) Using SST and a press, press in a new bearing.
SST 09950–60010 (09951–00500)

(d) Install the bearing retainer with the 4 screws.
Torque: 2.6 N·m (27 kgf·cm, 23 in.·lbf)



12. INSPECT REAR BEARING

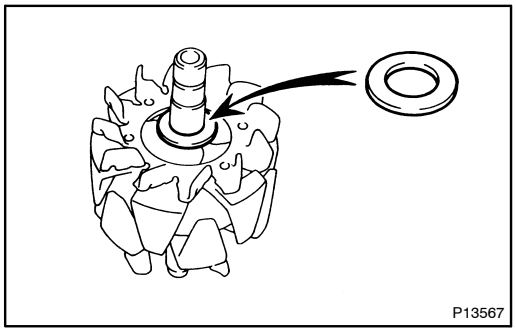
Check that the bearing is not rough or worn.

13. IF NECESSARY, REPLACE REAR BEARING

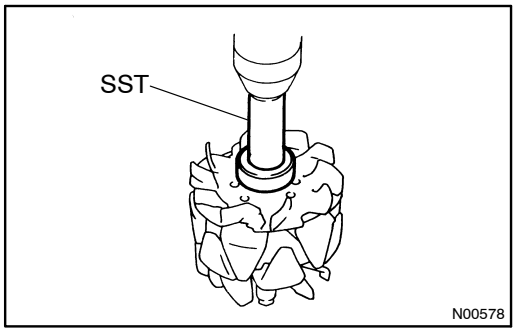
(a) Using SST, remove the bearing cover and bearing.
SST 09820–00021

(b) Remove the bearing cover (inside).

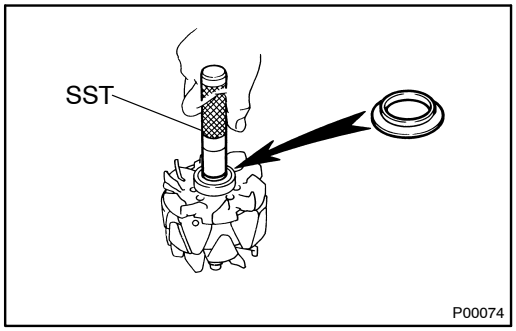
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(c) Place the bearing cover (inside) on the rotor.



(d) Using SST and a press, press in a new bearing.
SST 09820–00030



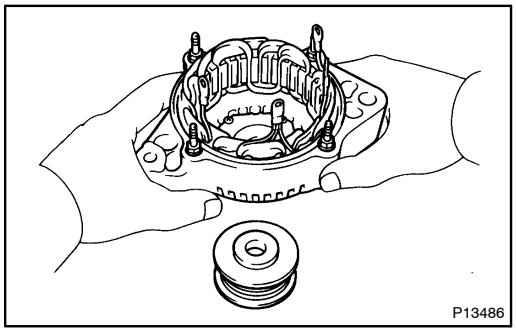
(e) Using SST, push in the bearing cover (outside).
SST 09285–76010

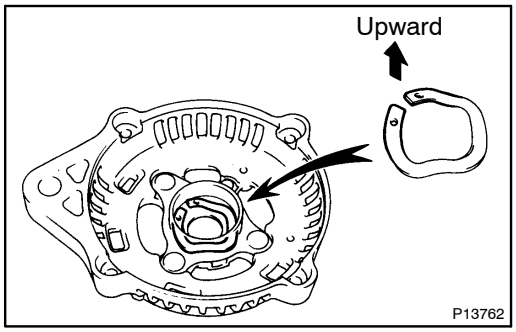
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CH0HX–01

REASSEMBLY

1. PLACE RECTIFIER END FRAME ON PULLEY
2. INSTALL ROTOR TO DRIVE END FRAME



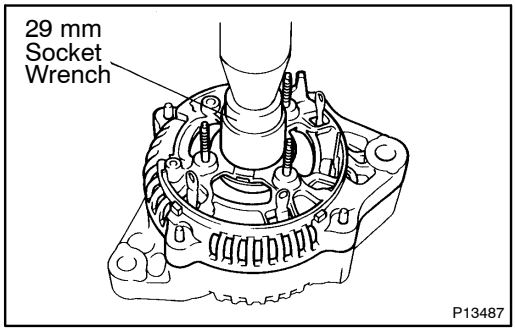


3. INSTALL RECTIFIER END FRAME

Install the generator washer to the rectifier end frame.

NOTICE:

Be careful of the generator washer installation directon.

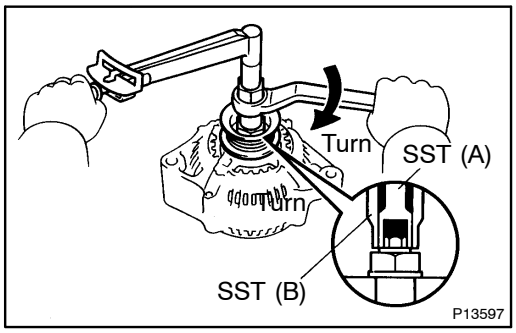


4. INSTALL RECTIFIER END FRAME

(a) Using a 29 mm socket wrench and press, slowly press in the rectifier end frame.

(b) Install the 4 nuts.

Torque: 4.5 N·m (46 kgf·cm, 39 in.·lbf)



5. INSTALL PULLEY

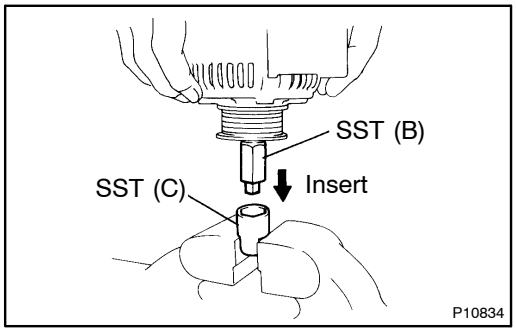
(a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.

(b) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.

SST 09820–63010

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

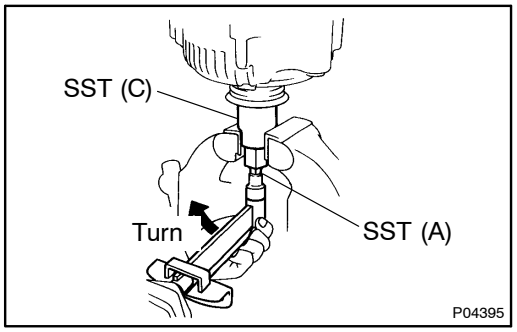
(c) Check that SST (A) is secured to the pulley shaft.



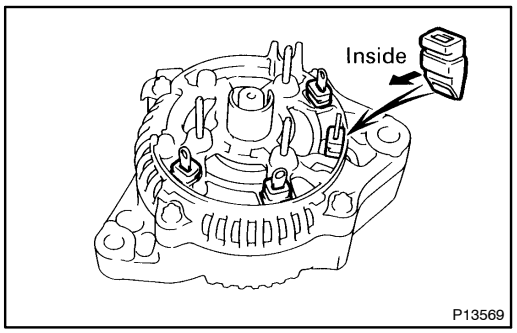
(d) Mount SST (C) in a vise.

(e) Insert SST (B) into SST (C), and attach the pulley nut to SST (C).

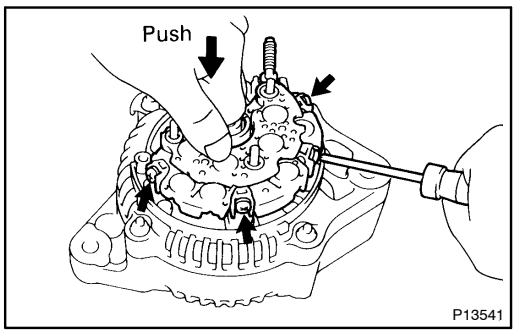
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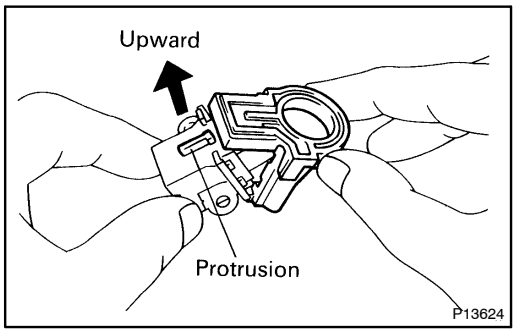
(f) To torque the pulley nut, turn SST (A) in the direction shown in the illustration.
Torque: 110 N·m (1,125 kgf·cm, 81 ft·lbf)
(g) Remove the generator from SST (C).
(h) Turn SST (B), and remove SST (A and B).



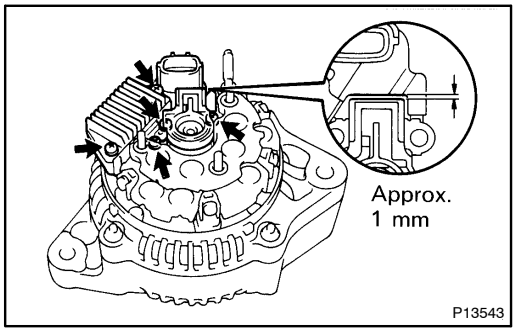
6. INSTALL RECTIFIER HOLDER
(a) Install the 4 rubber insulators on the lead wires.
NOTICE:
Be careful of the rubber insulators installation direction.



(b) Install the rectifier with the 4 screws.
Torque: 2.0 N·m (20 kgf·cm, 18 in.·lbf)



7. INSTALL VOLTAGE REGULATOR AND BRUSH HOLDER
(a) Install the brush holder cover to the brush holder.
NOTICE:
Be careful of the holder installation direction.
(b) Place the voltage regulator together with the brush holder horizontally on the rectifier end frame.



(c) Install the 5 screws until there is a clearance of approx. 1 mm (0.04 in.) between the brush holder and voltage regulator.
Torque: 2.0 N·m (20 kgf·cm, 17 in.·lbf)
(d) Fit the brush holder cover.

8. INSTALL REAR END COVER
(a) Install the end cover with the 3 nuts.
Torque: 4.5 N·m (46 kgf·cm, 40 in.·lbf)
(b) Install the terminal insulator with the nut.
Torque: 4.1 N·m (42 kgf·cm, 36 in.·lbf)

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9. CHECK THAT ROTOR ROTATES SMOOTHLY

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CH02H–02

INSTALLATION

Installation is in the reverse order of removal (See page CH–7).

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CH – CHARGING (5VZ-FE)

CHARGING SYSTEM	CH-1
GENERATOR	CH-5

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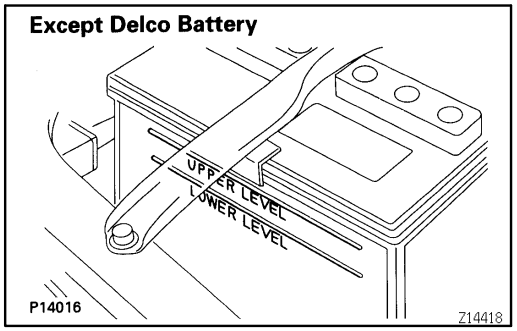
CHARGING SYSTEM

CH02P–03

ON–VEHICLE INSPECTION

CAUTION:

- **Check that the battery cables are connected to the correct terminals.**
- **Disconnect the battery cables when the battery is given a quick charge.**
- **Do not perform tests with a high voltage insulation resistance tester.**
- **Never disconnect the battery while the engine is running.**



1. CHECK BATTERY ELECTROLYTE LEVEL

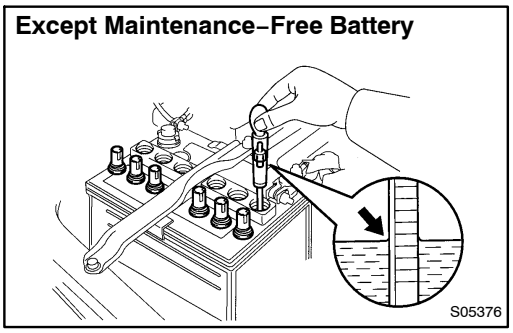
Check the electrolyte quantity of each cell.

Maintenance–Free Battery:

If under the lower level, replace the battery (or add distilled water if possible) and check the charging system.

Except Maintenance–Free Battery:

If under the lower level, add distilled water.

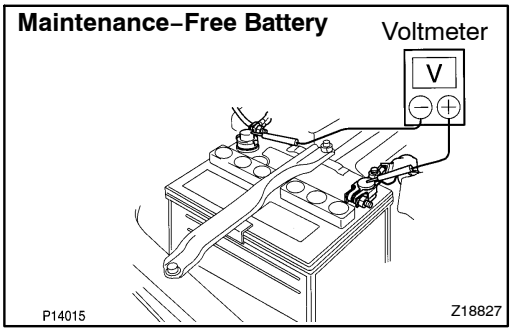


2. Except Maintenance–Battery: CHECK BATTERY SPECIFIC GRAVITY

Check the specific gravity of each cell.

Standard specific gravity: At 20°C (68°F): 1.25 – 1.29

If the specific gravity is less than specification, charge the battery.



3. Maintenance–Free Battery: CHECK BATTERY VOLTAGE

Measure the battery voltage between the negative (–) and positive (+) terminals of the battery.

Standard voltage: At 20°C (68°F): 12.7 – 12.9 V

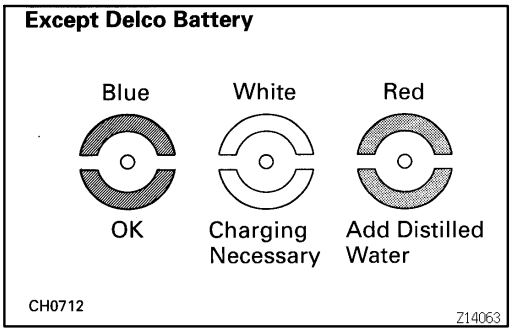
HINT:

- Before measuring the voltage, turn the ignition switch OFF and turn off the electrical systems (headlight, blower motor, rear defogger etc.) for 60 seconds to remove the surface charge.

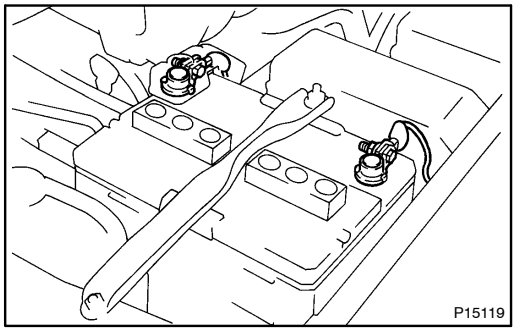
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- When measuring the voltage, however, turn the ignition switch OFF and turn off the electrical systems.

If the voltage is less than the specification, charge the battery.



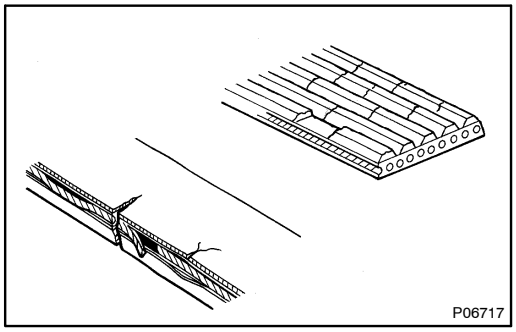
HINT:
Check the indicator as shown in the illustration.



4. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

(a) Check that the battery terminals are not loose or corroded.

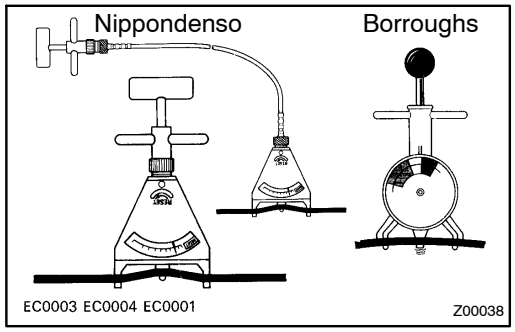
(b) Check the fusible link and fuses for continuity.



5. INSPECT DRIVE BELT

(a) Visually check the belt for excessive wear, frayed cords etc.

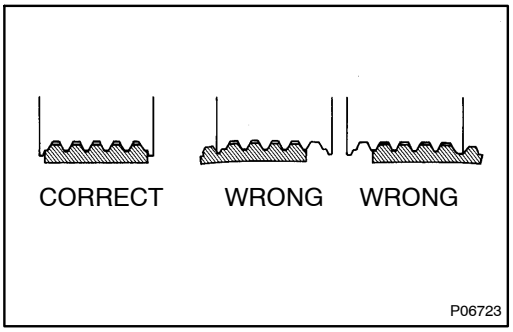
HINT:
Cracks on the ribbed side of the belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



(b) Using a belt tension gauge, check the drive belt tension.
Belt tension gauge:
Nippondenso BTG 20 (95506–00020) or
Borroughs No. BT–33–73F
Drive belt tension:
New belt: 160 ± 20 lbf
Used belt: 100 ± 20 lbf

If necessary, adjust the drive belt tension.

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HINT:

- ”New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly in the ribbed grooves. Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the crank pulley.
- After installing a new belt, run the engine for approx. 5 minutes and then recheck the tension.

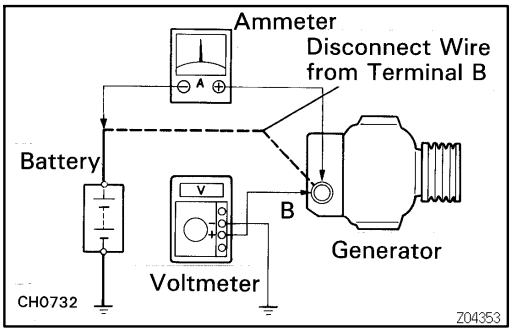
6. INSPECT FUSES FOR CONTINUITY

- ENGINE 10A
- CHARGE 7.5A
- IGN 7.5A

7. VISUALLY CHECK GENERATOR WIRING AND LISTEN FOR ABNORMAL NOISES

(a) Check that the wiring is in good condition.

(b) Check that there is no abnormal noise from the generator while the engine is running.



8. CHECK CHARGING CIRCUIT WITHOUT LOAD

HINT:

If a battery/generator tester is available, connect the tester to the charging circuit according to the manufactuer’s instructions.

(a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:

- Disconnect the wire from terminal B of the generator and connect the wire to the negative (–) terminal of the ammeter.
- Connect the test lead from the positive (+) terminal of the ammeter to terminal B of the generator.
- Connect the positive (+) lead of the voltmeter to terminal B of the generator.
- Ground the negative (–) lead of the voltmeter.

(b) Check the charging circuit as follows:

With the engine running from idling to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

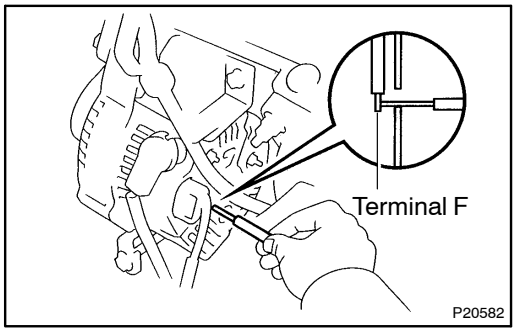
Standard voltage:

At 25 °C (77 °F): 14.0 – 15.0 V

At 115 °C (239 °F): 13.5 – 14.3 V

If the voltage reading is greater than the standard voltage, replace the voltage regulator.

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If the voltage reading is less than the standard voltage, check the voltage regulator and generator as follows:

- With terminal F grounded, start the engine and check the voltage reading of terminal B.
- If the voltage reading is higher than the standard voltage, replace the voltage regulator.
- If the voltage reading is less than the standard voltage, repair the generator.

9. INSPECT CHARGING CIRCUIT WITH LOAD

(a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater fan control switch to HI.

(b) Check the reading on the ammeter.

Standard amperage: 30 A or more

If the ammeter reading is less than standard amperage, repair the generator.

HINT:

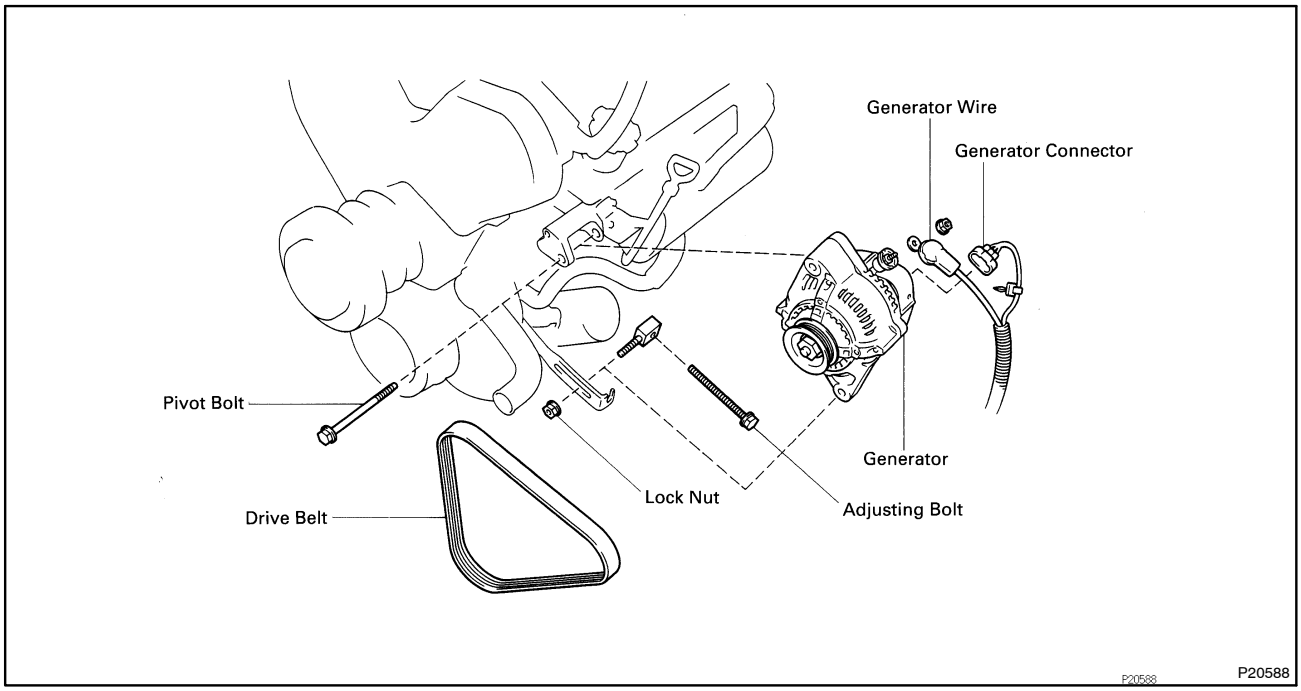
If the battery is fully charged, the indication will sometimes be less than standard amperage.

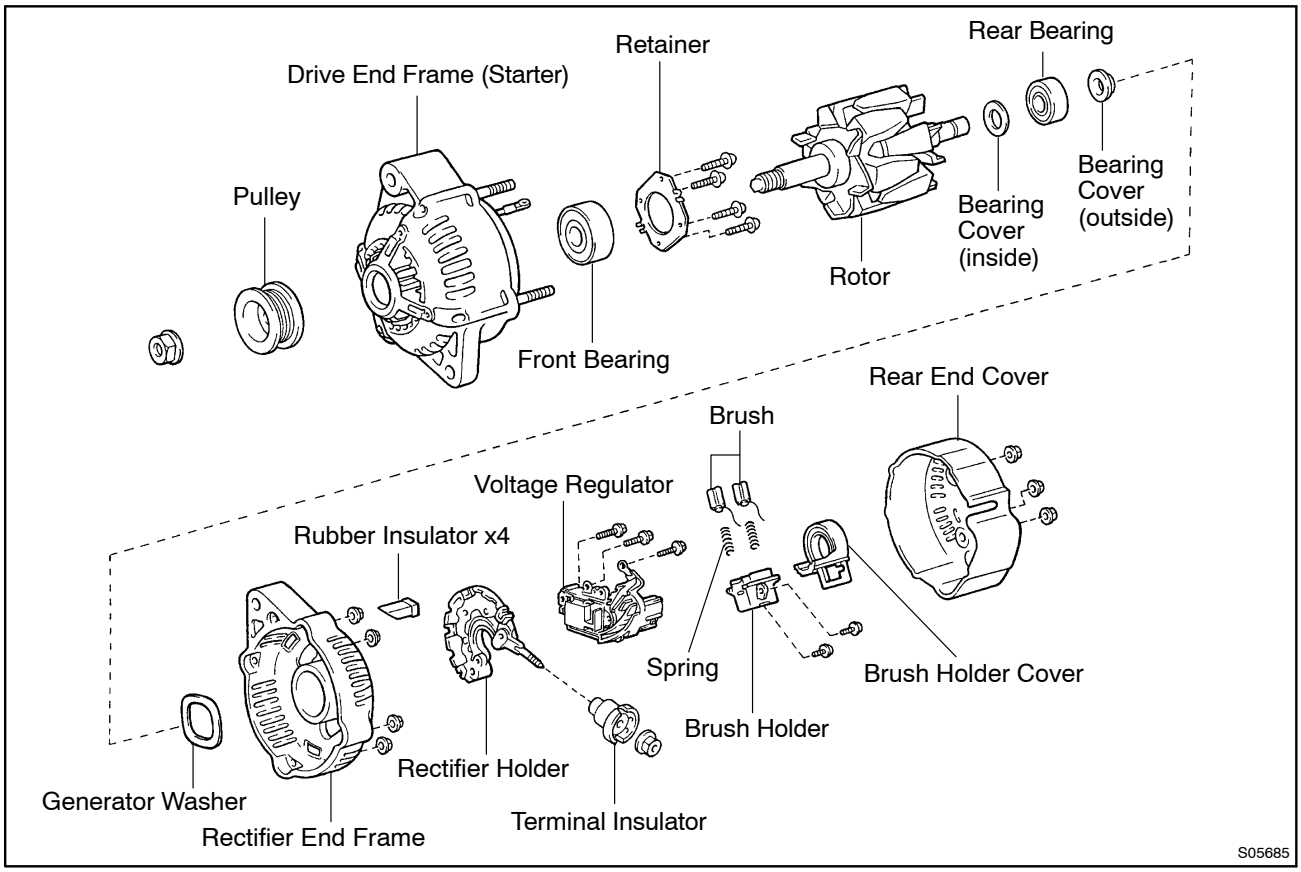
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GENERATOR

COMPONENTS

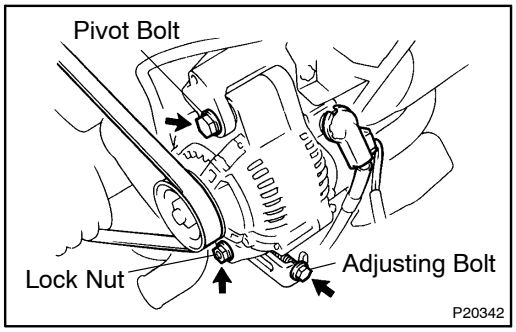
CH02J–05





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CH0HY–01

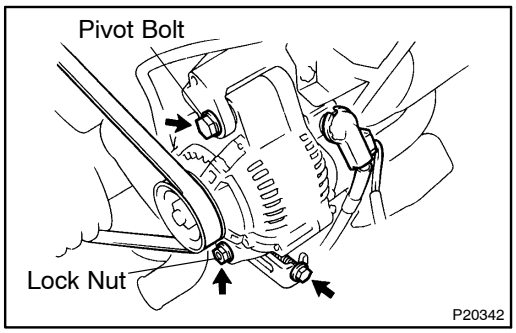


REMOVAL

1. DISCONNECT WIRING FROM GENERATOR

(a) Disconnect the connector from the generator.

(b) Remove the nut and disconnect the wire from the generator.



2. REMOVE GENERATOR DRIVE BELT

(a) Loosen the adjust lock nut, adjusting bolt and pivot bolt.

(b) Remove the drive belt.

3. REMOVE GENERATOR

(a) Remove the pivot bolt and adjusting lock nut.

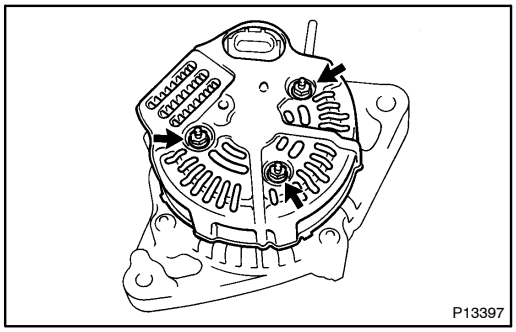
(b) Remove the generator.

Torque:
Pivot bolt: 51.0 N·m (520kgf·cm, 38 ft·lbf)
Lock Nut: 18.5 N·m (185kgf·cm, 14 ft·lbf)

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CH0HZ–01

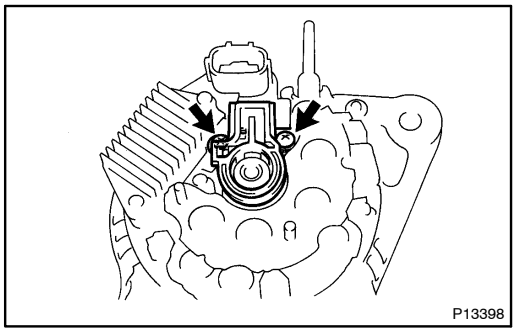
DISASSEMBLY



1. REMOVE REAR END COVER

(a) Remove the nut and terminal insulator.

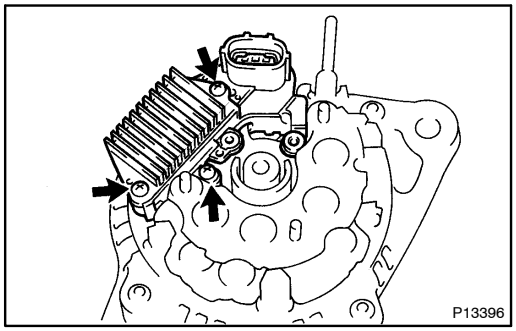
(b) Remove the 3 nuts and end cover.



2. REMOVE BRUSH HOLDER

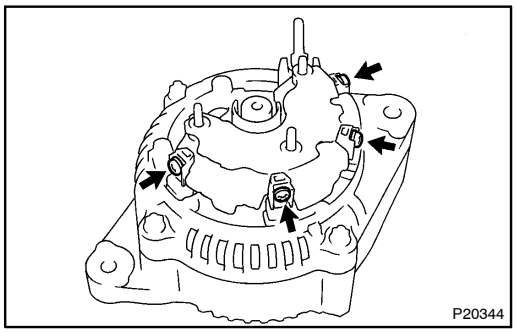
(a) Remove the 2 screws, brush holder and cover.

(b) Remove the brush holder cover from the brush holder.



3. REMOVE VOLTAGE REGULATOR

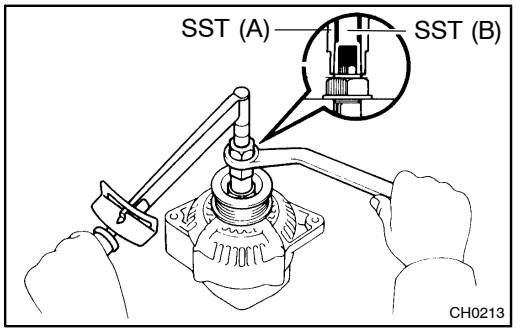
Remove the 3 screws and voltage regulator.



4. REMOVE RECTIFIER HOLDER

(a) Remove the 4 screws and rectifier holder.

(b) Remove the 4 rubber insulators.



5. REMOVE PULLEY

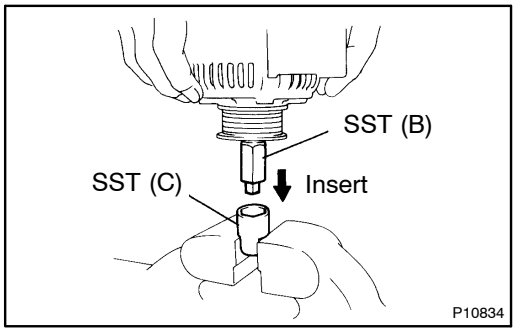
(a) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.

SST 09820–63010

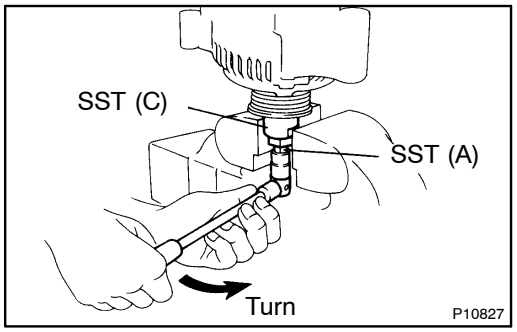
Torque:39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Check that SST (A) is secured to the rotor shaft.

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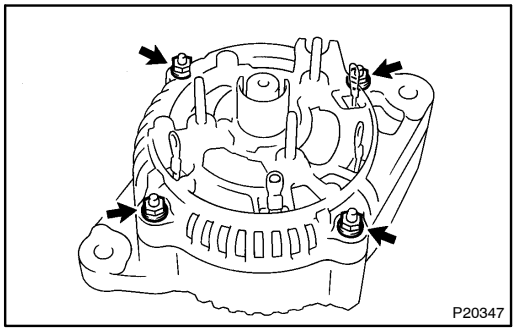
(c) Mount SST (C) in a vise.
(d) Insert SST (B) into SST (C), and attach the pulley nut to SST (C).



(e) To loosen the pulley nut, turn SST (A) in the direction shown in the illustration.

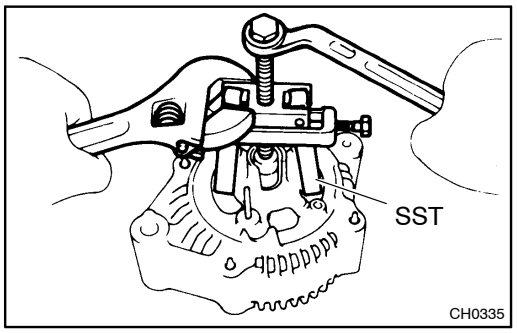
NOTICE:
To prevent damage to the rotor shaft, do not loosen the pulley nut more than one–half of a turn.

(f) Remove the generator from SST (C).
(g) Turn SST (B), and remove SST (A and B).
(h) Remove the pulley nut and pulley.

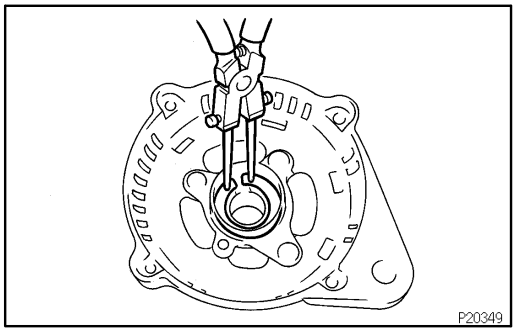


6. REMOVE RECTIFIER END FRAME

(a) Remove the 4 nuts.



(b) Using SST, remove the rectifier end frame.
SST 09286–46011



(c) Using snap ring pliers, the generator washer from the rectifier end continuity.

7. REMOVE ROTOR FROM DRIVE END FRAME

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CH0I0–01

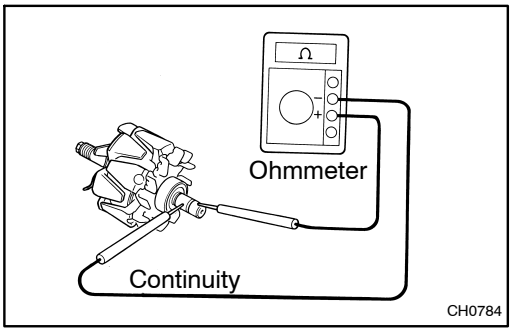
INSPECTION

1. INSPECT ROTOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance:
2.8 – 3.0 Ω at 20°C (68°F)

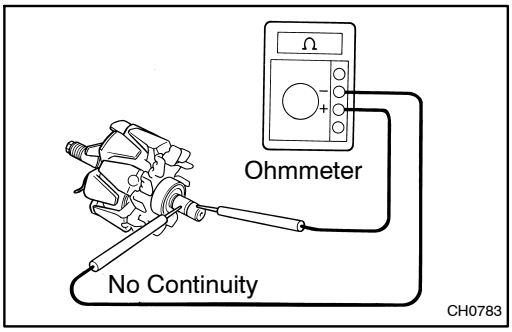
If there is no continuity, replace the rotor.



2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.



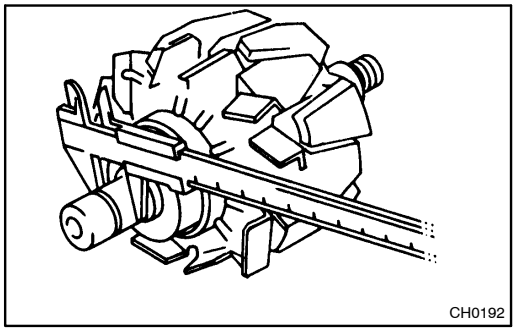
3. INSPECT SLIP RINGS

(a) Check that the slip rings are not rough or scored.

If rough or scored, replace the rotor.

(b) Using vernier calipers, measure the slip ring diameters.

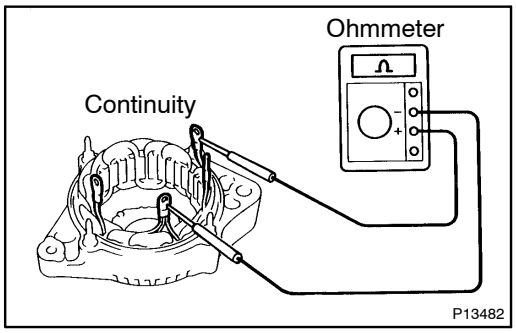
Standard diameter:
14.2 – 14.4 mm (0.559 – 0.567 in.)
Minimum diameter:
12.8 mm (0.504 in.)



4. INSPECT STATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the coil leads.

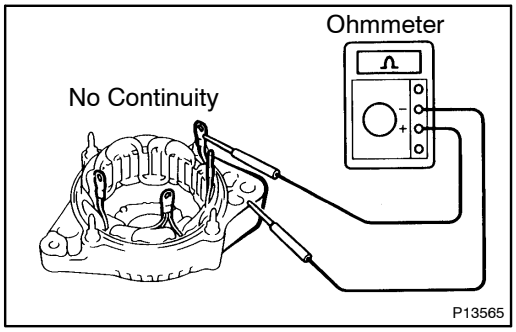
If there is no continuity, replace the drive end frame assembly.



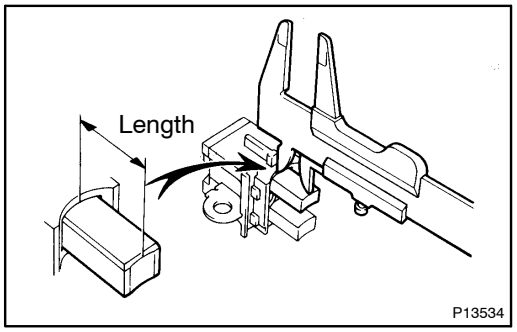
5. INSPECT STATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the coil leads and drive end frame.

If there is continuity, replace the drive end frame assembly.



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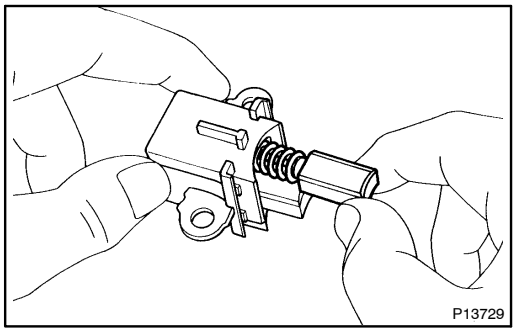


6. INSPECT EXPOSED BRUSH LENGTH

Using vernier calipers, measure the exposed brush length.

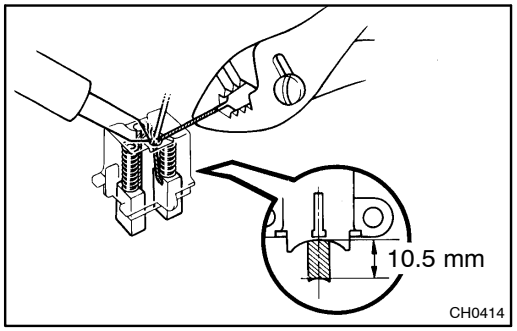
Standard exposed length:
10.5 mm (0.413 in.)
Minimum exposed length:
1.5 mm (0.059 in.)

If the exposed length is less than minimum, replace the brushes.

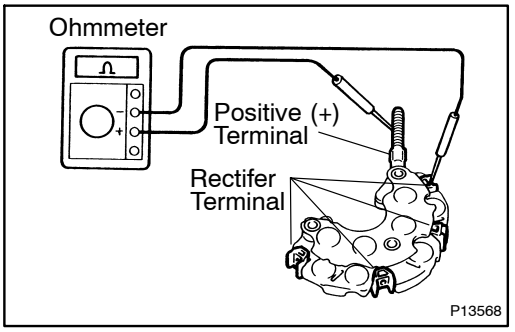


7. IF NECESSARY, REPLACE BRUSHES

(a) Unsolder and remove the brush and spring.
(b) Run the wire of the brush through the hole in the brush holder, and insert the spring and brush into the brush holder.



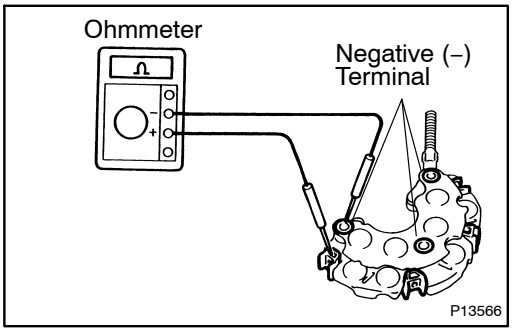
(c) Solder the brush wire to the brush holder at the exposed length.
Exposed length:
10.5 mm (0.413 in.)
(d) Check that the brush moves smoothly in the brush holder.
(e) Cut off the excess wire.
(f) Apply insulation paint to the soldered point.



8. INSPECT POSITIVE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to the positive (+) terminal and the other to each rectifier terminal.
(b) Reverse the polarity of the tester probes and repeat step (a).
(c) Check that one shows continuity and the other shows no continuity.

If continuity is not as specified, replace the rectifier holder.

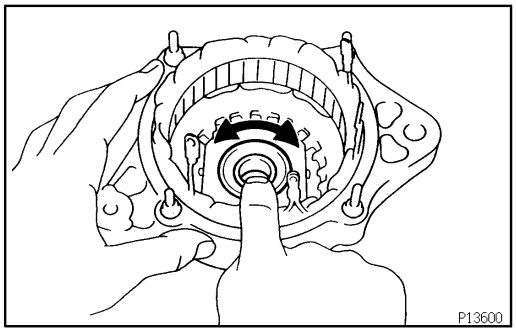


9. INSPECT NEGATIVE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to each negative (–) terminal and the other to each rectifier terminal.
(b) Reverse the polarity of the tester probes and repeat step (a).
(c) Check that one shows continuity and the other shows no continuity.

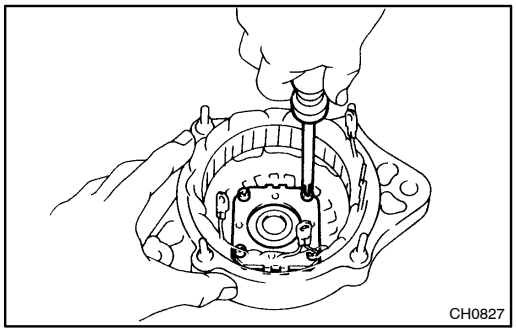
If continuity is not as specified, replace the rectifier holder.

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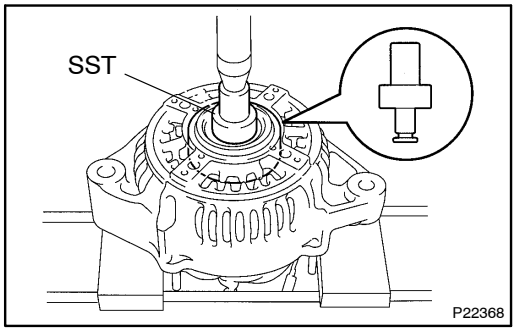
10. INSPECT FRONT BEARING

Check that the bearing is not rough or worn.

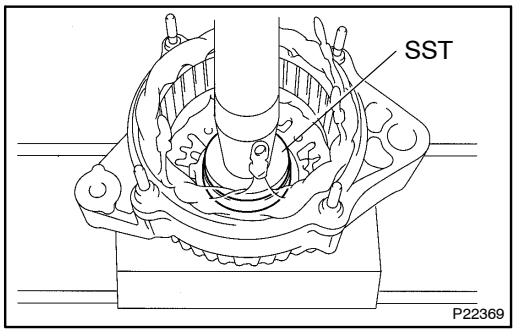


11. IF NECESSARY, REPLACE FRONT BEARING

(a) Remove the 4 screws and bearing retainer.

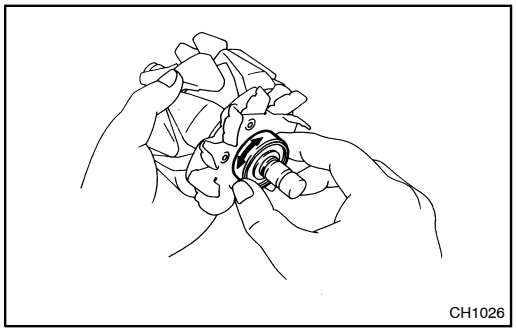


(b) Using SST and a press, press out the bearing.
SST 09950–60010 (09951–00260, 09952–06010)



(c) Using SST and a press, press in a new bearing.
SST 09950–60010 (09951–00500)

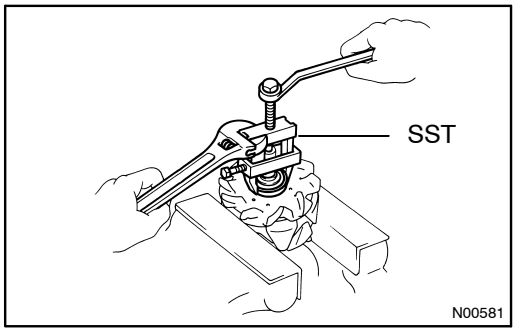
(d) Install the bearing retainer with the 4 screws.
Torque:2.6 N·m (27 kgf·cm, 23 in.·lbf)



12. INSPECT REAR BEARING

Check that the bearing is not rough or worn.

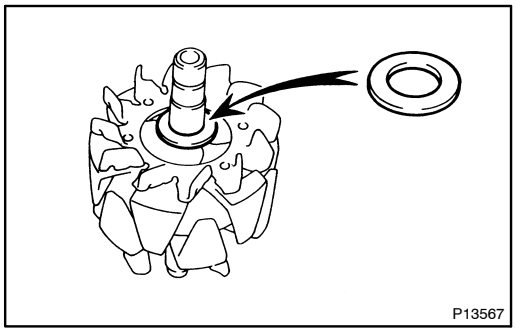
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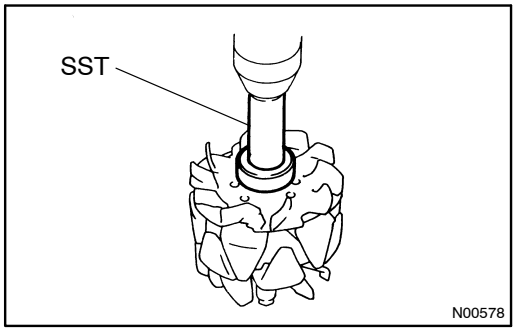
13. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the bearing cover and bearing.
SST 09820–00021

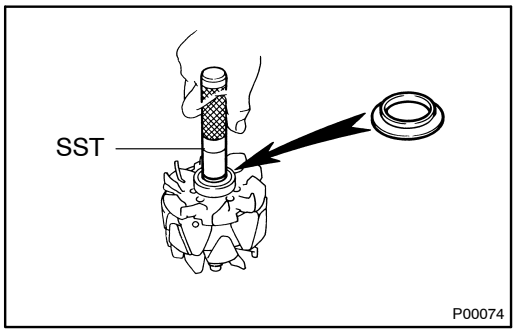
(b) Remove the bearing cover (inside).



(c) Place the bearing cover (inside) on the rotor.



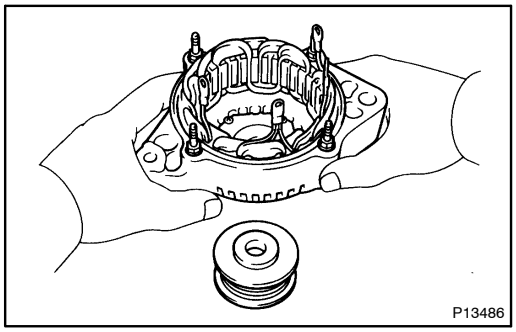
(d) Using SST and a press, press in a new bearing.
SST 09820–00030



(e) Using SST, push in the bearing cover (outside).
SST 09285–76010

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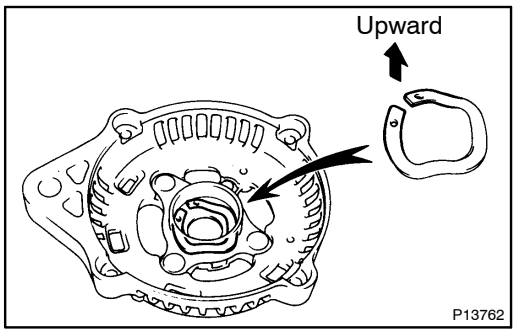
CH02N–03



REASSEMBLY

1. PLACE RECTIFIER END FRAME ON PULLEY

2. INSTALL ROTOR TO DRIVE END FRAME

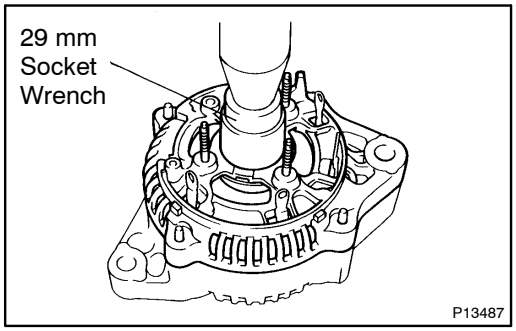


3. INSTALL RECTIFIER END FRAME

(a) Install the generator washer to the rectifier end frame.

NOTICE:

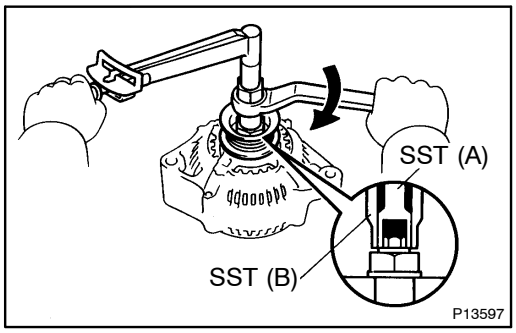
Be careful of the generator washer installation direction.



(b) Using a 29 mm socket wrench and press, slowly press in the rectifier end frame.

(c) Install the 4 nuts.

Torque:4.5 N·m (46 kgf·cm, 39 in.·lbf)



4. INSTALL PULLEY

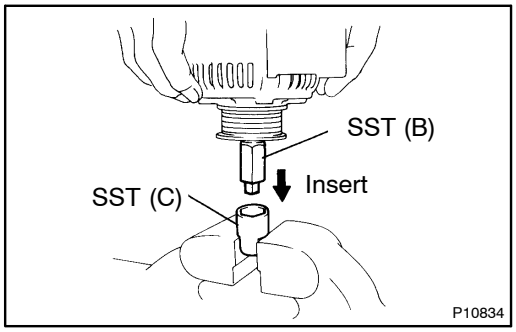
(a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.

(b) Hold SST (A) with a torque wrench, and tighten SST (B) clockwise to the specified torque.

SST 09820–63010

Torque:39 N·m (400 kgf·cm, 29 ft·lbf)

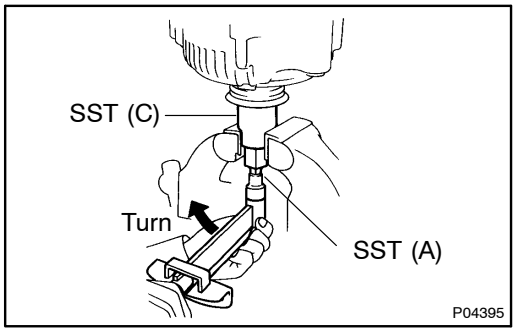
(c) Check that SST (A) is secured to the pulley shaft.



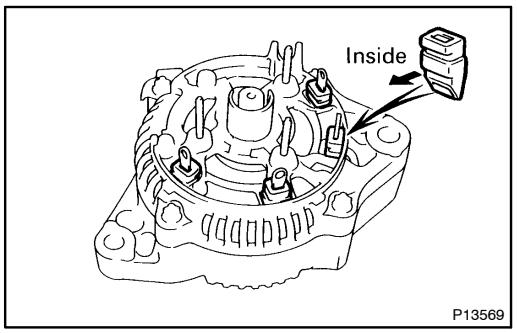
(d) Mount SST (C) in a vise.

(e) Insert SST (B) into SST (C), and attach the pulley nut to SST (C).

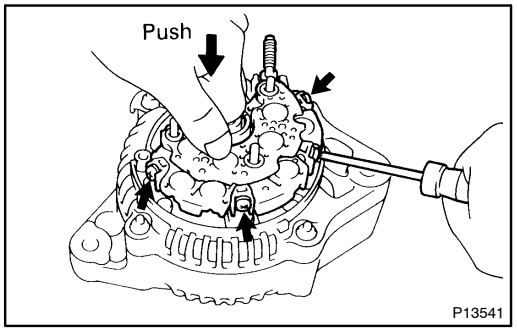
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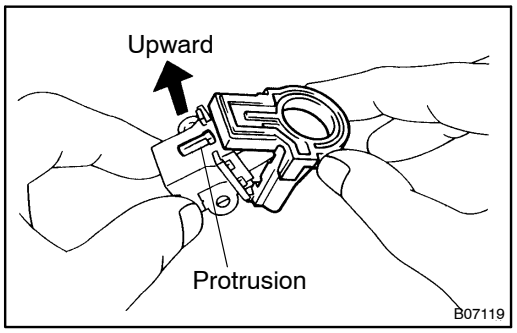
(f) To torque the pulley nut, turn SST (A) in the direction shown in the illustration.
Torque:110 N·m (1,125 kgf·cm, 81 ft·lbf)
(g) Remove the generator from SST (C).
(h) Turn SST (B), and remove SST (A and B).



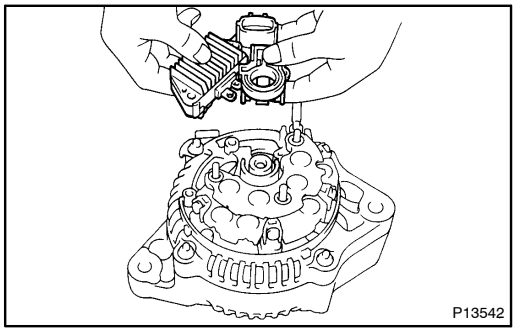
5. INSTALL RECTIFIER HOLDER
(a) Install the 4 rubber insulators on the lead wires.
NOTICE:
Be careful of the rubber insulators installation direction.



(b) Install the rectifier with the 4 screws.
Torque: 2.0 N·m (20 kgf·cm, 18 in.·lbf)

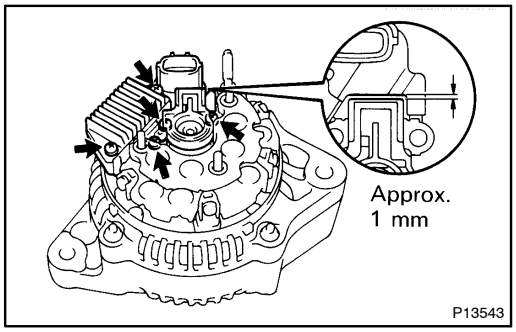


6. INSTALL BRUSH HOLDER AND VOLTAGE REGULATOR
(a) Install the brush holder cover to the brush holder.
NOTICE:
Be careful of the holder installation direction.

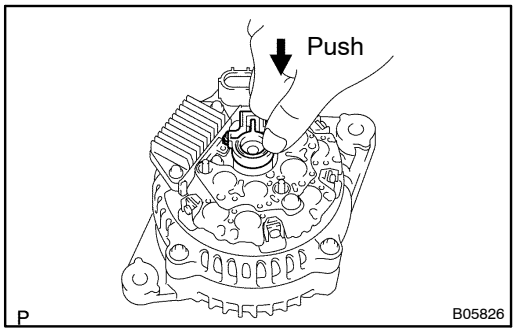


(b) Place the voltage regulator together with the brush holder horizontally on the rectifier end frame.

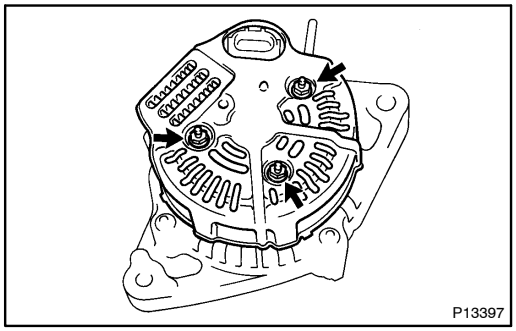
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(c) Install the 5 screws until there is a clearance of approx. 1 mm (0.04 in.) between the brush holder and voltage regulator.
Torque: 2.0 N·m (20 kgf·cm, 17 in.·lbf)

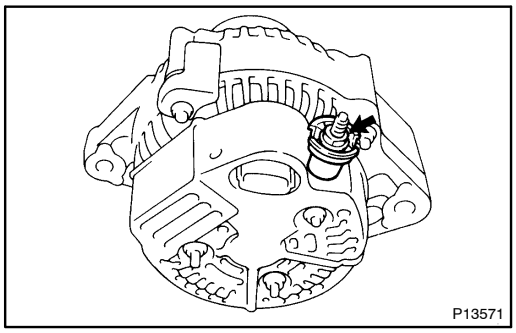


(d) Fit the brush holder cover.



7. INSTALL REAR END COVER

(a) Install the end cover with the 3 nuts.
Torque: 4.5 N·m (46 kgf·cm, 40 in.·lbf)



(b) Install the terminal insulator with the nut.
Torque:4.1 N·m (42 kgf·cm, 36 in.·lbf)

8. CHECK THAT ROTOR ROTATES SMOOTHLY

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CH02O–02

INSTALLATION

Installation is in the reverse order of removal (See page CH–6).

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CL – CLUTCH

TROUBLESHOOTING	CL-1
CLUTCH PEDAL	CL-2
CLUTCH MASTER CYLINDER	CL-5
CLUTCH RELEASE CYLINDER	CL-10
CLUTCH UNIT	CL-15

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TROUBLESHOOTING

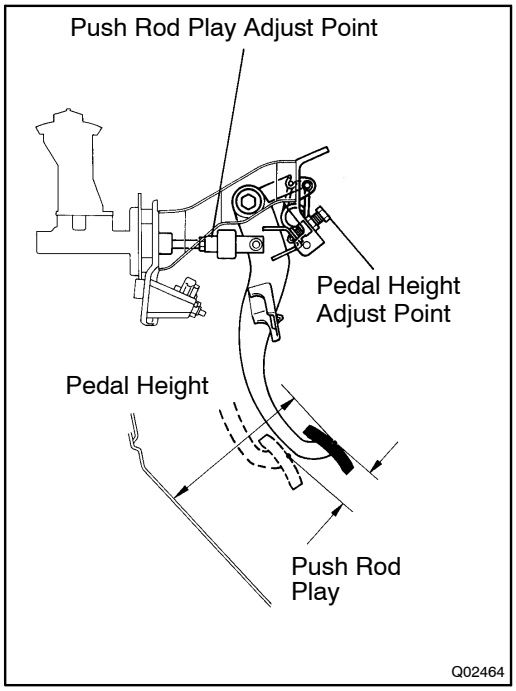
PROBLEM SYMPTOMS TABLE

CL026–01

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspect Area	See page
Clutch grabs/chatters	1. Engine mounting (Loosen)	–
	2. Clutch disc (Runout is excessive)	CL–15
	3. Clutch disc (Oily)	CL–15
	4. Clutch disc (Worn out)	CL–15
	5. Clutch disc (Damaged torsion rubber)	CL–15
	6. Clutch disc (Glazed)	CL–15
	7. Diaphragm spring (Out of tip alignment)	CL–19
Clutch pedal spongy	1. Clutch line (Air in line)	–
	2. Master cylinder cup (Damaged)	CL–5
	3. Release cylinder cup (Damaged)	CL–10
Clutch noisy	1. Release bearing (Worn, dirty or damaged)	CL–15
	2. Input shaft bearing (Worn, dirty or damaged)	–
	3. Clutch disc torsion rubber (Damaged)	CL–15
Clutch slips	1. Clutch pedal (Freeplay out of adjustment)	CL–2
	2. Clutch disc (Oily)	CL–15
	3. Clutch disc (Worn out)	CL–15
	4. Diaphragm spring (Damaged)	CL–15
	5. Pressure plate (Distortion)	CL–15
	6. Flywheel (Distortion)	–
Clutch does not disengage	1. Clutch pedal (Freeplay out of adjustment)	CL–2
	2. Clutch line (Air in line)	–
	3. Master cylinder cup (Damaged)	CL–5
	4. Release cylinder cup (Damaged)	CL–10
	5. Input shaft bearing (Worn, dirty or damaged)	–
	6. Clutch disc (Out of true)	CL–15
	7. Clutch disc (Runout is excessive)	CL–15
	8. Clutch disc (Lining broken)	CL–15
	9. Clutch disc (Dirty or burred)	CL–15
	10. Clutch disc (Oily)	CL–15
	11. Clutch disc (Lack of spline grease)	CL–19
	12. Diaphragm spring (Damaged)	CL–15
	13. Diaphragm spring (Out of tip alignment)	CL–19
	14. Pressure plate (Distortion)	CL–15

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CLUTCH PEDAL

CL027–01

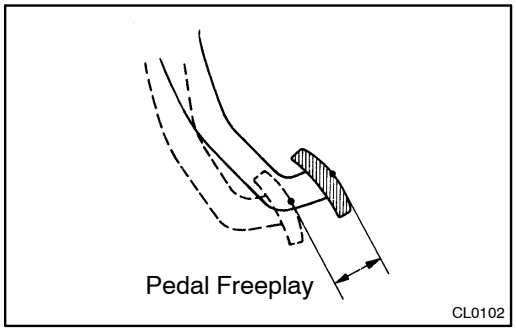
INSPECTION

1. CHECK THAT PEDAL HEIGHT IS CORRECT

Pedal height from floor panel:
154.6 – 164.6 mm (6.087 – 6.480 in.)
Pedal height from asphalt sheet:
Extra Cab (4WD): 150.1 – 160.1 mm (5.909 – 6.303 in.)
Others: 153.1 – 163.1 mm (6.027 – 6.421 in.)

2. IF NECESSARY, ADJUST PEDAL HEIGHT

Loosen the lock nut and turn the stopper bolt until the height is correct. Tighten the lock nut.



3. CHECK THAT PEDAL FREEPLAY AND PUSH ROD PLAY ARE CORRECT

- Push in on the pedal until the beginning of clutch resistance is felt.
  Pedal freeplay: 5.0 – 15.0 mm (0.197 – 0.591 in.)
- Gently push on the pedal until the resistance begins to increase a little.
  Push rod play at pedal top:
  1.0 – 5.0 mm (0.039 – 0.197 in.)

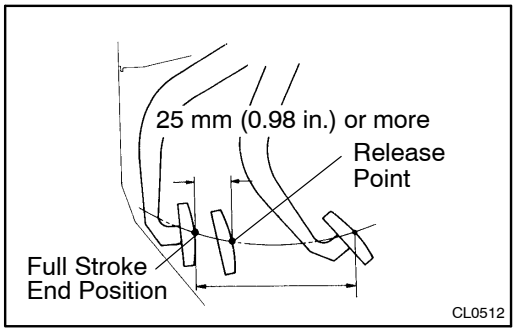
4. IF NECESSARY, ADJUST PEDAL FREEPLAY AND PUSH ROD PLAY

(a) Loosen the lock nut and turn the push rod until the freeplay and push rod play are correct.
(b) Tighten the lock nut.
(c) After adjusting the pedal freeplay, check the pedal height.
(d) Connect the air duct and install the lower finish panel.

5. CHECK CLUTCH RELEASE POINT

(a) Pull the parking brake lever and install wheel stopper.
(b) Start the engine and idle the engine.
(c) Without depressing the clutch pedal, slowly shift the shift lever into reverse position until the gears contact.

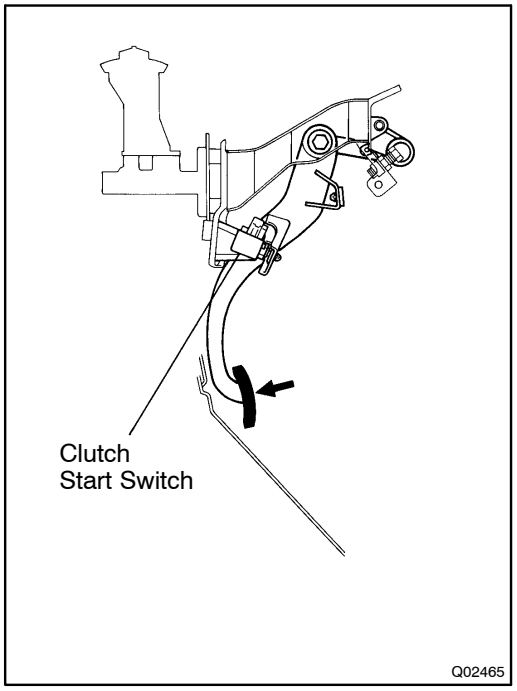
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(d) Gradually depress the clutch pedal and measure the stroke distance from the point the gear noise stops (release point) up to the full stroke end position.
Standard distance:
25 mm (0.98 in.) or more
(From pedal stroke end position to release point)

If the distance not as specified, perform the following operation.

- Check pedal height.
- Check push rod play and pedal freeplay.
- Bleed the clutch line.
- Check the clutch cover and disc.

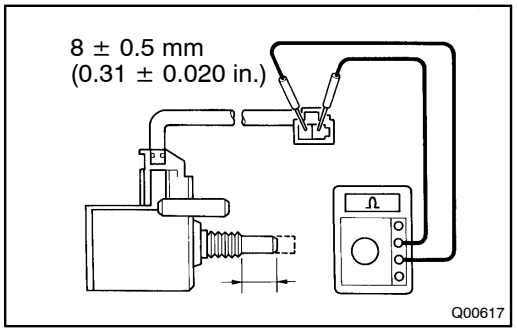


6. CHECK CLUTCH START SYSTEM

(a) Check that the engine does not start when the clutch pedal is released.

(b) Check that the engine starts when the clutch pedal is fully depressed.

If necessary, replace the clutch start switch.



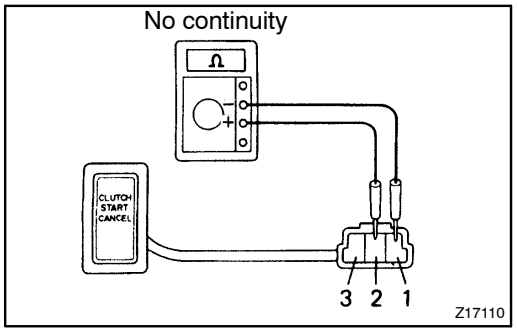
7. CHECK CONTINUITY OF CLUTCH START SWITCH

Check the continuity between terminals when the switch is ON and OFF.

Switch position	Condition
ON (pushed)	Continuity
OFF (free)	No Continuity

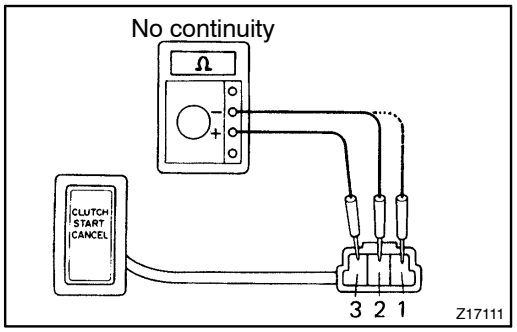
If continuity is not as specified, replace the switch.

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8. CHECK CONTINUITY OF CLUTCH START CANCEL SWITCH

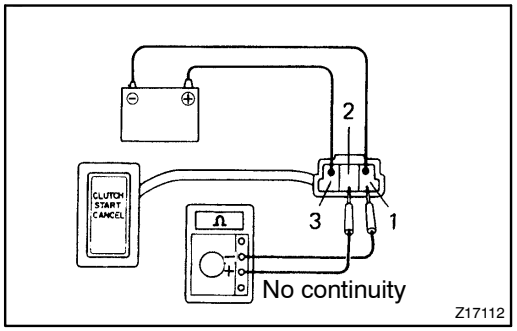
(a) Check that there is no continuity when connecting the positive (+) lead from the ohmmeter to terminal 2 and the negative (–) lead to terminal 1.



(b) Check that there is no continuity when connecting the positive (+) lead from the ohmmeter to terminal 3 and the negative (–) lead to terminal 1.

(c) Check the there is no continuity between terminals 2 and 3.

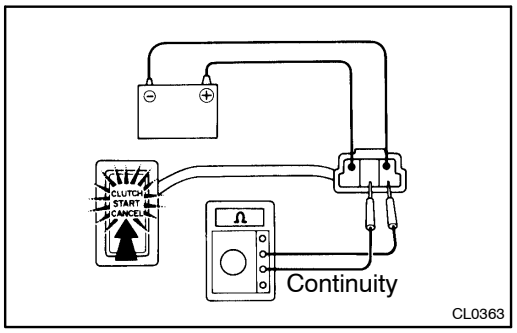
If continuity is not as specified, replace the clutch start cancel switch.



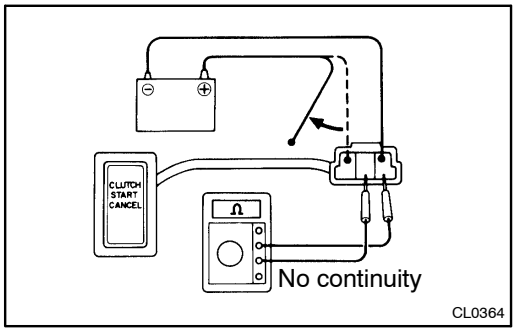
9. CHECK OPERATION OF CLUTCH START CANCEL SWITCH

(a) Connect positive (+) lead from the battery to terminal 3 and connect negative (–) lead to terminal 1.

(b) Check that there is no continuity when connecting the positive (+) lead from the ohmmeter to terminal 2 and the negative (–) lead to terminal 1.



(c) When pushing the switch, check that the indicator light connect on and there is continuity between terminal 1 and 2.



(d) Check that there is no continuity between terminals 1 and 2 when disconnect the battery lead.

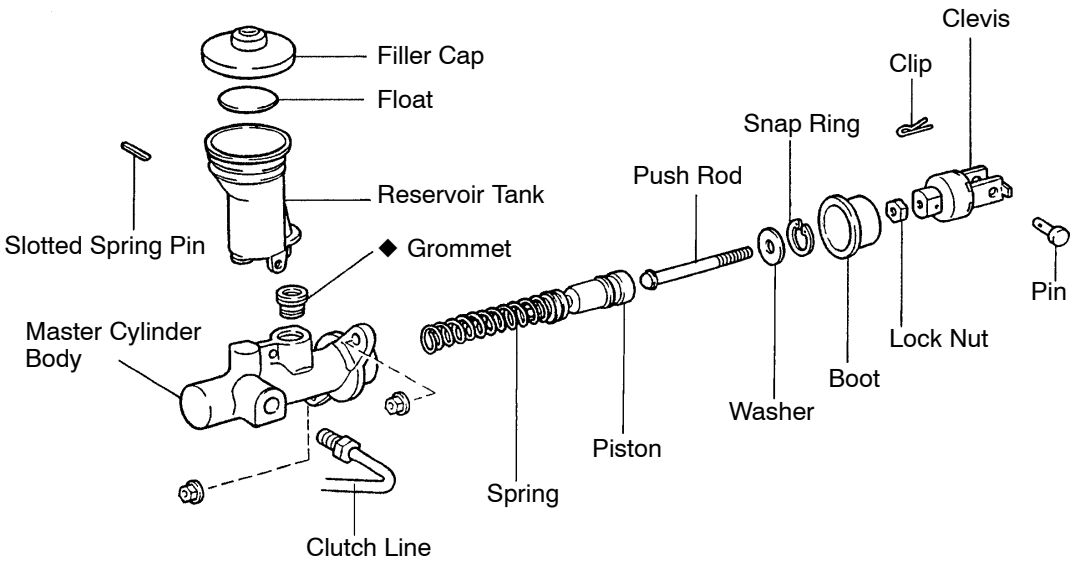
If continuity is not as specified, replace the clutch start cancel switch.

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CLUTCH MASTER CYLINDER

COMPONENTS

CL028–03



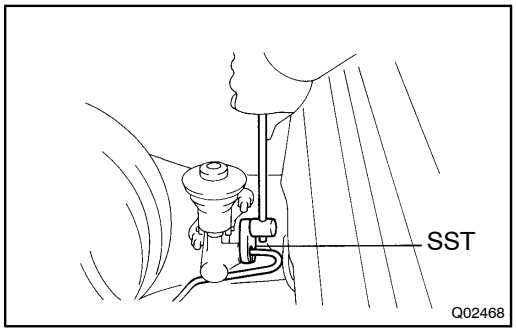
◆ Non–reusable part

Q07730

Author : Date : 1240

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CL029–01



REMOVAL

1. DRAW OUT FLUID WITH SYRINGE

2. DISCONNECT CLUTCH LINE

Using SST, disconnect the line. Use a container to catch the fluid.

SST 09023–00100

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

3. REMOVE CLIP AND CLEVIS PIN

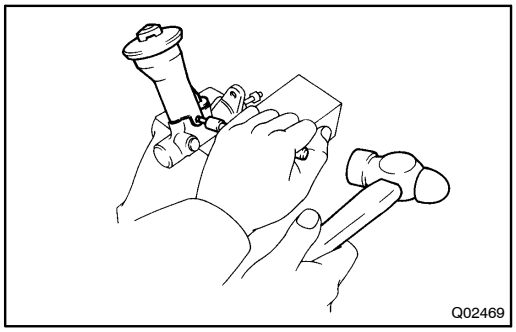
4. REMOVE MOUNTING NUTS AND PULL OUT MASTER CYLINDER

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

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CL02A–01

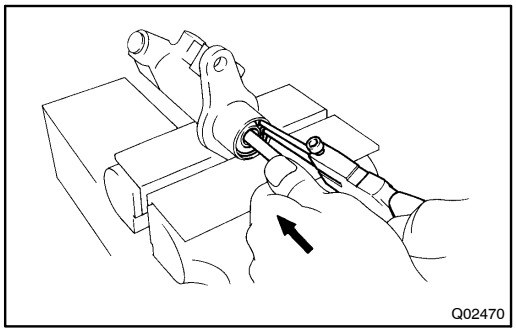
DISASSEMBLY


Q02469

1. REMOVE RESERVOIR TANK

(a) Using a pin punch and hammer, drive out the slotted spring pin.

(b) Remove the reservoir tank and grommet.


Q02470

2. REMOVE PUSH ROD

Pull back the boot, and using snap ring pliers, remove the snap ring.

3. REMOVE PISTON

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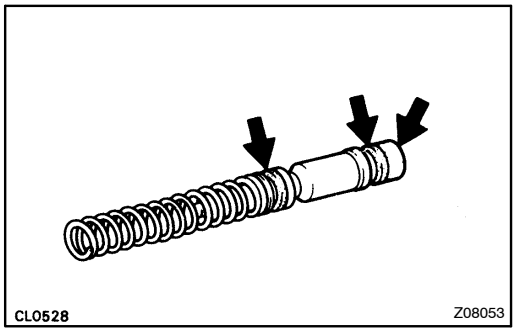
CL02B–01

REASSEMBLY

1. COAT PARTS WITH LITHIUM SOAP BASE GLYCOL GREASE, AS SHOWN

2. INSERT PISTON INTO CYLINDER

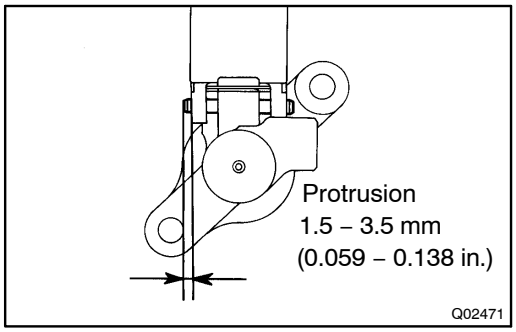
3. INSTALL PUSH ROD ASSEMBLY WITH SNAP RING



4. INSTALL RESERVOIR TANK

(a) Install the reservoir tank and a new grommet.

(b) Using a pin punch and hammer, drive in the slotted spring pin.



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CL02C–02

INSTALLATION

Installation is in the reverse order of removal (See page CL–6).

HINT:

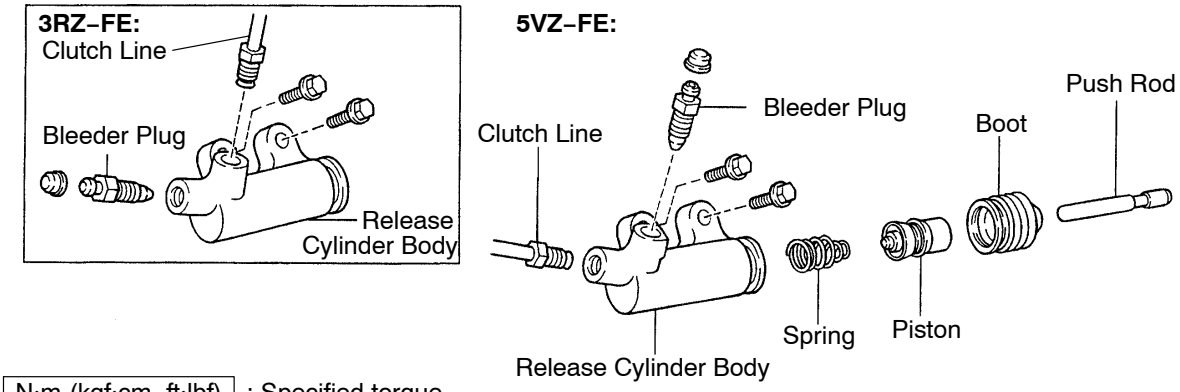
After installation, bleed system and adjust clutch pedal.

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CLUTCH RELEASE CYLINDER

COMPONENTS

CL02D–03

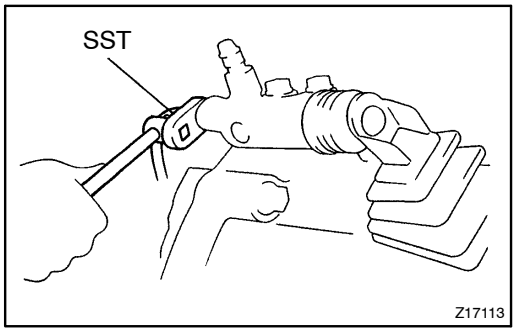


N·m (kgf·cm, ft·lbf) : Specified torque

Q07554

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CL02E–03



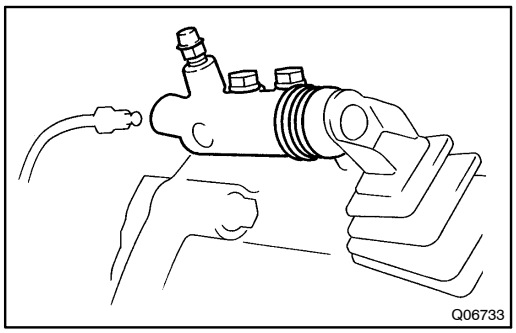
REMOVAL

1. DISCONNECT CLUTCH LINE

Using SST, disconnect the line. Use a container to catch the fluid.

SST 09023–00100

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

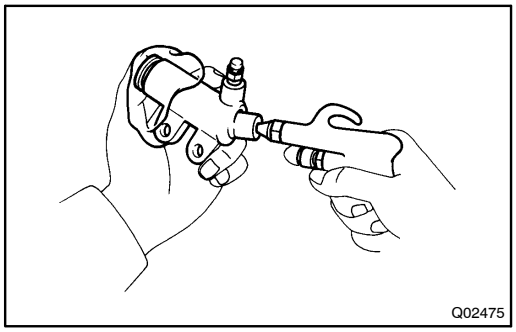


2. REMOVE 2 BOLTS AND PULL OUT RELEASE CYLINDER

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

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CL02F–01



DISASSEMBLY

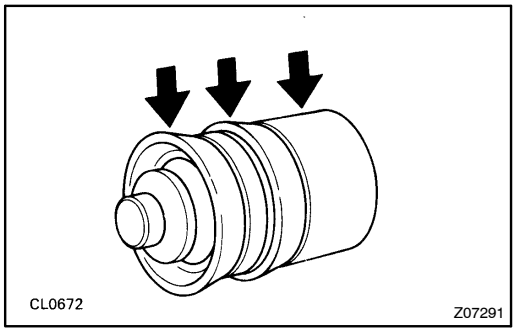
1. PULL OUT BOOT WITH PUSH ROD

2. REMOVE PISTON

Using compressed air, remove the piston with the spring from the cylinder.

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CL02G–01



REASSEMBLY

1. COAT PISTON WITH LITHIUM SOAP BASE GLYCOL GREASE, AS SHOWN
2. INSTALL PISTON WITH SPRING INTO CYLINDER
3. INSTALL BOOT WITH PUSH ROD TO CYLINDER

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CL02H–02

INSTALLATION

Installation is in the reverse order of removal (See page CL–11).

HINT:

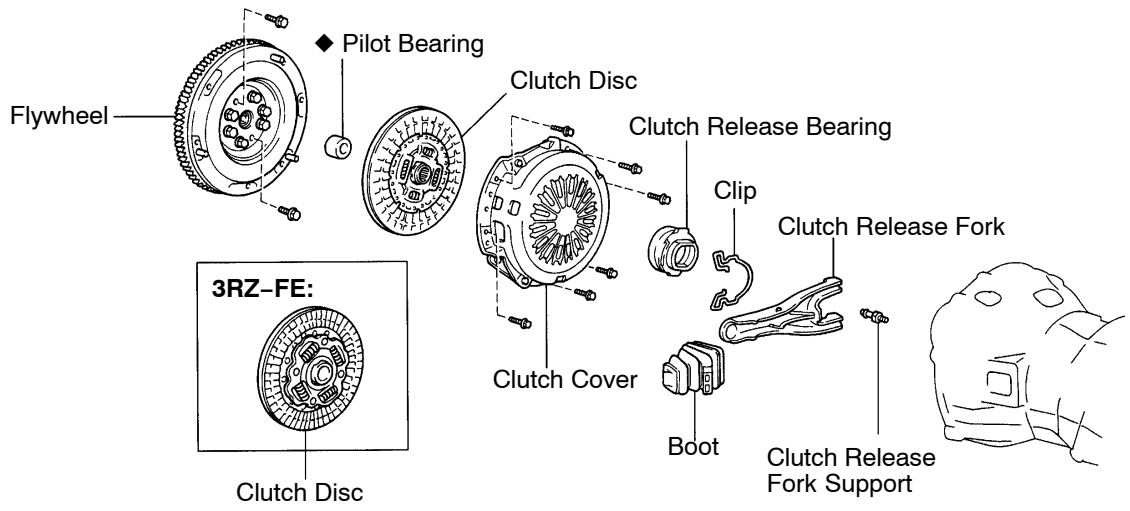
After installation, bleed clutch system.

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CLUTCH UNIT

COMPONENTS

CL02I–03



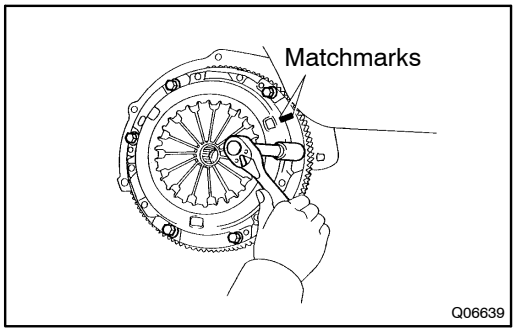
◆ Non–reusable part

Q08025

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CL02J–01

REMOVAL



1. REMOVE TRANSMISSION FROM ENGINE

W59: See page MT–3
R150 (2WD): MT–3
R150F (4WD): MT–6

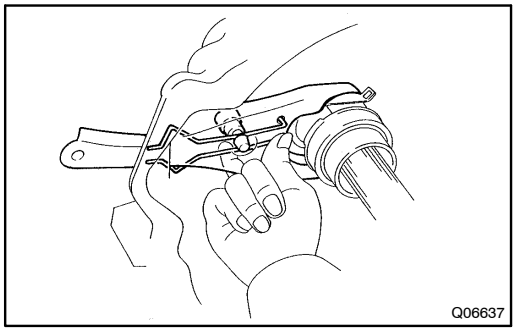
2. REMOVE CLUTCH COVER AND DISC

(a) Place matchmarks on the flywheel and clutch cover.

(b) Loosen each set bolt one turn at a time until spring tension is released.

(c) Remove the set bolts, and pull off the clutch cover with the clutch disc.

NOTICE:
Do not drop the clutch disc.



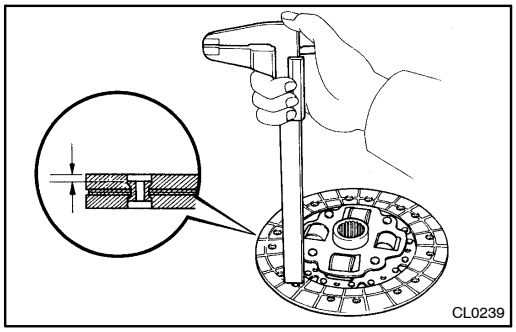
3. REMOVE BOOT, RELEASE BEARING AND FORK FROM TRANSMISSION

Remove the boot and release bearing together with the fork and then separate them.

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CL02K–04

INSPECTION

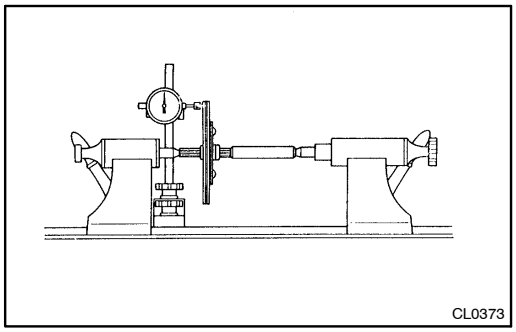


1. INSPECT CLUTCH DISC FOR WEAR OR DAMAGE

Using calipers, measure the rivet head depth.

Minimum rivet depth: 0.3 mm (0.012 in.)

If necessary, replace the clutch disc.

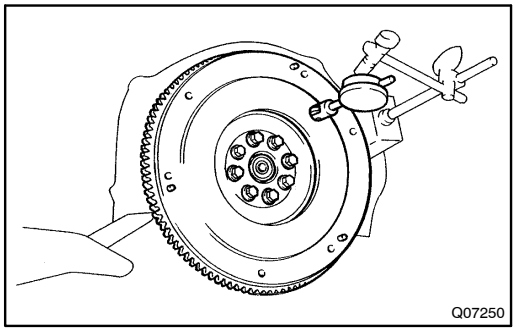


2. INSPECT CLUTCH DISC RUNOUT

Using a dial indicator, check the disc runout.

Maximum runout: 0.8 mm (0.031 in.)

If necessary, replace the clutch disc.

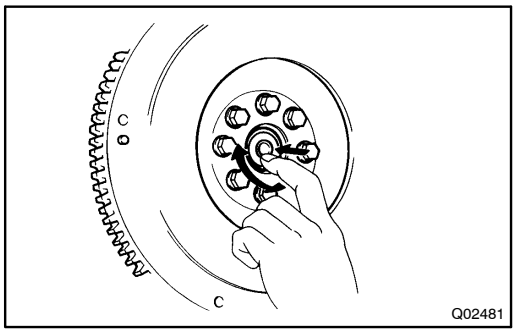


3. INSPECT FLYWHEEL RUNOUT

Using a dial indicator, check the flywheel runout.

Maximum runout: 0.1 mm (0.004 in.)

If necessary, replace the flywheel.



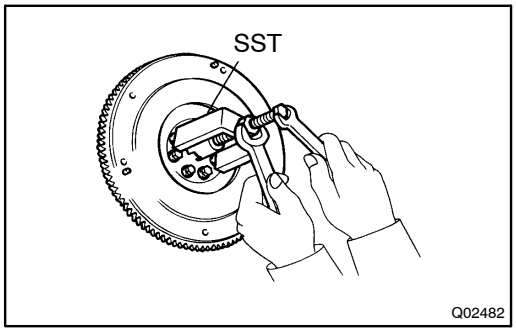
4. INSPECT PILOT BEARING

Turn the bearing by hand while applying force in the rotation direction.

If the bearing sticks or has much resistance, replace the pilot bearing.

HINT:

The bearing is permanently lubricated and requires no clearing or lubrication.

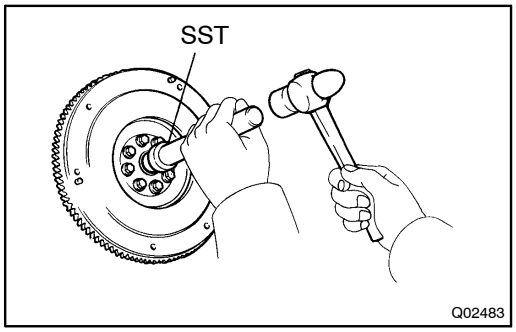


5. IF NECESSARY, REPLACE PILOT BEARING

(a) Using SST, remove the pilot bearing.

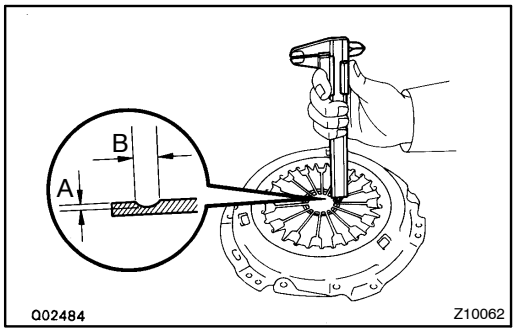
SST 09303–35011

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(b) Using SST, install a new pilot bearing.
SST 09304–30012

HINT:
After assembling the pilot bearing to the hub, install sure that it rotates smoothly.

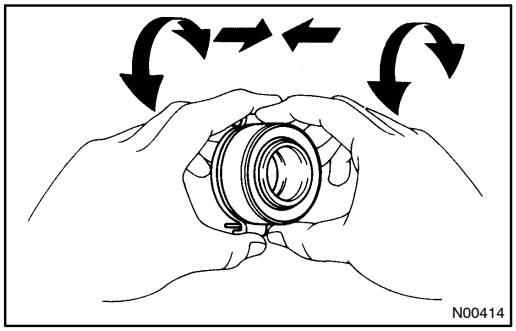


6. INSPECT DIAPHRAGM SPRING FOR WEAR

Using calipers, measure the diaphragm spring for depth and width of wear.

Maximum
Depth A: 0.6 mm (0.024 in.)
Width B: 5.0 mm (0.197 in.)

If necessary, replace the clutch cover.



7. INSPECT RELEASE BEARING

Turn the bearing by hand while applying force in the axial direction.

HINT:
The bearing is permanently lubricated and requires no cleaning or lubrication.

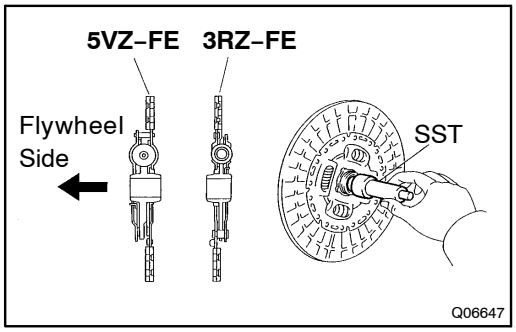
If necessary, replace the release bearing.

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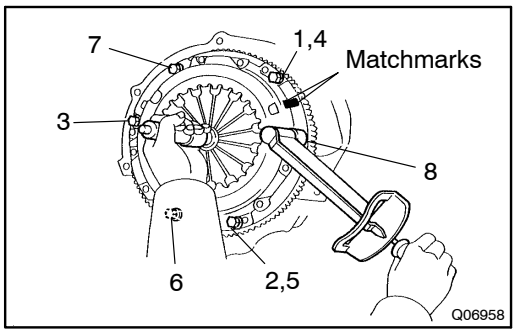
CL02L–01

INSTALLATION

1. INSTALL CLUTCH DISC AND CLUTCH COVER ON FLYWHEEL

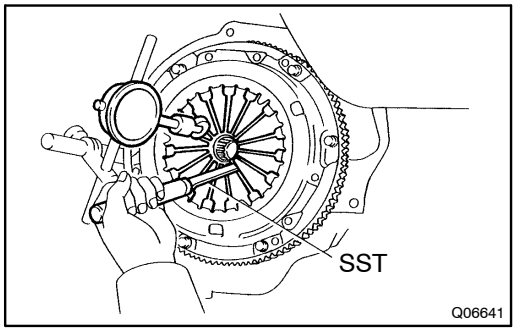


(a) Insert SST in the clutch disc, and then set them and the clutch cover in position.
SST 09301–00110



(b) Align the matchmarks on the clutch cover and flywheel.
(c) Torque the 6 bolts on the clutch cover in the order shown.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

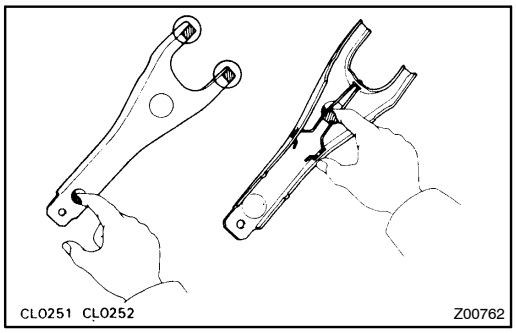
HINT:
Temporarily tighten the No.1 and No.2 bolts.



2. CHECK DIAPHRAGM SPRING TIP ALIGNMENT

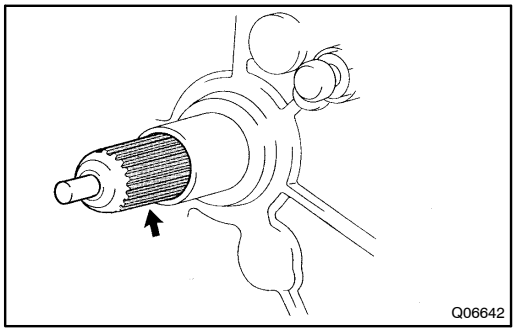
Using a dial indicator with roller instrument, check the diaphragm spring tip alignment.
Maximum non–alignment: 0.5 mm (0.020 in.)

If alignment is not as specified, using SST, adjust the diaphragm spring tip alignment.
SST 09333–00013



3. APPLY MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE (NLGI NO.2)

(a) Apply release hub grease to the these parts.
- Release fork and hub contact point
- Release fork and push rod contact point
- Release fork pivot point



(b) Apply clutch spline grease.
- Clutch disc spline

HINT:
Recommended grease part number 08887–01706 (100g).

4. INSTALL BOOT, RELEASE BEARING AND FORK TO TRANSMISSION

Install the boot and bearing to the release fork, and then install them to the transmission.

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5. INSTALL TRANSMISSION TO ENGINE
W59: See page MT–3
R150 (2WD): See page MT–3
R150F (4WD):See page MT–6

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MT – MANUAL TRANSMISSION (R150, R150F)

MANUAL TRANSMISSION SYSTEM	MT-1
TROUBLESHOOTING	MT-2
MANUAL TRANSMISSION UNIT (2WD)	MT-3
MANUAL TRANSMISSION UNIT (4WD)	MT-6
MANUAL TRANSMISSION ASSEMBLY	MT-11
INPUT SHAFT	MT-22
OUTPUT SHAFT	MT-25
COUNTER GEAR AND REVERSE IDLER GEAR	MT-34
FRONT BEARING RETAINER OIL SEAL	MT-40
EXTENSION HOUSING AND TRANSFER ADAPTOR	MT-42

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MANUAL TRANSMISSION SYSTEM

MT04I–02

PRECAUTION

When working with FIPG material, you must observe the following items.

- **Using a razor blade and gasket scraper, remove all the old FIPG material from the gasket surfaces.**
- **Thoroughly clean all components to remove all the loose material.**
- **Clean both sealing surfaces with a non–residue solvent.**
- **Apply FIPG in an approx. 1 mm (0.04 in.) wide bead along the sealing surface.**
- **Parts must be assembled within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.**

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TROUBLESHOOTING

MT04J–01

PROBLEM SYMPTOMS TABLE

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

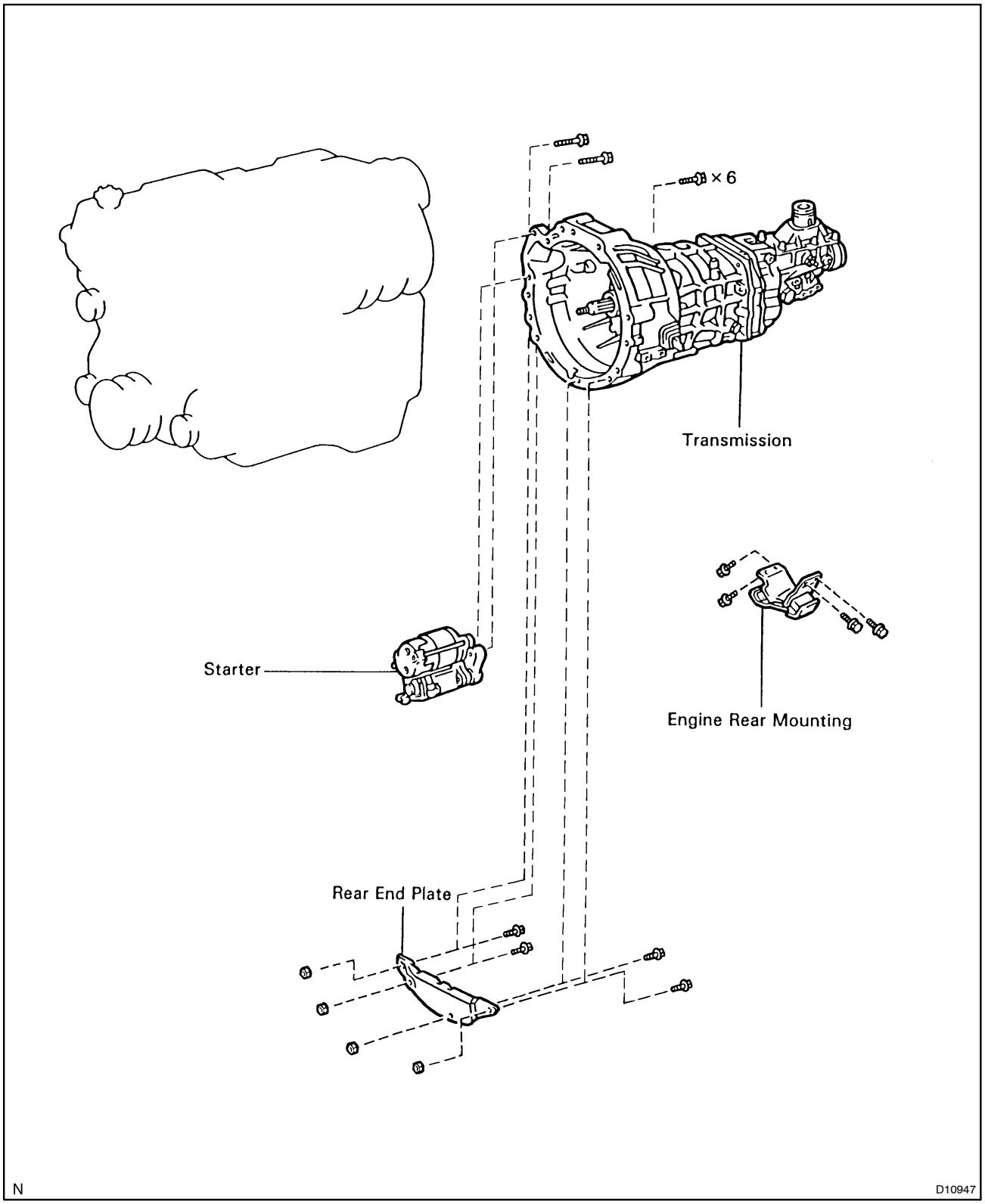
Symptom	Suspect Area		See page
Noise	1. Oil (Level low)	2WD	MT–4
		4WD	MT–7
	2. Oil (Wrong)	2WD	MT–4
		4WD	MT–7
	3. Gear (Worn or damaged)		MT–11
	4. Bearing (Worn or damaged)		MT–11
Oil leakage	1. Oil (Level too high)	2WD	MT–4
		4WD	MT–7
	2. Gasket (Damaged)		MT–11
	3. Oil seal (Worn or damaged)		MT–11
	4. O–Ring (Worn or damaged)		MT–11
Hard to shift or will not shift	1. Synchronizer ring (Worn or damaged)		MT–22 MT–25 MT–34
	2. Shift key spring (Damaged)		MT–25 MT–34
Jumps out of gear	1. Locking ball spring (Damaged)		MT–11
	2. Shift fork (Worn)		MT–11
	3. Gear (Worn or damaged)		MT–11
	4. Bearing (Worn or damaged)		MT–11

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MANUAL TRANSMISSION UNIT (2WD)

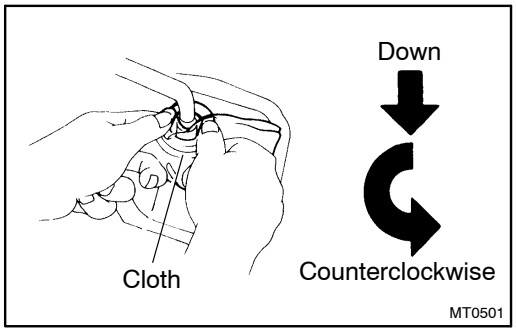
COMPONENTS

MT04K–04



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MT0ER–01



REMOVAL

1. REMOVE TRANSMISSION WITH ENGINE (See page EM–65)

2. REMOVE REAR END PLATE

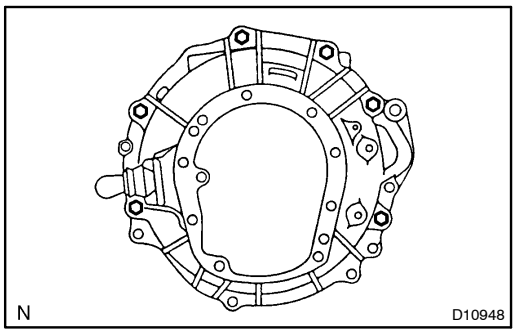
Remove the 4 bolts, nuts and rear end plate.

Torque:37 N·m (380 kgf·cm, 27 ft·lbf)

3. REMOVE STARTER

Remove the 2 bolts and starter.

Torque:39 N·m (400 kgf·cm, 29 ft·lbf)



4. REMOVE TRANSMISSION FROM ENGINE

(a) Remove the 6 transmission mounting bolts from the engine.

Torque:72 N·m (730 kgf·cm, 53 ft·lbf)

(b) Pull out the transmission toward the rear.

5. REMOVE ENGINE REAR MOUNTING

(a) Remove the 4 bolts and engine rear mounting.

Torque:25 N·m (250 kgf·cm, 18 ft·lbf)

(b) Lower the front side of the transmission and remove it from the front side of the vehicle.

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INSTALLATION

Installation is in the reverse order of removal (See page MT–4).

HINT:

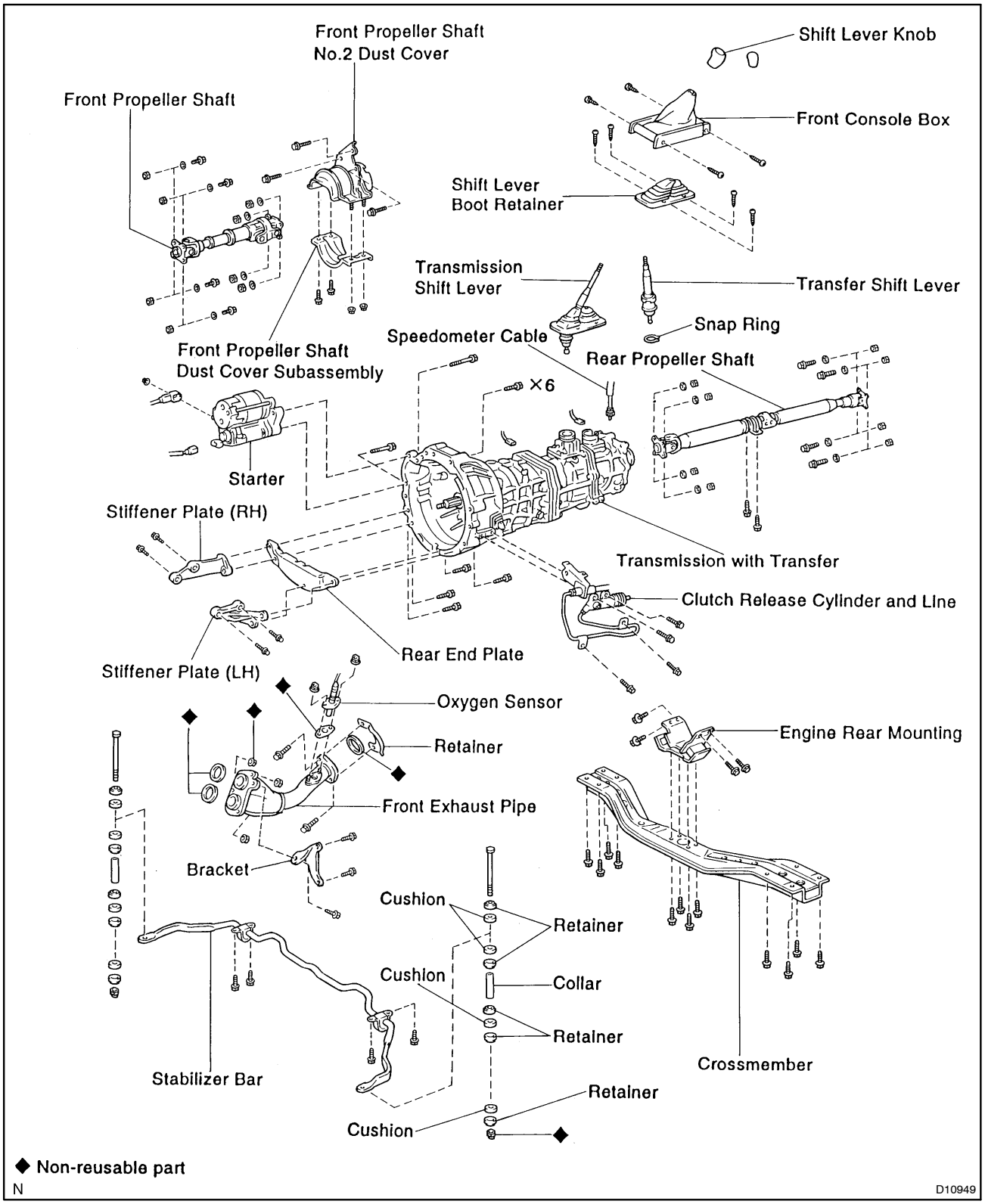
After installation, do the road test.

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MANUAL TRANSMISSION UNIT (4WD)

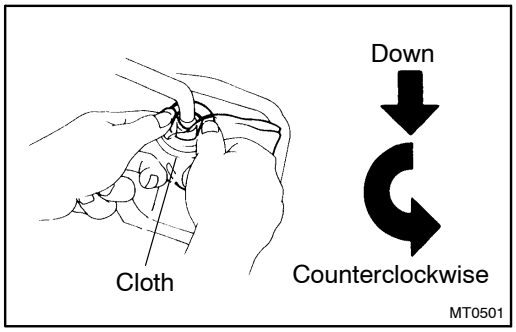
COMPONENTS

MT04N–04



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MT04O–02

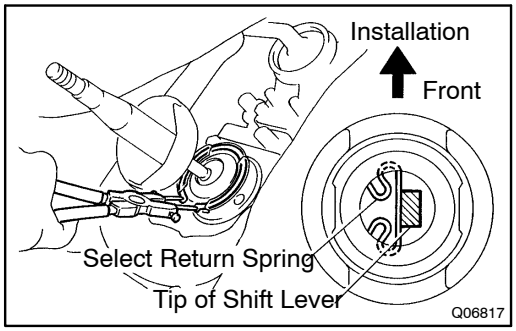


REMOVAL

1. REMOVE TRANSMISSION SHIFT LEVER

(a) Remove the 4 screws and front console box.
(b) Remove the 4 screws and shift lever boot retainer.
(c) Cover the shift lever cap with a cloth.
(d) Then, pressing down on the shift lever cap, rotate it counterclockwise to remove.
(e) Pull out the shift lever.

HINT:
At the time of installation, please refer to the following item.
Apply MP grease to the tip of the shift lever.



2. REMOVE TRANSFER SHIFT LEVER

Using snap ring pliers, remove the snap ring and pull out the shift lever.

HINT:
At the time of installation, please refer to the following item.
Apply MP grease to the tip of shift lever.

3. RAISE VEHICLE AND DRAIN TRANSMISSION OIL
Oil grade: API GL–4 or GL–5
Viscosity: SAE 75W–90
Capacity: 2.2 liters (2.3 US qts, 1.9 Imp. qts)
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

4. REMOVE FRONT AND REAR PROPELLER SHAFTS (See page PR–10)

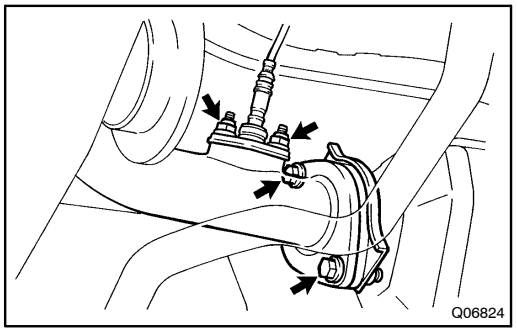
5. DISCONNECT SPEEDOMETER CABLE

6. DISCONNECT BACK–UP LIGHT SWITCH AND 4WD INDICATOR SWITCH CONNECTORS

7. DISCONNECT CLUTCH RELEASE CYLINDER AND LINE

Remove the 4 bolts, release cylinder and line.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

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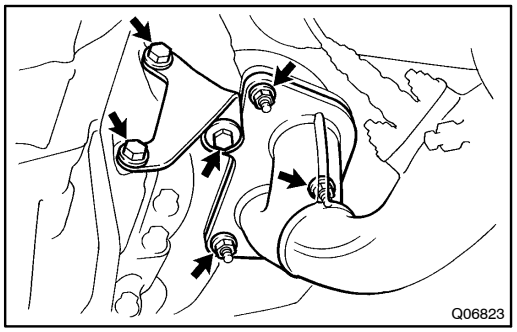


8. REMOVE FRONT EXHAUST PIPE

(a) Remove the 2 nuts, gasket and oxygen sensor.

(b) Remove the 2 bolts, retainer and gasket.

Torque: 48 N·m (490 kgf·cm, 35 ft·lbf)



(c) Remove the 3 bolts and bracket.

Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

(d) Remove the 3 nuts, front exhaust pipe and 2 gaskets.

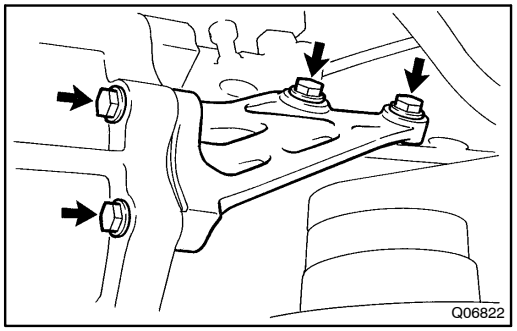
Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)

9. REMOVE STARTER

(a) Disconnect the connector and wire from the starter.

(b) Remove the 2 bolts and starter.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)



10. REMOVE STIFFENER PLATE (RH AND LH) AND REAR END PLATE

Remove the 8 bolts, stiffener plate (RH and LH) and rear end plate.

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

11. REMOVE STABILIZER BAR (See page SA–126)

12. JACK UP TRANSMISSION SLIGHTLY

Using a transmission jack, support the transmission.

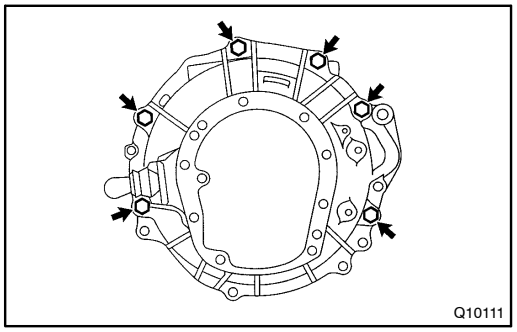
13. REMOVE CROSSMEMBER

(a) Remove the 4 set bolts of the engine rear mounting.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(b) Remove the 8 bolts and crossmember.

Torque: 95 N·m (970 kgf·cm, 70 ft·lbf)



14. REMOVE TRANSMISSION WITH TRANSFER

(a) Remove the 6 transmission mounting bolts from the engine.

Torque: 72 N·m (730 kgf·cm, 53 ft·lbf)

(b) Disconnect the 3 wire clamps from the transmission.

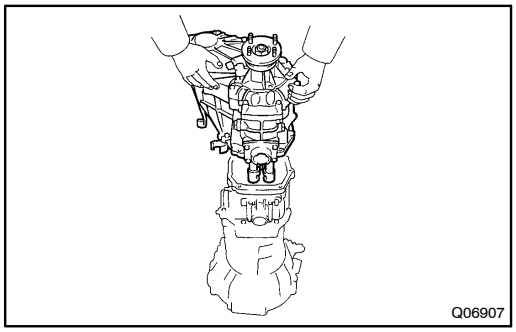
(c) Pull out the transmission with the transfer down and toward the rear.

15. REMOVE ENGINE REAR MOUNTING

Remove the 4 bolts and engine rear mounting.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

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Q06907

16. REMOVE TRANSFER FROM TRANSMISSION

(a) Remove the transfer adaptor rear mounting bolts.
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

(b) Pull the transfer straight up and remove it from the transmission.

HINT:
Take care not to damage the adaptor rear oil seal with the transfer input gear spline.

HINT:
At the time of installation, please refer to the following item.
Apply MP grease to the adaptor oil seal and shift the 2 shift fork shafts to the high – 4 position.

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MT04P–04

INSTALLATION

Installation is in the reverse order of removal (See page MT–7).

HINT:

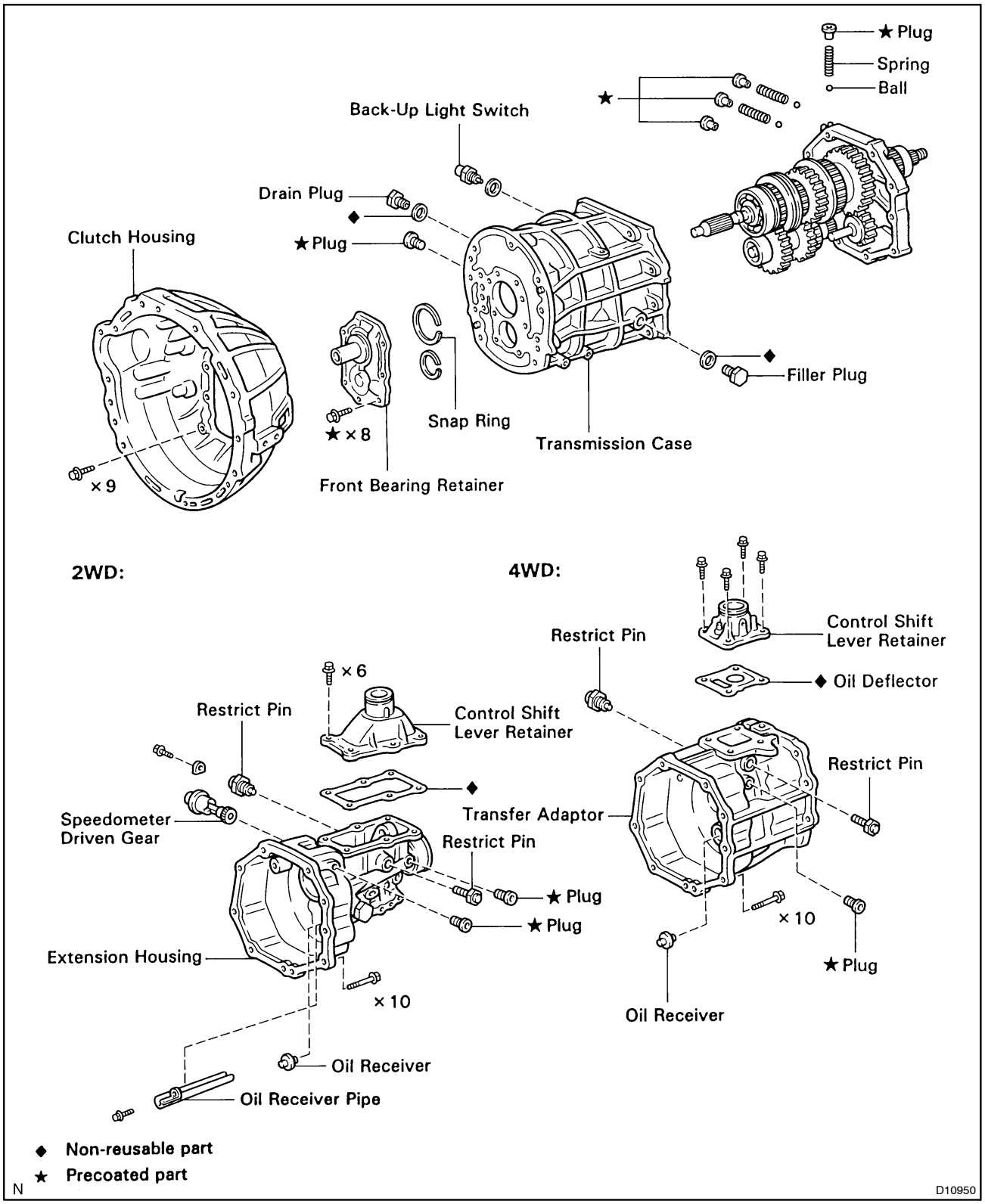
After installation, do the road test.

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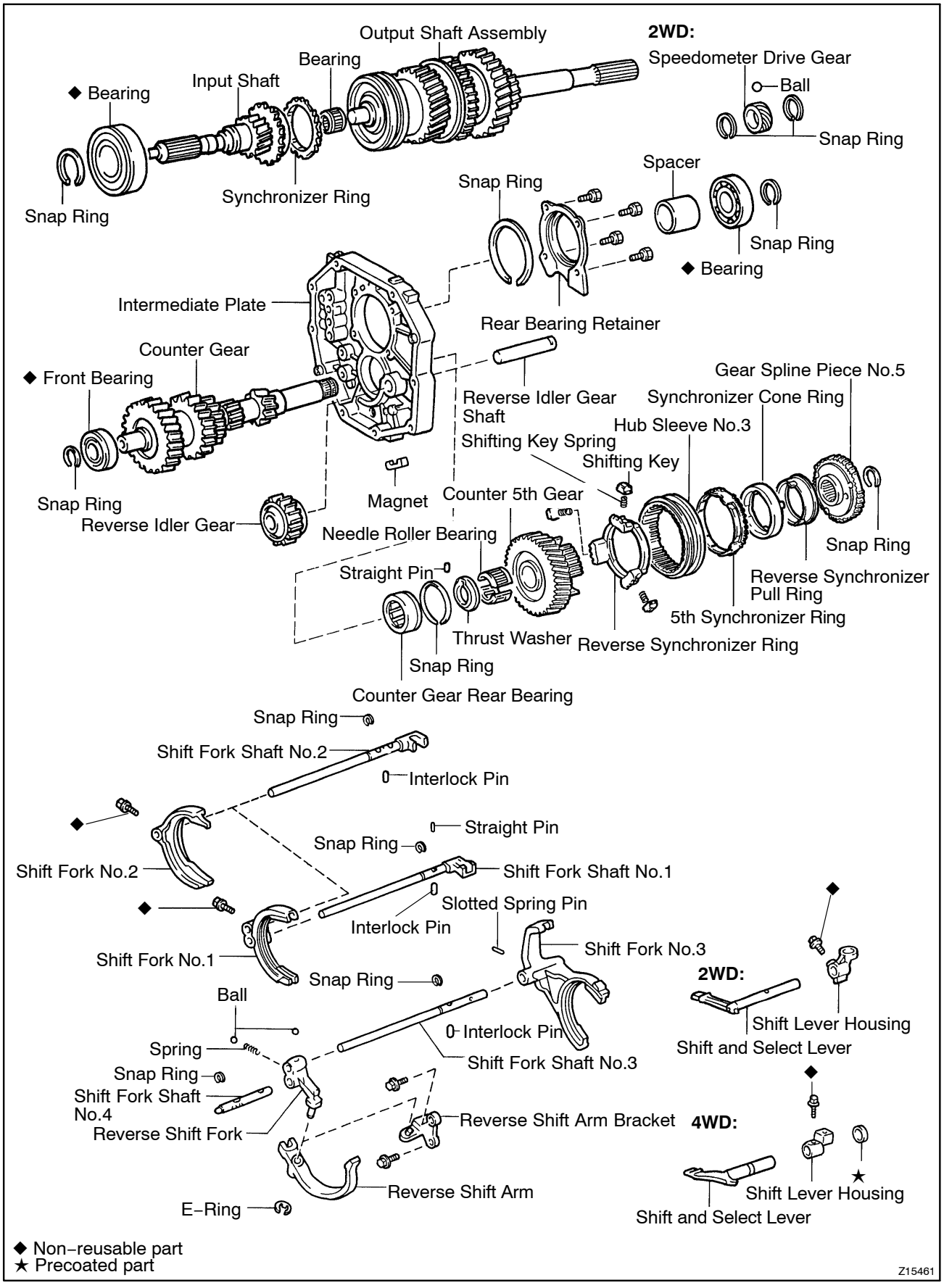
MANUAL TRANSMISSION ASSEMBLY

COMPONENTS

MT04Q–04



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MT04R–01

DISASSEMBLY

1. REMOVE BACK–UP LIGHT SWITCH
Torque: 44 N·m (450 kgf·cm, 32 ft·lbf)

2. 2WD:
REMOVE SPEEDOMETER DRIVEN GEAR

Remove the driven gear lock plate set bolt and driven gear.
Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)

3. REMOVE CLUTCH HOUSING FROM TRANSMISSION CASE

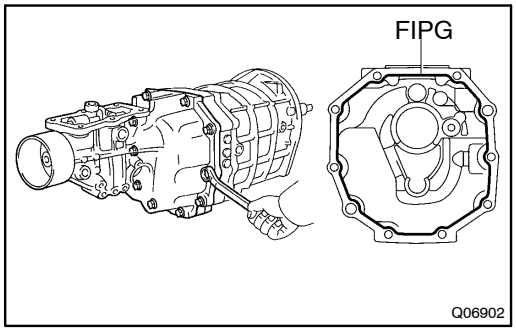
Remove the 9 bolts and clutch housing from the transmission case.
Torque: 36 N·m (370 kgf·cm, 27 ft·lbf)

4. REMOVE CONTROL SHIFT LEVER RETAINER

(a) Remove the 6 (2WD) or 4 (4WD) bolts.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

(b) Remove the retainer and gasket (2WD) or oil deflector (4WD).

5. REMOVE 2 RESTRICT PINS
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)



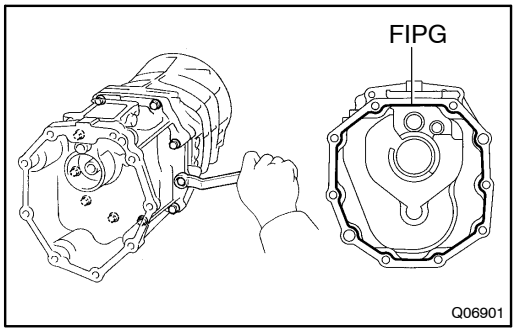
6. 2WD:
REMOVE EXTENSION HOUSING

(a) Remove the shift lever housing set bolt.
Torque: 38 N·m (390 kgf·cm, 28 ft·lbf)

(b) Remove the 10 bolts.
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

(c) Using a plastic hammer, tap the extension housing, remove the shift lever housing and shift and select lever.
FIPG:
Part No. 08826 – 00090, THREE BOND 1281 or equivalent

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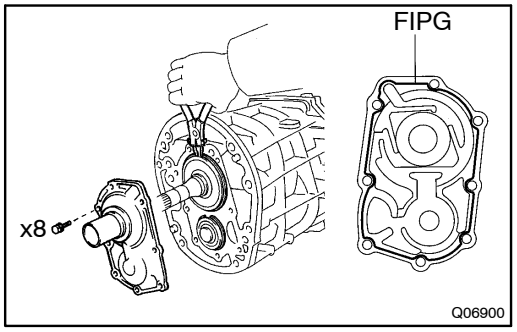


7. 4WD:
REMOVE TRANSFER ADAPTOR

(a) Remove the shift lever housing set bolt.
Torque: 38 N·m (390 kgf·cm, 28 ft·lbf)

(b) Remove the 10 bolts.
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

(c) Using a plastic hammer, tap the transfer adaptor, remove the shift lever housing and the shift and select lever.
FIPG:
Part No. 08826 – 00090, THREE BOND 1281 or equivalent



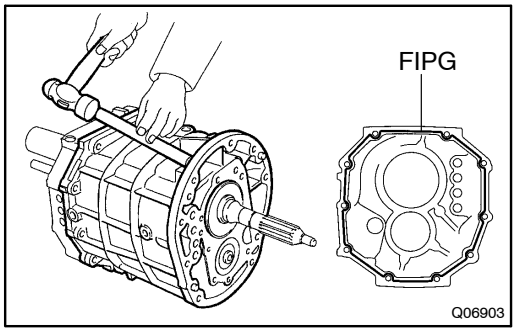
8. REMOVE FRONT BEARING RETAINER

(a) Remove the 8 bolts.
Sealant:
Part No. 08833 – 00080, THREE BOND 1344, LOCTITE 242 or equivalent
Torque: 17 N·m (170 kgf·cm, 12 ft·lbf)

(b) Using a plastic hammer, tap the front bearing retainer.
FIPG:
Part No. 08826 – 00090, THREE BOND 1281 or equivalent

9. REMOVE BEARING SNAP RING

Using a snap ring expander, remove the 2 snap rings.



10. SEPARATE INTERMEDIATE PLATE FROM TRANSMISSION CASE

(a) Using a brass bar and hammer, carefully tap the transmission case.

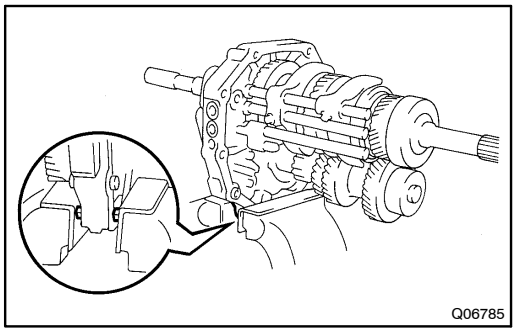
(b) Remove the transmission case from the intermediate plate.

HINT:
At the time of reassembly, please refer to the following item.
Align the each bearing outer race, each fork shaft end and reverse idler gear shaft end with the case installation holes.

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FIPG:
Part No. 08826 – 00090, THREE BOND 1281 or equivalent

11. REMOVE MAGNET FROM INTERMEDIATE PLATE

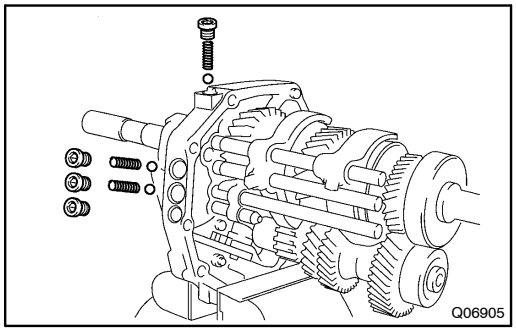

Q06785

12. MOUNT INTERMEDIATE PLATE IN VISE

(a) Use the 2 clutch housing bolts, plate washers and suitable nuts, as shown.

HINT:
Increase or decrease plate washers so that the bolt tip does not protrude from the nut.

(b) Mount the intermediate plate in a vise.


Q06905

13. REMOVE STRAIGHT SCREW PLUG, LOCKING BALL AND SPRING

(a) Using a hexagon wrench, remove the 4 plugs.
Sealant:
Part No. 08833 – 00080, THREE BOND 1344, LOCTITE 242 or equivalent
Torque: 19 N·m (190 kgf·cm, 14 ft·lbf)

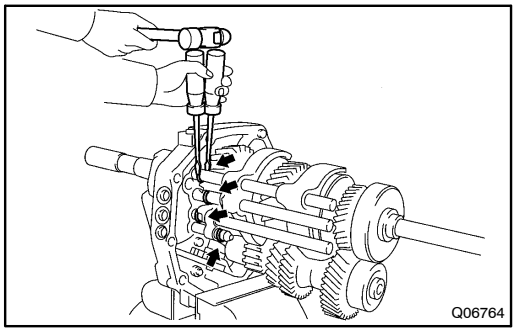
(b) Using a magnetic finger, remove the 3 springs and balls.

14. REMOVE SHIFT FORK SET BOLT

Remove the 2 bolts from the shift forks No.1 and No.2.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

15. REMOVE SLOTTED SPRING PIN

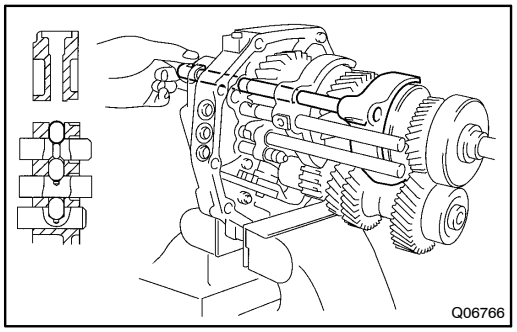
Using a pin punch and hammer, drive out the pin from the shift fork No.3.


Q06764

16. REMOVE SNAP RING

Using 2 screwdrivers and a hammer, tap out the 4 snap rings from each shift fork shaft.

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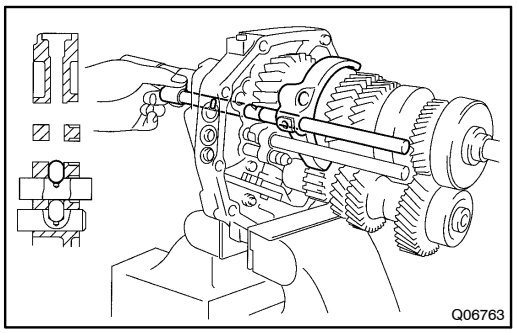


17. REMOVE SHIFT FORK SHAFT NO.2 AND SHIFT FORK NO.2

(a) Pull out the shift fork shaft No.2 from the shift forks No.1, No.2 and intermediate plate.

(b) Remove the shift fork No.2 from the groove of hub sleeve No.2.

(c) Using a magnetic finger, remove the interlock pin from the intermediate plate.

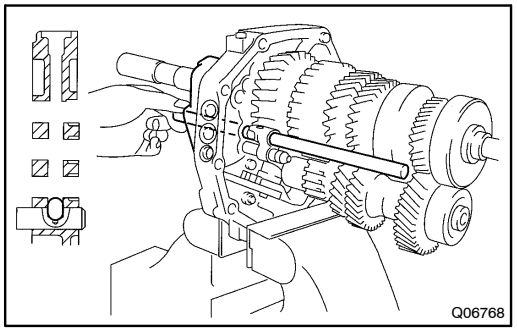


18. REMOVE SHIFT FORK SHAFT NO.1 AND SHIFT FORK NO.1

(a) Pull out the shift fork shaft No.1 with the straight pin from the shift fork No.1 and intermediate plate.

(b) Remove the shift fork No.1 from the groove of reverse gear.

(c) Using a magnetic finger, remove the interlock pin from the intermediate plate.

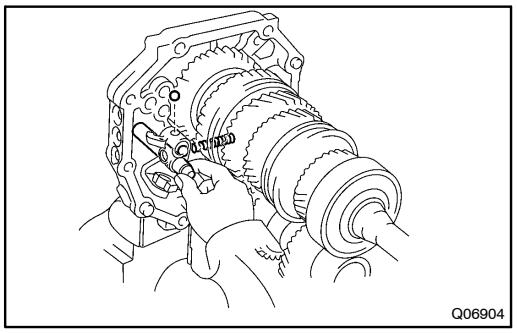


19. REMOVE SHIFT FORK SHAFT NO.3 AND SHIFT FORK NO.3

(a) Pull out the shift fork shaft No.3 from the shift fork No.3, reverse shift fork and intermediate plate.

(b) Remove the shift fork No.3 from the groove of hub sleeve No.3.

(c) Using a magnetic finger, remove the interlock pin from the intermediate plate.



20. REMOVE SHIFT FORK SHAFT NO.4

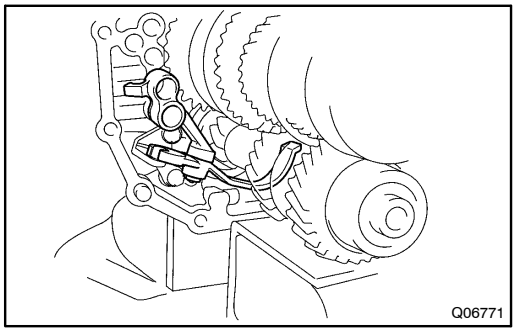
(a) Using a magnetic finger, remove the ball.

(b) Pull out the shift fork shaft No.4 from the reverse shift fork and intermediate plate.

NOTICE:

Take care of the ball in the reverse shift fork. It will spring out when you pull out the shift fork shaft No.4.

(c) Using a magnetic finger, remove the spring from the reverse shift fork.



21. REMOVE REVERSE SHIFT FORK AND ARM

(a) Remove the reverse shift fork and arm.

HINT:

At the time of reassembly, please refer to the following item.

Align the reverse shift arm to the pivot of the reverse shift arm bracket.

(b) Using a screwdriver, remove the E–ring.

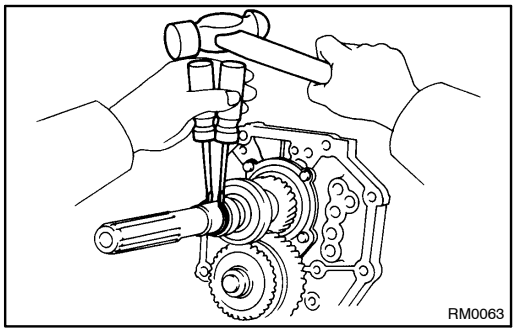
(c) Separate the reverse shift fork and arm.

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22. REMOVE REVERSE SHIFT ARM BRACKET

Remove the 2 bolts and reverse shift arm bracket.

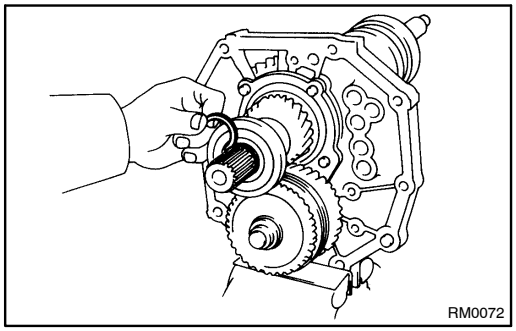
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



23. 2WD:
REMOVE SPEEDOMETER DRIVE GEAR

(a) Using 2 screwdrivers and a hammer, tap out the rear snap ring, and remove the drive gear and ball.

(b) Using 2 screwdrivers and a hammer, tap out the front snap ring, and remove the drive gear.



24. REMOVE OUTPUT SHAFT REAR BEARING

(a) Using 2 screwdrivers and a hammer, tap out the snap ring.

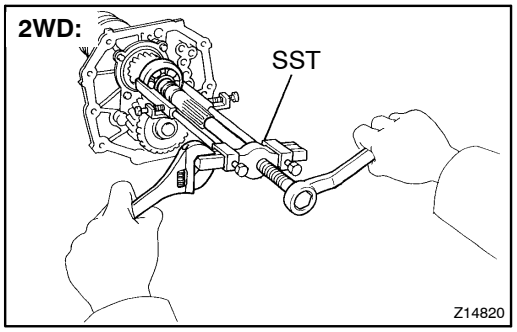
HINT:

At the time of reassembly, please refer to the following item.

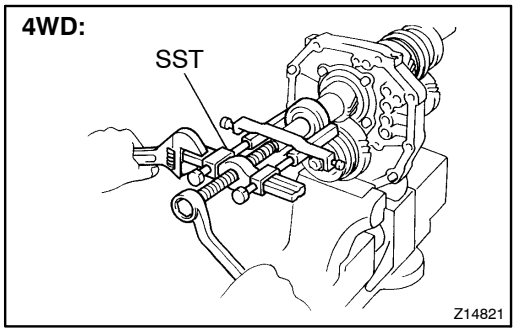
Select a snap ring that allows the minimum axial play.

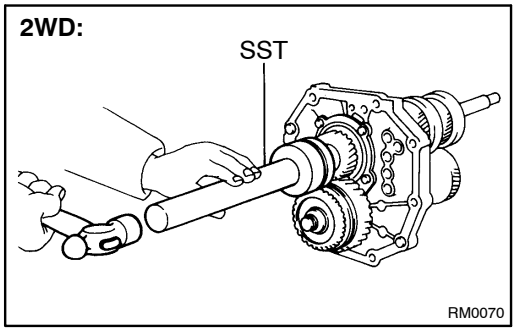
Mark	Thickness mm (in.)
A	2.65 – 2.70 (0.1043 – 0.1063)
B	2.70 – 2.75 (0.1063 – 0.1083)
C	2.75 – 2.80 (0.1083 – 0.1102)
D	2.80 – 2.85 (0.1102 – 0.1122)
E	2.85 – 2.90 (0.1122 – 0.1142)
F	2.90 – 2.95 (0.1142 – 0.1161)
G	2.95 – 3.00 (0.1161 – 0.1181)
H	3.00 – 3.05 (0.1181 – 0.1201)
J	3.05 – 3.10 (0.1201 – 0.1220)
K	3.10 – 3.15 (0.1220 – 0.1240)
L	3.15 – 3.20 (0.1240 – 0.1260)
M	3.20 – 3.25 (0.1260 – 0.1280)
N	3.25 – 3.30 (0.1280 – 0.1299)
P	3.30 – 3.35 (0.1299 – 0.1319)
Q	3.35 – 3.40 (0.1319 – 0.1339)
R	3.40 – 3.45 (0.1339 – 0.1358)
S	3.45 – 3.50 (0.1358 – 0.1378)

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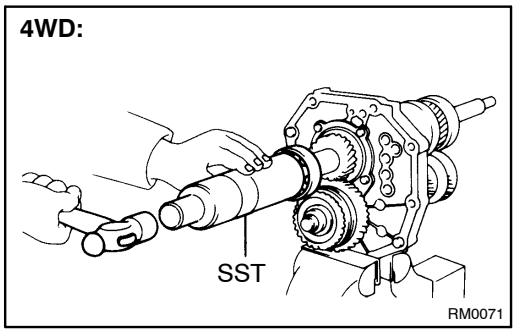
(b) Using SST, remove the rear bearing.
SST 09950–40010





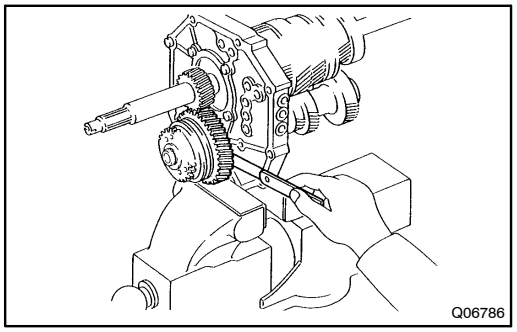
HINT:
At the time of reassembly, please refer to the following items.

- 2WD:
  Using SST and a hammer, drive in a new bearing.
  SST 09309–35010



- 4WD:
  Using SST and a hammer, drive in a new bearing.
  SST 09316–60011 (09316–00011, 09316–00071)

25. REMOVE SPACER

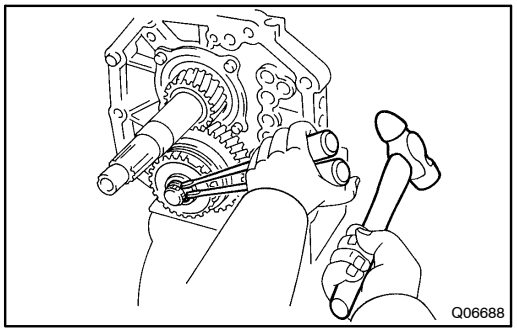


26. INSPECT COUNTER 5TH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the counter 5th gear thrust clearance.

Standard clearance:
0.10 – 0.35 mm (0.0039 – 0.0138 in.)
Maximum clearance:
0.40 mm (0.0157 in.)

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27. REMOVE GEAR SPLINE PIECE NO.5, SYNCHRONIZER RING, NEEDLE ROLLER BEARING AND COUNTER 5TH GEAR WITH HUB SLEEVE NO.3

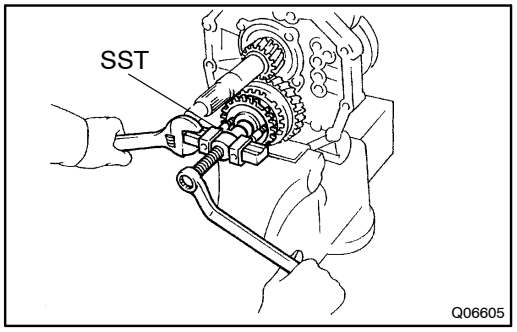
(a) Using 2 screwdrivers and a hammer, tap out the snap ring.

HINT:

At the time of reassembly, please refer to the following item.

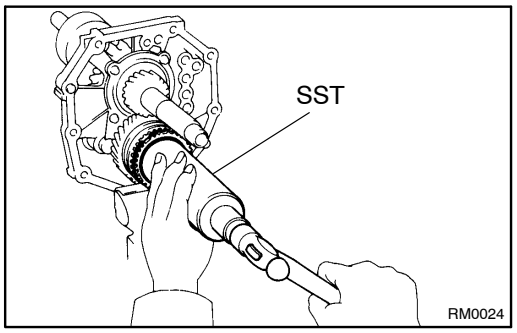
Select a snap ring that allows the minimum axial play.

Mark	Thickness mm (in.)
A	2.80 – 2.85 (0.1102 – 0.1122)
B	2.85 – 2.90 (0.1122 – 0.1142)
C	2.90 – 2.95 (0.1142 – 0.1161)
D	2.95 – 3.00 (0.1161 – 0.1181)
E	3.00 – 3.05 (0.1181 – 0.1201)
F	3.05 – 3.10 (0.1201 – 0.1220)
G	3.10 – 3.15 (0.1220 – 0.1240)



(b) Using SST, remove the gear spline piece No.5.
SST 09950–50010

(c) Remove the counter 5th gear with the hub sleeve No.3.



HINT:

At the time of reassembly, please refer to the following items.

- Using SST and a hammer, drive in the gear spline piece No.5 with the synchronizer ring slots aligned with the shifting keys.
  SST 09316–60011 (09316–00011)
- When installing the gear spline piece No.5, support the counter gear in front with a 1.4 – 2.3 kg (3 – 5 lb) hammer or equivalent.

28. REMOVE THRUST WASHER AND BALL FROM COUNTER GEAR

29. REMOVE REAR BEARING RETAINER

Remove the 4 bolts and rear bearing retainer.

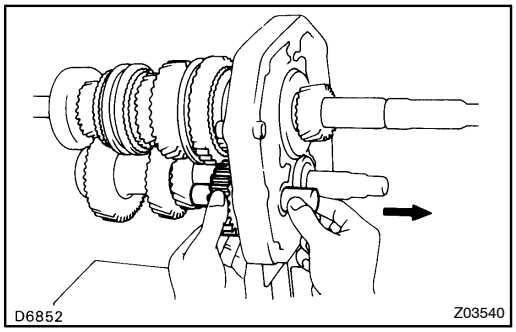
HINT:

At the time of reassembly, please refer to the following item.

Align the rear bearing retainer to the reverse idler gear shaft groove.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

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30. REMOVE REVERSE IDLER GEAR AND SHAFT

Pull out the shaft toward the rear.

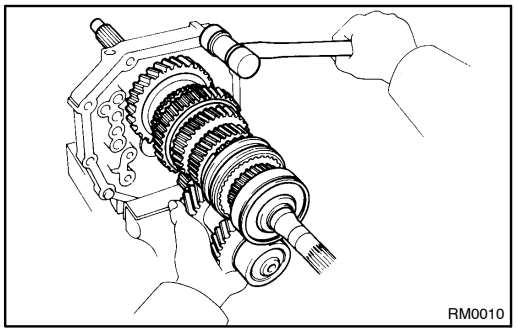
HINT:

At the time of the reassembly, please refer to the following item.

Align the reverse shift arm to the reverse idler gear shaft.

31. REMOVE OUTPUT SHAFT CENTER BEARING SNAP RING

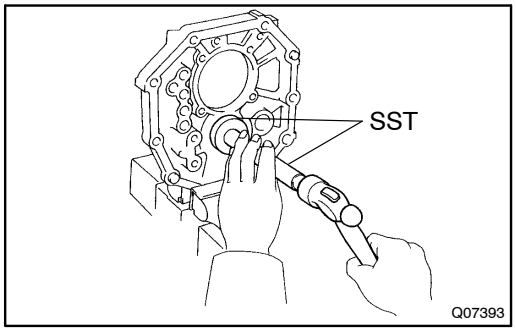
Using a snap ring expander, remove the snap ring.



32. REMOVE OUTPUT SHAFT AND COUNTER GEAR FROM INTERMEDIATE PLATE

(a) Remove the output shaft, counter gear and input shaft as a unit from the intermediate plate by pulling on the counter gear and tapping on the intermediate plate with a plastic hammer.

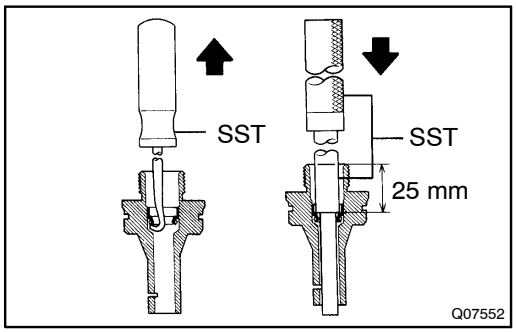
(b) Remove the input shaft with the needle roller bearing from the output shaft.



33. REMOVE COUNTER REAR BEARING FROM INTERMEDIATE PLATE

Using SST and a hammer, remove the counter rear bearing.

SST 09950–60010 (09951–00620), 09950–70010 (09951–07150)



34. 2WD:

IF NECESSARY, REPLACE SPEEDOMETER DRIVEN GEAR OIL SEAL

(a) Using SST, remove the oil seal.

SST 09921–00010

(b) Coat the lip of oil seal with MP grease.

(c) Using SST, drive in a new oil seal.

SST 09201–10000 (09201–01080), 09950–70010 (09951–07150)

Drive in depth: 25 mm (0.98 in.)

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MT04S–05

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page MT–13).

HINT:

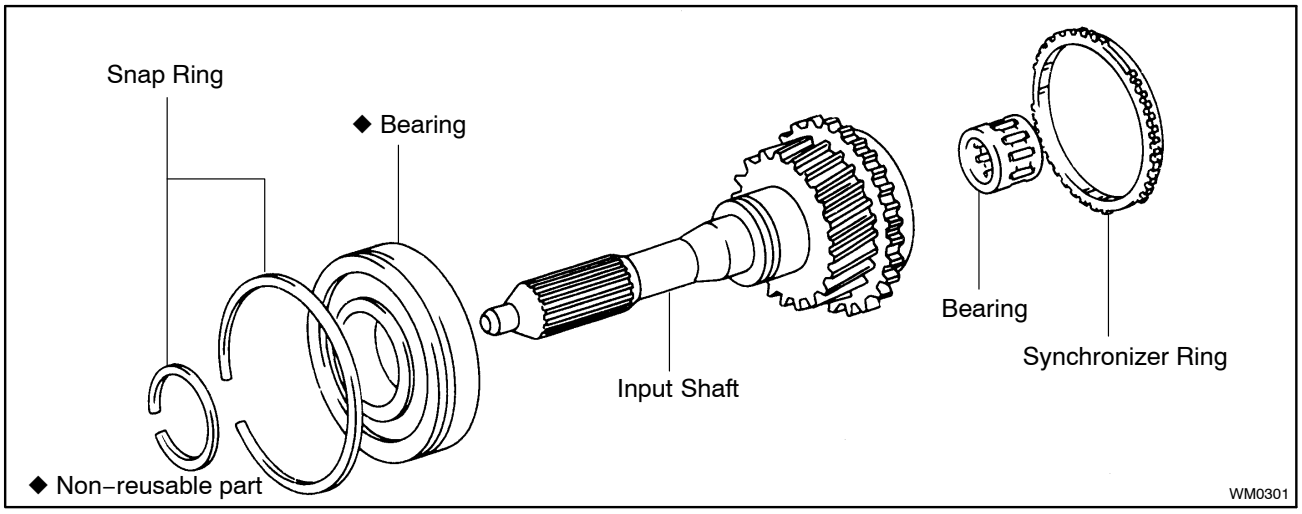
Coat all of the sliding and rotating surfaces with gear oil before reassembly.

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INPUT SHAFT

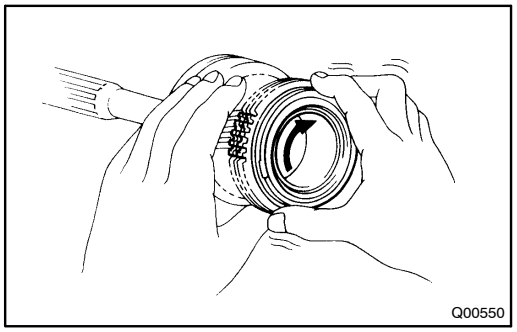
COMPONENTS

MT04T–01



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MT04U–01


Q00550

INSPECTION

INSPECT SYNCHRONIZER RING

(a) Check for wear or damage.

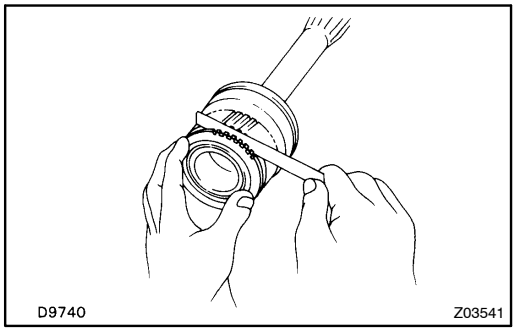
(b) Check the braking effect of the synchronizer ring.
Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

If the braking effect is insufficient, apply a small amount of the fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear cone together.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.

(c) Check again the braking effect of the synchronizer ring.


D9740 Z03541

(d) Using a feeler gauge, measure the clearance between the synchronizer ring back and gear spline end.
Minimum clearance: 0.8 mm (0.031 in.)

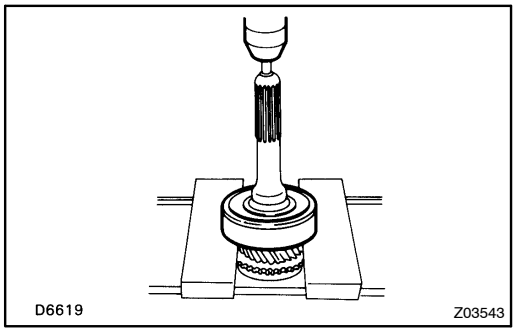
If the clearance is less than the minimum, replace the synchronizer ring, and apply a small amount of the fine lapping compound on gear cone.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.

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MT04V–01

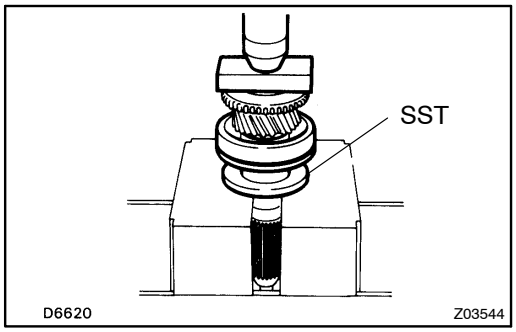


REPLACEMENT

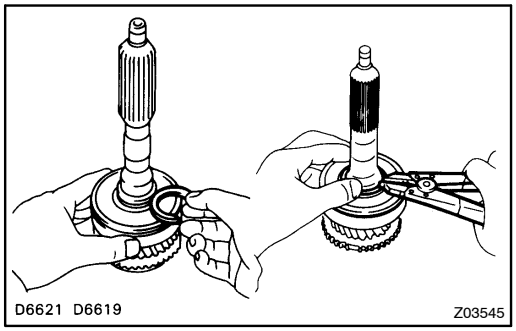
IF NECESSARY, REPLACE INPUT SHAFT BEARING

(a) Using a snap ring expander, remove the snap ring.

(b) Using a press, remove the bearing.



(c) Using SST and a press, install a new bearing.
SST 09506–35010



(d) Select a snap ring that allows minimum axial play.

Mark	Thickness mm (in.)
A	2.10 – 2.15 (0.0827 – 0.0846)
B	2.15 – 2.20 (0.0846 – 0.0866)
C	2.20 – 2.25 (0.0866 – 0.0886)
D	2.25 – 2.30 (0.0886 – 0.0906)
E	2.30 – 2.35 (0.0906 – 0.0925)
F	2.35 – 2.40 (0.0925 – 0.0945)
G	2.40 – 2.45 (0.0945 – 0.0965)

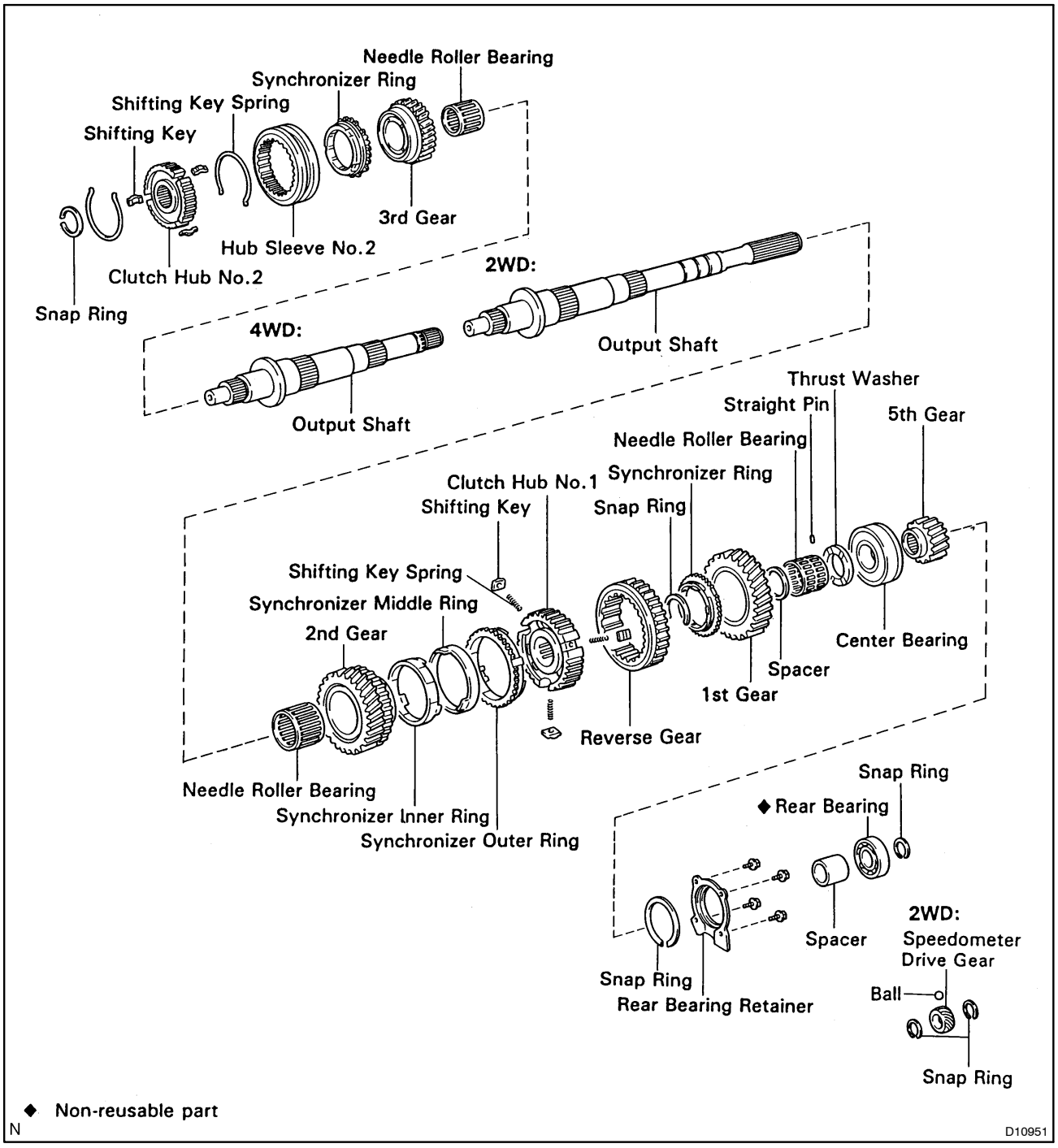
(e) Using a snap ring expander, install the snap ring.

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OUTPUT SHAFT

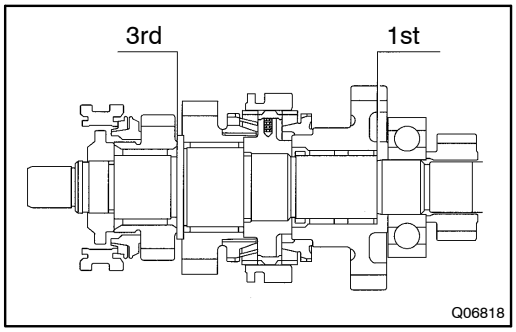
COMPONENTS

MT04W–05



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MT04X–01

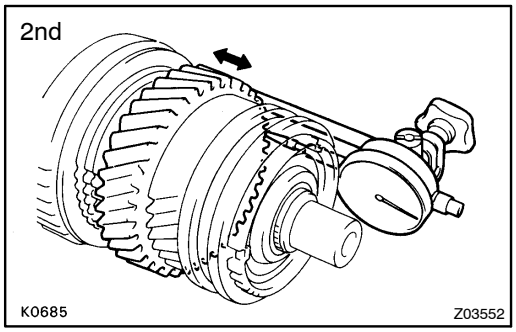


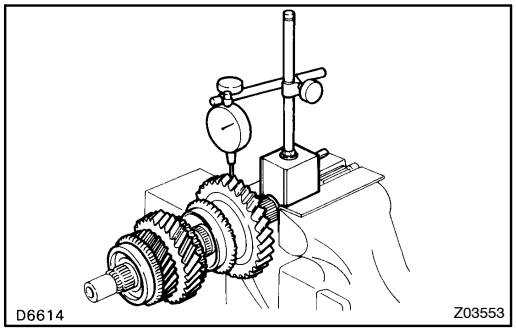
DISASSEMBLY

1. INSPECT EACH GEAR THRUST CLEARANCE

Measure the thrust clearance of each gear.

Standard clearance:
1st gear: 0.15 – 0.45 mm (0.0059 – 0.0177 in.)
2nd and 3rd gears: 0.10 – 0.25 mm (0.0039 – 0.0098 in.)
Maximum clearance:
1st gear: 0.50 mm (0.0197 in.)
2nd and 3rd gears: 0.30 mm (0.0118 in.)



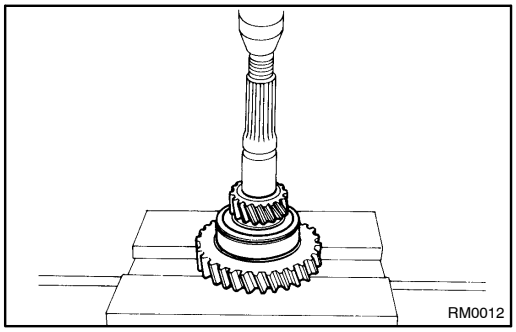


2. INSPECT EACH GEAR RADIAL CLEARANCE

Using a dial indicator, measure the radial clearance of each gear.

Standard clearance:
1st gear:
0.020 – 0.073 mm (0.0008 – 0.0029 in.)
2nd and 3rd gears:
0.015 – 0.068 mm (0.0006 – 0.0027 in.)
Maximum clearance:
1st gear: 0.160 mm (0.0063 in.)
2nd and 3rd gears: 0.160 mm (0.0063 in.)

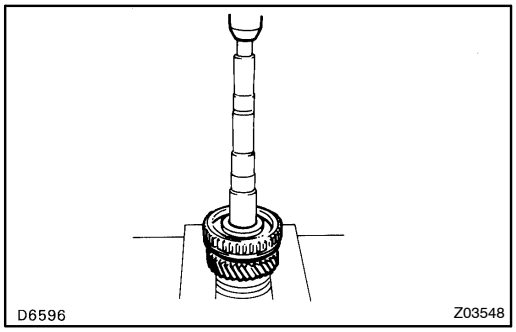
If the clearance exceeds the maximum, replace the gear, needle roller bearing or shaft.



3. REMOVE 5TH GEAR, OUTPUT SHAFT CENTER BEARING AND 1ST GEAR ASSEMBLY

(a) Using a press, remove the 5th gear, center bearing, thrust washer and 1st gear.
(b) Remove the synchronizer ring.
(c) Remove the straight pin and needle roller bearing.
(d) Remove the spacer.

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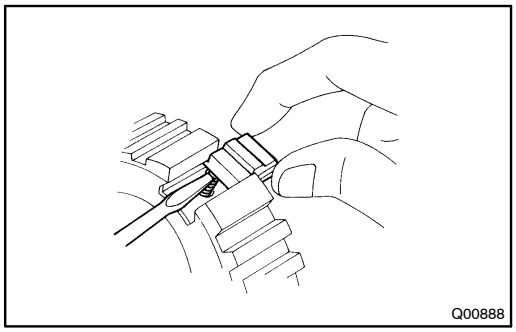


4. REMOVE REVERSE GEAR ASSEMBLY AND 2ND GEAR ASSEMBLY

(a) Using 2 screwdrivers and a hammer, tap out the snap ring.

(b) Using a press, remove the reverse gear assembly and 2nd gear assembly.

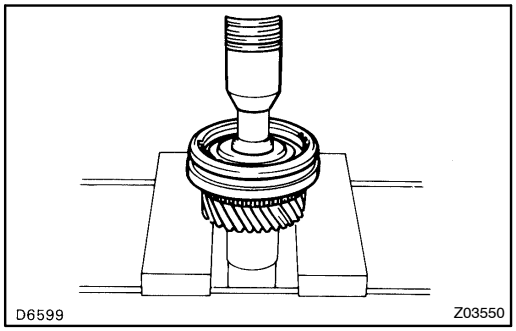
(c) Remove the needle roller bearing.



5. REMOVE REVERSE GEAR, SHIFTING KEY AND SPRING FROM CLUTCH HUB NO.1

(a) Remove the reverse gear from the clutch hub No.1.

(b) Push the shifting key spring with a screwdriver, remove the 3 shifting keys and key springs.



6. REMOVE HUB SLEEVE NO.2 ASSEMBLY AND 3RD GEAR ASSEMBLY

(a) Using a snap ring expander, remove the snap ring.

(b) Using a press, remove the hub sleeve No.2 assembly and 3rd gear assembly.

(c) Remove the needle roller bearing.

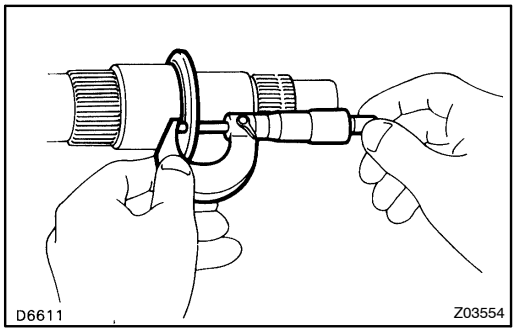
7. REMOVE SHIFTING KEY AND SPRING FROM HUB SLEEVE NO.2 ASSEMBLY

Using a screwdriver, remove the 3 shifting keys and 2 springs.

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MT04Y–05

INSPECTION

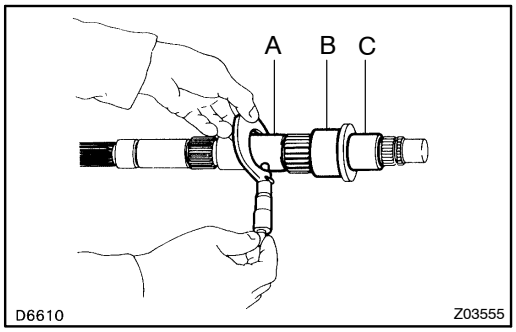


1. INSPECT OUTPUT SHAFT

(a) Using a micrometer, measure the output shaft flange thickness.

Minimum thickness: 4.70 mm (0.1850 in.)

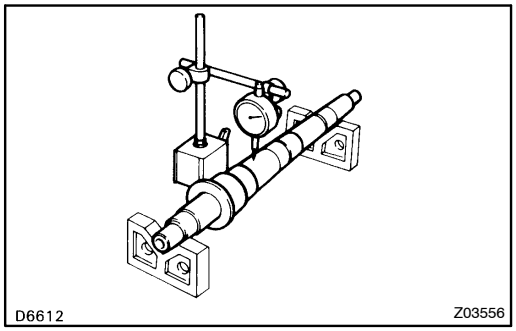
If the thickness is less than the minimum, replace the output shaft.



(b) Using a micrometer, measure the outer diameter of the output shaft journal.

Minimum diameter:
A 1st gear: 38.860 mm (1.5299 in.)
B 2nd gear: 46.860 mm (1.8449 in.)
C 3rd gear: 37.860 mm (1.4905 in.)

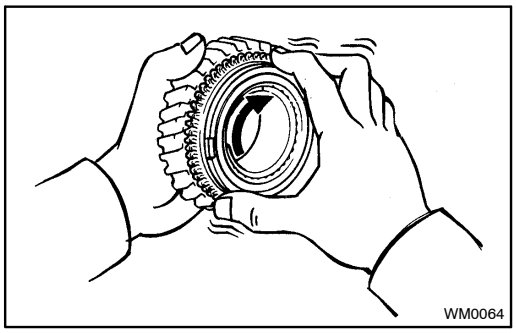
If the outer diameter is less than the minimum, replace the output shaft.



(c) Using a dial indicator, check the shaft runout.

Maximum runout: 0.06 mm (0.0024 in.)

If the runout exceeds the maximum, replace the output shaft.



2. INSPECT 1ST AND 3RD GEARS SYNCHRONIZER RING

(a) Check for wear or damage.

(b) Check the braking effect of the synchronizer ring.
Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

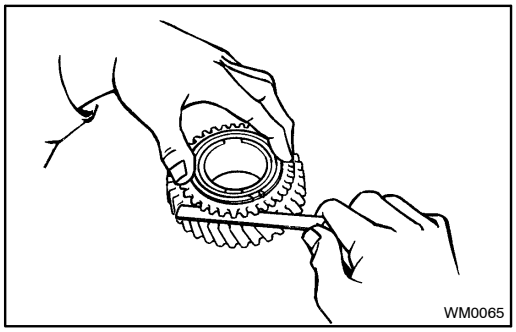
If the braking effect is insufficient, apply a small amount of the fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear cone together.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.

(c) Check again the braking effect of the synchronizer ring.

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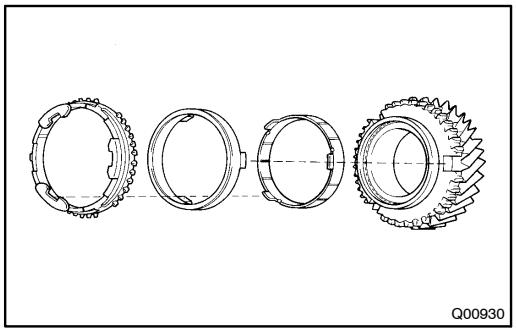
(d) Using a feeler gauge, measure the clearance between the synchronizer ring back and gear spline end.

Minimum clearance: 0.8 mm (0.031 in.)

If the clearance is less than the minimum, replace the synchronizer ring, and apply a small amount of the fine lapping compound on gear cone.

NOTICE:

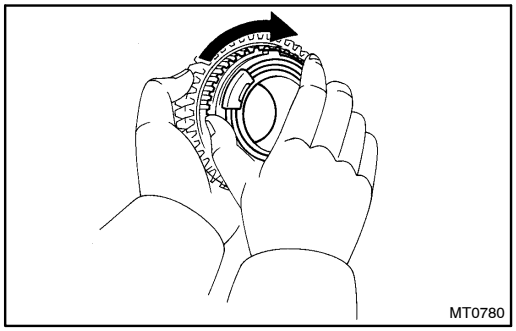
Ensure the fine lapping compound is completely washed off after rubbing.



3. INSPECT 2ND GEAR SYNCHRONIZER RING

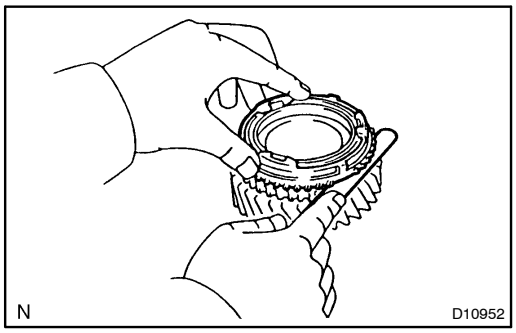
(a) Check for wear or damage.

(b) Install the synchronizer inner ring, middle ring and outer ring to each gear.



(c) Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

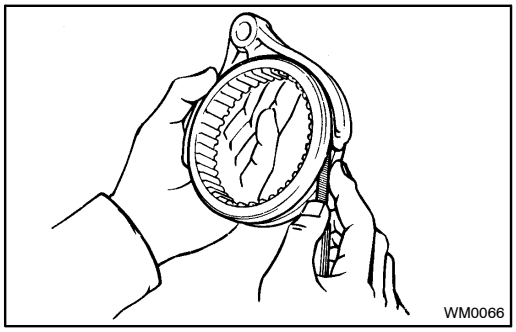
If it does not lock, replace the synchronizer ring.



(d) Using a feeler gauge, measure the clearance between the synchronizer ring back and gear spline end.

Minimum clearance: 0.8 mm (0.031 in.)

If the clearance is less than the minimum, replace the synchronizer ring.



4. INSPECT SHIFT FORK AND HUB SLEEVE CLEARANCE

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

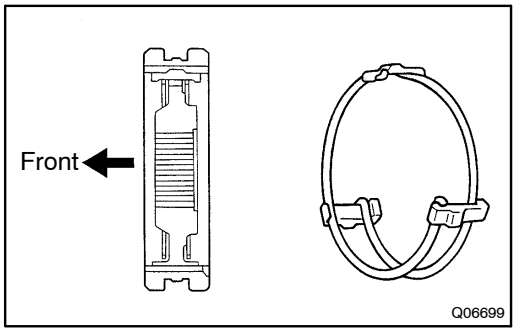
Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the maximum, replace the shift fork or hub sleeve.

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MT04Z–01

REASSEMBLY



HINT:

Coat all of the sliding and rotating surfaces with gear oil before reassembly.

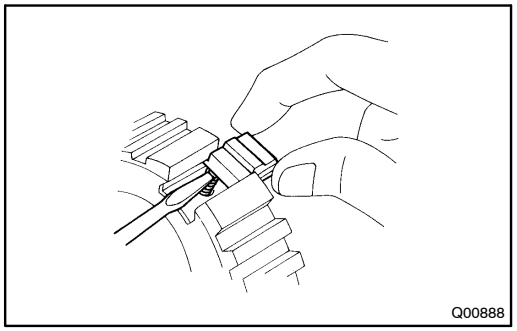
1. INSTALL CLUTCH HUB NO.2 INTO HUB SLEEVE NO.2

(a) Install the clutch hub No.2 and shifting keys to the hub sleeve No.2.

(b) Install the shifting key springs under the shifting keys.

NOTICE:

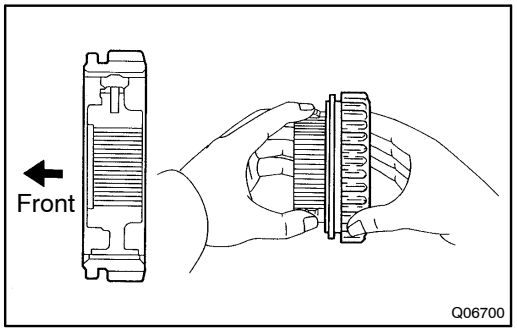
Position the key springs so that their end gaps are not aligned.



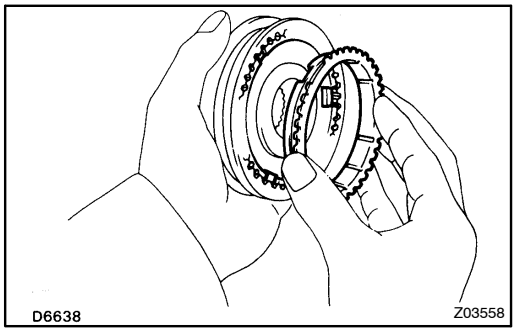
2. INSTALL CLUTCH HUB NO.1 INTO REVERSE GEAR

(a) Install the 3 shifting key springs to the clutch hub No.1.

(b) While pushing the shifting key spring with a screwdriver, install the 3 shifting keys.



(c) While pushing the 3 shifting keys, install the clutch hub No.1 to the reverse gear, as shown.



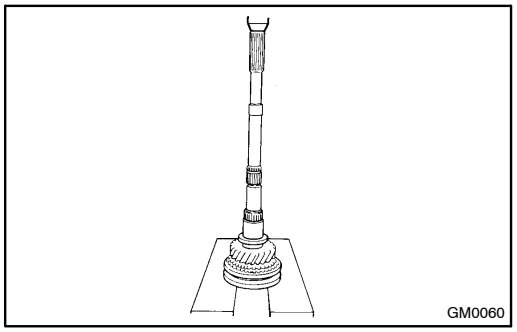
3. INSTALL 3RD GEAR AND HUB SLEEVE NO.2 ON OUTPUT SHAFT

(a) Apply gear oil to the shaft and needle roller bearing.

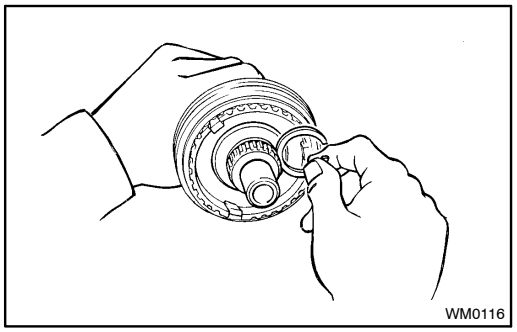
(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(c) Install the needle roller bearing in the 3rd gear.

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GM0060

(d) Using a press, install the 3rd gear and hub sleeve No.2.


WM0116

4. INSTALL SNAP RING

(a) Select a snap ring that allows the minimum axial play.

Mark	Thickness mm (in.)
A	1.80 – 1.85 (0.0709 – 0.0728)
B	1.85 – 1.90 (0.0728 – 0.0748)
C	1.90 – 1.95 (0.0748 – 0.0768)
D	1.95 – 2.00 (0.0768 – 0.0787)
E	2.00 – 2.05 (0.0787 – 0.0807)
F	2.05 – 2.10 (0.0807 – 0.0827)
G	2.10 – 2.15 (0.0827 – 0.0846)

(b) Using a snap ring expander, install the snap ring.

5. INSPECT 3RD GEAR THRUST CLEARANCE
(See page MT–26)

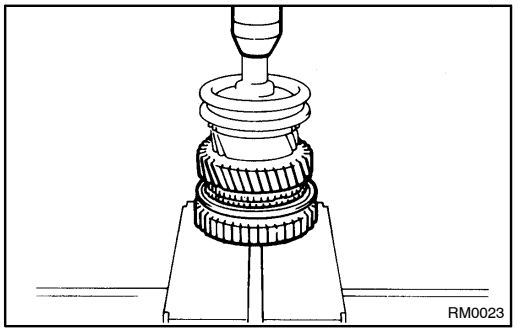
6. INSTALL 2ND GEAR AND REVERSE GEAR

(a) Apply gear oil to the shaft and needle roller bearing.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

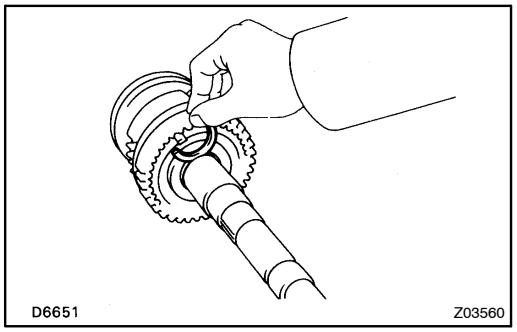
(c) Align the projection of the synchronizer inner ring with the slots of the clutch hub No.1.

(d) Install the needle roller bearing in the 2nd gear.


RM0023

(e) Using a press, install the 2nd gear assembly and reverse gear assembly.

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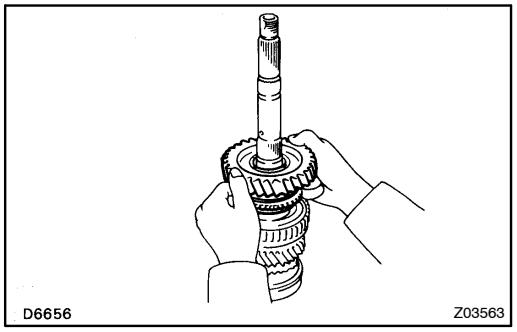


7. INSTALL SNAP RING

(a) Select a snap ring that allows the minimum axial play.

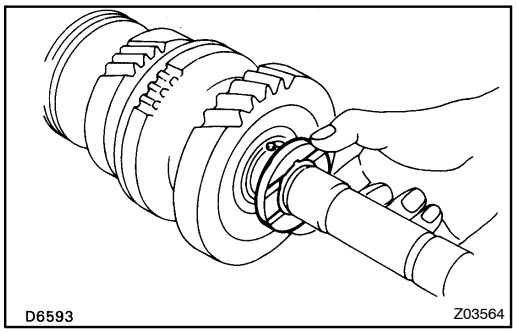
Mark	Thickness mm (in.)
A	2.30 – 2.35 (0.0906 – 0.0925)
B	2.35 – 2.40 (0.0925 – 0.0945)
C	2.40 – 2.45 (0.0945 – 0.0965)
D	2.45 – 2.50 (0.0965 – 0.0984)
E	2.50 – 2.55 (0.0984 – 0.1004)
F	2.55 – 2.60 (0.1004 – 0.1024)
G	2.60 – 2.65 (0.1024 – 0.1043)

(b) Using a screwdriver and hammer, install the snap ring.



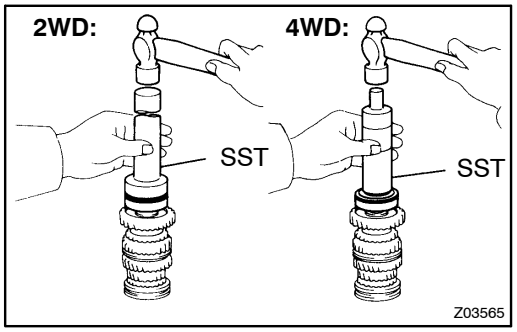
8. INSTALL SPACER AND 1ST GEAR ASSEMBLY

(a) Install the spacer on the output shaft.
(b) Apply gear oil to the needle roller bearing.
(c) Assemble the 1st gear, synchronizer ring and needle roller bearing.
(d) Install the assembly on the output shaft with the synchronizer ring slots aligned with the shifting keys.



9. INSTALL STRAIGHT PIN AND 1ST GEAR THRUST WASHER

Install the 1st gear thrust washer onto the output shaft with the straight pin aligned with the 1st gear thrust washer.



10. INSTALL OUTPUT SHAFT CENTER BEARING

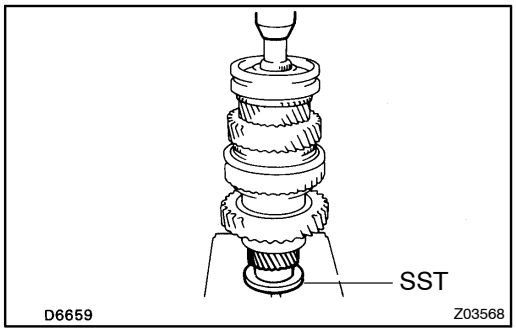
(a) 2WD:
Using SST and a hammer, drive in the bearing with the outer race snap ring groove toward the rear.
SST 09309–35010

(b) 4WD:
Using SST and a hammer, drive in the bearing with the outer race snap ring groove toward the rear.
SST 09316–60011 (09316–00011, 09316–00071)

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11. INSPECT 1ST GEAR THRUST CLEARANCE
(See page MT–26)

12. INSPECT 2ND GEAR THRUST CLEARANCE
(See page MT–26)



13. INSTALL 5TH GEAR

Using SST and a press, install the 5th gear.

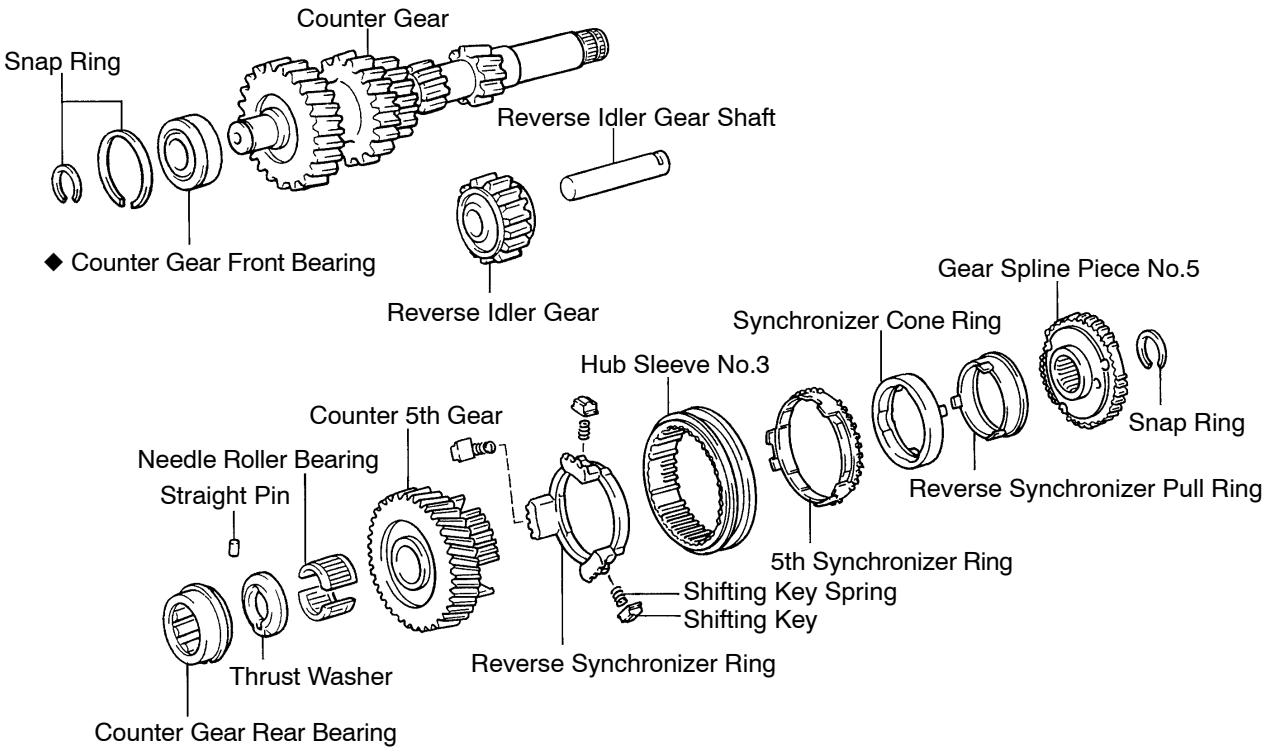
SST 09316–60011 (09316–00031)

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COUNTER GEAR AND REVERSE IDLER GEAR

COMPONENTS

MT050–01

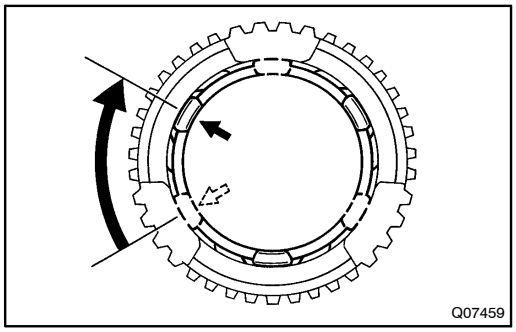


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MT051–01

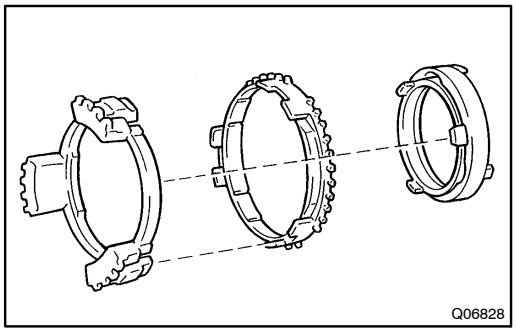
DISASSEMBLY

REMOVE HUB SLEEVE NO.3, SHIFTING KEY AND SPRING FROM SYNCHRONIZER RING

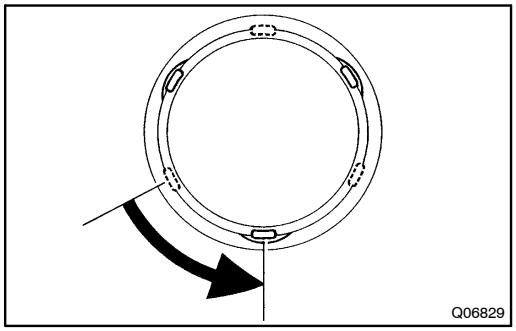


(a) Remove the synchronizer ring assembly from the hub sleeve No.3.

(b) Turn the reverse synchronizer pull ring.



(c) Remove the reverse synchronizer ring and 5th synchronizer ring from the synchronizer pull ring and cone ring.



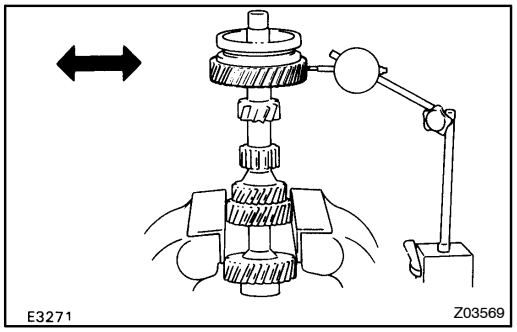
(d) Turn the reverse synchronizer pull ring, separate the pull ring and cone ring.

(e) Push the shifting key and spring, and remove the 3 shifting keys and springs to the reverse synchronizer ring.

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MT052–01

INSPECTION



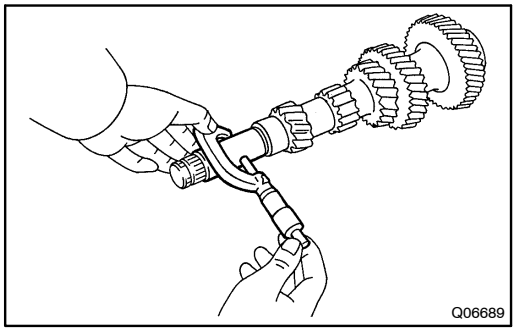
1. INSPECT 5TH GEAR RADIAL CLEARANCE

(a) Install the spacer, counter 5th gear and needle roller bearings.

(b) Using a dial indicator, measure the counter 5th gear radial clearance.

Standard clearance:
0.015 – 0.068 mm (0.0006 – 0.0027 in.)
Maximum clearance:
0.160 mm (0.0063 in.)

If the clearance exceeds the maximum, replace the gear bearing or shaft.

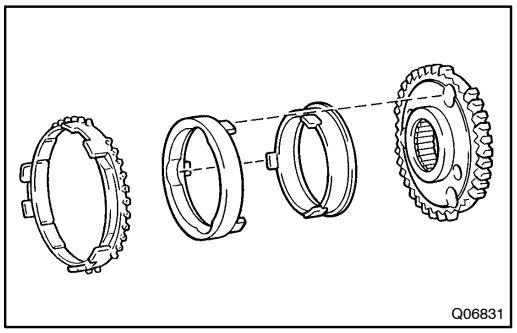


2. INSPECT COUNTER GEAR

Using a micrometer, measure the outer diameter of the counter gear journal.

Minimum diameter: 27.860 mm (1.0968 in.)

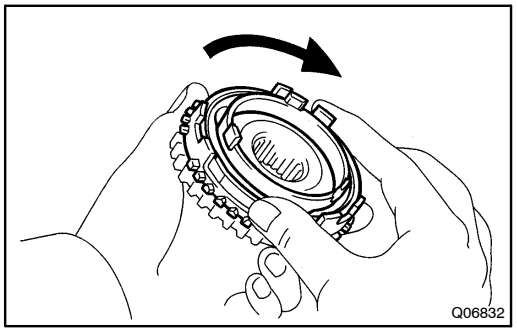
If the outer diameter is less than the minimum, replace the counter gear.



3. INSPECT 5TH SYNCHRONIZER RING

(a) Check for wear or damage.

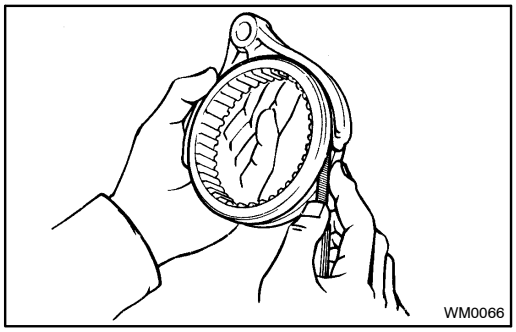
(b) Install the synchronizer pull ring, cone ring and outer ring to the gear spline piece No.5.



(c) Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

If it does not lock, replace the synchronizer ring.

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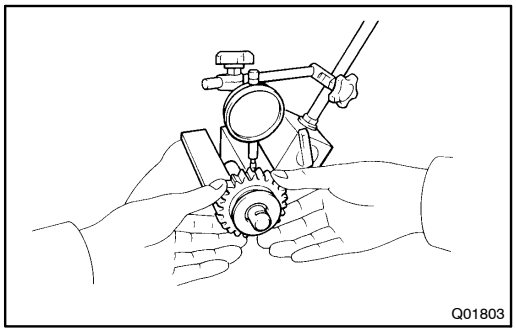

WM0066

4. INSPECT SHIFT FORK AND HUB SLEEVE CLEARANCE

Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the maximum, replace the shift fork or hub sleeve.

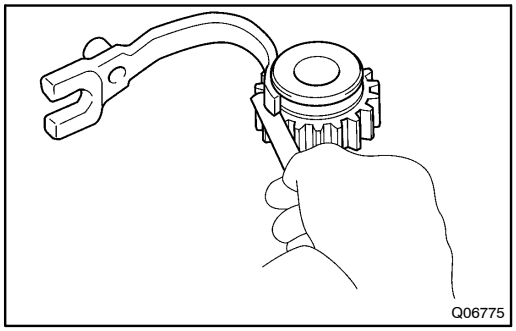

Q01803

5. INSPECT REVERSE IDLER GEAR RADIAL CLEARANCE

Using a dial indicator, measure the reverse idler gear radial clearance.

Standard clearance:
0.040 – 0.082 mm (0.0016 – 0.0032 in.)
Maximum clearance:
0.130 mm (0.0051 in.)

If the clearance exceeds the maximum, replace the reverse idler gear or reverse idler gear shaft.


Q06775

6. INSPECT REVERSE IDLER GEAR AND SHIFT ARM CLEARANCE

Using a feeler gauge, measure the clearance between the reverse idler gear and shift arm.

Standard clearance:
0.05 – 0.35 mm (0.0020 – 0.0138 in.)
Maximum clearance:
0.50 mm (0.0197 in.)

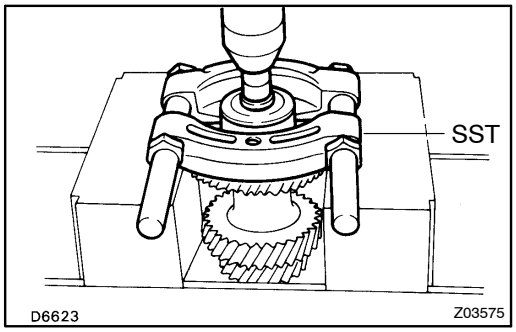
If the clearance exceeds the maximum, replace the shift arm or reverse idler gear.

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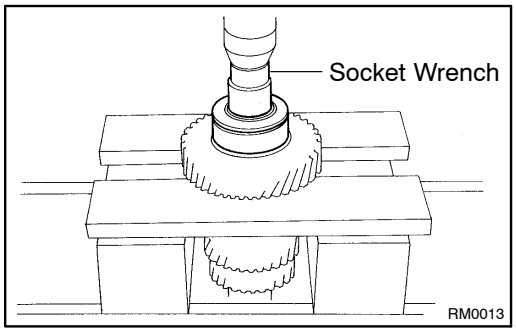
MT053–01

REPLACEMENT

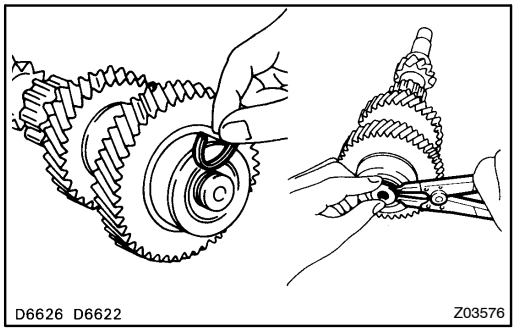
IF NECESSARY, REPLACE COUNTER GEAR FRONT BEARING



(a) Using a snap ring expander, remove the snap ring.
(b) Using SST and a press, remove the bearing.
SST 09950–00020
(c) Replace the side race.



(d) Using a socket wrench and press, install a new bearing and side race.



(e) Select a snap ring that allows the minimum axial play.

Mark	Thickness mm (in.)
A	2.00 – 2.05 (0.0787 – 0.0807)
B	2.05 – 2.10 (0.0807 – 0.0827)
C	2.10 – 2.15 (0.0827 – 0.0846)
D	2.15 – 2.20 (0.0846 – 0.0866)
E	2.20 – 2.25 (0.0866 – 0.0886)
F	2.25 – 2.30 (0.0886 – 0.0906)

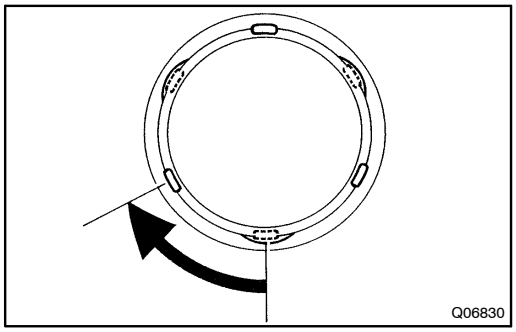
(f) Using a snap ring expander, install the snap ring.

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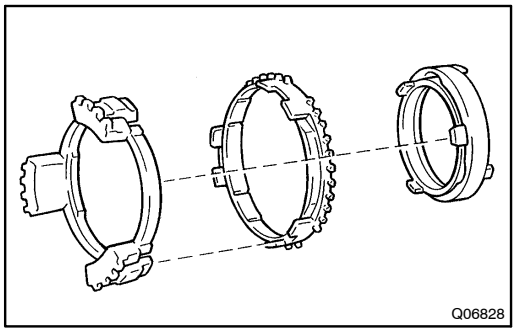
MT054–01

REASSEMBLY

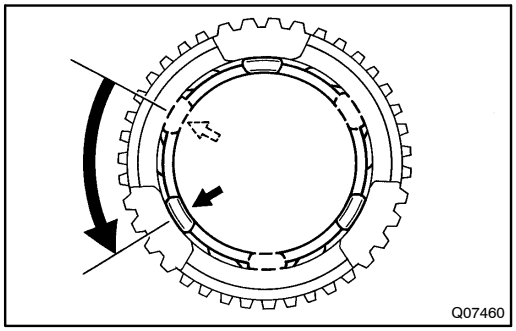
INSTALL SYNCHRONIZER RING ASSEMBLY TO HUB SLEEVE NO.3



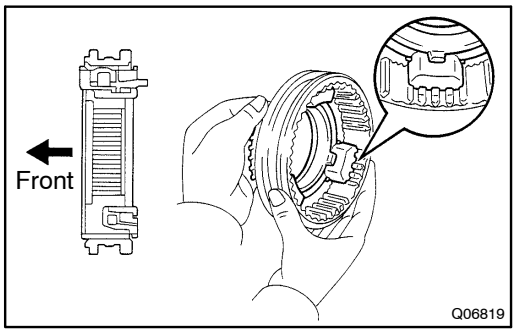
(a) Put the key spring to the hole of the shifting key.
(b) Push the 3 shifting keys with the 3 key springs to the reverse synchronizer ring.
(c) Install the synchronizer cone ring to the reverse synchronizer pull ring and turn the pull ring.



(d) Install the 5th synchronizer ring.
(e) Install the reverse synchronizer ring.



(f) Turn the reverse synchronizer pull ring.



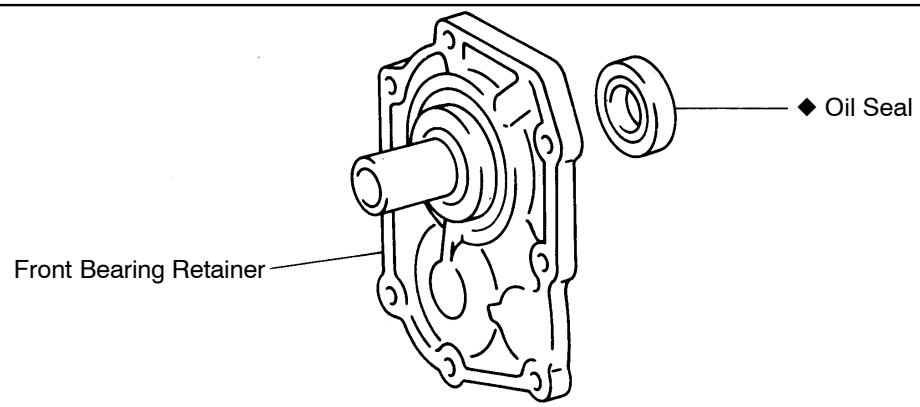
(g) While pushing the 3 shifting keys, install the synchronizer ring assembly to the hub sleeve No.3.

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FRONT BEARING RETAINER OIL SEAL

COMPONENTS

MT055–01

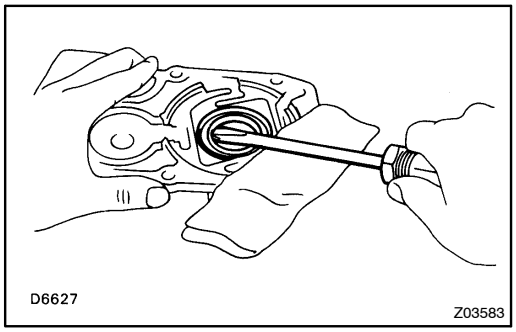


◆ Non–reusable part

RM0322

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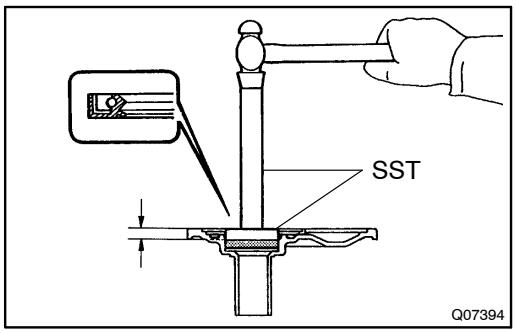
MT056–01



REPLACEMENT

IF NECESSARY, REPLACE FRONT BEARING RETAINER OIL SEAL

(a) Using a screwdriver, pry out the oil seal.



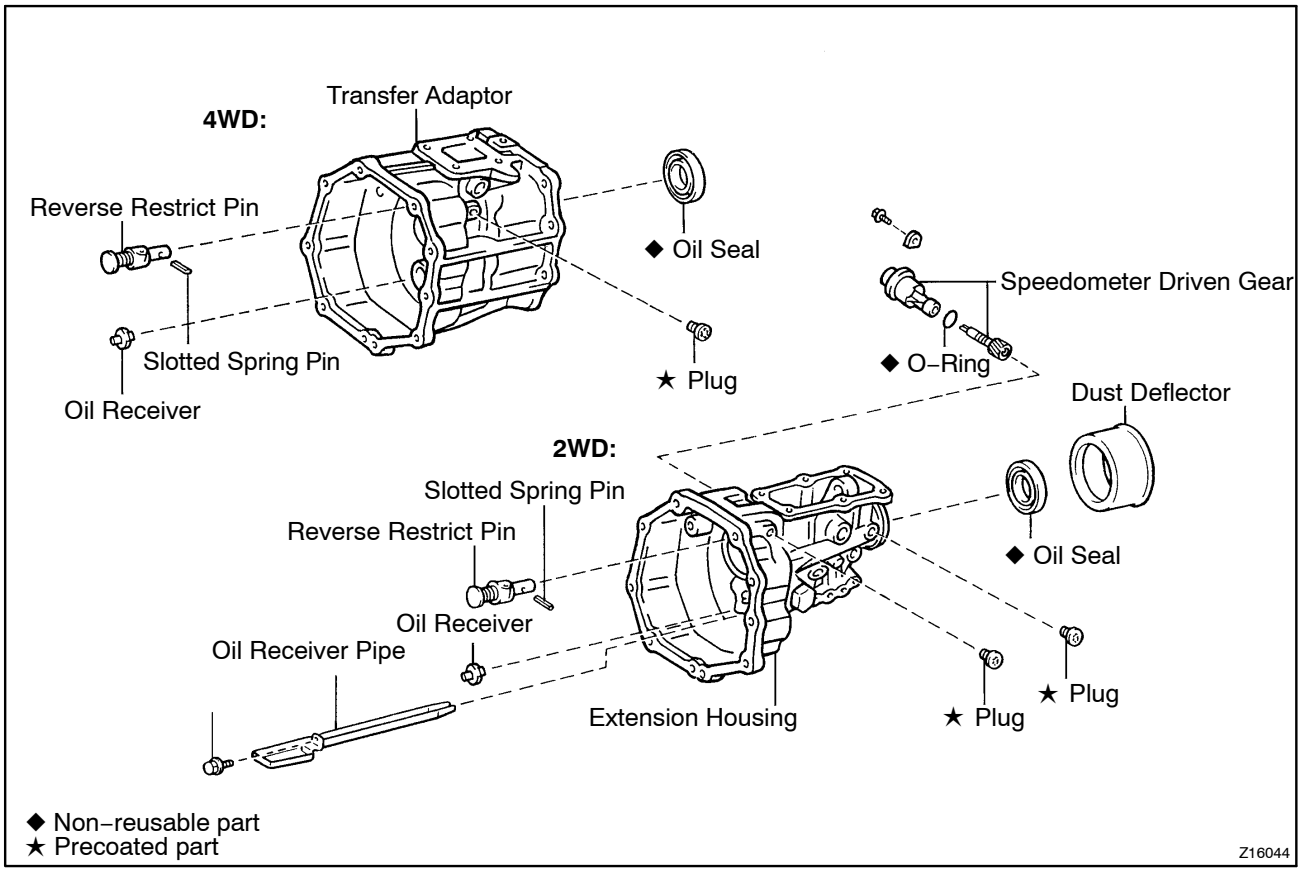
(b) Using SST and a hammer, drive in a new oil seal.
SST 09950–60010 (09951–00510), 09950–70010 (09951–07150)
Drive in depth:
11.7 ± 0.5 mm (0.461 ± 0.020 in.) from retainer end

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EXTENSION HOUSING AND TRANSFER ADAPTOR

COMPONENTS

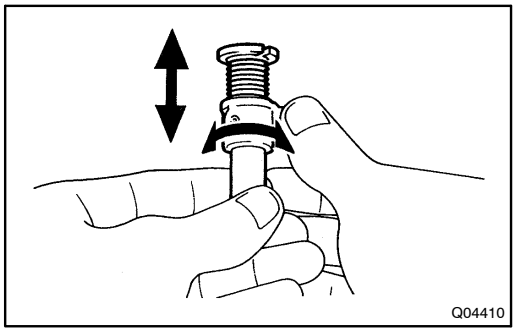
MT058–04



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MT057–01

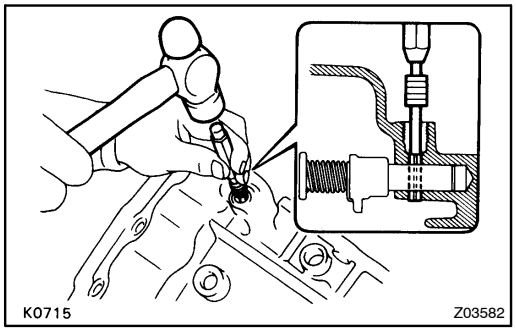
REPLACEMENT



1. IF NECESSARY, REPLACE REVERSE RESTRICT PIN

(a) Remove the reverse restrict pin.
  (1) Using a torx socket wrench (T40), remove the screw plug.
  (2) Using a pin punch and hammer, drive out the slotted spring pin.
  (3) Remove the reverse restrict pin.

(b) Inspect the reverse restrict pin.
Turn and push the reverse restrict pin by hand.
Check for smooth operation.

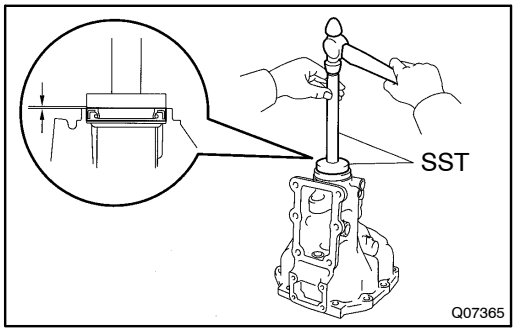


(c) Install the reverse restrict pin.
  (1) Install the reverse restrict pin to the extension housing or transfer adaptor.
  (2) Using a pin punch and hammer, drive in the slotted spring pin, as shown.
  (3) Apply sealant to the plug threads.

Sealant:
Part No. 08833 – 00080, THREE BOND 1344, LOCTITE 242 or equivalent

  (4) Using a torx socket wrench (T40), install and torque the screw plug.

Torque: 19 N·m (190 kgf·cm, 14 ft·lbf)



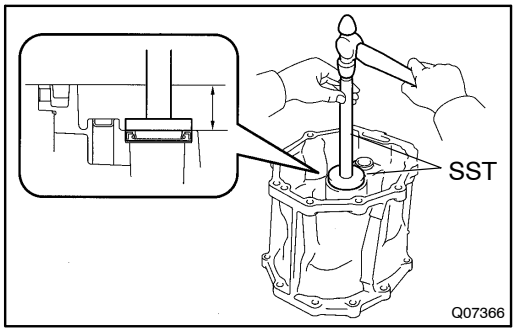
2. 2WD:
IF NECESSARY, REPLACE EXTENSION HOUSING OIL SEAL

(a) Remove the dust deflector.
(b) Using a screwdriver, pry out the oil seal.
(c) Using SST and a hammer, drive in a new oil seal.
SST 09950–60010 (09951–00570), 09950–70010 (09951–07150)

Drive in depth: 0 ± 0.5 mm (0 ± 0.020 in.)

(d) Install the deflector.

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3. 4WD:

IF NECESSARY, REPLACE TRANSFER ADAPTOR OIL SEAL

(a) Using a screwdriver, pry out the oil seal.

(b) Using SST and a hammer, drive in a new oil seal.

SST 09950–60010 (09951–00570), 09950–70010 (09951–07150)

Drive in depth: 45.6 ± 0.5 mm (1.795 ± 0.020 in.)

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MT – MANUAL TRANSMISSION (W59)

MANUAL TRANSMISSION SYSTEM	MT-1
TROUBLESHOOTING	MT-2
MANUAL TRANSMISSION UNIT	MT-3
MANUAL TRANSMISSION ASSEMBLY	MT-6
INPUT SHAFT	MT-18
OUTPUT SHAFT	MT-21
COUNTER GEAR AND REVERSE IDLER GEAR	MT-30
FRONT BEARING RETAINER OIL SEAL	MT-38
EXTENSION HOUSING	MT-40

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MANUAL TRANSMISSION SYSTEM

MT03H–01

PRECAUTION

When working with FIPG material, you must observe the following items.

- **Using a razor blade and gasket scraper, remove all the old FIPG material from the gasket surfaces.**
- **Thoroughly clean all components to remove all the loose material.**
- **Clean both sealing surfaces with a non–residue solvent.**
- **Apply FIPG in an approx. 1 mm (0.04 in.) wide bead along the sealing surface.**
- **Parts must be assembled within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.**

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TROUBLESHOOTING

MT03I–01

PROBLEM SYMPTOMS TABLE

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

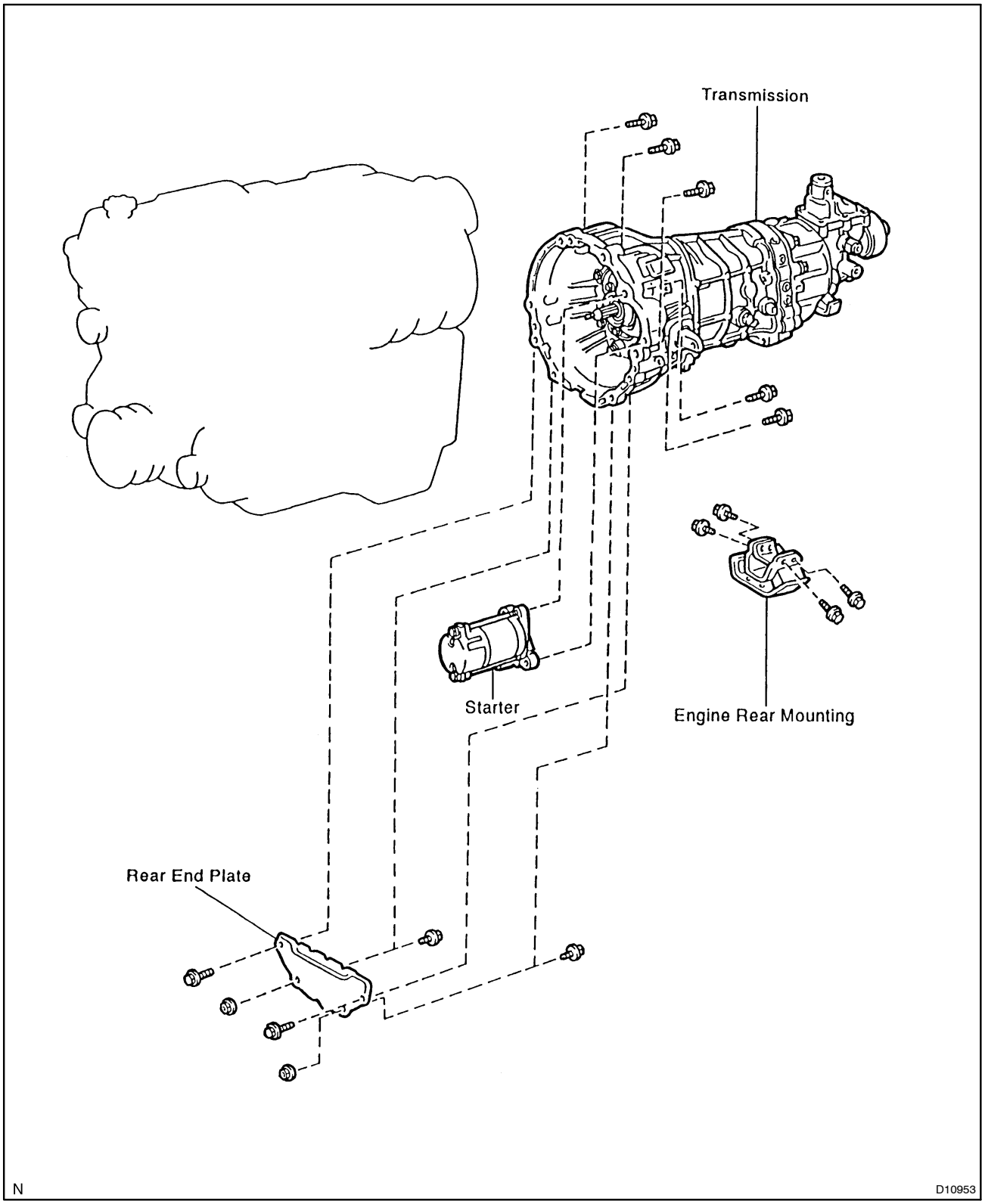
Symptom	Suspect Area	See page
Noise	1. Oil (Level low)	MT–4
	2. Oil (Wrong)	MT–4
	3. Gear (Worn or damaged)	MT–6
	4. Bearing (Worn or damaged)	MT–6
Oil leakage	1. Oil (Level too high)	MT–4
	2. Gasket (Damaged)	MT–6
	3. Oil seal (Worn or damaged)	MT–6
	4. O–Ring (Worn or damaged)	MT–6
Hard to shift or will not shift	1. Synchronizer ring (Worn or damaged)	MT–18 MT–21 MT–30
	2. Shift key spring (Damaged)	MT–18 MT–21 MT–30
Jumps out of gear	1. Locking ball spring (Damaged)	MT–6
	2. Shift fork (Worn)	MT–6
	3. Gear (Worn or damaged)	MT–6
	4. Bearing (Worn or damaged)	MT–6

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MANUAL TRANSMISSION UNIT

COMPONENTS

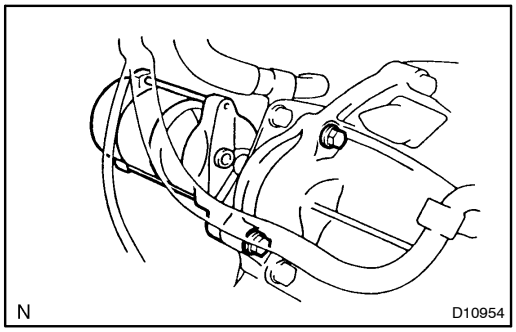
MT03J–02



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MT0ES–01

REMOVAL



1. REMOVE TRANSMISSION WITH ENGINE (See page EM–65)

2. REMOVE REAR END PLATE

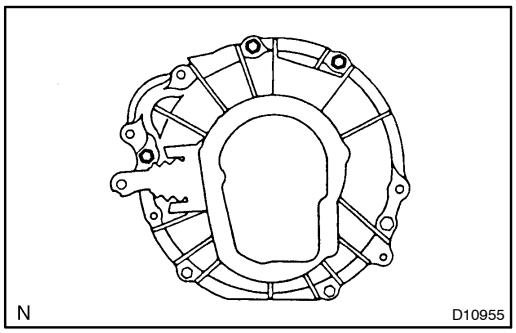
Remove the 4 bolts, 2 nuts and rear end plate.

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

3. REMOVE STARTER

Remove the 2 bolts and starter.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)



4. REMOVE TRANSMISSION FROM ENGINE

(a) Remove the 3 transmission mounting bolts from the engine.

Torque: 72 N·m (730 kgf·cm, 53 ft·lbf)

(b) Pull out the transmission toward the rear.

HINT:

At the time of installation, please refer to the following item. Align the input shaft spline with the clutch disc and install the transmission to the engine.

5. REMOVE ENGINE REAR MOUNTING

Remove the 4 bolts and engine rear mounting.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

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MT03L–02

INSTALLATION

Installation is in the reverse order of removal (See page MT–4).

HINT:

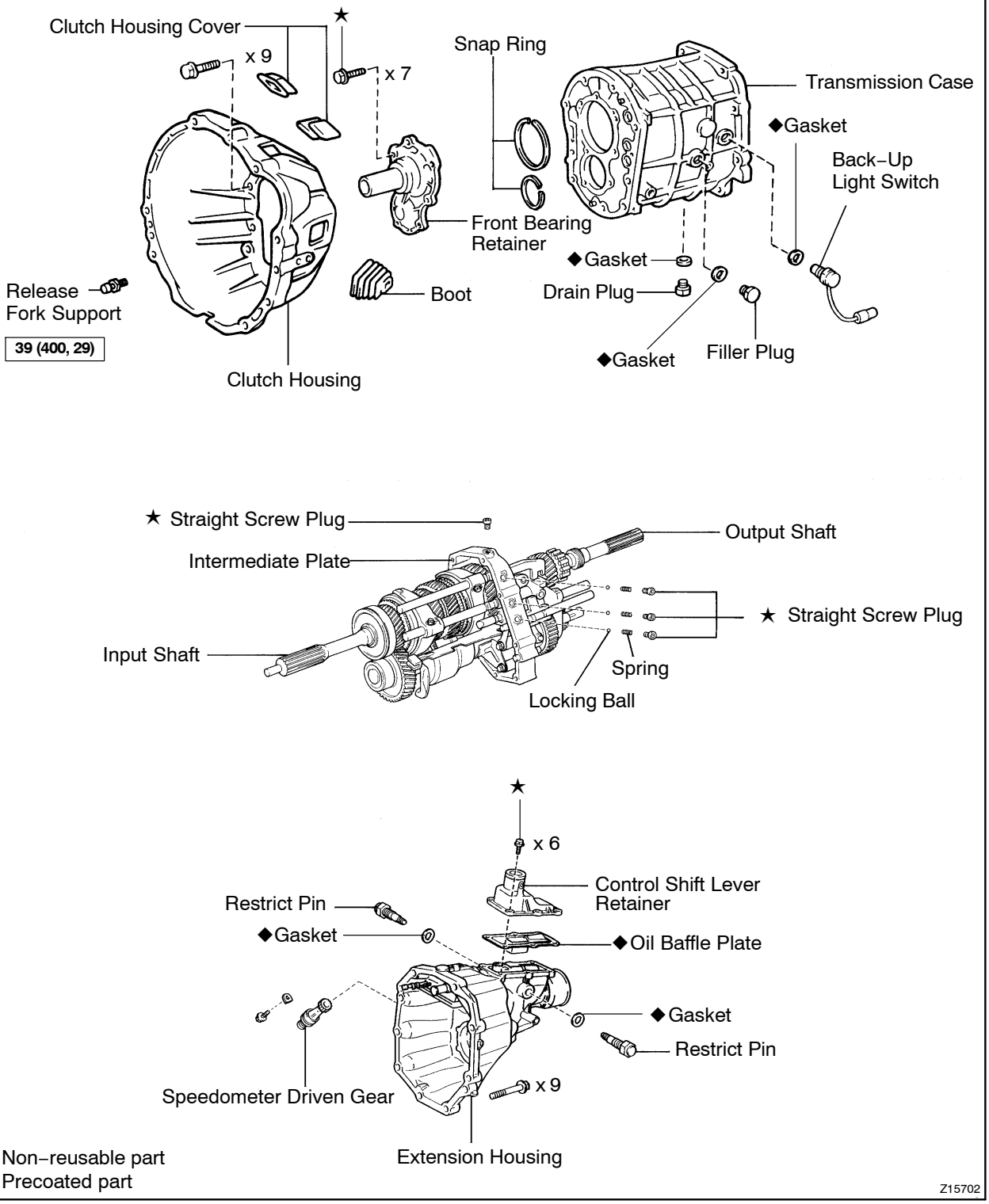
After installation, do the road test.

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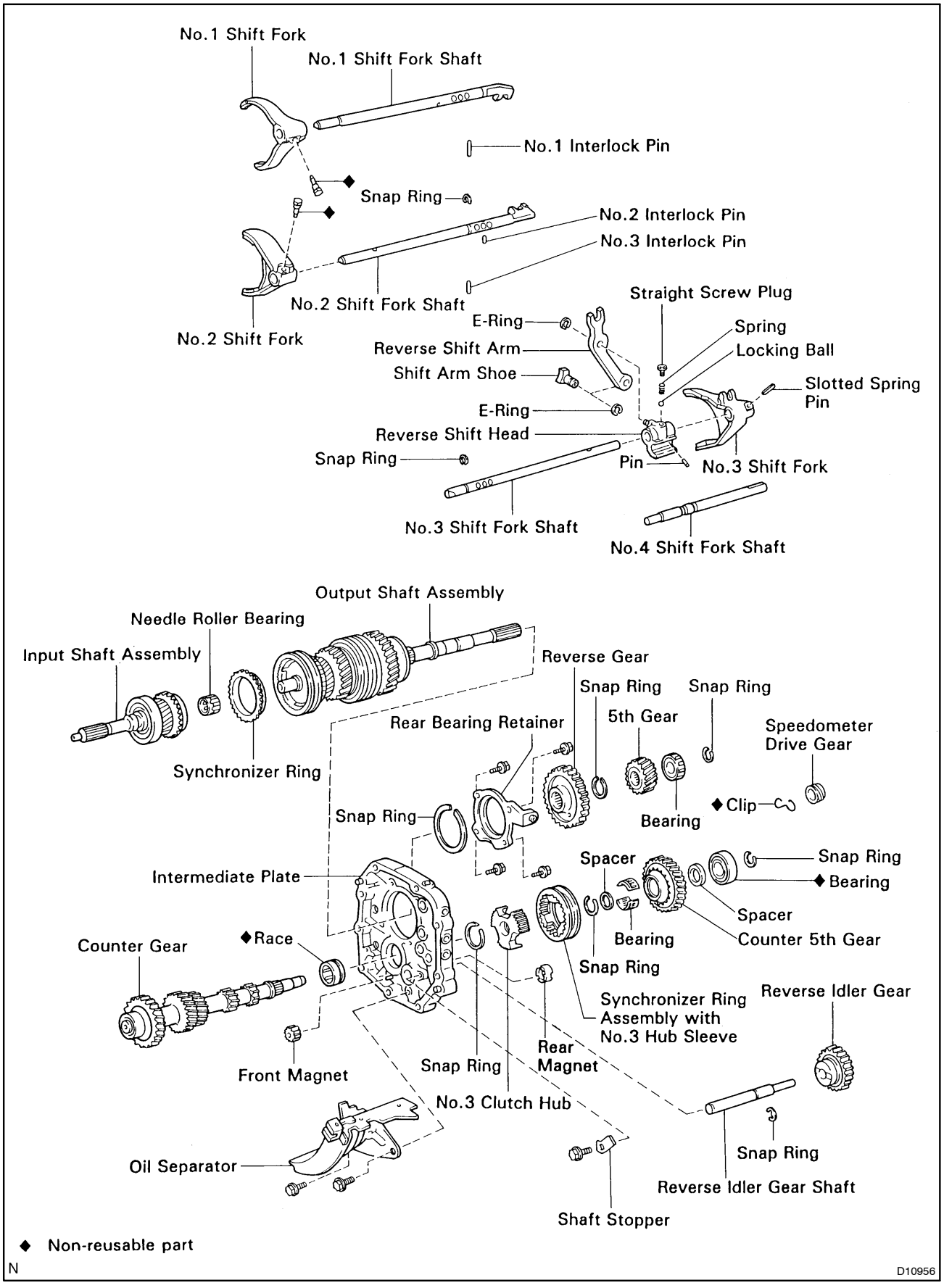
MANUAL TRANSMISSION ASSEMBLY

COMPONENTS

MT03M–03



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MT03N–04

DISASSEMBLY

1. REMOVE BACK–UP LIGHT SWITCH

Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)

2. REMOVE SPEEDOMETER DRIVEN GEAR

Remove the lock plate set bolt and driven gear.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

3. REMOVE CLUTCH HOUSING FROM TRANSMISSION CASE

Remove the 9 bolts and clutch housing.

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

4. REMOVE CONTROL SHIFT LEVER RETAINER

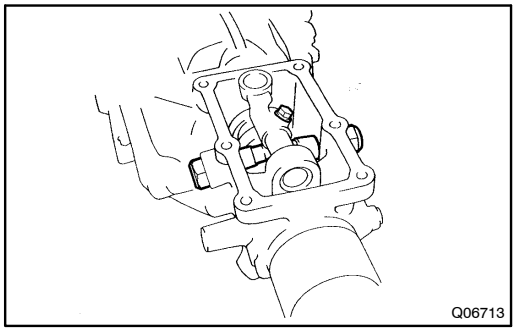
(a) Remove the 6 bolts.

Sealant:

Part No.08833 – 00080, THREE BOND 1344, LOCTITE 242 or equivalent

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

(b) Remove the control shift lever retainer and oil baffle plate.



5. REMOVE 2 RESTRICT PINS AND GASKETS

HINT:

At the time of reassembly, please refer to the following item.

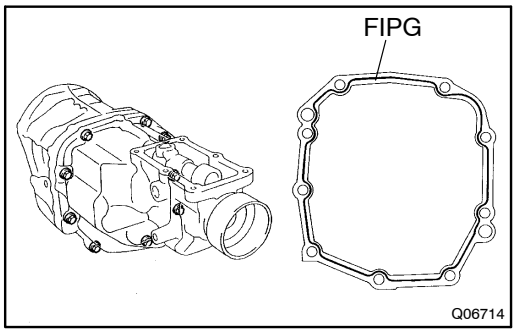
Install the black pin on the reverse gear/5th gear side.

Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)

6. REMOVE EXTENSION HOUSING

(a) Remove the shift lever housing set bolt.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)



(b) Remove the 9 bolts from the extension housing.

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

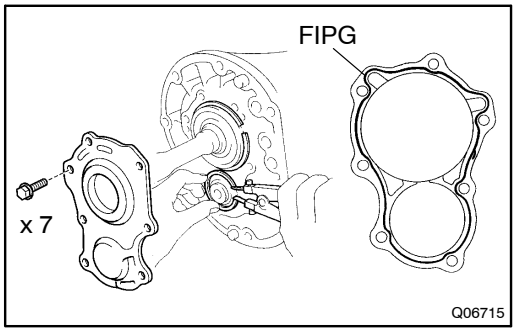
(c) Using a plastic hammer, carefully tap the extension housing.

(d) Disengage the shift and select lever from the shift head.

(e) Pull out the extension housing.

FIPG:

Part No. 08826 – 00090, THREE BOND 1281 or equivalent



7. REMOVE FRONT BEARING RETAINER AND BEARING SNAP RING

(a) Remove the 7 bolts.

Sealant:

Part No.08833 – 00080, THREE BOND 1344, LOCTITE 242 or equivalent

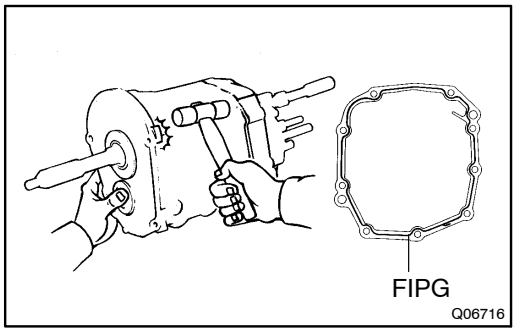
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(b) Remove the front bearing retainer.

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FIPG:
Part No. 08826 – 00090, THREE BOND 1281 or equivalent

(c) Using a snap ring expander, remove the 2 bearing snap rings.



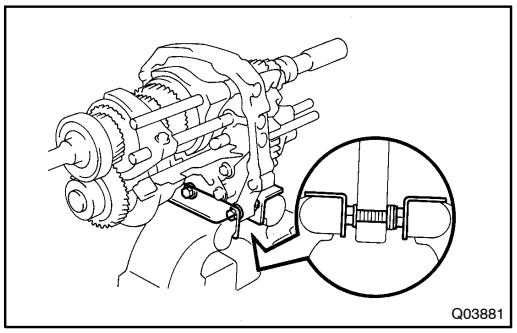
8. SEPARATE INTERMEDIATE PLATE FROM TRANSMISSION CASE

(a) Using a plastic hammer, carefully tap the transmission case.

(b) Pull the transmission case from the intermediate plate.

NOTICE:
At the time of reassembly, please refer to the following item.
Align each bearing outer race and each shift fork shaft end with the case holes.

FIPG:
Part No. 08826 – 00090, THREE BOND 1281 or equivalent



9. MOUNT INTERMEDIATE PLATE IN VISE

(a) Use the 2 long clutch housing bolts, plate washers and suitable nuts, as shown.

HINT:
Increase or decrease plate washers so that the bolt tip does not protrude from the nut.

(b) Mount the intermediate plate in a vise.

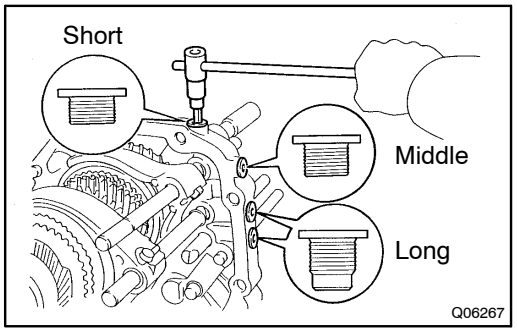
10. REMOVE OIL SEPARATOR

Remove the 2 bolts and oil separator.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

11. REMOVE FRONT MAGNET

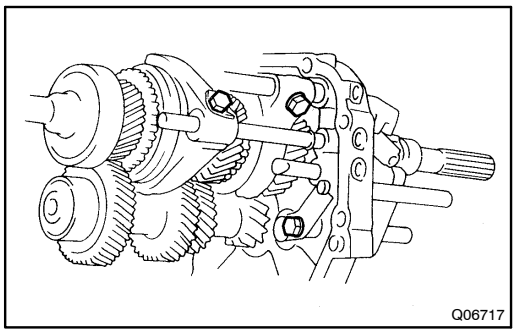
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12. REMOVE LOCKING BALL AND SPRING

(a) Using a hexagon wrench, remove the 4 straight screw plugs.
Sealant:
Part No.08833 – 00080, THREE BOND 1344, LOCTITE 242 or equivalent
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(b) Using a magnetic finger, remove the 3 springs and balls.



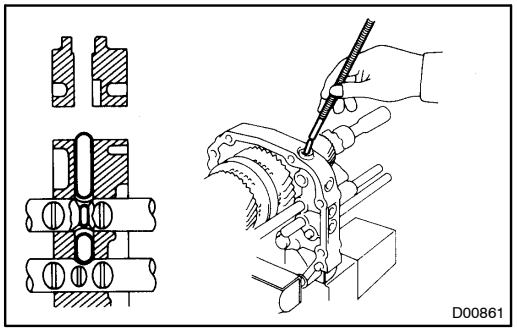
13. REMOVE SHIFT FORK, SHIFT FORK SHAFT AND REVERSE IDLER GEAR

(a) Remove the No.1 and No.2 shift fork set bolts.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

(b) Remove the bolt and reverse idler gear shaft stopper.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(c) Remove the reverse idler gear and shaft with the snap ring.

(d) Remove the No.1 shift fork and shaft.

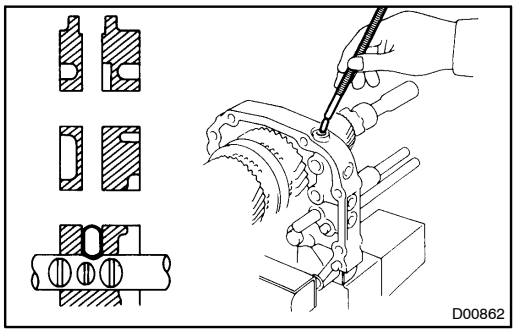


(e) Using a magnetic finger, remove the No.1 and No.2 interlock pins.

HINT:
At the time of reassembly, please refer to the following item.
Apply MP grease to the No.1 and No.2 interlock pins.

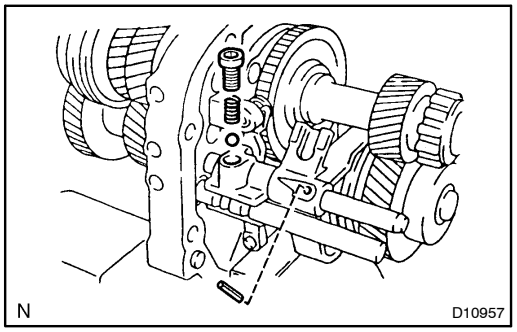
(f) Using 2 screwdrivers and a hammer, tap out the No. 2 shift fork shaft snap ring.

(g) Remove the No. 2 shift fork and shaft.



(h) Using a magnetic finger, remove the No. 3 interlock pin.

HINT:
At the time of reassembly, please refer to the following item.
Apply MP grease to the No.3 interlock pin.

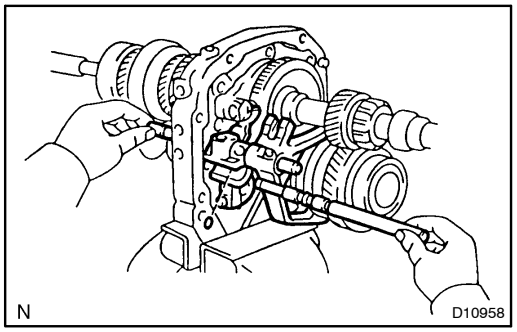


(i) Using a pin punch and hammer, drive out the No. 3 shift fork pin.

(j) Using a hexagon wrench, remove the plug.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(k) Using a magnetic finger, remove the spring and ball.

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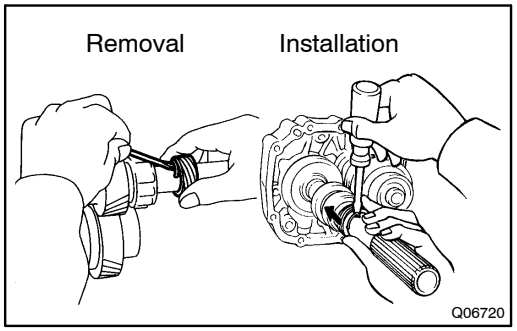


(l) Pull out the No.4 shift fork shaft.
(m) Remove the pin from the reverse shift head.

HINT:
At the time of reassembly, please refer to the following item.
Apply MP grease to the pin.

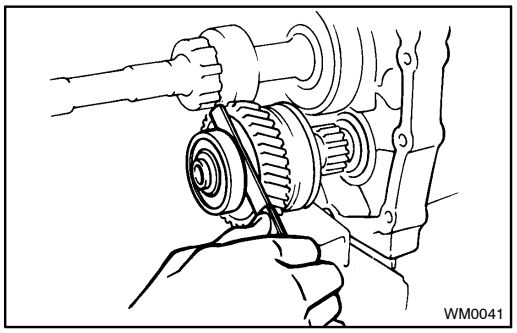
(n) Remove the No.3 shift fork, fork shaft and reverse shift arm with the snap ring.

HINT:
At the time of reassembly, please refer to the following item.
Align the No.3 shift fork with the No.3 hub sleeve groove, put the reverse shift arm into the pivot of bearing retainer and align the reverse shift arm shoe with the reverse idler gear groove.



14. REMOVE SPEEDOMETER DRIVE GEAR

Pry out both ends of the clip and remove the drive gear.

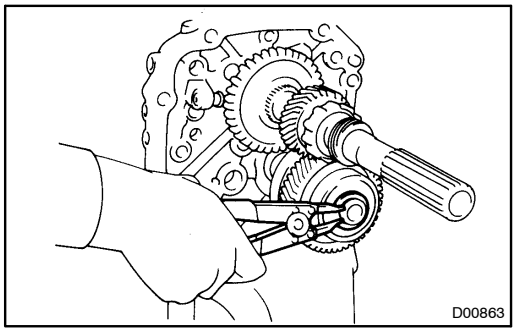


15. INSPECT COUNTER 5TH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the counter 5th gear thrust clearance.

Standard clearance:
0.10 – 0.41 mm (0.0039 – 0.0161 in.)
Maximum clearance:
0.46 mm (0.0181 in.)

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16. REMOVE COUNTER REAR BEARING, SPACER, COUNTER 5TH GEAR AND NEEDLE ROLLER BEARING

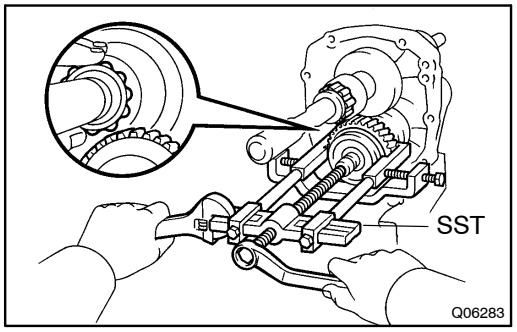
(a) Using a snap ring expander, remove the snap ring.

HINT:

At the time of reassembly, please refer to the following item.

Select a snap ring that allows the minimum axial play.

Mark	Thickness mm (in.)
1	1.90 – 1.95 (0.0748 – 0.0768)
2	1.96 – 2.01 (0.0772 – 0.0791)
3	2.02 – 2.07 (0.0795 – 0.0815)
4	2.08 – 2.13 (0.0819 – 0.0839)
5	2.14 – 2.19 (0.0843 – 0.0862)
6	2.20 – 2.25 (0.0866 – 0.0886)
7	2.26 – 2.31 (0.0890 – 0.0909)



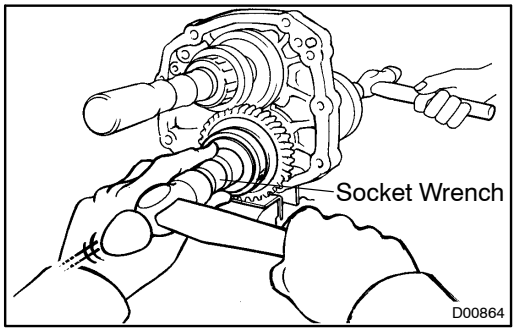
(b) Using SST, remove the rear bearing, spacer, counter 5th gear and bearing.

SST 09950–40010

NOTICE:

Be careful not to catch the output shaft rear bearing roller on the counter 5th gear.

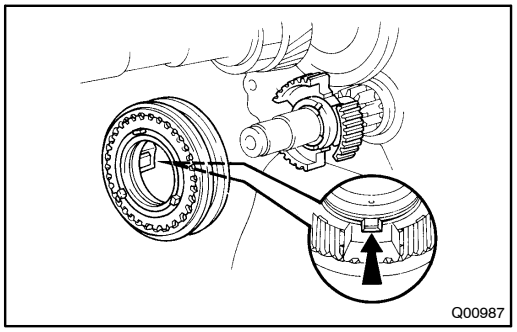
(c) Remove the spacer.



HINT:

At the time of reassembly, please refer to the following items.

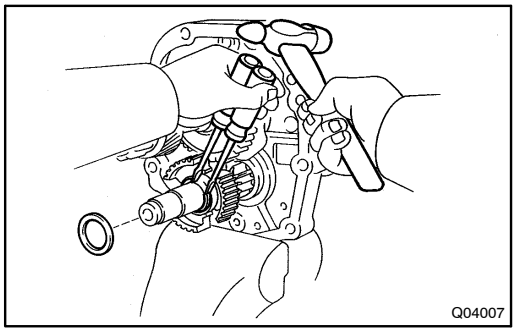
- Install the counter 5th gear with the 5th gear gaps aligned with the synchronizer cone ring pin.
- Using a socket wrench and hammer, drive in the bearing.
- When driving in the bearing, support the counter shaft in front with a 1.4 – 2.3 kg (3 – 5 lb) hammer or equivalent.



17. REMOVE SYNCHRONIZER RING ASSEMBLY WITH NO.3 HUB SLEEVE AND NO.3 CLUTCH HUB

(a) Remove the synchronizer ring assembly with the No.3 hub sleeve from the No.3 clutch hub.

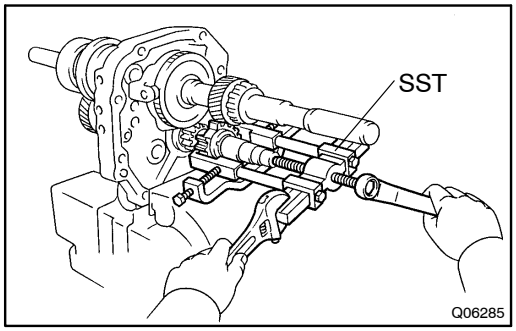
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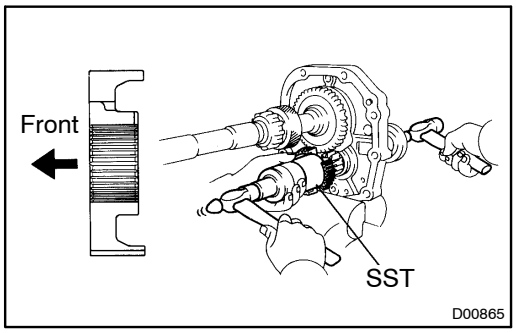
(b) Remove the spacer.
(c) Using 2 screwdrivers and a hammer, tap out the snap ring.

HINT:
At the time of reassembly, please refer to the following item.
Select a snap ring that allows the minimum axial play.

Mark	Thickness mm (in.)
2	2.06 – 2.11 (0.0811 – 0.0831)
3	2.12 – 2.17 (0.0835 – 0.0854)
4	2.18 – 2.23 (0.0858 – 0.0878)
5	2.24 – 2.29 (0.0882 – 0.0902)



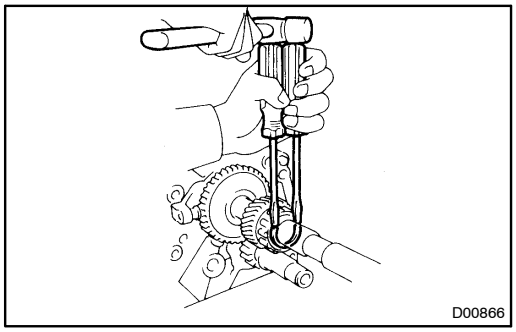
(d) Using SST, remove the No.3 clutch hub.
SST 09950–40010



HINT:
At the time of reassembly, please refer to the following items.
- Using SST and a hammer, drive in the No.3 clutch hub.
SST 09316–60011 (09316–00011, 09316–00071)
- When installing the No.3 clutch hub, support the counter shaft in front with a 1.4 – 2.3 kg (3 – 5 lb) hammer or equivalent.

18. REMOVE REAR MAGNET

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D00866

19. REMOVE OUTPUT SHAFT REAR BEARING AND 5TH GEAR

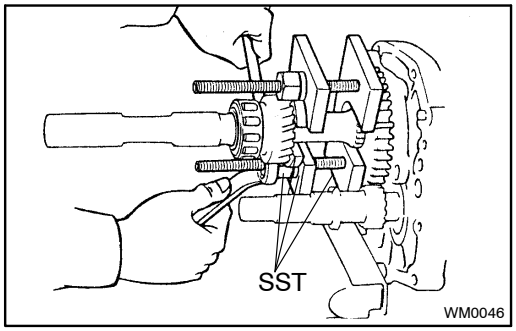
(a) Using 2 screwdrivers and a hammer, tap out the snap ring.

HINT:

At the time of reassembly, please refer to the following item.

Select a snap ring that allows the minimum axial play.

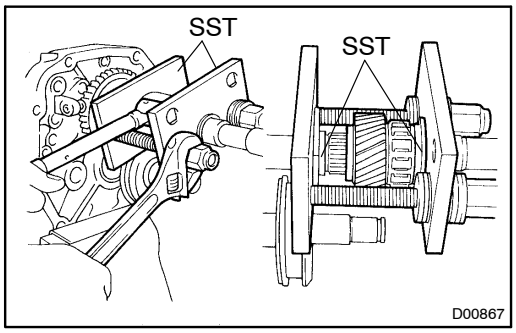
Mark	Thickness mm (in.)
8	2.31 – 2.36 (0.0909 – 0.0929)
9	2.37 – 2.42 (0.0933 – 0.0953)
10	2.43 – 2.48 (0.0957 – 0.0976)
11	2.49 – 2.54 (0.0980 – 0.1000)
12	2.55 – 2.60 (0.1004 – 0.1024)
13	2.61 – 2.66 (0.1028 – 0.1047)
14	2.68 – 2.73 (0.1055 – 0.1075)
15	2.74 – 2.79 (0.1079 – 0.1098)



WM0046

(b) Using SST, remove the rear bearing and 5th gear.

SST 09312–20011 (09313–00030, 09313–00040, 09313–00050)



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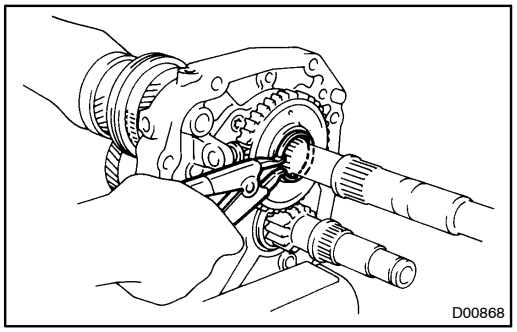
HINT:

At the time of reassembly. please refer to the following item.

Using SST, install the 5th gear and rear bearing.

SST 09312–20011 (09313–00010, 09313–00030, 09313–00040, 09313–00050)

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20. REMOVE REVERSE GEAR

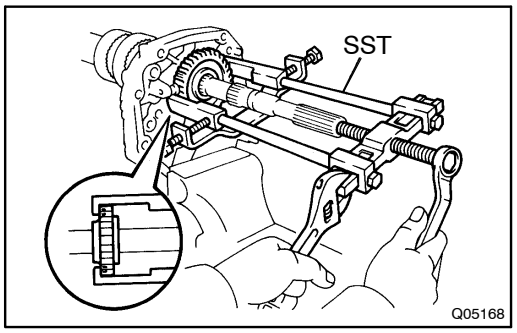
(a) Using a snap ring expander, remove the snap ring.

HINT:

At the time of reassembly, please refer to the following item.

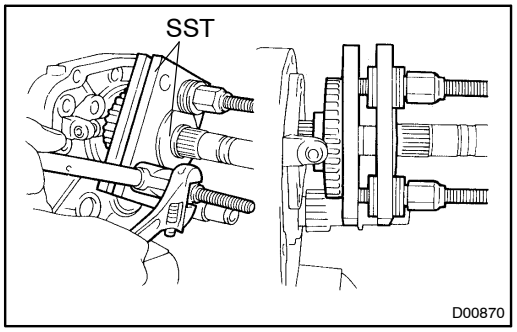
Select a snap ring that allows the minimum axial play.

Mark	Thickness mm (in.)
5	2.25 – 2.30 (0.0886 – 0.0906)
11	2.30 – 2.35 (0.0906 – 0.0925)
12	2.35 – 2.40 (0.0925 – 0.0945)
13	2.40 – 2.45 (0.0945 – 0.0965)
14	2.45 – 2.50 (0.0965 – 0.0984)
15	2.50 – 2.55 (0.0984 – 0.1004)
16	2.55 – 2.60 (0.1004 – 0.1024)
17	2.61 – 2.66 (0.1028 – 0.1047)
18	2.67 – 2.72 (0.1051 – 0.1071)
19	2.73 – 2.78 (0.1075 – 0.1094)
20	2.79 – 2.84 (0.1098 – 0.1118)
21	2.85 – 2.90 (0.1122 – 0.1142)
22	2.91 – 2.96 (0.1146 – 0.1165)
23	2.97 – 3.02 (0.1169 – 0.1189)



(b) Using SST, remove the reverse gear.

SST 09950–40010



HINT:

At the time of reassembly, please refer to the following item.

Using SST, install the reverse gear.

SST 09312–20011 (09313–00030, 09313–00040, 09313–00050)

21. REMOVE REAR BEARING RETAINER

(a) Using a torx socket wrench (T40), unscrew the 4 torx screws and remove the rear bearing retainer.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

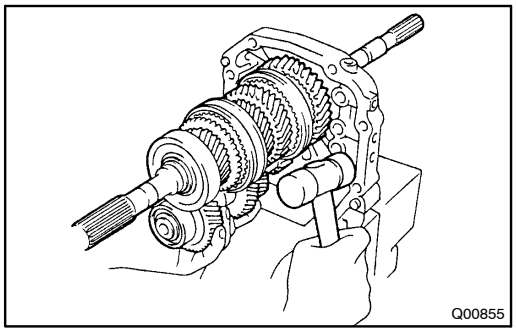
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(b) Using a snap ring expander, remove the 2 snap rings.

HINT:

At the time of reassembly, please refer to the following item.

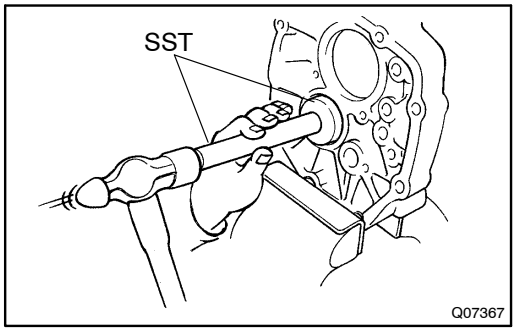
Make sure the snap ring is flush with the intermediate plate surface.



22. REMOVE OUTPUT SHAFT AND COUNTER GEAR FROM INTERMEDIATE PLATE

(a) Remove the output shaft, input shaft and counter gear as a unit from the intermediate plate by pulling on the counter gear and tapping on the intermediate plate with a plastic hammer.

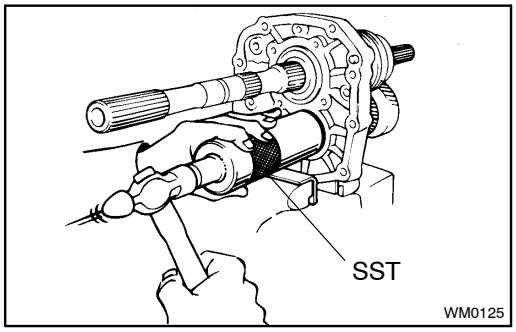
(b) Remove the input shaft from the output shaft.



HINT:

At the time of reassembly, please refer to the following items.

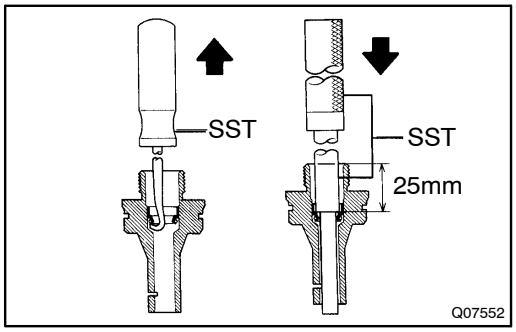
- Before installing the output shaft, use SST to remove the counter gear center bearing outer race.
  SST 09950–60010 (09951–00510), 09950–70010 (09951–07150)
- Install the outer race after installing the counter gear.
- Install the output shaft into the intermediate plate by pulling on the output shaft and tapping on the intermediate plate.



HINT:

At the time of reassembly, please refer to the following items.

- Apply gear oil to the needle roller bearing.
- Install the needle roller bearing to the input shaft.
- Install the input shaft and counter gear together.
- Using SST and a hammer, install a new counter gear center bearing outer race.
  SST 09316–60011 (09316–00011)
- Be careful not to damage the bearing rollers.



23. IF NECESSARY REPLACE SPEEDOMETER DRIVEN GEAR OIL SEAL

(a) Using SST, remove the oil seal.
SST 09921–00010

(b) Coat the lip of oil seal with MP grease.

(c) Using SST, drive in a new oil seal.
SST 09201–10000 (09201–01080), 09950–70010 (09951–07150)
Drive in depth: 25 mm (0.98 in.)

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MT03O–02

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page MT–8).

HINT:

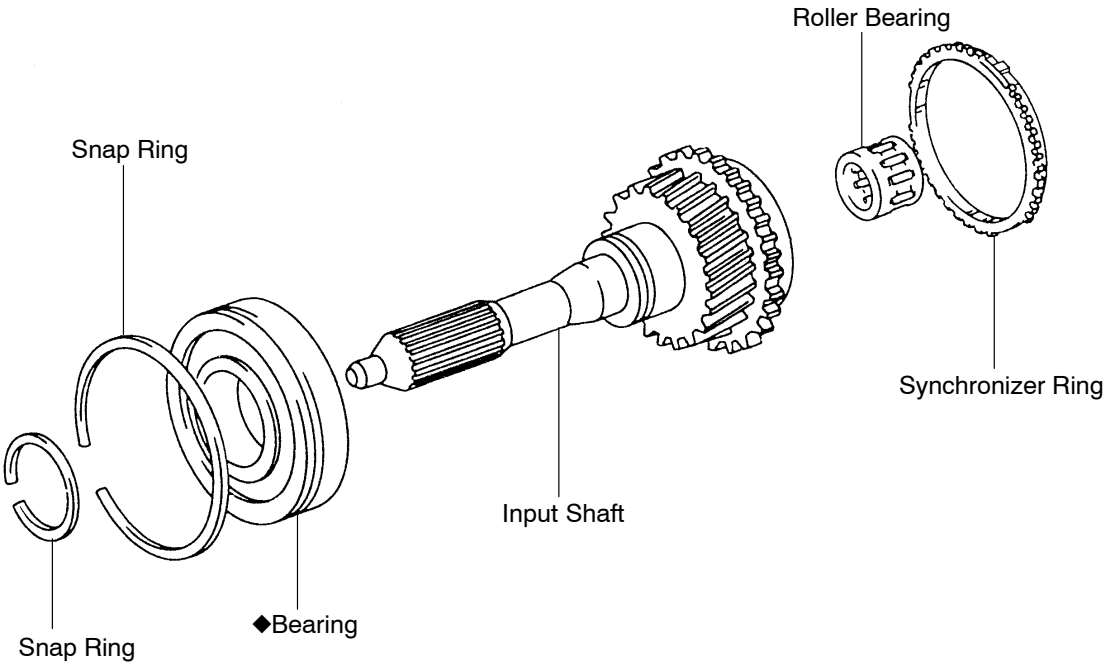
Coat all of the sliding and rotating surfaces with gear oil before reassembly.

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INPUT SHAFT

COMPONENTS

MT03P–01

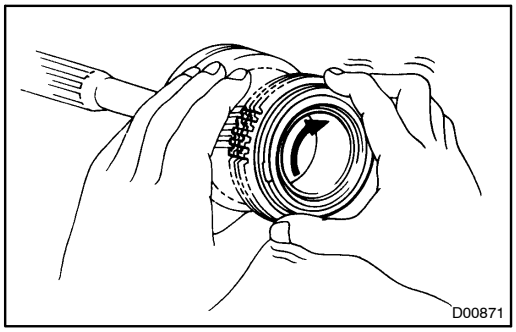


◆Non–reusable part

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MT03Q–01



INSPECTION

INSPECT SYNCHRONIZER RING

(a) Check for wear or damage.

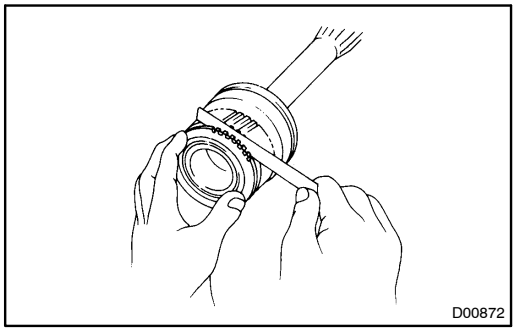
(b) Check the braking effect of the synchronizer ring.
Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

If the braking effect is insufficient, apply a small amount of the fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear cone together.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.

(c) Check again the braking effect of the synchronizer ring.



(d) Using a feeler gauge, measure the clearance between the synchronizer ring back and gear spline end.
Minimum clearance: 0.5 mm (0.020 in.)

If the clearance is less than the minimum, replace the synchronizer ring, and apply a small amount of the fine lapping compound on gear cone.

NOTICE:

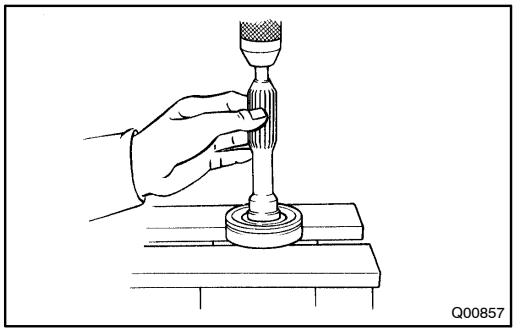
Ensure the fine lapping compound is completely washed off after rubbing.

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MT03R–01

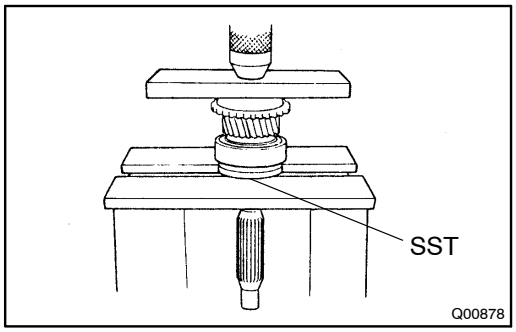
REPLACEMENT

IF NECESSARY, REPLACE INPUT SHAFT BEARING

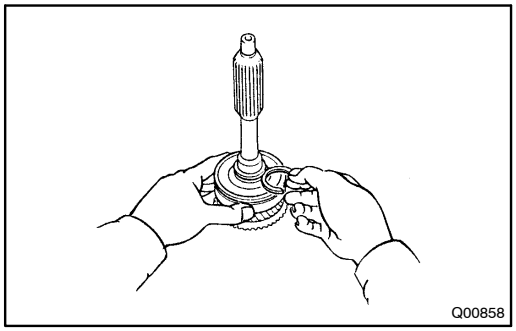


(a) Using a snap ring expander, remove the snap ring.

(b) Using a press, remove the bearing.



(c) Using SST and a press, install a new bearing.
SST 09506–35010



(d) Select a snap ring that allows the minimum axial play.

Mark	Thickness mm (in.)
1	2.05 – 2.10 (0.0807 – 0.0827)
2	2.10 – 2.15 (0.0827 – 0.0846)
3	2.15 – 2.20 (0.0846 – 0.0866)
4	2.20 – 2.25 (0.0866 – 0.0886)
5	2.25 – 2.30 (0.0886 – 0.0906)
11	2.30 – 2.35 (0.0906 – 0.0925)
12	2.35 – 2.40 (0.0925 – 0.0945)

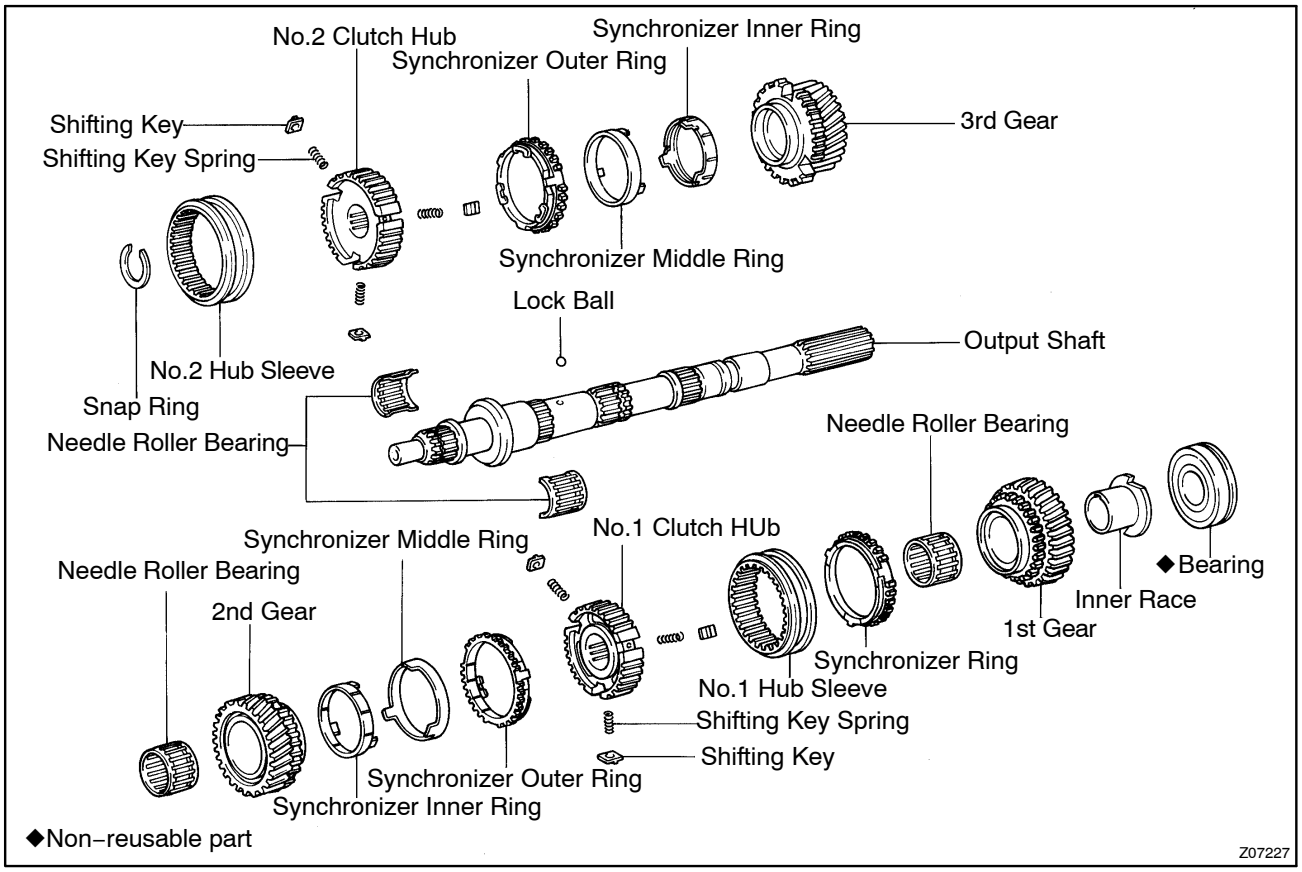
(e) Using a snap ring expander, install the snap ring.

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OUTPUT SHAFT

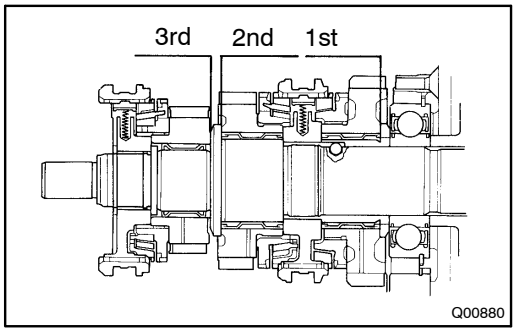
COMPONENTS

MT03S–01



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MT03T–01

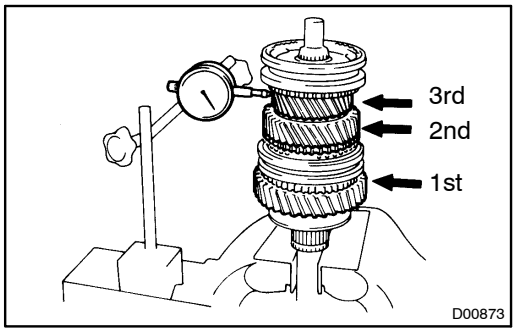


DISASSEMBLY

1. INSPECT EACH GEAR THRUST CLEARANCE

Using a feeler gauge, measure the thrust clearance of each gear.

Standard clearance:
0.10 – 0.25 mm (0.0039 – 0.0098 in.)
Maximum clearance:
0.30 mm (0.0118 in.)

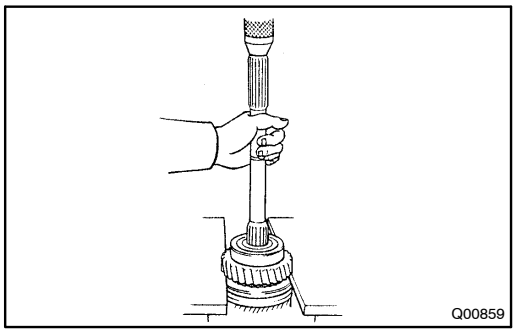


2. INSPECT EACH GEAR RADIAL CLEARANCE

Using a dial indicator, measure the radial clearance of each gear.

Standard clearance:
1st and 2nd gears:
0.009 – 0.060 mm (0.0004 – 0.0024 in.)
3rd gear:
0.015 – 0.066 mm (0.0006 – 0.0026 in.)
Maximum clearance:
1st and 2nd gears:
0.150 mm (0.0059 in.)
3rd gear:
0.200 mm (0.0079 in.)

If the clearance exceeds the maximum, replace the gear, shaft or needle roller bearing.

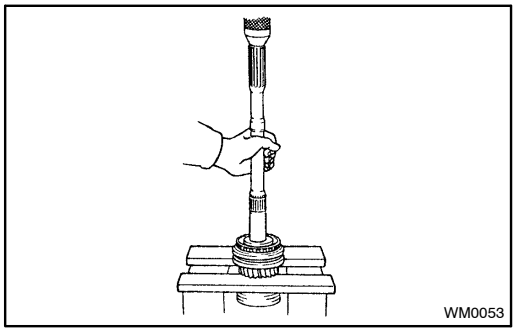


3. REMOVE OUTPUT SHAFT CENTER BEARING AND 1ST GEAR ASSEMBLY

(a) Shift the No.1 hub sleeve onto the 2nd gear.
(b) Using a press, remove the center bearing, 1st gear, needle roller bearing, inner race and synchronizer ring.

4. REMOVE LOCKING BALL ON OUTPUT SHAFT

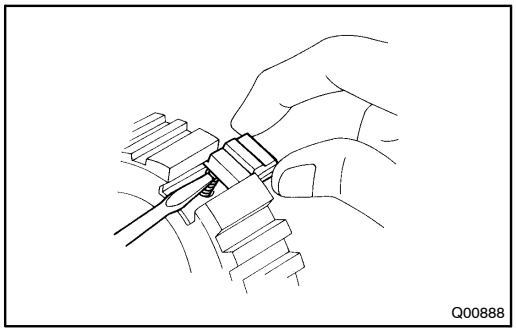
Using a magnetic finger, remove the locking ball.



5. REMOVE NO.1 HUB SLEEVE ASSEMBLY, 2ND GEAR AND NEEDLE ROLLER BEARING

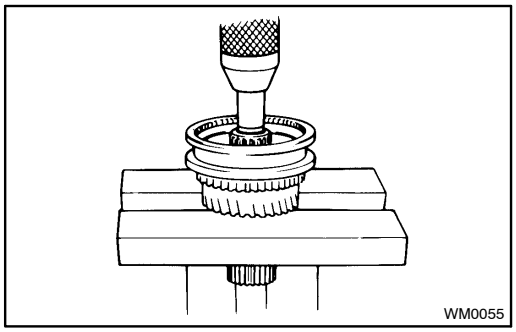
Using a press, remove the parts from the shaft as an assembly.

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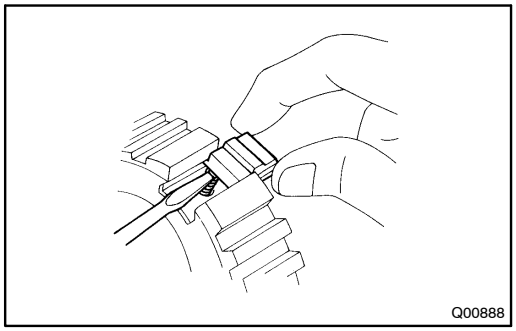
6. REMOVE NO.1 HUB SLEEVE, SHIFTING KEY AND SPRING FROM NO. 1 CLUTCH HUB

(a) Remove the No.1 hub sleeve from the No.1 clutch hub.
(b) Push the shifting key spring with a screwdriver, remove the 3 shifting keys and key springs.



7. REMOVE NO.2 HUB SLEEVE ASSEMBLY AND 3RD GEAR

(a) Using a snap ring expander, remove the snap ring.
(b) Using a press, remove the No.2 hub sleeve, synchronizer ring and 3rd gear.



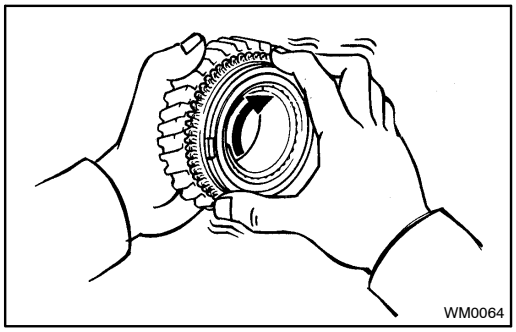
8. REMOVE NO.2 HUB SLEEVE, SHIFTING KEY AND SPRING FROM NO.2 CLUTCH HUB

(a) Remove the No.2 hub sleeve from the No.2 clutch hub.
(b) Push the shifting key spring with a screwdriver, remove the 3 shifting keys and key springs.

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MT03U–01

INSPECTION


WM0064

1. INSPECT 1ST GEAR SYNCHRONIZER RING

(a) Check for wear or damage.

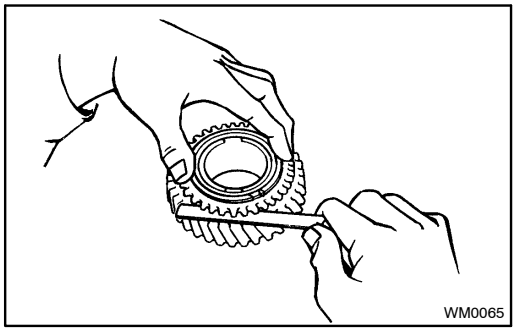
(b) Check the braking effect of the synchronizer ring.
Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

If the braking effect is insufficient, apply a small amount of the fine lapping compound between the synchronizer ring and gear cone. Lightly rub the synchronizer ring and gear cone together.

NOTICE:

Ensure the fine lapping compound is completely washed off after rubbing.

(c) Check again the braking effect of the synchronizer ring.

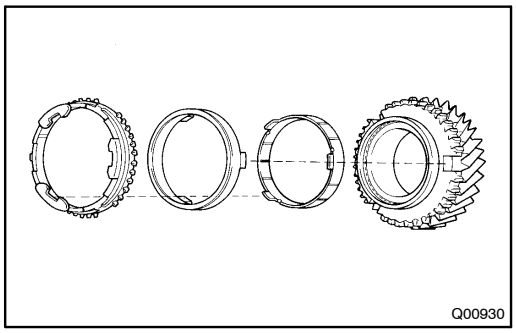

WM0065

(d) Using a feeler gauge, measure the clearance between the synchronizer ring back and gear spline end.
Minimum clearance: 0.5 mm (0.020 in.)

If the clearance is less than the minimum, replace the synchronizer ring, and apply a small amount of the fine lapping compound on gear cone.

NOTICE:

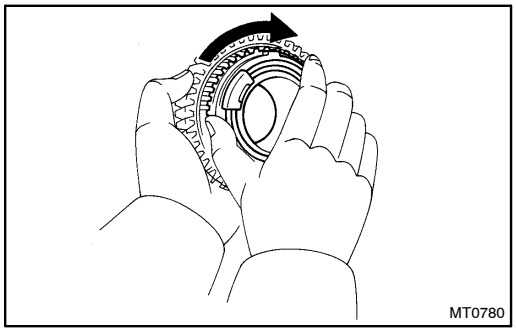
Ensure the fine lapping compound is completely washed off after rubbing.


Q00930

2. INSPECT 2ND AND 3RD GEAR SYNCHRONIZER RINGS

(a) Check for wear or damage.

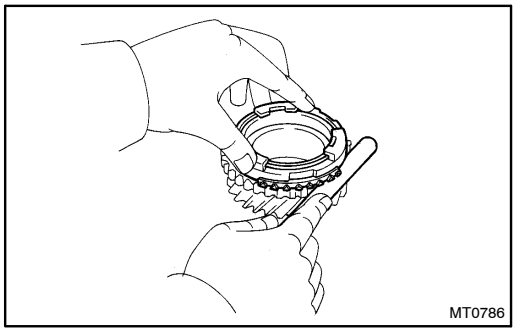
(b) Install the synchronizer inner ring, middle ring and outer ring to each gear.


MT0780

(c) Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

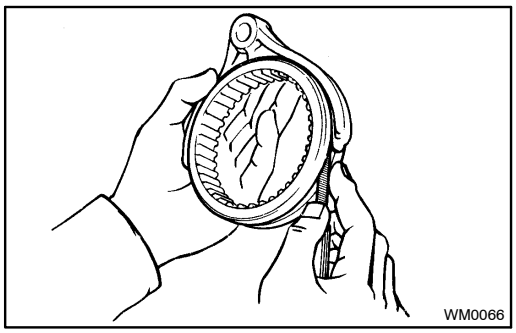
If it does not lock, replace the synchronizer ring.

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MT0786

(d) Using a feeler gauge, measure the clearance between the synchronizer ring back and the gear spline end.
Minimum clearance: 0.7 mm (0.028 in.)

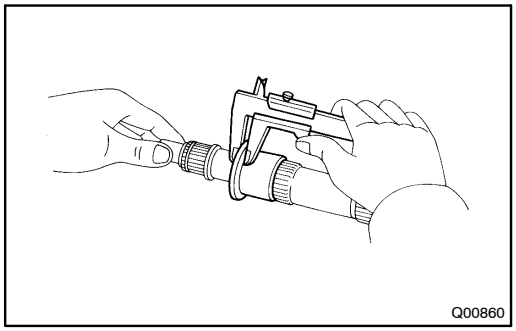
If the clearance is less than the minimum, replace the synchronizer ring.


WM0066

3. INSPECT SHIFT FORK AND HUB SLEEVE CLEARANCE

Using a feeler gauge, measure the clearance between the hub sleeves and shift forks.
Maximum clearance: 1.0 mm (0.039 in.)

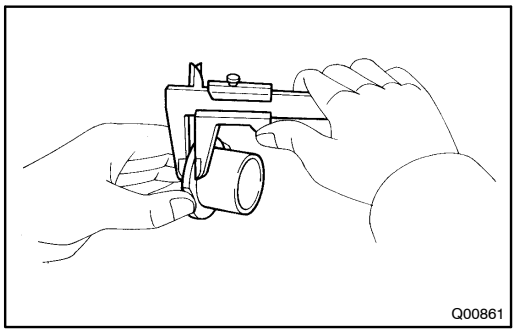
If the clearance exceeds the maximum, replace the shift fork or hub sleeve.


Q00860

4. INSPECT OUTPUT SHAFT AND INNER RACE

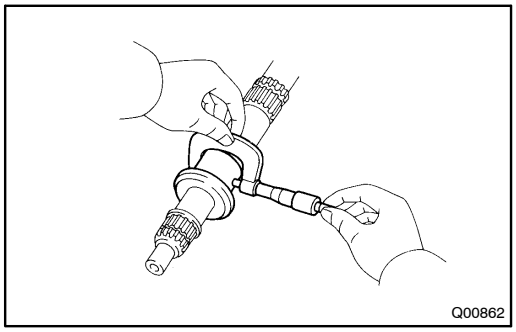
(a) Using vernier calipers, measure the output shaft flange thickness.
Minimum thickness: 5.60 mm (0.2205 in.)

If the thickness is less than the minimum, replace the output shaft.


Q00861

(b) Using vernier calipers, measure the inner race flange thickness.
Minimum thickness: 4.78 mm (0.1881 in.)

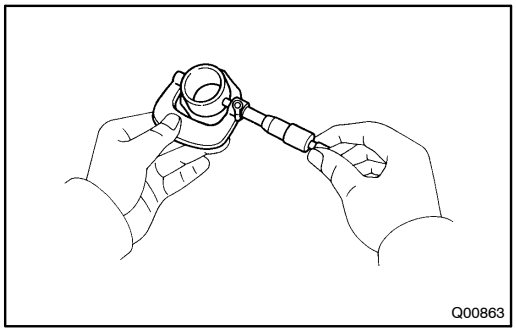
If the thickness is less than the minimum, replace the inner race.


Q00862

(c) Using a micrometer, measure the outer diameter of the output shaft journal.
Minimum diameter:
2nd gear: 42.975 mm (1.6919 in.)
3rd gear: 31.969 mm (1.2586 in.)

If the outer diameter is less than the minimum, replace the output shaft.

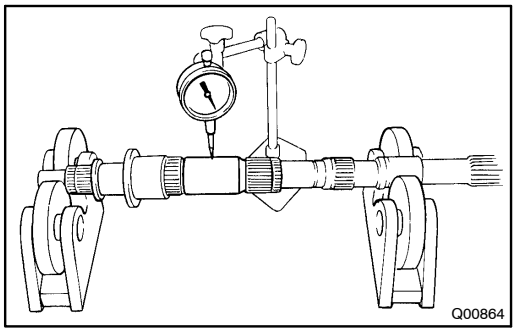
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(d) Using a micrometer, measure the outer diameter of the inner race.

Minimum diameter: 42.975 mm (1.6919 in.)

If the outer diameter is less than the minimum, replace the inner race.



(e) Using a dial indicator, check the shaft runout.

Maximum runout: 0.06 mm (0.0024 in.)

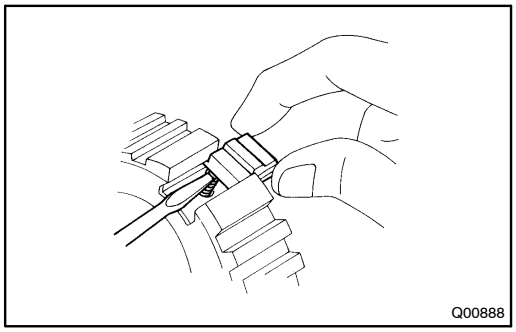
If the runout exceeds the maximum, replace the output shaft.

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MT03V–01

REASSEMBLY

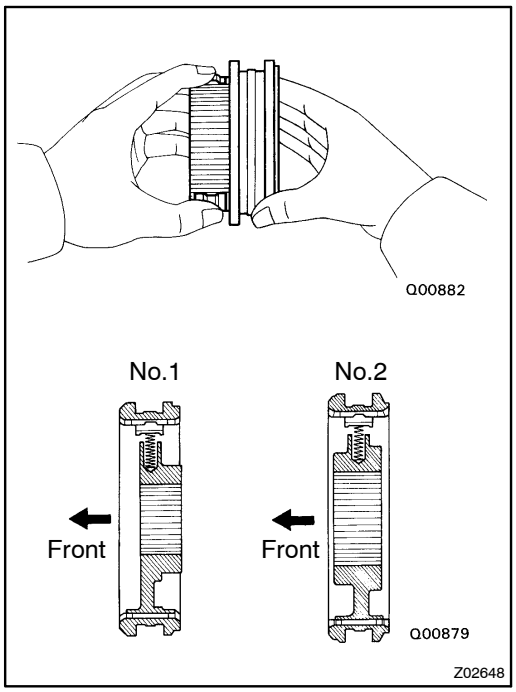
HINT:
Coat all of the sliding and rotating surfaces with gear oil before reassembly.



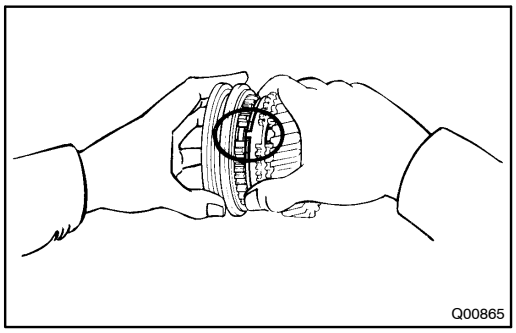
1. INSTALL NO.1 AND NO.2 CLUTCH HUBS INTO HUB SLEEVE

(a) Install the 3 shifting key springs to the clutch hub.

(b) While pushing the shifting key spring with a screwdriver, install the 3 shifting keys.



(c) While pushing the 3 shifting keys, install the clutch hub to the hub sleeve, as shown.

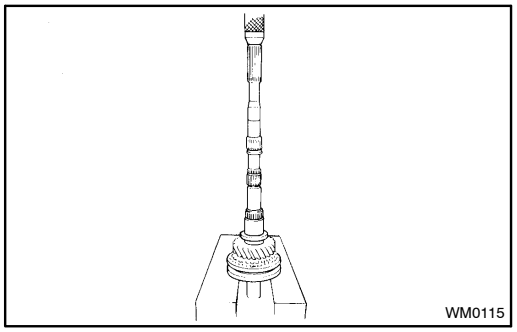


2. INSTALL 3RD GEAR AND NO.2 CLUTCH HUB ON OUTPUT SHAFT

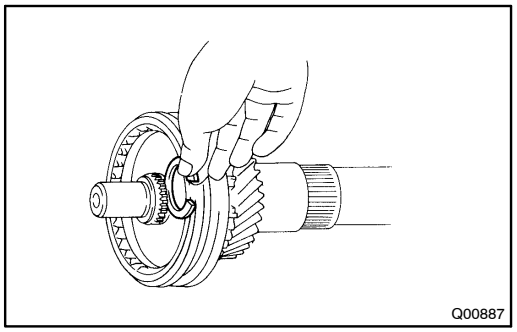
(a) Apply gear oil to the shaft.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

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WM0115

(c) Using a press, install the 3rd gear and No.2 clutch hub.


Q00887

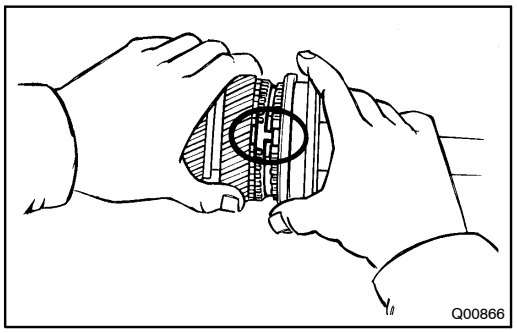
3. INSTALL SNAP RING

(a) Select a snap ring that allows the minimum axial play.

Mark	Thickness mm (in.)
C–1	1.75 – 1.80 (0.0689 – 0.0709)
D	1.80 – 1.85 (0.0709 – 0.0728)
11	1.86 – 1.91 (0.0732 – 0.0752)
12	1.92 – 1.97 (0.0756 – 0.0776)
13	1.98 – 2.03 (0.0780 – 0.0799)
14	2.04 – 2.09 (0.0803 – 0.0823)
15	2.10 – 2.15 (0.0827 – 0.0846)

(b) Using a snap ring expander, install the snap ring.

4. INSPECT 3RD GEAR THRUST CLEARANCE
(See page MT–21)

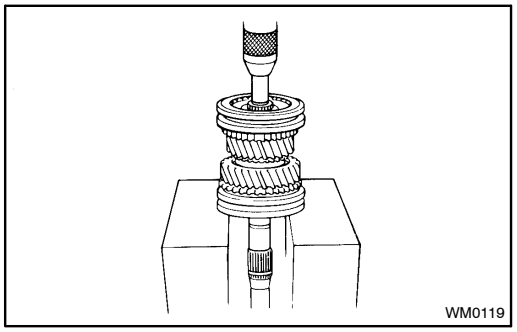

Q00866

5. INSTALL 2ND GEAR AND NO.1 CLUTCH HUB

(a) Apply gear oil to the shaft and needle roller bearing.

(b) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

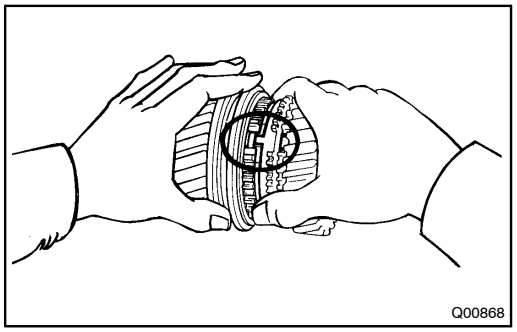
(c) Install the needle roller bearing in the 2nd gear.


WM0119

(d) Using a press, install the 2nd gear and No.1 clutch hub.

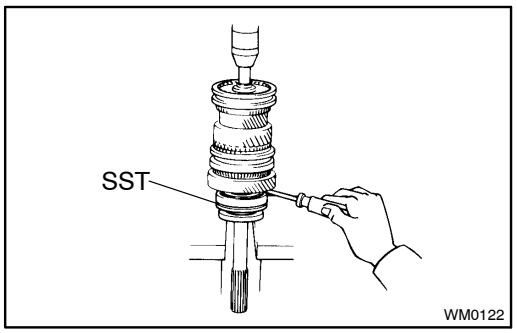
6. INSPECT 2ND GEAR THRUST CLEARANCE
(See page MT–21)

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7. INSTALL LOCKING BALL AND 1ST GEAR ASSEMBLY

(a) Install the locking ball in the shaft.
(b) Apply gear oil to the bearing.
(c) Assemble the 1st gear, synchronizer ring, needle roller bearing and bearing inner race.
(d) Install the assembly on the output shaft with the synchronizer ring slots aligned with the shifting keys and turn the inner race to align it with the locking ball.



8. INSTALL OUTPUT SHAFT CENTER BEARING

Using SST and a press, install the bearing on the output shaft with the outer race snap ring groove toward the rear.

SST 09506–35010

HINT:

Hold the 1st gear inner race to prevent it from falling.

9. INSPECT 1ST GEAR THRUST CLEARANCE

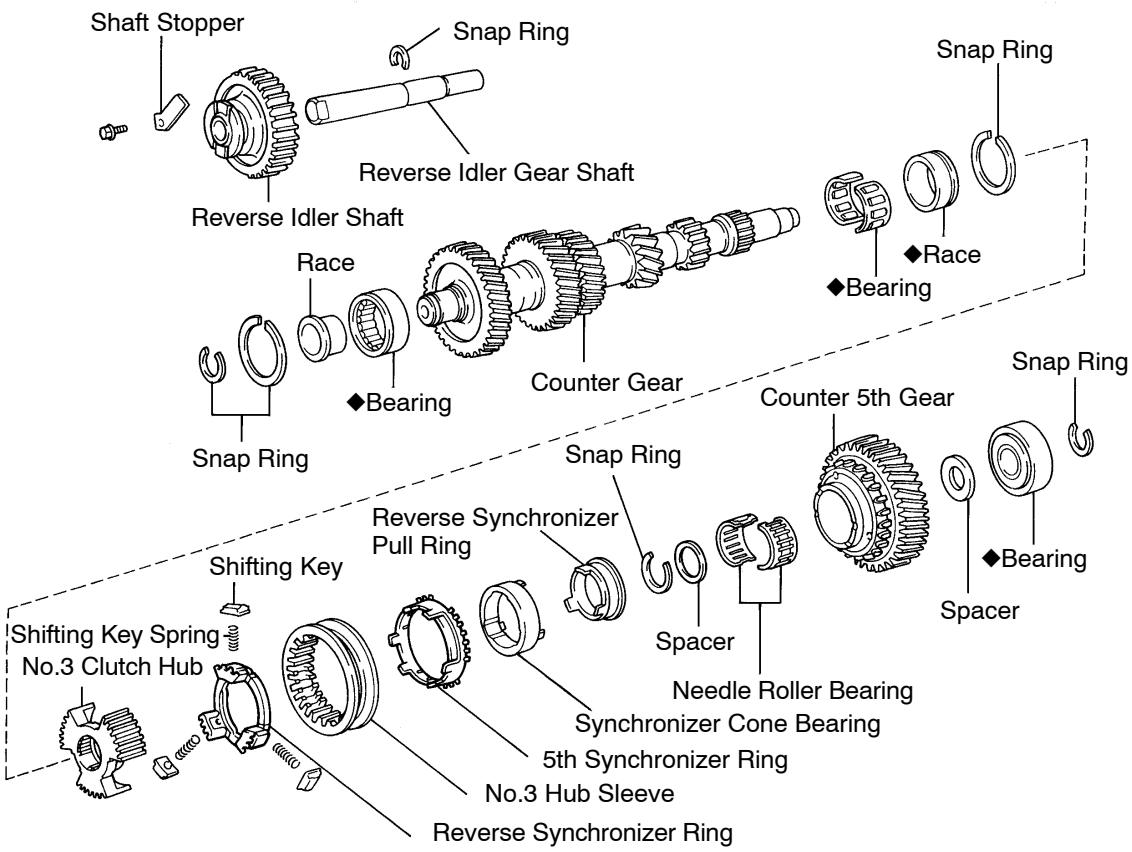
(See page MT–21)

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COUNTER GEAR AND REVERSE IDLER GEAR

COMPONENTS

MT03W–03



◆Non–reusable part

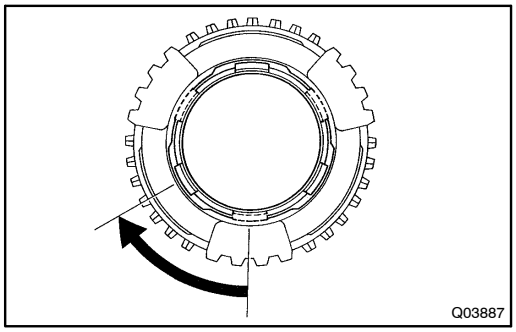
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MT03X–01

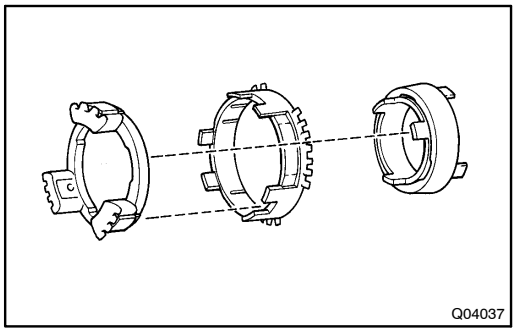
DISASSEMBLY

REMOVE NO.3 HUB SLEEVE, SHIFTING KEY AND SPRING FROM SYNCHRONIZER RING

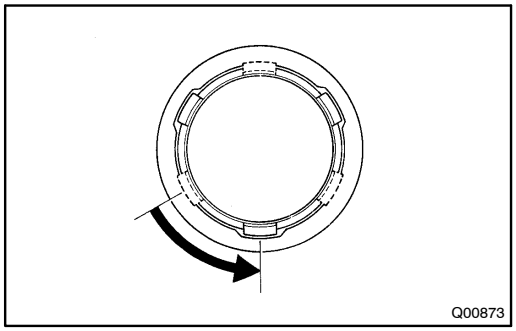


(a) Remove the synchronizer ring assembly from the No.3 hub sleeve.

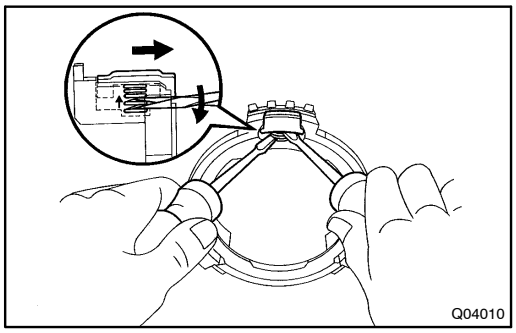
(b) Turn the reverse synchronizer pull ring.



(c) Remove the reverse synchronizer ring and 5th synchronizer ring from the synchronizer pull ring and cone ring.



(d) Turn the reverse synchronizer pull ring and separate the pull ring and cone ring.

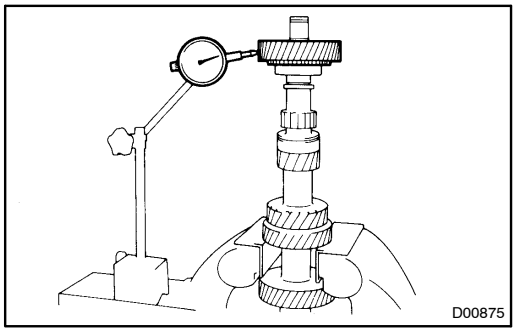


(e) Remove the 3 shifting keys and key springs by carefully levering up the shifting key spring with one screwdriver and levering the shifting key away from the reverse synchronizer ring with another screwdriver.

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MT03Y–01

INSPECTION



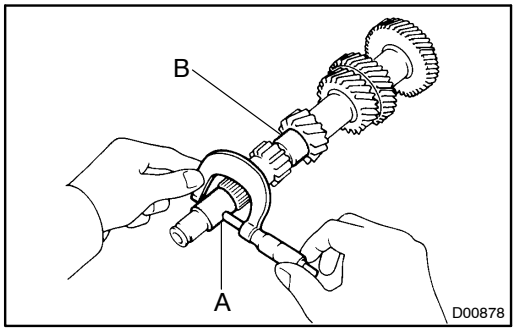
1. INSPECT COUNTER 5TH GEAR RADIAL CLEARANCE

(a) Install the spacer, counter 5th gear and needle roller bearing to the counter gear.

(b) Using a dial indicator, measure the counter 5th gear radial clearance.

Standard clearance:
0.009 – 0.060 mm (0.0004 – 0.0024 in.)
Maximum clearance:
0.150 mm (0.0059 in.)

If the clearance exceeds the maximum, replace the counter gear, needle roller bearing or counter 5th gear.

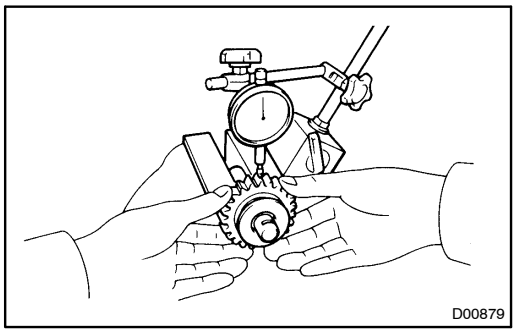


2. INSPECT COUNTER GEAR

Using a micrometer, measure the outer diameter of the counter shaft journal.

Minimum diameter:
Part A: 26.975 mm (1.0620 in.)
Part B: 29.950 mm (1.1791 in.)

If the outer race is less than the minimum, replace the counter gear.

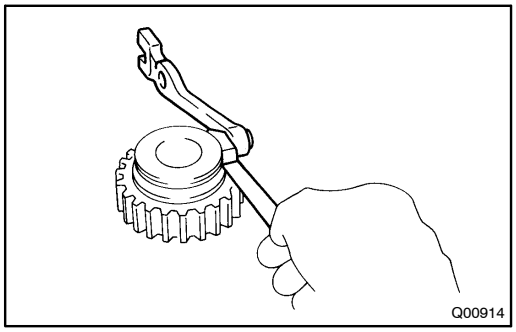


3. INSPECT REVERSE IDLER GEAR RADIAL CLEARANCE

Using a dial indicator, measure the reverse idler gear radial clearance.

Standard clearance:
0.041 – 0.074 mm (0.0016 – 0.0029 in.)
Maximum clearance:
0.194 mm (0.0076 in.)

If the clearance exceeds the maximum, replace the gear or shaft.



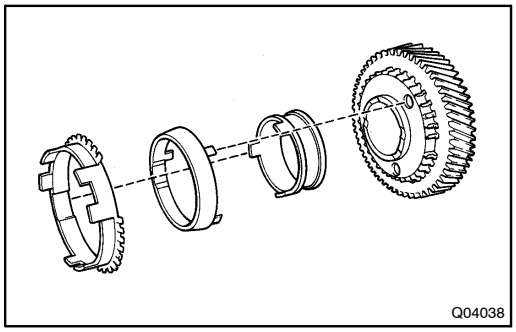
4. INSPECT REVERSE IDLER GEAR AND SHIFT ARM SHOE CLEARANCE

Using a feeler gauge, measure the clearance between the reverse idler gear and shift arm shoe.

Standard clearance:
0.20 – 0.41 mm (0.0079 – 0.0161 in.)
Maximum clearance:
0.90 mm (0.0354 in.)

If the clearance exceeds the maximum, replace the shift arm shoe or reverse idler gear.

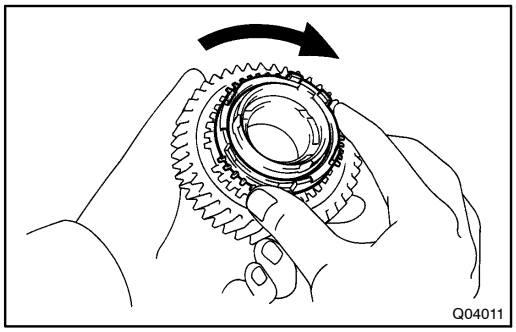
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Q04038

5. INSPECT 5TH GEAR SYNCHRONIZER RING

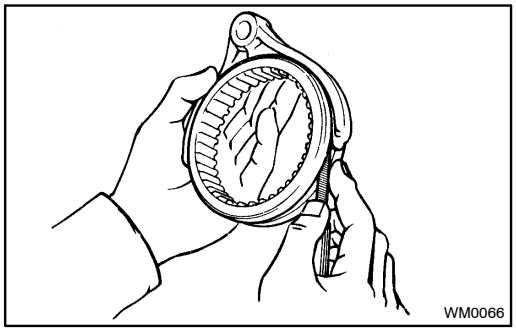
(a) Check for wear or damage.

(b) Install the synchronizer pull ring, cone ring and outer ring to the 5th gear.


Q04011

(c) Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

If it does not lock, replace the synchronizer ring.


WM0066

6. INSPECT SHIFT FORK AND HUB SLEEVE CLEARANCE

Using a feeler gauge, measure the clearance between the hub sleeves and shift forks.

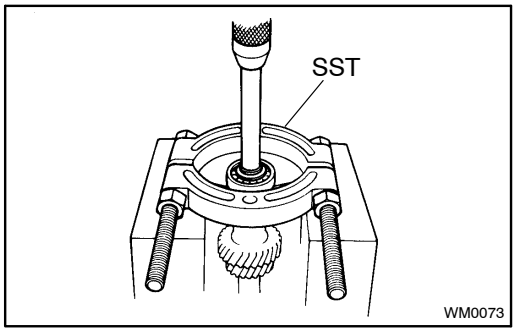
Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the maximum, replace the shift fork or hub sleeve.

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MT03Z–01

REPLACEMENT

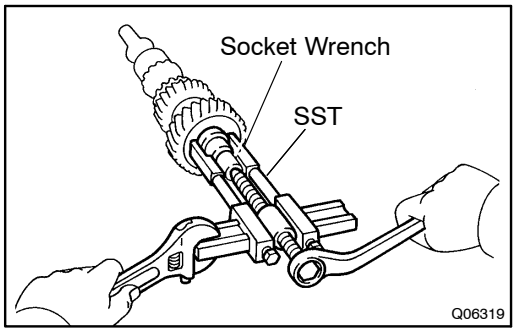


1. IF NECESSARY, REPLACE COUNTER GEAR FRONT BEARING AND SIDE RACE

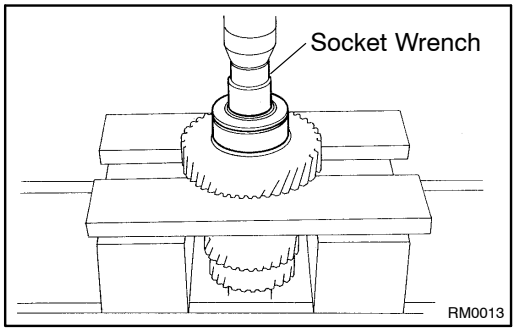
(a) Using a snap ring expander, remove the snap ring.

(b) Using SST and a press, press out the bearing.
SST 09950–00020

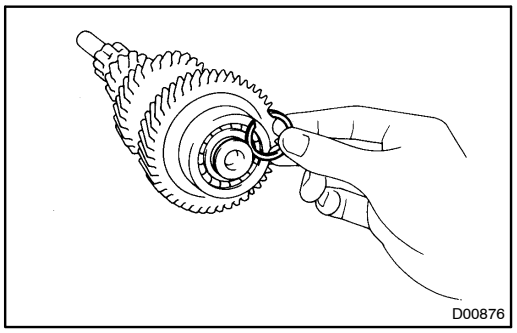
(c) Check the side race for wear or damage.



(d) If necessary, remove the side race.
Using SST and a socket wrench, remove the side race.
SST 09950–40010



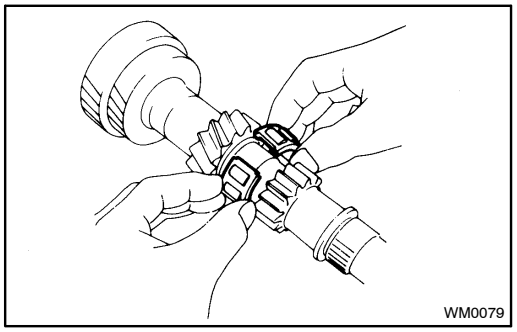
(e) Using a socket wrench and press, install a new bearing, side race and inner race.



(f) Select a snap ring that allows the minimum axial play.

Mark	Thickness mm (in.)
A	2.05 – 2.10 (0.0807 – 0.0827)
B	2.10 – 2.15 (0.0827 – 0.0846)
C	2.15 – 2.20 (0.0846 – 0.0866)
D	2.20 – 2.25 (0.0866 – 0.0886)
E	2.25 – 2.30 (0.0886 – 0.0906)
F	2.30 – 2.35 (0.0906 – 0.0925)

(g) Using a snap ring expander, install the snap ring.



2. IF NECESSARY, REPLACE COUNTER GEAR CENTER BEARING

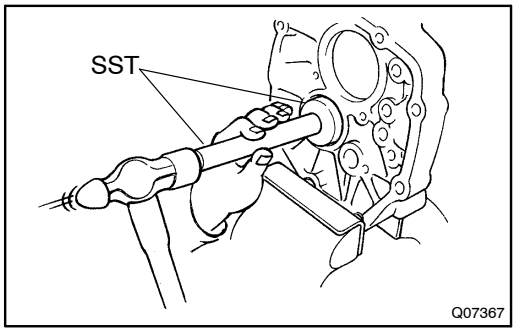
(a) Remove the bearing from the counter gear.

(b) Install a new bearing on the counter gear.

HINT:

Engage the roller cages.

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(c) Using SST, tap out the bearing outer race.
SST 09950–60010 (09951–00510), 09950–70010 (09951–07150)

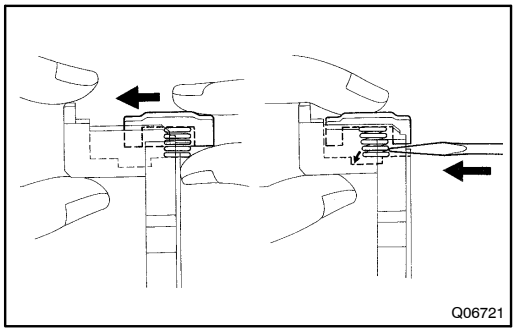
HINT:
After the outer race has been installed, the transmission is reassembled.

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MT040–01

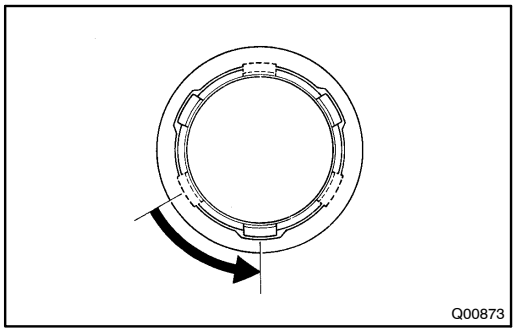
REASSEMBLY

INSTALL SYNCHRONIZER RING ASSEMBLY TO NO.3 HUB SLEEVE

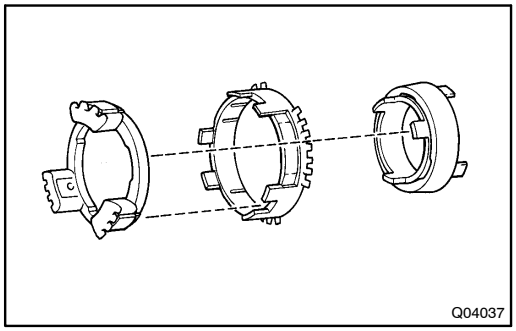


(a) Push the synchronizer key spring, install the shifting key and key spring to the reverse synchronizer ring.

(b) Using a screwdriver, push the 3 key springs into the synchronizer ring spring gaps.

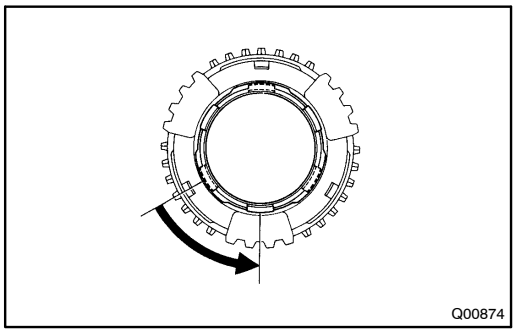


(c) Install the synchronizer cone ring to the reverse synchronizer pull ring and turn the pull ring.



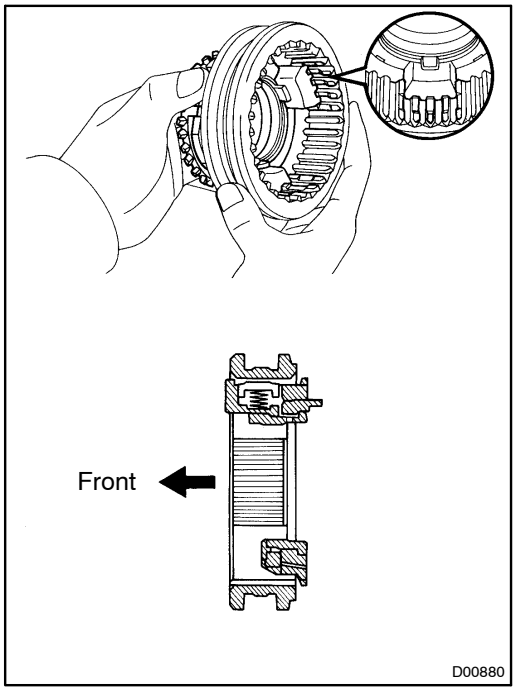
(d) Install the 5th synchronizer ring.

(e) Install the reverse synchronizer ring.



(f) Turn the reverse synchronizer pull ring.

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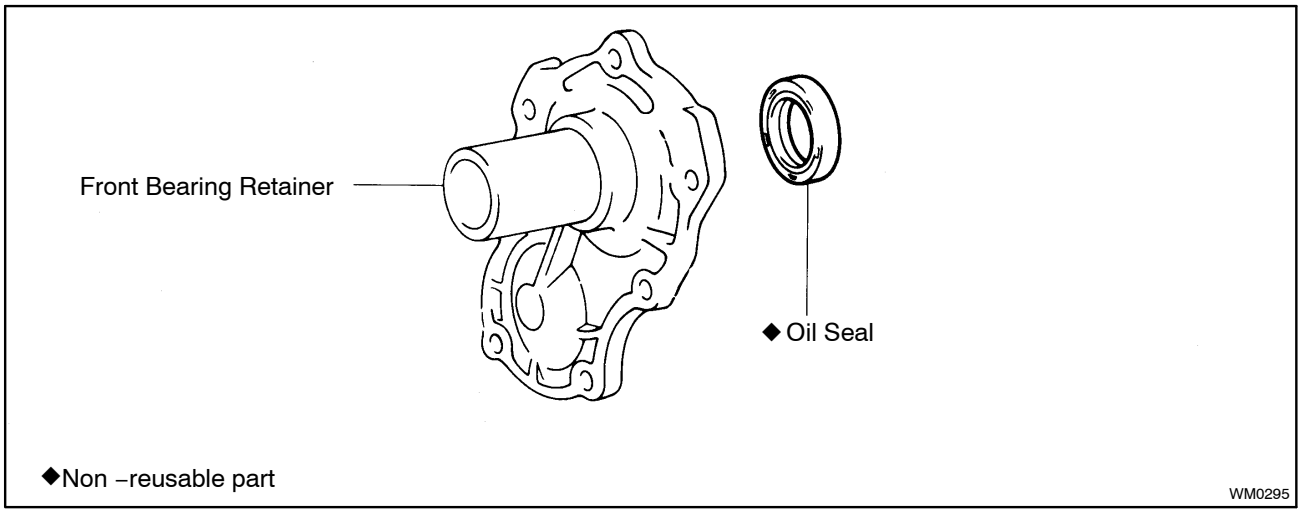
(g) While pushing 3 shifting keys, install the synchronizer ring assembly to the No.3 hub sleeve.

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FRONT BEARING RETAINER OIL SEAL

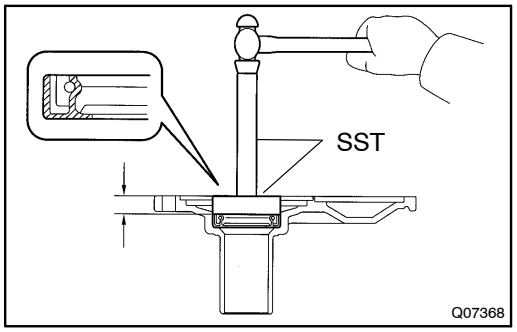
COMPONENTS

MT041–01



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MT042–01



REPLACEMENT

IF NECESSARY, REPLACE FRONT BEARING RETAINER OIL SEAL

(a) Using a screwdriver, pry out the oil seal.

(b) Using SST and a press, install a new oil seal.

SST 09950–60010 (09951–00440), 09950–70010 (09951–07150)

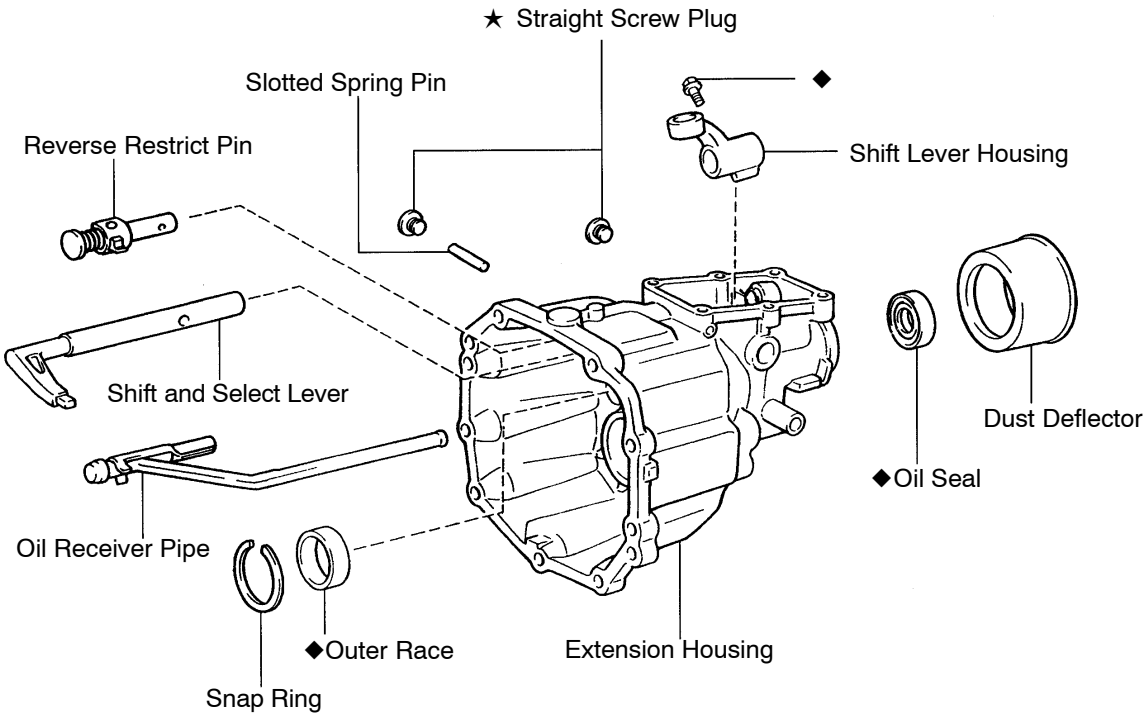
Drive in depth: 12.2 ± 0.5 mm (0.480 ± 0.020 in.)

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EXTENSION HOUSING

COMPONENTS

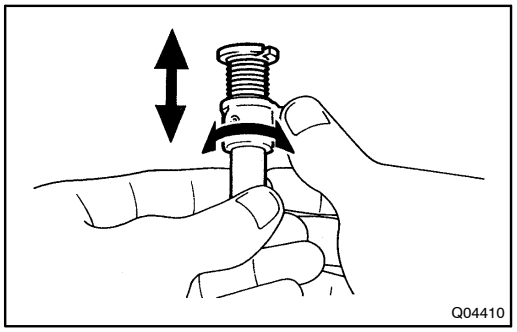
MT043–03



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MT044–01

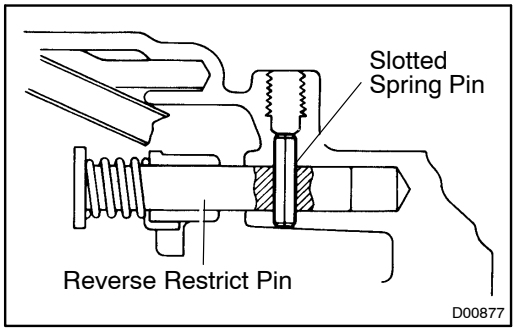
REPLACEMENT


Q04410

1. IF NECESSARY, REPLACE REVERSE RESTRICT PIN

(a) Remove the reverse restrict pin.
  (1) Using a hexagon wrench, remove the screw plug.
  (2) Using a pin punch and hammer, drive out the slotted spring pin.
  (3) Pull off the lever housing and slide out the shaft.

(b) Inspect the reverse restrict pin.
Turn and push the reverse restrict pin by hand.
Check for smooth operation.



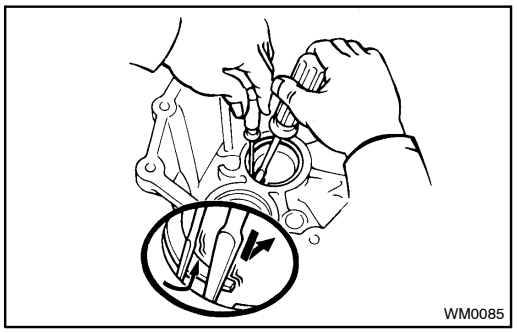
D00877

(c) Install the reverse restrict pin.
  (1) Install the lever housing.
  (2) Using a pin punch and hammer, drive in the slotted spring pin, as shown.
  (3) Apply sealant to the plug threads.

Sealant:
Part No. 08833 – 00080, THREE BOND 1344, LOCTITE 242 or equivalent

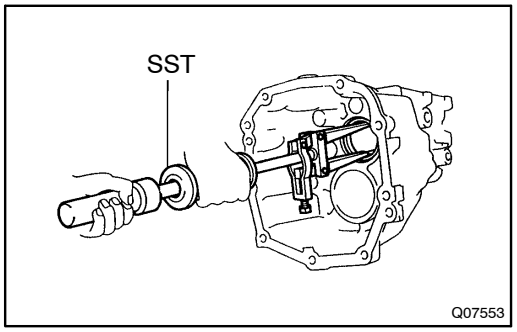
  (4) Install and torque the screw plug.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)


WM0085

2. IF NECESSARY, REPLACE REAR BEARING OUTER RACE

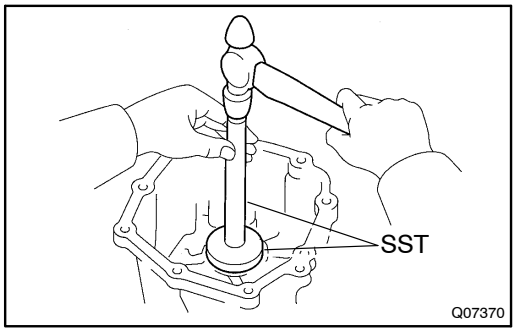
(a) Using 2 screwdrivers, remove the snap ring.



Q07553

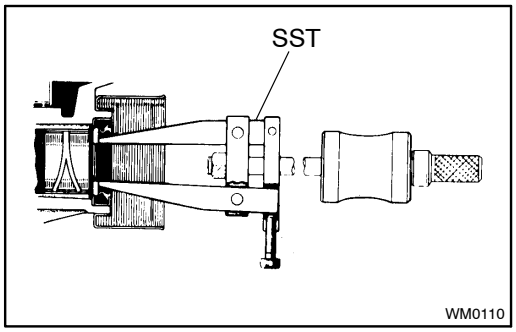
(b) Using SST, remove the outer race.
SST 09308–00010

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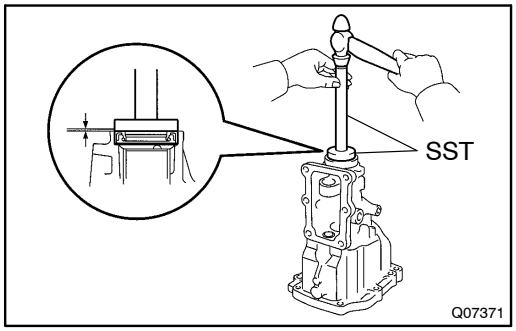
(c) Using SST, install a new outer race.
SST 09950–60010 (09951–00560), 09950–70010 (09951–07150)

(d) Using a screwdriver, install the snap ring.



3. IF NECESSARY, REPLACE EXTENSION HOUSING OIL SEAL

(a) Using SST, remove the oil seal.
SST 09308–00010 or 09308–10010 w/ output shaft installed



(b) Using SST and a hammer, drive in a new oil seal.
SST 09950–60010 (09951–00560), 09950–70010 (09951–07150)
Drive in depth: 0 ± 0.5 mm (0 ± 0.020 in.)

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AT – AUTOMATIC TRANSMISSION

AUTOMATIC TRANSMISSION SYSTEM	AT-1
EXTENSION HOUSING OIL SEAL (A340E)	AT-3
SENSOR ROTOR (A340E)	AT-4
SPEEDOMETER DRIVEN GEAR	AT-8
VEHICLE SPEED SENSOR	AT-10
PARK/NEUTRAL POSITION (PNP) SWITCH	AT-11
VALVE BODY ASSEMBLY	AT-12
PARKING LOCK PAWL	AT-17
THROTTLE CABLE	AT-18
SHIFT LOCK SYSTEM	AT-19
AUTOMATIC TRANSMISSION UNIT (A340E)	AT-26
AUTOMATIC TRANSMISSION UNIT (A340F)	AT-33
TORQUE CONVERTER CLUTCH AND DRIVE PLATE	AT-38

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AUTOMATIC TRANSMISSION SYSTEM

AT01U–01

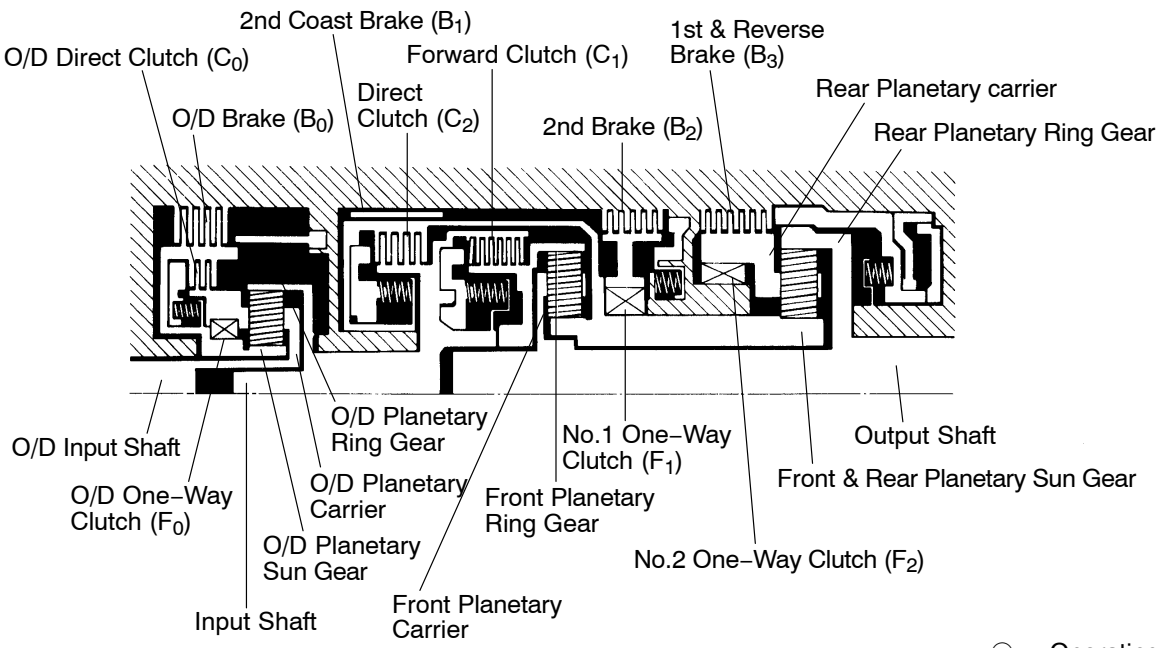
PRECAUTION

If the vehicle is equipped with a mobile communication system, refer to the precautions in the IN section.

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AT007–04

OPERATION



AT2157

○ ... Operating

Shift lever position	Gear position	C_0	C_1	C_2	B_0	B_1	B_2	B_3	F_0	F_1	F_2
P	Parking	○									
R	Reverse	○		○				○	○		
N	Neutral	○									
D	1st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1st	○	○						○		○
	2nd	○	○			○	○		○	○	
	*1 3rd	○	○	○			○		○		
L	1st	○	○					○	○		○
	*2 2nd	○	○			○	○		○	○	

*1: Down–shift only in the 2 position and 3rd gear — no up–shift.
*2: Down–shift only in the L position and 2nd gear — no up–shift.

V07130

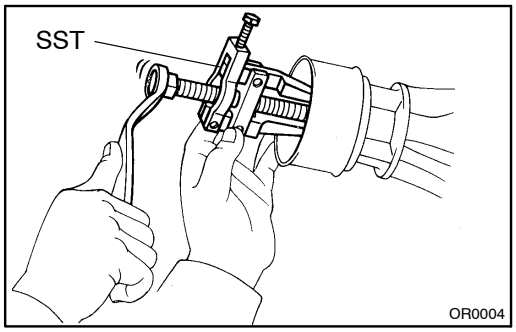
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EXTENSION HOUSING OIL SEAL (A340E)

AT022–06

ON–VEHICLE REPAIR

1. REMOVE PROPELLER SHAFT (See page PR–3)



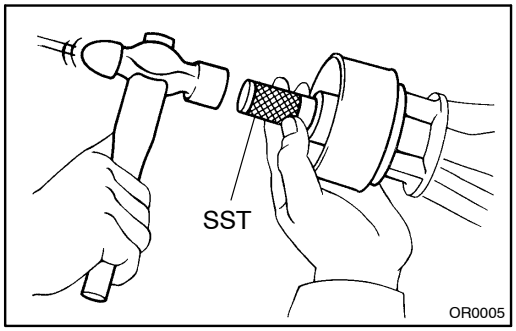
2. REMOVE REAR OIL SEAL

NOTICE:

Clean the extension housing before removing the oil seal.

Using SST, remove the oil seal.

SST 09308–10010



3. INSTALL NEW OIL SEAL

(a) Using SST and a hammer, carefully drive the oil seal in as far as it will go.

SST 09325–40010

(b) Coat the lip of a new oil seal with MP grease.

4. INSTALL PROPELLER SHAFT (See page PR–9)

5. CHECK FLUID LEVEL (See page DI–265)

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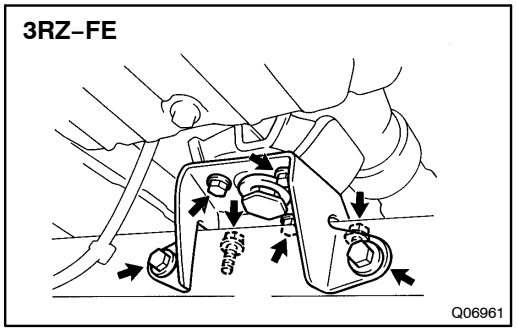
SENSOR ROTOR (A340E)

AT023–02

ON–VEHICLE REPAIR

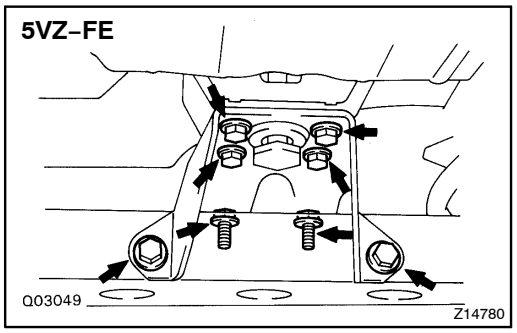
1. **REMOVE PROPELLER SHAFT (See page PR–3)**
2. **DISCONNECT SPEEDOMETER CABLE AND REMOVE SPEEDOMETER DRIVEN GEAR (See page AT–8)**
3. **REMOVE NO.2 VEHICLE SPEED SENSOR (See page AT–10)**
4. **JACK UP TRANSMISSION SLIGHTLY**

Securely support the transmission on a transmission jack. Lift the transmission slightly from the crossmember.



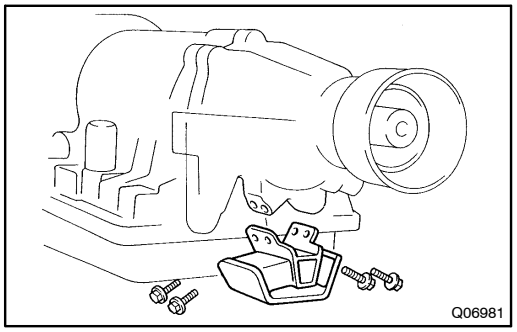
5. **3RZ–FE: REMOVE REAR MOUNTING BRACKET FROM REAR SUPPORT MEMBER**

Remove the 7 bolts from the rear mounting bracket.



6. **5VZ–FE: REMOVE REAR MOUNTING BRACKET FROM REAR SUPPORT MEMBER**

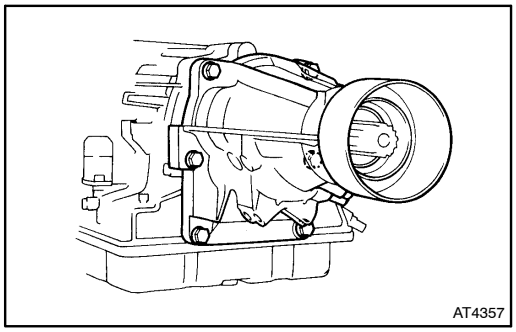
Remove the 8 bolts from the rear mounting bracket.



7. **REMOVE REAR MOUNTING INSULATOR FROM EXTENSION HOUSING**

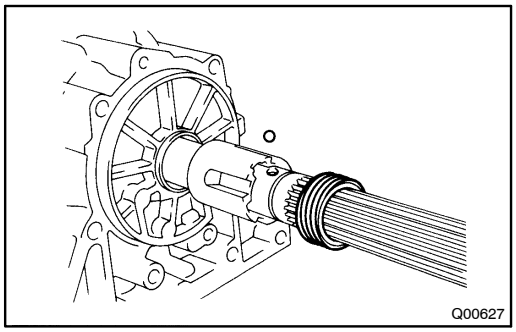
Remove the 4 bolts and the engine rear mounting insulator from the extension housing.

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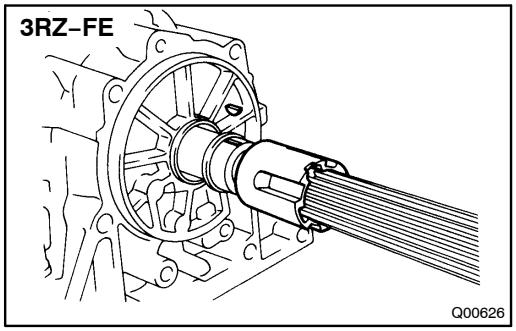
8. REMOVE EXTENSION HOUSING AND GASKET

Remove the 6 bolts. If necessary, tap the extension housing with a plastic hammer or a block of wood to loosen it.



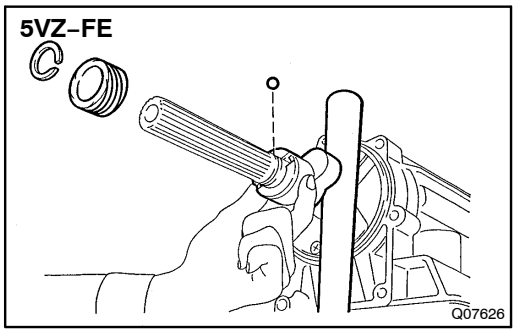
9. REMOVE SPEEDOMETER DRIVE GEAR AND BALL

(a) Using a snap ring expander, remove the snap ring.
(b) Remove the speedometer drive gear and ball.



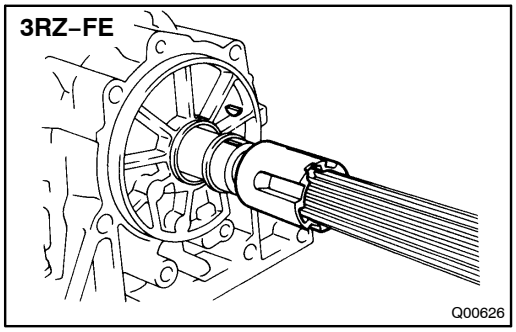
10. 3RZ–FE:
REMOVE SENSOR ROTOR

(a) Remove the sensor rotor and key.
(b) Using snap ring pliers, remove the snap ring.



11. 5VZ–VE:
REMOVE SENSOR ROTOR

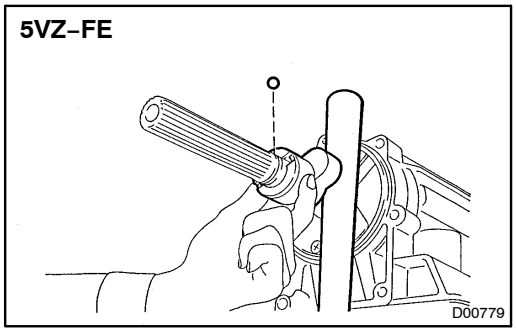
(a) Using a hammer handle, remove the sensor rotor from the output shaft.
(b) Remove the lock ball.



12. 3RZ–FE:
INSTALL SENSOR ROTOR

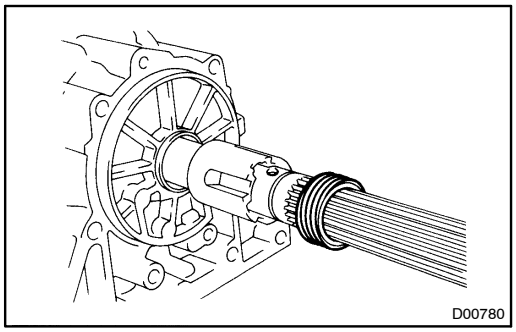
(a) using snap ring pliers, install the snap ring.
(b) Install the key and sensor rotor.

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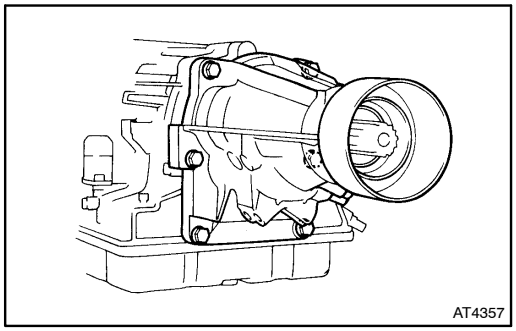
13. 5VZ–FE:
INSTALL SENSOR ROTOR

Install the lock ball and sensor rotor.



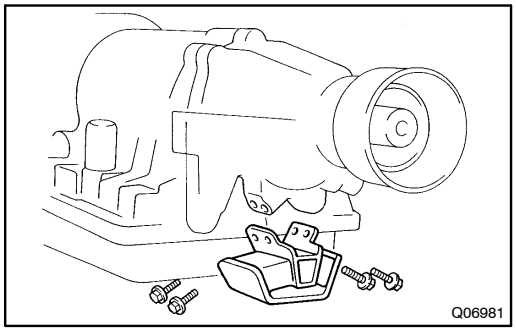
14. INSTALL SPEEDOMETER DRIVE GEAR AND BALL

(a) Install the speedometer drive gear and ball.
(b) Using a snap ring expander, install the snap ring.



15. INSTALL EXTENSION HOUSING AND GASKET

(a) Apply sealant or equivalent to the 6 bolts.
Sealant:
Part No. 08833 – 00080, THREE BOND 1344, LOCTITE 242 or equivalent
(b) Install the extension housing with a new gasket to the case.
(c) Install the 6 bolts.
Torque: 36 N·m (370 kgf·cm, 27 ft·lbf)

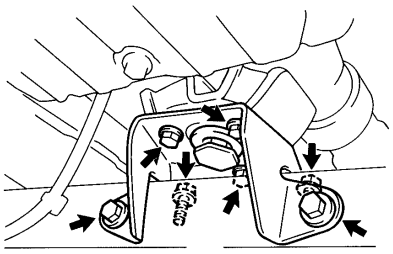


16. INSTALL REAR MOUNTING INSULATOR TO EXTENSION HOUSING

Install the engine rear mounting insulator with the 4 bolts.
Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)

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3RZ–FE

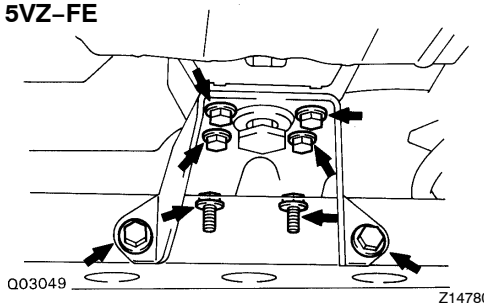


17. **3RZ–FE:**
INSTALL REAR MOUNTING BRACKET TO REAR SUPPORT MEMBER

Install the 7 bolts to the rear mounting bracket.

Torque:
Rear mounting side: 18 N·m (185 kgf·cm, 13 ft·lbf)
Frame side: 58 N·m (590 kgf·cm, 42 ft·lbf)

5VZ–FE



18. **5VZ–FE:**
INSTALL REAR MOUNTING BRACKET TO REAR SUPPORT MEMBER

Install the 8 bolts from the rear mounting bracket.

Torque:
Rear mounting side: 18 N·m (185 kgf·cm, 13 ft·lbf)
Frame side: 58 N·m (590 kgf·cm, 42 ft·lbf)

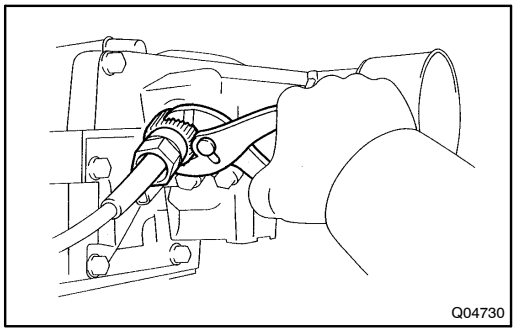
19. **INSTALL NO.2 VEHICLE SPEED SENSOR (See page AT–10)**
20. **INSTALL SPEEDOMETER DRIVEN GEAR AND CONNECT SPEEDOMETER CABLE (See page AT–8)**
21. **INSTALL PROPELLER SHAFT (See page PR–9)**

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SPEEDOMETER DRIVEN GEAR

AT01W–02

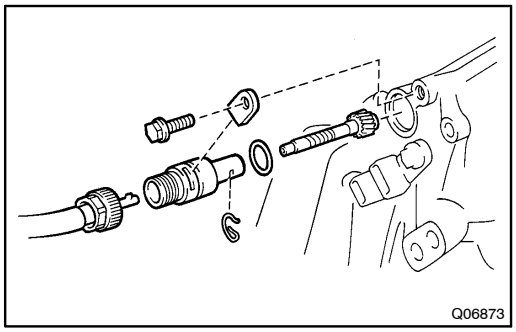
ON–VEHICLE REPAIR



1. DISCONNECT SPEEDOMETER CABLE AND REMOVE SPEEDOMETER DRIVEN GEAR

(a) Loosen the serrated collar with pliers. Do not lose the felt dust protector and washer.

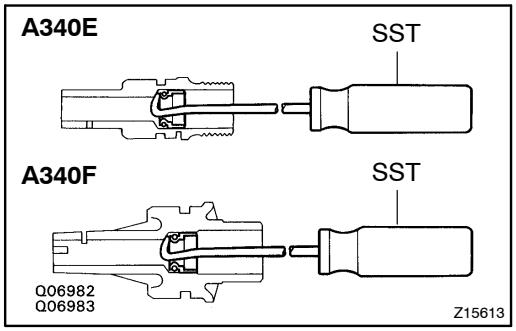
(b) Disconnect the speedometer cable.



(c) Remove the bolt and locking plate. Pry out the speedometer driven gear assembly.

(d) Remove the O–ring from the speedometer drive gear assembly.

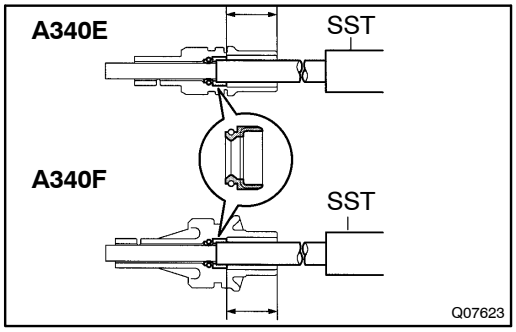
(e) Remove the clip and speedometer driven gear from the speedometer driven gear sleeve.



2. REMOVE SPEEDOMETER DRIVEN GEAR OIL SEAL

Using SST, remove the oil seal.

SST 09921–00010



3. INSTALL SPEEDOMETER DRIVEN GEAR OIL SEAL

Using SST, install a new oil seal.

SST 09201–10000 (09201–01080)

Drive in depth: 20 mm (0.79 in.)

4. INSTALL SPEEDOMETER DRIVEN GEAR AND CONNECT SPEEDOMETER CABLE

(a) Install the clip and speedometer driven gear to the speedometer driven gear sleeve.

(b) Install a new O–ring to the speedometer driven gear assembly.

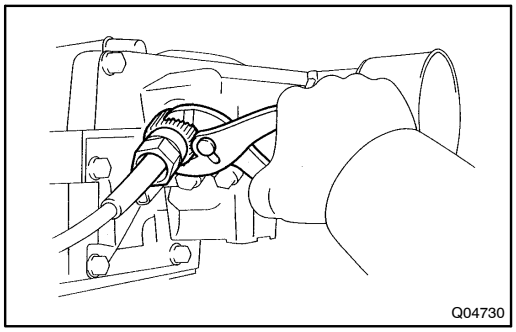
(c) Install the speedometer driven gear.

(d) Install the locking plate with the bolt.

Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

(e) Connect the speedometer cable.

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(f) Tighten the serrated collar with pliers.

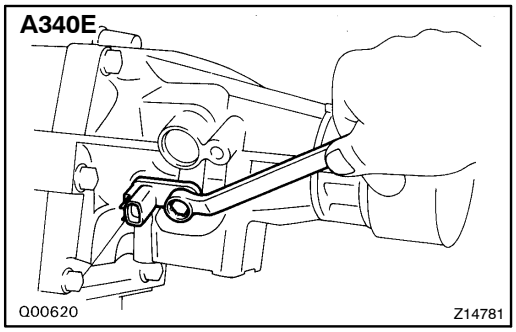
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VEHICLE SPEED SENSOR

AT01X–01

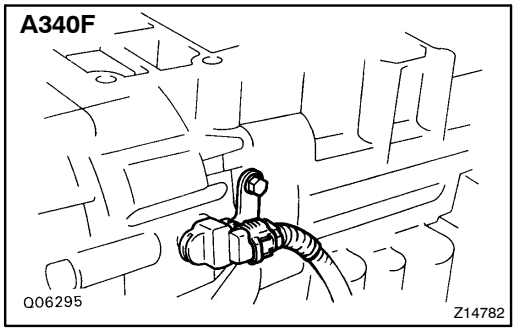
ON–VEHICLE REPAIR

1. DISCONNECT NO.2 VEHICLE SPEED SENSOR CONNECTOR



2. REMOVE NO.2 VEHICLE SPEED SENSOR

(a) A340E:
Remove the bolt and No.2 vehicle speed sensor.



(b) A340F:
Remove the bolt and No.2 vehicle speed sensor.

(c) Remove the O–ring from it.

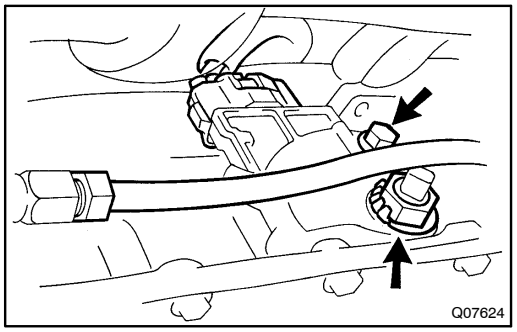
3. INSTALL NO.2 VEHICLE SPEED SENSOR

(a) Cost a new O–ring with ATF and install it to the vehicle speed sensor.

(b) Install the speed sensor and torque the bolt.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

4. CONNECT NO.2 VEHICLE SPEED SENSOR CONNECTOR

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PARK/NEUTRAL POSITION (PNP) SWITCH

AT01Y–01

ON–VEHICLE REPAIR

1. DISCONNECT OIL COOLER PIPES
(See page A340E AT–28, A340F AT–34)

2. REMOVE PARK/NEUTRAL POSITION SWITCH

(a) Disconnect the connector.
(b) Pry off the lock washer and remove the nut.
(c) Remove the bolt and park/neutral position switch.

3. INSTALL PARK/NEUTRAL POSITION SWITCH

(a) Install the park/neutral position switch and bolt.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)
(b) Install a new lock plate and the nut.
Torque: 3.9 N·m (40 kgf·cm, 35 in.·lbf)
(c) Bend claws on the lock plate to fix the nut.
(d) Connect the connector.
(e) Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.

If not as stated above, carry out the adjustment procedure.
(See page DI–265)

4. CONNECT OIL COOLER PIPES
(See page A340E AT–28, A340F AT–34)

5. TEST DRIVE VEHICLE

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VALVE BODY ASSEMBLY

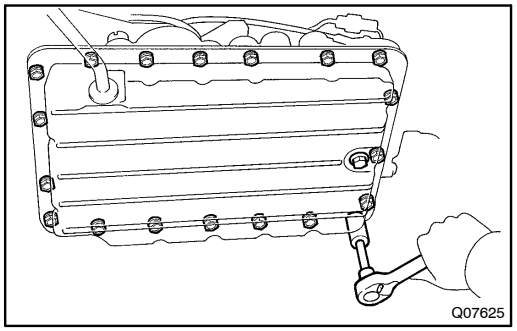
AT0ZJ–01

ON–VEHICLE REPAIR

CAUTION:

When working with FIPG material, you must observe the followings.

- **Using a razor blade and a gasket scraper, remove all oil FIPG material from the gasket surfaces.**
- **Remove all loose material to thoroughly clean all components.**
- **Clean both sealing surfaces with a non–residue solvent.**
- **Apply FIPG in an approx. 1 mm (0.04 in.) wide bead along the sealing surface.**
- **Parts must be assembled within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.**



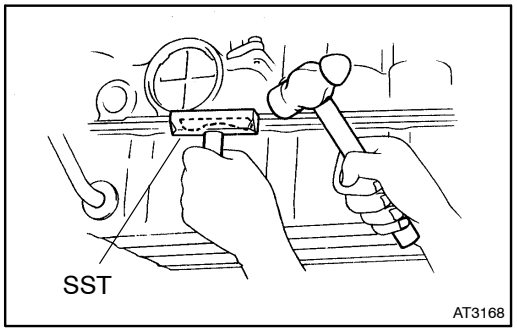
1. REMOVE DRAIN PLUG AND DRAIN ATF
Torque: 20 N·m (205 kgf·cm, 15 ft·lbf)

2. REMOVE OIL PAN

NOTICE:

Some fluid will remain in the oil pan.

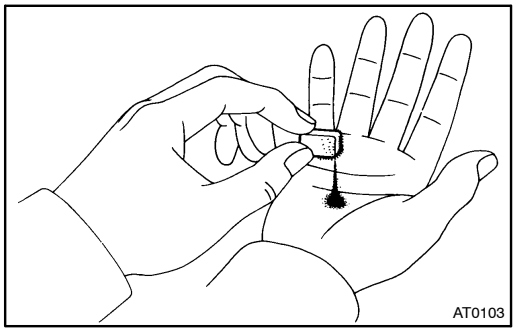
(a) Remove the 19 bolts.
Torque: 7.4 N·m (75 kgf·cm, 65 in.·lbf)



(b) Install the blade of SST between the transmission case and oil pan, cut off applied sealer, and remove the oil pan.
SST 09032–00100

NOTICE:

When removing the oil pan, be careful not to damage the oil pan flange.

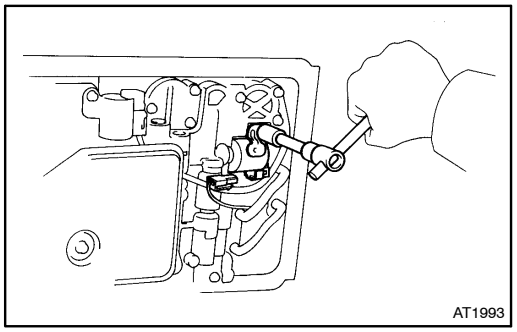


3. EXAMINE PARTICLES IN PAN

Remove the magnets and use them to collect steel particles. Carefully look at the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission.

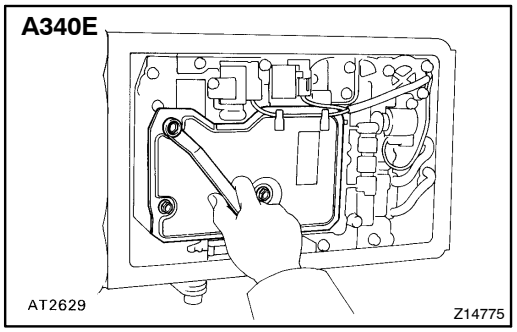
Steel (magnetic).....bearing, gear and clutch plate wear
Brass (non–magnetic) ..... bushing wear

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4. REMOVE SHIFT SOLENOID VALVE

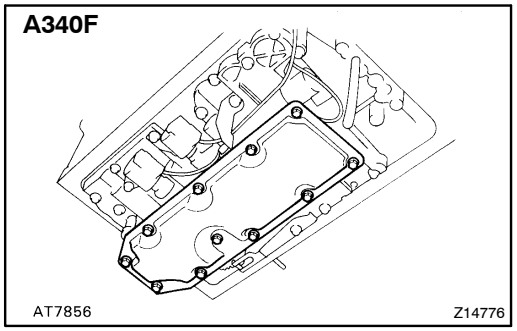
(a) Disconnect the connectors from the solenoid valves.
(b) Remove the 3 solenoid valve mounting bolts.
(c) Remove the 3 solenoid valves.
(d) Remove the 3 O–rings from the solenoid valves.



5. A340E:
REMOVE OIL STRAINER

NOTICE:
Be careful as some fluid will come out with the oil strainer.

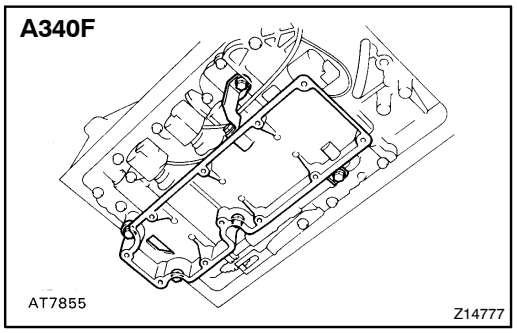
(a) Separate the solenoid wire from the oil strainer.
(b) Remove the 3 bolts, oil strainer and 2 gaskets.



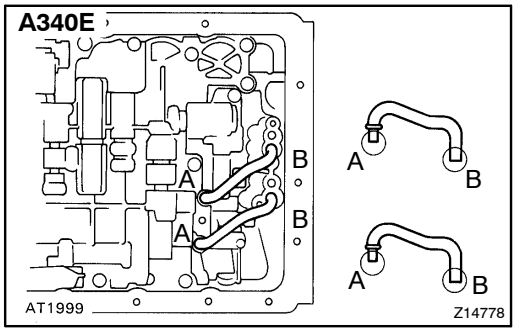
6. A340F:
REMOVE OIL STRAINER

NOTICE:
Be careful as some fluid will come out with the oil strainer.

(a) Remove the 11 bolts and oil strainer from the oil strainer case.
(b) Remove the 2 gaskets from the oil strainer.



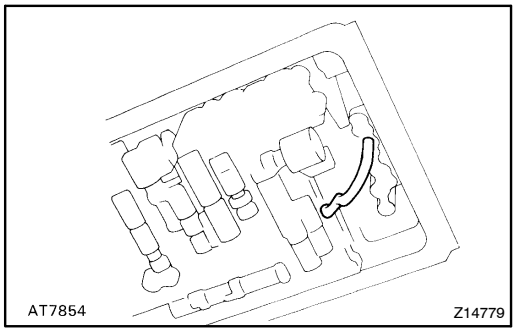
(c) Remove the 5 bolts and oil strainer case.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)



7. A340E:
REMOVE OIL PIPE

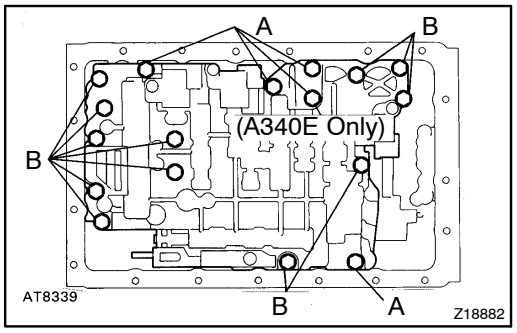
Pry up both pipe ends with a large screwdriver and remove the 2 pipes.

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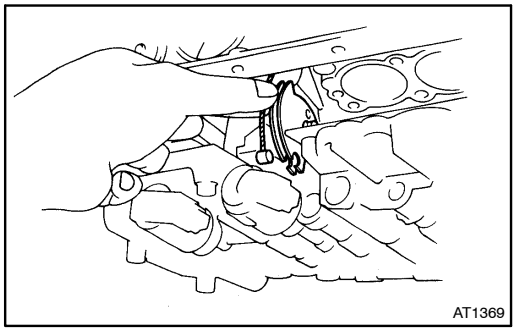
8. A340F:
REMOVE OIL PIPE

Pry up both pipe ends with a large screwdriver and remove the pipe.



9. REMOVE VALVE BODY

(a) Remove the 17 (or 16) bolts.
Bolt length:
Bolt A: 23 mm (0.91 in.)
Bolt B: 32 mm (1.26 in.)

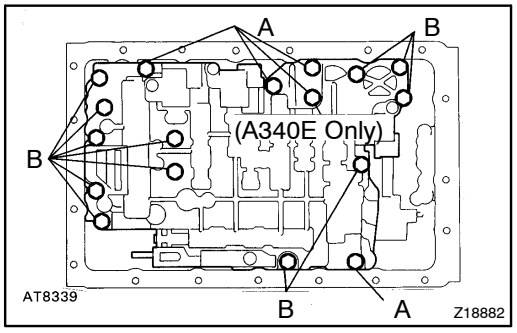


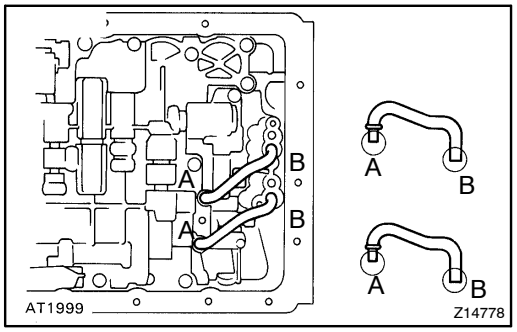
(b) Disconnect the throttle cable from the cam.
(c) Remove the valve body.

NOTICE:
Be careful not to drop the check ball body and spring.

10. INSTALL VALVE BODY

(a) Align the groove of the manual valve with the pin of the lever.
(b) Connect the throttle cable cam.
(c) Check the springs into the accumulator pistons are installed correctly.
(d) Install the 17 (or 16) bolts.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)
Bolt length:
Bolt A: 23 mm (0.91 in.)
Bolt B: 32 mm (1.26 in.)



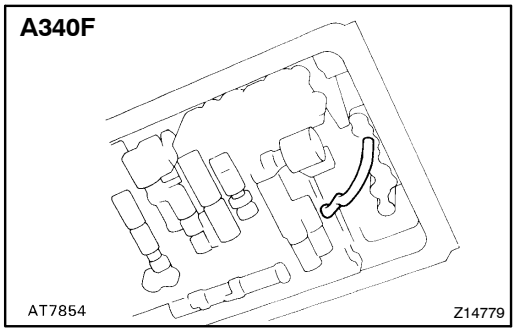


11. A340E:
INSTALL OIL PIPE

Using a plastic hammer, install the 2 pipes into the position, as shown in the illustration.

NOTICE:
Be careful not to bend or damage the pipes.

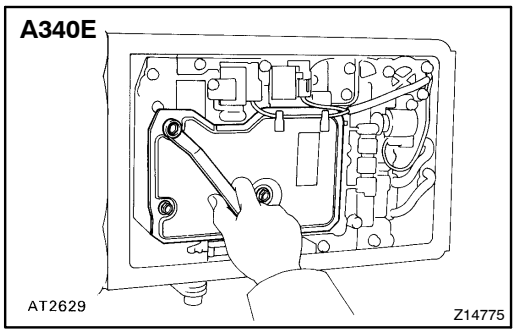
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12. A340F:
INSTALL OIL PIPE

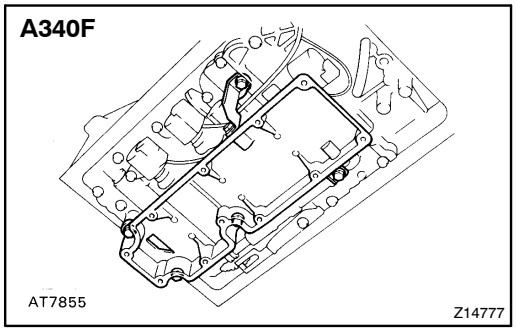
Using a plastic hammer, install the pipe into the position, as shown in the illustration.

NOTICE:
Be careful not to bend or damage the pipes.



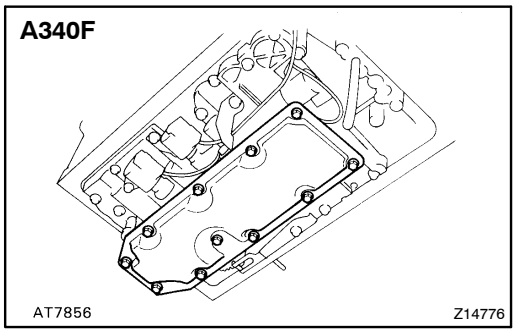
13. A340E:
INSTALL OIL STRAINER

(a) Install 2 new gaskets to the oil strainer.
(b) Install the 3 bolts.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)
(c) Clamp the solenoid wire.

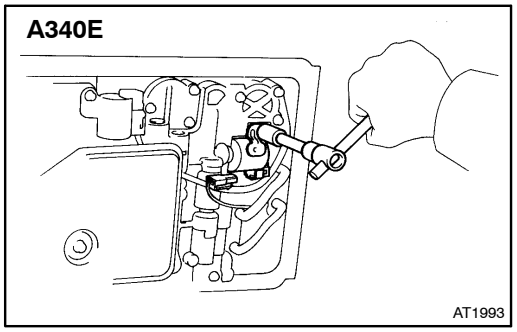


14. A340F:
INSTALL OIL STRAINER

(a) Install 2 new gaskets to the oil strainer case.
(b) Install the oil strainer case with the 5 bolts.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)



(c) Install the oil strainer with the 11 bolts.
Torque: 6.9 N·m (70 kgf·cm, 61 in.·lbf)



15. INSTALL SHIFT SOLENOID VALVE

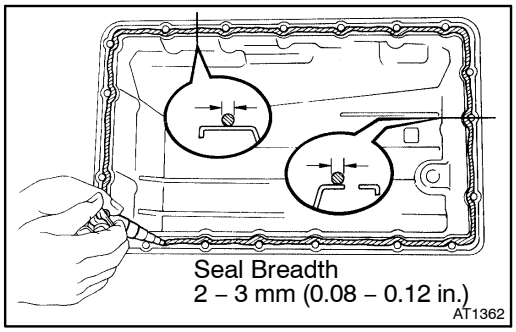
(a) Install the 3 new O–rings to the solenoid valves.
(b) Install the 3 solenoid valves.
(c) Install the 3 solenoid valve mounting bolts.
(d) Connect the connectors to the solenoid valves.

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16. INSTALL OIL PAN

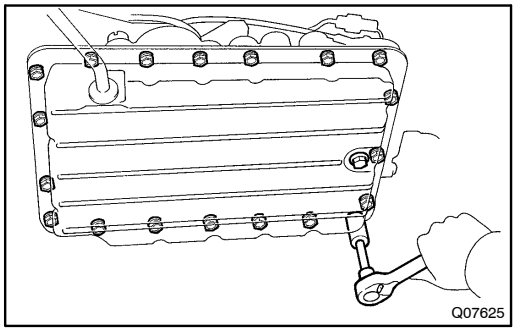
(a) A340E:
Install the 4 magnets.

(b) A340F:
Install the 6 magnets.



(c) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transmission case and oil pan.

(d) Apply FIPG to the oil pan, as shown in the illustraiton.
FIPG: Part No. 08826–00090, THREE BOND 1281 or equivalent

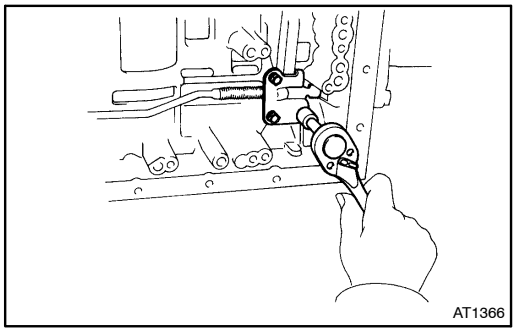


(e) Install the oil pan with the 19 bolts.
Torque: 7.4 N·m (75 kgf·cm, 65 in.·lbf)

17. INSTALL DRAIN PLUG
Torque: 20 N·m (205 kgf·cm, 15 ft·lbf)

18. FILL FLUID AND CHECK FLUID

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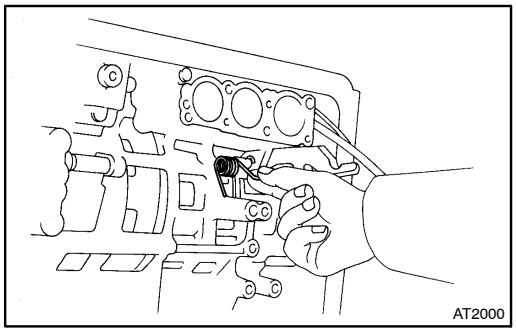


PARKING LOCK PAWL

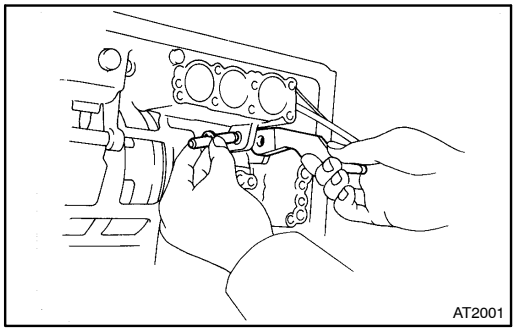
AT020–01

ON–VEHICLE REPAIR

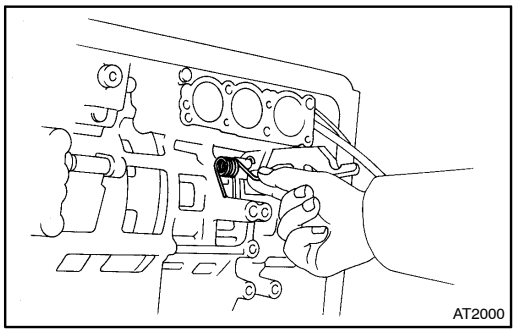
1. **REMOVE VALVE BODY (See page AT–12)**
2. **REMOVE PARKING LOCK PAWL BRACKET**



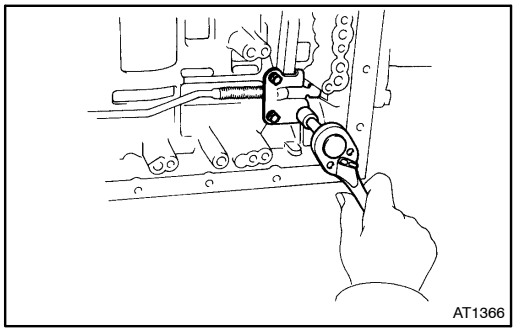
3. **REMOVE SPRING FROM PARKING LOCK PAWL SHAFT**



4. **REMOVE PARKING LOCK PAWL AND SHAFT**
5. **INSTALL PARKING LOCK PAWL AND SHAFT**



6. **INSTALL SPRING TO PARKING LOCK PAWL SHAFT**



7. **INSTALL PARKING LOCK PAWL BRACKET**
   Torque: 7.4 N·m (75 kgf·cm, 65 in.·lbf)

HINT:

- Push the lock rod fully forward.
- Check that the parking lock pawl operates smoothly.

8. **INSTALL VALVE BODY (See page AT–12)**

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THROTTLE CABLE

AT0ZK–01

ON–VEHICLE REPAIR

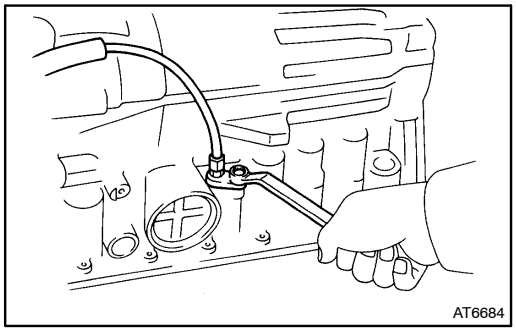
1. DISCONNECT THROTTLE CABLE

(a) Disconnect the cable from the throttle linkage.

(b) Disconnect the cable from the cable clamps in the engine compartment.

(c) Remove the bolt and disconnect the cable clamp from the torque converter clutch housing.

2. REMOVE VALVE BODY (See page AT–12)



3. REMOVE THROTTLE CABLE

Remove the retaining bolt and pull out the throttle cable.

4. INSTALL THROTTLE CABLE

(a) Make sure to push it in all the way.

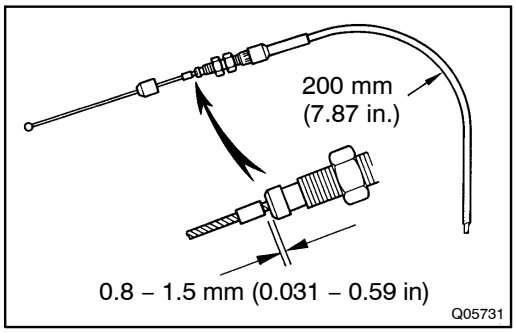
(b) Install the bolt.

5. INSTALL VALVE BODY (See page AT–12)

6. IF THROTTLE CABLE IS NEW, STAKE STOPPER ON INNER CABLE

HINT:

New cable does not have a staked cable stopper.



(a) Bend the cable so there is a radius of about 200 mm (7.87 in.).

(b) Pull the inner cable lightly until slight resistance is felt, and hold it there.

(c) Stake the stopper, 0.8 – 1.5 mm (0.031 – 0.059 in.) from the end of outer cable.

7. CONNECT THROTTLE CABLE

(a) Install the bolt and connect the cable clamp to the torque converter clutch housing.

(b) Connect the cable to the cable clamps in the engine compartment.

(c) Connect the cable to the throttle linkage.

8. ADJUST THROTTLE CABLE (See page DI–265)

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SHIFT LOCK SYSTEM

ON–VEHICLE INSPECTION

AT024–01

CHECK SHIFT LOCK SYSTEM

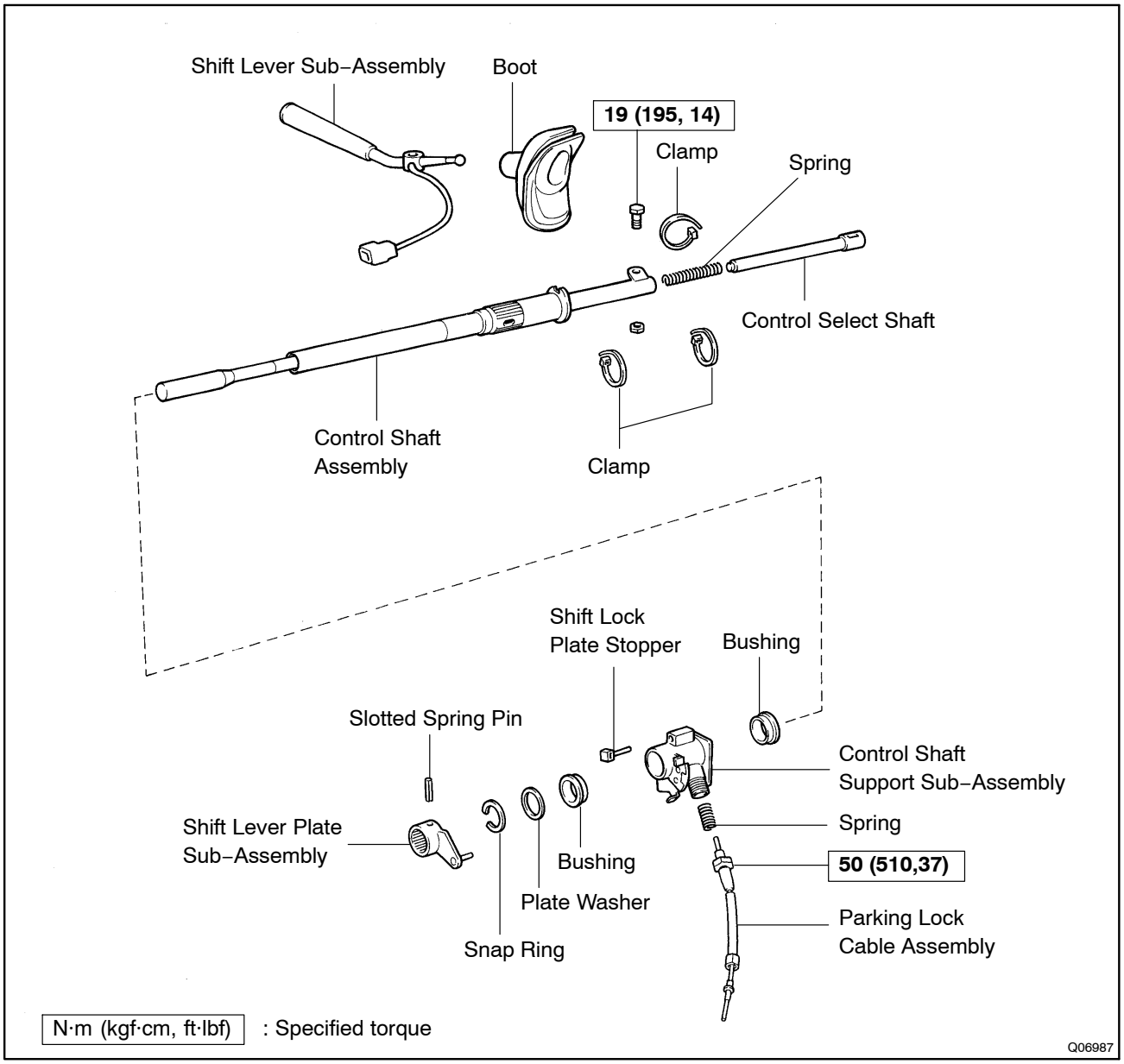
(a) With depressing the brake pedal, check that the tip of the parking lock cable protrudes from the pedal bracket.
(b) Set the shift position to the P position. With the brake pedal depressed, check the select lock cancel.
(c) Check that the lock pin has no unusual operation sound.
(d) Remove the center cluster finish lower panel. (See page BO–36)
    (1) Check that the sliding rod is protruded when the ignition key plate is turned from LOCK position to ACC position.
    (2) Check that the sliding rod is released when the ignition key plate is turned to LOCK position.

If the key interlock solenoid operation is defective, replace the key cylinder.

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AT025–01

COMPONENTS



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AT026–01

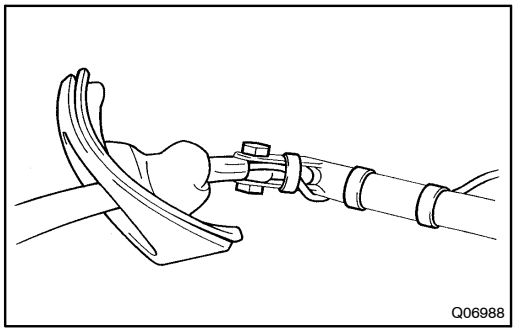
REMOVAL

(See page SR–13)

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AT027–02

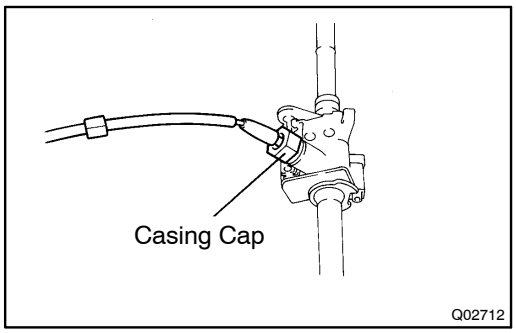
DISASSEMBLY



1. REMOVE 3 CLAMPS

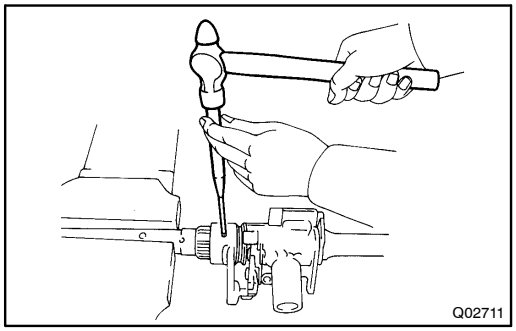
2. REMOVE SHIFT LEVER SUB–ASSEMBLY

Remove the nut, bolt and shift lever sub–assembly.



3. REMOVE PARKING LOCK CABLE ASSEMBLY

Loosen the casing cap and remove the parking lock cable assembly and spring.



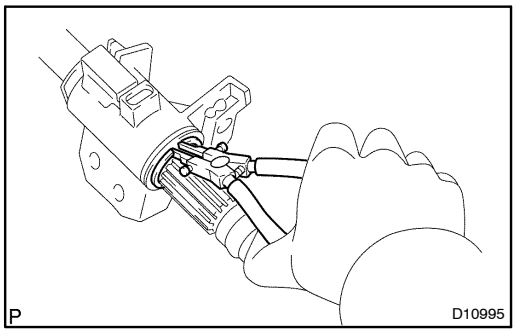
4. REMOVE SHIFT LEVER PLATE SUB–ASSEMBLY, CONTROL SELECT SHAFT AND SPRING

(a) Using a pin punch and hammer, tap out the slotted spring pin and control select shaft.

CAUTION:

Be careful when tapping out the slotted spring pin so that the spring and control select shaft do not fly out.

(b) Remove the shift lever plate sub–assembly.



5. REMOVE CONTROL SHAFT SUPPORT SUB–ASSEMBLY

(a) Using a snap ring expander, remove the snap ring.

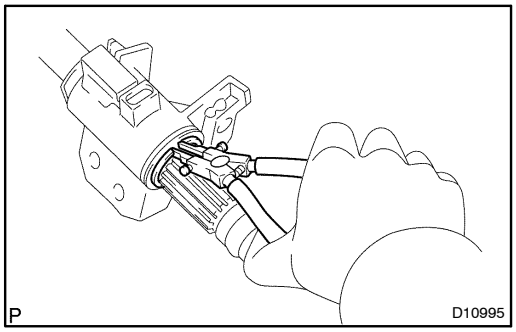
(b) Remove the plate washer, bushings and control shaft support sub–assembly.

(c) Remove the shift lock plate stopper.

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AT028–02

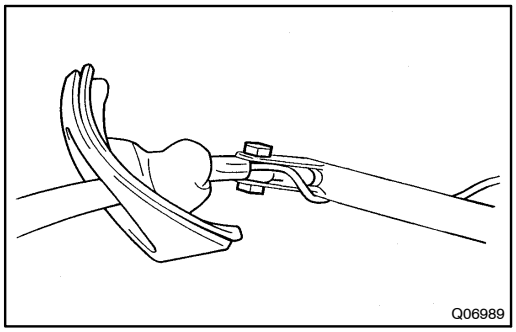
REASSEMBLY



1. INSTALL CONTROL SHAFT SUPPORT

(a) Install the bushings, control shaft support sub–assembly and plate washer.

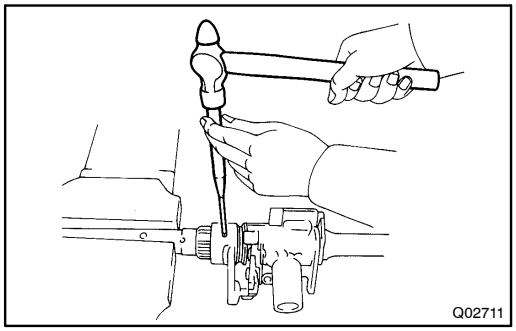
(b) Using a snap ring expander, install the snap ring.



2. INSTALL SHIFT LEVER SUB–ASSEMBLY, CONTROL SELECT SHAFT AND SPRING

(a) Insert the spring and control select shaft.

(b) Install the shift lever sub–assembly with the bolt and nut.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

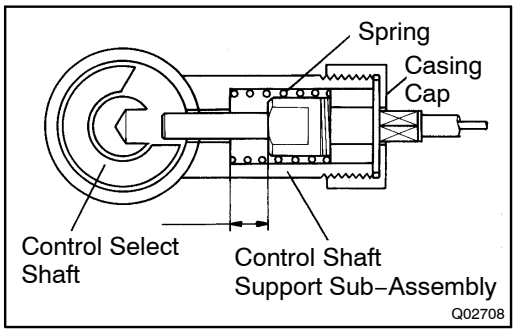


3. INSTALL SHIFT LEVER PLATE SUB–ASSEMBLY

(a) Install the shift lever plate sub–assembly.

(b) Align the hole of the shift lever plate assembly and hole of the control select shaft.

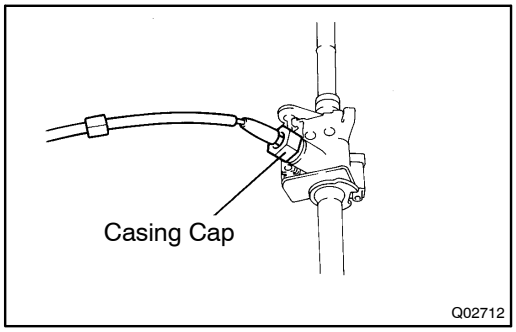
(c) Using a pin punch, tap in the slotted spring pin.



4. INSTALL PARKING LOCK CABLE ASSEMBLY

(a) Apply MP grease to the inside sliding surface of the control shaft support sub–assembly.

(b) Install the parking lock cable assembly to the control shaft support sub–assembly, as shown.



(c) Tighten the casing cap.
Torque: 50 N·m (510 kgf·cm, 37 ft·lbf)

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5. CHECK PARKING LOCK CABLE OPERATION

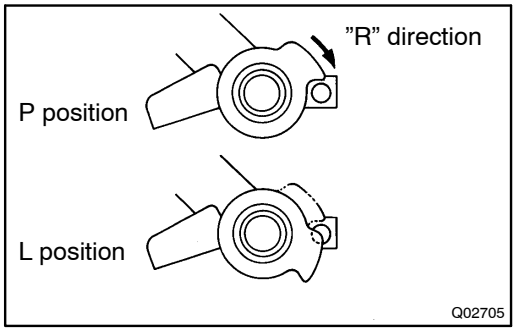
(a) Push the parking lock cable to check that there is no scraping noise and stopper knocking due to lack of grease.

(b) Shift the shift lever in P position and check that the lever is locked when you push the parking lock cable 7 mm (0.28 in.).

(c) Check that the select lever is released when the parking lock cable is free.

(d) Measure the freeplay of the tip of the control lever when the control shaft is in play.
Freeplay: 6 mm (0.24 in.)

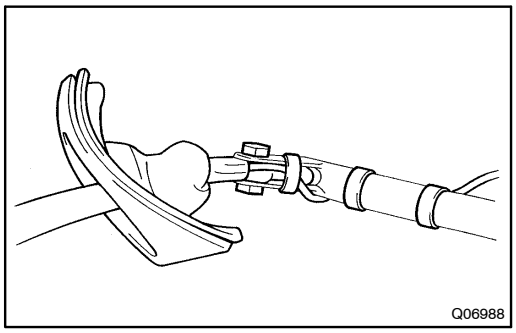
(e) Release the select lock and measure the freeplay of the tip of the control lever when the shift lock plate and stopper lock in the shift direction.
Freeplay: 10 mm (0.39 in.)



(f) Shift the shift in P position and check that the shift lock plate does not contact with the stopper when the control shaft is rotated towards R position.

(g) With the stopper in operation, release shift lock and check that shifting from P to R position is prevented when selecting a position.

(h) For each shift position from R to L position, check that the ignition key plate turning from ACC position to LOCK position is prevented.



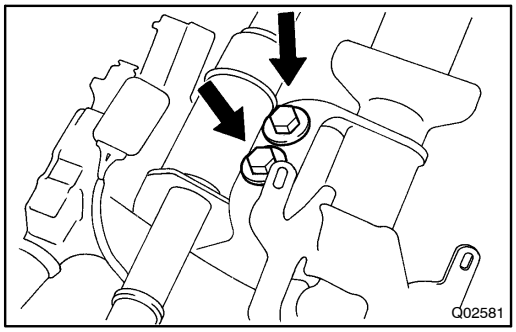
6. INSTALL 3 CLAMPS

7. CHECK SHIFT LOCK SYSTEM

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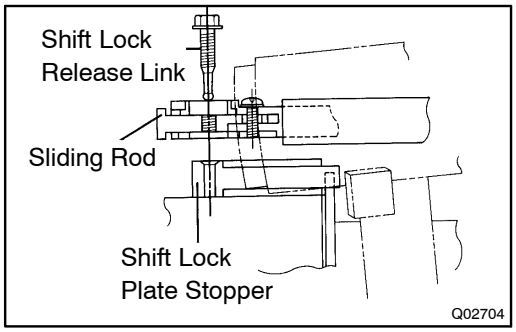
AT029–01

INSTALLATION



1. TEMPORARILY INSTALL SHIFT LEVER ASSEMBLY TO STEERING COLUMN ASSEMBLY

Install the shift lever assembly to the steering column assembly with the 2 bolts.



2. CONNECT AND ADJUST INTER LOCK

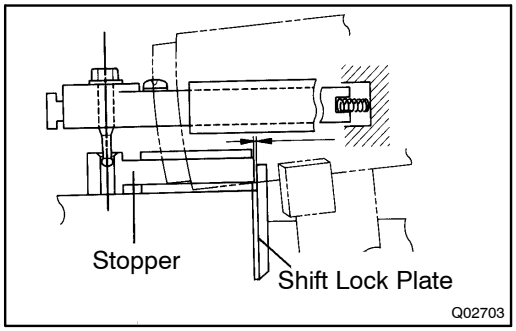
(a) Put the control shaft in the P position.

(b) Turn the ignition key plate to the LOCK position.

(c) Slide the shift lock plate of the control shaft until it touch the surface of the holder.

(d) Slide the sliding rod, then align the center of the shift lock pate stopper's hole and shift lock release link's hole.

(e) Install the shift lock release link.
Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)



(f) Tighten the screw.
Torque: 1.4 N·m (14 kgf·cm, 12 in.·lbf)

(g) Turn the ignition switch key plate in the ACC position.

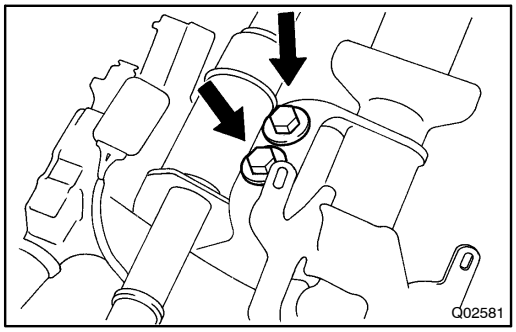
(h) Set the control shaft in the D position.

(i) Measure the clearance of the stopper and shift lock plate.
Clearance: 1.0 ± 0.8 mm (0.039 ± 0.031 in.)

(j) When the control shaft is set in D position, check that the ignition key plate does not turn to LOCK position.

(k) When the control lever is changed from the R position to L position, check that the shift lock plate does not interfere with stopper.

(l) Set the control shaft in the P position.
When the ignition key plate is turned from the LOCK position to the ACC position, check that the stopper is unlocked from the lock condition.



3. TORQUE SHIFT LEVER ASSEMBLY MOUNTING BOLTS
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

4. INSTALL SHIFT LEVER ASSEMBLY WITH STEERING COLUMN ASSEMBLY (See page SR–20)

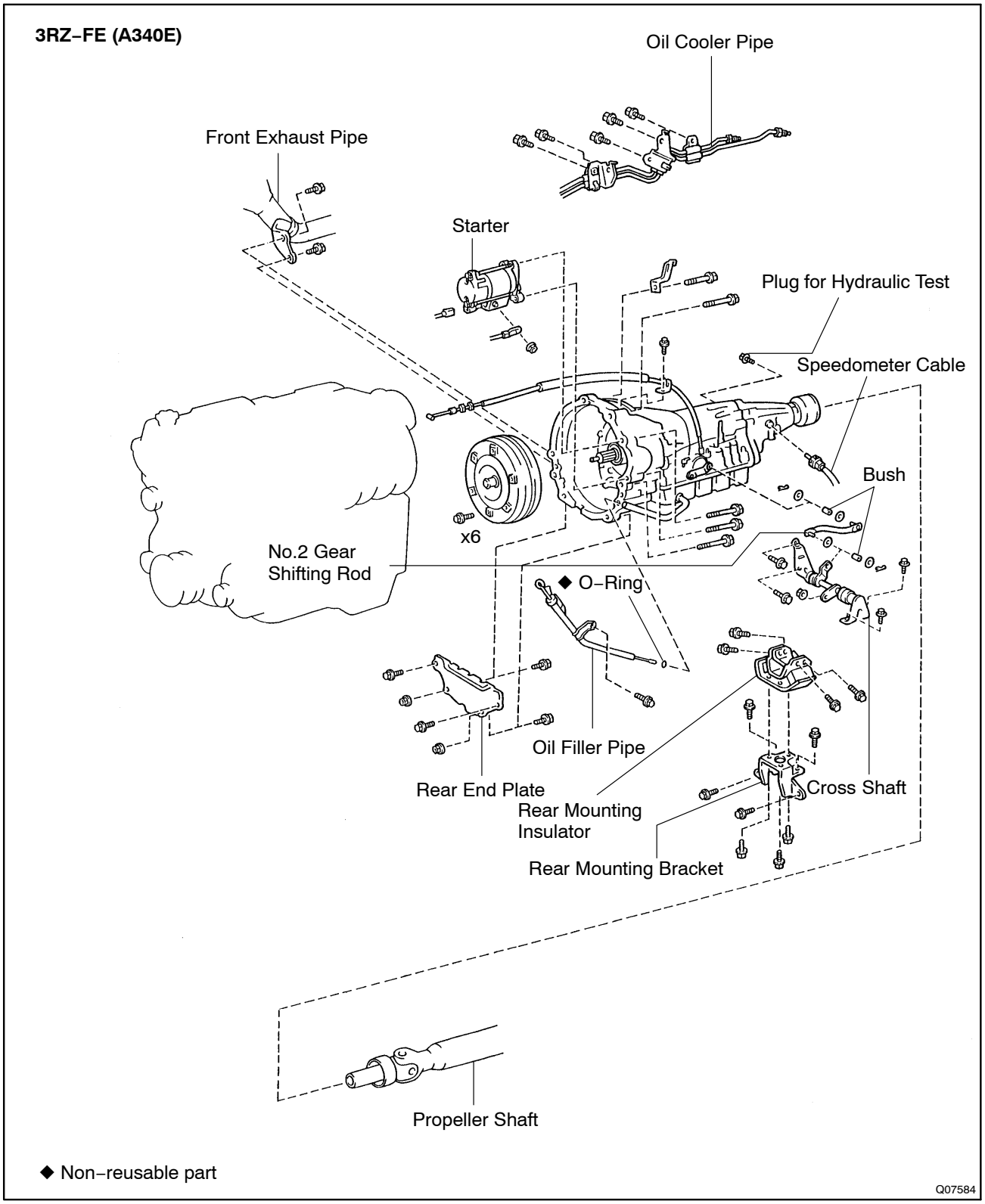
5. CHECK AND ADJUST SHIFT LEVER POSITION (See page DI–265)

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AUTOMATIC TRANSMISSION UNIT (A340E)

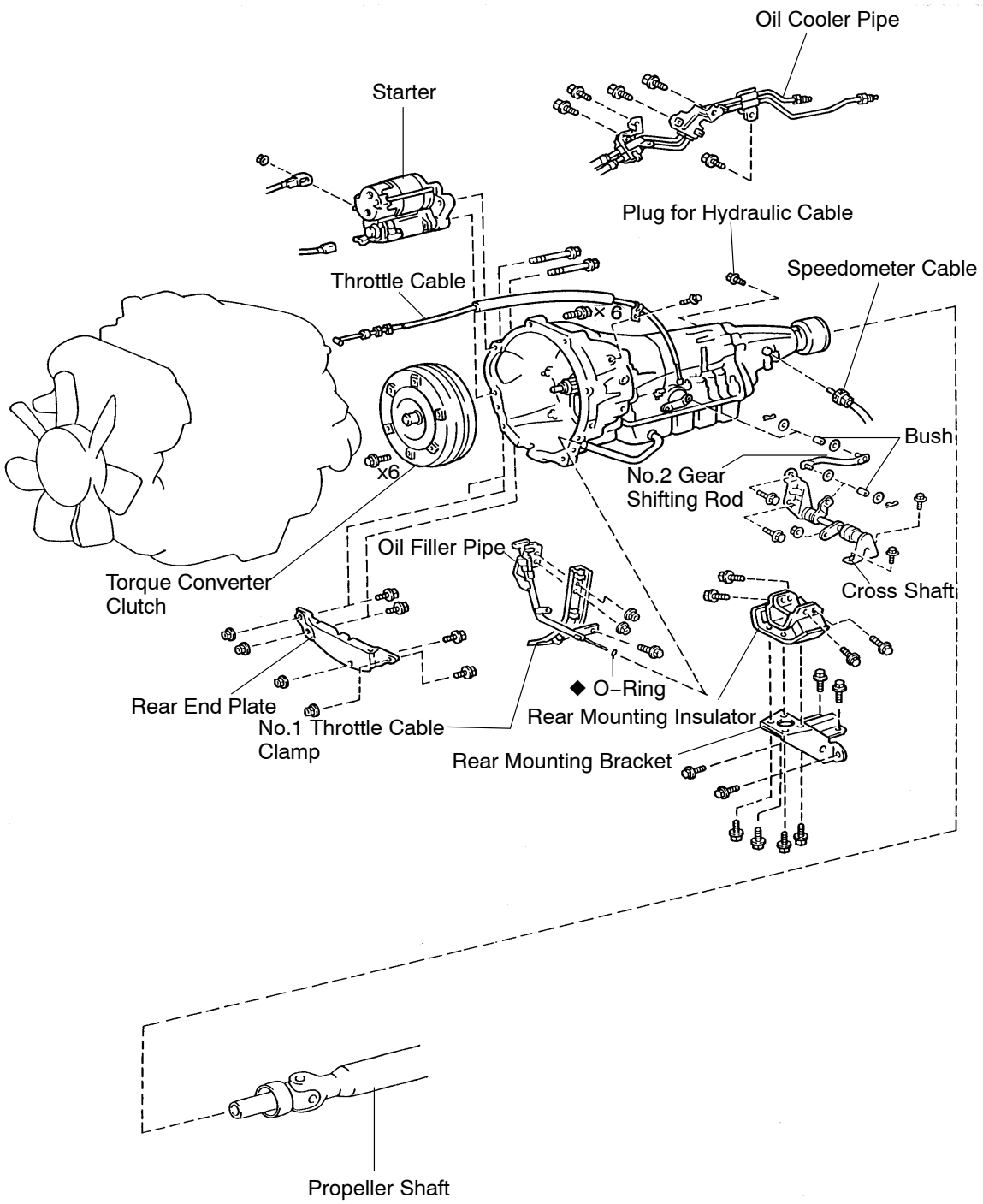
COMPONENTS

AT02A–02



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5VZ–FE (A340E)



◆ Non–reusable part

Q07585

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AT02B–02

REMOVAL

1. REMOVE ATF LEVEL GAUGE

2. REMOVE ENGINE UNDER COVER

3. DISCONNECT THROTTLE CABLE

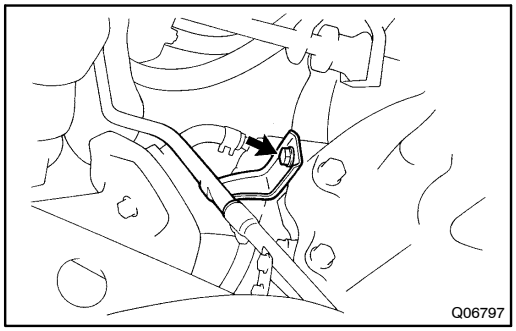
(a) Loosen the nut and disconnect the cable.

(b) Remove the throttle cable from the clamps.

4. 5VZ–FE:
REMOVE NO.1 THROTTLE CABLE CLAMP

Remove the 2 nuts and No.1 throttle cable clamp.

5. JACK UP VEHICLE



6. REMOVE OIL FILLER PIPE

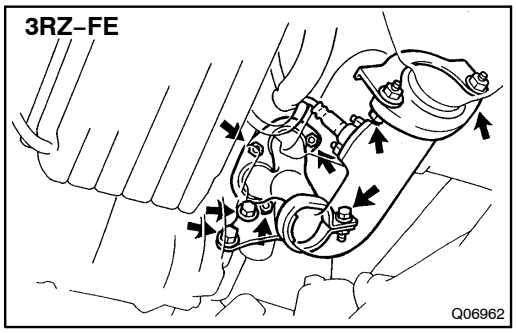
Remove the bolt and oil filler pipe with the O–ring.

HINT:

At the time of reassembly, please refer to the following item.

Replace used O–ring with a new one.

7. REMOVE PROPELLER SHAFT (See page PR–3)



8. 3RZ–FE:
REMOVE FRONT EXHAUST PIPE

(a) Disconnect the oxygen sensor connector.

(b) Remove the 2 bolts and retainer.
Torque: 48 N·m (490 kgf·cm, 35 ft·lbf)

(c) Loosen the clamp bolt and disconnect the clamp from the support bracket.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

(d) Remove the 2 bolts and support bracket.
Torque: 71 N·m (730 kgf·cm, 53 ft·lbf)

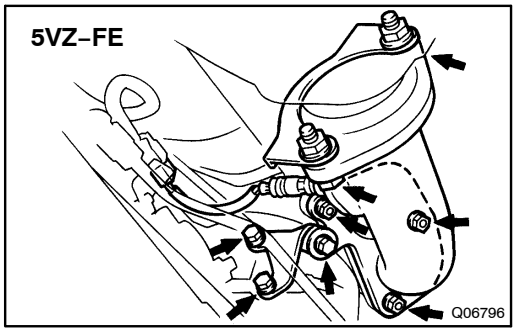
(e) Remove the 3 nuts, front exhaust pipe and 3 gaskets.
Torque: 62 N·m (630 kgf·cm, 40 ft·lbf)

HINT:

At the time of reassembly, please refer to the following item.

Replace the used 3 gaskets with new ones.

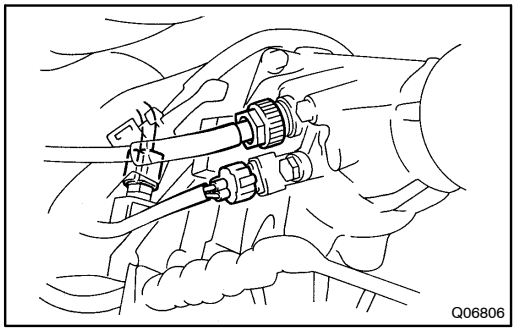
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9. 5VZ–FE:
REMOVE FRONT EXHAUST PIPE

(a) Disconnect the oxygen sensor connector.
(b) Remove the 2 bolts and retainer.
Torque: 48 N·m (490 kgf·cm, 35 ft·lbf)
(c) Remove the 3 bolts and support bracket.
Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)
(d) Remove the 3 nuts, front exhaust pipe and 3 gaskets.
Torque: 62 N·m (630 kgf·cm, 40 ft·lbf)

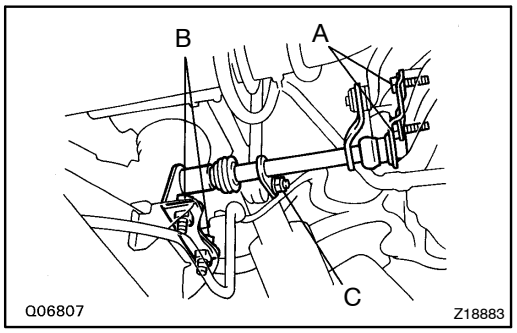
HINT:
At the time of reassembly, please refer to the following item.
Replace the used 3 gaskets with new ones.



10. DISCONNECT SPEEDOMETER CABLE

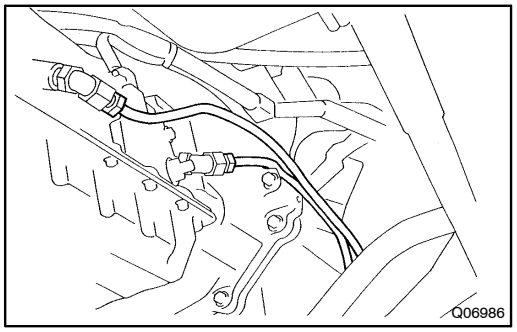
(a) Loosen the serrated collar with pliers. Do not lose the felt dust protector and washer.
(b) Disconnect the cable.

11. DISCONNECT NO.2 VEHICLE SPEED SENSOR CONNECTOR AND SOLENOID CONNECTOR



12. REMOVE CROSS SHAFT

(a) Remove the clip and disconnect the No.2 gear shifting rod.
(b) Remove the nut, washer, 4 bolts and the cross shaft.
Torque:
A (Transmission side): 13 N·m (130 kgf·cm, 9 ft·lbf)
B (Frame side): 28 N·m (290 kgf·cm, 21 ft·lbf)
C (Nut): 13 N·m (130 kgf·cm, 9 ft·lbf)



13. REMOVE OIL COOLER PIPE

(a) Remove the bolts and 3 clamps.
(b) Disconnect the 2 oil cooler pipes.
Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)

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14. DISCONNECT ATF TEMPERATURE SENSOR

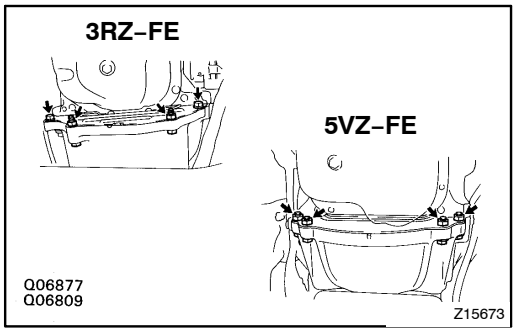
15. DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR

16. DISCONNECT STARTER WIRE

(a) Remove the nut and disconnect the starter wire.

(b) Disconnect the starter connector.

17. REMOVE FRONT STABILIZER BAR
(See page SA–124)

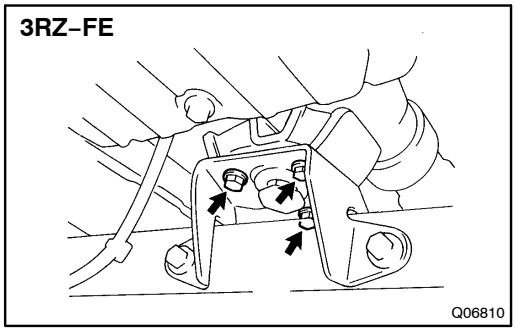


18. 3RZ–FE:
REMOVE REAR END PLATE

Remove the 4 bolts, 2 nuts and rear end plate.
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

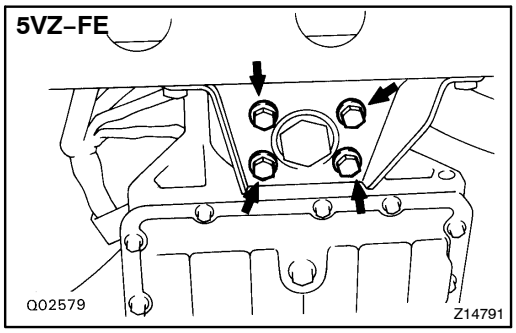
19. 5VZ–FE:
REMOVE REAR END PLATE

Remove the 4 nuts, bolts and rear end plate.
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)



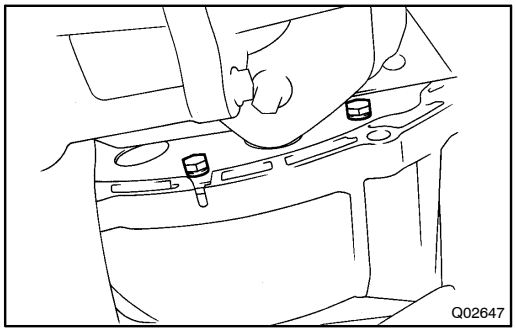
20. 3RZ–FE:
DISCONNECT REAR MOUNTING INSULATOR

Remove the 3 bolts and disconnect the rear mounting insulator.
Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)



21. 5VZ–FE:
DISCONNECT REAR MOUNTING INSULATOR

Remove the 4 bolts and disconnect the rear mounting insulator.
Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)



22. JACK UP TRANSMISSION

23. REMOVE TRANSMISSION WITH ENGINE

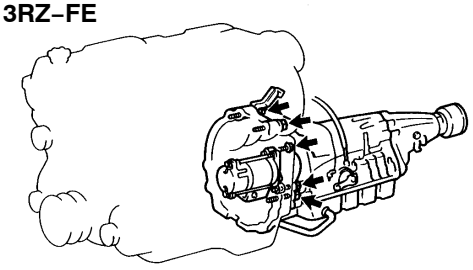
(a) Turn the crankshaft to gain access to each bolt, remove the 6 bolts with holding the crankshaft pully bolt with a wrench.
Torque: 41 N·m (420 kgf·cm, 30 ft·lbf)

(b) Disconnect the wire harness and connectors from the transmission.

(c) Remove the transmission with the engine from the vehicle. (See page 3RZ–FE EM–65, 5VZ–FE EM–65)

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3RZ–FE



Q06878

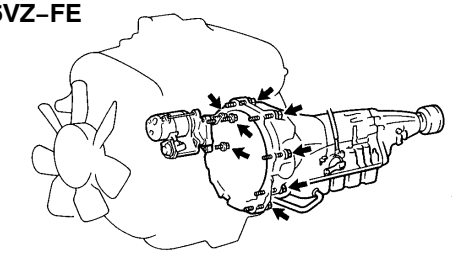
24. 3RZ–FE:
REMOVE TRANSMISSION FROM ENGINE

(a) Remove the 2 starter bolts and starter.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Remove the 3 transmission mounting bolts from the engine.
Torque: 71 N·m (730 kgf·cm, 53 ft·lbf)

(c) Pull out the transmission toward the rear.

5VZ–FE



Q06879

25. 5VZ–FE:
REMOVE TRANSMISSION FROM ENGINE

(a) Remove the 2 starter bolts and starter.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

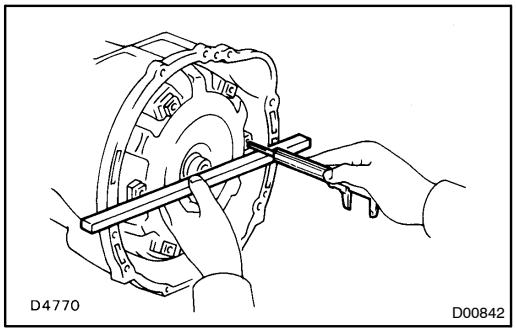
(b) Remove the 6 transmission mounting bolts from the engine.
Torque: 71 N·m (730 kgf·cm, 53 ft·lbf)

(c) Pull out the transmission toward the rear.

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AT02C–01

INSTALLATION



1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure the distance from the installed surface of the transmission housing to the installed surface of the torque converter clutch.

Correct distance:
More than 31.75 mm (1.2500 in.) for 3RZ–FE
More than 17.95 mm (0.7067 in.) for 5VZ–FE

2. INSTALL TRANSMISSION

Installation is in the reverse order of removal (See page AT–28).

HINT:

- After installation, adjust the shift lever position (See page DI–265).
- Fill ATF and check the fluid level (See page DI–265).

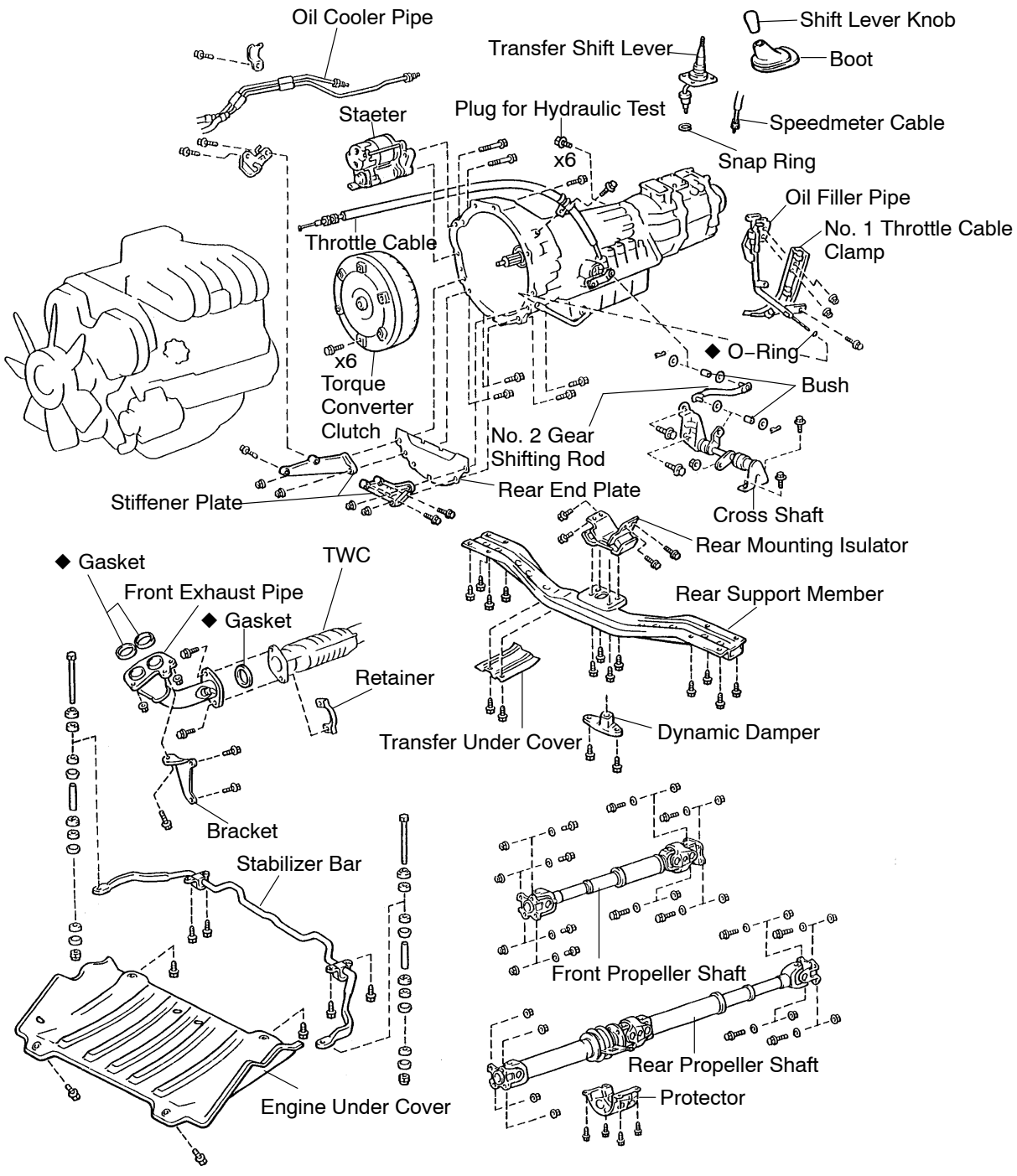
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AUTOMATIC TRANSMISSION UNIT (A340F)

COMPONENTS

AT02D–02

5VZ–FE (A340F)



◆ Non–reusable part

Q07586

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AT02E–02

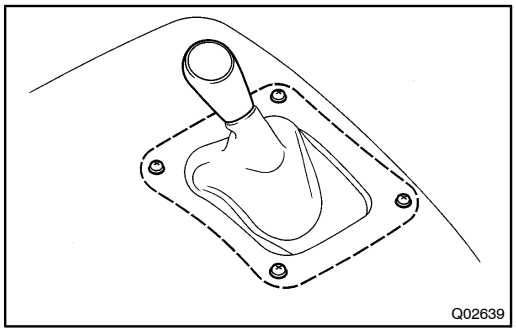
REMOVAL

1. REMOVE ENGINE UNDER COVER

2. DISCONNECT THROTTLE CABLE

(a) Loosen the nut and disconnect the cable.

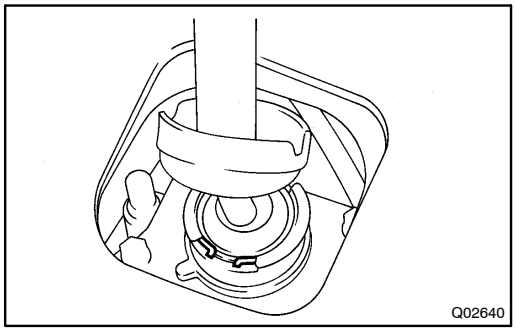
(b) Remove the throttle cable from the clamp.



3. REMOVE TRANSFER SHIFT LEVER FROM INSIDE OF VEHICLE

(a) Remove the shift lever knob.

(b) Remove the 4 screws and the boot.

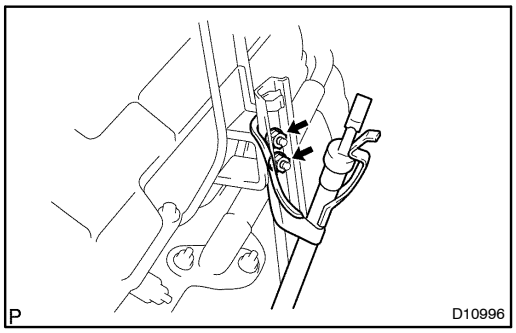


(c) Using pliers, remove the snap ring and pull out the shift lever from the transfer.

HINT:

At the time of reassembly, please refer to the following item.

Apply MP grease to the transfer shift lever.



4. REMOVE NO.1 THROTTLE CABLE CLAMP

Remove the 2 nuts and No.1 throttle cable clamp.

5. JACK UP VEHICLE

6. REMOVE OIL FILLER PIPE

Remove the bolt and oil filler pipe with the O–ring.

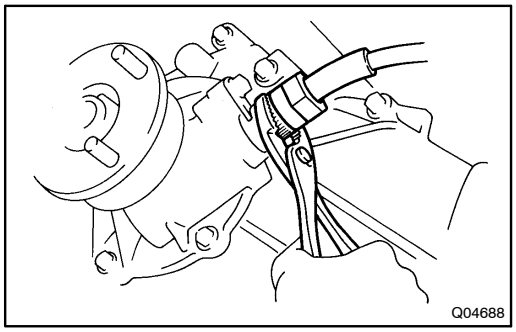
HINT:

At the time of reassembly, please refer to the following item.Replace the used O–ring with a new one.

7. REMOVE FRONT AND REAR PROPELLER SHAFT (See page PR–11)

8. REMOVE FRONT EXHAUST PIPE (See page EM–108)

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9. DISCONNECT SPEEDOMETER CABLE

(a) Loosen the serrated collar with pliers. Do not lose the felt dust protector and washer.

(b) Disconnect the cable.

10. DISCONNECT NO.2 VEHICLE SPEED SENSOR CONNECTOR

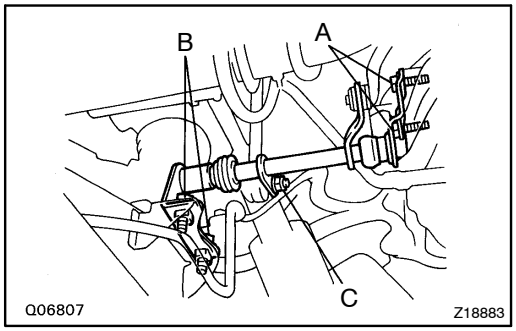
11. DISCONNECT SOLENOID CONNECTOR

12. DISCONNECT TRANSFER NEUTRAL POSITION SWITCH

13. DISCONNECT TRANSFER L4 POSITION SWITCH

14. DISCONNECT TRANSFER INDICATOR SWITCH

15. SEPARATE WIRE HARNESS FROM TRANSMISSION AND TRANSFER



16. REMOVE CROSS SHAFT

(a) Remove the clip and disconnect the No.2 gear shifting rod.

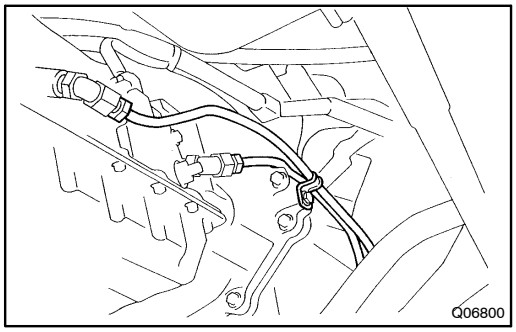
(b) Remove the nut, washer, 4 bolts and the cross shaft.

Torque:
A (Transmission side): 13 N·m (130 kgf·cm, 9 ft·lbf)
B (Frame side): 28 N·m (290 kgf·cm, 21 ft·lbf)
C (Nut): 13 N·m (130 kgf·cm, 9 ft·lbf)

17. DISCONNECT STARTER WIRE

(a) Remove the nut and disconnect the starter wire.

(b) Disconnect the starter connector.



18. REMOVE OIL COOLER PIPE

(a) Remove the bolt and front side oil cooler pipe clamp.

(b) Remove the bolt and rear side oil cooler pipe clamp.

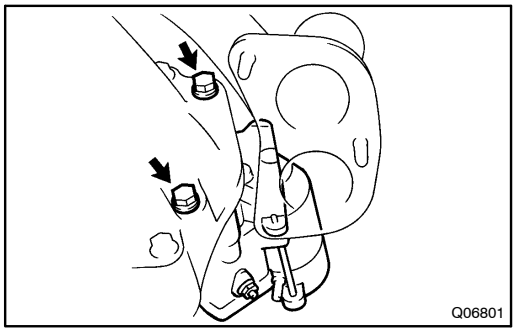
(c) Disconnect the 2 oil cooler pipes.

Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)

19. DISCONNECT ATF TEMPERATURE SENSOR CONNECTOR

20. DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR

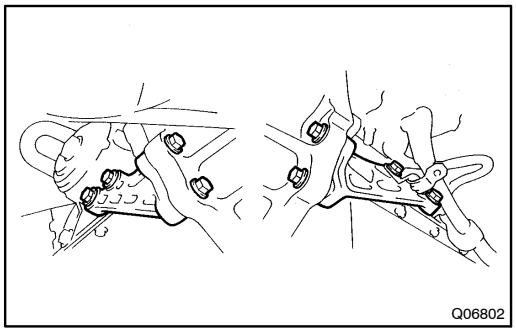
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21. REMOVE STARTER

Remove the 2 bolts and starter.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)



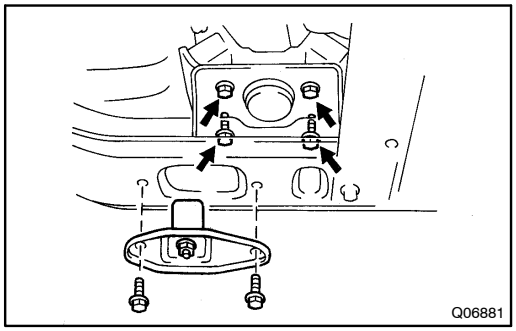
22. REMOVE STIFFENER PLATE AND REAR END PLATE

Remove the 8 bolts, LH, RH stiffener plates and rear end plate.

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

23. REMOVE FRONT STABILIZER BAR (See page SA–127)

24. JACK UP TRANSMISSION



25. DISCONNECT REAR MOUNTING INSULATOR

(a) Remove the 2 bolts and dynamic damper.

Torque: 61 N·m (620 kgf·cm, 44 ft·lbf)

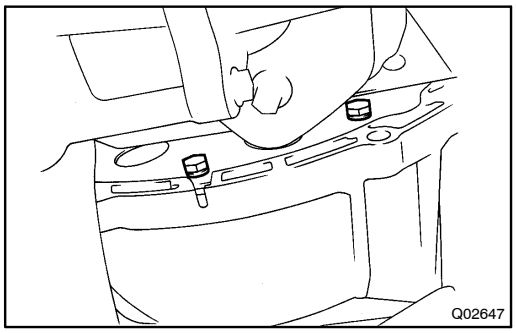
(b) Remove the 4 bolts and rear mounting bracket.

Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

26. REMOVE REAR SUPPORT MEMBER

Remove the 8 bolts and support member.

Torque: 95 N·m (970 kgf·cm, 70 ft·lbf)

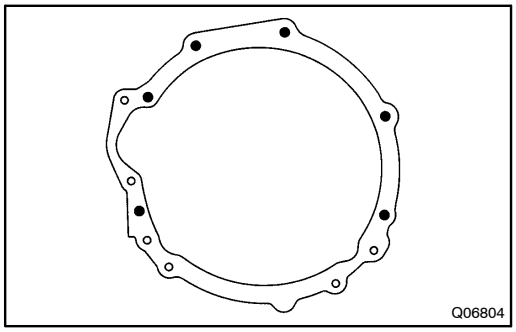


27. REMOVE TRANSMISSION

(a) Turn the crankshaft to gain access to each bolt, remove the 6 bolts with holding the crankshaft pully bolt with a wrench.

Torque: 41 N·m (420 kgf·cm, 30 ft·lbf)

(b) Disconnect the wire harness and connectors from the transmission.

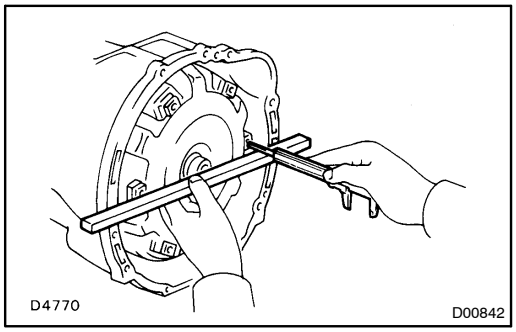


(c) Remove the 6 bolts and transmission.

Torque: 71 N·m (730 kgf·cm, 53 ft·lbf)

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AT02F–01



INSTALLATION

1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure from the installed surface of the transmission housing.

Correct distance: More than 17.95 mm (0.7067 in.)

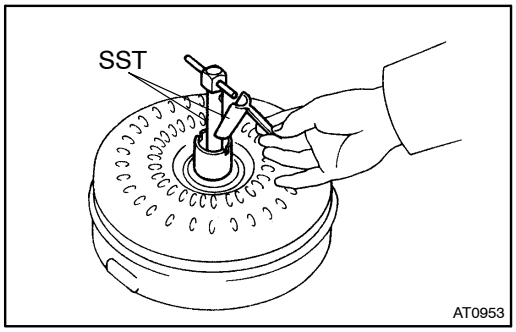
2. INSTALL TRANSMISSION

Installation is in the reverse order of removal (See page AT–34).

HINT:

- After installation, adjust the shift lever position (See page DI–265).
- Fill ATF and check fluid level (See page DI–265).

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TORQUE CONVERTER CLUTCH AND DRIVE PLATE

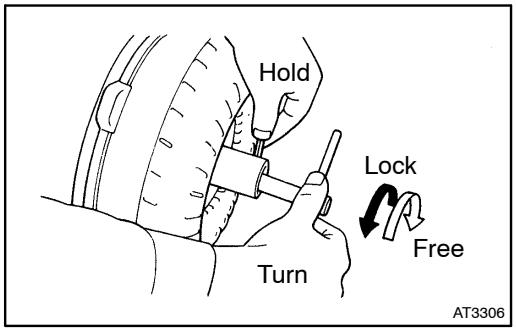
AT02G–06

INSPECTION

1. INSPECT ONE–WAY CLUTCH

(a) Install SST in the inner race of one–way clutch.
SST 09350–30020 (09351–32010)

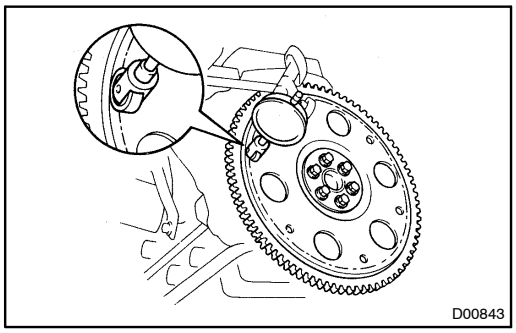
(b) Install SST so that it fits in the notch of the converter hub and outer race of the one–way clutch.
SST 09350–30020 (09351–32020)



(c) With the torque converter clutch standing on its side, check that the clutch locks when turned counterclockwise, and rotates freely and smoothly clockwise.

If necessary, clean the converter and retest the clutch.

(d) Replace the converter if the clutch still fails the test.



2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

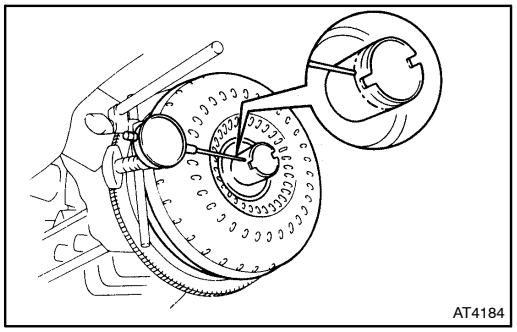
Set up a dial indicator, measure the drive plate runout.

Maximum runout: 0.20 mm (0.0079 in.)

If runout is not within the specification or if the ring gear is damaged, replace the drive plate.

Torque: 83 N·m (850 kgf·cm, 61 ft·lbf)

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3. MEASURE TORQUE CONVERTER CLUTCH SLEEVE RUNOUT

Temporarily mount the torque converter clutch to the drive plate.

Set up a dial indicator, measure the torque corverter clutch sleeve runout.

Maximum runout: 0.30 mm (0.0118 in.)

If runout is not within the specification, try to correct by reorienting the installation of the converter clutch.

HINT:

Mark the position of the converter clutch to ensure the correct installation.

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TR – TRANSFER

TRANSFER SYSTEM	TR-1
TROUBLESHOOTING	TR-2
TRANSFER UNIT	TR-3
TRANSFER ASSEMBLY	TR-5
OIL PUMP BODY	TR-17
DRIVEN SPROCKET	TR-21
REAR OUTPUT SHAFT	TR-23
INPUT SHAFT	TR-30
PLANETARY GEAR	TR-33
OIL SEAL	TR-36

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TRANSFER SYSTEM

TR01P–01

PRECAUTION

When working with FIPG material, you must be observe the following.

- **Using a razor blade and gasket scraper, remove all the old FIPG material from the gasket surfaces.**
- **Thoroughly clean all components to remove all the loose material.**
- **Clean both sealing surfaces with a non–residue solvent.**
- **Apply the FIPG in approx. a 1 mm (0.04 in.) wide bead along the sealing surface.**
- **Parts must be assembled within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.**

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TROUBLESHOOTING

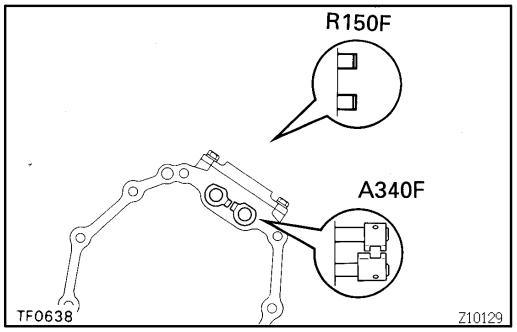
PROBLEM SYMPTOMS TABLE

TR01Q–01

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspect Area	See page
Noise	1. Oil (Level low)	–
	2. Oil (Wrong)	–
	3. Transfer faulty	TR–5
Oil leakage	1. Oil (Level too high)	–
	2. Gasket (Damaged)	–
	3. Oil seal (Worn or damaged)	TR–36
	4. O–ring (Worn or damaged)	TR–36
Tight corner braking	Center differential or transfer faulty	TR–5

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TRANSFER UNIT

TR0CY–02

REMOVAL

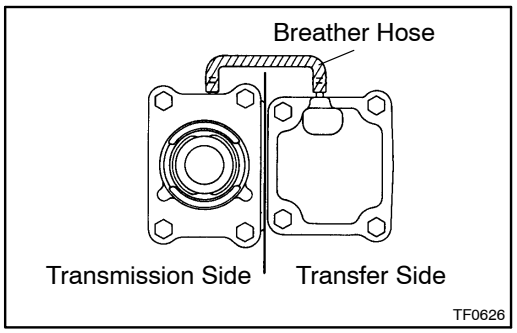
1. REMOVE TRANSFER WITH TRANSMISSION

M/T (See page MT–7)

A/T (See page AT–34)

HINT:

At the time of installation, shift the 2 shift fork shafts to the H4 position.

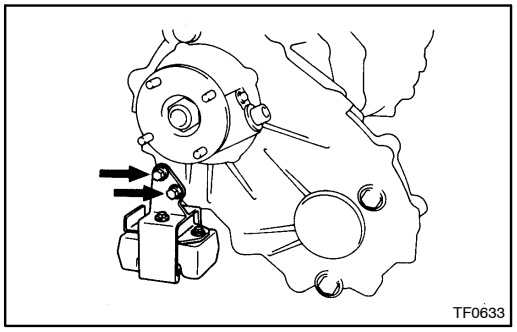


2. A/T:

REMOVE BREATHER HOSE

Disconnect the breather hose from transfer upper cover and transmission control retainer.

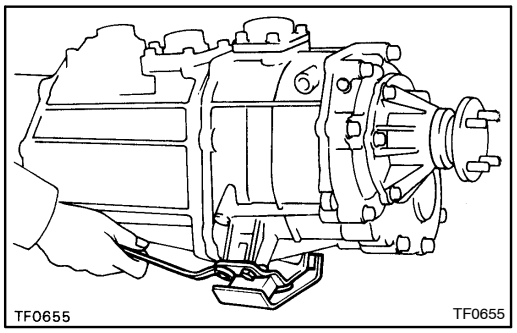
Hose depth: 13 mm (0.51 in.) or more



3. REMOVE DYNAMIC DAMPER

Remove the 2 bolts and dynamic damper.

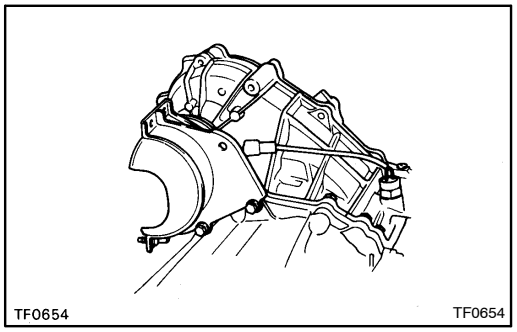
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)



4. REMOVE ENGINE REAR MOUNTING

Remove the 4 bolts and engine rear mounting from the transmission.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)



5. REMOVE PROPELLER SHAFT UPPER DUST COVER AND TRANSFER FROM TRANSMISSION

(a) Remove the dust cover bolt from the bracket.

Torque: 23 N·m (230 kgf·cm, 17 ft·lbf)

(b) Remove the transfer adapter rear mounting bolts.

(c) Pull the transfer straight up and remove it from the transmission.

HINT:

Take care not to damage the adaptor rear oil seal with the transfer input gear spline.

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TR01T–01

INSTALLATION

Installation is in the reverse order of removal (See page TR–3).

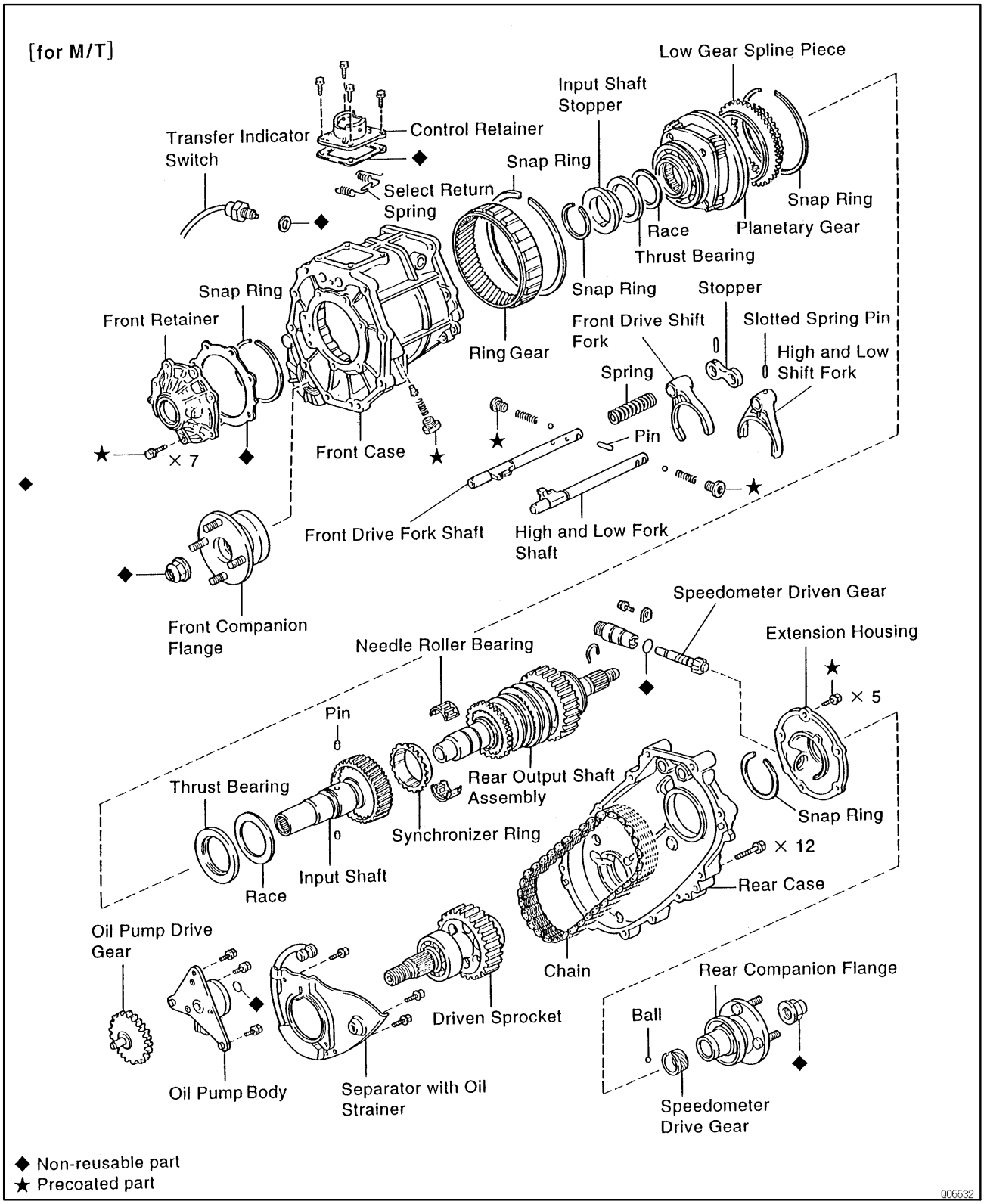
1. **APPLY MP GREASE TO TRANSFER ADAPTOR OIL SEAL**
2. **AFTER INSTALLATION, DO ROAD TEST**

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TRANSFER ASSEMBLY

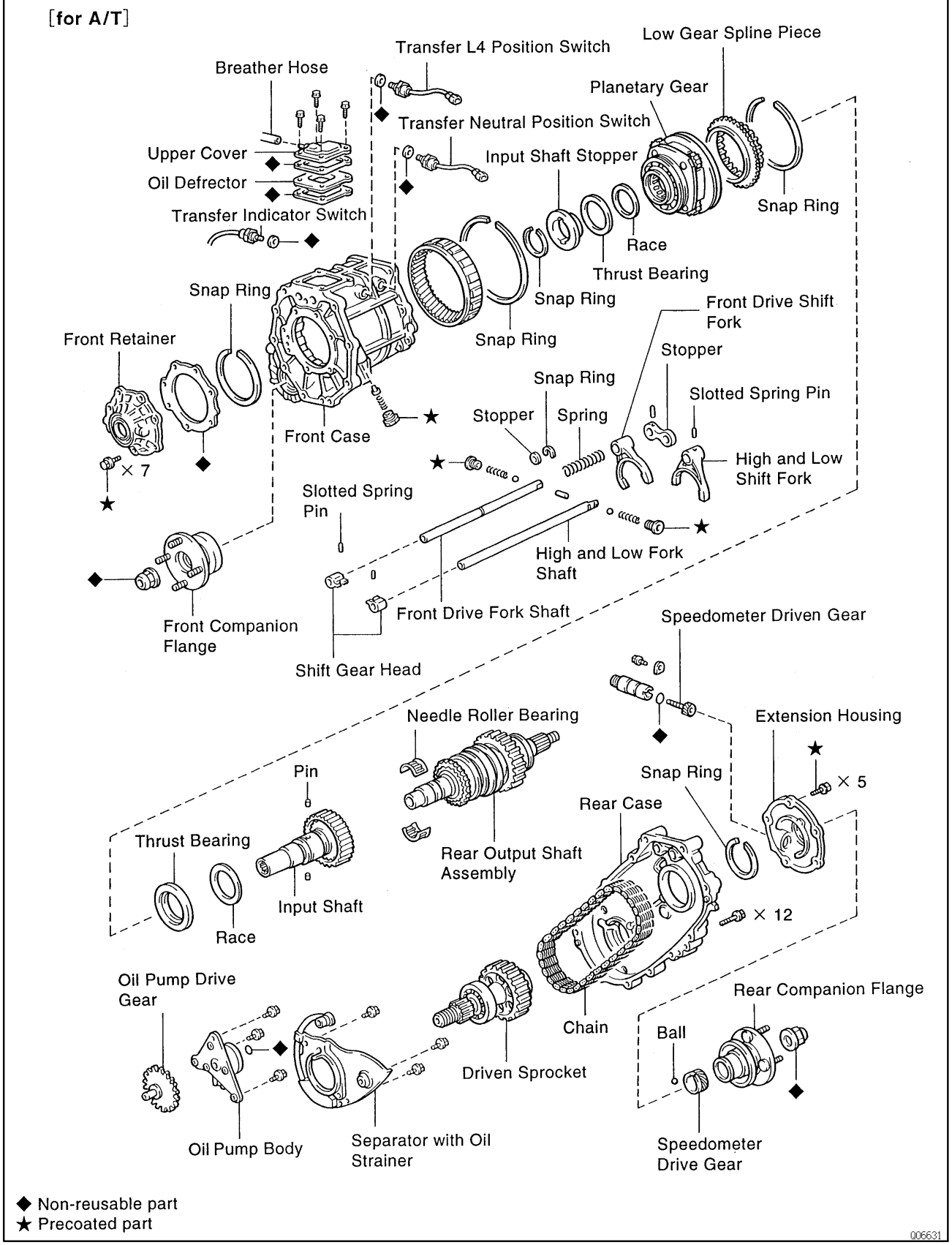
COMPONENTS

TR01U–02



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TR0CZ–01

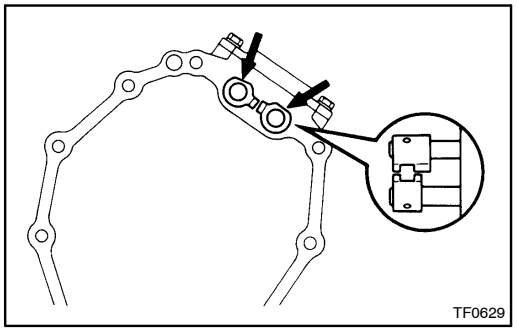
DISASSEMBLY

1. **REMOVE SPEEDOMETER DRIVEN GEAR**
   Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)
2. **REMOVE TRANSFER INDICATOR SWITCH**
   Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)
3. **A/T:**
   REMOVE TRANSFER L4 AND NEUTRAL POSITION SWITCH
   Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

HINT:

At the time of installation, check the following items.

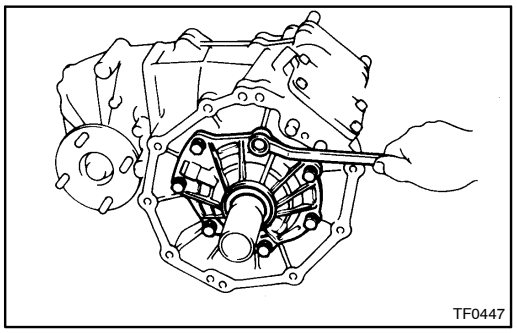
- Check to see that the input shaft and output shafts rotate smoothly.
- Check to see that shifting can be made smoothly to all position.


TF0629

4. **A/T:**
   REMOVE SHIFT GEAR HEAD NO.1 AND NO.2

(a) Using a pin punch and hammer, drive out the 2 slotted spring pins.

(b) Remove the 2 shift gear heads.


TF0447

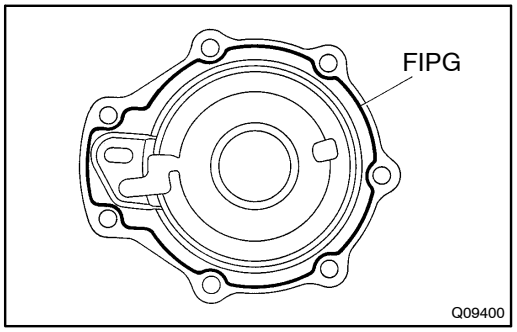
5. **REMOVE FRONT RETAINER**

(a) Remove the 7 bolts.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

HINT:

At the time of installation, apply liquid sealer to the bolts.
Sealant:
Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Using a plastic hammer, tap the front retainer and remove it.



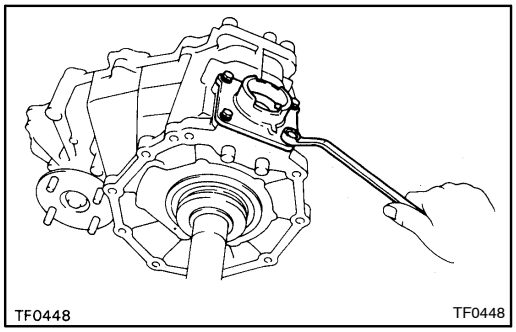
Q09400

HINT:

At the time of installation, please refer to the following items.

- Remove any FIPG material and be careful not to drop oil on the contacting surfaces of the front retainer.
- Apply FIPG to the front retainer, as shown.
  FIPG:
  Part No.08826–00090, THREE BOND 1281, LOCTITE 242 or equivalent

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6. M/T:

REMOVE CONTROL RETAINER

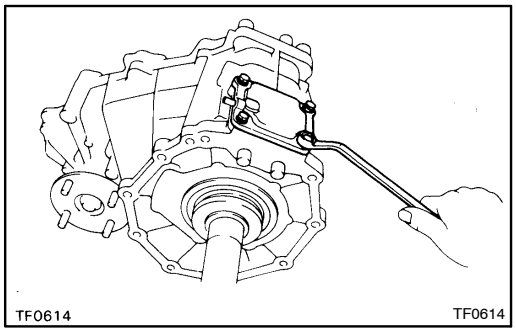
(a) Remove the 4 bolts, control retainer and gasket.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

HINT:

At the time of installation, install a new gasket.

(b) Remove the select return spring from the retainer.



7. A/T:

REMOVE UPPER COVER AND OIL DEFLECTOR

Remove the 4 bolts, upper cover, 2 gaskets and oil deflector.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

HINT:

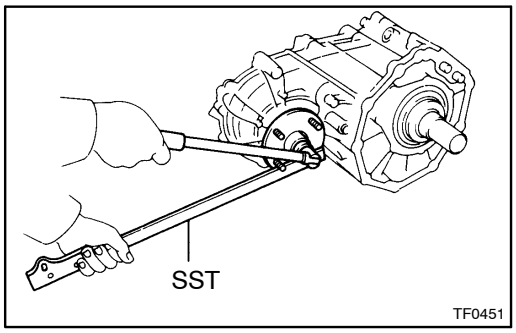
At the time of installation, install a new gasket.

8. REMOVE FRONT COMPANION FLANGE

(a) Using a chisel and hammer, loosen the staked part of the nut.

HINT:

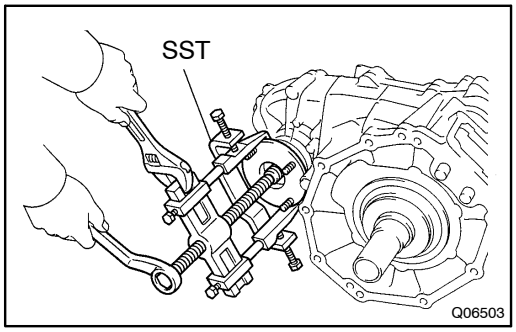
At the time of installation, stake a new lock nut.



(b) Using SST to hold the flange, remove the companion flange lock nut.

SST 09330–00021

Torque: 118 N·m (1,200 kgf·cm, 87 ft·lbf)



(c) Using SST, remove the companion flange.

SST 09950–40010

9. REMOVE REAR COMPANION FLANGE

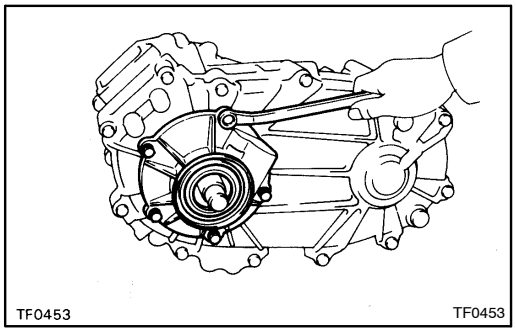
Remove the rear companion flange in the same way as the front companion flange.

HINT:

At the time of installation, please refer to the following items.

- Front companion flange bolts are silver.
- Rear companion flange bolts are black.

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10. REMOVE EXTENSION HOUSING

(a) Remove the 5 bolts.

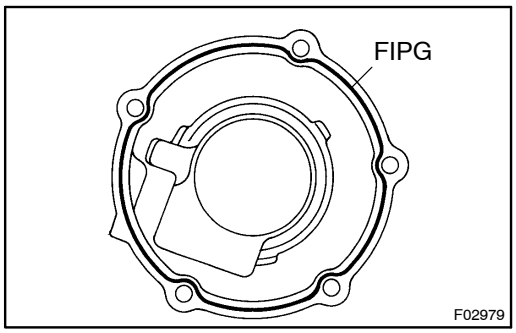
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

HINT:

At the time of installation, apply liquid sealer to the bolts.

Sealant:
Part No.08833–00080, THREE BOND 1344,
LOCTITE 242 or equivalent

(b) Using a plastic hammer, tap the extension housing and remove it.

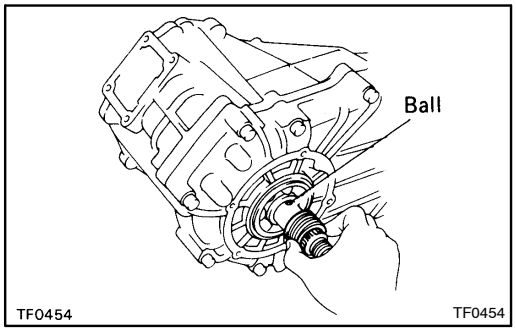


HINT:

At the time of installation, please refer to the following items.

- Remove any FIPG material and be careful not to drop oil on the contacting surfaces of the extension housing.
- Apply FIPG to the extension housing, as shown.

FIPG:
Part No.08826–00090,
THREE BOND 1281 or equivalent



11. REMOVE SPEEDOMETER DRIVE GEAR

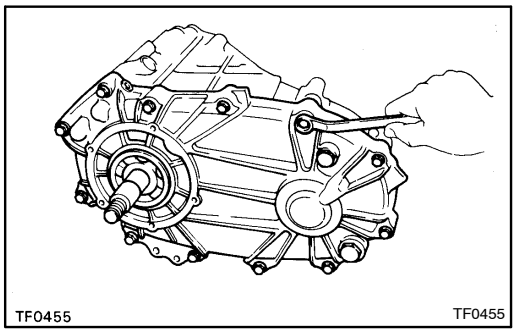
(a) Remove the speedometer drive gear.

HINT:

At the time of installation, please refer to the following item.

Make sure to install the speedometer drive gear in the correct direction.

(b) Using a magnetic finger, remove the ball from the rear output shaft.

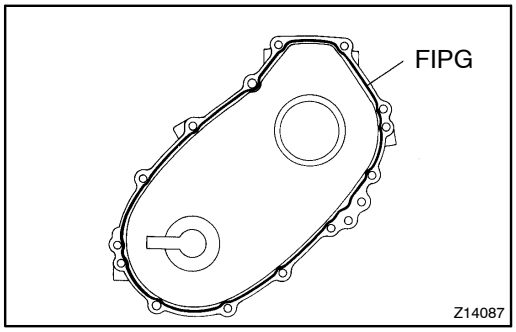


12. SEPARATE FRONT CASE AND REAR CASE

(a) Remove the 12 bolts.

Torque: 28 N·m (285 kgf·cm, 20 ft·lbf)

(b) Using a plastic hammer, tap the rear case and separate the front case and rear case.



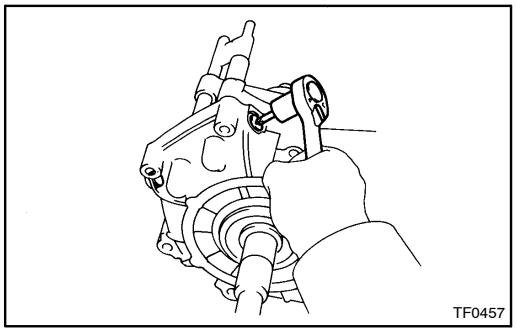
HINT:

At the time of installation, please refer to the following items.

- Shift the high and low clutch sleeve to low side (rear side) and assemble the front case and rear case.
- Remove any FIPG material and be careful not to drop oil on the contacting surfaces of the rear case.
- Apply FIPG to the rear case, as shown.

FIPG:
Part No.08826–00090,
THREE BOND 1281 or equivalent

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TF0457

13. REMOVE STRAIGHT SCREW PLUGS, SPRINGS AND LOCKING BALLS

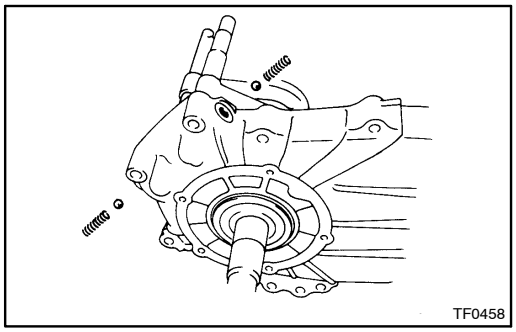
(a) Using a hexagon wrench, remove the 2 straight screw plugs.

Torque: 19 N·m (190 kgf·cm, 14 ft·lbf)

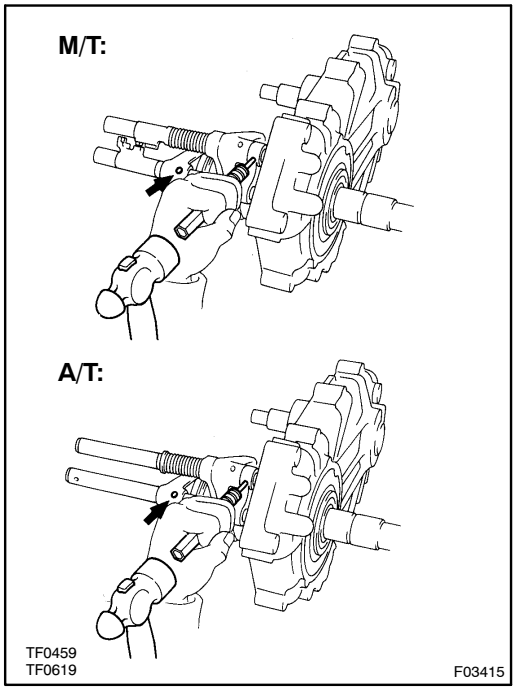
HINT:

At the time of installation, apply liquid sealer to the plugs.

Sealant:
Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent


TF0458

(b) Using a magnetic finger, remove the spring and ball from the both holes.



TF0459
TF0619
F03415

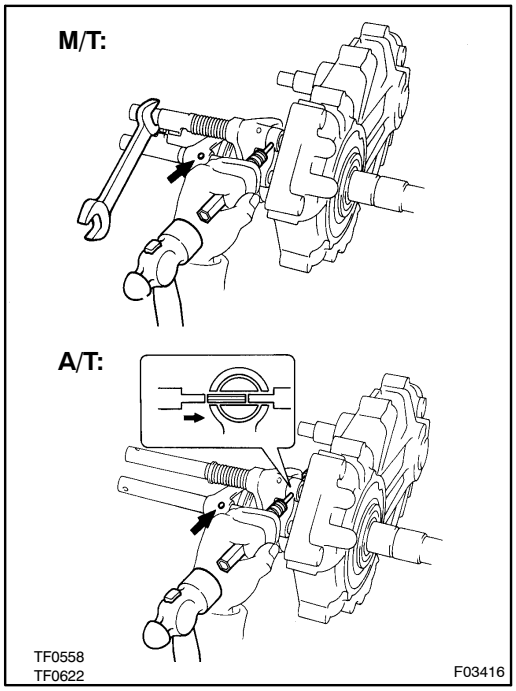
14. REMOVE FRONT DRIVE FORK SHAFT, FORK, SPRING AND STOPPER

(a) Using a pin punch and hammer, drive out the 2 slotted spring pins.

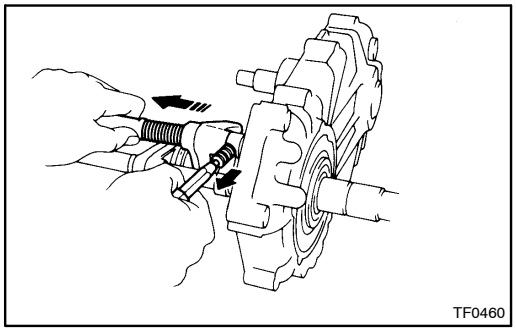
HINT:

When the pin is removed from the front drive fork shaft, the shaft will spring loose if the pin punch is removed, so keep the pin punch inserted in the shaft hole.

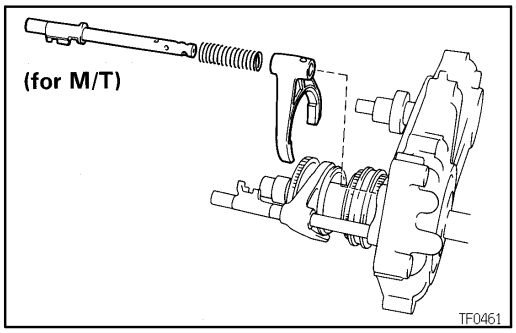
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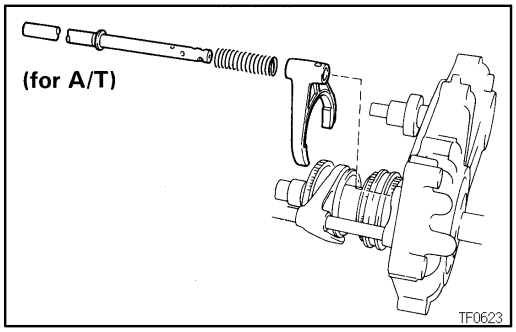
HINT:
At the time of installation, please refer to the following item.
When installing the pin in the front drive fork shaft, push the shaft towards the rear case and install the pin while the spring is compressed.



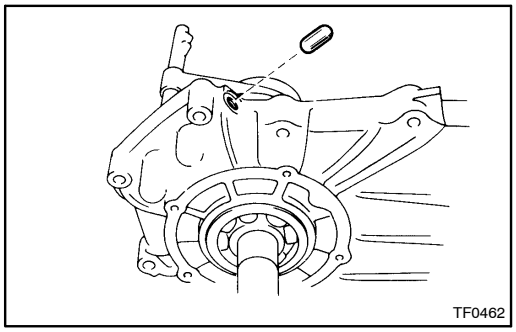
(b) Hold the front drive fork shaft in place by hand, when removing the pin punch.



(c) Remove the front drive fork shaft, spring and fork.
HINT:
At the time of installation, please refer to the following items.
- Place the front drive shift fork into the groove of the clutch sleeve.
- Make sure to install the shift fork and stopper in the correct direction.



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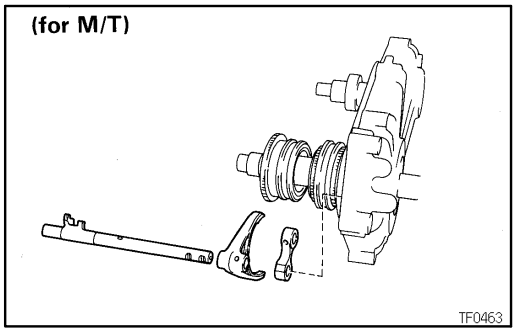

TF0462

(d) Using a magnetic finger, remove the straight pin.

HINT:

At the time of installation, please refer to the following item.

Apply gear oil to the straight pin and insert it into the case hole.



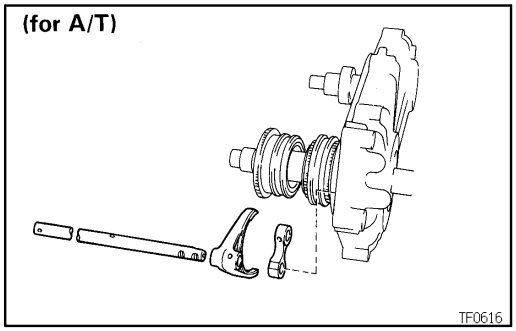
TF0463

15. REMOVE HIGH AND LOW FORK SHAFT, SHIFT FORK AND STOPPER

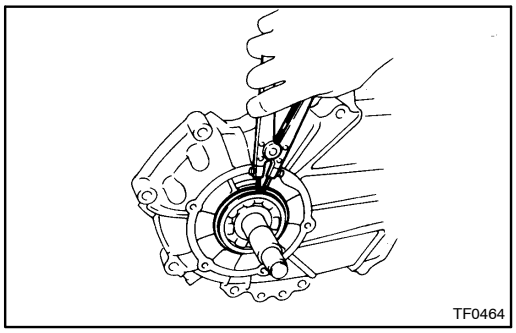
HINT:

At the time of installation, please refer to the following items.

- Place the high and low shift fork into the groove of the clutch sleeve.
- Make sure to install the shift fork in the correct direction.

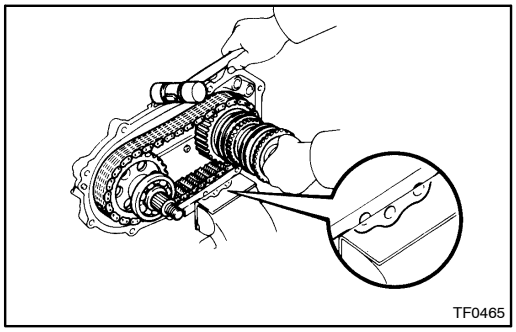


TF0616


TF0464

16. REMOVE REAR OUTPUT SHAFT, DRIVEN SPROCKET AND CHAIN

(a) Using a snap ring expander, remove the snap ring.


TF0465

(b) Mount the rear case in the vise.

NOTICE:

Be careful not to damage the sealing surface.

(c) Using a plastic hammer, tap the rear case with pulling the rear output shaft and driven sprocket.

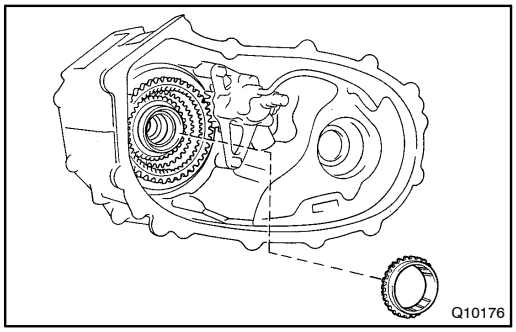
HINT:

At the time of installation, please refer to the following item.

If necessary, heat the rear case to about 70˚C (158˚F).

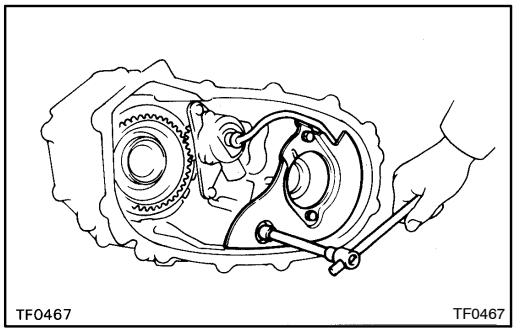
(d) Remove the chain.

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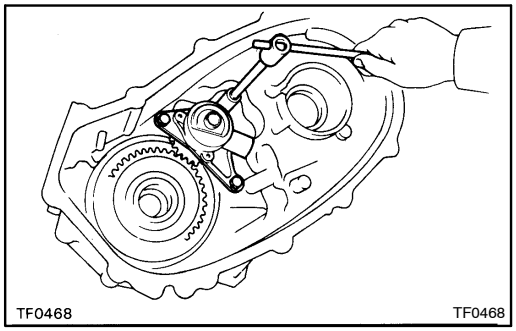
17. M/T:
REMOVE SYNCHRONIZER RING FROM INPUT SHAFT

HINT:
At the time of installation, please refer to the following items.
- Apply gear oil to the synchronizer ring.
- Align the synchronizer ring slots with the shifting keys, and install it on the high and low clutch hub.



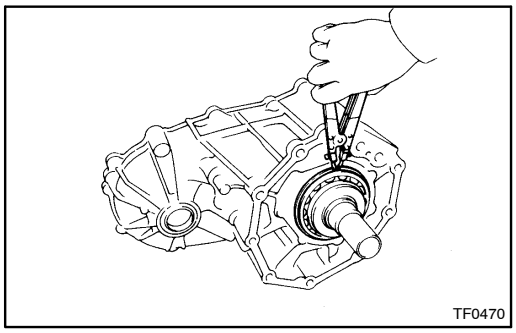
18. REMOVE SEPARATOR WITH OIL STRAINER
(a) Remove the 3 bolts and the separator with the oil strainer.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)
(b) Remove the O–ring from the oil strainer pipe.

HINT:
At the time of installation, please refer to the following item.
Coat a new O–ring with gear oil and install it to the oil strainer pipe.

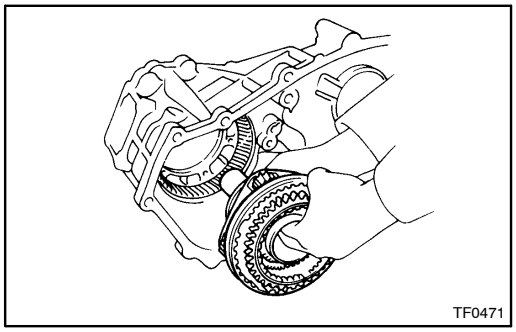


19. REMOVE OIL PUMP BODY ASSEMBLY
Remove the 3 bolts and the oil pump body assembly.
Torque: 11 N·m (115 kgf·cm, 8 ft·lbf)

20. REMOVE OIL PUMP DRIVE GEAR



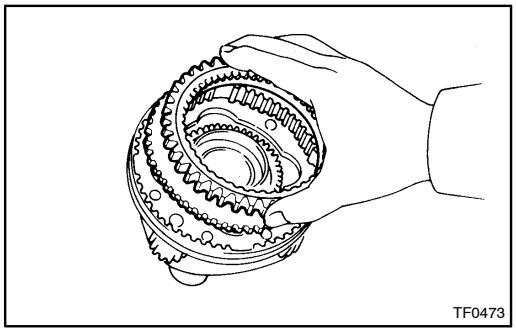
21. REMOVE PLANETARY GEAR ASSEMBLY WITH INPUT SHAFT
(a) Using a snap ring expander, remove the snap ring.



(b) Pull out the planetary gear assembly with the input shaft.

HINT:
At the time of installation, please refer to the following item.
If necessary, heat the front case to about 70°C (158°F).

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TF0473

22. REMOVE LOW GEAR SPLINE PIECE

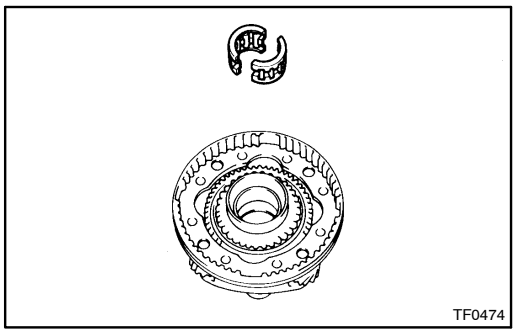
(a) Using a screwdriver, remove the snap ring.

HINT:

At the time of installation, please refer to the following item.

Be sure the end gap of the snap ring is not aligned with cutout portion of the planetary carrier.

(b) Remove the low gear spline piece.


TF0474

23. REMOVE NEEDLE ROLLER BEARING FROM INPUT SHAFT

HINT:

At the time of installation, apply gear oil to the needle roller bearing.

24. REMOVE INPUT SHAFT STOPPER AND THRUST BEARING

(a) Using a snap ring expander, remove the snap ring.

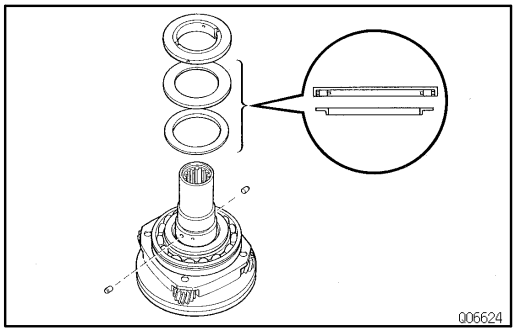
HINT:

At the time of installation, please refer to the following item.

Select a snap ring that will allow 0.05 – 0.15 mm (0.0020 – 0.0059 in.) axial play.

Mark	Thickness mm (in.)
A	2.10 – 2.15 (0.0827 – 0.0846)
B	2.15 – 2.20 (0.0846 – 0.0866)
C	2.20 – 2.25 (0.0866 – 0.0886)
D	2.25 – 2.30 (0.0886 – 0.0906)
E	2.30 – 2.35 (0.0906 – 0.0925)
F	2.35 – 2.40 (0.0925 – 0.0945)
G	2.40 – 2.45 (0.0945 – 0.0965)
H	2.45 – 2.50 (0.0965 – 0.0984)
J	2.50 – 2.55 (0.0984 – 0.1004)
K	2.55 – 2.60 (0.1004 – 0.1024)
L	2.60 – 2.65 (0.1024 – 0.1043)
M	2.65 – 2.70 (0.1043 – 0.1063)
N	2.70 – 2.75 (0.1063 – 0.1083)
P	2.75 – 2.80 (0.1083 – 0.1102)
Q	2.80 – 2.85 (0.1102 – 0.1122)
R	2.85 – 2.90 (0.1122 – 0.1142)
S	2.90 – 2.95 (0.1142 – 0.1161)
T	2.95 – 3.00 (0.1161 – 0.1181)
U	3.00 – 3.05 (0.1181 – 0.1201)

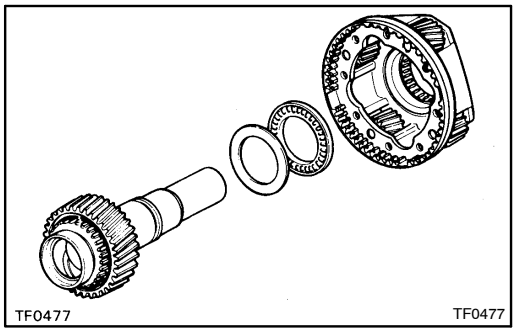
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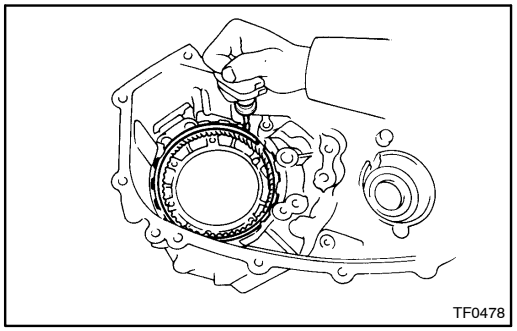
(b) Remove the input gear stopper, thrust bearing, race and the 2 pins.

HINT:

At the time of installation, apply gear oil to the thrust bearing and race.



25. REMOVE INPUT SHAFT, THRUST BEARING AND RACE



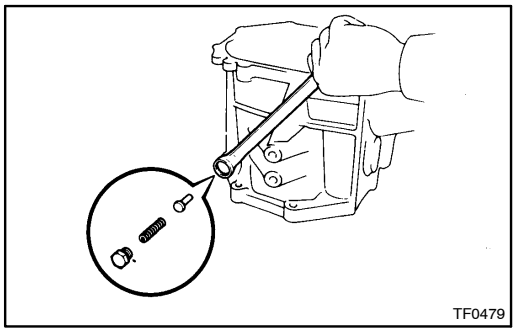
26. REMOVE PLANETARY RING GEAR

(a) Using a screwdriver, remove the snap ring.

HINT:

At the time of installation, please refer to the following item.

Be sure the end gap of the snap ring is not aligned with the upper side of the case.



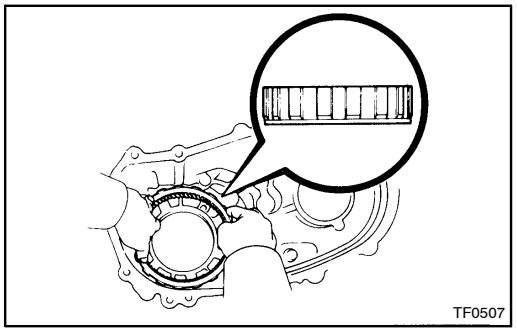
(b) Remove the plug, spring and pin.

Torque: 19 N·m (190 kgf·cm, 14 ft·lbf)

HINT:

At the time of installation, apply liquid sealer to the plug.

Sealant:
Part No.08833–00080, THREE BOND 1344,
LOCTITE 242 or equivalent



(c) Remove the planetary ring gear.

HINT:

At the time of installation, make sure to install the ring gear in the correct direction.

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TR01W–01

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page TR–7).

HINT:

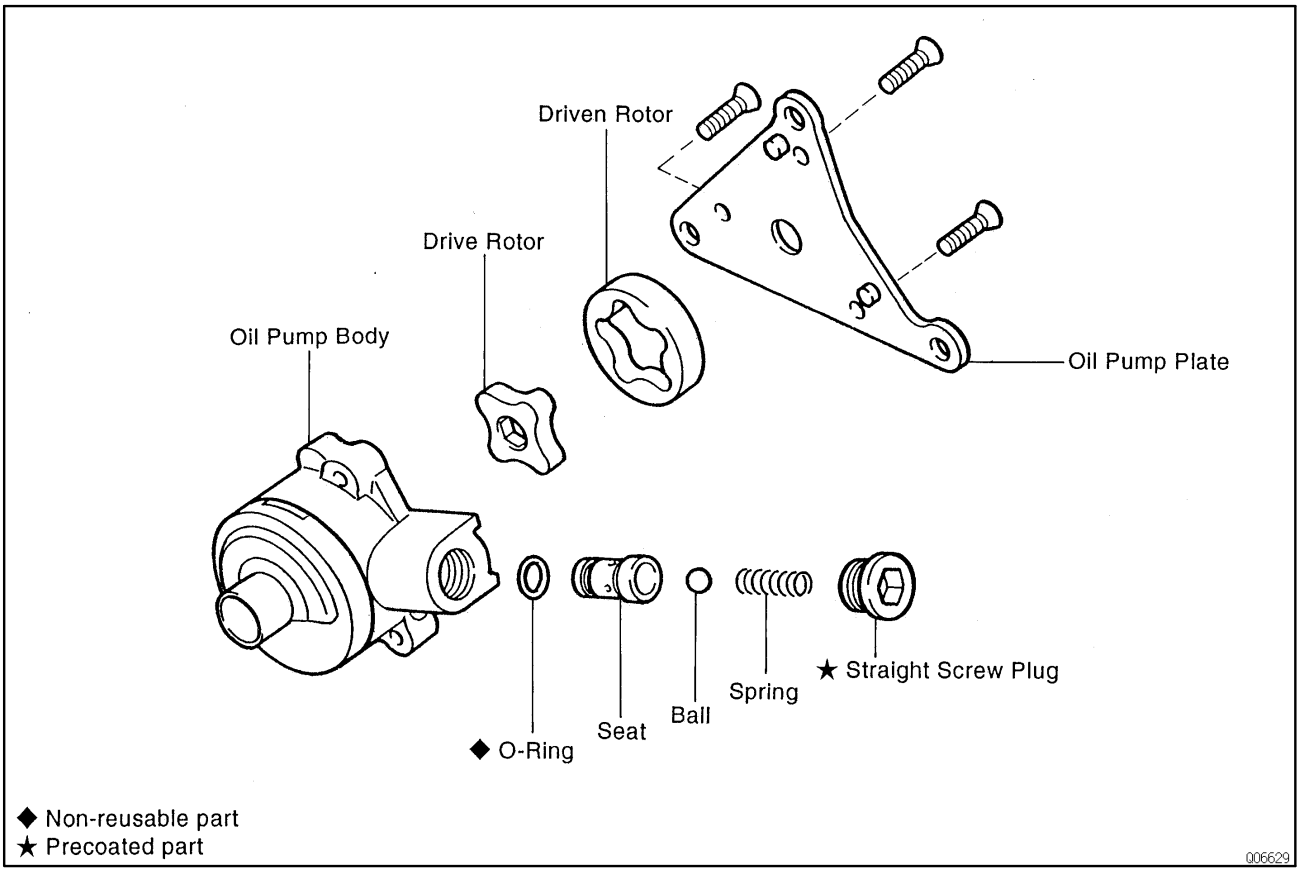
Coat all of the sliding and rotating surfaces with gear oil before assembly.

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OIL PUMP BODY

COMPONENTS

TR01X–02



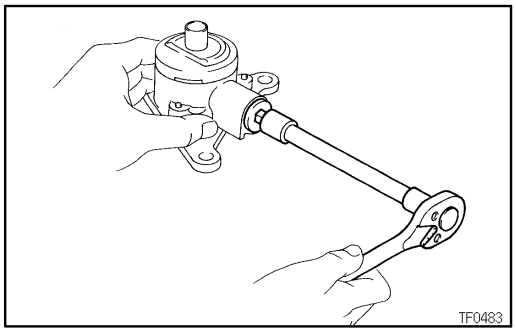
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TR0D0–01

DISASSEMBLY

1. CHECK OIL PUMP OPERATION

Install the oil pump drive gear to the drive rotor and check that the drive rotor turns smoothly.

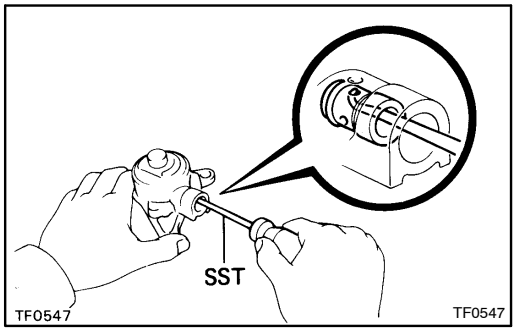


2. REMOVE STRAIGHT SCREW PLUG, SPRING, BALL AND SEAT

(a) Using a hexagon wrench, remove the straight screw plug.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

HINT:

At the time of installation, apply liquid sealer to the plug.
Sealant:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

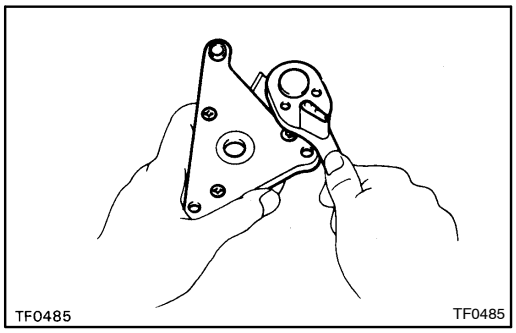


(b) Using a magnetic finger remove the spring and ball.
(c) Using SST, pull out the seat.
SST 09921–00010
(d) Remove the O–ring from the seat.

HINT:

At the time of reassembly, please refer to the following items.

- Install a new O–ing to the seat.
- When installing the seat, push the seat until it touches the bottom of the hole in the body.



3. REMOVE OIL PUMP PLATE

(a) Using a torx socket wrench (T30), unscrew the 3 torx screws.
Torque: 7.4 N·m (75 kgf·cm, 65 in.·lbf)
(b) Remove the oil pump plate.

4. REMOVE DRIVE ROTOR AND DRIVEN ROTOR

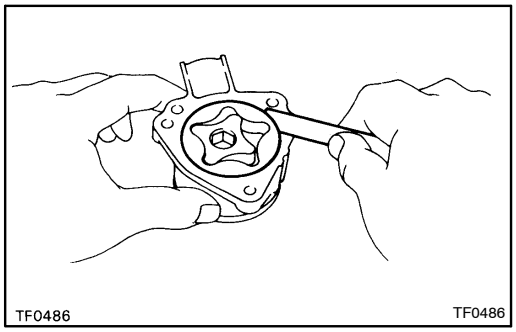
HINT:

At the time of reassembly, apply gear oil to the both rotors.

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TR0D1–01

INSPECTION



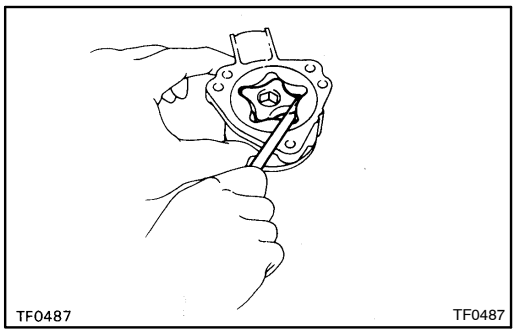
1. INSPECT DRIVEN ROTOR BODY CLEARANCE

(a) Push the driven rotor to one side of the body.

(b) Using a feeler gauge, measure the clearance.

Standard clearance:
0.10 – 0.16 mm (0.0039 – 0.0063 in.)
Maximum clearance: 0.16 mm (0.0063 in.)

If the clearance exceeds the maximum, replace the drive rotor, driven rotor or pump body.

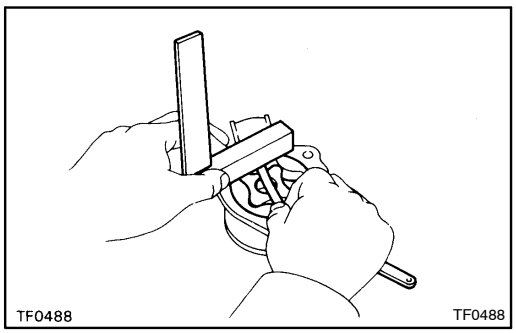


2. INSPECT BOTH ROTORS TIP CLEARANCE

Using a feeler gauge, measure the clearance between both rotor tips.

Standard clearance:
0.08 – 0.16 mm (0.0031 – 0.0063 in.)
Maximum clearance: 0.16 mm (0.0063 in.)

If the clearance exceeds the maximum, replace the drive rotor, driven rotor or pump body.



3. INSPECT BOTH ROTORS SIDE CLEARANCE

Using a steel straight edge and feeler gauge, measure the clearance between the rotors and straight edge.

Standard clearance:
0.03 – 0.08 mm (0.0012 – 0.0031 in.)
Maximum clearance: 0.08 mm (0.0031 in.)

If the clearance exceeds the maximum, replace the drive rotor, driven rotor or pump body.

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TR0D2–01

REASSEMBLY

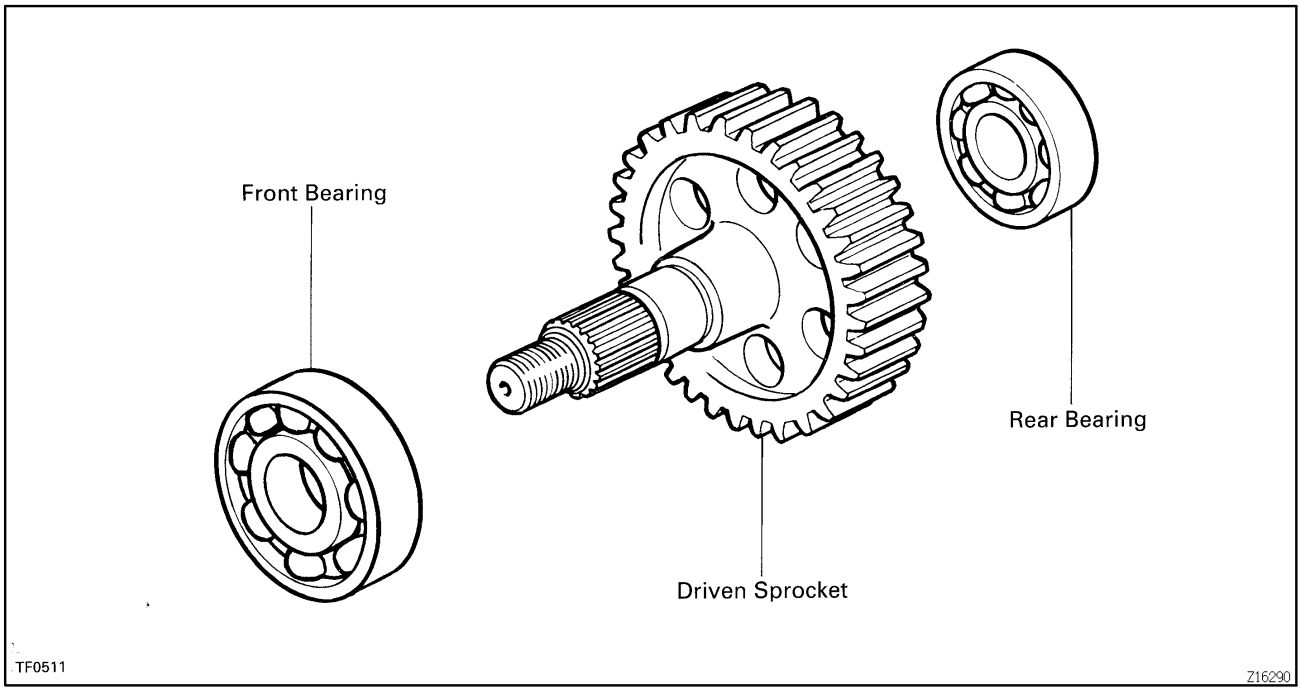
Reassembly is in the reverse order of disassembly (See page TR–18).

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DRIVEN SPROCKET

COMPONENTS

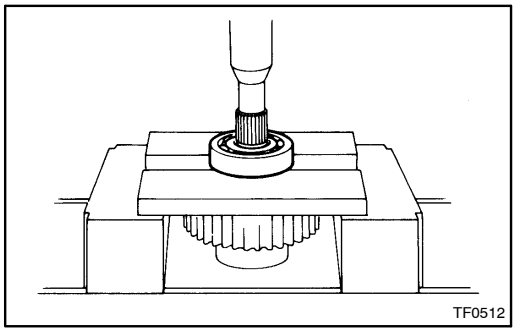
TR01Z-02



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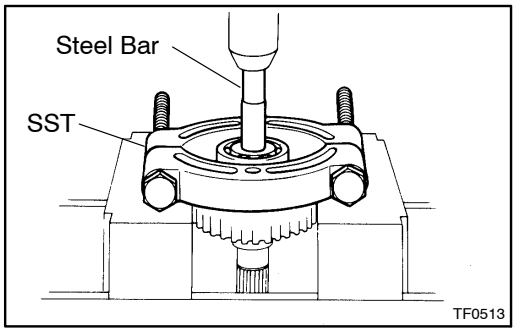
TR020–02

REPLACEMENT



1. REMOVE FRONT BEARING

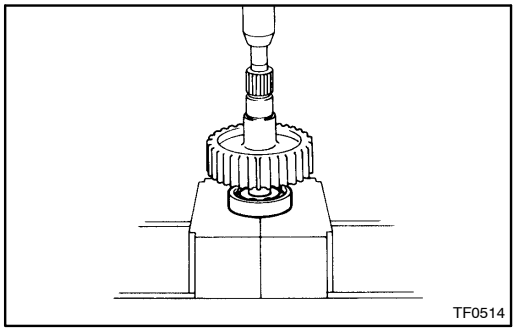
Using a press, remove the front bearing.



2. REMOVE REAR BEARING

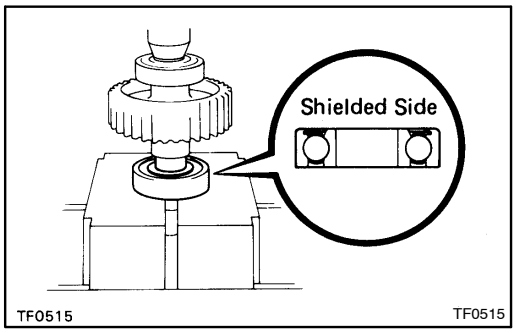
Using SST, steel bar and a press, remove the rear bearing.

SST 09950–00020



3. INSTALL REAR BEARING

Using a press, install the rear bearing.



4. INSTALL FRONT BEARING

Using a press, install the front bearing.

HINT:

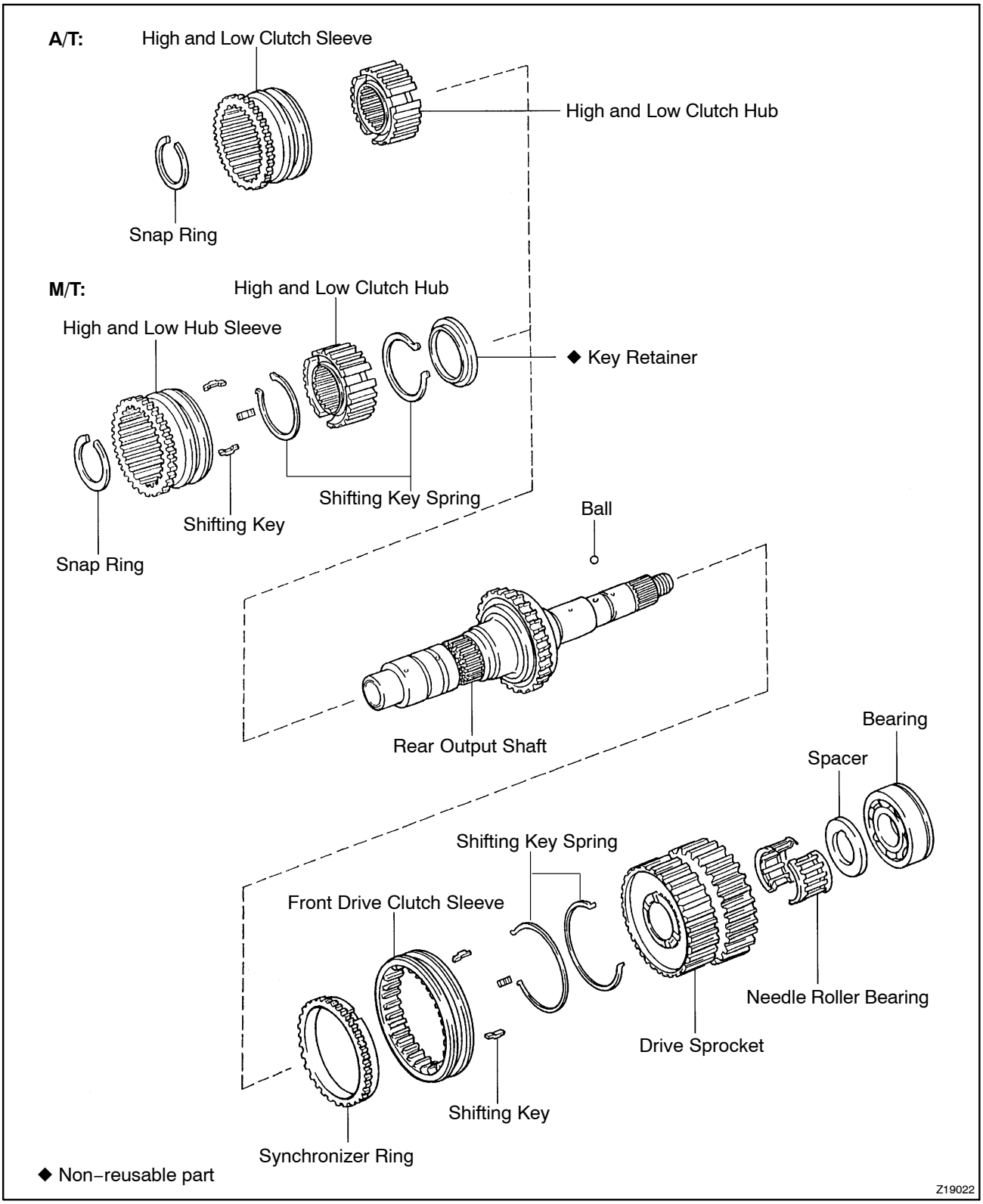
Make sure to install the bearing in the correct direction.

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REAR OUTPUT SHAFT

COMPONENTS

TR021-02

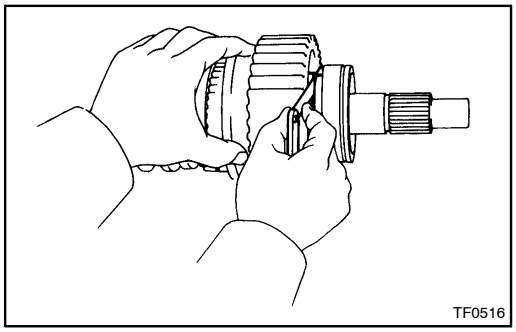


Author : Date : 1403

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TR0D3–01

DISASSEMBLY

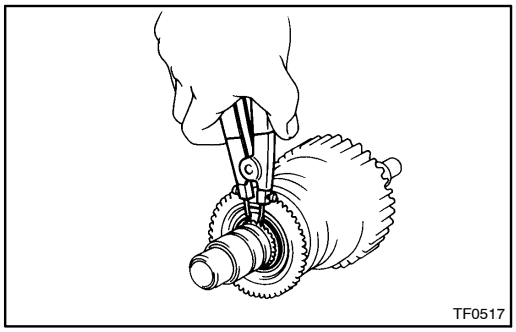

TF0516

1. INSPECT DRIVE SPROCKET THRUST CLEARANCE

Using a feeler gauge, measure the drive sprocket thrust clearance.

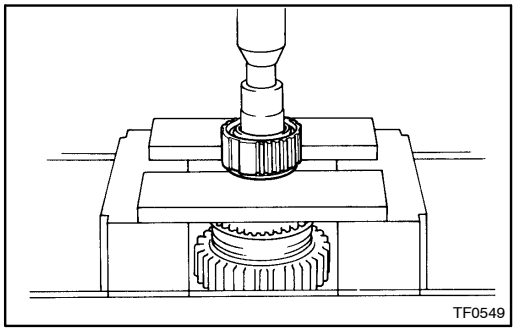
Standard clearance:
0.10 – 0.25 mm (0.0039 – 0.0098 in.)
Maximum clearance: 0.25 mm (0.0098 in.)

If the clearance exceeds the maximum, replace the drive sprocket.


TF0517

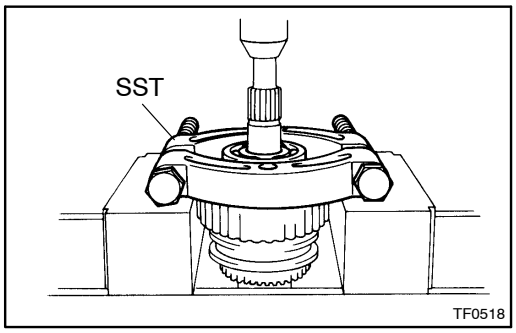
2. M/T:
REMOVE HIGH AND LOW HUB SLEEVE ASSEMBLY

(a) Using a snap ring expander, remove the snap ring.
(b) Remove the hub sleeve and 3 shifting keys.
(c) Using a press, remove the clutch hub, 2 key springs and key retainer.


TF0549

3. A/T:
REMOVE HIGH AND LOW HUB SLEEVE ASSEMBLY

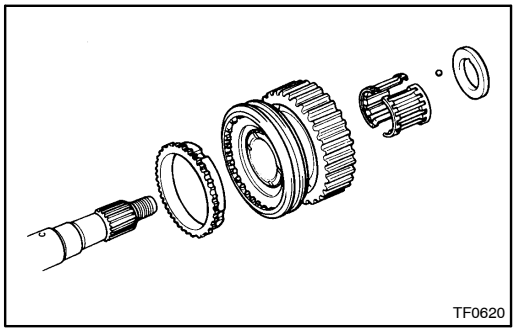
(a) Using a snap ring expander, remove the snap ring.
(b) Remove the hub sleeve.
(c) Using a press, remove the clutch hub.



TF0518

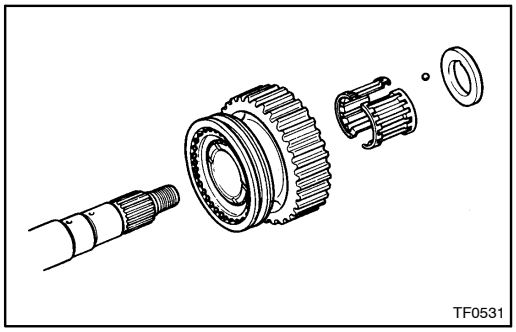
4. REMOVE REAR BEARING, SPACER AND DRIVE SPROCKET WITH FRONT DRIVE CLUTCH SLEEVE ASSEMBLY

(a) Using SST and a press, remove the bearing.
SST 09950–00020


TF0620

(b) Remove these parts:
- Spacer and ball
- Drive sprocket with front drive hub and hub sleeve
- Needle roller bearing
- Synchronizer ring

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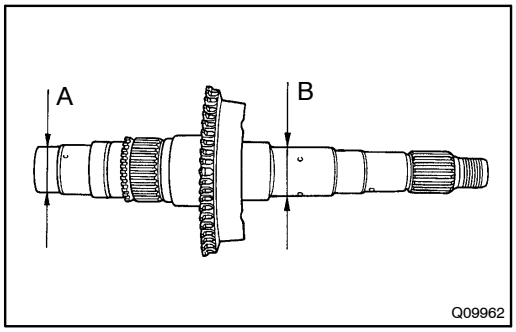
5. REMOVE 3 SHIFTING KEYS AND 2 KEY SPRINGS FROM FRONT DRIVE HUB ASSEMBLY

Using a screwdriver, remove the 2 shifting key springs and 3 shifting keys.

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TR023–02

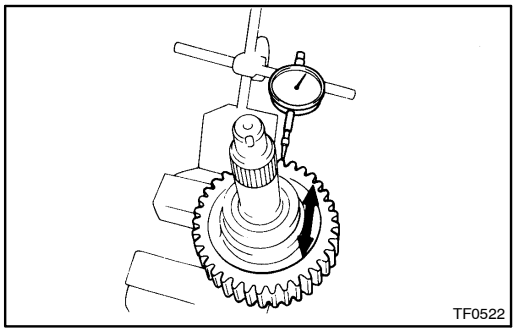
INSPECTION



1. INSPECT REAR OUTPUT SHAFT

Using a micrometer, measure the outer diameter of the rear output shaft journal surface.

Minimum diameter:
Part A: 27.98 mm (1.1016 in.)
Part B: 36.99 mm (1.4563 in.)

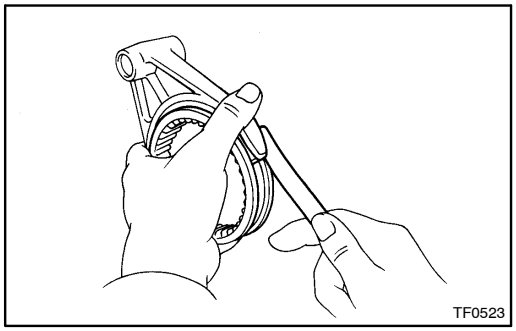


2. INSPECT DRIVE SPROCKET RADIAL CLEARANCE

Using a dial indicator, measure the radial clearance between the sprocket and shaft with the needle roller bearing installed.

Standard clearance:
0.010 – 0.055 mm (0.0004 – 0.0022 in.)
Maximum clearance: 0.055 mm (0.0022 in.)

If the clearance exceeds the maximum, replace the drive sprocket, rear output shaft or needle roller bearing.

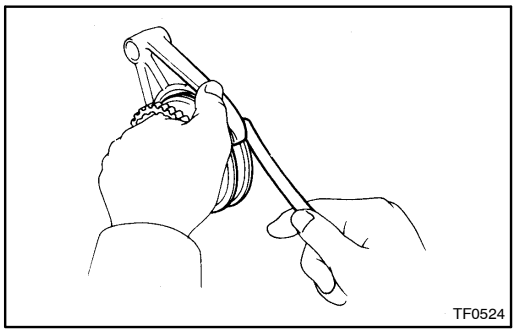


3. INSPECT FRONT DRIVE SHIFT FORK AND HUB SLEEVE CLEARANCE

Using a feeler gauge, measure the clearance between the front drive shift fork and hub sleeve.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the maximum, replace the shift fork or hub sleeve.



4. INSPECT HIGH AND LOW SHIFT FORK AND HUB SLEEVE CLEARANCE

Using a feeler gauge, measure the clearance between the high and low shift fork and hub sleeve.

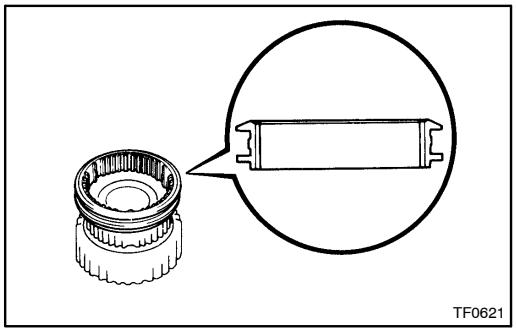
Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the maximum, replace the shift fork or hub sleeve.

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TR024–02

REASSEMBLY

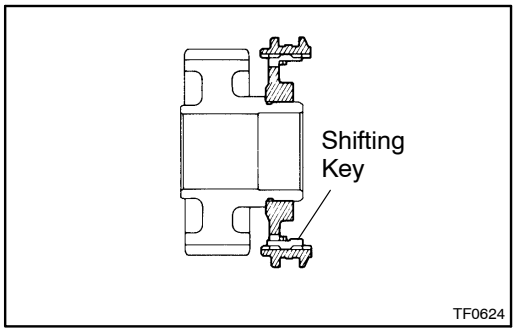

TF0621

1. INSTALL FRONT DRIVE CLUTCH HUB AND HUB SLEEVE

(a) Install the front drive hub sleeve onto the clutch hub.

HINT:

Make sure to install the hub sleeve in the correct direction.

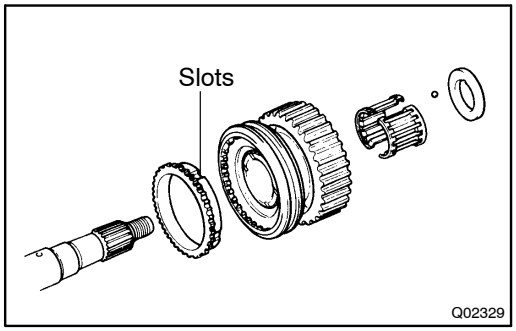


TF0624

(b) Install the 3 shifting keys and 2 springs.

NOTICE:

Install the key springs positioned so that their end gaps are not in line.



Q02329

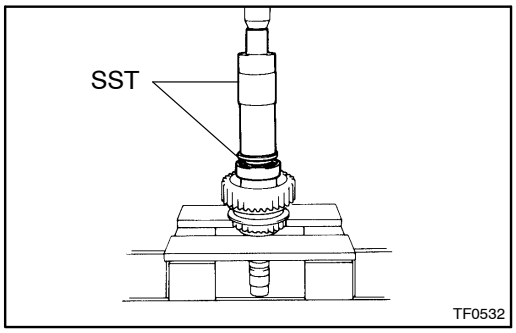
2. INSTALL DRIVE SPROCKET WITH FRONT DRIVE HUB SLEEVE ASSEMBLY, SPACER AND REAR BEARING

(a) Apply gear oil to the shaft and needle roller bearing.

(b) Install the synchronizer ring.

(c) Install the needle roller bearing in the drive sprocket.

(d) Install the drive sprocket with the front drive hub sleeve.



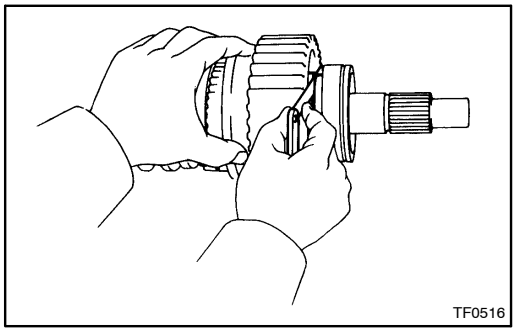
TF0532

(e) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

(f) Install the spacer to align it with the ball.

(g) Using SST and a press, install the rear bearing with the outer race snap ring groove toward the rear.

SST 09316–60011 (09316–00011, 09316–00071)


TF0516

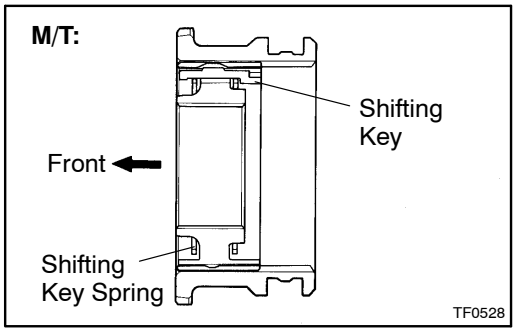
3. INSPECT DRIVE SPROCKET THRUST CLEARANCE

Using a feeler gauge, measure the drive sprocket thrust clearance.

Standard clearance:

0.10 – 0.25 mm (0.0039 – 0.0098 in.)

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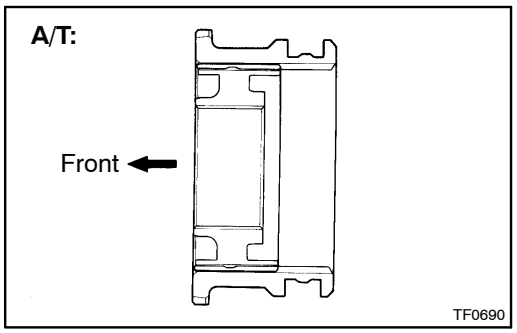


4. M/T:
INSERT HIGH AND LOW CLUTCH HUB INTO HUB SLEEVE

(a) Install the clutch hub and 3 shifting keys to the hub sleeve.

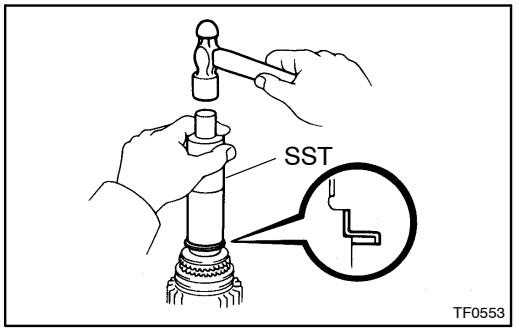
(b) Install the 2 shifting key springs under the 3 shifting keys.

NOTICE:
Install the key springs positioned so that their end gaps are not in line.



5. A/T:
INSERT HIGH AND LOW CLUTCH HUB INTO HUB SLEEVE

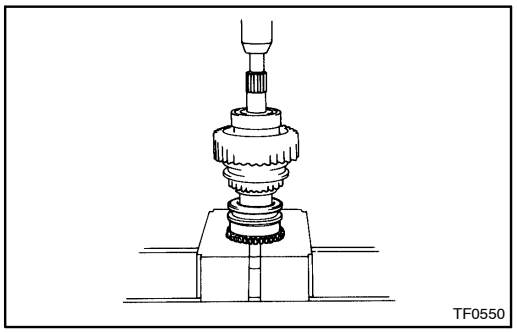
Install the clutch hub to the hub sleeve.



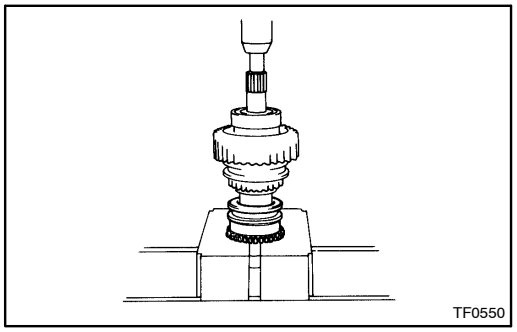
6. M/T:
INSTALL HIGH AND LOW HUB SLEEVE ASSEMBLY

(a) Using SST and a hammer, drive in a new key retainer.
SST 09316–60011 (09316–00011)

NOTICE:
Be careful not to deform or damage the key retainer.



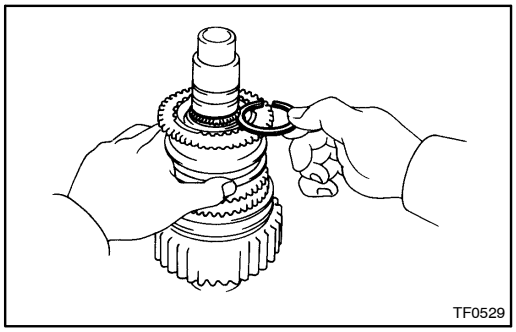
(b) Using a press, install the high and low hub sleeve assembly.



7. A/T:
INSTALL HIGH AND LOW HUB SLEEVE ASSEMBLY

Using a press, install the high and low hub sleeve assembly.

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TF0529

8. INSTALL SNAP RING

Select a snap ring that will allow minimum axial play and install it to the shaft.

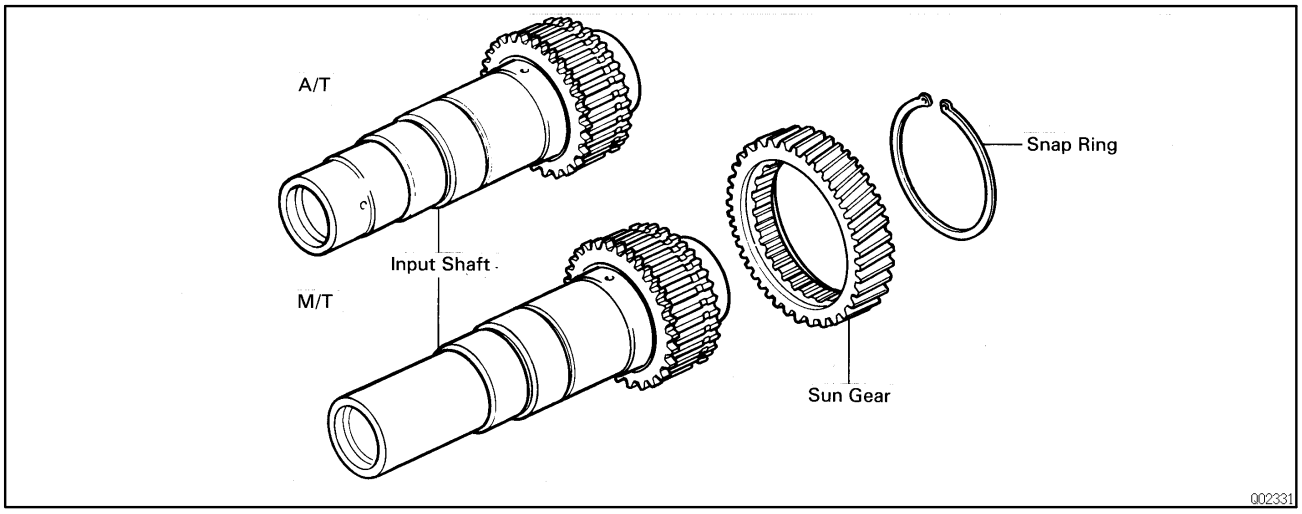
Mark	Thickness mm (in.)
A	2.10 – 2.15 (0.0827 – 0.0846)
B	2.15 – 2.20 (0.0846 – 0.0866)
C	2.20 – 2.25 (0.0866 – 0.0886)
D	2.25 – 2.30 (0.0886 – 0.0906)
E	2.30 – 2.35 (0.0906 – 0.0925)
F	2.35 – 2.40 (0.0925 – 0.0945)
G	2.40 – 2.45 (0.0945 – 0.0965)
H	2.45 – 2.50 (0.0965 – 0.0984)
J	2.50 – 2.55 (0.0984 – 0.1004)
K	2.00 – 2.05 (0.0787 – 0.0807)
L	2.05 – 2.10 (0.0807 – 0.0827)

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INPUT SHAFT

COMPONENTS

TR025-02



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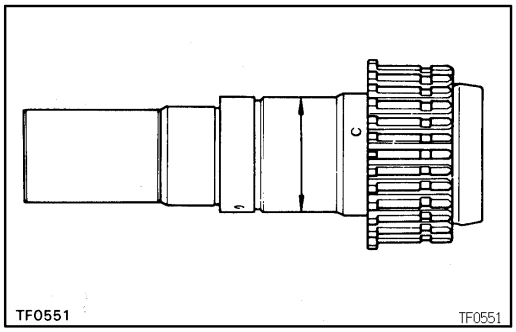
TR026-02

INSPECTION

1. REMOVE SUN GEAR

(a) Using snap ring pliers, remove the snap ring.

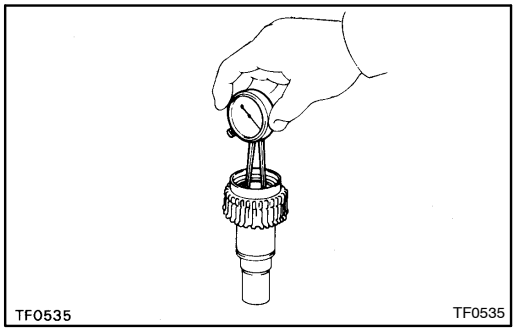
(b) Remove the sun gear from the input shaft.



2. INSPECT INPUT SHAFT

(a) Using a micrometer, measure the outer diameter of the input shaft journal surface.

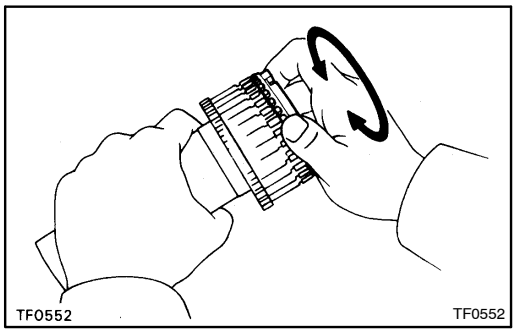
Minimum diameter: 47.59 mm (1.8736 in.)



(b) Using a dial indicator, measure the inside diameter of the input shaft bushing.

Maximum inside diameter: 39.14 mm (1.5409 in.)

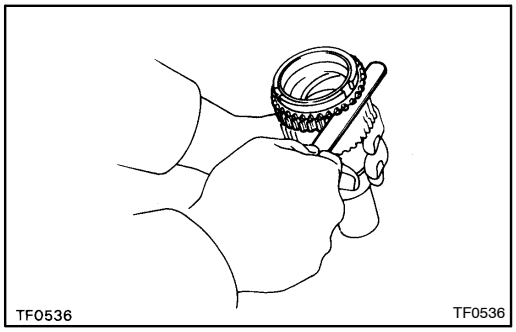
If the inside diameter exceeds the maximum, replace the input shaft.



3. M/T:

INSPECT SYNCHRONIZER RING

(a) Turn the ring and push it in to check the braking action.



(b) Measure the clearance between the synchronizer ring back and the input shaft spline end.

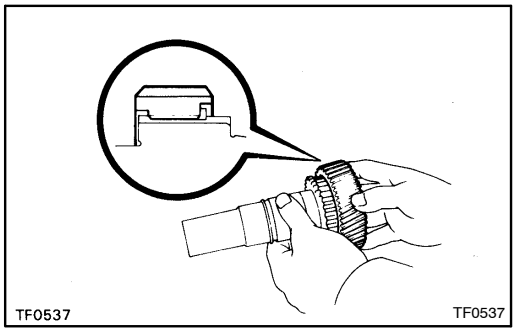
Standard clearance:

1.15 – 1.85 mm (0.0453 – 0.0728 in.)

Minimum clearance: 0.80 mm (0.0315 in.)

If the clearance is less than the minimum, replace the synchronizer ring.

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4. INSTALL SUN GEAR

(a) Install the sun gear to the input shaft.

HINT:

Make sure to install the sun gear in the correct direction.

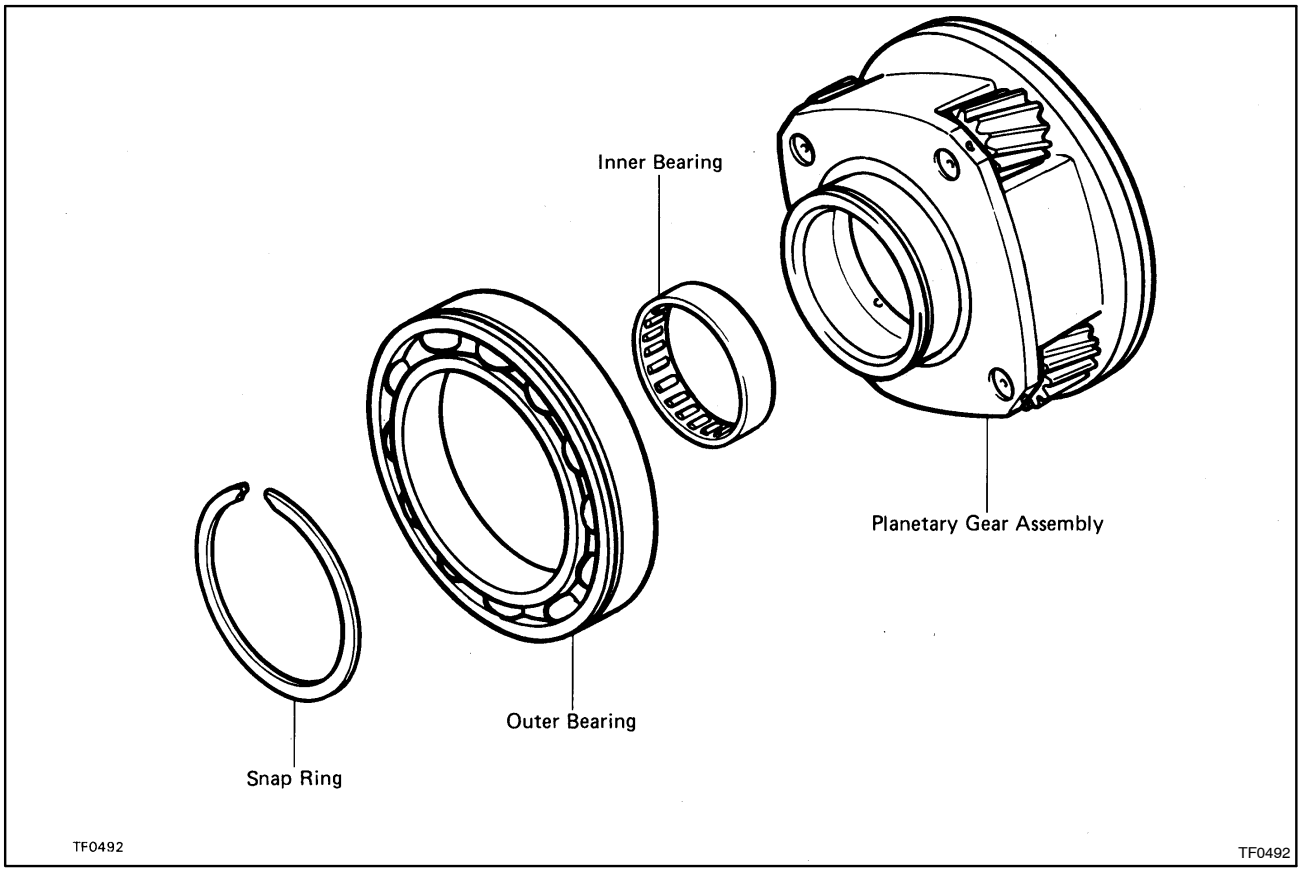
(b) Using snap ring pliers, install the snap ring.

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PLANETARY GEAR

COMPONENTS

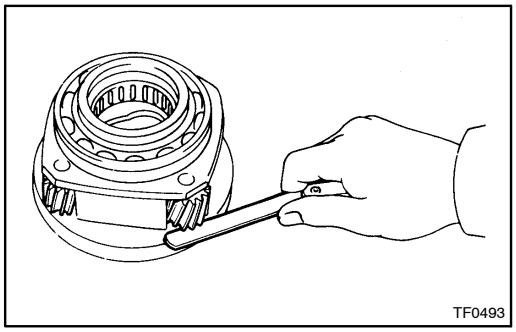
TR027-02



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TR028–02

INSPECTION

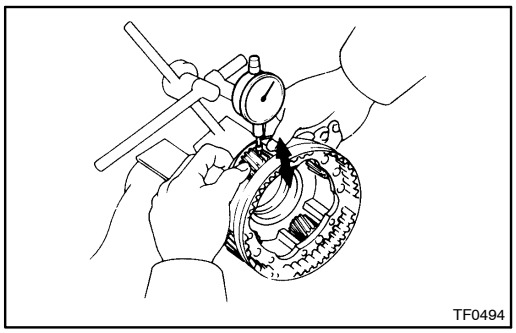

TF0493

1. INSPECT PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

Standard clearance:
0.11 – 0.86 mm (0.0043 – 0.0339 in.)
Maximum clearance: 0.86 mm (0.0339 in.)

If the clearance exceeds the maximum, replace the planetary gear assembly

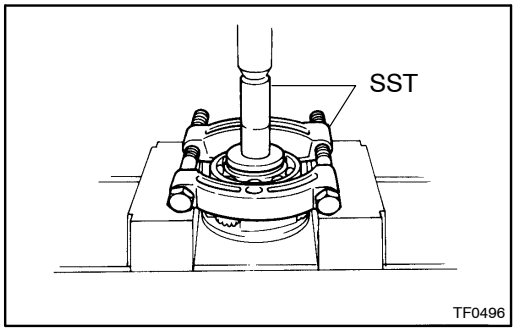

TF0494

2. INSPECT PLANETARY PINION GEAR RADIAL CLEARANCE

Using a dial indicator, measure the radial clearance of the planetary pinion gear.

Standard clearance:
0.009 – 0.038 mm (0.0004 – 0.0015 in.)
Maximum clearance: 0.038 mm (0.0015 in.)

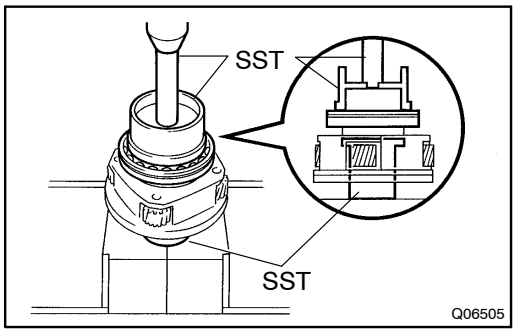
If the clearance exceeds the maximum, replace the planetary gear assembly.



TF0496

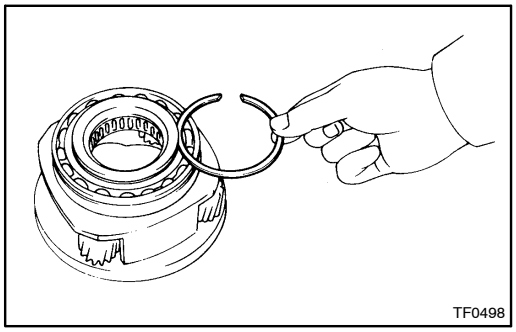
3. IF NECESSARY, REPLACE PLANETARY GEAR OUTER BEARING

(a) Using a snap ring expander, remove the snap ring.
(b) Using SST and a press, remove the outer bearing.
SST 09554–30011, 09555–55010



Q06505

(c) Using SST and a press, install a new bearing with the outer race snap ring groove the front.
SST 09223–15020, 09515–30010, 09550–22011 (09550–00020)

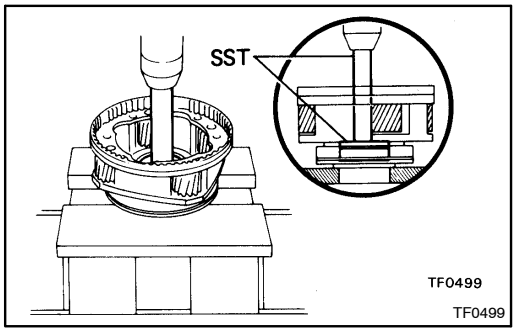

TF0498

(d) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
1	1.45 – 1.50 (0.0571 – 0.0591)
2	1.50 – 1.55 (0.0591 – 0.0610)
3	1.55 – 1.60 (0.0610 – 0.0630)
4	1.60 – 1.65 (0.0630 – 0.0650)
5	1.65 – 1.70 (0.0650 – 0.0669)

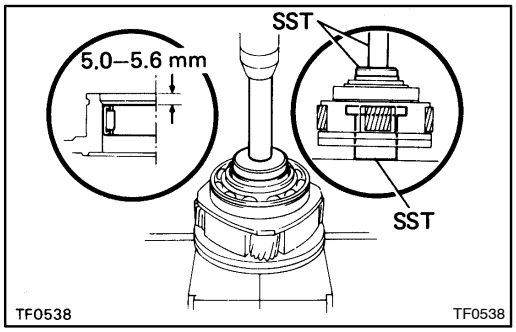
(e) Using a snap ring expander, install the snap ring.

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4. IF NECESSARY, REPLACE PLANETARY GEAR INNER BEARING

(a) Using SST and a press, remove the bearing.
SST 09550–10012 (09252–10010, 09557–10010)



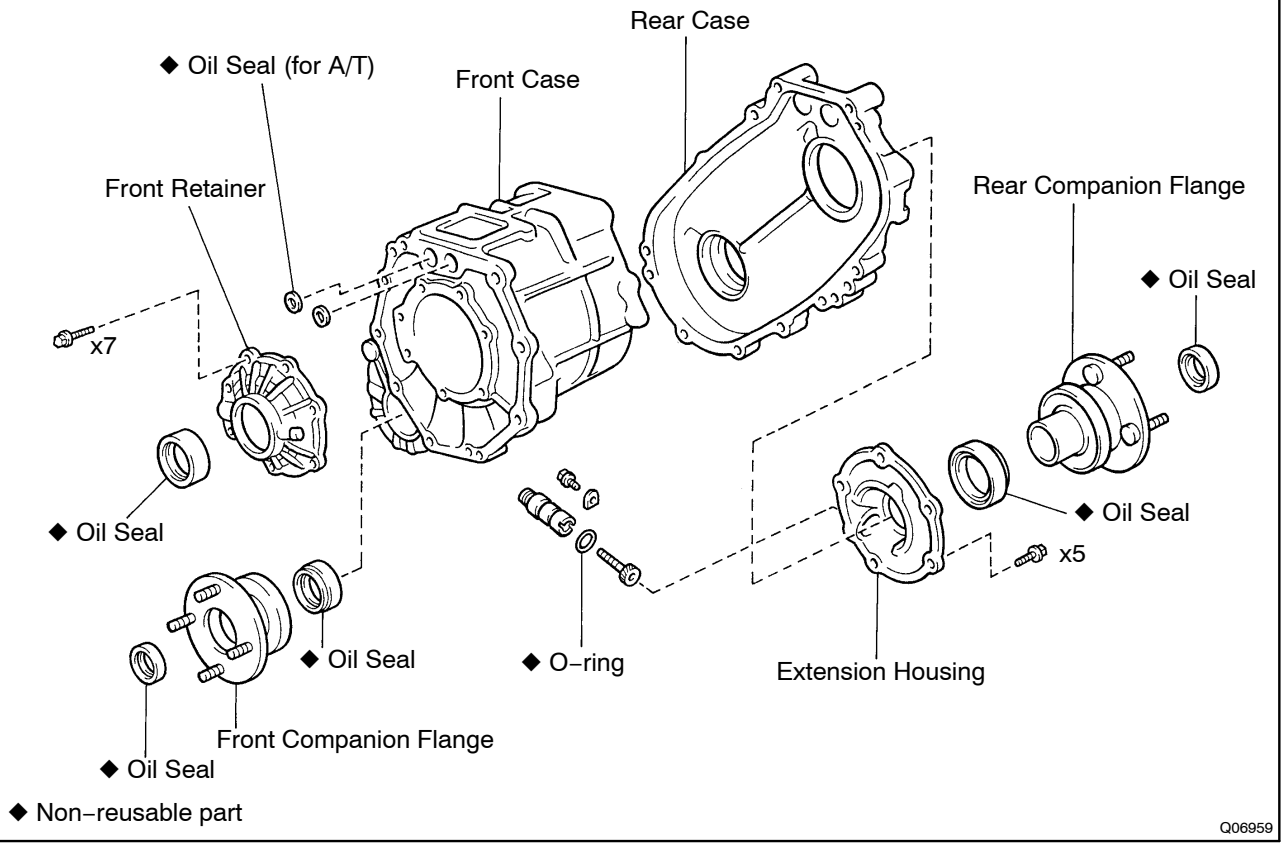
(b) Using SST and a press, install a new bearing.
SST 09550–10012 (09252–10010, 09557–10010), 09515–30010
Bearing depth: 5.0 – 5.6 mm (0.197 – 0.220 in.)

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OIL SEAL

COMPONENTS

TR029–02



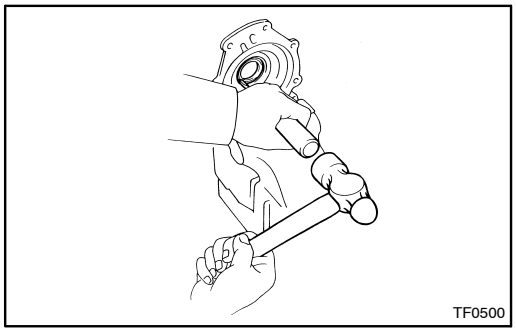
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TR0D4–01

REPLACEMENT

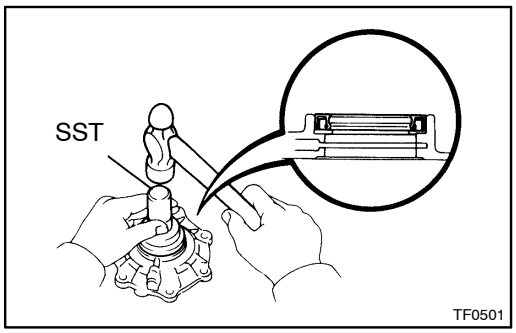
1. REPLACE FRONT RETAINER OIL SEAL

(a) Using a screwdriver and hammer, drive out the oil seal.



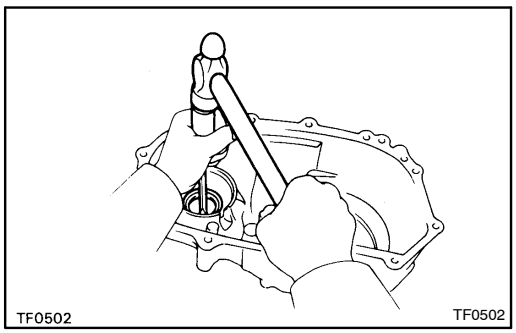
(b) Using SST and a hammer, drive in a new oil seal until its surface is flush with the retainer upper surface.
SST 09223–22010

(c) Coat the lip of the oil seal with MP grease.



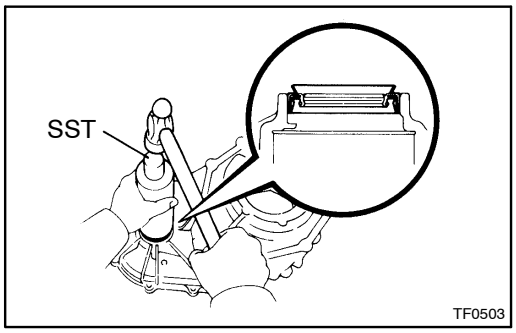
2. REPLACE FRONT CASE OIL SEAL

(a) Using a screwdriver and hammer, drive out the oil seal.



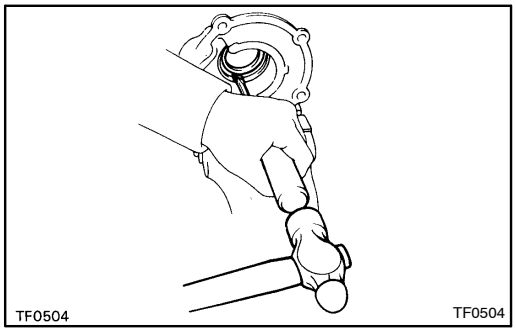
(b) Using SST and a hammer, drive in a new oil seal until its surface is flush with the case upper surface.
SST 09316–60011 (09316–00011)

(c) Coat the lip of the oil seal with MP grease.

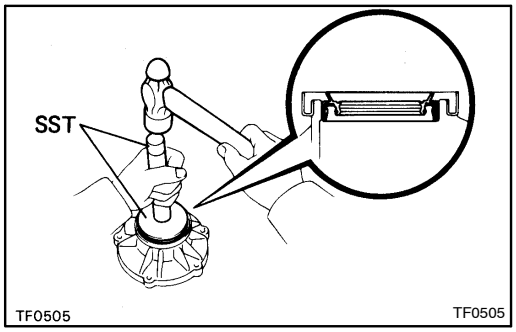


3. REPLACE EXTENSION HOUSING OIL SEAL

(a) Using a screwdriver and hammer, drive out the oil seal.

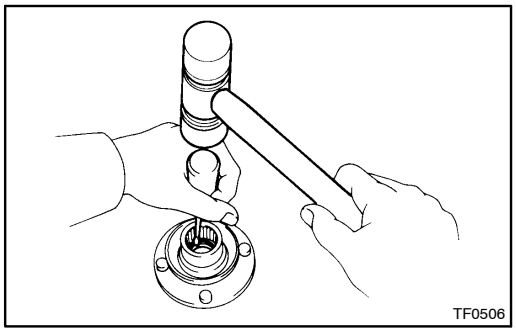


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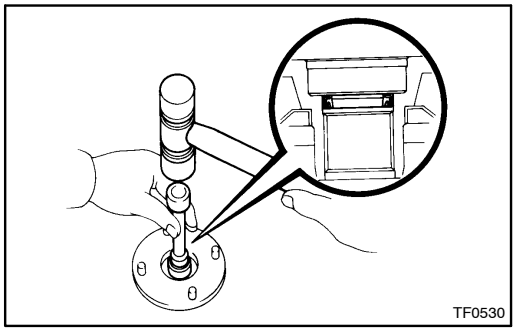
(b) Using SST and a hammer, drive in a new oil seal until its surface is flush with the housing upper surface.
SST 09550–00032, 09550–10012 (09252–10010)

(c) Coat the lip of the oil seal with MP grease.



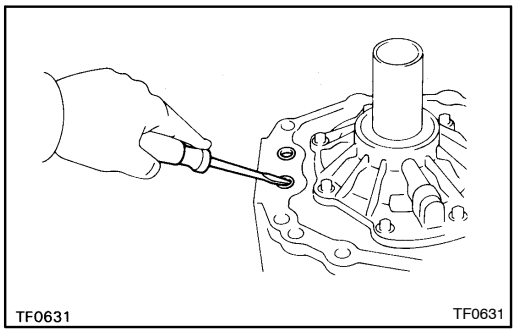
4. REPLACE FRONT AND REAR COMPANION FLANGE OIL SEALS

(a) Using a screwdriver and hammer, drive out the oil seals from the 2 flanges.



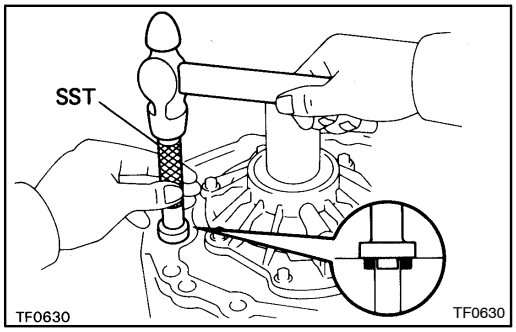
(b) Using a socket wrench and hammer, drive in a new oil seal.

(c) Coat the lip of the oil seal with MP grease.



5. A/T:
REPLACE SHIFT FORK SHAFT OIL SEALS

(a) Using a screwdriver, pry out the oil seal.



(b) Using SST and a hammer, drive in a new oil seal.
SST 09304–12012
Oil seal depth: –0.5 – 0.5 mm (–0.020 – 0.020 in.)

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PR – PROPELLER SHAFT

TROUBLESHOOTING	PR-1
PROPELLER SHAFT ASSEMBLY (2WD)	PR-2
PROPELLER SHAFT ASSEMBLY (4WD)	PR-10
SPIDER BEARING	PR-18

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TROUBLESHOOTING

PROBLEM SYMPTOMS TABLE

PR01F–01

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

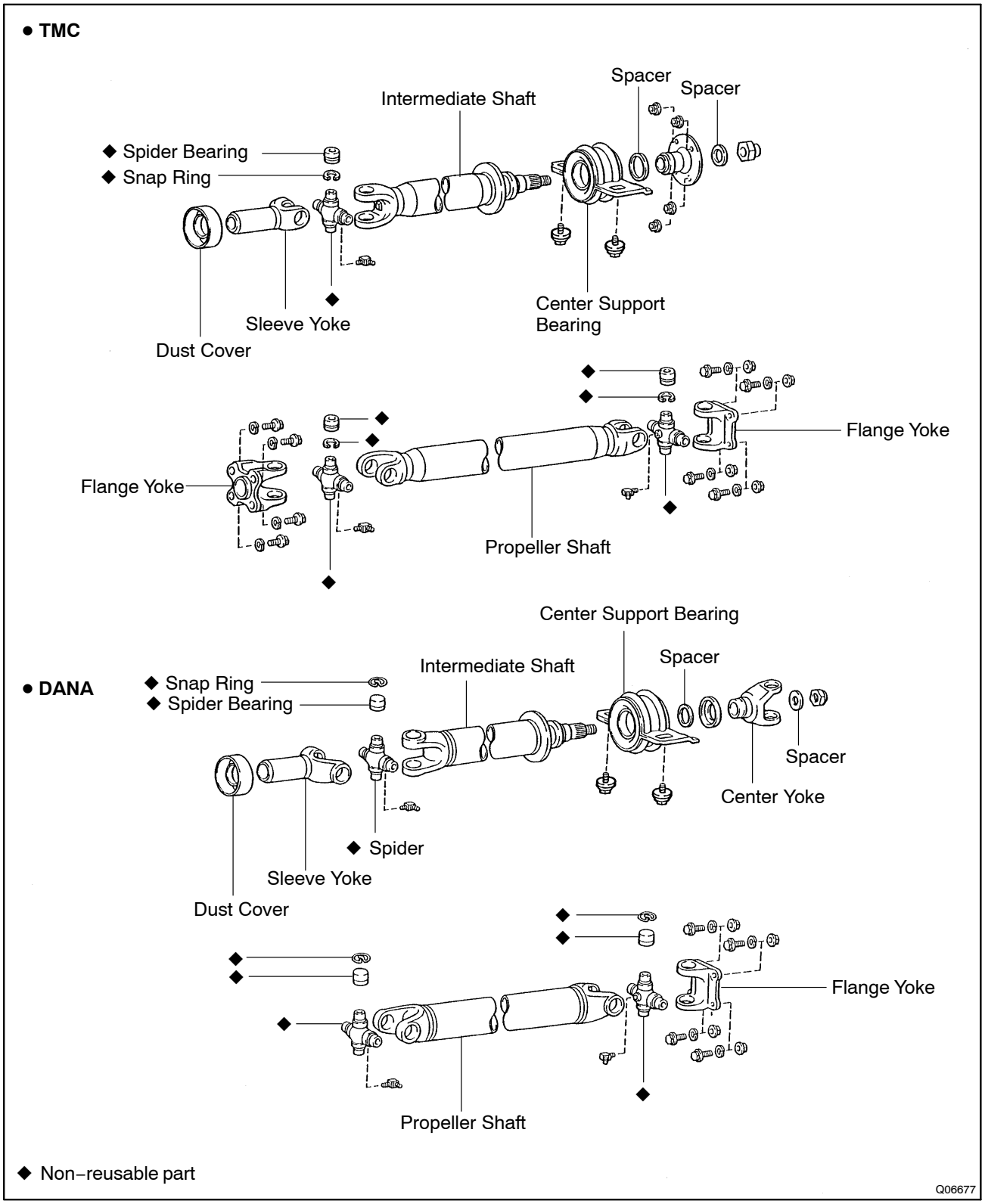
Symptom	Suspect Area		See page
Noise	1. Center support bearing (Worn)	2WD	PR–5
		4WD	PR–13
	2. Sleeve yoke spline (Worn)	2WD	PR–5
		4WD	PR–13
	3. Spider bearing (Worn or stuck)	2WD	PR–5
		4WD	PR–13
Vibration	1. Transmission extension housing rear bushing (Runout)		–
	2. Sleeve yoke spline (Stuck)	2WD	PR–5
		4WD	PR–13
	3. Propeller shaft (Runout)	2WD	PR–5
		4WD	PR–13
	4. Propeller shaft (Imbalance)	2WD	PR–5
		4WD	PR–13

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PROPELLER SHAFT ASSEMBLY (2WD)

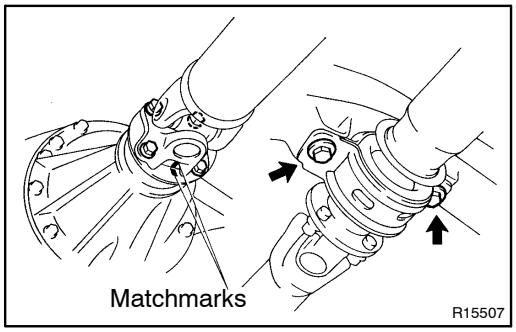
COMPONENTS

PR01G–05



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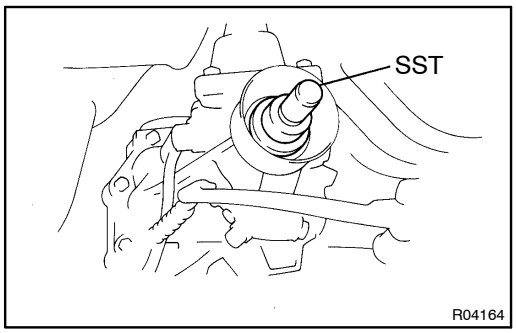
PR01H–01



REMOVAL

REMOVE PROPELLER SHAFT

(a) Place matchmarks on the differential and propeller shaft flanges.
(b) Remove the 4 bolts, washers and nuts.
(c) Remove the 2 mounting bolts and center support bearing from the frame crossmember.



(d) Pull out the propeller shaft yoke from the transmission.
(e) Insert SST in the transmission to prevent oil leakage.
SST 09325–40010

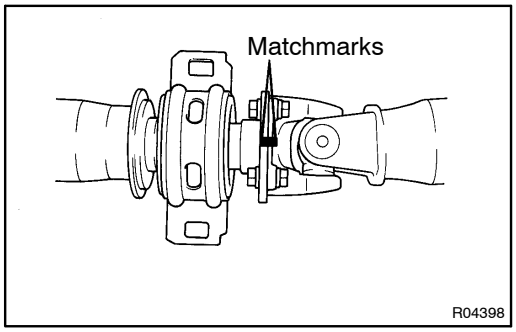
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PR01I–02

DISASSEMBLY

NOTICE:

Be careful not to grip the propeller shaft tube too tightly in a vise as this will cause deformation.

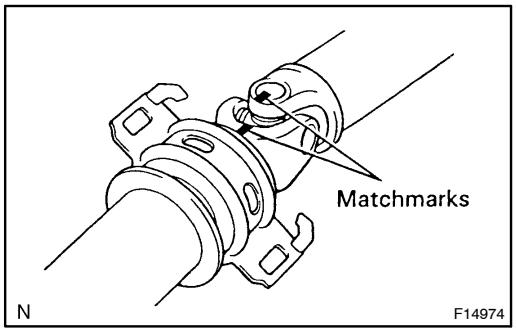


1. TMC–made:

SEPARATE PROPELLER SHAFT AND INTERMEDIATE SHAFT

(a) Place matchmarks on the flanges.

(b) Remove the 4 bolts, washers and nuts.



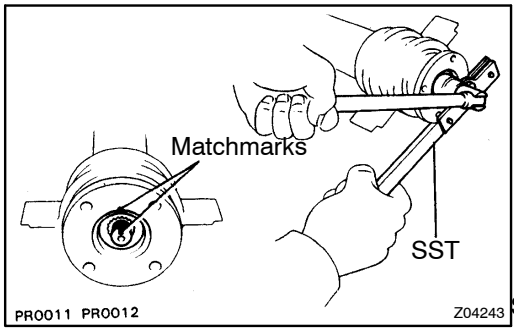
2. DANA–made:

SEPARATE PROPELLER SHAFT AND INTERMEDIATE SHAFT

(a) Place matchmarks on the yoke and propeller shaft.

(b) Disassemble center yoke.

(See SPIDER BEARING REPLACEMENT on page PR–18)



3. TMC–made:

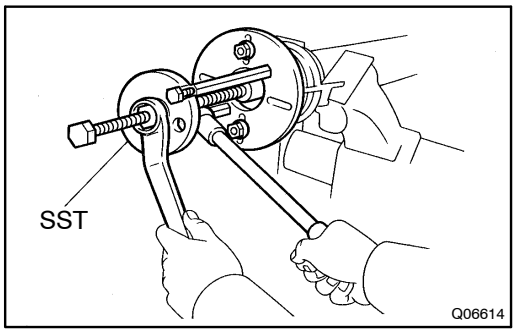
REMOVE CENTER SUPPORT BEARING FROM INTERMEDIATE SHAFT

(a) Using a hammer and chisel, loosen the staked part of the nut.

(b) Using SST to hold the flange, remove the nut.

SST 09330–00021

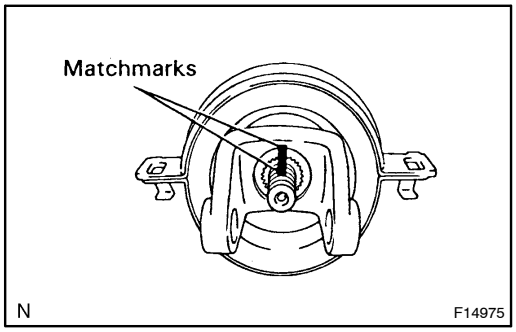
(c) Place matchmarks on the flange and shaft.



(d) Using SST, remove the flange from the intermediate shaft.

SST 09950–30010

(e) Remove the center support bearing from the intermediate shaft.



4. DANA–made:

REMOVE CENTER SUPPORT BEARING FROM INTERMEDIATE SHAFT

(a) Using a hammer and chisel, loosen the staked part of the nut.

(b) Clamp the yoke in a vise and remove the nut.

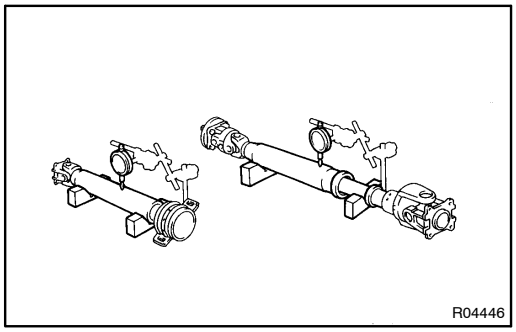
(c) Place matchmarks on the yoke and shaft.

(d) Clamp the yoke in a vise and top off the shaft.

(e) Using a brass bar and hammer, remove the center support bearing from the intermediate shaft.

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PR01J–01


R04446

INSPECTION

NOTICE:

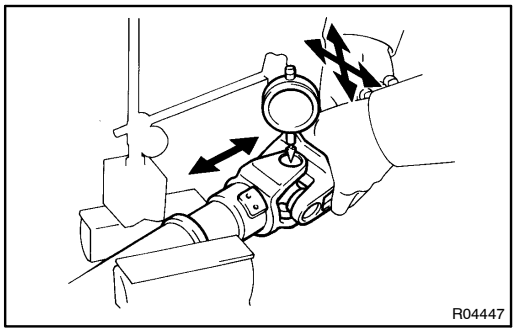
Be careful not to grip the propeller shaft tube too tightly in a vise as this will cause deformation.

1. INSPECT PROPELLER SHAFT AND INTERMEDIATE SHAFT FOR DAMAGE OR RUNOUT

Using a dial indicator, check each runout of shaft.

Maximum runout: 0.8 mm (0.031 in.)

If shaft runout is greater than the maximum, replace the shaft.

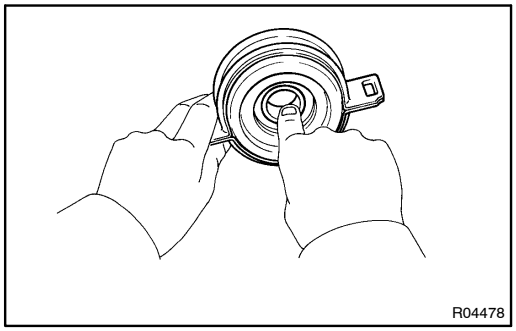

R04447

2. INSPECT SPIDER BEARING

(a) Inspect the spider bearing for wear or damage.

(b) Using a dial indicator, check the spider bearing axial play by turning the yoke of flange while holding the shaft tightly.

Bearing axial play: 0.05 mm (0.0020 in.)


R04478

3. INSPECT CENTER SUPPORT BEARING FOR WEAR OR DAMAGE

Check that the bearing turns freely.

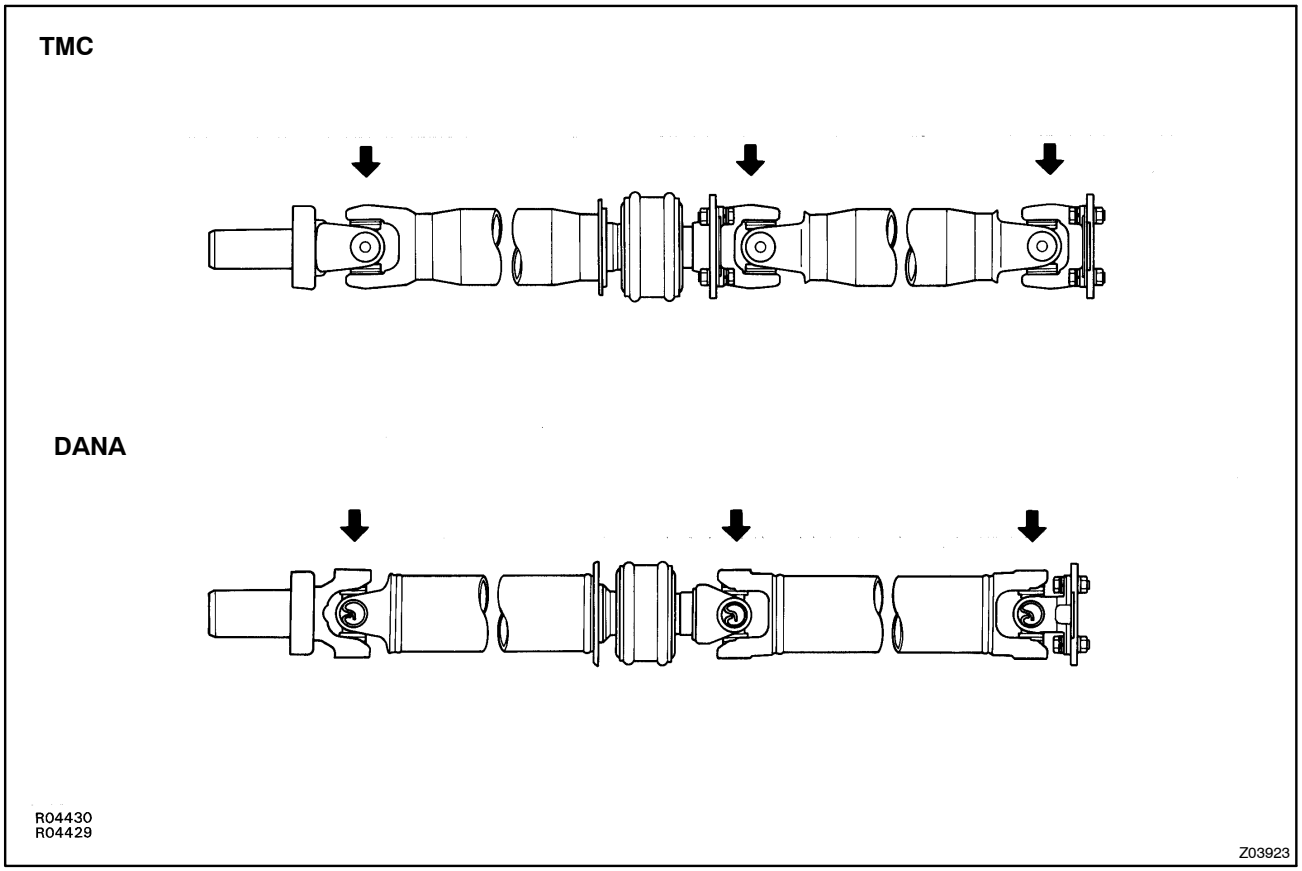
If the bearing is damaged, worn, or does not turn freely, replace it.

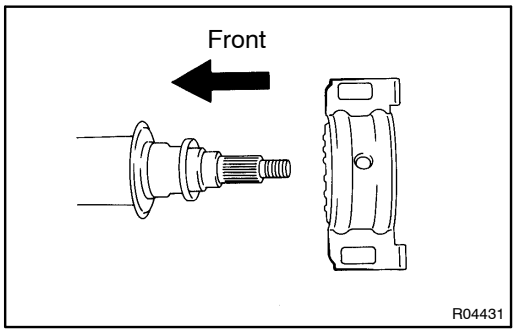
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PR01K–02

REASSEMBLY

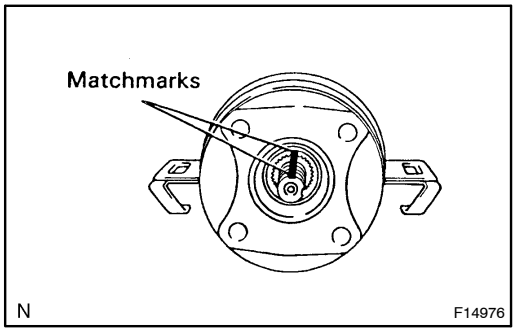
HINT:
When removing or installing any part, make sure that each joint is facing the correct direction, as shown in the illustration below.





1. TMC–made:
INSTALL CENTER SUPPORT BEARING ON INTERMEDIATE SHAFT

HINT:
Install the center support bearing in the direction, as shown.

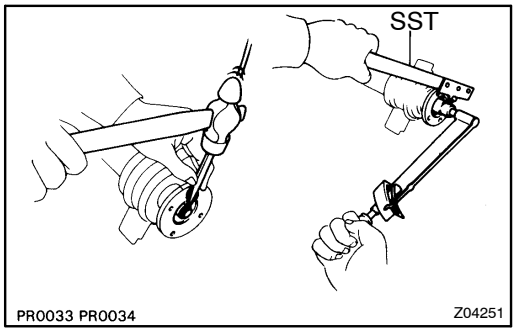


2. INSTALL FLANGE ON INTERMEDIATE SHAFT

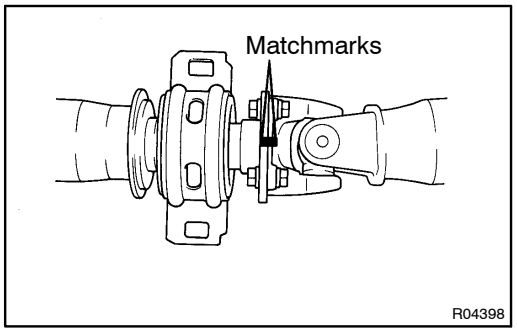
(a) Coat the splines of the intermediate shaft with MP grease.
(b) Place the flange on the shaft and align the marks.

HINT:
If replacing either the center flange or intermediate shaft, reassemble them so that the front yoke of the intermediate shaft and the rear yoke of the propeller shaft are facing in the same direction.

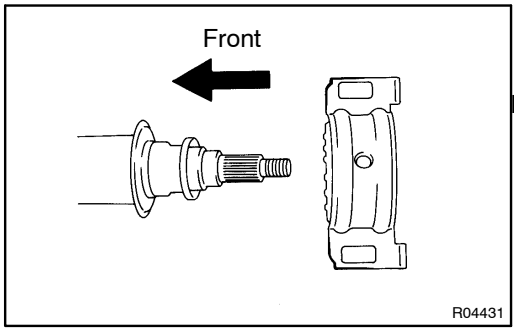
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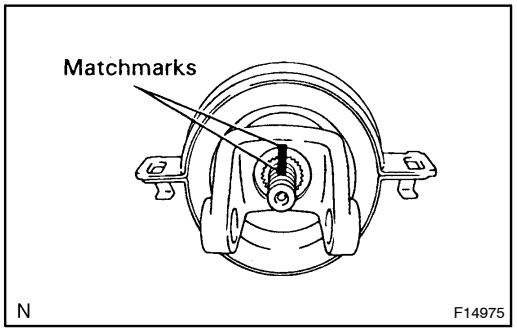
(c) Using SST to hold the flange, press the bearing into position by tightening down a new nut.
SST 09330–00021
Torque: 181 N·m (1,850 kgf·cm, 134 ft·lbf)
(d) Loosen the nut.
(e) Torque the nut again.
Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)
(f) Using a hammer and chisel, stake the nut.



3. INSTALL PROPELLER SHAFT
(a) Align the matchmarks on the flange and connect the flanges with 4 bolts, washers and nuts.
HINT:
If replacing either the center flange or intermediate shaft, reassemble them so that the front yoke of the intermediate shaft and the rear yoke of the propeller shaft are facing in the same direction.
(b) Torque the bolts.
Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)

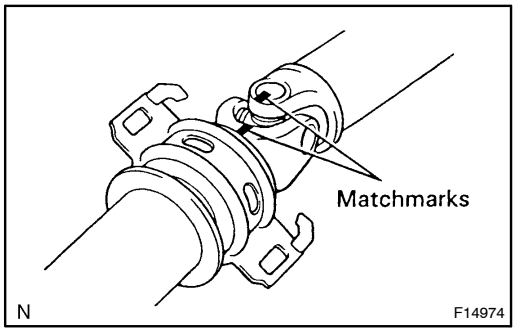


4. DANA–made:
INSTALL CENTER SUPPORT BEARING INTERMEDIATE SHAFT
HINT:
Install the center support bearing in the direction, as shown.
5. INSTALL YOKE ON INTERMEDIATE SHAFT
(a) Coat the splines of the intermediate shaft with MP grease.



(b) Place the center yoke on the shaft and align the matchmarks.
HINT:
If replacing either the center yoke or intermediate shaft.
(c) Clamp the yoke in a vise, press the bearing into position by tightening down a new nut.
Torque: 181 N·m (1,850 kgf·cm, 134 ft·lbf)
(d) Loosen the nut.
(e) Torque the nut again.
Torque: 81 N·m (830 kgf·cm, 60 ft·lbf)
(f) Using a hammer and punch, stake the nut.

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6. CONNECT PROPELLER SHAFT AND INTERMEDIATE SHAFT

Assemble the center yoke (See SPIDER BEARING REPLACEMENT on page PR–18).

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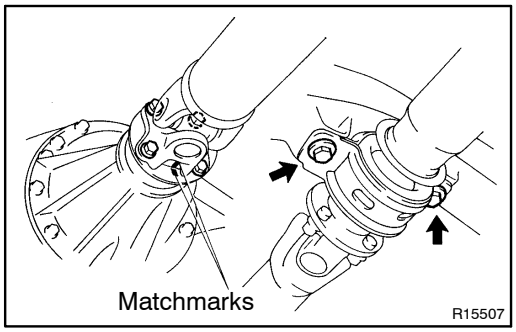
PR07Z–01

INSTALLATION

1. INSTALL PROPELLER SHAFT

(a) Remove SST from the transmission.
SST 09325–40010

(b) Insert the yoke into the transmission.

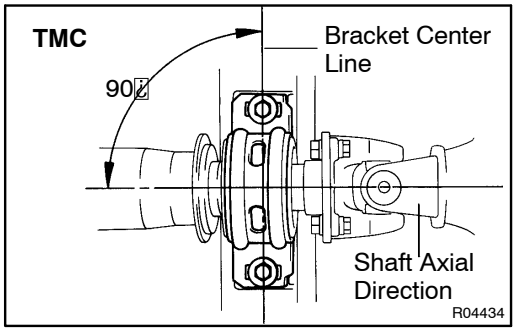


(c) Temporarily install the center support bearing with 2 mounting bolts.

HINT:
Make sure the bearing is installed with facing the drain hole downwards.

(d) Align the matchmarks on the flanges and connect the flanges with the 4 bolts, washers and nuts.

(e) Torque the 4 bolts.
Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)

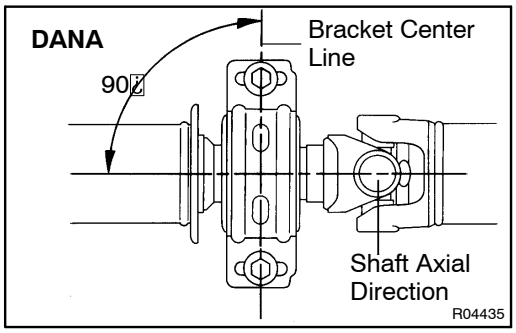


2. ADJUST CENTER SUPPORT BEARING

HINT:

- With the vehicle unladen, adjust the center support bearing to keep the intervals, as shown.
- At the same condition, check the center line in the axial direction. Adjust the bearing if necessary.
- Check that the center line of the center bearing is set to the center line of the bracket when the vehicle is unladen. Adjust the bracket if necessary.

Torque the 2 bolts.
Torque: 36 N·m (370 kgf·cm, 27 ft·lbf)

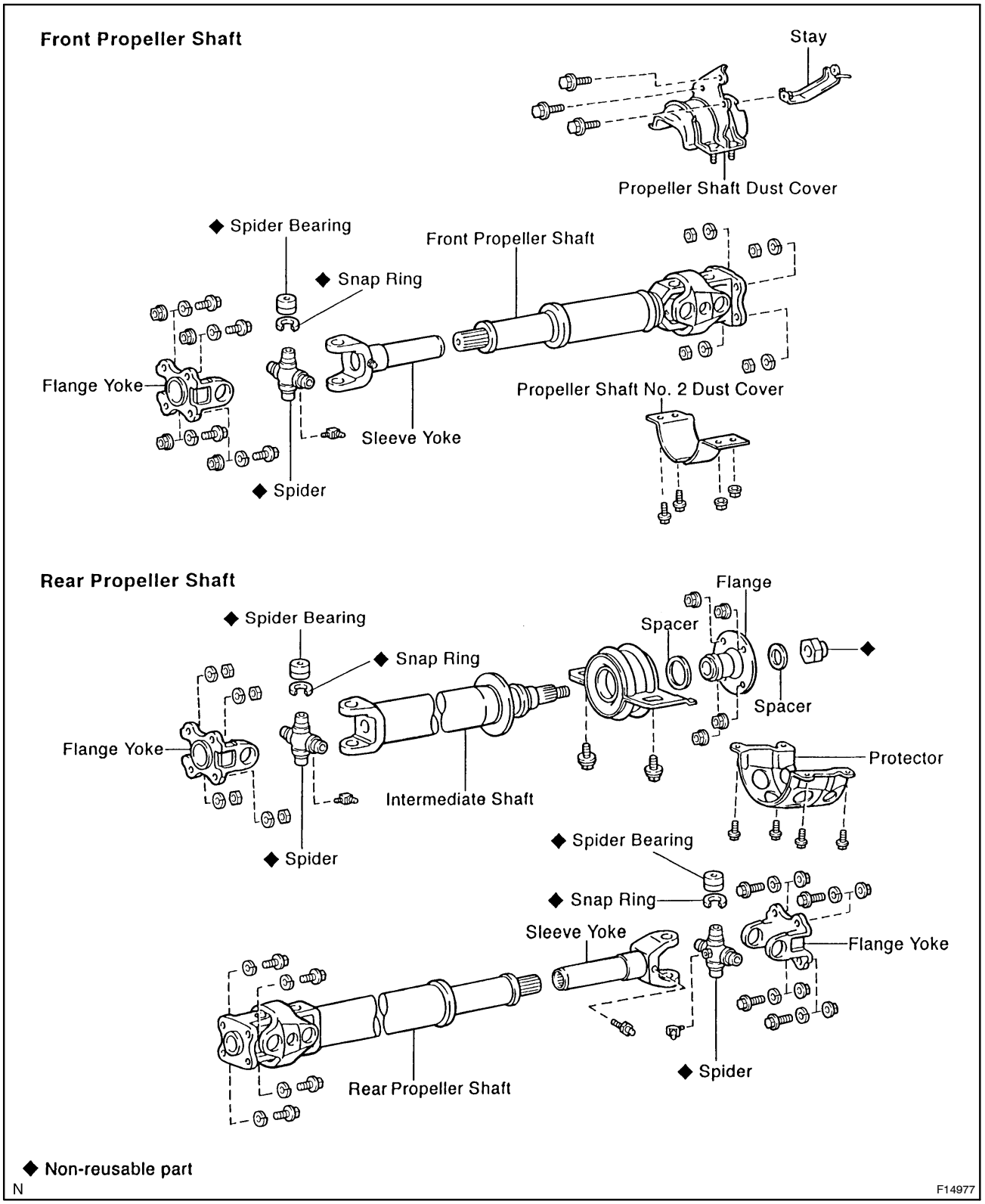


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PROPELLER SHAFT ASSEMBLY (4WD)

COMPONENTS

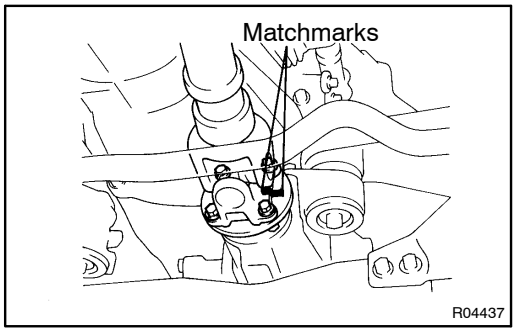
PR01M–04



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PR01N–01

REMOVAL



1. REMOVE FRONT PROPELLER SHAFT

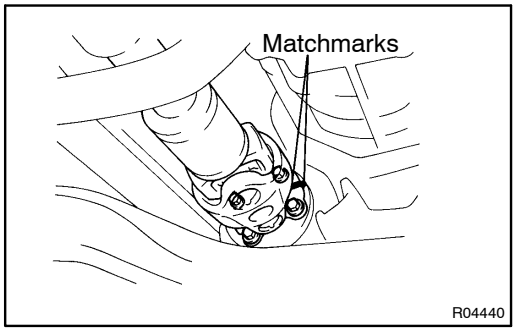
(a) Place matchmarks on the differential and propeller shaft flange.

(b) Remove the 4 bolts, washers and nuts, disconnect the propeller shaft from the differential.

(c) M/T:
Remove the 2 bolts, nuts and propeller shaft No.2 dust cover.

(d) Remove the 3 bolts and propeller shaft dust cover.

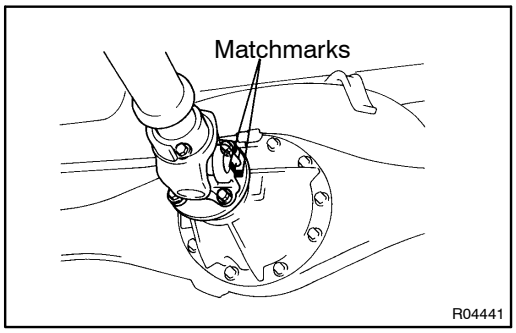
(e) Suspend the front side of the propeller shaft.



(f) Place matchmarks on the transfer and propeller shaft flanges.

(g) Remove the 4 nuts and washers.

(h) Remove the propeller shaft from the transfer.

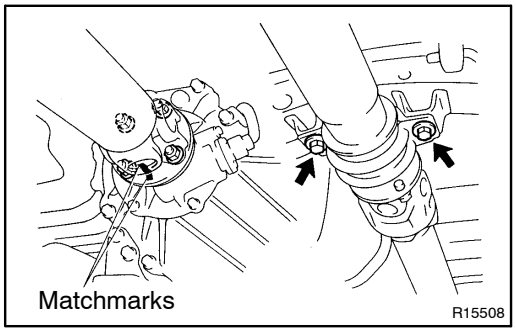


2. REMOVE REAR PROPELLER SHAFT

(a) Place matchmarks on the differential and propeller shaft flanges.

(b) Remove the 4 bolts, washers and nuts, disconnect the propeller shaft from the differential.

(c) Remove the 4 bolts and protector.



(d) Remove the 2 mounting bolts and center support bearing.

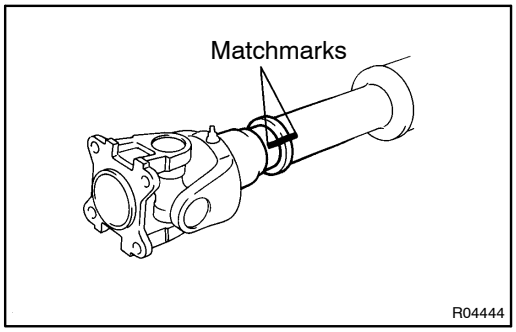
(e) Place matchmarks on the transfer and propeller shaft flanges.

(f) Remove the 4 nuts and washers, and the propeller shaft.

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PR01O–02

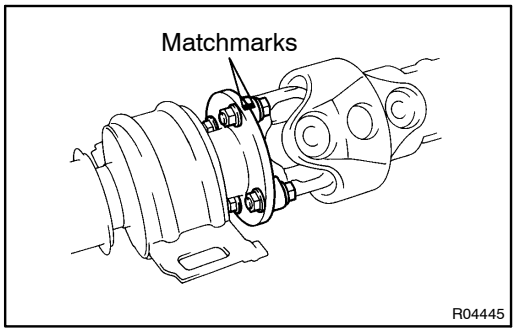
DISASSEMBLY



1. Front:
REMOVE SLEEVE YOKE FROM FRONT PROPELLER SHAFT

(a) Place matchmarks on the sleeve yoke and propeller shaft.

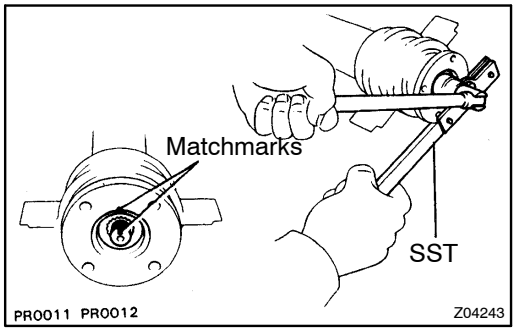
(b) Pull out the sleeve yoke from the propeller shaft.



2. Rear:
SEPARATE PROPELLER SHAFT AND INTERMEDIATE SHAFT

(a) Place the matchmarks on the flanges.

(b) Remove the 4 nuts, bolts and washers.

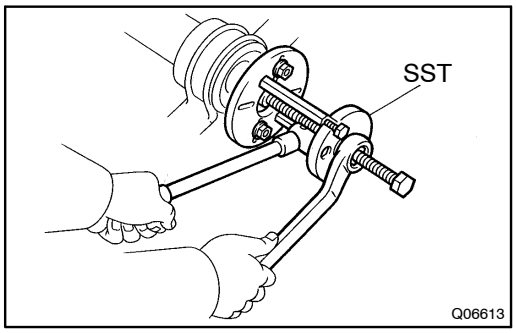


3. REMOVE CENTER SUPPORT BEARING FROM INTERMEDIATE SHAFT

(a) Using a hammer and chisel, loosen the staked part of the nut.

(b) Using SST to hold the flange, remove the nut.
SST 09330–00021

(c) Place matchmarks on the flange and shaft.

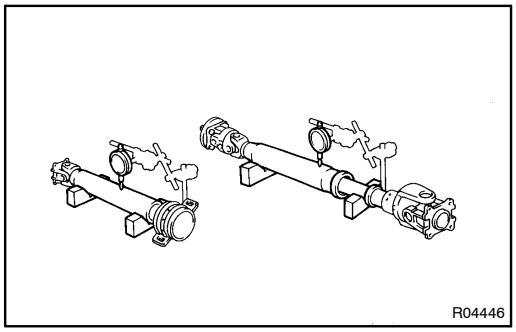


(d) Using SST, remove the flange from the intermediate shaft.
SST 09950–30010

(e) Remove the center support bearing from the intermediate shaft.

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PR01P–01


R04446

INSPECTION

NOTICE:

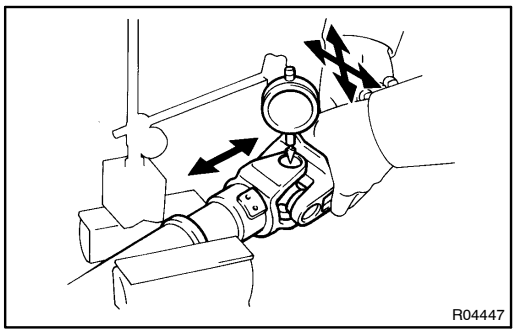
Be careful not to grip the propeller shaft tube too tightly in a vise as this will cause deformation.

1. INSPECT PROPELLER SHAFT AND INTERMEDIATE SHAFT FOR DAMAGE OR RUNOUT

Using a dial indicator, check the runout of shafts.

Maximum runout: 0.8 mm (0.031 in.)

If shaft runout is greater than the maximum, replace the shaft.

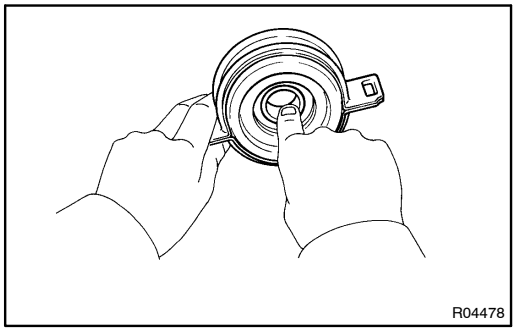

R04447

2. INSPECT SPIDER BEARING

(a) Inspect the spider bearing for wear or damage.

(b) Using a dial indicator, check the spider bearing axial play by turning the yoke of flange while holding the shaft tightly.

Bearing axial play: 0.05 mm (0.0020 in.)


R04478

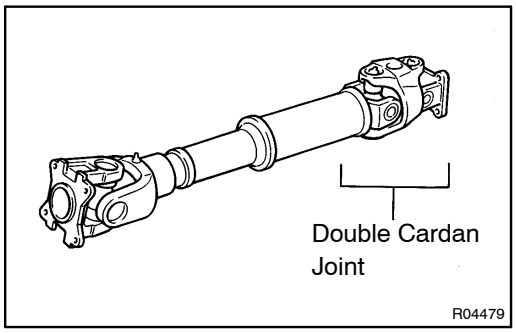
3. INSPECT CENTER SUPPORT BEARING FOR WEAR OR DAMAGE

Check that the bearing turns freely.

If the bearing is damaged, worn, or does not turn freely, replace it.

HINT:

When replacing the rear propeller shaft spider, be sure that the grease fitting assembly hole is facing in the direction shown in the illustration.



R04479

4. INSPECT WITH DOUBLE CARDAN JOINT PROPELLER SHAFT

(a) Inspect the shaft for wear or damage.

(b) Inspect the double cardan joint for wear damage.

If any problem is found, replace the propeller shaft assembly.

HINT:

Double cardan joint is used on front and rear propeller shafts.

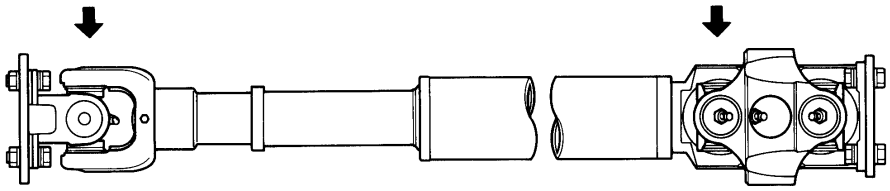
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PR01Q–01

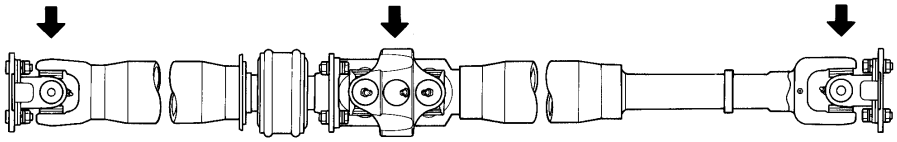
REASSEMBLY

HINT:
When removing or installing any part, make sure that each joint is facing to the correct direction, as shown in the illustration below.

Front Propeller Shaft



Rear Propeller Shaft



R04480
R04481

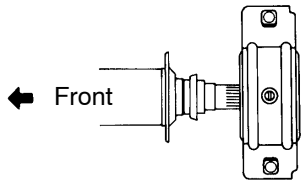
Z03924

1. **Frsont:**
INSERT SLEEVE YOKE INTO FRONT PROPELLER SHAFT

(a) Apply MP grease to the propeller shaft spline and sleeve yoke sliding surface.

(b) Align the matchmarks on the sleeve yoke and propeller shaft.

(c) Insert the sleeve yoke into the propeller shaft.

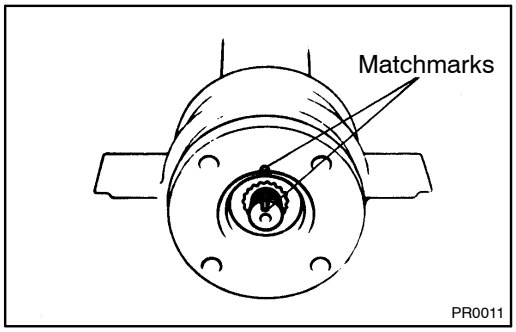


PR0036

2. **Rear:**
INSTALL CENTER SUPPORT BEARING ON INTERMEDIATE SHAFT

HINT:
Install the center support bearing in the direction, as shown.

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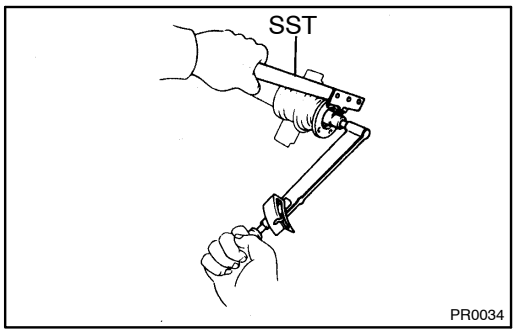
3. Rear:
INSTALL FLANGE ON INTERMEDIATE SHAFT

(a) Coat the splines of the intermediate shaft with MP grease.

(b) Place the flange on the shaft and align the matchmarks.

HINT:

If replacing either the center flange or intermediate shaft, reassemble it so that the front side flange yoke of the intermediate shaft and the rear side flange yoke of the propeller shaft facing in the same direction.



(c) Using SST to hold the flange, press the bearing into position by tightening down a new nut.
SST 09330–00021
Torque: 181 N·m (1,850 kgf·cm, 134 ft·lbf)

(d) Loosen the nut.

(e) Torque the nut again.
Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)

(f) Using a hammer and punch, stake the nut.

4. Rear:
INSTALL PROPELLER SHAFT

(a) Align the matchmarks on the flanges and connect the flanges with 4 bolts, washers and nuts.

HINT:

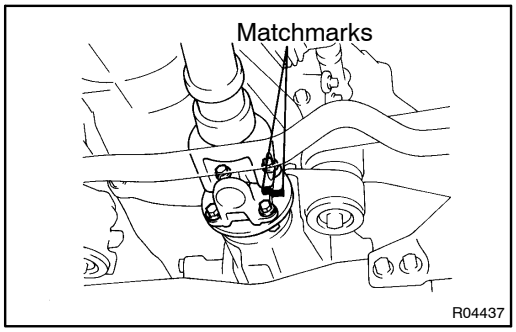
If replacing either the center flange or intermediate shaft, reassembly it so that the front side flange yoke of the intermediate shaft and the rear side flange yoke of the propeller shaft are facing in the same direction.

(b) Torque the bolts.
Torque: 76 N·m (780 kgf·cm, 56 ft·lbf)

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PR080–01

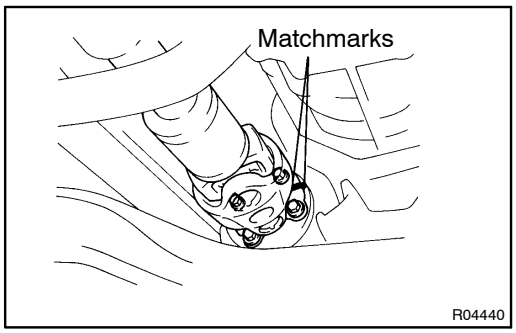
INSTALLATION



1. INSTALL FRONT PROPELLER SHAFT:

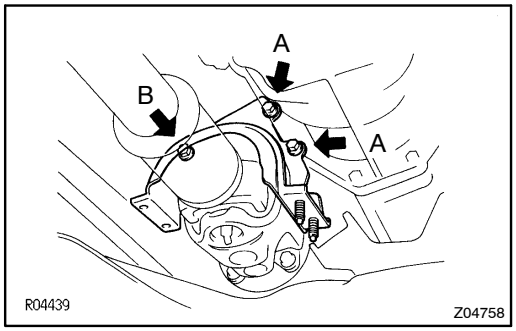
(a) Align the matchmarks on the propeller shaft and differential flanges, and connect the flanges with the 4 nuts and washers.

(b) Torque the 4 nuts.
Torque: 74 N·m (750 kgf·cm,54 ft·lbf)



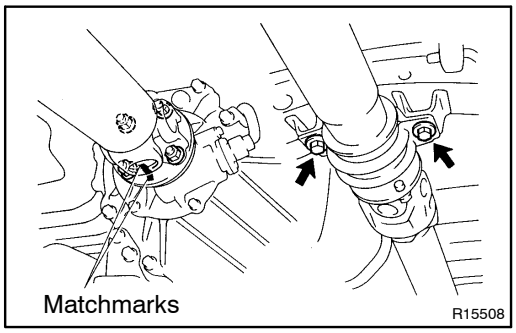
(c) Align the matchmarks on the propeller shaft and transfer flanges, and connect the flanges with the 4 bolts, washers and nuts.

(d) Torque the 4 bolts.
Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)



(e) Install the propeller shaft dust cover with the 3 bolts.
Torque:
A bolt: 36 N·m (370 kgf·cm, 27 ft·lbf)
B bolt: 23 N·m (230 kgf·cm, 17 ft·lbf)

(f) M/T:
Install the propeller shaft No.2 dust cover with the 2 bolts and nuts.
Torque:
Bolt: 17 N·m (175 kgf·cm, 13 ft·lbf)
Nut: 13 N·m (135 kgf·cm, 10 ft·lbf)



2. INSTALL REAR PROPELLER SHAFT

(a) Align the matchmarks on the propeller shaft and transfer flanges, and connect the flanges with 4 nuts and washers.

(b) Torque the 4 nuts.
Torque: 76 N·m (780 kgf·cm, 56 ft·lbf)

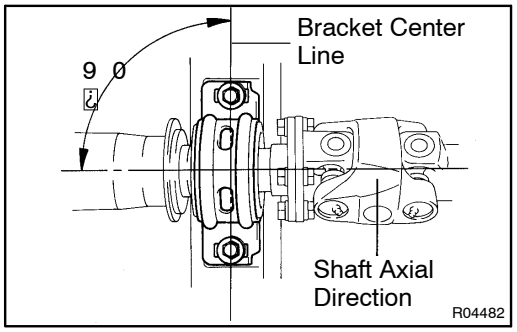
(c) Temporarily install the center support bearing with 2 mount bolts finger tight.

HINT:
Make sure the bearing is installed with facing the drain hole downwards.

(d) Align the matchmarks on the flanges, and connect the flanges with the 4 bolts, washers and nut.

(e) Torque the 4 bolts.
Torque: 76 N·m (780 kgf·cm, 56 ft·lbf)

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3. ADJUST CENTER SUPPORT BEARING

HINT:

- With the vehicle unladen, adjust the center support bearing to keep the intervals, as shown.
- At the same condition, check the center line in the axial direction. Adjust the bearing if necessary.
- Check that the center line of the center bearing is set to the center line of the bracket when the vehicle is unladen. Adjust the bracket if necessary.

(a) Torque the 2 bolts.
Torque: 36 N·m (370 kgf·cm, 27 ft·lbf)

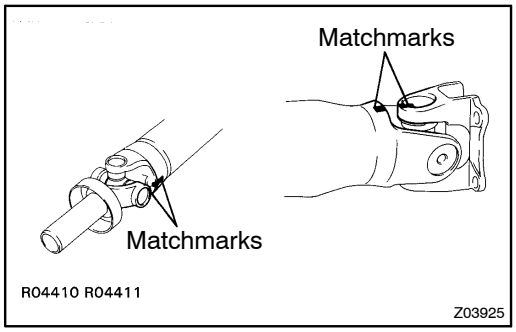
(b) Install propeller shaft protector with 4 bolts.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

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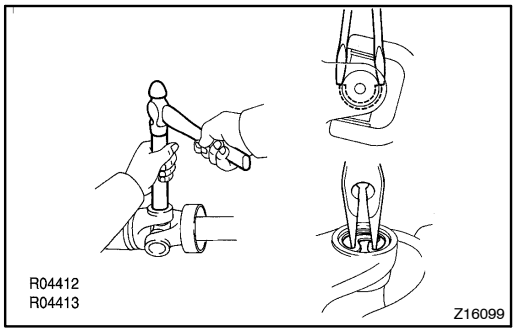
SPIDER BEARING

REPLACEMENT

PR01S–01



1. PLACE MATCHMARKS ON SHAFT AND YOKE

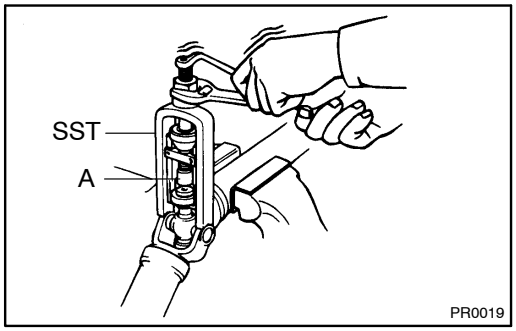


2. REMOVE SNAP RING

(a) Using a brass bar and hammer, slightly tap in the bearing outer race.

(b) 2WD (TMC–made) and 4WD:
Using 2 screwdrivers, remove the 4 snap rings from the grooves.

(c) 2WD (DANA–made):
Using a long nosed plier, remove the 4 snap rings from the grooves.



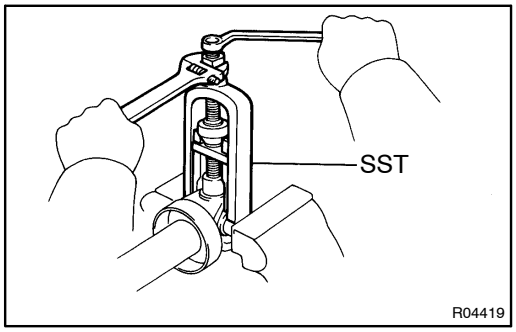
3. REMOVE SPIDER BEARING

(a) Using SST, push out the bearing from the flange.
SST 09332–25010

HINT:
Sufficiently raise the part indicated by "A" so that it does not come into contact with the bearing.

(b) Clamp the bearing outer race in a vise and tap off the flange with a hammer.

HINT:
Remove the bearing on the opposite side in the same procedure.



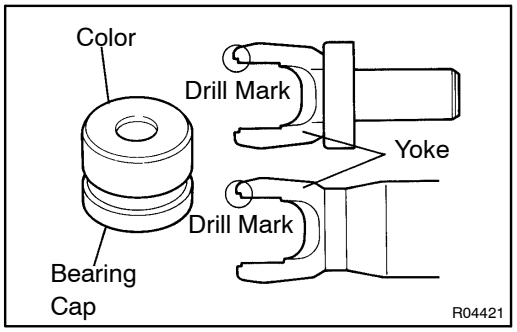
(c) Install the 2 removed bearing outer races to the spider.

(d) Using SST, push out the bearing from the yoke.
SST 09332–25010

(e) Clamp the outer bearing race in a vise and tap off the yoke with a hammer.

HINT:
Remove the bearing on the opposite side in the same procedure.

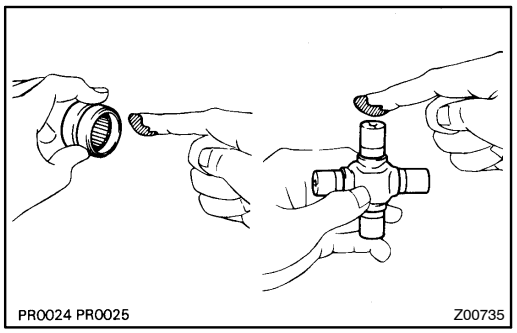
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4. SELECT SPIDER BEARING

Select the appropriate bearing according to the existence of drill mark on the yoke.

Yoke	Bearing
With drill mark	With color mark (Red)
No drill mark	No color mark



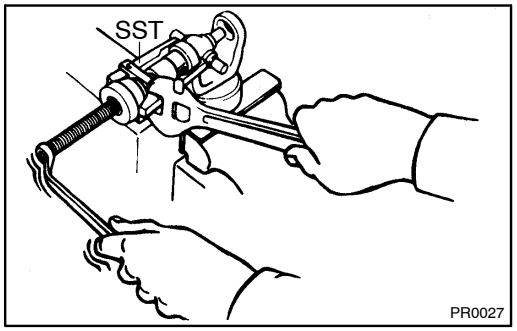
5. INSTALL SPIDER BEARING

(a) Apply MP grease to the spider and bearings.

HINT:

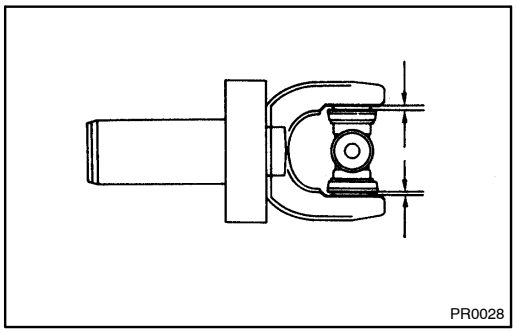
Be careful not to apply too much grease.

(b) Align the matchmarks on the yoke and shaft.

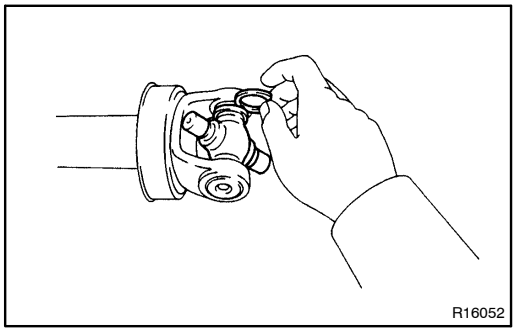


(c) Fit a new spider into the yoke.

(d) Using SST, install a new bearing on the spider.
SST 09332–25010



(e) Using SST, adjust both bearings so that the snap ring grooves are at maximum and equal in width.



6. INSTALL SNAP RINGS

(a) Install 2 new snap rings of equal thickness which will allow 0 – 0.05 mm (0 – 0.0020 in.) axial play.

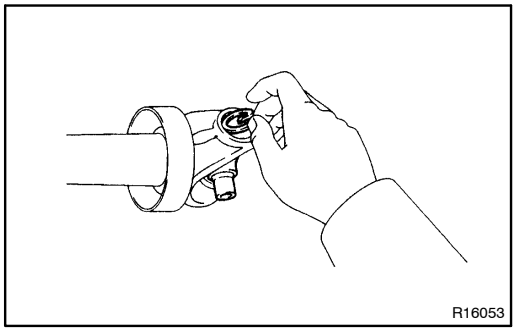
HINT:

Do not reuse the snap rings.

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2WD (TMC–made) and 4WD:

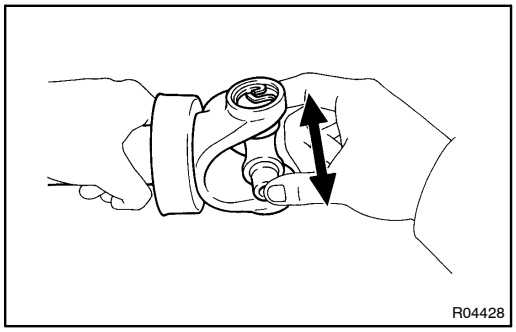
Color	Mark	Thickness mm (in.)
–	1	2.100 – 2.150 (0.0827 – 0.0846)
–	2	2.150 – 2.200 (0.0846 – 0.0866)
–	3	2.200 – 2.250 (0.0866 – 0.0886)
Brown	–	2.250 – 2.230 (0.0886 – 0.0906)
Blue	–	2.300 – 2.350 (0.0906 – 0.0925)
–	6	2.350 – 2.400 (0.0925 – 0.0945)
–	7	2.400 – 2.450 (0.0945 – 0.0965)
–	8	2.450 – 2.500 (0.0965 – 0.0984)


R16053

2WD (DANA–made):

Color	Thickness mm (in.)
Green	1.384 (0.0545)
Red	1.435 (0.0565)
Black	1.486 (0.0585)
Copper	1.511 (0.0595)
Silver	1.537 (0.0605)
Yellow	1.588 (0.0625)
Blue	1.638 (0.0645)

(b) Using a hammer, tap the yoke until there is no clearance between the bearing outer race and snap ring.


R04428

7. CHECK SPIDER BEARING

(a) Check that the spider bearing moves smoothly.

(b) Check the spider bearing axial play.

Bearing axial play: Less than 0.05 mm (0.0020 in.)

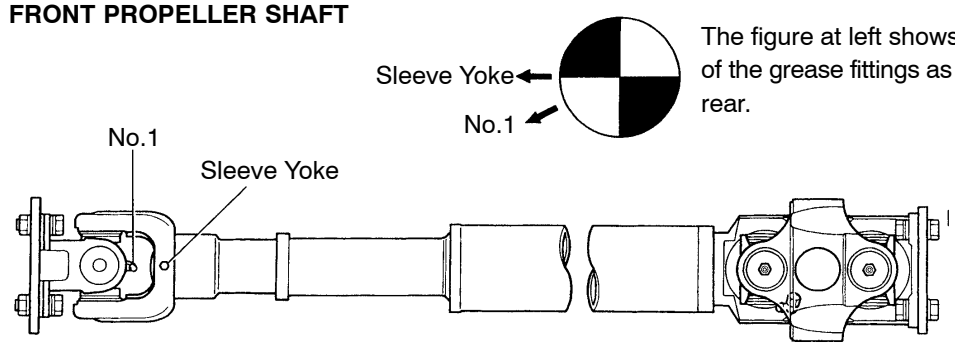
HINT:

Install new spider bearings on the flange side in the procedure described above.

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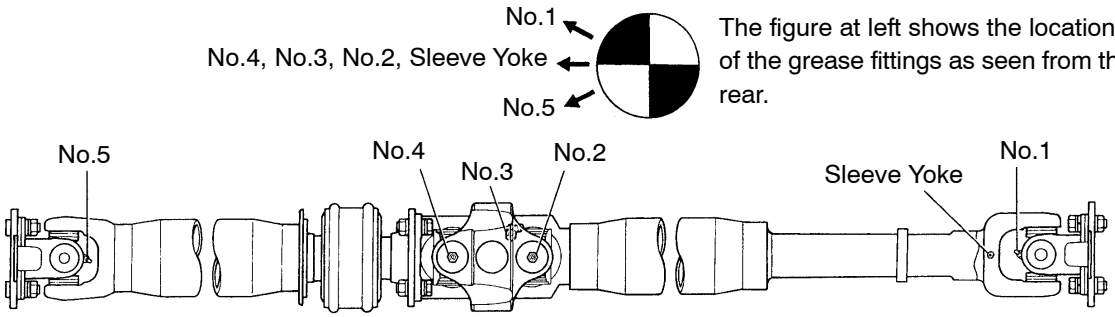
HINT:
When replacing the rear propeller shaft spider on 4WD vehicle, be sure that the grease fitting assembly hole is facing in the direction shown in the illustration.

SPIDER GREASE FITTING ASSEMBLY DIRECTION FOR 4WD FRONT PROPELLER SHAFT



The figure at left shows the locations of the grease fittings as seen from the rear.

SPIDER GREASE FITTING ASSEMBLY DIRECTION FOR 4WD REAR PROPELLER SHAFT



The figure at left shows the locations of the grease fittings as seen from the rear.

R15911
R04677
Z16476

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SA – SUSPENSION AND AXLE

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SA – SUSPENSION AND AXLE

FRONT UPPER BALL JOINT (2WD)	SA-107
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FRONT STABILIZER BAR (4WD)	SA-126
REAR AXLE SHAFT	SA-129
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REAR LEAF SPRING	SA-160

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TROUBLESHOOTING

PROBLEM SYMPTOMS TABLE

SA0FC–01

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspect Area	See page
Wander/pulls	1. Tires (Worn or improperly inflated)	SA–3 SA–5
	2. Wheel alignment (Incorrect)	SA–7 SA–10
	3. Steering linkage (Loosen or worn)	–
	4. Hub bearings (Loosen or worn)	SA–15 SA–22 SA–129
	5. Suspension parts (Worn out)	–
	6. Steering gear (Out of adjustment or broken)	–
Bottoming	1. Vehicle (Overloaded)	–
	2. Spring (Weak)	SA–82 SA–85 SA–160
	3. Shock absorber (Worn out)	SA–72 SA–77 SA–155
Sways/pitches	1. Tires (Worn or improperly inflated)	SA–3 SA–5
	2. Stabilizer bar (Bent or broken)	SA–123 SA–126
	3. Shock absorber (Worn out)	SA–72 SA–77 SA–155
Front wheel shimmy	1. Tires (Worn or improperly inflated)	SA–3 SA–5
	2. Wheels (Out of balance)	SA–3 SA–5
	3. Shock absorber (Worn out)	SA–72 SA–77 SA–155
	4. Wheel alignment (Incorrect)	SA–7 SA–10
	5. Ball joints (Worn)	SA–107 SA–111 SA–115 SA–119
	6. Hub bearings (Loosen or worn)	SA–15 SA–22 SA–129
	7. Steering linkage (Loosen or worn)	–
	8. Steering gear (Out of adjustment or broken)	–
Abnormal tire wear	1. Tires (Improperly inflated)	SA–3 SA–5
	2. Wheel alignment (Incorrect)	SA–3 SA–5
	3. Suspension parts (Worn out)	–
	4. Shock absorber (Worn out)	SA–72 SA–77 SA–155

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Noise in front differential	1. Oil level (Low or wrong grade) 2. Excessive backlash between pinion and ring gear 3. Ring, pinion or side gears (Worn or chipped) 4. Pinion shaft bearing (Worn) 5. Side bearing (Worn) 6. Differential bearing (Loosen or worn)	SA–42 SA–45 SA–45 SA–45 SA–45 SA–45
Oil leak from front differential	1. Oil level (Too high or wrong grade) 2. Front differential rear oil seal (Worn or damaged) 3. Side gear oil seal (Worn or damaged) 4. Companion flange (Loose or damaged) 5. Side gear shaft (Damaged)	SA–42 SA–42 SA–45 SA–42 SA–45
Noise in rear axle	1. Oil level (Low or wrong grade) 2. Excessive backlash between pinion and ring gear 3. Ring, pinion or side gears (Worn or chipped) 4. Pinion shaft bearing (Worn) 5. Axle shaft bearing (Worn) 6. Differential bearing (Loosen or worn)	SA–137 SA–137 SA–137 SA–137 SA–129 SA–137
Oil leak from rear axle	1. Oil seal (Worn or damaged) 2. Rear axle housing (Cracked)	SA–129 SA–129
Oil leak from rear differential	1. Oil level (Too high or wrong grade) 2. Oil seal (Worn or damaged) 3. Companion flange (Loose or damaged)	SA–137 SA–137 SA–137

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TIRE AND WHEEL (2WD)

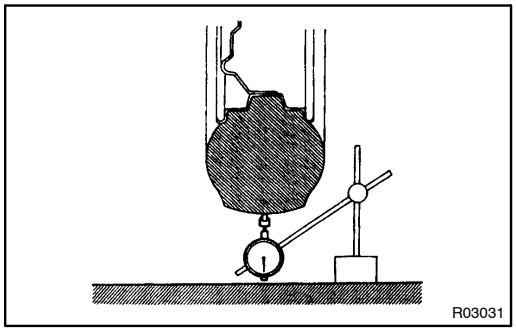
SA0FD–01

INSPECTION

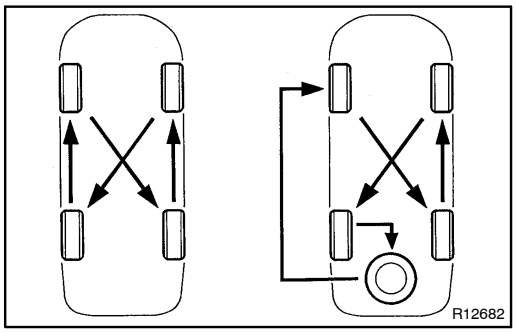
1. INSPECT TIRE

(a) Check the tires for wear and proper inflation pressure.
Cold tire inflation pressure
For driving under 120 km/h (75 mph).

Tire size	Front kPa (kg/cm^2, psi)	Rear kPa (kg/cm^2, psi)
P215/75R15	230 (2.3, 33)	240 (2.4, 35)
P235/75R15 (0.5 ton)	180 (1.8, 26)	200 (2.0, 29)
P235/75R15 (1.0 ton)	180 (1.8, 26)	280 (2.8, 41)

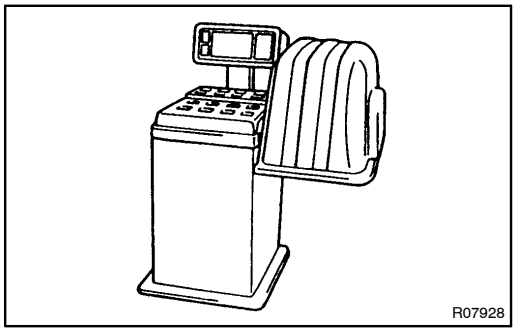


(b) Check the tire runout.
Tire runout: 3.0 mm (0.118 in.) or less



2. ROTATING TIRES

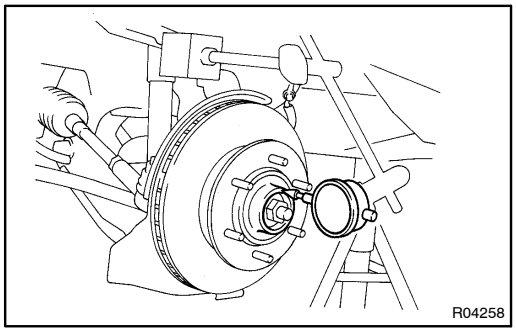
HINT:
See the illustration for where to rotate each tire.



3. INSPECT WHEEL BALANCE

(a) Check and adjust the Off–the–car balance.
(b) If necessary, check and adjust the On–the–car balance.
Unbalance after adjustment: 14.0 g (0.031 lb) or less

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4. CHECK WHEEL BEARING LOOSENESS

Check the backlash in the bearing shaft direction.

Maximum: 0.05 mm (0.0020 in.)

5. CHECK FRONT SUSPENSION FOR LOOSENESS

6. CHECK STEERING LINKAGE FOR LOOSENESS

7. CHECK BALL JOINT FOR LOOSENESS

8. CHECK SHOCK ABSORBER WORKS PROPERLY

- Check for oil leaks.
- Check mounting bushings for wear.
- Check front and rear of the vehicle for bounce.

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TIRE AND WHEEL (4WD)

SA0FE–02

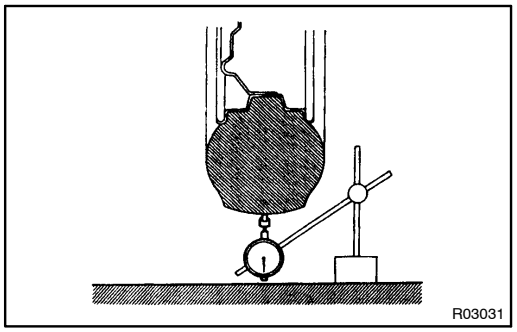
INSPECTION

1. INSPECT TIRE

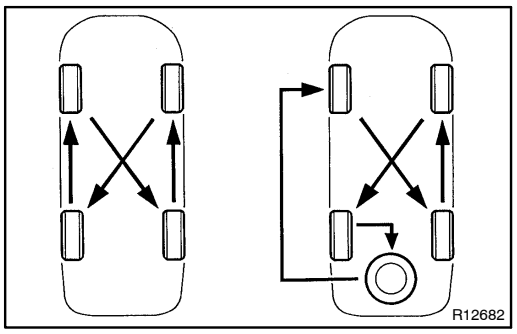
(a) Check the tires for wear and for the proper inflation pressure.

Cold tire inflation pressure
For driving under 120 km/h (75 mph).

Tire size	Front kPa (kg/cm^2, psi)	Rear kPa (kg/cm^2, psi)
P235/75R15	180 (1.8, 26)	200 (2.0, 29)
31 x 10.5 R15LT	180 (1.8, 26)	200 (2.0, 29)
31 x 10.5 R15LT Extra cab	200 (2.0, 29)	240 (2.4, 35)

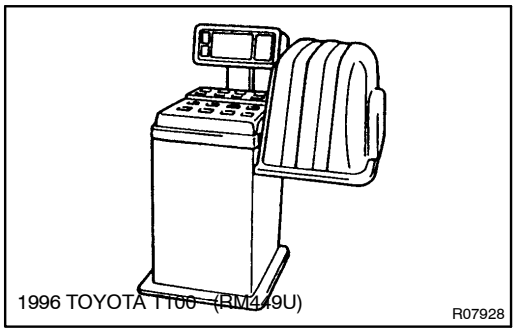


(b) Check the tire runout.
Tire runout: 3.0 mm (0.118 in.) or less



2. ROTATING TIRES

HINT:
See the illustration for where to rotate each tire.



3. INSPECT WHEEL BALANCE

(a) Check and adjust the Off–the–car balance.
(b) If necessary, check and adjust the On–the–car balance.
Unbalance after adjustment: 14.0 g (0.031 lb) or less

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4. CHECK FRONT SUSPENSION FOR LOOSENESS

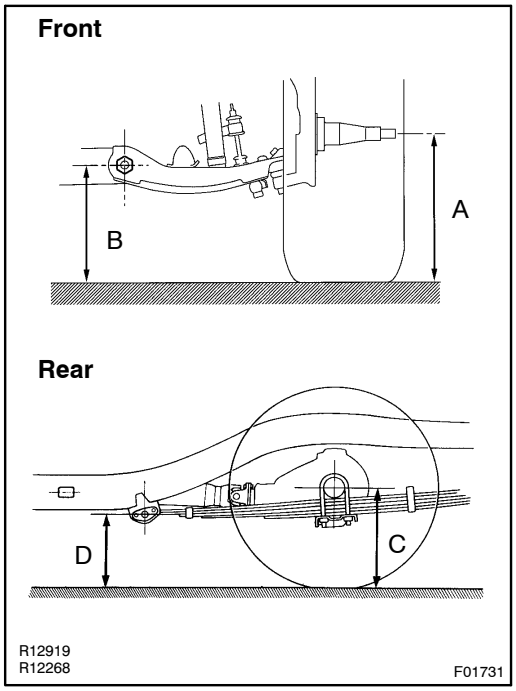
5. CHECK STEERING LINKAGE FOR LOOSENESS

6. CHECK BALL JOINT FOR LOOSENESS

7. CHECK SHOCK ABSORBER WORKS PROPERLY

- Check for oil leaks.
- Check mounting bushings for wear.
- Check front and rear of the vehicle for bounce.

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FRONT WHEEL ALIGNMENT (2WD)

SA0FF–02

INSPECTION

HINT:

For the vehicle height of non–loaded vehidles for each model and alighment standed values, refer to page SA–119.

1. MEASURE VEHICLE HEIGHT

Vehicle height: See page SS–58

Front: A – B = 74.0 mm (2.913 in.)

Rear: C – D = Standed cab

0.5 ton: 122.0 mm (4.803 in.)

1.0 ton: 107.0 mm (4.213 in.)

Extre cab: 115.5 mm (4.547 in.)

Measuring points:

A: Steering knuckle height measured at its center on the outer edge.

B: Lower suspension arm front adjusting bolt height measured at its center.

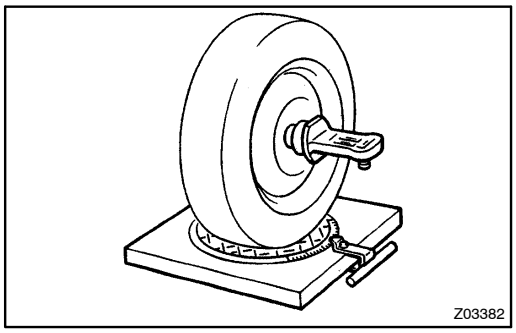
C: Rear axle shaft height measured at its center.

D: Rear leaf spring front bushing height measured at its center.

NOTICE:

Before inspecting the wheel alignment, adjust the vehicle height to specification.

If the vehicle height is not standard, try to adjust it by pushing down on or lifting the body.



2. INSTALL CAMBER–CASTER–KINGPIN GAUGE OR ONTO WHEEL ALIGNMENT TESTER

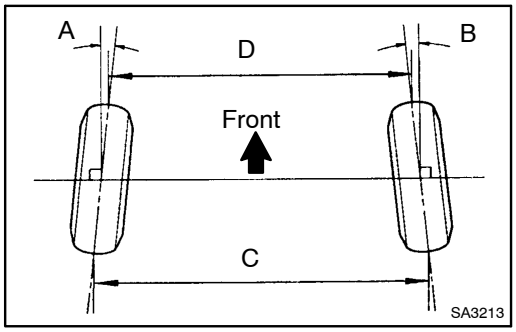
Follow the specific instructions of the equipment manufacturer.

3. INSPECT CAMBER, CASTER AND STEERING AXIS INCLINATION

Camber	0°00' ± 45' (0° ± 0.75°)
Left–right error	45' (0.75°) or less
Caster	4°00' ± 45' (4° ± 0.75°)
Left–right error	45' (0.75°) or less
Steering axis inclination	12°30' ± 45' (12.5° ± 0.75°)
Left–right error	45' (0.75°) or less

If the steering axis inclination is not as specified, after camber and caster have correctly adjusted, recheck the steering knuckle front wheel for bearing or looseness.

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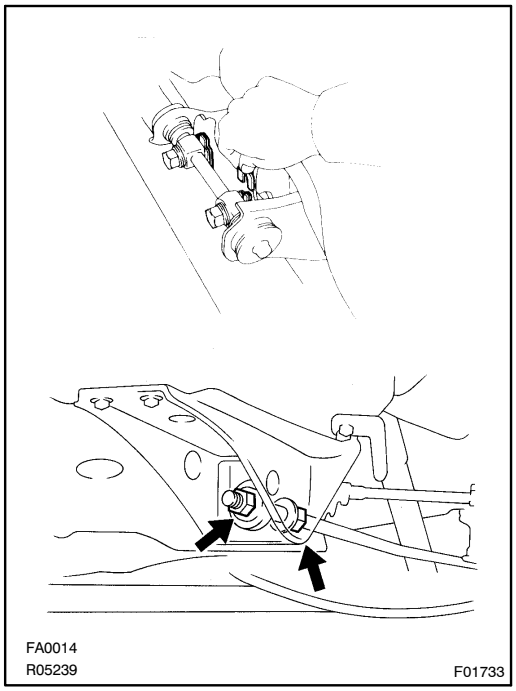


4. INSPECT TOE–IN

Toe–in (total)

STD cab	A + B: 0° ± 12' (0° ± 0.2°) C – D: 0 ± 2 mm (0 ± 0.08 in.)
Extra cab P215/75 R15	A + B: 0°22' ± 12' (–0.36° ± 0.2°) C – D: –4.7 ± 2 mm (0.18 ± 0.08 in.)
Extra cab P235/75 R15	A + B: 0°22' ± 12' (0.36° ± 0.2°) C – D: –4.9 ± 2 mm (0.19 ± 0.08 in.)

If the toe–in is not within the specification, adjust the rack end.



5. ADJUST CAMBER AND CASTER

HINT:

Try to adjust the camber and caster to center value.

If camber or caster is not within the specification, adjust by adding or removing shims on the upper suspension arm.

Shim thickness

4.0 mm (0.157 in.)	1.6 mm (0.063 in.)	1.2 mm (0.047 in.)

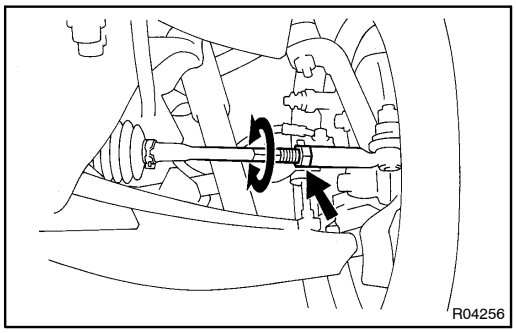
HINT:

If the steering axis inclination is not as specified after camber and caster have been correctly adjusted, recheck the steering knuckle and front wheel for distortion or looseness.

NOTICE:

Adjust the shim thickness to 7 mm (+4, –3), and adjust the difference between the front and rear of the upper suspension arm shaft to within 4 mm.

If this adjustment is not possible, adjust the strut bar bush set nut.



6. ADJUST TOE–IN

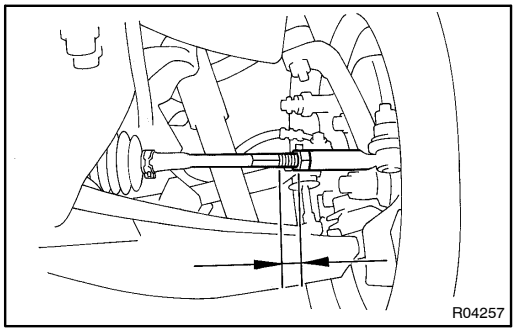
(a) Remove the boot clamps.

(b) Loosen the tie rod end lock nuts.

(c) Turn the left and right rack ends an amount to adjust the toe–in.

HINT:

- Try to adjust the toe–in to the center value.



- Make sure that the length of the left and right rack ends are the same.

  Rack end difference: 3.0 mm (0.118 in.) or less

(d) Tighten the tie rod end lock nut.

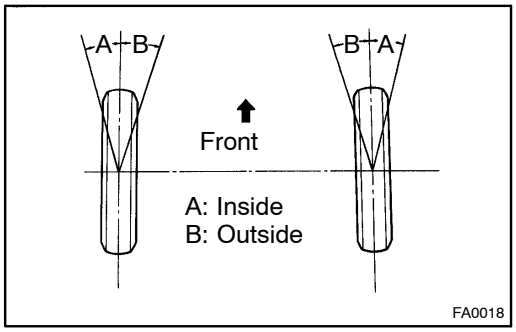
Torque: 56 N·m (570 kgf·cm, 41 ft·lbf)

(e) Place the boot on the seat and install the clip.

HINT:

Make sure that the boots are not twisted.

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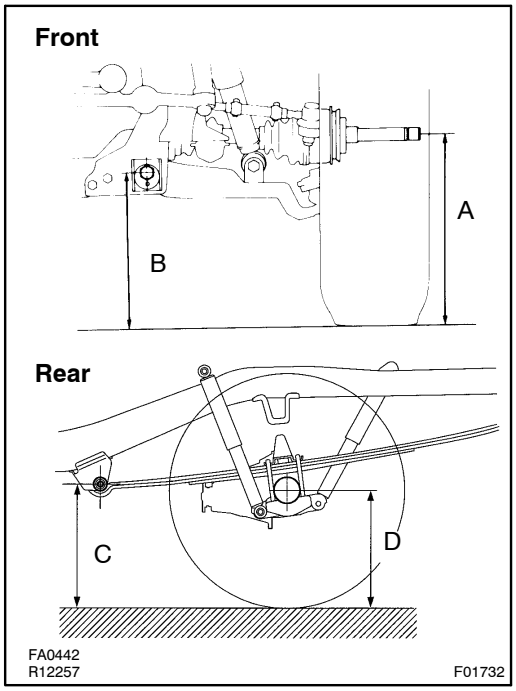
7. INSPECT WHEEL ANGLE

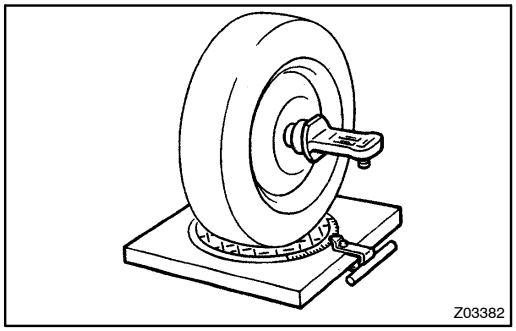
Turn the steering wheel fully, and measure the turning angle.

Item	Inside wheel	Outside wheel <Reference>
STD cab 0.5 ton	40°42' ± 2° (40.7° ± 2°)	34°23' (34.38°)
Left–right error	30'(0.5°)	
STD cab 1.0 ton	39°55' ± 2° (39.92° ± 2°)	34°37' (34.67°)
Left–right error	30'(0.5°)	
Extra cab	40°10' ± 2° (40.17' ± 2°)	34°25' (34.47°)
Left–right error	30'(0.5°)	

If the wheel angle differ from the standard specifications, check to see if the lengths of the left and right tie rods are the same.
HINT:
If the tie rods lengths are not equal, the wheel angle cannot be adjusted properly.
Reinspect the toe–in after adjusting the tie rods lengths.

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FRONT WHEEL ALIGNMENT (4WD)

SA0FG–02

INSPECTION

HINT:

For the vehicle height of non–loaded vehicles for each model and alignment standed values, refer to page SA–121.

1. MEASURE VEHICLE HEIGHT

Vehicle height:

Front: A – B = 58.0 mm (2.283 in.)

Rear: C – B = STD cab: 23.0 mm (0.906 in.)

Extra cab: 28.0 mm (1.102 in.)

Measuring points:

A: Drive shaft height measured at its center on the outer edge.

B: Lower suspension arm front adjusting bolt height measured at its center.

C: Rear leaf spring front bushing height measured at its center.

D: Rear axle shaft height measured at its center.

NOTICE:

Before inspecting the wheel alignment, adjust the vehicle height to specification.

If the vehicle height is not standard, try to adjust it by pushing down on or lifting the body.

2. INSTALL CAMBER–CASTER–KINGPIN GAUGE OR ONTO WHEEL ALIGNMENT TESTER

Follow the specific instructions of the equipment manufacturer.

3. INSPECT CAMBER, CASTER AND STEERING AXIS INCLINATION

STD cab

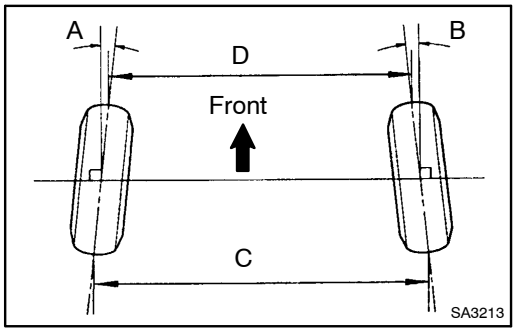
Camber Left–right error	0°45' ± 45' (0.75° ± 0.75°) 45' (0.75°) or less
Caster Left–right error	1°30' ± 45' (1.5° ± 0.75°) 45' (0.75°) or less
Steering axis inclination Left–right error	11°50' ± 45' (11.83° ± 0.75°) 45' (0.75°) or less

Extra cab

Camber Left–right error	0°45' ± 45' (0.75° ± 0.75°) 45' (0.75°) or less
Caster Left–right error	1°20' ± 45' (1.33° ± 0.75°) 45' (0.75°) or less
Steering axis inclination Left–right error	11°50' ± 45' (11.83° ± 0.75°) 45' (0.75°) or less

If the steering axis inclination is not as specified, after camber and caster have correctly adjusted, recheck the steering knuckle front wheel for bearing or looseness.

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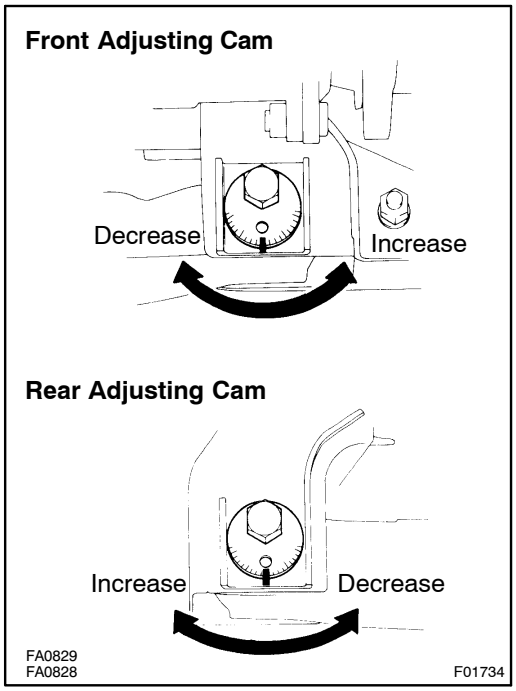


4. INSPECT TOE–IN

Toe–in (total)

0.5 ton	A + B: 0°05' ± 12' (0.08° ± 0.2°) C – D: 1.0 ± 2 mm (0.04 ± 0.08 in.)
Extra cab P235/75 R15	A + B: –0°08' ± 12' (–0.14° ± 0.2°) C – D: –1.9 ± 2 mm (0.07 ± 0.08 in.)
Extra cab 31 x 10.5 R15	A + B: –0°08' ± 12' (–0.14° ± 0.2°) C – D: –2.0 ± 2 mm (0.08 ± 0.08 in.)

If the toe–in is not within specification, adjust the tie rod end.



5. ADJUST CAMBER AND CASTER

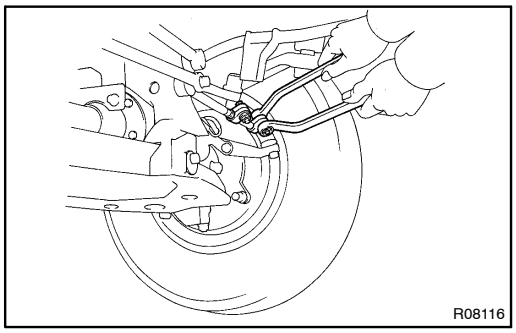
(a) Loosen the front and/or rear adjusting cam nuts.

(b) Adjust the camber and caster by front and/or rear adjusting cams (See adjustment chart).

HINT:

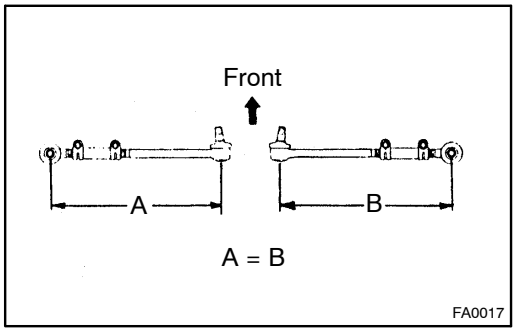
Try to adjust the camber and caster to the center value.

(c) Torque the front and/or rear adjusting cam nuts.
Torque: 226 N·m (2,300 kgf·cm, 166 ft·lbf)



6. ADJUST TOE–IN

(a) Loosen the clamp bolts and nuts.

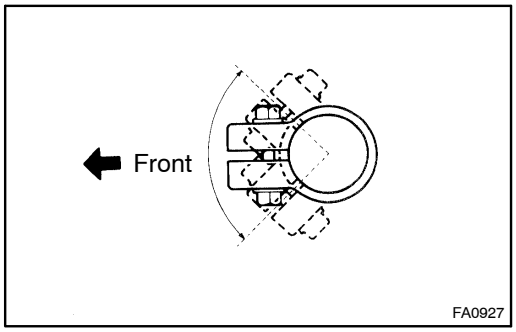


(b) Adjust toe–in by turning the left and right tie rod tubes an equal amount.

HINT:

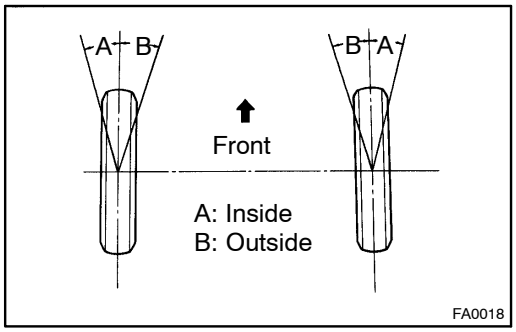
- Try to adjust the toe–in to the center value.
- Make sure that the length of the left and right tie rods end is equal.

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(c) Torque the tie rod clamp bolt.
Torque: 22 N·m (225 kgf·cm, 16 ft·lbf)

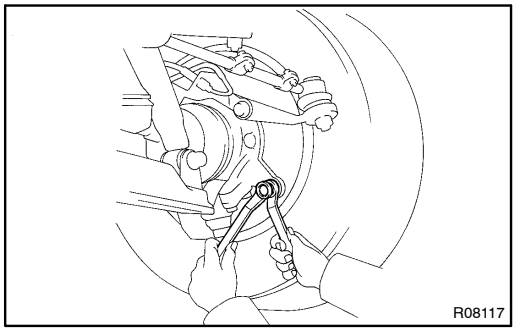
HINT:
Face the clamp bolt toward the front of the vehicle.



7. INSPECT WHEEL ANGLE

Turn the steering wheel fully, and measure the turning angle.

Item	Inside wheel	Outside wheel <Reference>
STD cab	32°01' ± 2° (32.02° ± 2°)	30°30' (30.5°)
Extra cab	32°14' ± 2° (33.23° ± 2°)	30°30' (30.5°)



If maximum steering angles differ from standard value, adjust the wheel angle with the knuckle stopper bolts.
Torque: 47 N·m (480 kgf·cm, 35 ft·lbf)

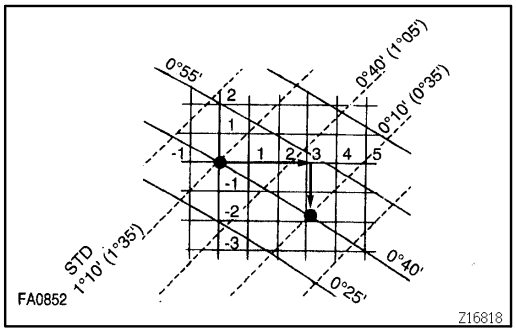
If the wheel angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts.

8. HOW TO READ ADJUSTMENT CHART

(a) Mark on the graph the measurements taken from the vehicle.

Example:

Camber 0°40' (0.67°)
Caster 0°35' (0.58°)

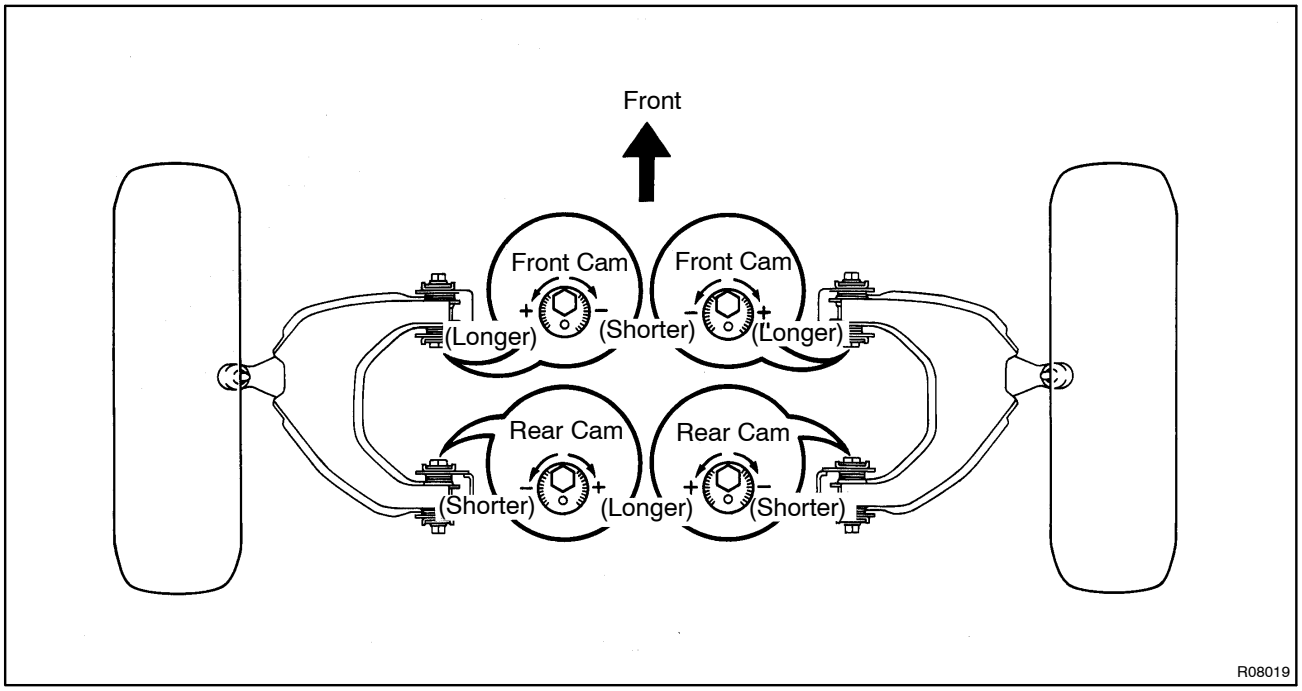


(b) As shown in the chart, read from the graph the amounts by which the from and/or rear cams are to be adjusted.

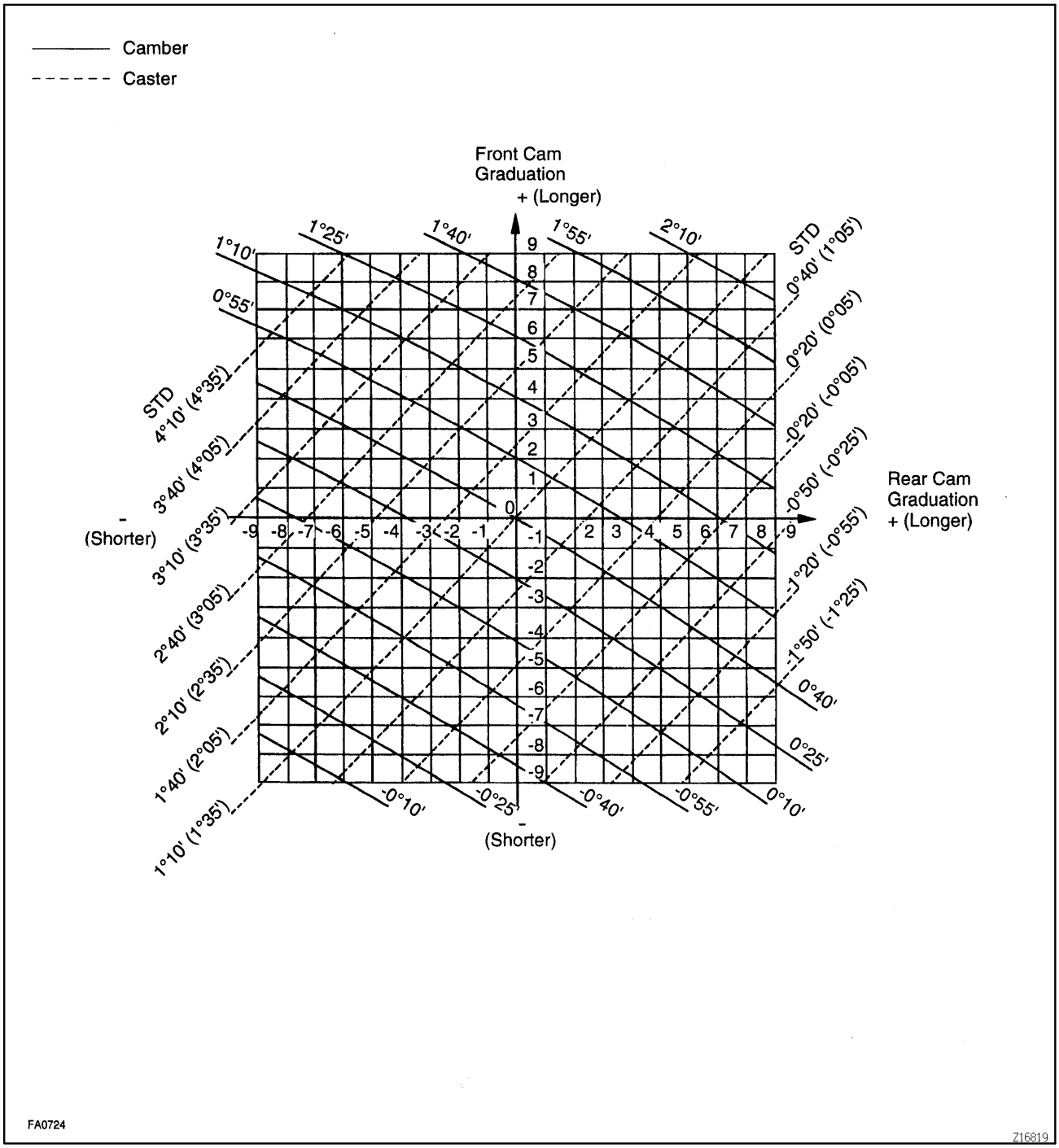
Amount to turn adjusting cam (by graduation):

Front cam –(Shorter) 1.8
Rear cam +(Longer) 3.1

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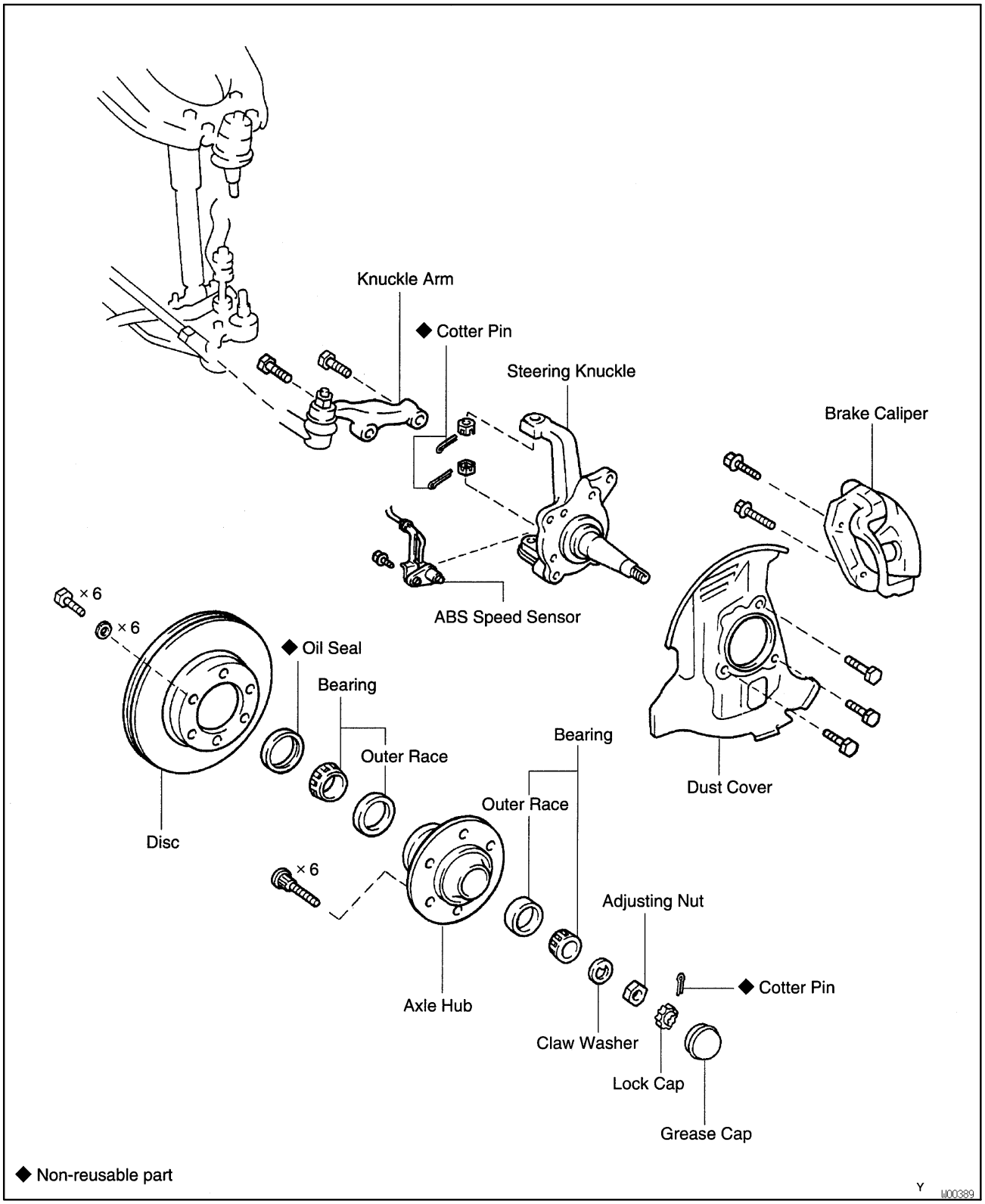


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FRONT AXLE HUB (2WD)

COMPONENTS

SA0FH–06



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SA0FI–01

REMOVAL

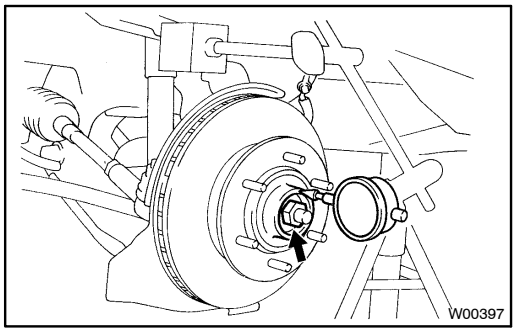
1. REMOVE FRONT WHEEL

2. w/ ABS:
DISCONNECT ABS SPEED SENSOR FROM STEERING KNUCKLE

3. REMOVE BRAKE CALIPER

(a) Remove the 2 brake caliper set bolts.

(b) Support the brake caliper securely.



4. CHECK AXLE HUB BEARING BACKLASH

(a) Remove the cap, cotter pin and lock cap.

(b) Using a dial indicator near the center of the axle hub and check the backlash in the bearing shaft direction.
Maximum: 0.05 mm (0.0020 in.)

If the backlash is not within the specification replace the bearing.

5. REMOVE AXLE HUB WITH DISC

(a) Using a 30 mm socket, remove the nut.

(b) Remove the axle hub with the disc together with the outer bearing from the steering knuckle.

NOTICE:

Be careful not to drop the outer bearing.

6. REMOVE OIL SEAL AND INNER BEARING

(a) Using a screwdriver, pry out the oil seal.

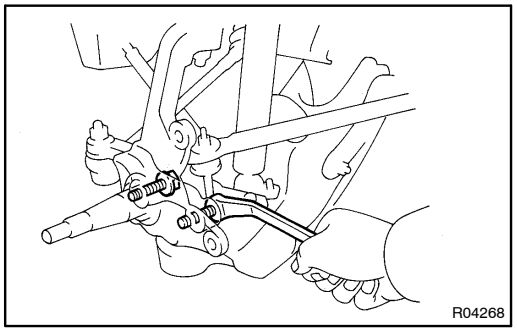
NOTICE:

Be careful not to damage the ABS speed sensor rotor.

(b) Remove the inner bearing from the axle hub.

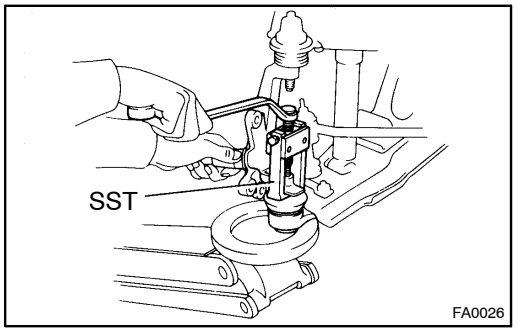
7. REMOVE DUST COVER

Remove the 3 bolts and dust cover.



8. DISCONNECT KNUCKLE ARM FROM STEERING KNUCKLE

Remove the 2 bolts and disconnect the knuckle arm from the steering knuckle.



9. REMOVE STEERING KNUCKLE

(a) Support the lower suspension arm with a jack.

(b) Remove the upper and lower cotter pins.

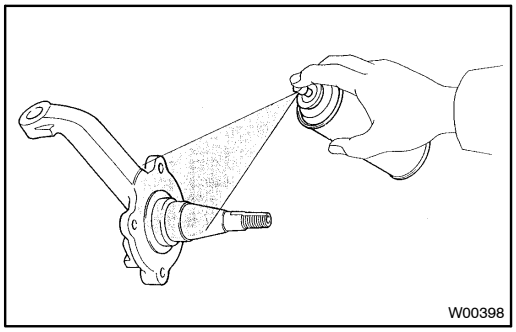
(c) Remove the upper and lower nuts.

(d) Using SST, disconnect the steering knuckle from the upper and lower ball joints.
SST 09628–62011

(e) Remove the steering knuckle.

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SA0FJ–01



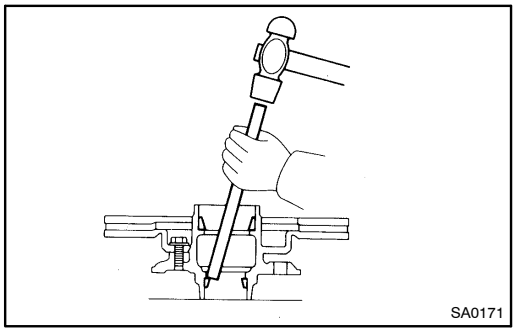
INSPECTION

INSPECT STEERING KNUCKLE

Using a dye penetrant, check the steering knuckle for cracks.

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SA0FK–01


SA0171

REPLACEMENT

1. INSPECT BEARINGS

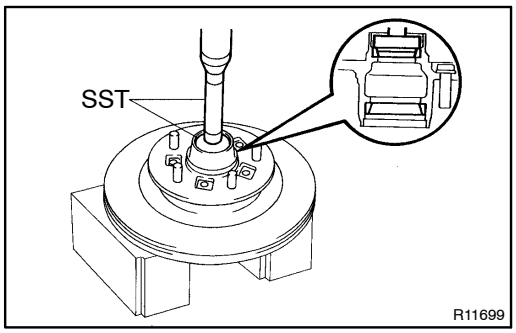
Clean the bearings and outer races and inspect them for wear or damage.

2. REPLACE BEARING OUTER RACES

(a) Using a brass bar and hammer, remove the inside and outside bearing outer races.

NOTICE:

Be careful not to damage the ABS speed sensor rotor.



R11699

(b) Using SST and a press, install a new outside bearing outer race.

SST 09950–60010 (09951–00480),
09950–70010 (09951–07150)

NOTICE:

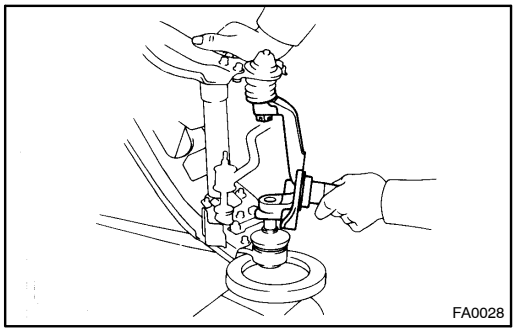
Be careful not to damage the ABS speed sensor rotor.

(c) Using SST and a press, install a new inside bearing outer race.

SST 09950–60020 (09951–00710),
09950–70010 (09951–07150)

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SA0FL–01


FA0028

INSTALLATION

1. INSTALL STEERING KNUCKLE

(a) Support the lower suspension arm with a jack.

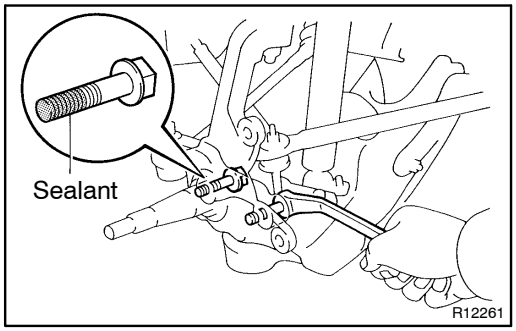
(b) Install the steering knuckle to the upper ball joint and nut.

(c) Push down the upper suspension arm and steering knuckle and install the steering knuckle to the lower ball joint and nut.

(d) Torque the upper ball joint nut.
Torque: 108 N·m (1,100 kgf·cm, 80 ft·lbf)

(e) Torque the lower ball joint nut.
Torque: 142 N·m (1,450 kgf·cm, 105 ft·lbf)

(f) Install 2 new cotter pins.



R12261

2. CONNECT KNUCKLE ARM AND TO STEERING KNUCKLE

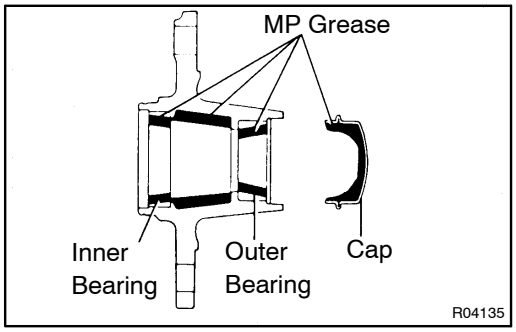
(a) Clean the threads of the bolts and steering knuckle with toluene or trichloroethylene.

(b) Apply sealant to the bolt threads.
Sealant:
Part No. 08833–00070, THREE BOND 1324 or equivalent.

(c) Tighten the 2 bolts.
Torque: 183 N·m (1,870 kgf·cm, 135 ft·lbf)

3. INSTALL DUST COVER

Install the 3 bolts and tighten them.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)



R04135

4. PACK BEARINGS WITH MP GREASE

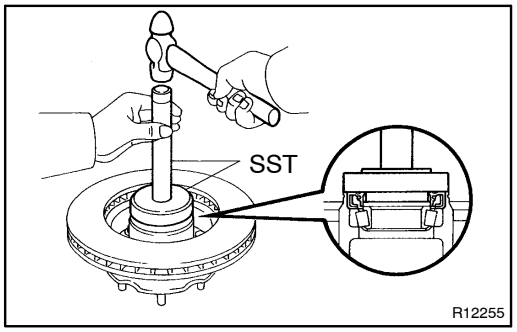
(a) Place MP grease in the palm of your hand.

(b) Pack grease into the bearing, continuing until the grease oozes out from the other side.

(c) Employ the same manner around the bearing circumference.

5. COAT INSIDE OF HUB AND CAP WITH MP GREASE

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6. INSTALL INNER BEARING AND OIL SEAL

(a) Place inner bearing into the axle hub.

(b) Using SST and a hammer, install a new oil seal into the hub.

SST 09950–60020 (09951–00710),
09950–70010 (09951–00150)

NOTICE:

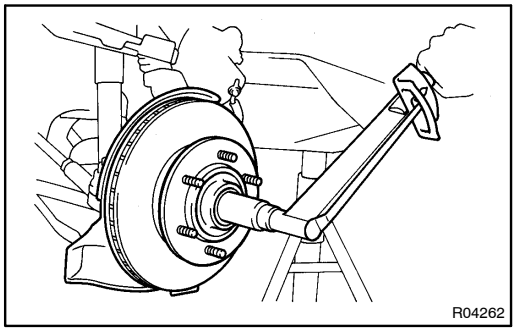
Be careful not to damage the ABS speed sensor rotor.

(c) Coat the oil seal lip with MP grease.

7. INSTALL AXLE HUB WITH DISC

(a) Place the axle hub on the spindle.

(b) Install the outer bearing and thrust washer.



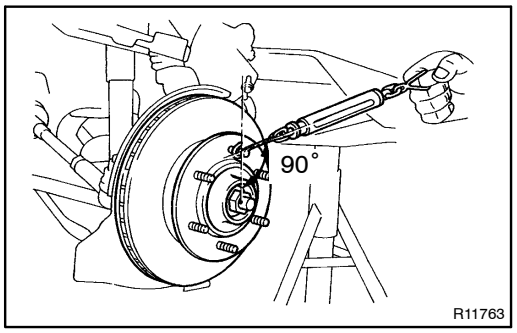
8. ADJUST PRELOAD

(a) Install and torque the nut.

Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

(b) Turn the hub several times to make the bearing more smoothly

(c) Loosen the nut until it can be turned by hand.

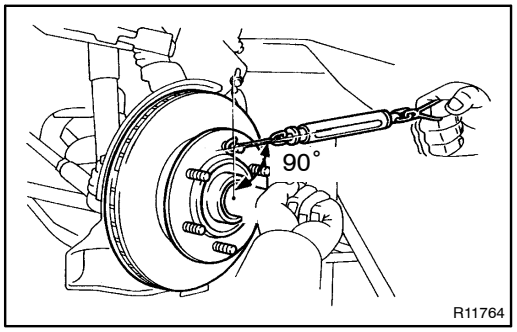


(d) Using a spring tension gauge, measure and make a note of the frictional force of the oil seal.

Preload (at starting): 4.0 N (0.4 kgf, 0.9 lbf) or less

HINT:

Make sure to check preload in the direction of rotation.



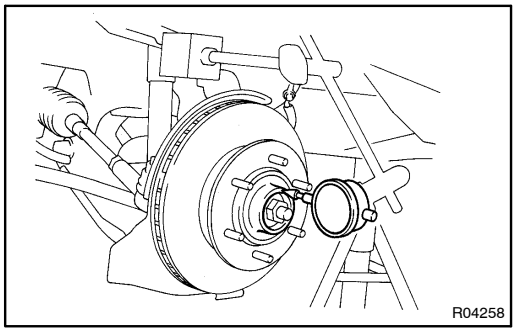
(e) Tighten the nut until the preload is within specification.

Preload (at starting) :
Frictional force plus
5.0 – 14.0 N (0.5 – 1.4 kgf, 1.1 – 3.1 lbf)

HINT:

Make sure to check preload in the direction of rotation.

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(f) Using a dial indicator, measure the hub bearing backlash.
Maximum: 0.05 mm (0.0020 in.)

9. INSTALL LOCK CAP, COTTER PIN AND GREASE CAP

(a) Install the lock cap and a new cotter pin.

(b) Install the grease cap.

10. INSTALL BRAKE CALIPER

Install the 2 brake caliper set bolts.
Torque: 108 N·m (1,100 kgf·cm, 80 ft·lbf)

11. w/ ABS:
CONNECT ABS SPEED SENSOR TO STEERING KNUCKLE
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

12. INSTALL FRONT WHEEL
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

13. CHECK FRONT WHEEL ALIGNMENT
(See page SA–7)

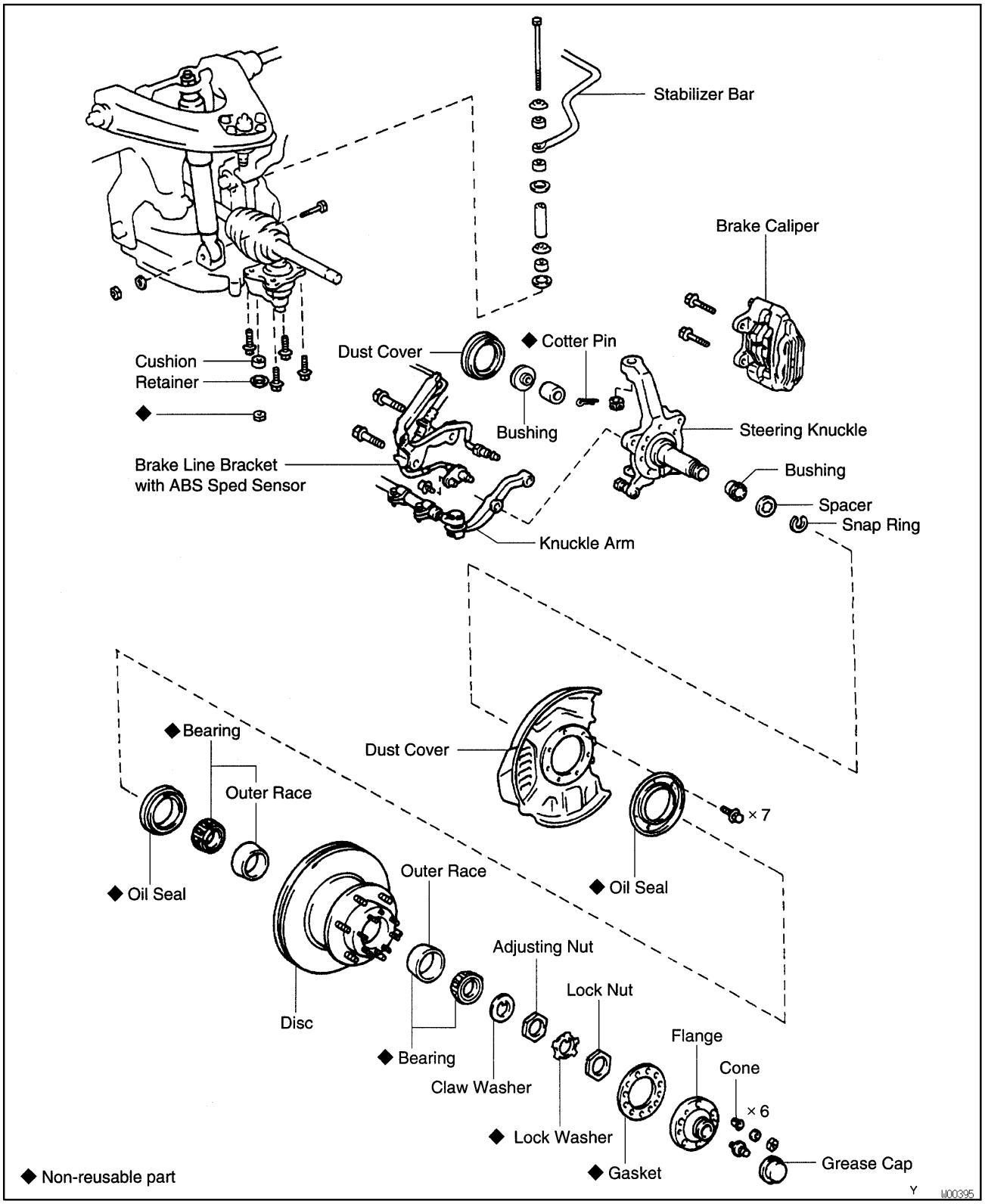
14. w/ ABS:
CHECK ABS SPEED SENSOR SIGNAL
(See page DI–321)

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FRONT AXLE HUB (4WD)

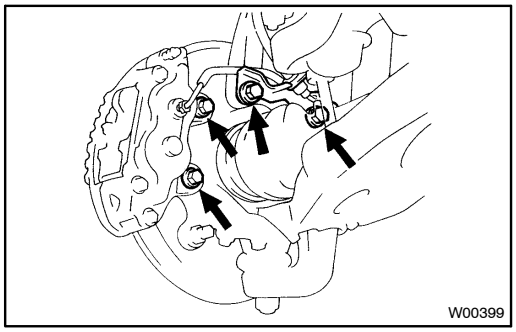
COMPONENTS

SA0FM–03



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SA0FN–01


W00399

REMOVAL

1. REMOVE FRONT WHEEL

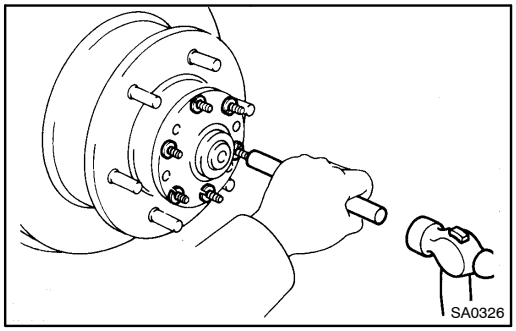
2. w/ ABS:
DISCONNECT ABS SPEED SENSOR FROM STEERING KNUCKLE

3. REMOVE BRAKE CALIPER

(a) Remove the 2 bolts and disconnect the knuckle arm with brake line bracket from the steering knuckle.

(b) Remove the 2 brake caliper set bolts.

(c) Support the brake caliper securely.


SA0326

4. REMOVE FLANGE

(a) Remove the grease cap from the flange.

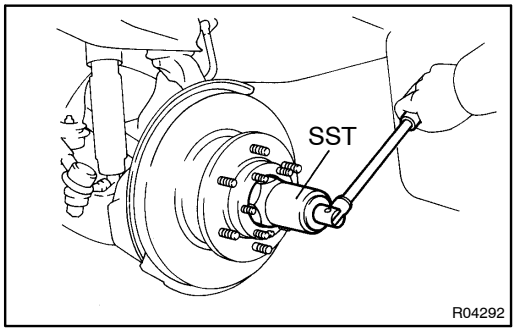
(b) Remove the bolt.

(c) Remove the 6 mounting nuts and washers.

(d) Using a brass bar and hammer, tap on the bolts head and remove the 6 cone washers.

(e) Install and tighten the 2 bolts and remove the flange.

(f) Remove the gasket.



R04292

5. REMOVE AXLE HUB WITH DISC

(a) Using a screwdriver, release the lock washer.

(b) Using SST, remove the lock nut.
SST 09607–60020

(c) Remove the lock washer and adjusting nut.

(d) Remove the claw washer.

(e) Remove the axle hub with the disc together with the outer bearing.

NOTICE:
Be careful not to damage the ABS speed sensor rotor.

6. REMOVE OIL SEAL AND INNER BEARING

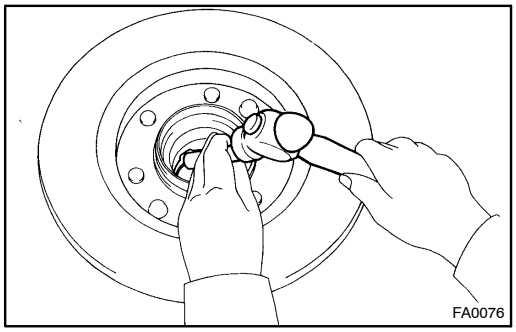
(a) Using a screwdriver, pry out the oil seal.

(b) Remove the inner bearing from the hub.

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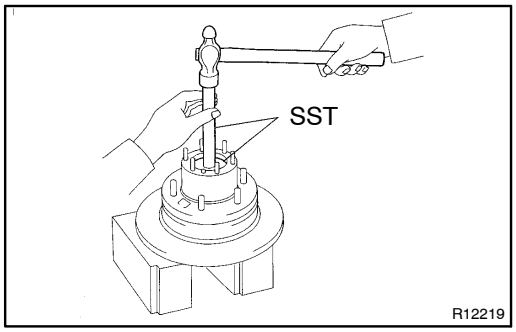
SA0FO–01

REPLACEMENT



1. INSPECT BEARINGS

Clean the bearings and outer races and inspect them for wear or damage.



2. REPLACE BEARING OUTER RACES

(a) Using a brass bar and hammer, remove the inside and outside outer bearing outer races.

NOTICE:

Be careful not to damage the ABS speed sensor rotor.

(b) Using SST and a hammer, install a new outside bearing outer race.

SST 09950–60020 (09951–00720),
09950–70010 (09951–07100)

(c) Using SST and a hammer, install a new inside bearing outer race.

SST 09950–60020 (09951–00810),
09950–70010 (09951–07150)

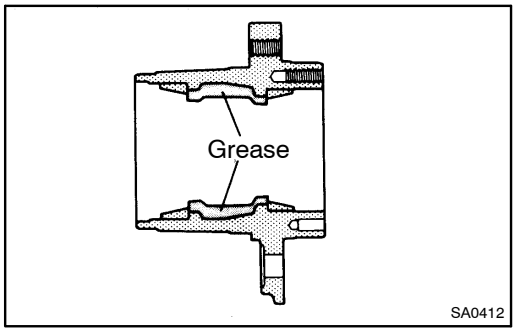
NOTICE:

Be careful not to damage the ABS speed sensor rotor.

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SA0FP–01

INSTALLATION



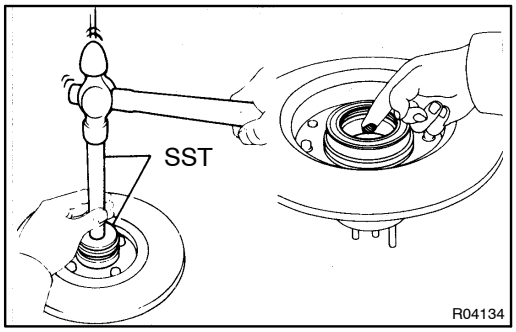
1. PACK BEARING WITH MP GREASE

(a) Place MP grease in the palm of your hand.

(b) Pack grease into the bearing, continuing until the grease oozes out from the other side.

(c) Employ the same manner around the bearing circumference.

2. COAT INSIDE OF HUB WITH MP GREASE



3. INSTALL INNER BEARING AND OIL SEAL

(a) Place the inner bearing into the hub.

(b) Using SST and a hammer, install a new oil seal into the hub.

SST 09950–60020 (09951–00910),
09950–70010 (09951–07100)

NOTICE:

Be careful not to damage the ABS speed sensor rotor.

(c) Coat the oil seal lip with MP grease.

4. INSTALL AXLE HUB TO STEERING KNUCKLE

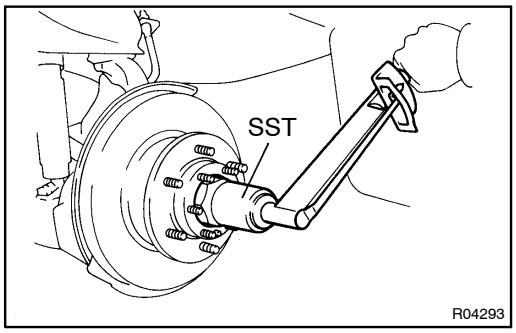
(a) Place the axle hub to the steering knuckle.

NOTICE:

Be careful not to damage the ABS speed sensor rotor.

(b) Install the outer bearing.

(c) Install the claw washer.



5. ADJUST PRELOAD

(a) Using SST, torque the adjusting nut.

SST 09607–60020

Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)

(b) Snug down the bearing by turning the hub several times.

(c) Using SST, loosen the nut until it can be turned by hand.

SST 09607–60020

(d) Using SST, retighten the adjusting nut.

SST 09607–60020

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(e) Check that the bearing has no play.

6. INSTALL LOCK WASHER AND LOCK NUT

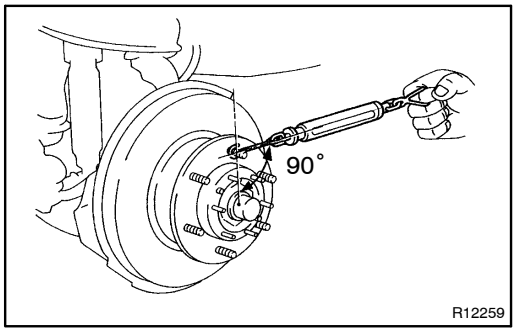
(a) Install a new lock washer and lock nut.

(b) Using SST, torque the lock nut.

SST 09607–60020

Torque: 47 N·m (480 kgf·cm, 35 ft·lbf)

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(c) Using a spring tension gauge, check the preload.
Preload (starting) :
25 – 53 N (2.6 – 5.4 kgf, 5.7 –11.9 lbf)

HINT:
Make sure to check preload in the direction of rotation.
If the preload is not within the specification, adjust it again with the adjusting nut.

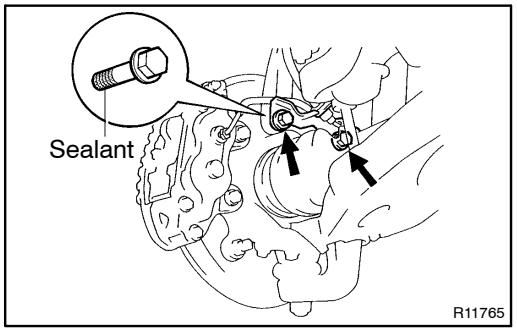
(d) Secure the lock nut by bending one of the lock washer teeth inward and the other lock washer teeth outward.

7. INSTALL FLANGE

(a) Place a new gasket in position on the axle hub.
(b) Install the flange to the axle hub.
(c) Install 6 cone washers, plate washers and nuts.
(d) Torque the 6 nuts.
Torque: 31 N·m (315 kgf·cm, 23 ft·lbf)
(e) Install the bolt and grease cap.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

8. INSTALL BRAKE CALIPER

(a) Install the brake caliper to the steering knuckle.
(b) Torque the 2 bolts.
Torque: 123 N·m (1,250 kgf·cm, 90 ft·lbf)



9. CONNECT KNUCKLE ARM TO STEERING KNUCKLE

(a) Clean the threads of the bolts and steering knuckle with toluene or trichloroethylene.
(b) Apply sealant to the bolt threads.
Sealant:
Part No. 08833–00070, THREE BOND 1324 or equivalent.
(c) Connect the knuckle arm with brake line bracket to the steering knuckle and torque the bolts.
Torque: 183 N·m (1,870 kgf·cm, 135 ft·lbf)

10. w/ ABS:
CONNECT ABS SPEED SENSOR TO STEERING KNUCKLE
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

11. INSTALL FRONT WHEEL
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

12. w/ ABS:
CHECK ABS SPEED SENSOR SIGNAL
(See page DI–321)

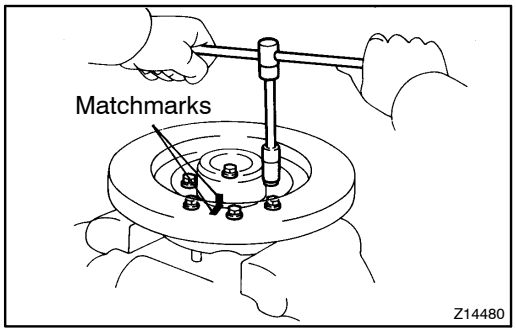
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FRONT WHEEL HUB BOLT (2WD)

SA0FQ–01

REPLACEMENT

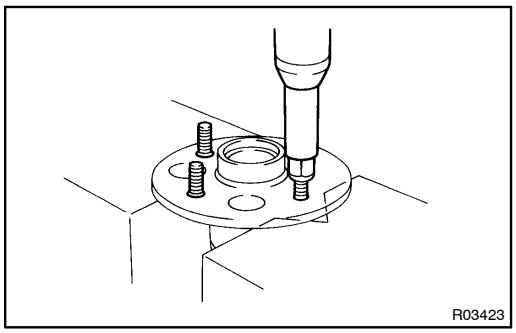
1. REMOVE FRONT WHEEL
2. REMOVE AXLE HUB WITH DISC (See page SA–16)



3. REMOVE HUB BOLT

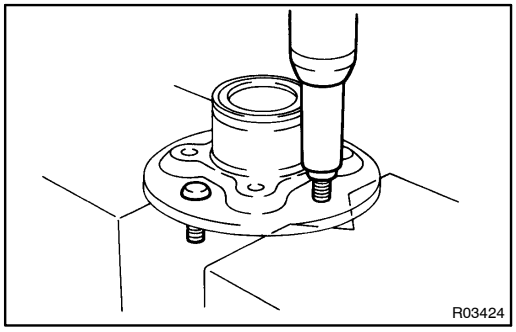
(a) Place matchmarks on the disc and axle hub.

(b) Remove the 6 bolts, washers and separate the disc and axle hub.



(c) Install the nut to the axle hub bolt.

(d) Using an extension bar and press, remove the hub bolt.



4. INSTALL HUB BOLT

(a) Using an extension bar and press, install the hub bolt.

(b) Align the matchmarks and install the axle hub to the disc with the 6 washers and bolts.

Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

5. INSTALL AXLE HUB WITH DISC (See page SA–19)
6. INSTALL FRONT WHEEL

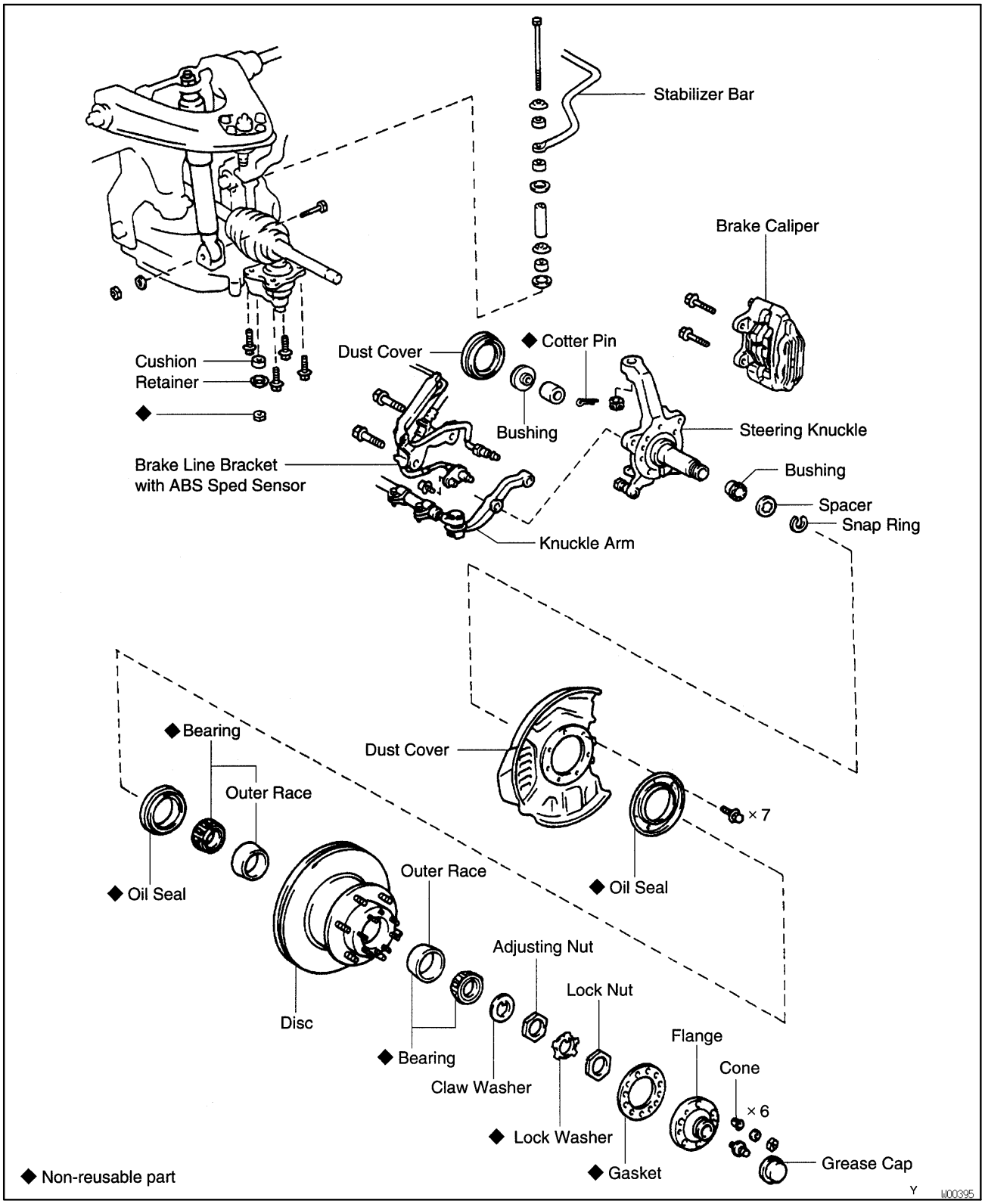
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

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STEERING KNUCKLE (4WD)

COMPONENTS

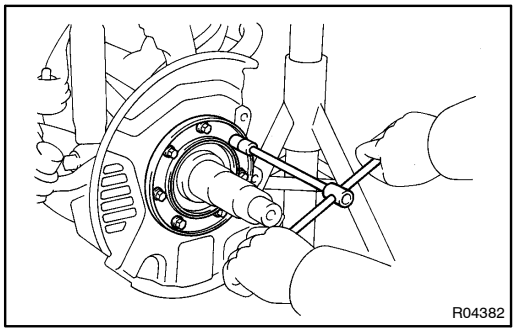
SA0FR–02



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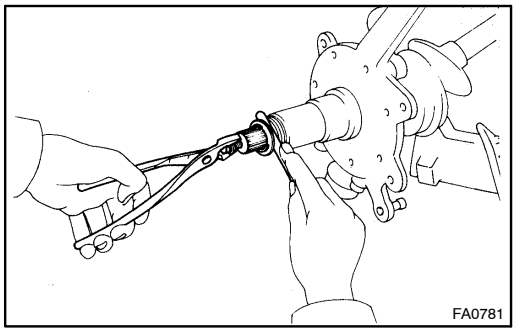
SA0FS–01

REMOVAL


R04382

1. REMOVE BRAKE CALIPER AND FRONT AXLE HUB (See page SA–23)

2. REMOVE DUST COVER AND OIL SEAL


FA0781

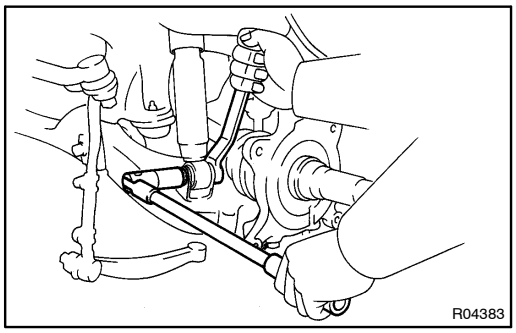
3. MEASURE STEERING KNUCKLE BUSHING THRUST CLEARANCE

(a) Install a bolt in the drive shaft.

(b) Using a feeler gauge, measure the drive shaft thrust clearance between the steering knuckle outside bushing and spacer, by pulling the bolt and applying a load of 98 N (10 kgf, 22.0 lbf).

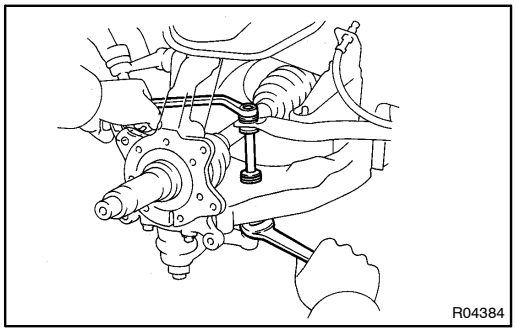
Front drive shaft thrust clearance:
Standard: 0.10 – 0.50 mm (0.0039 – 0.0197 in.)
Maximum: 1.0 mm (0.039 in.)

If the thrust clearance than the maximum, replace the steering knuckle outside and inside bushings.


R04383

4. DISCONNECT FRONT SHOCK ABSORBER FROM LOWER SUSPENSION ARM

Remove the nut, washer, bolt and shock absorber from the lower suspension arm.

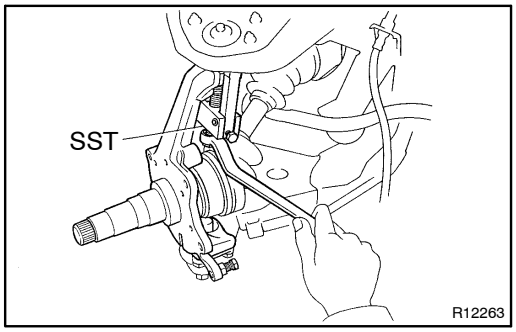

R04384

5. DISCONNECT STABILIZER BAR FROM LOWER SUSPENSION ARM

(a) Remove the nut, bolt, 5 retainers, 4 cushions and collar.

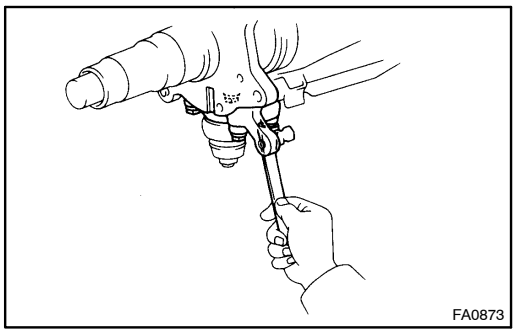
(b) Disconnect the stabilizer bar from the lower suspension arm.

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6. REMOVE STEERING KNUCKLE

(a) Using snap ring pliers, remove the snap ring and spacer.
(b) Support the lower suspension arm with a jack.
(c) Remove the cotter pin and nut from the upper ball joint.
(d) Using SST, disconnect the steering knuckle from the upper ball joint.
SST 09628–62011

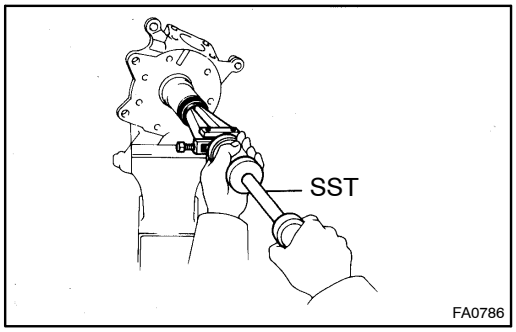


(e) Remove the 4 bolts from the lower ball joint and disconnect the steering knuckle from the lower ball joint.
(f) Push down the lower suspension arm and remove the steering knuckle.

NOTICE:
Be careful not to damage the oil seal and boot.

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SA0FT–01



DISASSEMBLY

1. REMOVE DUST COVER

Using a screwdriver and hammer, remove the dust cover from the steering knuckle.

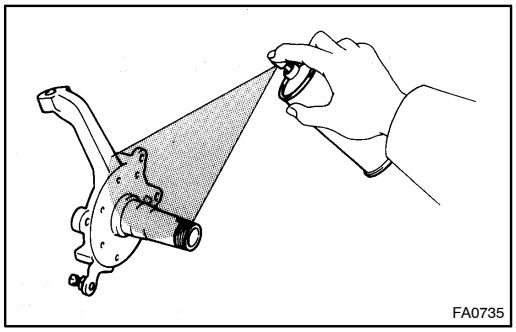
2. REMOVE STEERING KNUCKLE BUSHING

(a) Using SST, remove the steering knuckle outside bushing.
SST 09308–00010

(b) Using a brass bar and hammer, remove the steering knuckle needle roller bearing and inside bushing.

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SA0FU–01


FA0735

INSPECTION

INSPECT STEERING KNUCKLE

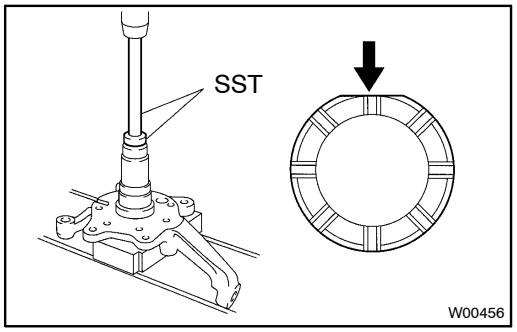
Using a dye penetrant, check the steering knuckle for cracks.

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SA0FV–02

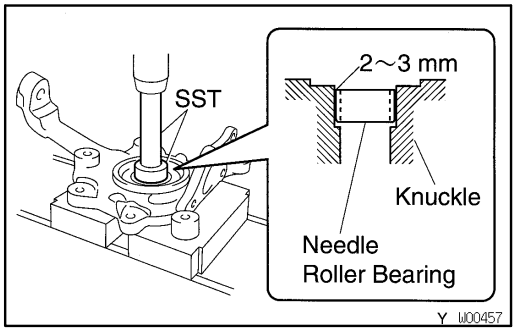
REASSEMBLY

1. INSTALL STEERING KNUCKLE BUSHING



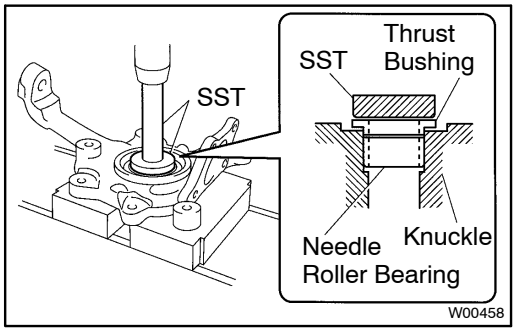
(a) Using SST and a press, install a new steering knuckle outside bushing.
SST 09950–60010 (09951–00360),
09950–70010 (09951–07150)

HINT:
When installing the bushing to the spindle, make sure the flat portion of the bushing is aligned with the spindle groove, as shown in the illustration.



(b) Using SST and a press, install a new needle roller bearing, as shown in the illustration.
SST 09950–60010 (09951–00360),
09950–70010 (09951–07150)

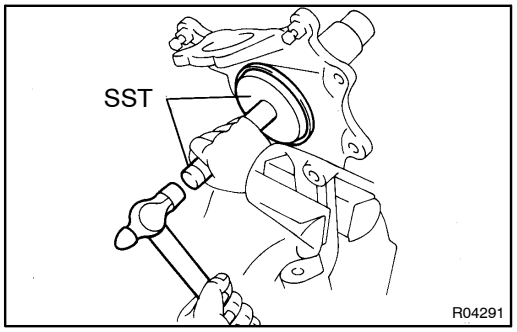
HINT:
- Bearing must be installed with flat side which has I.D. and part number facing outward.
- Press the bearing in until the top surface of the bearing is in approx. 2 – 3 mm (0.08 – 0.12 in.) inside the knuckle surface.



(c) Using SST and a press, install a new thrust bushing.
SST 09950–60010 (09951–00500),
09950–70010 (09951–07150)

(d) Apply synthetic oil and lithium soap base chassis grease, NLGI No.1 to the steering knuckle inner side of thrust bushing.

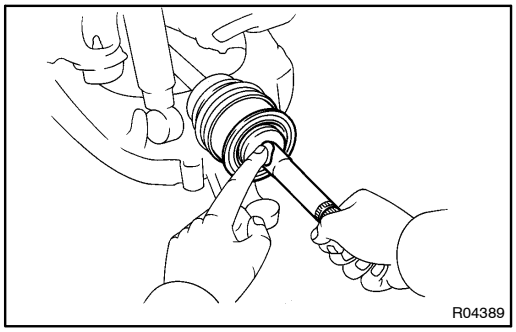
2. INSTALL DUST DEFLECTOR TO STEERING KNUCKLE



Using SST and a hammer, install a new dust deflector.
SST 09950–60020 (09951–00910),
09950–70010 (09951–07150)

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SA0FW–02


R04389

INSTALLATION

1. INSTALL STEERING KNUCKLE

(a) Apply synthetic oil and lithium soap base chassis grease, NLGI No.1 to the drive shaft.

(b) Push down the lower suspension arm and install the steering knuckle.

NOTICE:

Be careful not to damage the oil seal and boot.

(c) Connect the lower ball joint to the steering knuckle, install and torque the nut.

Torque: 142 N·m (1,450 kgf·cm, 105 ft·lbf)

(d) Install a new cotter pin.

(e) Connect the upper ball joint to the steering knuckle, install and torque the 4 nuts.

Torque: 142 N·m (1,450 kgf·cm, 105 ft·lbf)

(f) Install a new cotter pin.

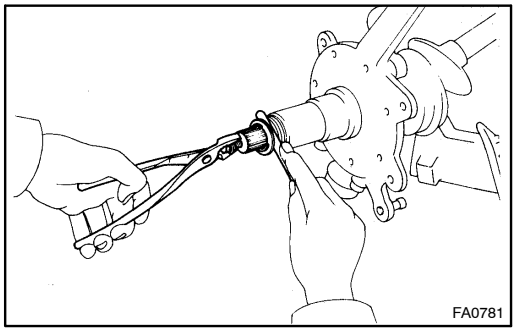
(g) Install the spacer to the drive shaft.

(h) Using snap ring pliers, install the snap ring.

NOTICE:

If you replace the steering knuckle bushing, recheck the drive shaft thrust clearance.

(i) Install the bolt in the drive shaft.


FA0781

(j) Using a feeler gauge, measure the drive shaft thrust clearance between the steering knuckle outside bushing and spacer, by pulling the bolt and applying a load of 98 N (10 kgf, 22.0 lbf).

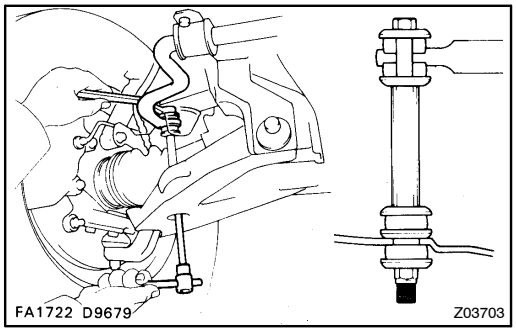
Front drive shaft thrust clearance:

Standard: 0.10 – 0.50 mm (0.0039 – 0.0197 in.)

If the clearance is not within specification, replace the spacer.

Spacer thickness

1.80 mm (0.0709 in.)	2.25 mm (0.0886 in.)


FA1722 D9679 Z03703

2. CONNECT STABILIZER BAR TO LOWER SUSPENSION ARM

(a) Connect the stabilizer bar to the lower suspension arm with the bolt, 5 retainers, 4 cushions, collar and a new nut, as shown in the illustration.

(b) Torque the nut.

Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)

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3. CONNECT FRONT SHOCK ABSORBER TO LOWER SUSPENSION ARM

Install the shock absorber, bolt, washer and nut to the lower suspension arm.

Torque: 137 N·m (1,400 kgf·cm, 101 ft·lbf)

4. INSTALL DUST COVER AND NEW OIL SEAL

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

5. INSTALL FRONT AXLE HUB AND BRAKE CALIPER

(See page SA–25)

6. CHECK FRONT WHEEL ALIGNMENT

(See page SA–10)

7. w/ ABS:

CHECK ABS SPEED SENSOR SIGNAL

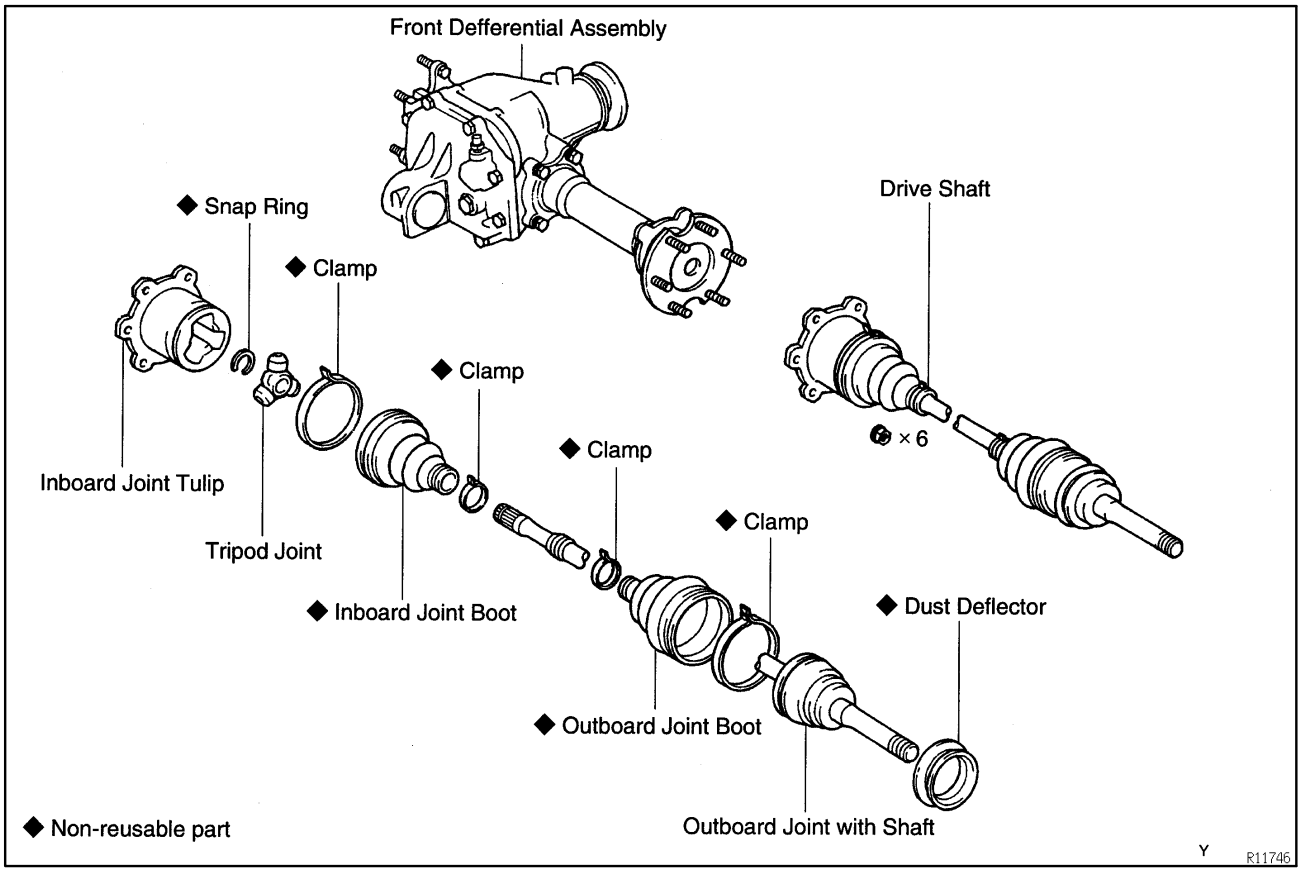
(See page DI–321)

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FRONT DRIVE SHAFT (4WD)

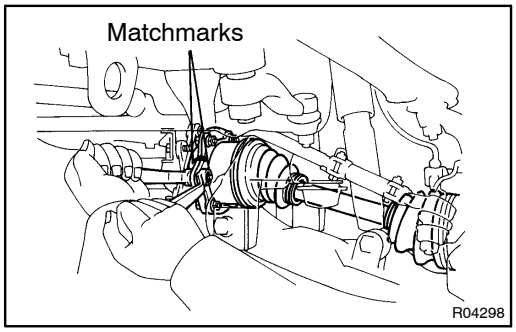
COMPONENTS

SA0FX–02



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SA0FY–01



REMOVAL

1. LOOSEN NUTS HOLDING FRONT DRIVE SHAFT

(a) Place matchmarks on the inboard joint tulip and side gear shaft.

(b) Loosen the 6 nuts, with depressing the brake pedal.
Torque: 83 N·m (845 kgf·cm, 61 ft·lbf)

2. REMOVE FLANGE (See page SA–23)

3. REMOVE SNAP RING AND SPACER

Using a snap ring expander, remove the snap ring from the drive shaft.

4. REMOVE FRONT DRIVE SHAFT

First pull the drive shaft inboard joint tulip from the side gear shaft and then pull it out from the steering knuckle.

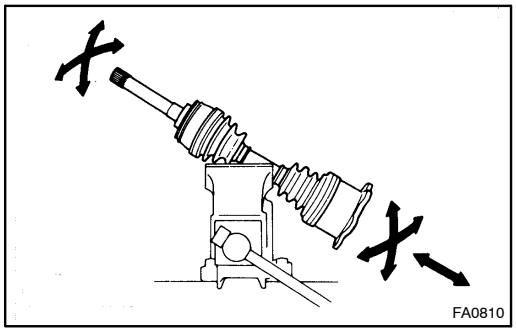
NOTICE:

Be careful not to damage the oil seal and boot.

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SA0FZ–02

DISASSEMBLY


FA0810

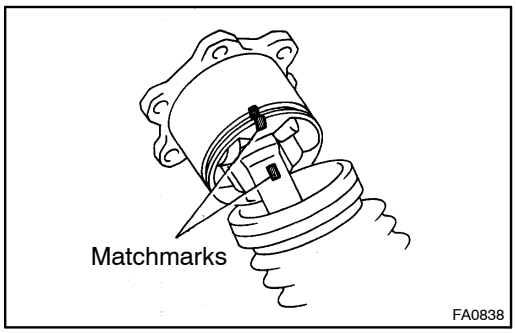
1. CHECK DRIVE SHAFT

(a) Check to see there is no play in the inboard and outboard joints.

(b) Check to see that the inboard joint slides smoothly in the thrust direction.

(c) Check to see that there is no obvious play in the radial direction of the universal joints.

(d) Check the boot for damage.



FA0838

2. REMOVE INBOARD AND OUTBOARD JOINT BOOT CLAMPS

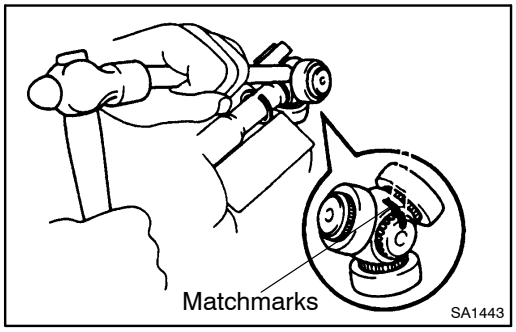
(a) Using a screwdriver, remove the 4 boot clamps.

(b) Slide the inboard joint boot toward the outboard joint.

3. DISASSEMBLE INBOARD JOINT TULIP

(a) Place matchmarks on the inboard joint tulip and drive shaft.

(b) Remove the inboard joint tulip from the drive shaft.



SA1443

4. DISASSEMBLE TRIPOD

(a) Using a snap ring expander, remove the snap ring.

(b) Place matchmarks on the shaft and tripod.

(c) Using a brass bar and hammer, remove the tripod from the drive shaft.

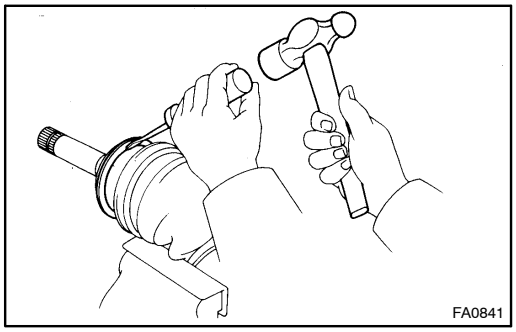
NOTICE:

Do not tap the roller.

5. REMOVE INBOARD AND OUTBOARD JOINT BOOT CLAMPS AND BOOTS

NOTICE:

Do not disassemble the outboard joint.


FA0841

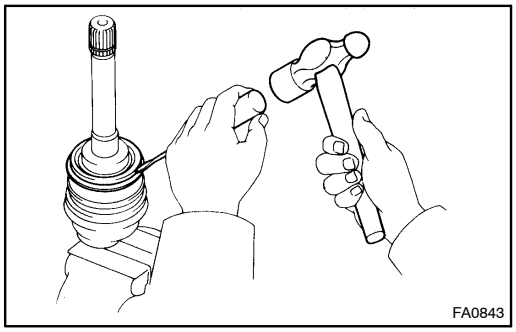
6. REMOVE DUST DEFLECTOR

Using a screwdriver and hammer, remove the dust deflector.

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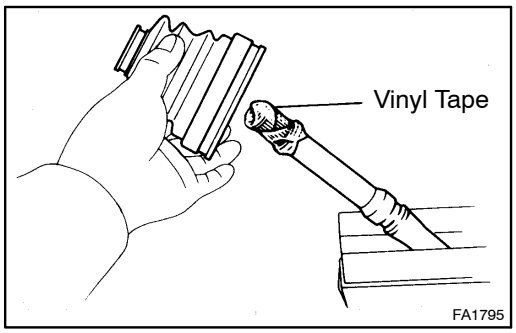
SA0G0–02

REASSEMBLY



1. INSTALL DUST DEFLECTOR

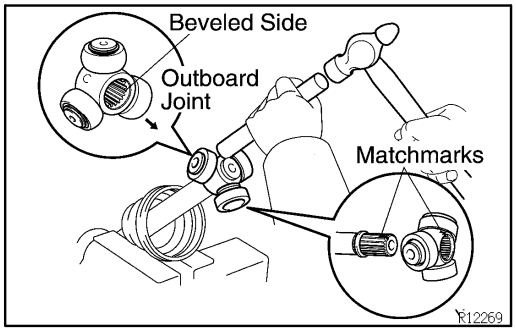
Using a screwdriver and hammer, install a new dust deflector.



2. TEMPORARILY INSTALL NEW INBOARD AND OUTBOARD BOOTS AND NEW BOOT CLAMPS

HINT:

Before installing the boots, wrap vinyl tape around the spline of the drive shaft to prevent the boots from being damaged.



3. INSTALL TRIPOD

(a) Place the beveled side of the tripod axial spline toward the outboard joint.

(b) Align the matchmarks placed before disassembly.

(c) Using a brass bar and hammer, tap the tripod onto the drive shaft.

NOTICE:

Do not tap the roller

(d) Using a snap ring expander, install a new snap ring.

4. ASSEMBLE BOOT TO OUTBOARD JOINT

Before assembling the boot, coat the outboard joint and boot with grease in the boot kit.

Grease capacity:

176 – 186 g (6.21 – 6.56 oz.)

5. ASSEMBLE INBOARD JOINT TO INBOARD JOINT TULIP

(a) Coat the inboard joint tulip and boot with grease in the boot kit.

Grease capacity:

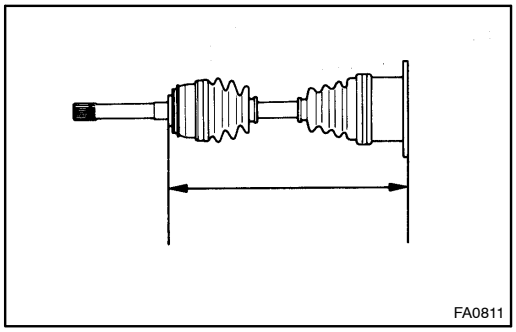
270 – 280 g (9.52 – 9.88 oz.)

(b) Align the matchmarks placed before disassembly.

(c) Install the inboard tulip to the drive shaft.

(d) Temporarily install the boot to the inboard tulip.

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FA0811

6. ASSEMBLE NEW BOOT CLAMPS TO BOTH BOOTS

(a) Make sure the 2 boots are on the shaft groove.

(b) Make sure that the 2 boots are not stretched or contracted when the drive shaft is at standard length.

Standard length:

481.2 – 491.2 mm (18.945 – 19.339 in.)

(c) Using a screwdriver, bend the clamp and lock with a screwdriver.

7. CHECK DRIVE SHAFT (See page SA–38)

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SA0G1–01

INSTALLATION

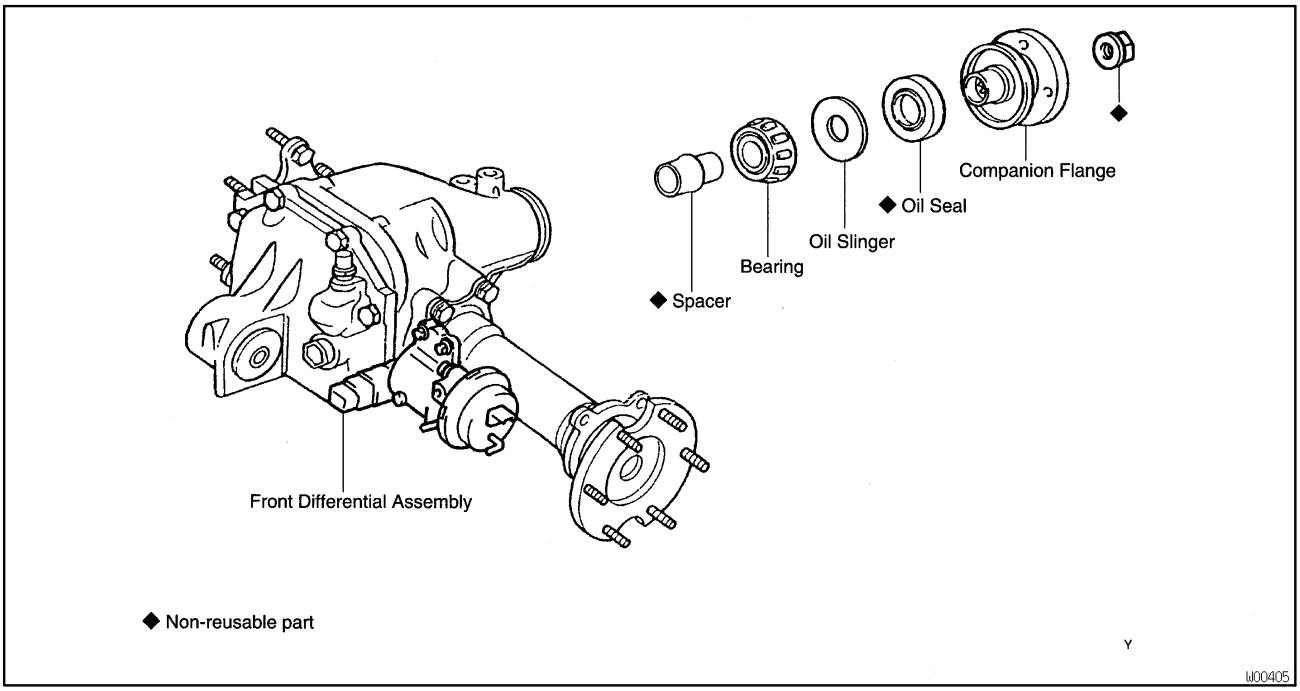
Installation is in the reverse order of removal (See page SA–37).
AFTER INSTALLATION, CHECK FRONT WHEEL ALIGNMENT (See page SA–10)

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FRONT DIFFERENTIAL REAR OIL SEAL (4WD)

SA0G2–02

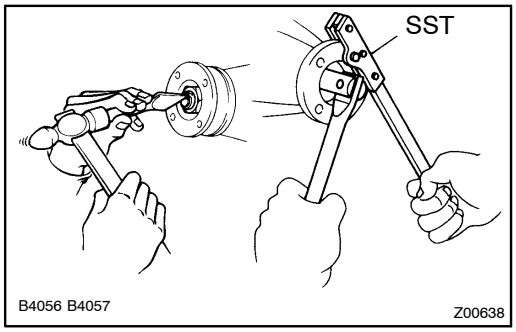
COMPONENTS



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SA0G3–02

REPLACEMENT



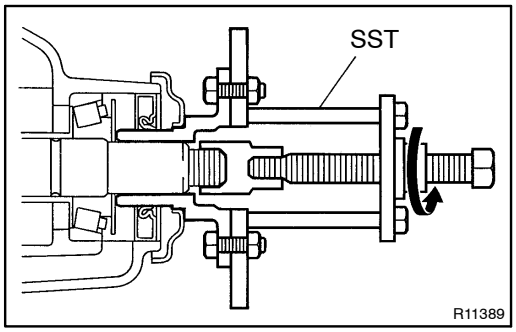
1. REMOVE ENGINE UNDER COVER

2. REMOVE FRONT PROPELLER SHAFT
(See page PR–11)

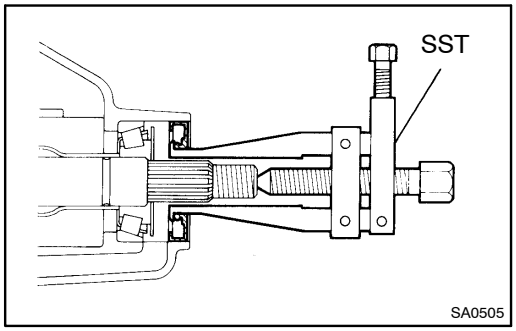
3. REMOVE COMPANION FLANGE

(a) Using a chisel and hammer, loosen the staked part of the nut.

(b) Using SST to hold the flange, remove the nut.
SST 09330–00021



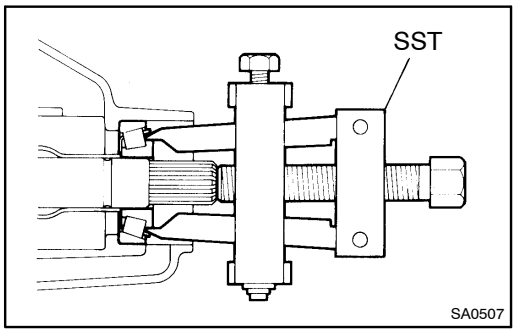
(c) Using SST, remove the companion flange.
SST 09950–30010



4. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal.
SST 09308–10010

(b) Remove the oil slinger.



5. REMOVE REAR BEARING AND BEARING SPACER

(a) Using SST, remove the rear bearing from the drive pinion.
SST 09556–22010

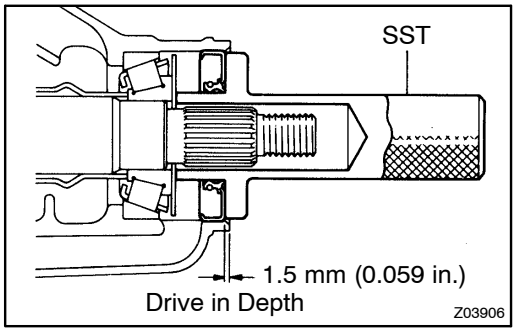
(b) Remove the bearing spacer.

6. INSTALL BEARING SPACER, REAR BEARING AND OIL SLINGER

(a) Install a new bearing spacer.

(b) Install the rear bearing.

(c) Install the oil slinger.

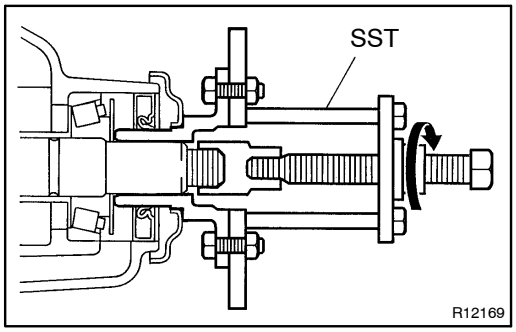


7. INSTALL OIL SEAL

(a) Using SST and a hammer, install a new oil seal.
SST 09554–30011
Oil seal drive in depth: 1.5 mm (0.059 in.)

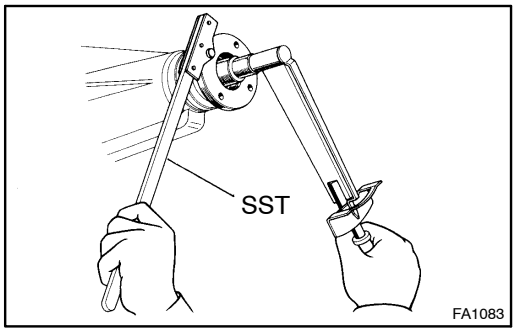
(b) Apply MP grease to the oil seal lip.

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8. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange on the drive pinion.
SST 09950–30010



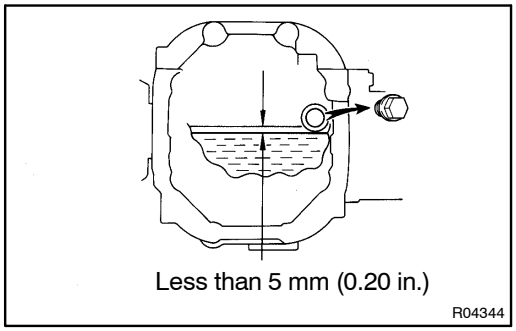
(b) Apply light coat of hypoid gear oil on threads of a new companion flange nut.

(c) Using SST to hold the flange, torque the nut.
SST 09330–00021
Torque: 108 N·m (1,100 kgf·cm, 80 ft·lbf)

9. ADJUST DRIVE PINION PRELOAD
(See page SA–57)

10. STAKE DRIVE PINION NUT

11. INSTALL FRONT PROPELLER SHAFT
(See page PR–16)



12. FILL DIFFERENTIAL WITH HYPOID GEAR OIL
Torque:
Drain plug: 49 N·m (500 kgf·cm, 36 ft·lbf)
Filler plug: 39 N·m (400 kgf·cm, 29 ft·lbf)
Oil type: Hypoid gear oil API GL–5
Recommended oil viscosity: SAE 75W–90
Capacity: 1.86 liters (1.97 US qts, 1.64 Imp. qts)

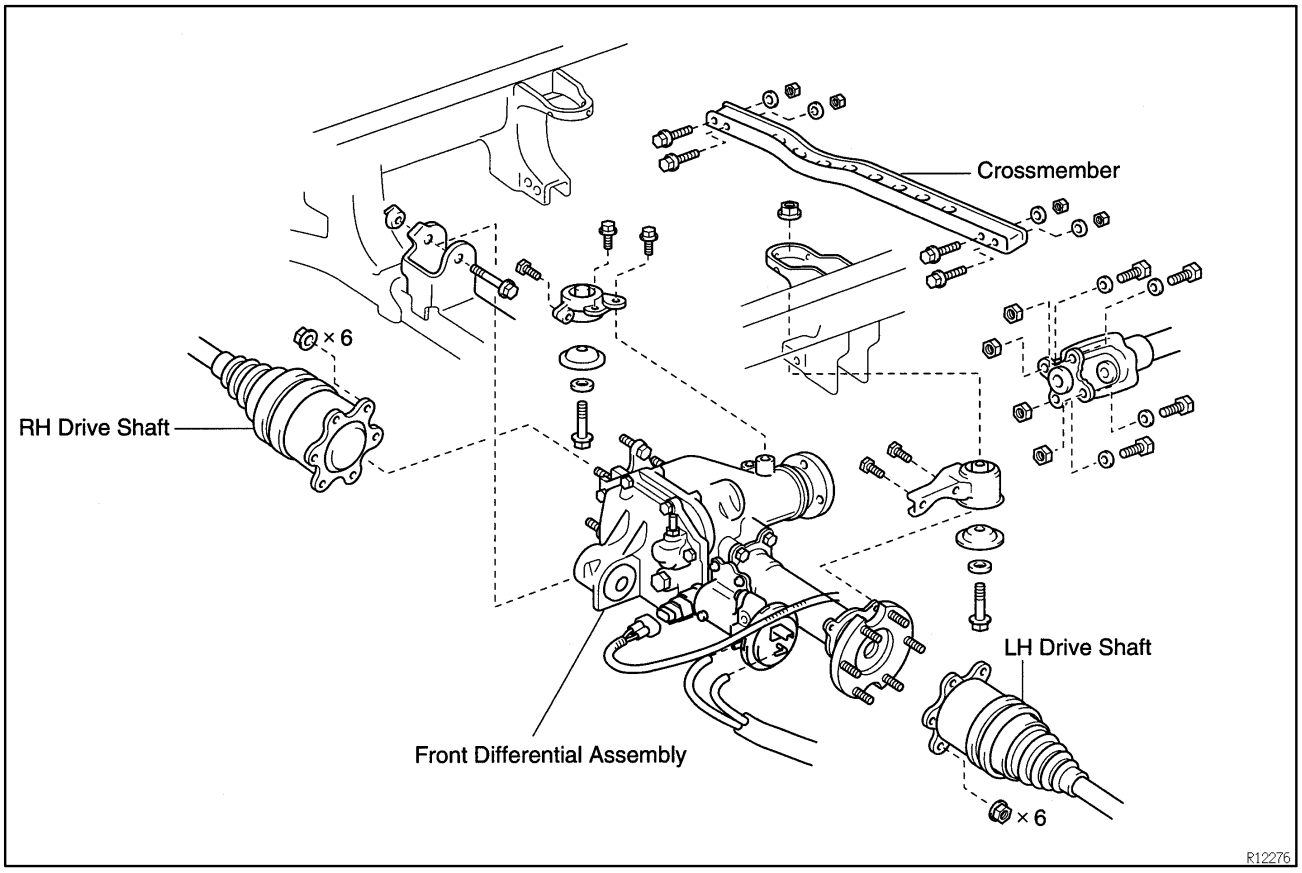
13. INSTALL ENGINE UNDER COVER

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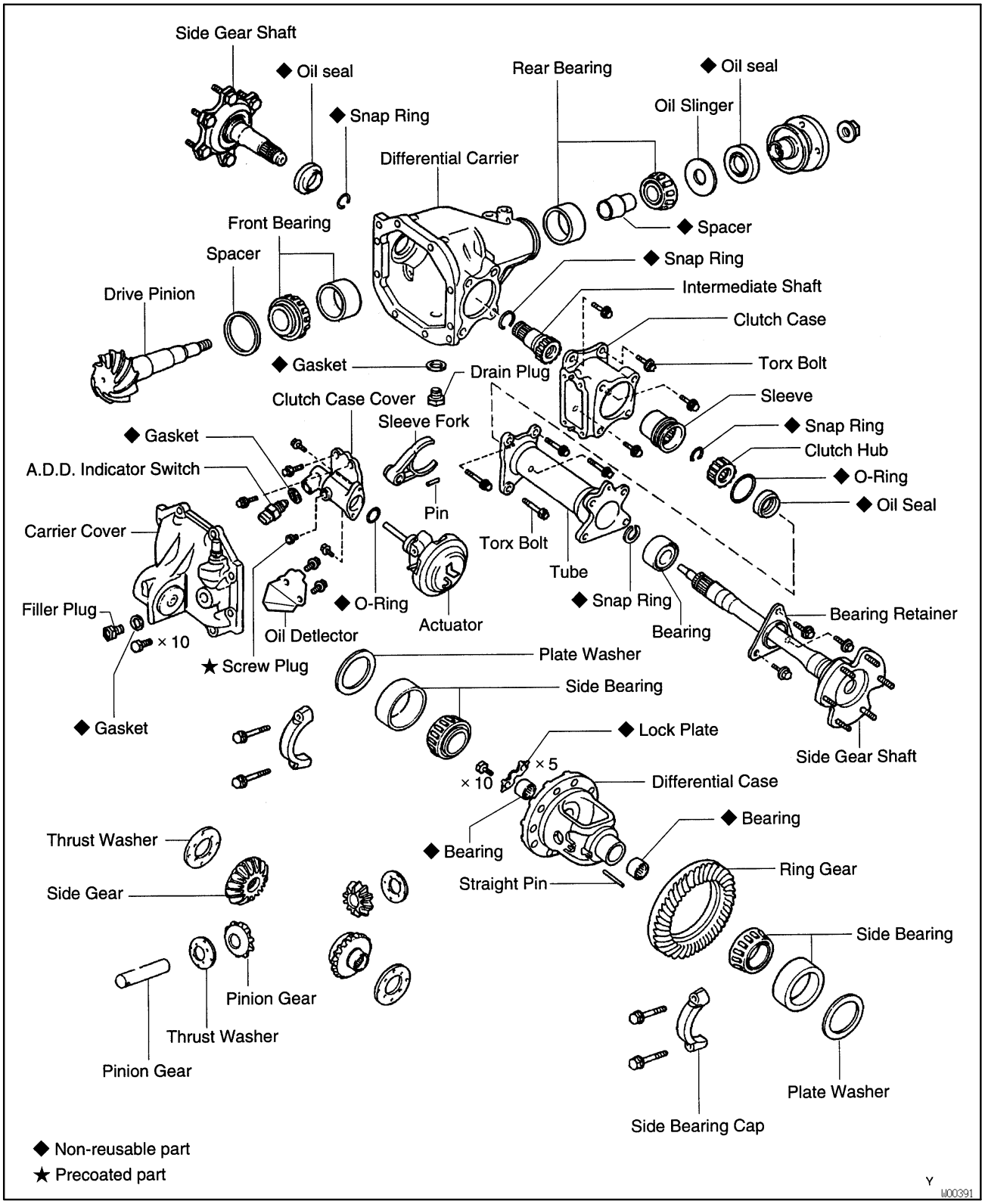
FRONT DIFFERENTIAL CARRIER (4WD)

COMPONENTS

SA0G4–03



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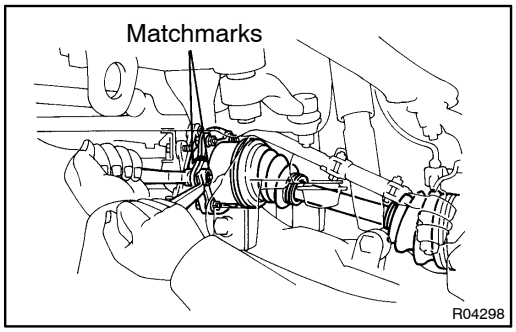


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SA0G5–01

REMOVAL

1. **REMOVE ENGINE UNDER COVER AND DRAIN HYPOID GEAR OIL**
2. **REMOVE FRONT PROPELLER SHAFT**
   (See page PR–11)



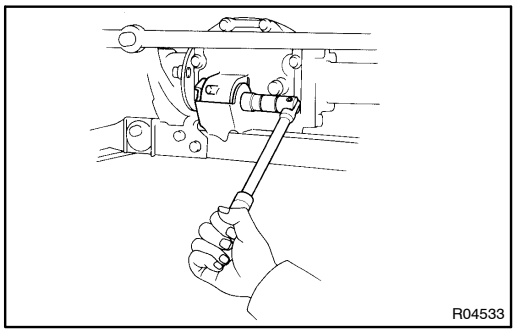
3. **REMOVE DRIVE SHAFT NUTS**

(a) Place matchmarks on the drive shaft and side gear shaft, and remove the 6 nuts holding the drive shaft and side gear shaft.
Torque: 83 N·m (845 kgf·cm, 61 ft·lbf)

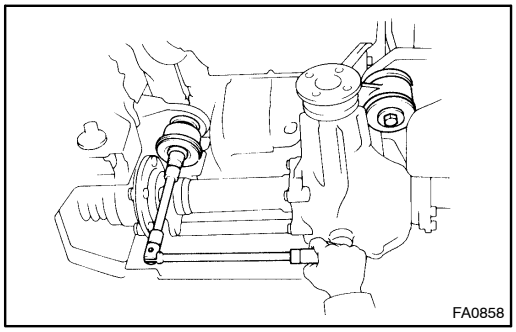
(b) Employ the same manner described above to the other side.

4. **DISCONNECT VACUUM HOSES AND 4WD INDICATOR SWITCH CONNECTOR**
5. **REMOVE CROSSMEMBER**

Remove the 4 nuts, washers, bolts and crossmember.
Torque: 126 N·m (1,280 kgf·cm, 93 ft·lbf)



6. **REMOVE DIFFERENTIAL FRONT MOUNTING BOLT AND NUT**
Torque: 147 N·m (1,500 kgf·cm, 108 ft·lbf)



7. **REMOVE FRONT DIFFERENTIAL ASSEMBLY**

(a) Support the front differential with a jack.

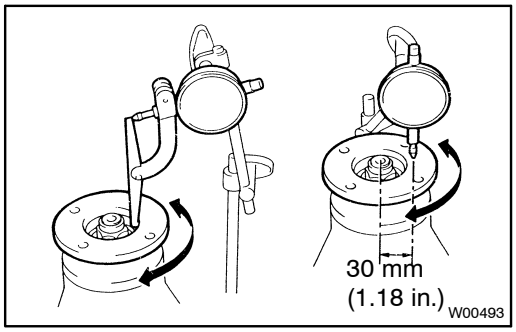
(b) Remove the left and right rear mounting bolts.
Torque: 167 N·m (1,700 kgf·cm, 123 ft·lbf)

(c) Lower the jack and remove the front differential assembly.

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SA258–01

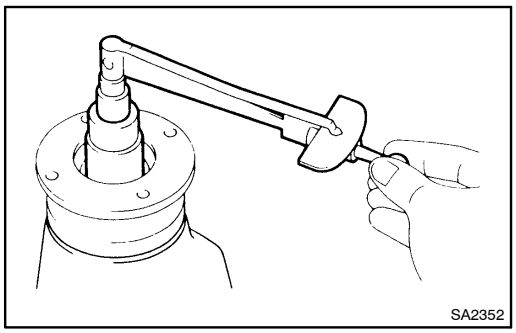
DISASSEMBLY



1. CHECK RUNOUT OF COMPANION FLANGE

Using a dial indicator, measure the runout of the companion flange vertical and lateral.

Maximum
Vertical runout: 0.10 mm (0.0039 in.)
Lateral runout: 0.10 mm (0.0039 in.)



2. MEASURE DRIVE PINION PRELOAD

Using a torque wrench, measure the drive pinion preload using the backlash of the drive pinion and ring gear.

Preload (at starting):
0.6 – 1.0 N·m (6 – 10 kgf·cm, 5.2 – 8.7 in.·lbf)

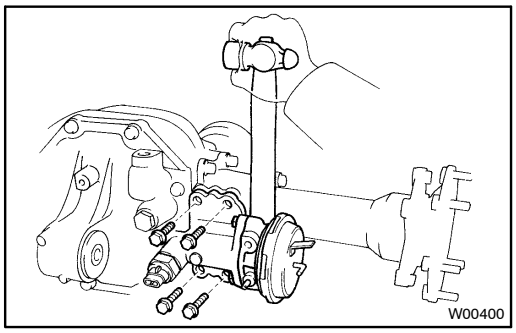
If the runout is greater than the maximum, replace the companion flange.

3. CHECK TOTAL PRELOAD

Using a torque wrench, measure the total preload.

Total preload (at starting):
Drive pinion preload plus
0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.·lbf)

If necessary, disassemble and inspect the differential.

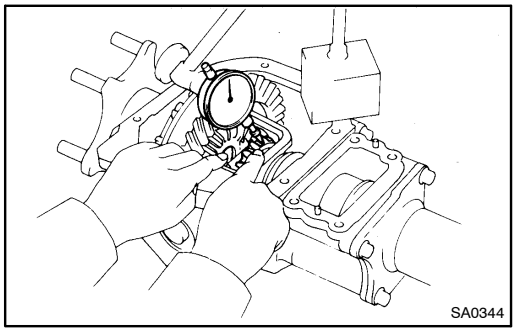


4. REMOVE A.D.D. ACTUATOR

(a) Remove the 4 bolts.
(b) Using a hammer handle, remove the actuator.

5. REMOVE DIFFERENTIAL CARRIER COVER

Remove the 8 bolts and tap out the cover with a plastic hammer.



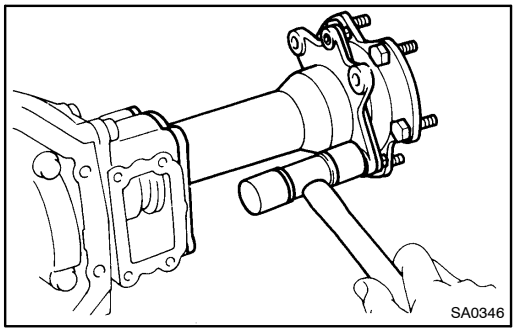
6. CHECK SIDE GEAR BACKLASH

Using a dial indicator, measure the side gear backlash with holding one pinion gear toward the differential case.

Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

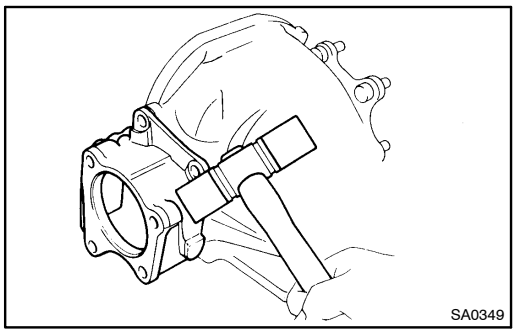
If the backlash is out of specification, install the correct thrust washers (See page SA–57).

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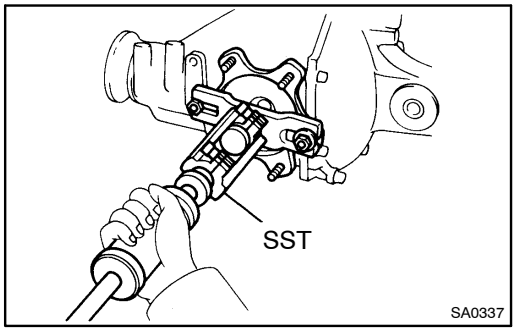
7. REMOVE LH SIDE GEAR SHAFT WITH TUBE

(a) Using a torx socket (E14), remove the 4 torx bolts.
(b) Using a plastic hammer, tap on the tube to remove it.
(c) Remove the sleeve.
(d) Remove the O–ring from the tube.



8. REMOVE CLUTCH CASE

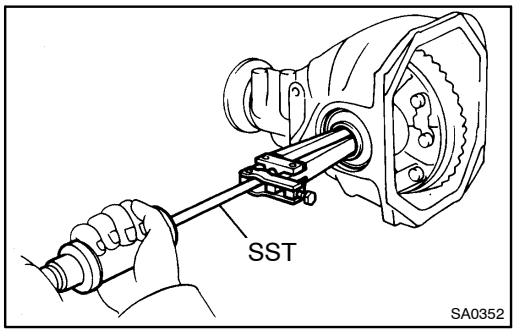
(a) Using a torx socket (E14), remove the 2 torx bolts.
(b) Using a plastic hammer, tap on the clutch case to remove it.



9. REMOVE RH SIDE GEAR SHAFT

Using SST, remove the side gear shaft.

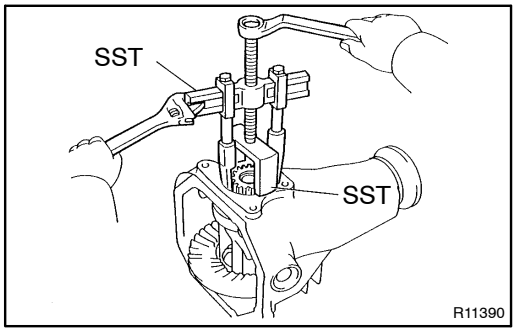
SST 09910–00015 (09911–00011, 09912–00010, 09914–00011)



10. REMOVE RH SIDE GEAR SHAFT OIL SEAL

Using SST, remove the right side gear shaft oil seal.

SST 09308–00010

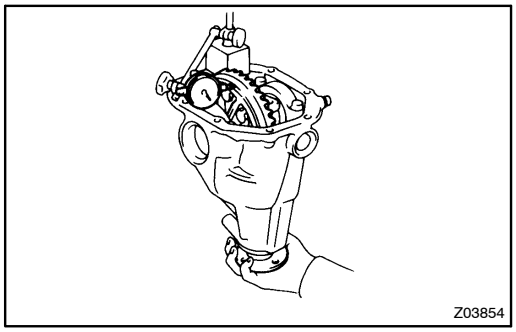


11. REMOVE INTERMEDIATE SHAFT

Using SST, remove the intermediate shaft.

SST 09350–20015 (09369–20040), 09950–40010

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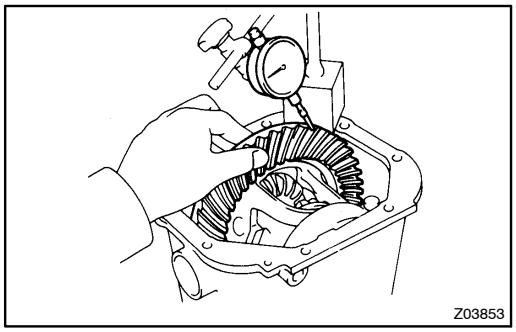

Z03854

12. CHECK RING GEAR RUNOUT

Using a dial indicator, measure the ring gear runout.

Maximum runout: 0.07 mm (0.0028 in.)

If the runout is greater than the maximum, replace the ring gear and drive pinion as a set.


Z03853

13. CHECK RING GEAR BACKLASH

(a) Fix the dial indicator on the tooth surface at a 90° angle.

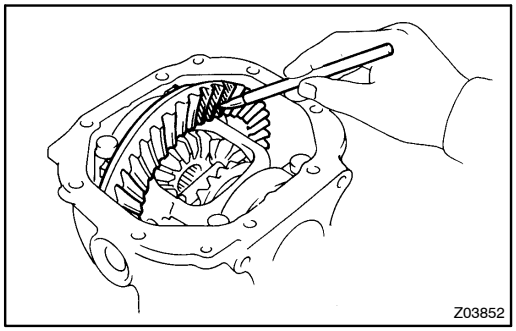
(b) Using a dial indicator, with holding the drive pinion flange and measure the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0070 in.)

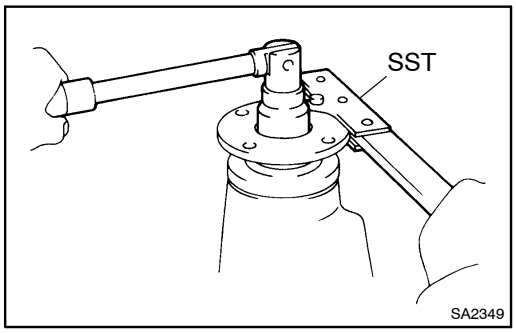
If the backlash is not within the specification, adjust the ring gear backlash.

HINT:

Measure from 3 or more places on the circumference of the ring gear.


Z03852

14. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See page SA–57)



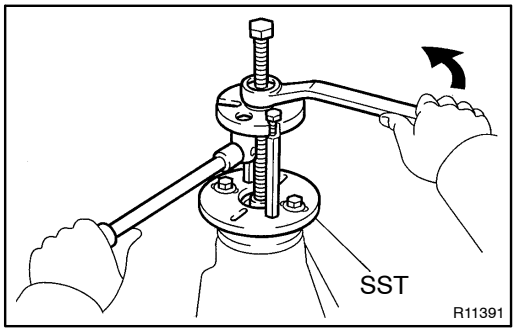
SA2349

15. REMOVE COMPANION FLANGE

(a) Using a chisel and hammer, unstake the nut.

(b) Using SST to hold the flange, remove the nut.

SST 09330–00021

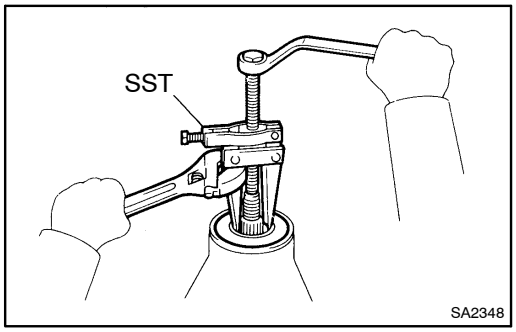


R11391

(c) Using SST, remove the companion flange.

SST 09950–30010

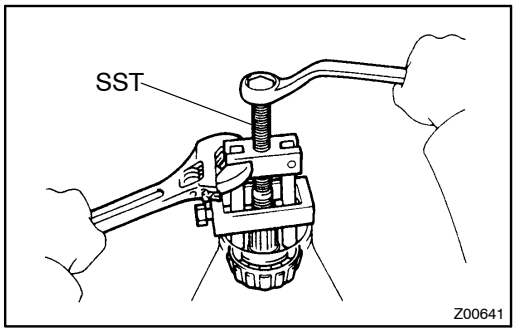
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16. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal from the differential carrier.
SST 09308–10010

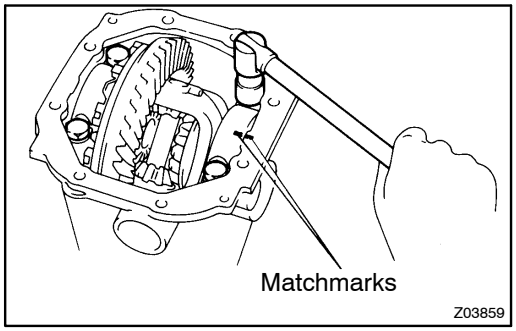
(b) Remove the oil slinger.



17. REMOVE REAR BEARING AND BEARING SPACER

(a) Using SST, remove the rear bearing from the drive pinion.
SST 09556–30010

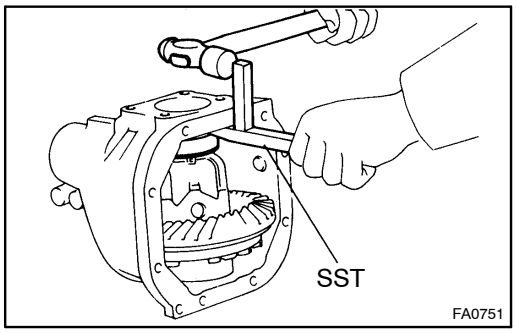
(b) Remove the bearing spacer.



18. REMOVE DIFFERENTIAL CASE ASSEMBLY

(a) Place matchmarks on the bearing cap and differential carrier.

(b) Remove the 4 bolts and 2 bearing caps.



(c) Using SST and a hammer, remove the 2 side bearing plate washers.
SST 09504–22011

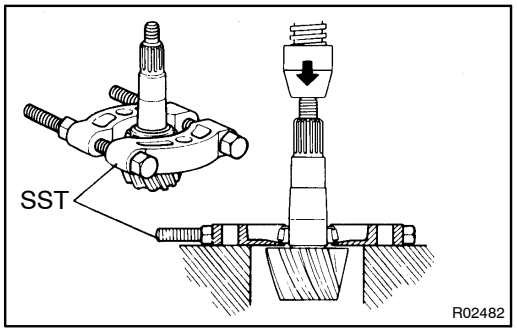
HINT:
Measure the plate washer and note down the thickness.

(d) Remove the differential case with the bearing outer races from the differential carrier.

HINT:
Tag the bearing outer races to show the location for reassembling.

19. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER

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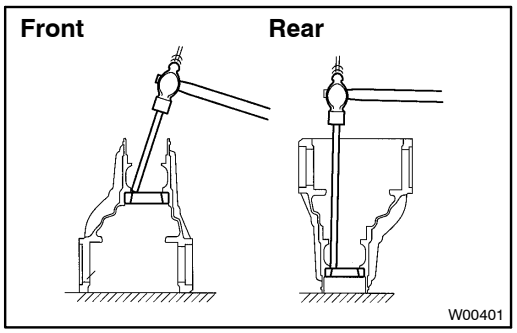
20. REMOVE DRIVE PINION FRONT BEARING

Using SST and a press, remove the bearing from the drive pinion.

SST 09950–00020

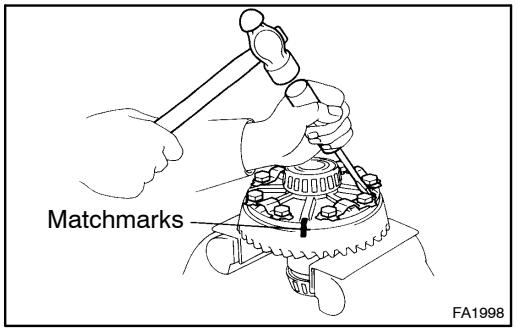
HINT:

If the drive pinion or ring gear are damaged replace them as a set.



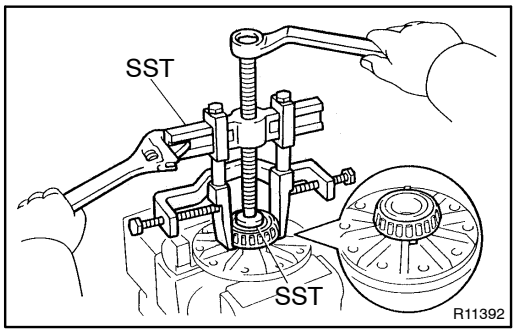
21. REMOVE DRIVE PINION BEARING OUTER RACES

Using a brass bar and hammer, remove the 2 outer races from the differential carrier.



22. REMOVE RING GEAR

(a) Place matchmarks on the ring gear and differential case.
(b) Using a screwdriver and hammer, unstake the lock plates.
(c) Remove the 10 bolts and 5 lock plates.
(d) Using a plastic hammer, tap on the ring gear to separate it from the differential case.



23. REMOVE SIDE BEARINGS

Using SST, remove the 2 side bearings from the differential case.

SST 09950–40010, 09950–60010 (09951–00480)

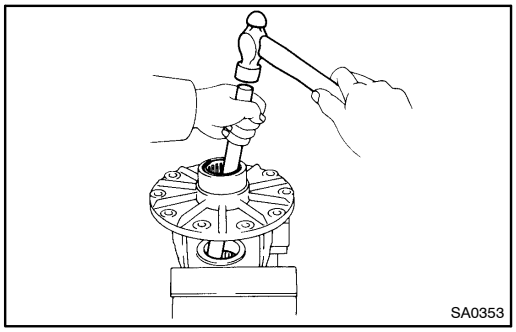
HINT:

Fix the claws of SST to the notch in the differential case.

24. DISASSEMBLE DIFFERENTIAL CASE ASSEMBLY

(a) Using a pin punch and hammer, remove the straight pin.
(b) Remove these parts from the differential case:
- Pinion shaft
- 2 pinion gears
- 2 pinion gear thrust washers
- 2 side gears
- 2 side gear thrust washers

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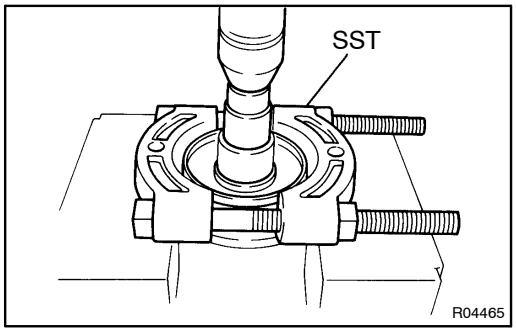
(c) Using a brass bar and hammer, remove the 2 bearings.

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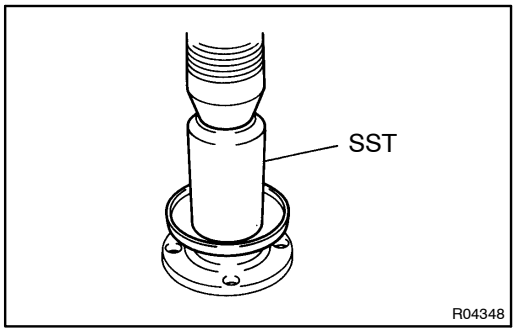
SA0G7–02

REPLACEMENT

1. REPLACE COMPANION FLANGE DUST DEFLECTOR, IF NECESSARY

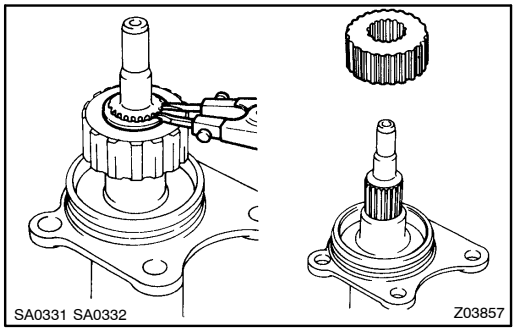


(a) Using SST and a press, remove the dust deflector.
SST 09950–00020

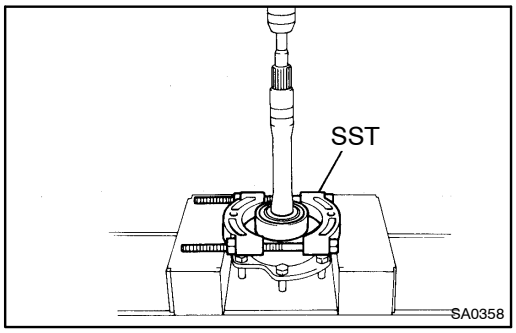


(b) Using SST and a press, install a new dust deflector.
SST 09636–20010

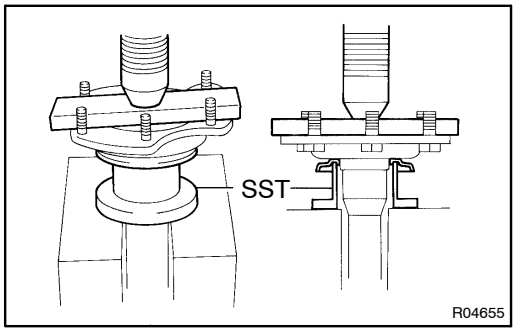
2. REPLACE SIDE GEAR SHAFT, IF NECESSARY



(a) Remove the clutch hub.
(1) Using a snap ring expander, remove the snap ring.
(2) Remove the clutch hub from the side gear shaft.
(b) Remove the LH side gear shaft from the tube.
(1) Remove the 3 bearing retainer bolts.
(2) Remove the side gear shaft from the tube.

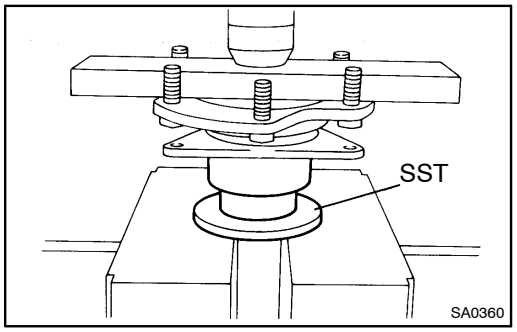


(c) Replace the LH side gear shaft bearing and dust cover.
(1) Using a snap ring expander, remove the snap ring.
(2) Using SST and a press, remove the bearing.
SST 09950–00020
(3) Remove the bearing retainer.
(4) Using a screwdriver and hammer, remove the dust cover.

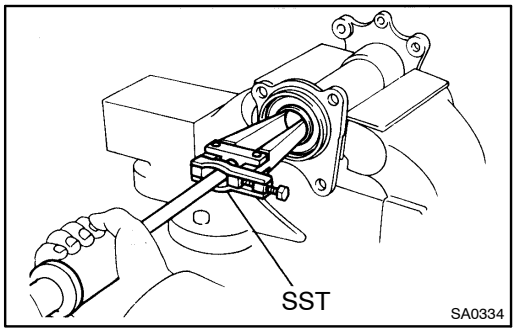


(5) Using SST and a press, install a new dust cover.
SST 09316–20011
(6) Install the bearing retainer.

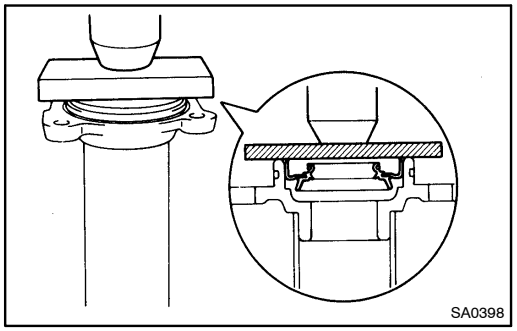
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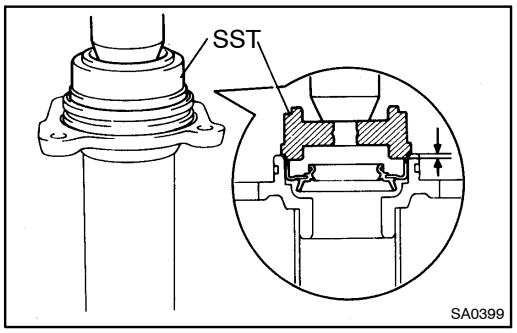
(7) Using SST and a press, install a new bearing.
SST 09316–60011 (09316–00041)
(8) Using a snap ring expander, install a new snap ring.



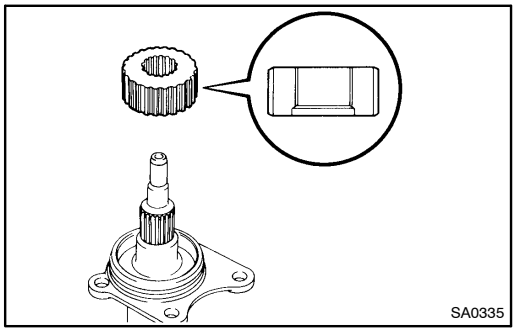
(d) Replace the LH side oil seal.
(1) Using SST, remove the side oil seal.
SST 09308–00010



(2) With the oil seal lip facing upward, use press and plate to press in a new oil seal until its end is flush with the surface of the tube.

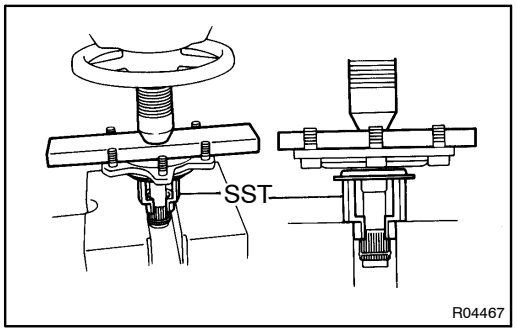


(3) Using SST and a press, install the oil seal.
SST 09554–14010
Oil seal drive in depth: 2.5 mm (0.098 in.)
(4) Coat the lip of oil seal with MP grease.

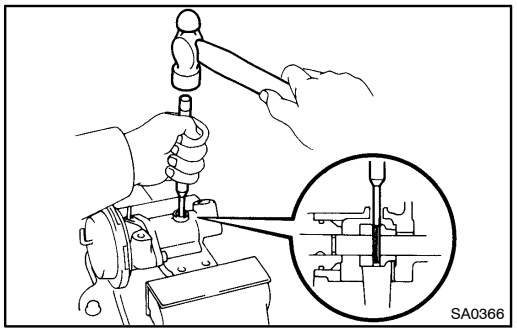


(e) Install the LH side gear shaft to the tube.
(1) Install the side gear shaft into the tube.
(2) Torque the 3 bearing retainer bolts.
Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)
(f) Install the clutch hub.
(1) Install the clutch hub to the shaft.
(2) Using a snap ring expander, install a new snap ring.

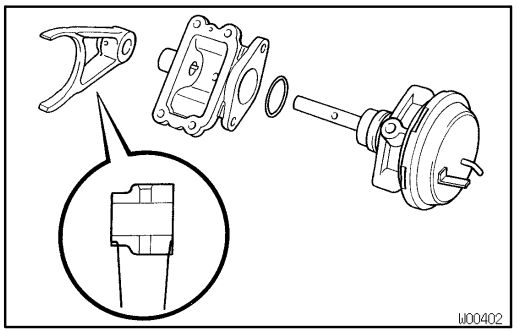
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(g) Repalce the RH side gear shaft dust cover.
(1) Using a screwdriver and hammer, remove the dust cover.
(2) Using SST and a press, install a new dust cover.
SST 09710–30055



3. REPLACE A.D.D. ACTUATOR, IF NECESSARY
(a) Remove the A.D.D. indicator switch.
(b) Remove the sleeve fork pin.
(1) Using a hexagon wrench, remove the screw plug.
(2) Using a pin punch and hammer, remove the pin through the hole of clutch case cover.
(c) Seperate A.D.D. actuator from the clutch case cover and remove the sleeve fork.
(1) Using a hexagon wrench, remove the screw plug.
(2) Remove the spring seat, spring and steel ball.
(3) Remove the 2 bolts and actuator from the clutch case cover.
(4) Separate the actuator from the clutch case cover and remove the sleeve fork.
(5) Remove the O–ring from the actuator.



(d) Install the sleeve fork and A.D.D. actuator into the clutch case cover.
(1) Install the new O–ring to the actuator.
(2) Coat the O–ring with MP grease.
(3) Place the sleeve fork and install the actuator to the clutch case cover.
(4) Torque the 2 bolts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)
(5) Install the steel ball, spring and spring seat.
(6) Coat the threads of screw plug with FIPG.
FIPG:
Part No.08826–00090, THREE BOND 1281 or equivalent
(7) Using a hexagon wrench, install the screw plug.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)
(e) Install the sleeve fork pin.
(1) Using a pin punch and hammer, install the pin through the hole of clutch case cover.
(2) Using a hexagon wrench, install the screw plug.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

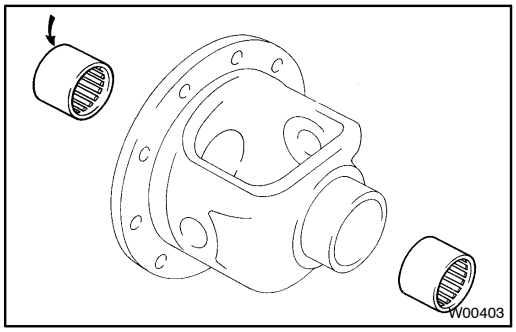
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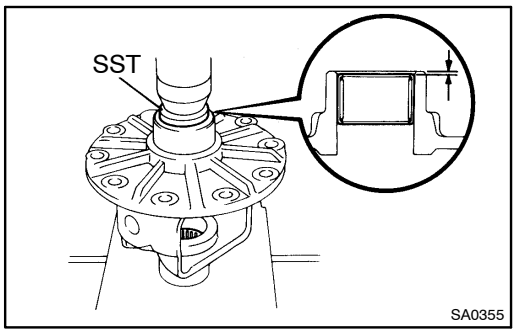
SA0G8–03

REASSEMBLY

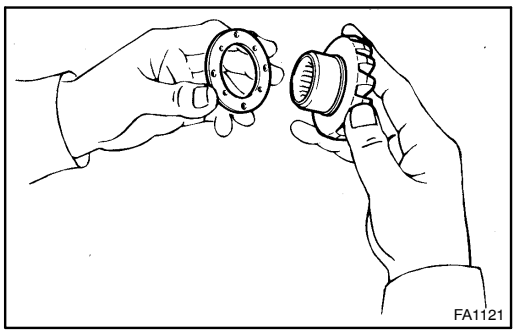
1. ASSEMBLE DIFFERENTIAL CASE

(a) Using SST and a press, install 2 new needle bearings.
SST 09950–60010 (09951–00370),
09950–70010 (09951–07150)





Bearing press in depth: 2.0 mm (0.079 in.)



(b) Install the 2 proper thrust washers on the side gears.

HINT:

Refer to the table below to select thrust washers which will ensure that the backlash is within specifications.

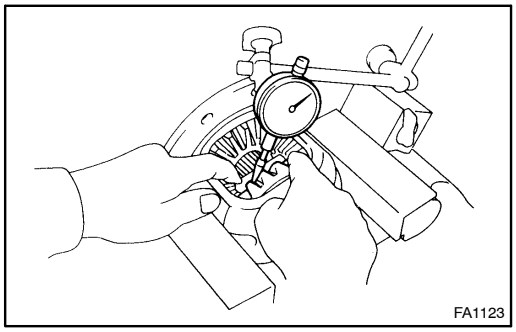
Washer thickness

Thickness mm (in.)	Thickness mm (in.)
0.96 – 1.04 (0.0378 – 0.0409)	1.16 – 1.24 (0.0457 – 0.0488)
1.06 – 1.14 (0.0417 – 0.0449)	1.26 – 1.34 (0.0496 – 0.0528)

(c) Install the 2 side gears, pinion gears, pinion gear thrust washers and pinion shaft in the differential case.

HINT:

Align the holes of the differential case and pinion shaft.

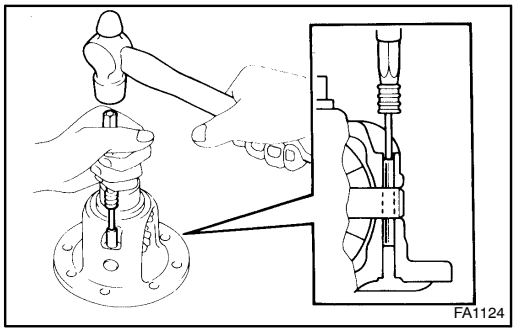


(d) Using a dial indicator measure the side gear backlash with holding one pinion gear toward the differential case.

Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

If the backlash is not within the specification, install side gear thrust washers with different thicknesses.

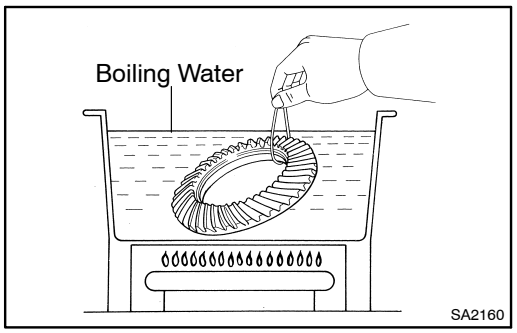
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2. INSTALL STRAIGHT PIN AND STAKE DIFFERENTIAL CASE

(a) Using a pin punch and hammer, install the straight pin through the differential case and hole of the pinion shaft.

(b) Using a chisel and hammer, stake the out side of the differential case pin hole.



3. INSTALL RING GEAR ON DIFFERENTIAL CASE

(a) Clean the contact surfaces of the differential case and ring gear.

(b) Heat the ring gear to about 100°C (212°F) in boiling water.

(c) Carefully take the ring gear out of the boiling water.

(d) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case.

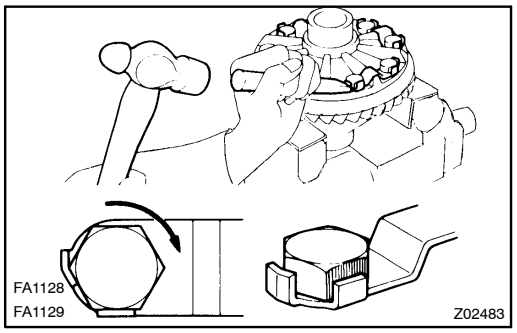
HINT:

Align the matchmarks on the ring gear and differential case.

(e) Temporarily install 5 new lock plates and 10 bolts so that the bolt holes in the ring gear and differential case are not misaligned.

(f) After the ring gear has cooled sufficiently, torque the 10 ring gear set bolts.

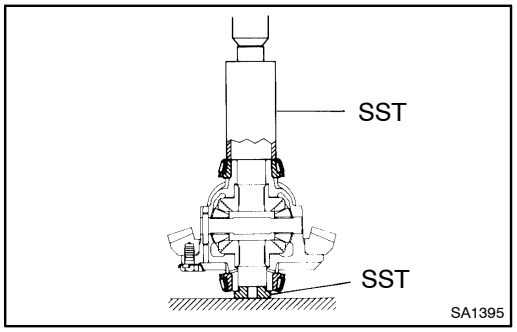
Torque: 97 N·m (985 kgf·cm, 71 ft·lbf)



(g) Using a chisel and hammer, stake the 5 lock plates.

HINT:

Stake the claw so that it is flush with the flat surface of the bolt. For the claw contacting the protruding portion of the bolt, stake only the half of it on the tightening side.

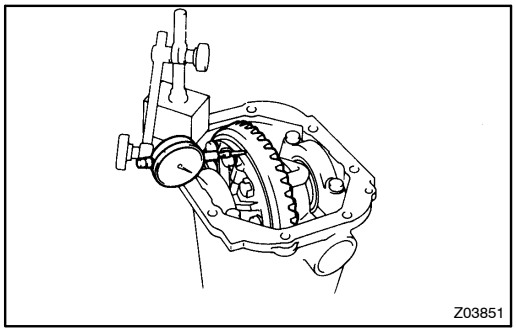


4. INSTALL SIDE BEARINGS

Using SST and a press, install the 2 bearings into the differential case.

SST 09226–10010, 09550–10012 (09558–10010)

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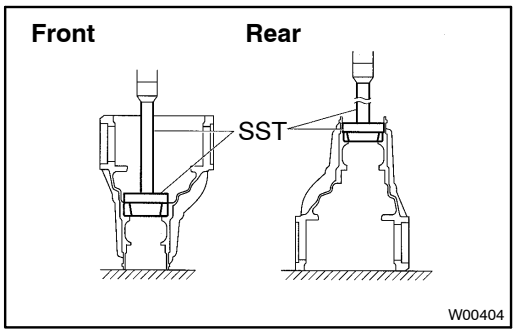

Z03851

5. CHECK RING GEAR RUNOUT

(a) Install the differential case onto the carrier and install the 2 plate washers to fill the play in the bearing (See page SA–57).

(b) Install 2 bearing caps (See page SA–57).

(c) Using a dial indicator, measure the runout of ring gear.
Maximum runout: 0.07 mm (0.0028 in.)

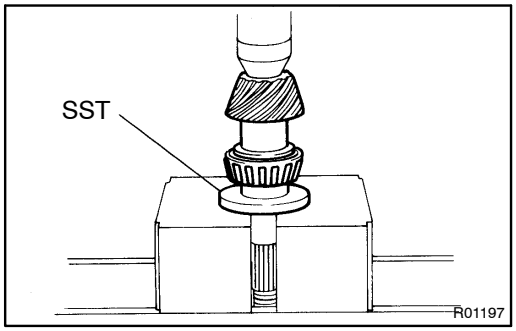


W00404

6. INSTALL DRIVE PINION FRONT AND REAR BEARING OUTER RACES

(a) Using SST and a press, install the front side of the outer race.
SST 09950–60020 (09951–00710),
09950–70010 (09951–07150)

(b) Using SST and a press, install the rear side of the outer race.
SST 09950–60020 (09951–00790),
09950–70010 (09951–07150)



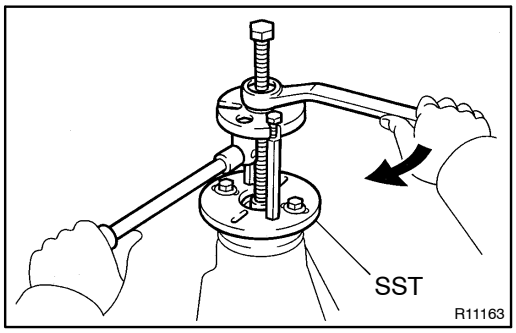
R01197

7. INSTALL DRIVE PINION FRONT BEARING

(a) Install the washer on the drive pinion.

HINT:
First fit a washer with the same thickness as the washer which was removed, then after checking the tooth contact pattern, replace the washer with one of a different thickness if necessary.

(b) Using SST, install the front bearing onto the drive pinion.
SST 09506–30012



R11163

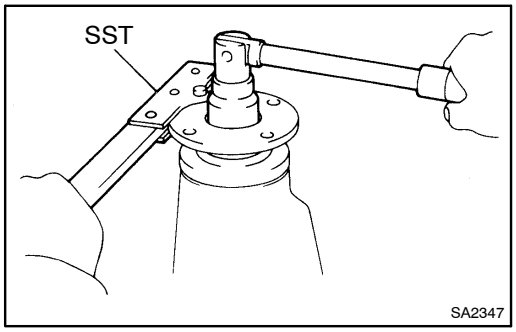
8. TEMPORARILY ADJUST DRIVE PINION PRELOAD

(a) Install the drive pinion, rear bearing and oil slinger.

HINT:
Assemble the spacer and oil seal after adjusting the gear contact pattern.

(b) Using SST, install the companion flange.
SST 09950–30010

(c) Coat the threads of the nut with hypoid gear oil.

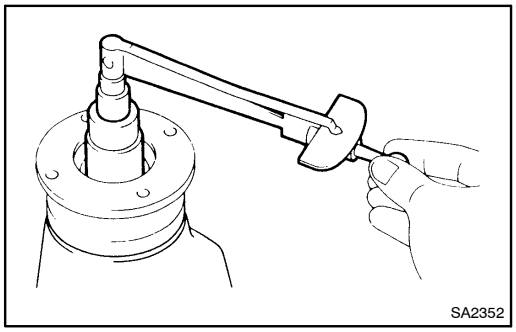


SA2347

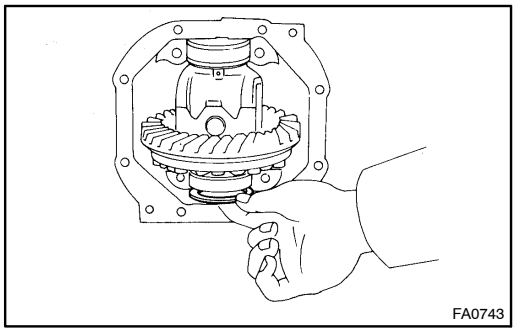
(d) Adjust the drive pinion preload by tightening the companion flange nut.
Using SST to hold the flange, tighten the nut.
SST 09330–00021

NOTICE:
As there is no spacer, tighten the nut a little at a time, being careful not to overtighten it.

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SA2352

(e) Using a torque wrench, measure the preload.
Preload (at starting):
New bearing:
1.2 – 1.9 N·m (12 – 19 kgf·cm, 10.4 – 16.5 in.·lbf)
Reused bearing:
0.6 – 1.0 N·m (6 – 10 kgf·cm, 5.2 – 8.7 in.·lbf)


FA0743

9. INSTALL DIFFERENTIAL CASE IN DIFFERENTIAL CARRIER

(a) Place the 2 bearing outer races on their respective bearings. Check that the left and right outer races are not interchanged.

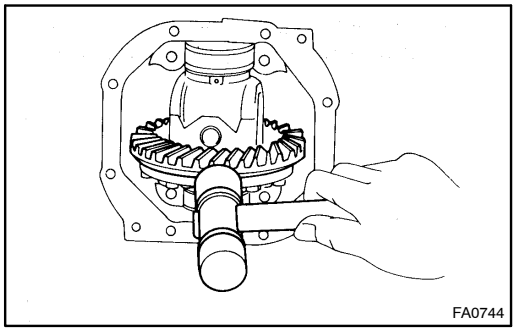
(b) Install the differential case in the differential carrier.

10. ADJUST RING GEAR BACKLASH

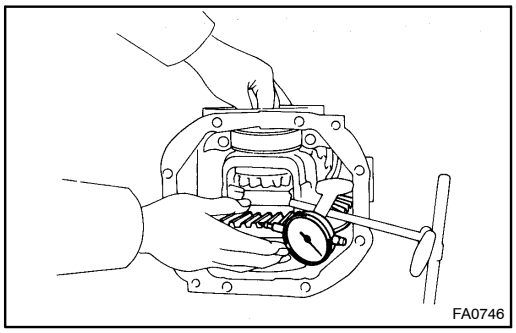
(a) Only install the plate washer on the ring gear back side.

HINT:

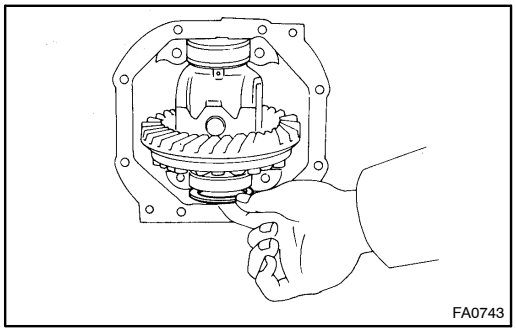
Make sure that the ring gear has backlash.


FA0744

(b) Tap on the ring gear with a plastic hammer so that the washer fit to the bearing.

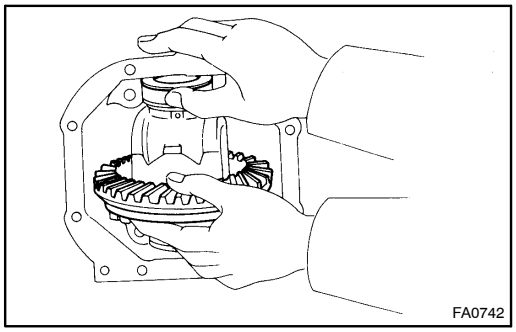

FA0746

(c) Using a dial indicator, measure the side gear backlash with holding one pinion gear toward the differential case.
Backlash (reference): 0.13 mm (0.0051 in.)

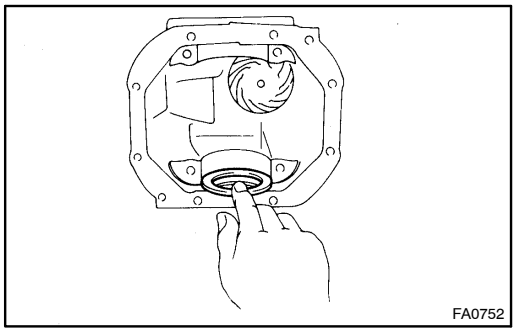

FA0743

(d) Select a plate washer for back side ring gear, using the backlash as reference (See page SA–57).

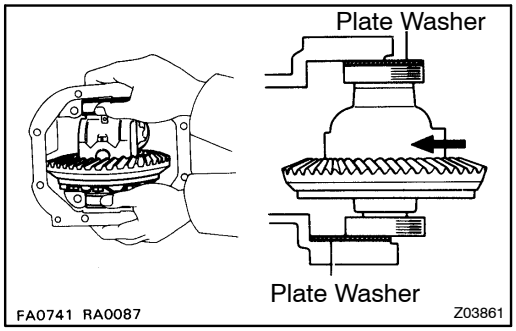
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FA0742

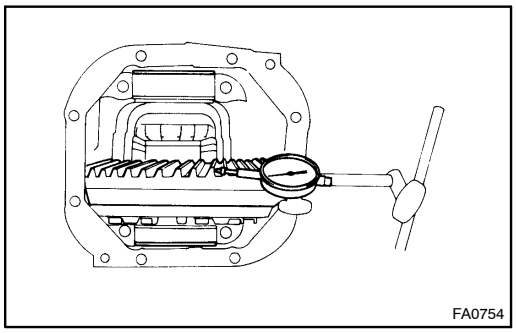
(e) Select a ring gear teeth side plate washer with a thickness which eliminates any clearance between the outer race and case.


FA0752

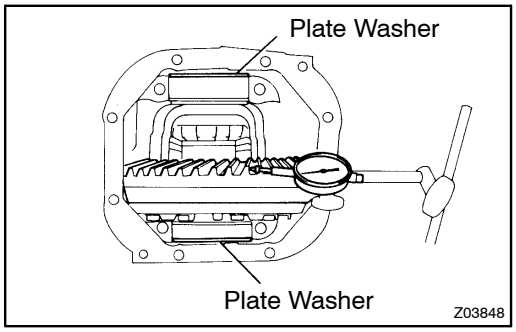
(f) Remove the plate washes and differential case.
(g) Install the plate washer into the ring gear back side of the carrier.



(h) Place the other plate washer onto the differential case together with the outer race, and install the differential case with the outer race into the carrier.
(i) Tap on the ring gear with a plastic hammer so that the washer fit to the bearing.


FA0754

(j) Using a dial indicator, measure the ring gear backlash.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0070 in.)

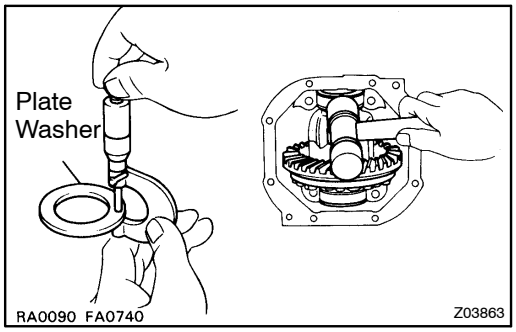


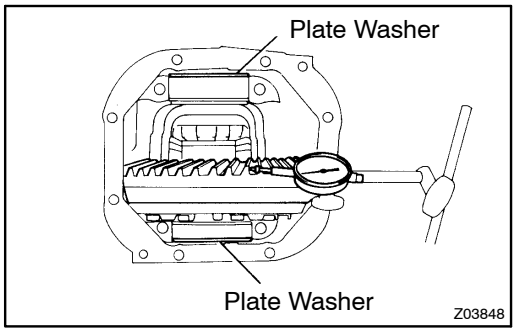
(k) If not within specification, adjust by either increasing or decreasing the thickness of washers on both sides by an equal amount.

HINT:

- There should be no clearance between the plate washer and case.
- Make sure that there is ring gear backlash.

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11. ADJUST SIDE BEARING PRELOAD

(a) Remove the ring gear teeth side plate washer and measure the thickness.

(b) Using the backlash as a reference, install a new washer of 0.06 – 0.09 mm (0.0024 – 0.0035 in.) thicker than the washer removed.

HINT:

Select a washer which can be pressed in 2/3 of the way with your finger.

(c) Using a plastic hammer, install the plate washer.

(d) Recheck the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0070 in.)

(e) If not within specification, adjust by either increasing or decreasing the thickness of washers on both sides by an equal amount.

HINT:

The backlash will change by about 0.02 mm (0.0008 in.) with every 0.03 mm (0.0012 in.) change in the plate washer.

Washer thickness

Thickness mm (in.)	Thickness mm (in.)	Thickness mm (in.)
2.57 – 2.59 (0.1012 – 0.1020)	2.81 – 2.83 (0.1106 – 0.1114)	3.05 – 3.07 (0.1201 – 0.1209)
2.60 – 2.62 (0.1024 – 0.1031)	2.84 – 2.86 (0.1118 – 0.1126)	3.08 – 3.10 (0.1213 – 0.1220)
2.63 – 2.65 (0.1035 – 0.1043)	2.87 – 2.89 (0.1130 – 0.1138)	3.11 – 3.13 (0.1224 – 0.1232)
2.66 – 2.68 (0.1047 – 0.1055)	2.90 – 2.92 (0.1142 – 0.1150)	3.14 – 3.16 (0.1236 – 0.1244)
2.69 – 2.71 (0.1059 – 0.1067)	2.93 – 2.95 (0.1154 – 0.1161)	3.17 – 3.19 (0.1248 – 0.1256)
2.72 – 2.74 (0.1071 – 0.1079)	2.96 – 2.98 (0.1165 – 0.1173)	3.20 – 3.22 (0.1260 – 0.1268)
2.75 – 2.77 (0.1083 – 0.1091)	2.99 – 3.01 (0.1177 – 0.1185)	3.23 – 3.25 (0.1272 – 0.1280)
2.78 – 2.80 (0.1094 – 0.1102)	3.02 – 3.04 (0.1189 – 0.1197)	–

12. INSTALL BEARING CAPS

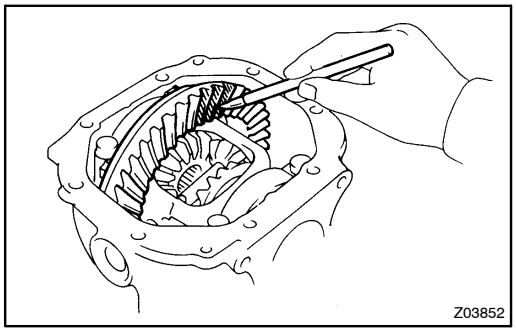
Align the matchmarks on the 2 caps and carrier.

Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)

13. MEASURE TOTAL PRELOAD

Using a torque wrench, measure the total preload.

Total preload (at starting):
Drive pinion preload plus
0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.·lbf)



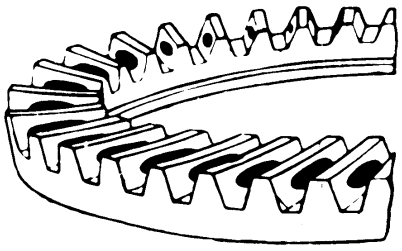
14. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead primer.

(b) Hold the companion flange firmly and rotate the ring gear in both directions.

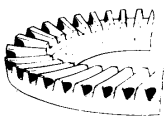
(c) Inspect the tooth contact pattern.

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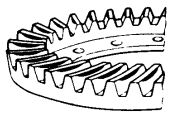


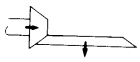
Proper Contact

Heel Contact



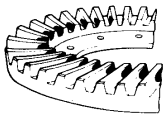
Face Contact



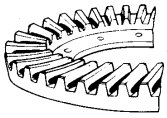


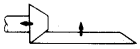
Select an adjusting shim that will bring the drive pinion closer to the gear.

Toe Contact



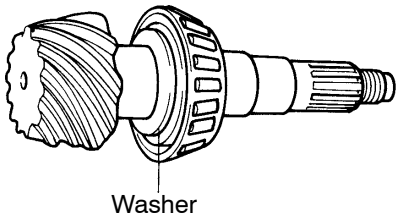
Flank Contact





Select an adjusting shim that will shaft the drive pinion gear away from the ring gear.

R02495



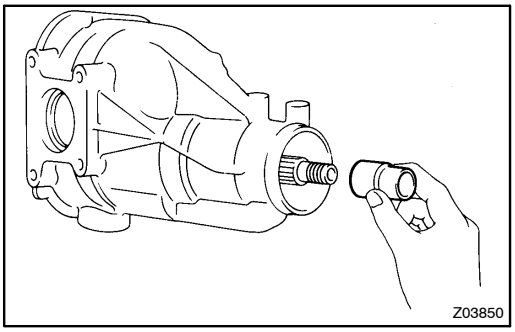
Washer

FA2008

If the teeth are not contacting properly, use the following chart to select a proper washer for correction.

Washer thickness

Thickness mm (in.)	Thickness mm (in.)
2.27 (0.0894)	2.51 (0.0988)
2.30 (0.0906)	2.54 (0.1000)
2.33 (0.0917)	2.57 (0.1012)
2.36 (0.0929)	2.60 (0.1024)
2.39 (0.0941)	2.63 (0.1035)
2.42 (0.0953)	2.66 (0.1047)
2.45 (0.0965)	2.69 (0.1059)
2.48 (0.0976)	–



Z03850

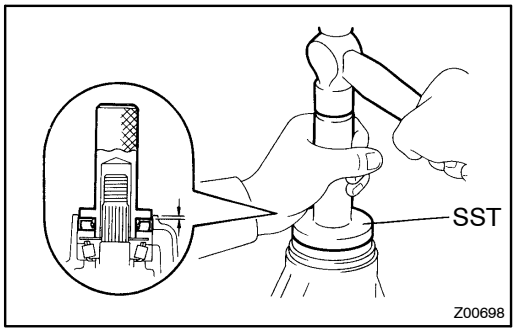
15. INSTALL BEARING SPACER

(a) Remove the companion flange, oil slinger and rear bearing (See page SA–48).

(b) Install a new bearing spacer.

(c) Install the rear bearing and oil slinger.

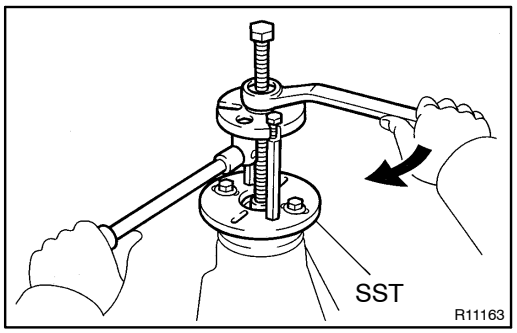
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16. INSTALL OIL SEAL

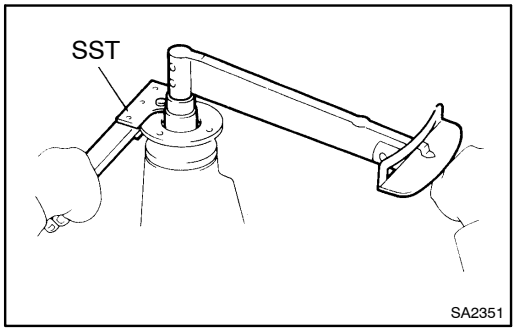
(a) Using SST and a hammer, install a new oil seal.
SST 09554–30011
Oil seal drive in depth: 1.5 mm (0.059 in.)

(b) Apply MP grease to the oil seal lip.



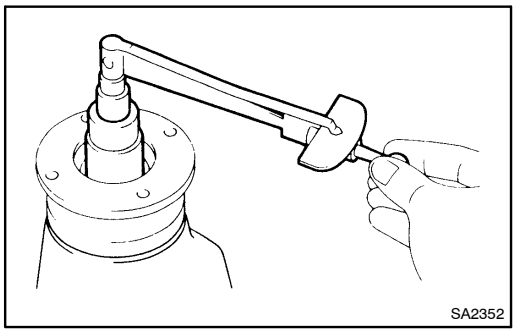
17. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange.
SST 09950–30010



(b) Coat the threads of a new nut with hypoid gear oil install it.

(c) Using SST to hold the flange, tighten the nut.
SST 09330–00021
Torque: 108 N·m (1,100 kgf·cm, 80 ft·lbf)



18. ADJUST DRIVE PINION PRELOAD

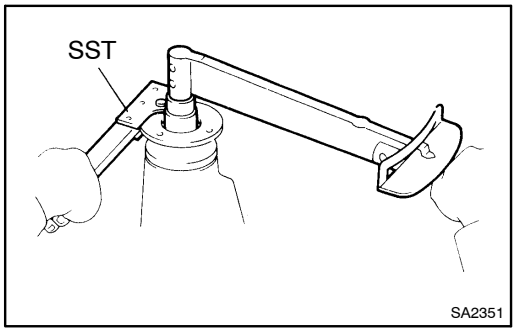
Using a torque wrench, measure the drive pinion preload using the backlash of the drive pinion and the ring gear.

Preload (at starting):
New bearing:
1.2 – 1.9 N·m (12 – 19 kgf·cm, 10.4 – 16.5 in.·lbf)
Reused bearing:
0.6 – 1.0 N·m (6 – 10 kgf·cm, 5.2 – 8.7 in.·lbf)

If the preload is greater than the specification, replace the spacer.

If the preload is less than the specification, retighten the nut a little at a time with a torque of 13 N·m (130 kgf·cm, 9 ft·lbf) until the specified preload is reached.

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Maximum torque: 235 N·m (2,400 kgf·cm, 173 ft·lbf)

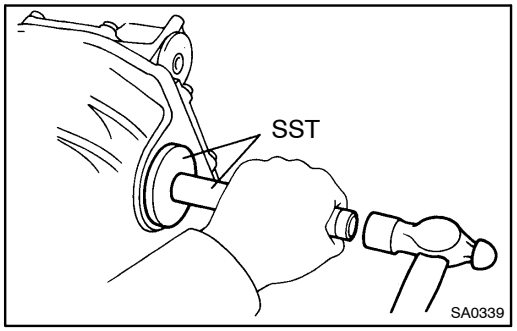
If the maximum torque is exceeded while retightening the nut, replace the spacer and repeat the preload procedure. Do not loosen the nut to reduce the preload.

19. RECHECK RING GEAR BACKLASH (See page SA–57)

20. RECHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See page SA–57)

21. CHECK RUNOUT OF COMPANION FLANGE (See page SA–48)

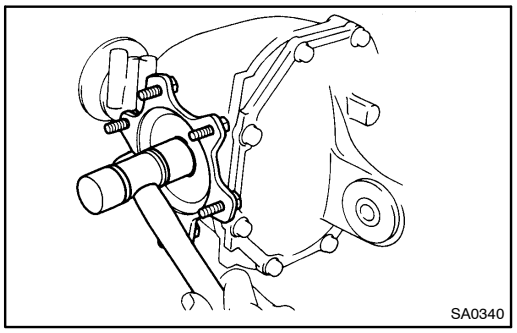
22. STAKE DRIVE PINION NUT



23. INSTALL RH SIDE GEAR SHAFT OIL SEAL

(a) Using SST and a hammer, install a new oil seal until its surface is flush with the differential carrier end.
SST 09550–00032, 09950–70010 (09951–07150)

(b) Apply MP grease to the oil seal lip.



24. INSTALL RH SIDE GEAR SHAFT

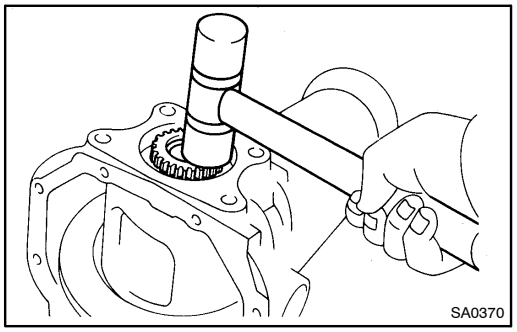
(a) Install a new snap ring to the side gear shaft.

(b) Using a plastic hammer, install the side gear shaft to the differential case.

25. CHECK INSTALLATION OF SIDE GEAR SHAFT

(a) Check that there is 2 – 3 mm (0.08 – 0.12 in.) of play in axial direction.

(b) Check that the side gear shaft will not come out by trying to pull it completely out by hand.



26. INSTALL INTERMEDIATE SHAFT

(a) Install a new snap ring to the shaft.

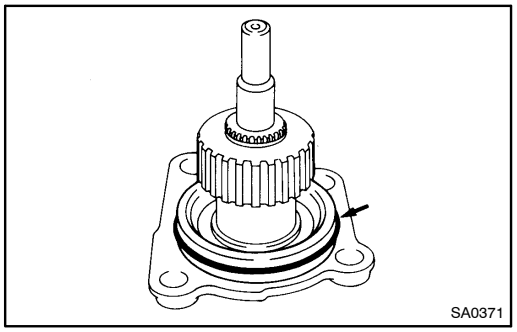
(b) Using a plastic hammer, install the shaft to the differential case.

27. CHECK INSTALLATION OF INTERMEDIATE SHAFT

(a) Check that there is 2 – 3 mm (0.08 – 0.12 in.) of play in the axial direction.

(b) Check that the intermediate shaft will not come out by trying to pull it completely out by hand.

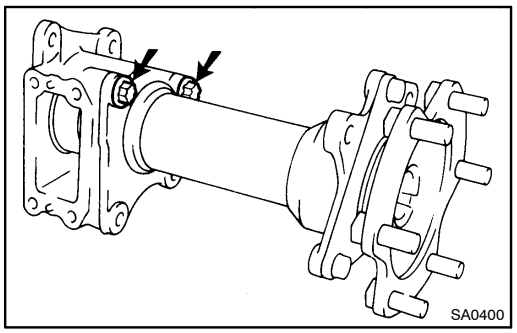
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SA0371

28. INSTALL CLUTCH CASE TO SIDE GEAR SHAFT TUBE

(a) Install a new O–ring to the tube.

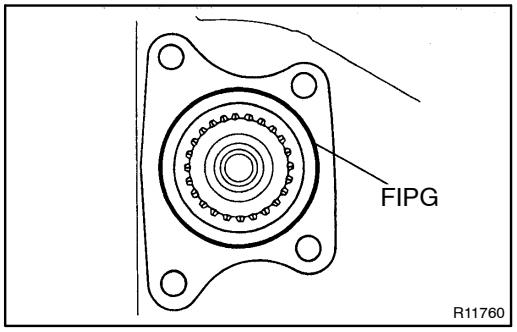
(b) Coat the O–ring with MP grease.


SA0400

(c) Install the clutch case to the tube.

(d) Using a torx socket (E14), torque the 2 torx bolts.
Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)

29. INSTALL CLUTCH SLEEVE



R11760

30. INSTALL LH SIDE GEAR SHAFT TO DIFFERENTIAL CARRIER

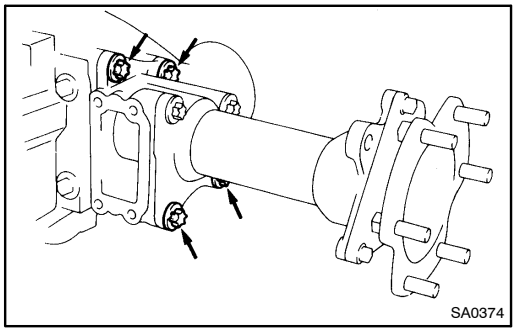
(a) Remove any old FIPG material and be careful not to drop oil on the contact surfaces of the differential carrier and clutch case.

(b) Clean surfaces with FIPG material attached to using gasoline or alcohol.

(c) Apply FIPG to the carrier, as shown.
FIPG:
Part No. 08826–00090, THREE BOND 1281 or equivalent

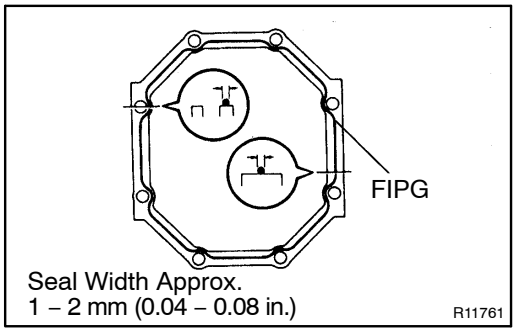
HINT:
Install the side gear shaft within 10 minutes after applying FIPG.

(d) Install LH side gear shaft to the differential carrier.


SA0374

(e) Using a torx socket (E14), torque the 4 torx bolts.
Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)

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31. INSTALL DIFFERENTIAL CARRIER COVER

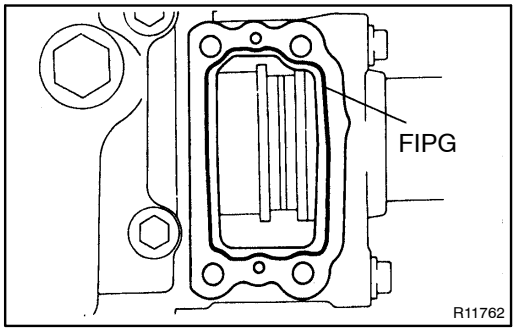
(a) Remove any old FIPG material and be careful not to drop oil on the contact surfaces of the differential carrier and carrier cover.

(b) Clean surfaces with FIPG material attached to using gasoline or alcohol.

(c) Apply FIPG to the carrier cover, as shown.
FIPG:
Part No. 08826–00090, THREE BOND 1281 or equivalent

HINT:
Install the carrier cover within 10 minutes after applying FIPG.

(d) Install the differential carrier cover with the 8 bolts.
Torque: 47 N·m (475 kgf·cm, 34 ft·lbf)



32. INSTALL A.D.D. ACTUATOR

(a) Remove any old FIPG material and be careful not to drop oil on the contact surfaces of the actuator and clutch case.

(b) Clean surfaces with FIPG material attached to using gasoline or alcohol.

(c) Apply FIPG to the clutch case, as shown.
FIPG:
Part No. 08826–00090, THREE BOND 1281 or equivalent

HINT:
Install the actuator within 10 minutes after applying FIPG.

(d) Torque the 4 bolts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

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SA0G9–01

INSTALLATION

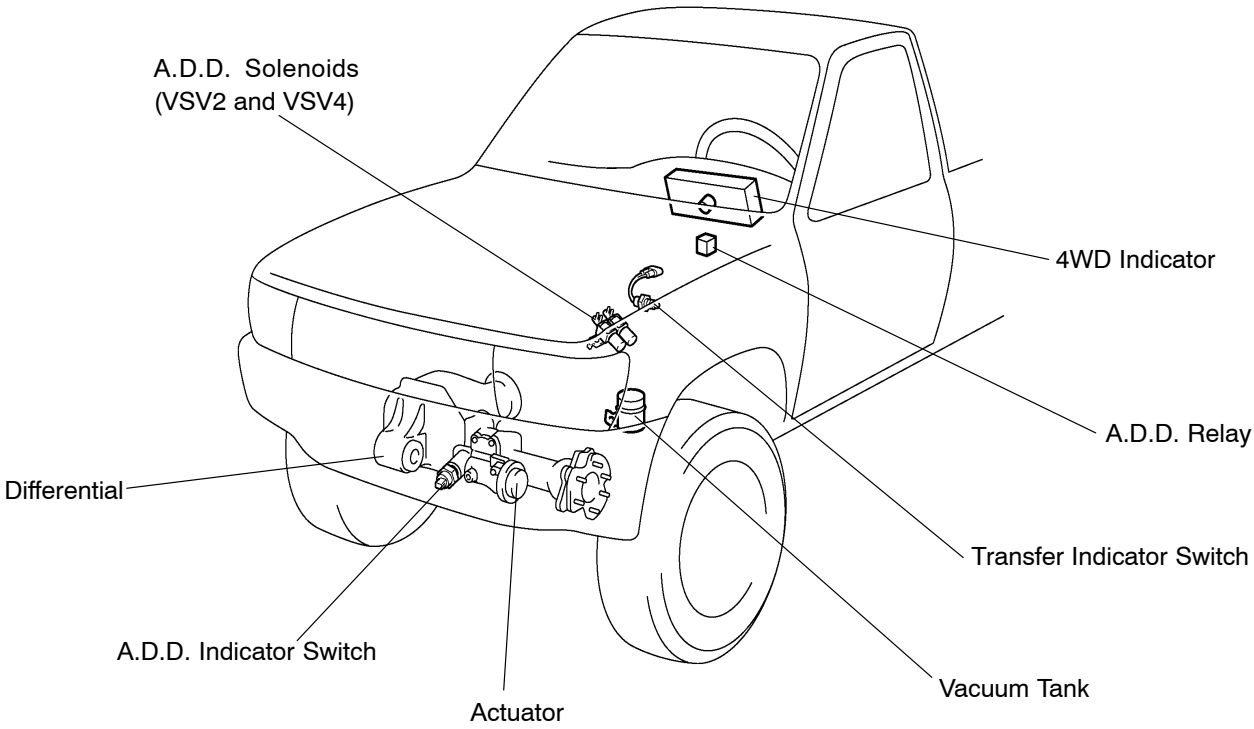
Installation is in the reverse order of removal (See page SA–47).
AFTER INSTALLATION, FILL DIFFERENTIAL WITH HYPOID GEAR OIL (See page SA–43)

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A.D.D. CONTROL SYSTEM

LOCATION

SA0GA–01

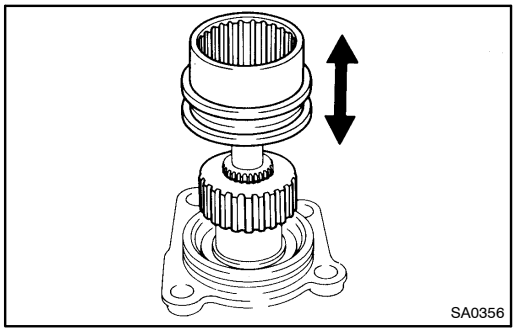


F01743

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SA0GB–01

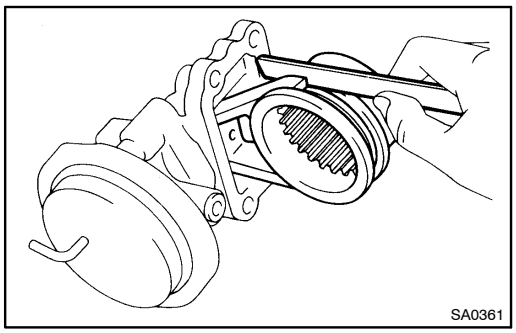
INSPECTION


SA0356

1. INSPECT CLUTCH HUB AND CLUTCH SLEEVE

(a) Check the clutch hub and clutch sleeve for wear and damage.

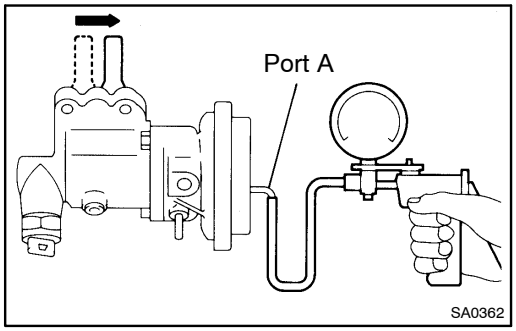
(b) Check that clutch sleeve sides smoothly on the clutch hub.


SA0361

2. MEASURE CLEARANCE OF SLEEVE FORK AND CLUTCH SLEEVE

Using a feeler gauge, measure the clearance between the sleeve fork and the clutch sleeve.

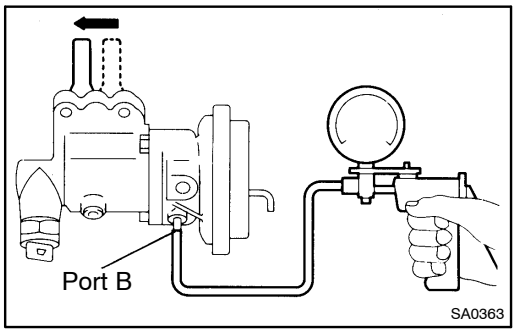
Maximum clearance: 0.35 mm (0.0138 in.)



SA0362

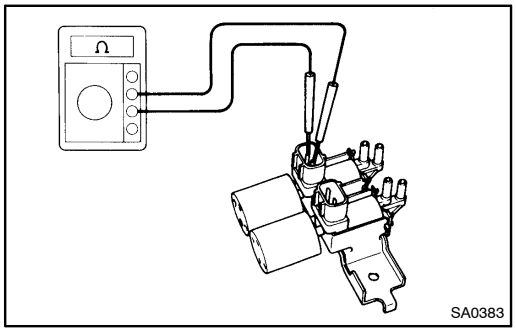
3. INSPECT A.D.D. ACTUATOR

(a) Check that the sleeve fork moves to the actuator side when a vacuum of 66.7 kPa (500 mmHg, 19.69 in.Hg) is applied to the port A. Also check that the vacuum remains constant.



SA0363

(b) Check that the sleeve fork moves away from the actuator when a vacuum of 66.7 kPa (500 mmHg, 19.69 in.Hg) is applied to port B. Also check that the vacuum remains constant.



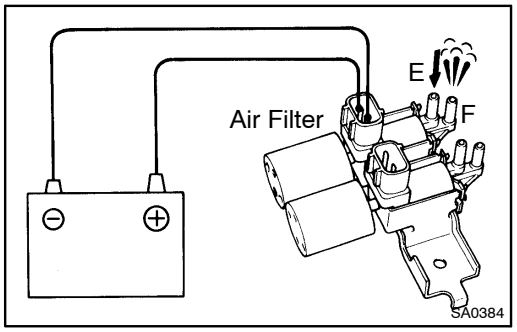
SA0383

4. INSPECT A.D.D. SOLENOIDS

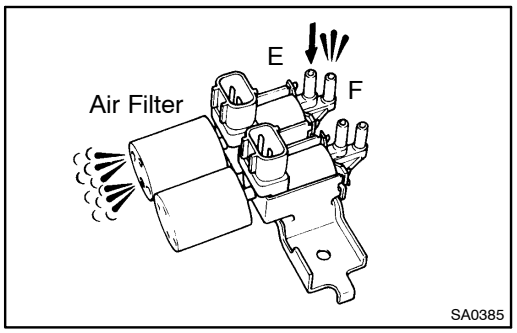
(a) Using an ohmmeter, measure the resistance of the solenoids.

Resistance: 37 – 44 Ω

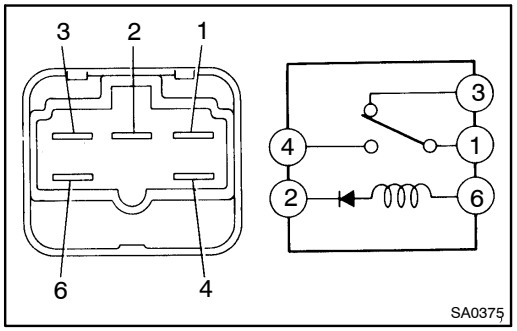
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(b) Connect the battery to the solenoid.
Check that air flows from the port E to port F.
Check that air does not flow from the port E to the air filter.



(c) Disconnect the battery positive voltage from the solenoid.
Check that air flows from the port E to the air filter.
Check that air does not flow from the port E to port F.



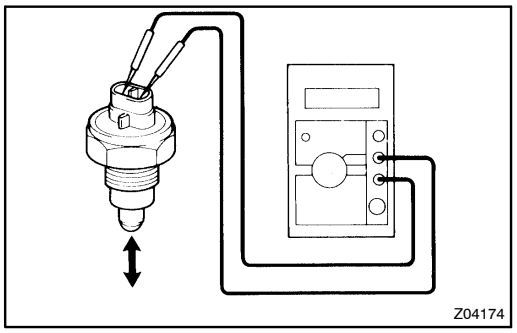
5. INSPECT A.D.D. RELAY

(a) Using an ohmmeter, check that continuity exists between terminals 1 and 3.

(b) Using an ohmmeter, check that continuity exists between terminals 2 and 6.

(c) Connect the positive (+) lead from the battery to terminal 6 and the negative (–) lead to terminal 2.

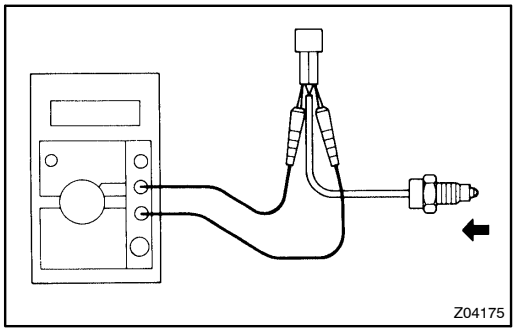
(d) Using an ohmmeter, check that continuity exists between terminals 1 and 4.



6. INSPECT A.D.D. INDICATOR SWITCH

(a) Using an ohmmeter, check that continuity exists between terminals when the switch when the switch is pushed (differential connected position).

(b) Using an ohmmeter, check that continuity doesn't exists when the switch is free (differential disconnected position).



7. INSPECT TRANSFER INDICATOR SWITCH

(a) Using an ohmmeter, check that there is continuity between terminals between terminals when the switch is pushed (transfer 4WD position).

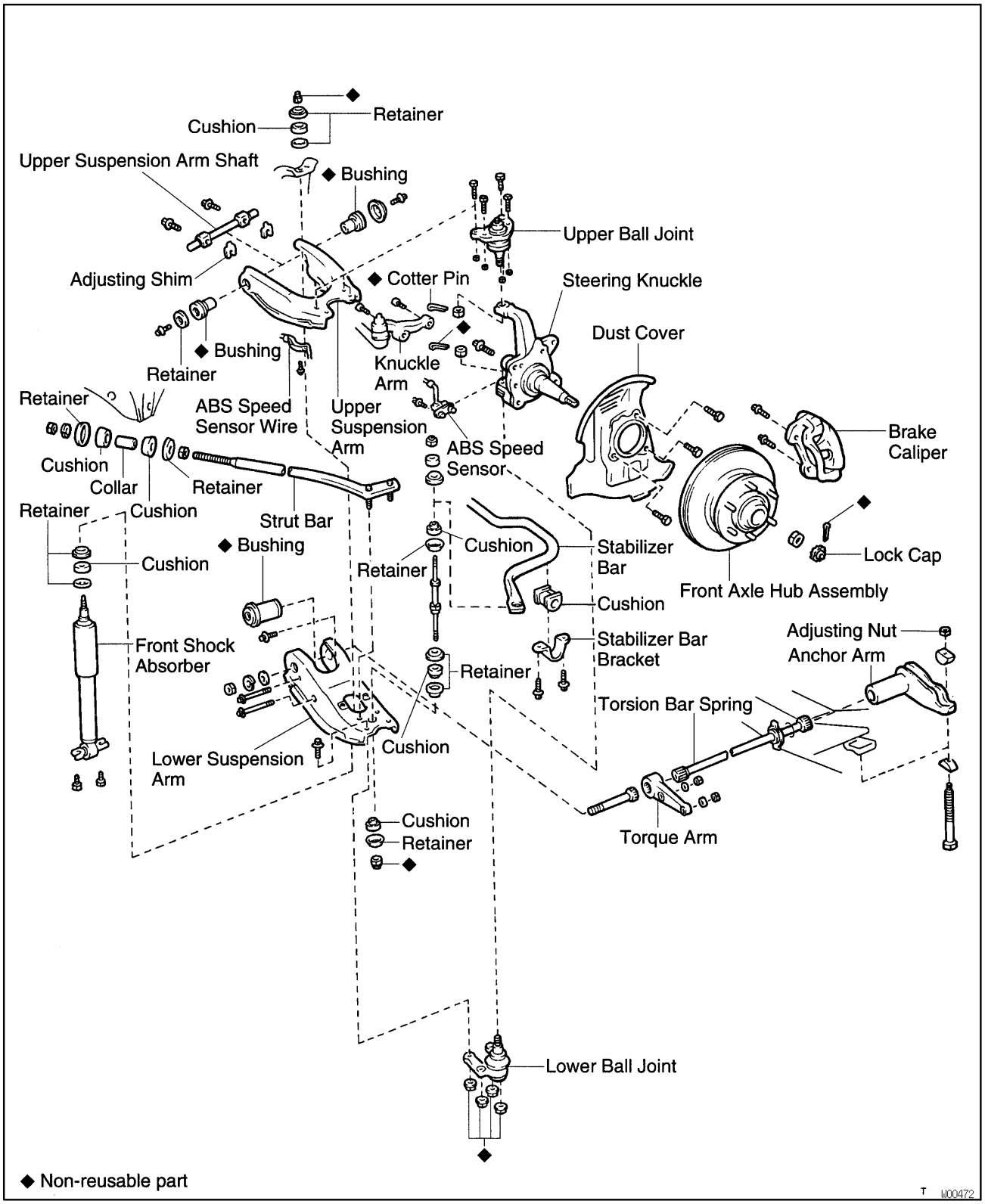
(b) Using an ohmmeter, check that there is continuity between terminals when switch is free (transfer H2 position).

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FRONT SHOCK ABSORBER (2WD)

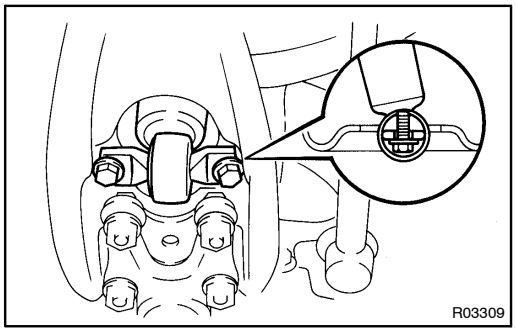
COMPONENTS

SA0GC–07



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SA0GD-01



REMOVAL

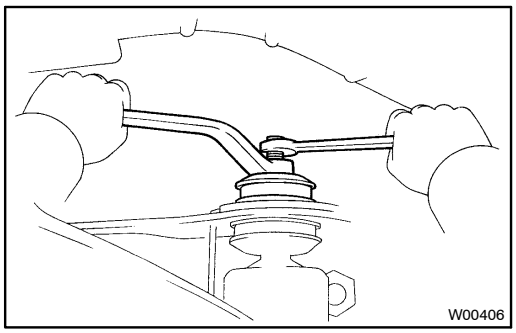
1. REMOVE FRONT WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

2. REMOVE SHOCK ABSORBER

(a) Remove the 2 bolts and disconnect the shock absorber lower side from the lower suspension arm.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



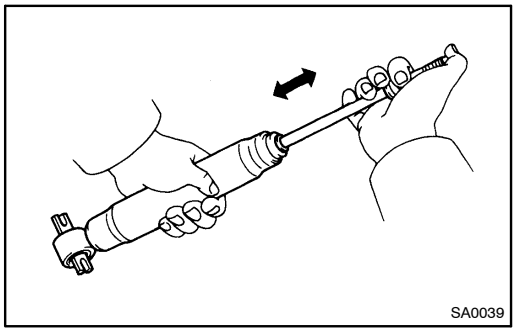
(b) Hold the shock absorber and remove the set nut, 2 retainers, cushion and shock absorber.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(c) Remove the 2 retainers and cushion from the shock absorber.

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SA0GE–01


SA0039

INSPECTION

INSPECT SHOCK ABSORBER

Compress and extend the shock absorber piston rod and check that there is no abnormal resistance or unusual operation sound.

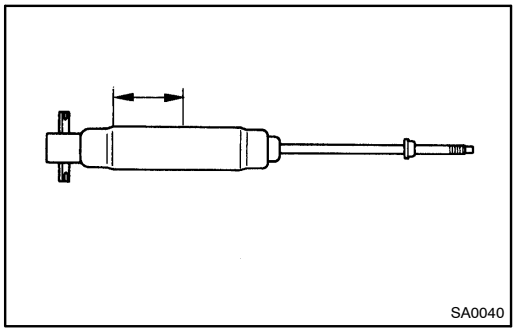
If there is any abnormality, replace the shock absorber with a new one.

NOTICE:

When discarding the shock absorber, see DISPOSAL on page SA–75.

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SA0GF–01


SA0040

DISPOSAL

1. FULLY EXTEND SHOCK ABSORBER ROD

2. DRILL HOLE TO REMOVE GAS FROM CYLINDER

Using a drill, make a hole in the cylinder, as shown to remove the gas inside.

CAUTION:

The discharged gas is harmless, but be careful of chips which may fly up when drilling.

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SA0GG–01

INSTALLATION

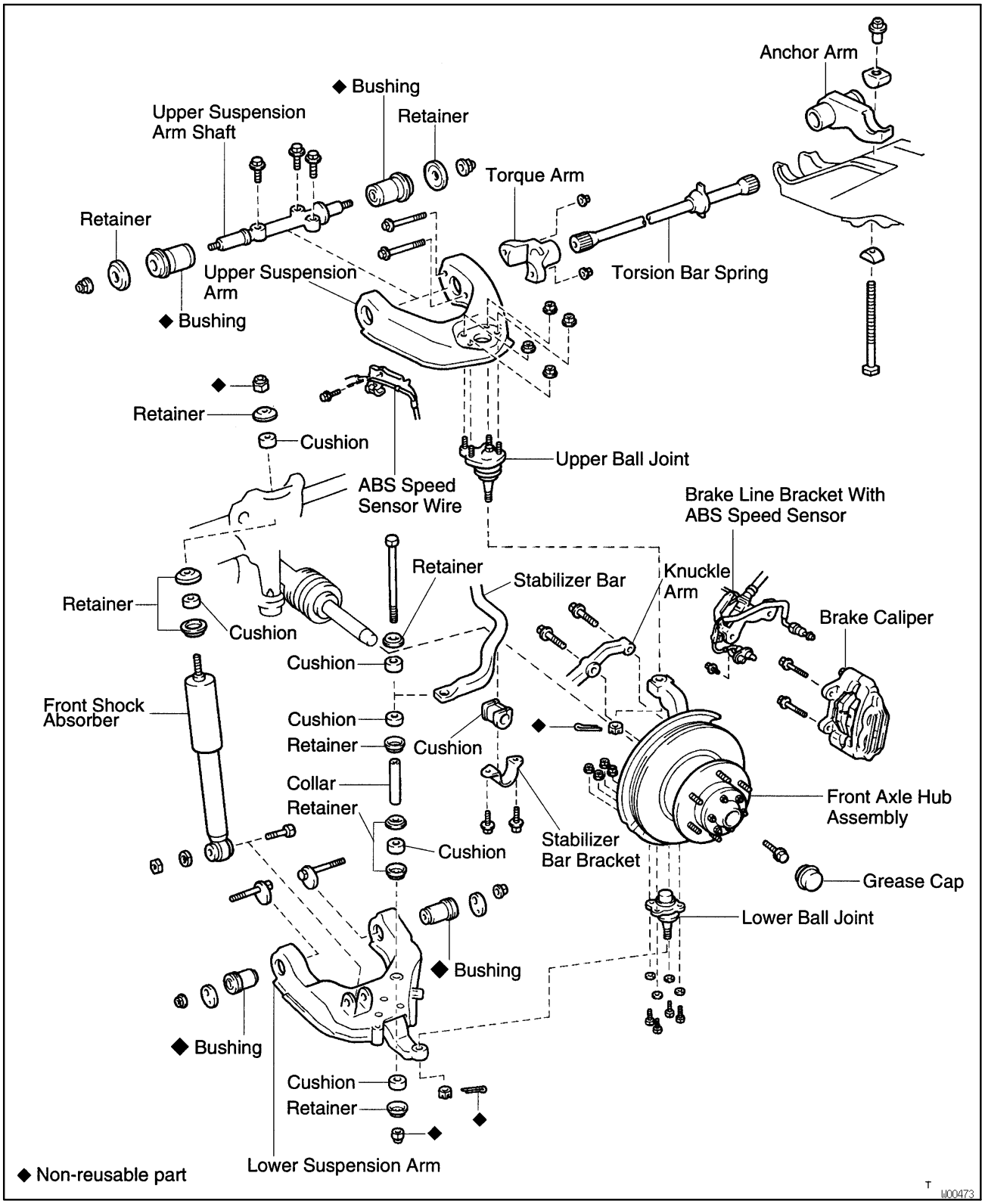
Installation is in the reverse order of removal (See page SA–73).

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FRONT SHOCK ABSORBER (4WD)

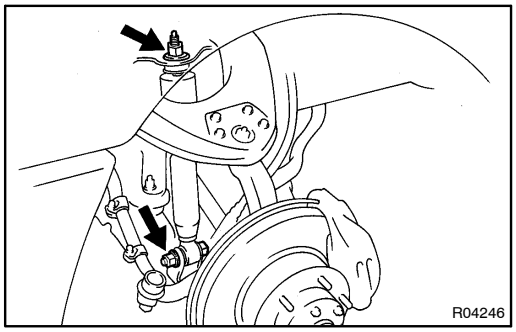
COMPONENTS

SA0GH–02



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SA0GI–01



REMOVAL

1. REMOVE FRONT WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

2. REMOVE SHOCK ABSORBER

(a) Remove the nut and washer, and disconnect the shock absorber lower side from the lower suspension arm.

Torque: 137 N·m (1,400 kgf·cm, 101 ft·lbf)

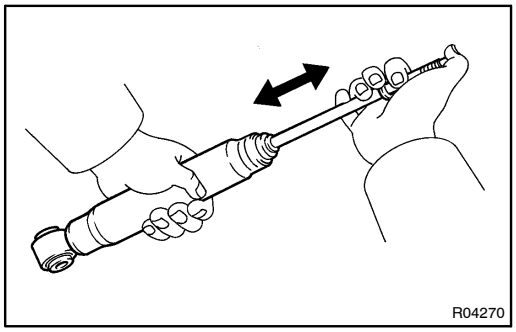
(b) Hold the shock absorber and remove the nut, retainer, cushion and shock absorber.

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(c) Remove the 2 retainers and cushion from the shock absorber.

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SA0GJ–01



INSPECTION

INSPECT SHOCK ABSORBER

Compress and extend the shock absorber piston rod and check that there is no abnormal resistance or unusual operation sound.

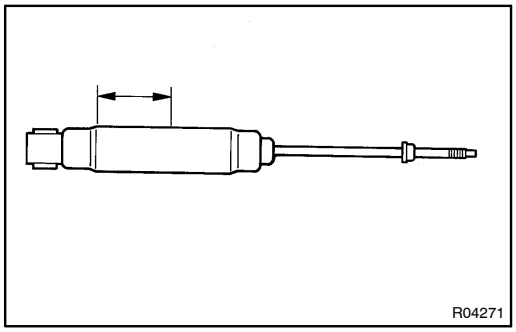
If there is any abnormality, replace the shock absorber with a new one.

NOTICE:

When discarding the shock absorber, see DISPOSAL on page SA–80.

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SA0GK–01


R04271

DISPOSAL

1. FULLY EXTEND SHOCK ABSORBER ROD

2. DRILL HOLE TO REMOVE GAS FROM CYLINDER

Using a drill, make a hole in the cylinder, as shown to remove the gas inside.

CAUTION:

The discharged gas is harmless, but be careful of chips which may fly up when drilling.

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SA0GL–01

INSTALLATION

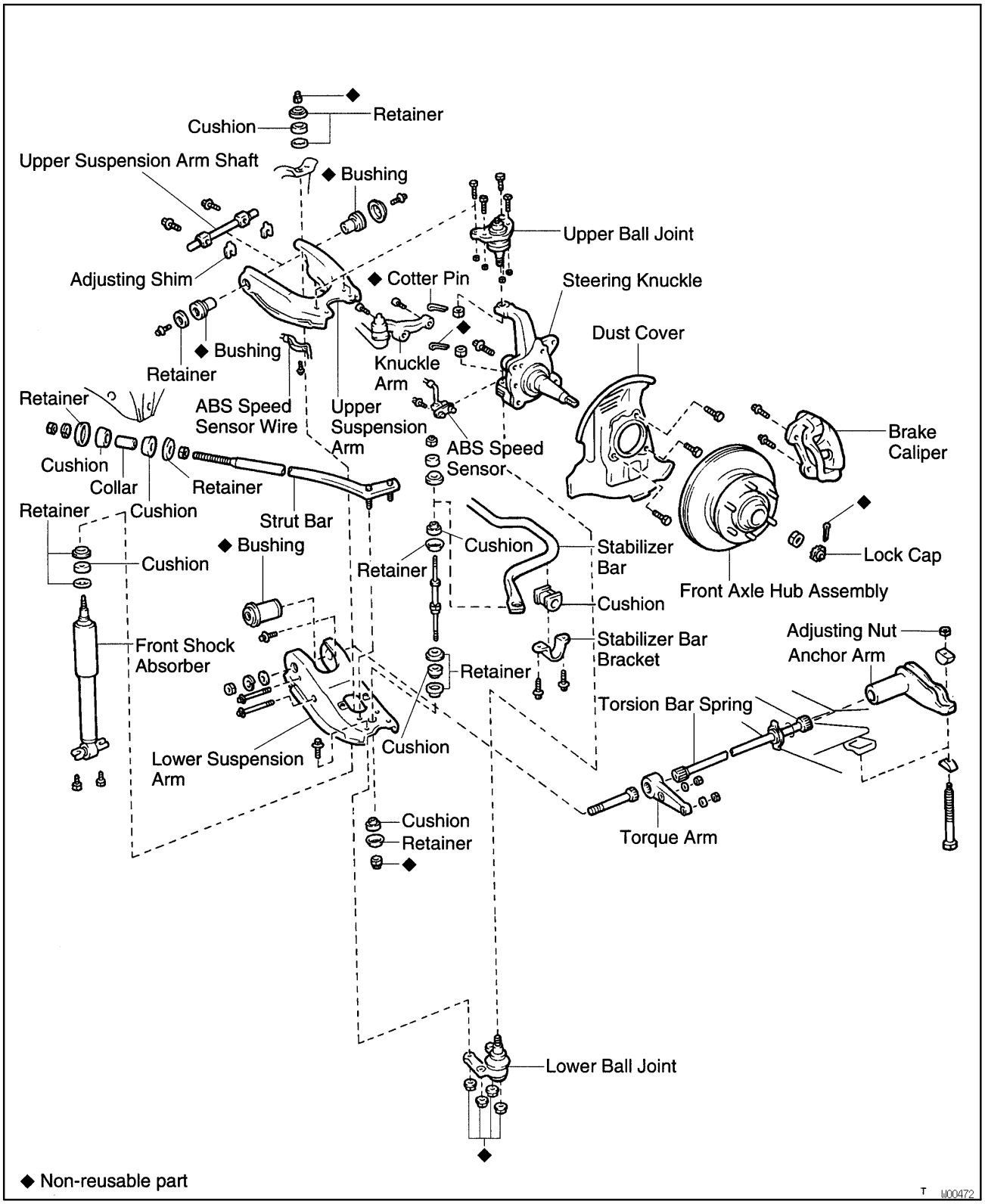
Installation is in the reverse order of removal (See page SA–78).

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FRONT TORSION BAR SPRING (2WD)

COMPONENTS

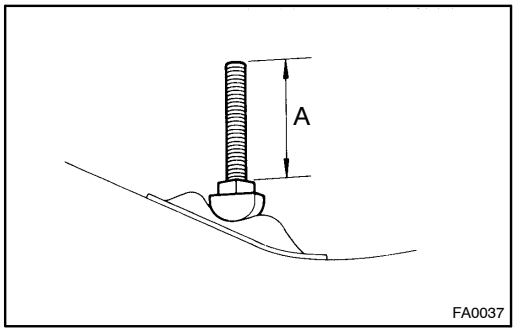
SA0GM–07



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SA0GN–01

REMOVAL



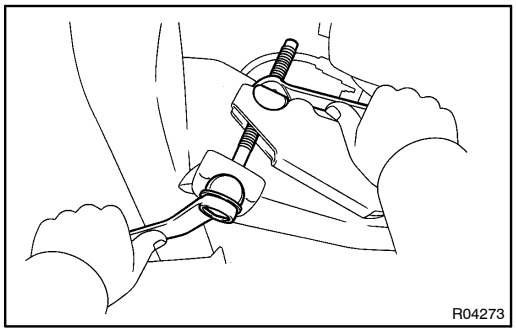
1. REMOVE FRONT WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

2. MEASURE PROTRUDING BOLT END "A" AS SHOWN

HINT:

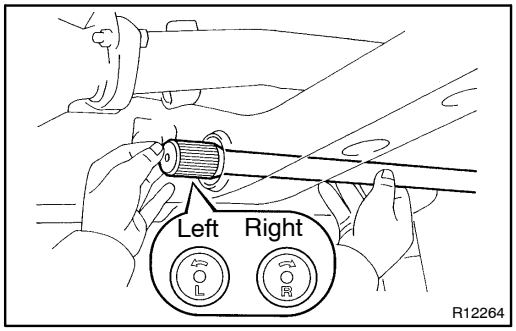
- Use this measurement for reference when adjusting the vehicle height.
- After stabilizing the suspension, adjust the vehicle height by turning the adjusting nut (See page SA–7).



3. LOOSEN ADJUSTING NUT AND REMOVE ANCHOR ARM

HINT:

At the time of installation, tighten the adjusting nut to the bolt protrusion length is of before removal.

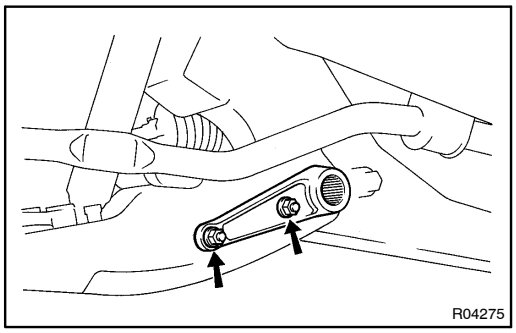


4. REMOVE TORSION BAR SPRING

HINT:

At the time of installation, please refer to the following items.

- There are left and right matchmarks on the rear end of the torsion bar springs.
  Be careful not to interchange them.
- Apply a light coat of MP grease to the spline of the torsion bar spring.



5. REMOVE TORQUE ARM

Remove the 2 torque arm mounting nuts.

Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

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SA0GO–01

INSTALLATION

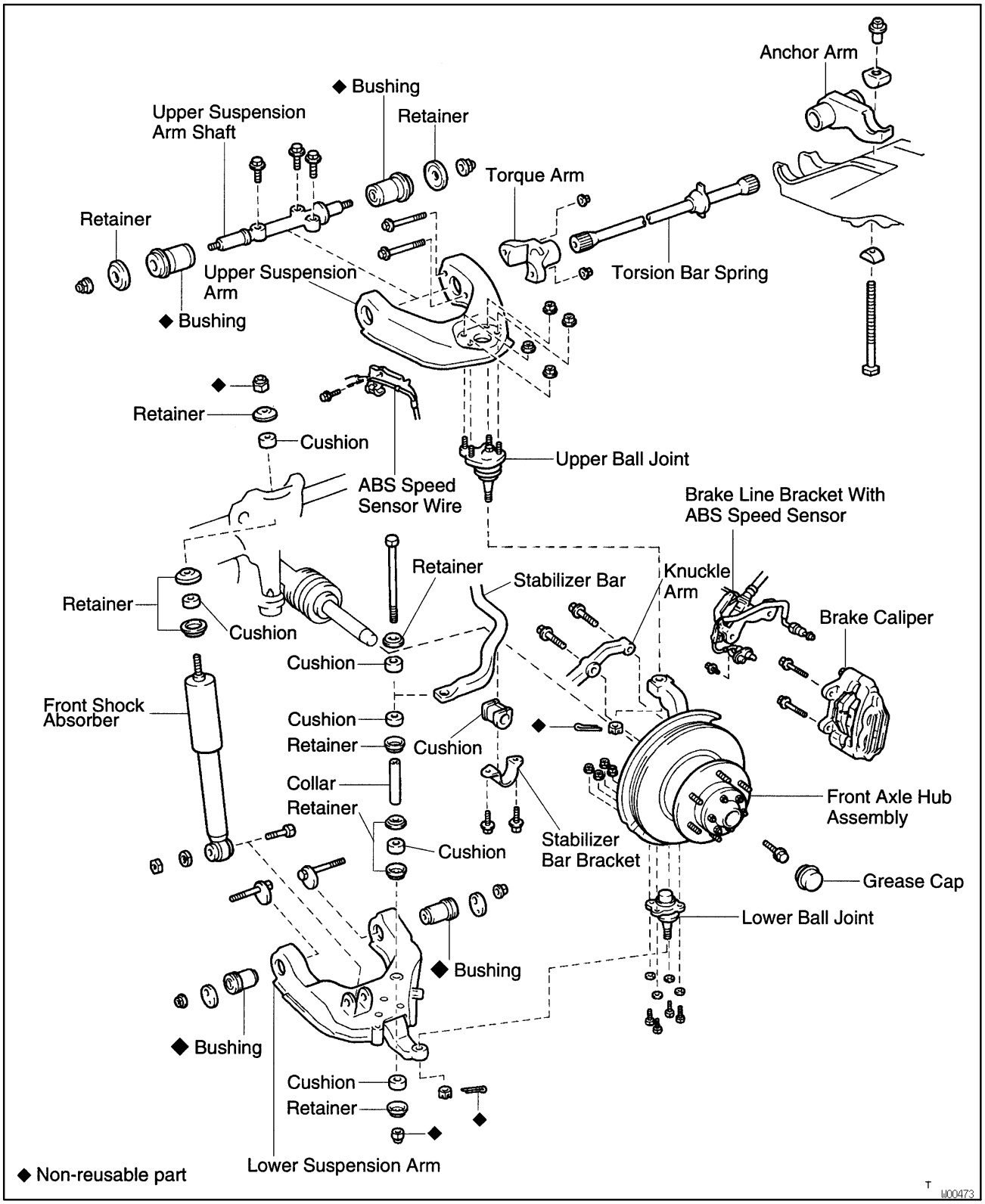
Installation is in the reverse order of removal (See page SA–83).
AFTER INSTALLATION CHECK FRONT WHEEL ALIGNMENT (See page SA–7)

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FRONT TORSION BAR SPRING (4WD)

COMPONENTS

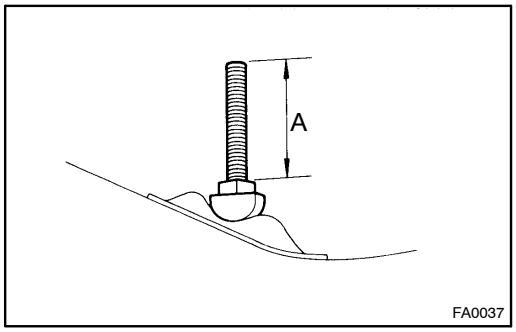
SA0GP–02



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SA0GQ–01

REMOVAL



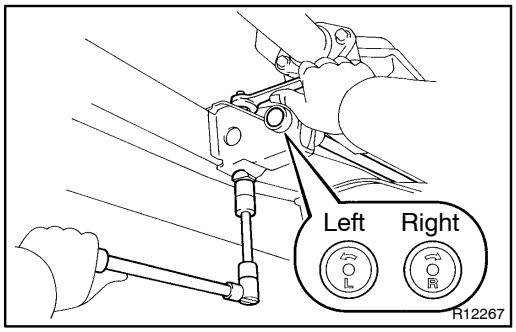
1. REMOVE FRONT WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

2. MEASURE PROTRUDING BOLT END "A" AS SHOWN

HINT:

- Use this measurement for reference when adjusting the vehicle height.
- After stabilizing the suspension, adjust the vehicle height by turning the adjusting nut (See page SA–10).

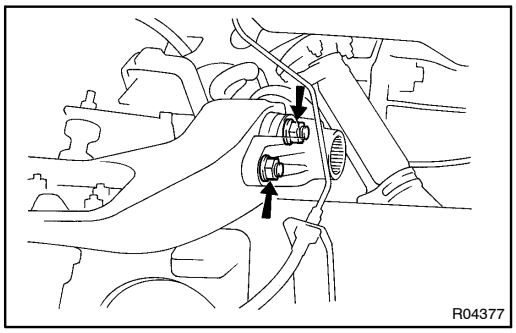


3. LOOSEN ADJUSTING NUT, REMOVE ANCHOR AND TORSION BAR SPRING

HINT:

At the time of installation, please refer to the following items.

- Tighten the adjusting nut to the bolt protrusion length is of before removal.
- There are left and right matchmarks on the rear end of the torsion bar springs.
  Be careful not to interchange them.
- Apply a light coat of MP grease to the spline of the torsion bar spring.



4. REMOVE TORQUE ARM

Remove the 2 torque arm mounting nuts.

Torque: 87 N·m (890 kgf·cm, 64 ft·lbf)

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SA0GR–01

INSTALLATION

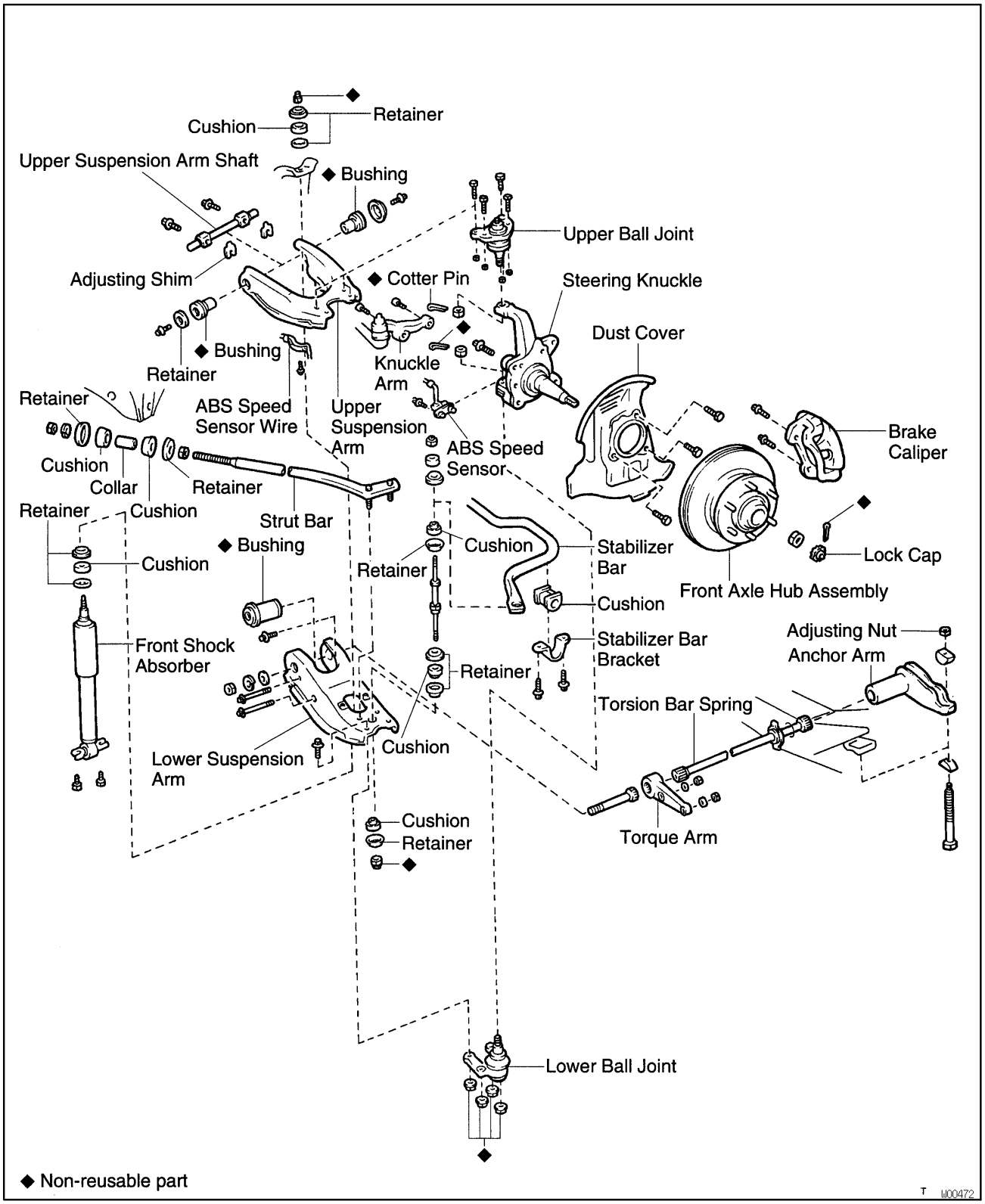
Installation is in the reverse order of removal (See page SA–86).
AFTER INSTALLATION, CHECK FRONT WHEEL ALIGNMENT (See page SA–10)

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FRONT STRUT BAR (2WD)

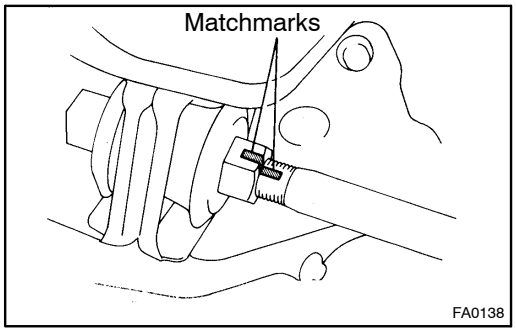
COMPONENTS

SA0GS–07



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SA0GT–01



REMOVAL

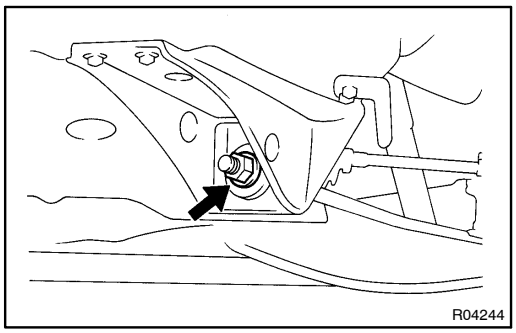
1. REMOVE FRONT WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

2. REMOVE ENGINE UNDER COVER

3. PLACE MATCHMARKS ON STRUT BAR

Place matchmarks on the strut bar and nut.



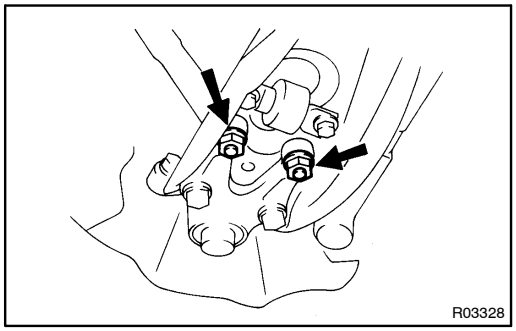
4. REMOVE STRUT BAR

(a) Remove the nut, washer, retainer and cushion on the front side of the strut bar.

Torque: 123 N·m (1,250 kgf·cm, 90 ft·lbf)

HINT:

At the time of installation, after stabilizing the suspension, torque the nut.

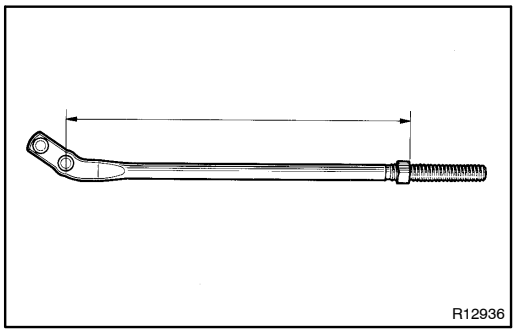


(b) Remove the 2 nuts and disconnect the strut bar from the lower suspension arm.

Torque: 75 N·m (760 kgf·cm, 55 ft·lbf)

(c) Remove the collar, cushion, retainer and strut bar.

(d) Remove the nut from the strut bar.



HINT:

At the time of installation, if using a new strut bar, set the rear side nut to the standard distance.

Standard distance: 423 mm (16.65 in.)

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SA0GU–01

INSTALLATION

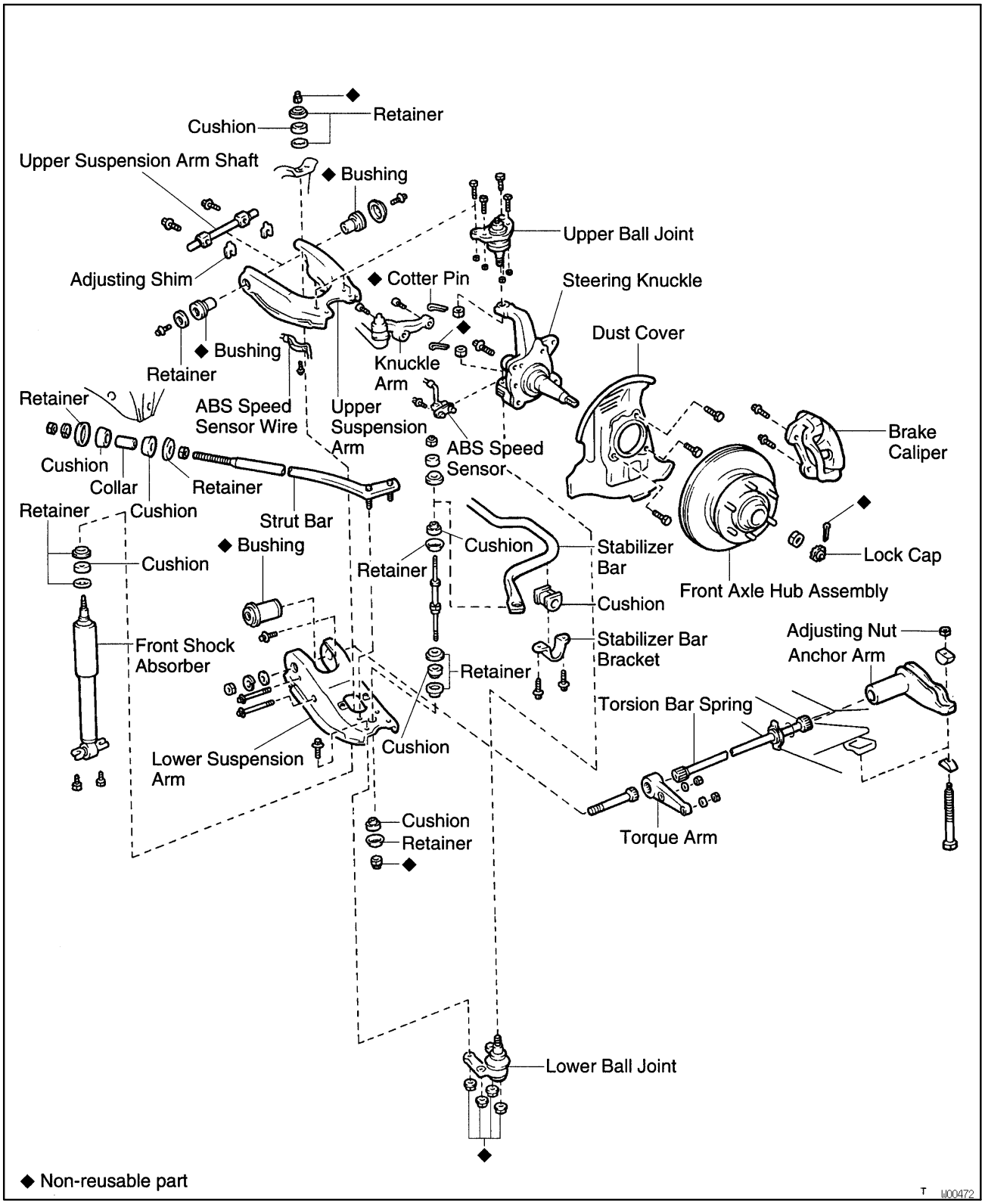
Installation is in the reverse order of removal (See page SA–89).
AFTER INSTALLATION, CHECK FRONT WHEEL ALIGNMENT (See page SA–7)

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FRONT UPPER SUSPENSION ARM (2WD)

COMPONENTS

SA0GV–07

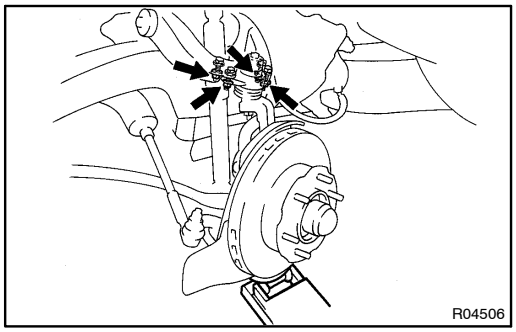


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SA0GW–07

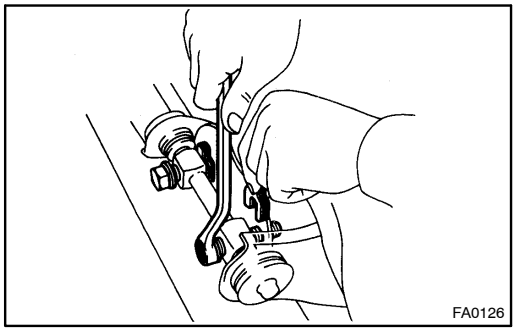
REMOVAL

1. **REMOVE FRONT WHEEL**
   Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
2. **REMOVE BRAKE CALIPER (See page BR–27)**
3. **w/ ABS:**
   DISCONNECT ABS SPEED SENSOR WIRE FROM UPPER SUSPENSION ARM
   Torque:8.0 N·m (82 kgf·cm, 71 in.·lbf)


R04506

4. **REMOVE UPPER BALL JOINT FROM UPPER SUSPENSION ARM**

(a) Support the lower suspension arm with a jack.
(b) Remove the 4 nuts and bolts, and disconnect the upper suspension arm.
Torque: 31 N·m (320 kgf·cm, 23 ft·lbf)


FA0126

5. **REMOVE UPPER SUSPENSION ARM**

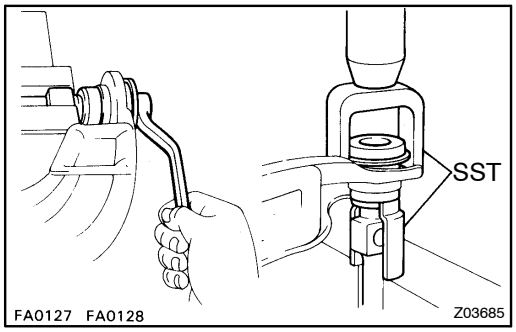
(a) Remove the 2 bolts and camber adjusting shims.
Torque: 96 N·m (980 kgf·cm, 71 ft·lbf)
(b) Remove the upper suspension arm.

NOTICE:

- **Do not loose the camber adjusting shims. Record the position and the thickness of camber adjusting shims so that these can be reinstalled to their original location.**
- **At the times of installation, install an equal number and thickness of shims in their original position.**

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SA0GX–01



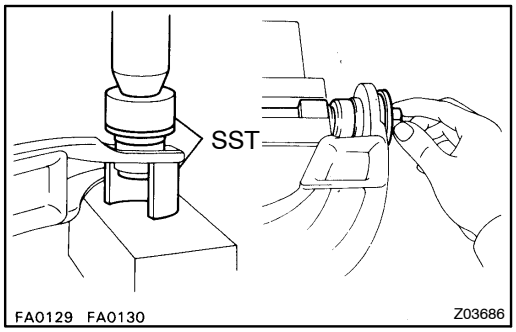
REPLACEMENT

1. REMOVE BUSHING

(a) Remove the 2 bolts and retainers.

(b) Using SST, remove the 2 bushings.

SST 09710–30021 (09710–03031, 09710–03041)



2. INSTALL NEW BUSHING

(a) Using SST, install 2 new bushings.

SST 09710–30021 (09710–03051, 09710–03061)

(b) Install the washer and tighten the bolt by the hand.

NOTICE:

Do not torque the bolts.

HINT:

At the time of installation, after stabilizing the suspension, torque the bolts.

Torque: 126 N·m (1,280 kgf·cm, 93 ft·lbf)

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SA0GY–01

INSTALLATION

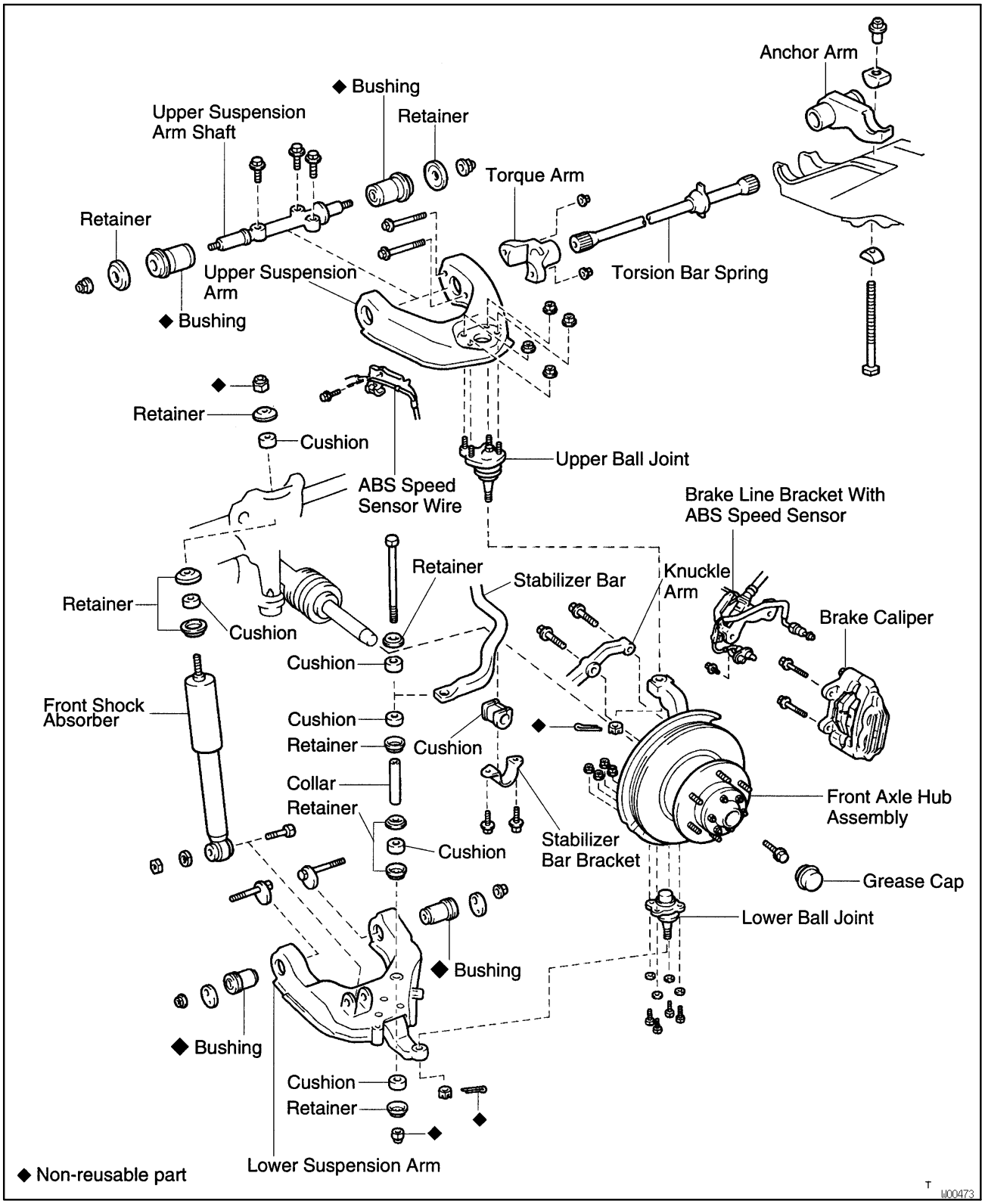
Installation is in the reverse order of removal (See page SA–92).
AFTER INSTALLATION, CHECK FRONT WHEEL ALIGNMENT (See page SA–7)

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FRONT UPPER SUSPENSION ARM (4WD)

SA0GZ–02

COMPONENTS

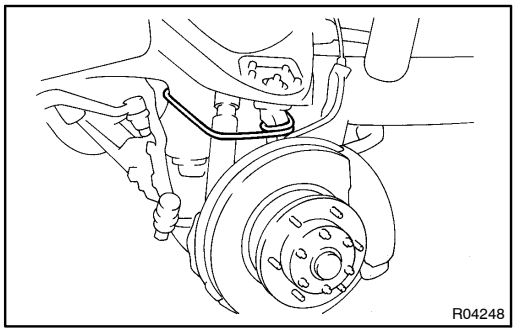


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SA0H0–02

REMOVAL

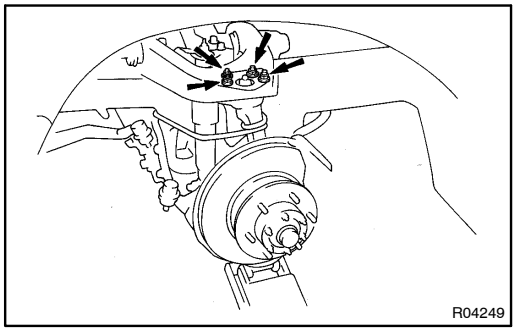
1. **REMOVE FRONT WHEEL**
   Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
2. **w/ ABS:**
   DISCONNECT ABS SPEED SENSOR WIRE FROM UPPER SUSPENSION ARM
   Torque:8.0 N·m (82 kgf·cm, 71 in.·lbf)


R04248

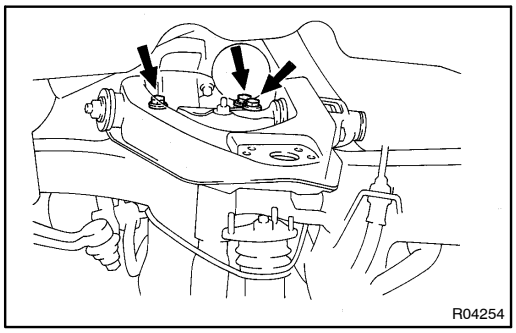
3. **REMOVE TORSION BAR SPRING (See page SA–86)**
4. **REMOVE UPPER BALL JOINT FROM UPPER SUSPENSION ARM**

NOTICE:

Make sure the steering knuckle is positively secured, as shown, before removing upper ball joint from upper suspension arm.


R04249

(a) Support the lower suspension arm with a jack.
(b) Remove the 4 nuts and disconnect the upper suspension arm from the steering knuckle.
Torque: 33 N·m (340 kgf·cm, 25 ft·lbf)

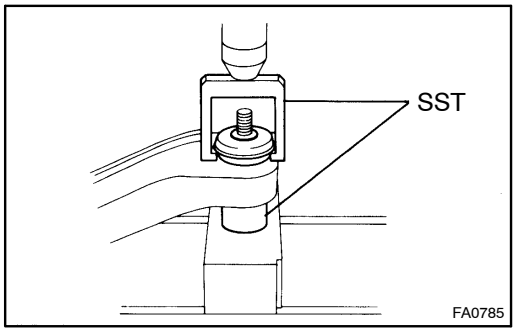

R04254

(c) Remove the 3 bolts and remove the upper suspension arm from frame.
Torque: 178 N·m (1,810 kgf·cm, 131 ft·lbf)

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SA0H1–01

REPLACEMENT

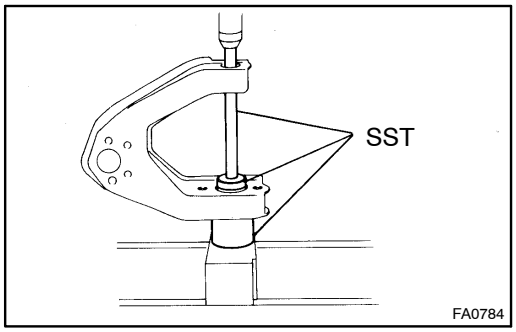


1. REMOVE TORQUE ARM

2. REMOVE FRONT BUSHING

(a) Using a chisel and hammer, loosen the staked part of the nut and remove the nut.

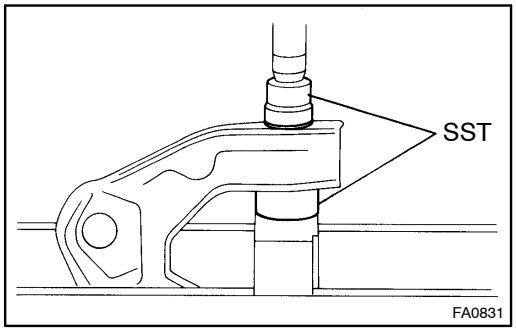
(b) Using SST and press, remove the front bushing.
SST 09710–26011 (09710–05041, 09710–05051)



3. REMOVE UPPER SUSPENSION ARM SHAFT

4. REMOVE REAR BUSHING

Using SST and press, remove the rear bushing
SST 09710–26011 (09710–05081),
09950–60010 (09951–00530),
09950–70010 (09951–07200)

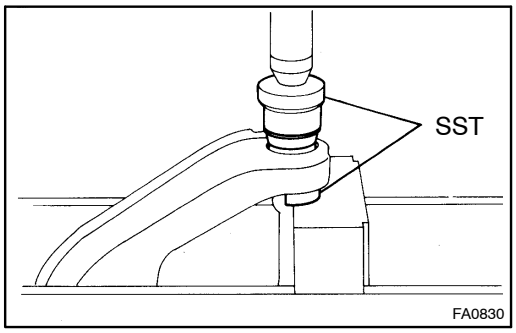


5. INSTALL REAR BUSHING

(a) Using SST and press, install a new rear bushing.
SST 09710–26011 (09710–05061, 09710–05081)

HINT:
Do not apply grease or oil to the bushing.

(b) Install the upper suspension arm shaft.

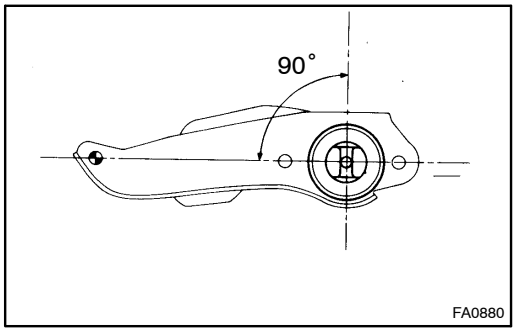


6. INSTALL FRONT BUSHING

Using SST and press, install a new front bushing
SST 09710–26011 (09710–05061, 09710–05081)

7. TORQUE UPPER SUSPENSION ARM SHAFT

(a) Install the 2 retainers and new nuts.



HINT:
Position the upper suspension arm shaft so that the frame installation surface is level with the suspension shaft arm.

(b) Torque the suspension arm shaft nuts.
Torque: 226 N·m (2,300 kgf·cm, 166 ft·lbf)

(c) Stake the nuts with a chisel and hammer.

8. INSTALL TORQUE ARM TO UPPER SUSPENSION ARM
Torque: 87 N·m (890 kgf·cm, 64 ft·lbf)

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SA0H2–01

INSTALLATION

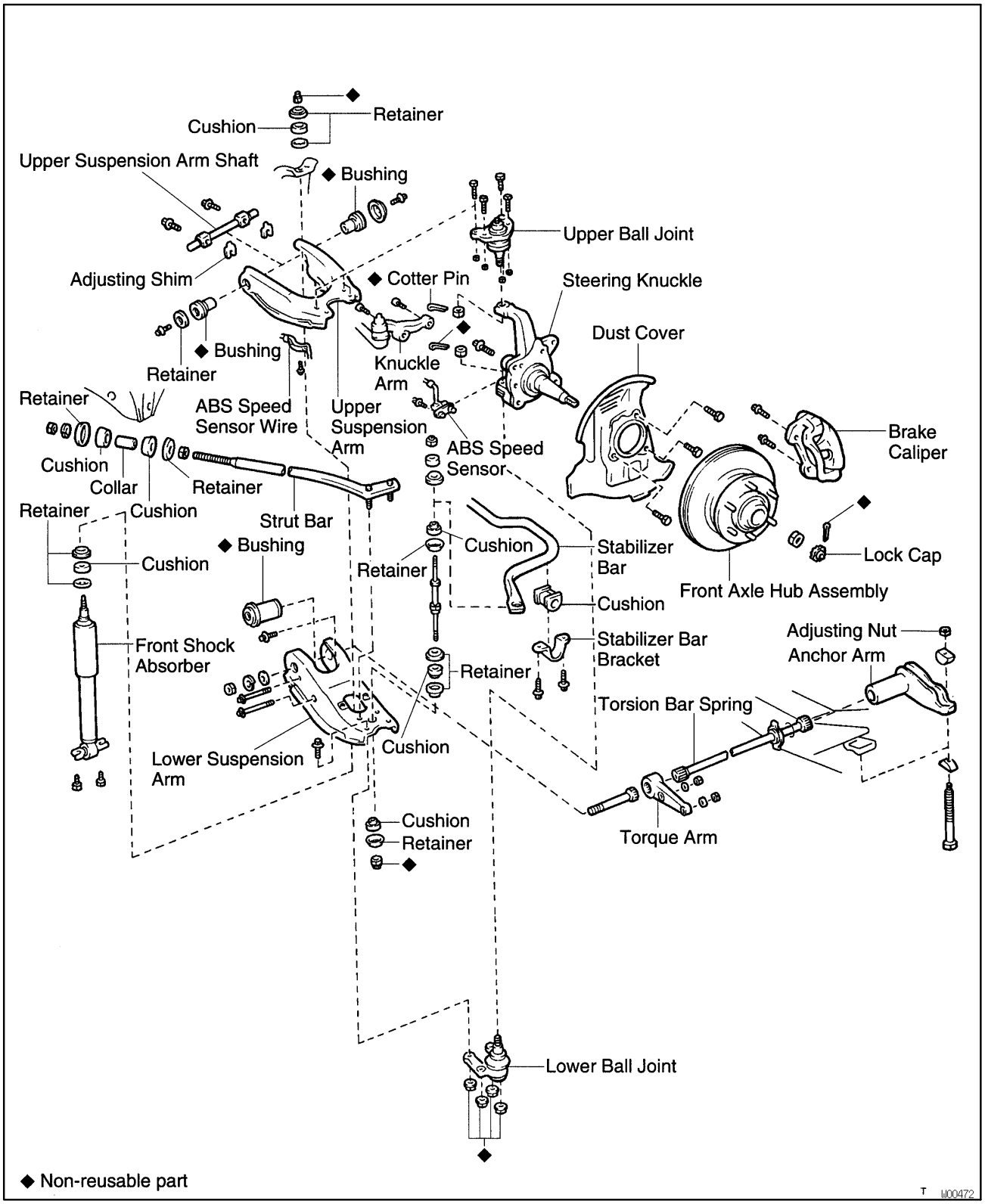
Installation is in the reverse order of removal (See page SA–96).
AFTER INSTALLATION, CHECK FRONT WHEEL ALIGNMENT (See page SA–10)

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FRONT LOWER SUSPENSION ARM (2WD)

COMPONENTS

SA0H3–07

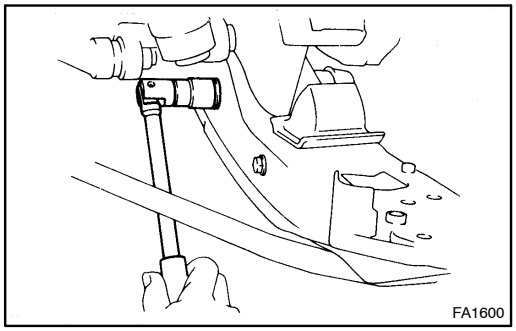


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SA0H4–01

REMOVAL

1. **REMOVE FRONT WHEEL**
   Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
2. **REMOVE ENGINE UNDER COVER**
3. **REMOVE TORSION BAR SPRING (See page SA–83)**
4. **DISCONNECT SHOCK ABSORBER FROM LOWER SUSPENSION ARM (See page SA–73)**
5. **DISCONNECT STABILIZER BAR FROM LOWER SUSPENSION ARM (See page SA–124)**
6. **DISCONNECT STRUT BAR FROM LOWER SUSPENSION ARM (See page SA–89)**
7. **DISCONNECT LOWER BALL JOINT FROM LOWER SUSPENSION ARM (See page SA–116)**


FA1600

8. **REMOVE LOWER SUSPENSION ARM**

Remove the nut and lower suspension arm.

Torque: 206 N·m (2,100 kgf·cm, 152 ft·lbf)

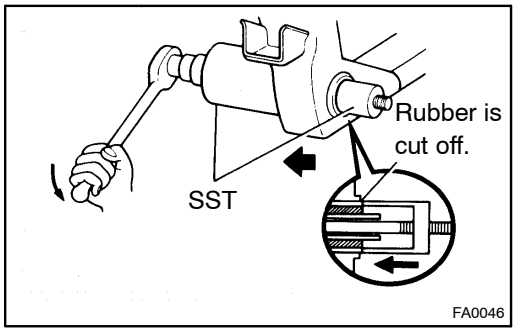
HINT:

At the time of installation, after stabilizing the suspension, torque the nut.

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SA0H5–01

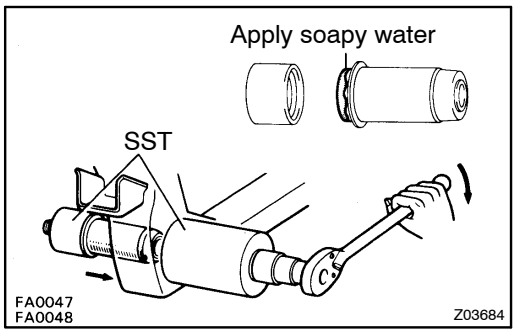
REPLACEMENT



1. REMOVE BUSHING

(a) Cut off the bushing rubber, as shown in the illustration.

(b) Using SST, remove the bushing.
SST 09726–35011



2. INSTALL NEW BUSHING

(a) Apply soapy water on the front rubber part of a new bushing and fit SST on the bushing.
SST 09726–35011

(b) Using SST, install the bushing.
SST 09726–35011

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SA0H6–01

INSTALLATION

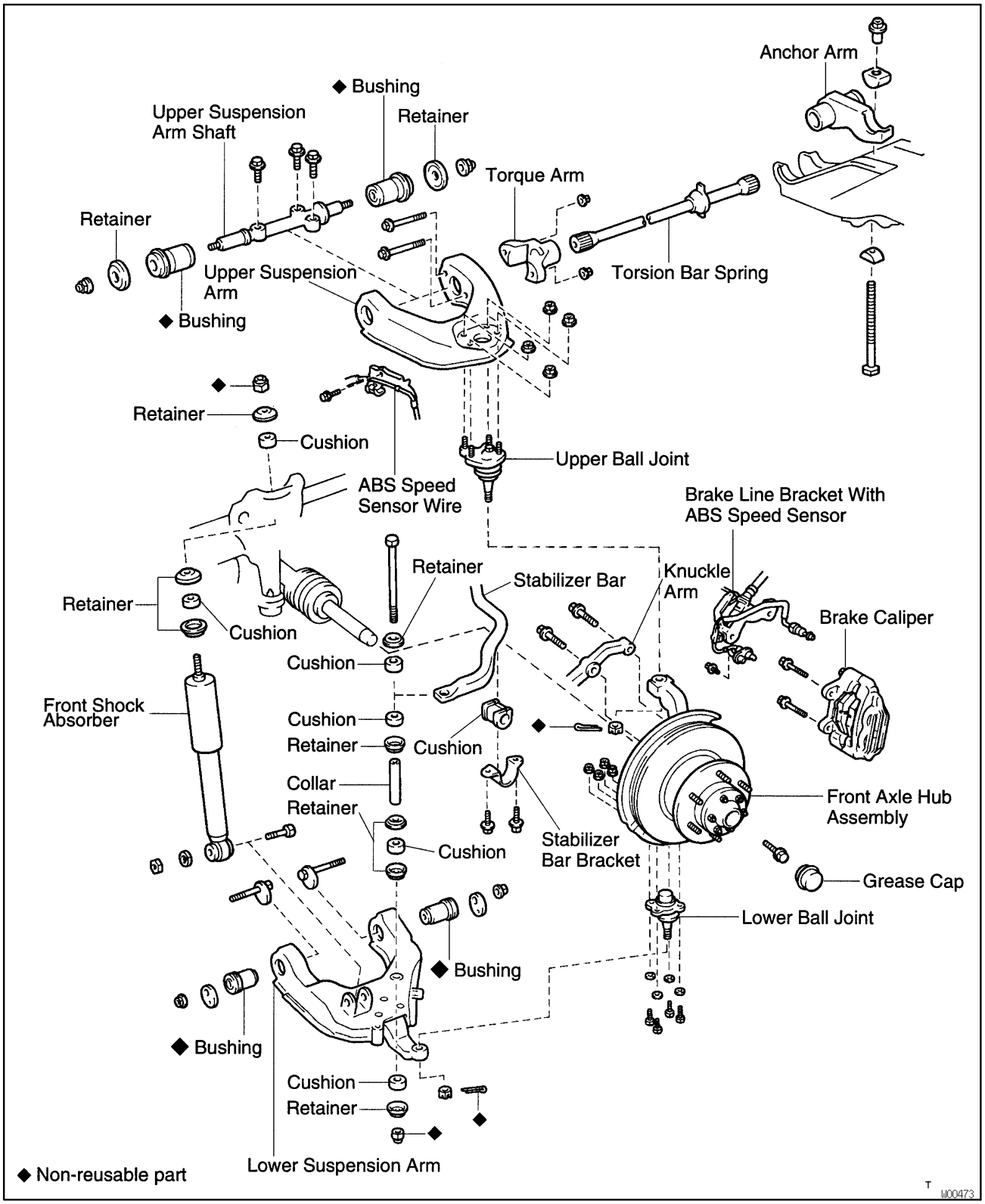
Installation is in the reverse order of removal (See page SA–100).
AFTER INSTALLATION, CHECK FRONT WHEEL ALIGNMENT (See page SA–7)

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FRONT LOWER SUSPENSION ARM (4WD)

COMPONENTS

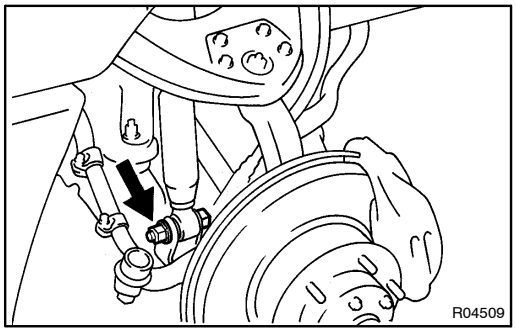
SA0H7–02



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SA0H8–01

REMOVAL



1. REMOVE FRONT WHEEL

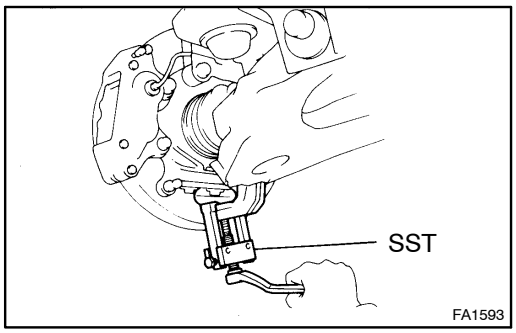
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

2. REMOVE FRONT SHOCK ABSORBER FROM LOWER SUSPENSION ARM

Remove the front shock absorber lower side set nut.

Torque: 137 N·m (1,400 kgf·cm, 101 ft·lbf)

3. DISCONNECT STABILIZER BAR FROM LOWER SUSPENSION ARM (See page SA–127)



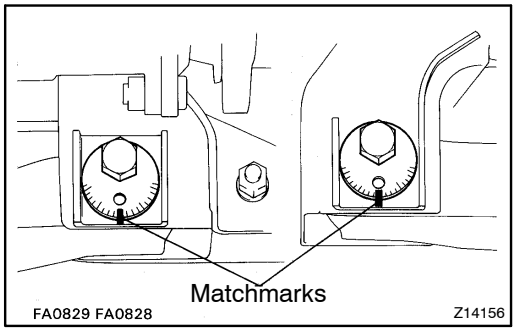
4. DISCONNECT LOWER SUSPENSION ARM FROM LOWER BALL JOINT

(a) Remove the cotter pin and loosen the nut.

Torque: 142 N·m (1,450 kgf·cm, 105 ft·lbf)

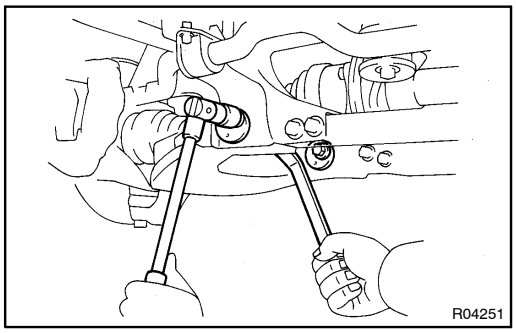
(b) Using SST, disconnect the lower suspension arm from the lower ball joint.

SST 09628–62011



5. REMOVE LOWER SUSPENSION ARM

(a) Place matchmarks on the front and rear adjusting cams.



(b) Remove the 2 nuts and adjusting cams and remove the lower suspension arm.

Torque: 196 N·m (2,000 kgf·cm, 145 ft·lbf)

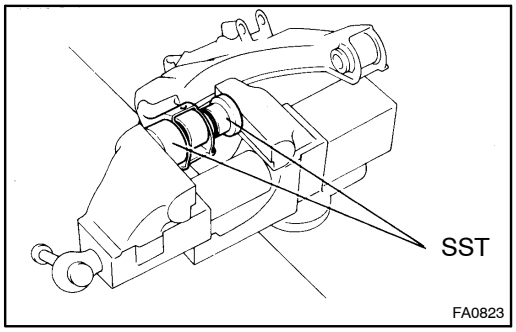
HINT:

At the time of installation, after stabilizing the suspension, torque the nuts.

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SA0H9–01

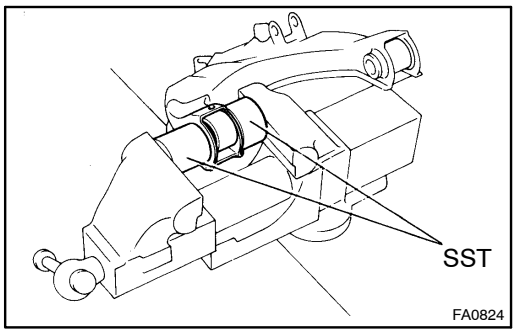
REPLACEMENT



1. REMOVE FRONT AND REAR BUSHINGS

Using SST, remove the 2 bushings from the lower suspension arm.

SST 09726–27012 (09726–02051, 09726–02061)



2. INSTALL FRONT AND REAR BUSHINGS

Using SST, install 2 new bushings from the lower suspension arm.

SST 09726–27012 (09726–02041, 09726–02061)

HINT:

Do not apply grease or oil to the bushing.

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SA0HA–01

INSTALLATION

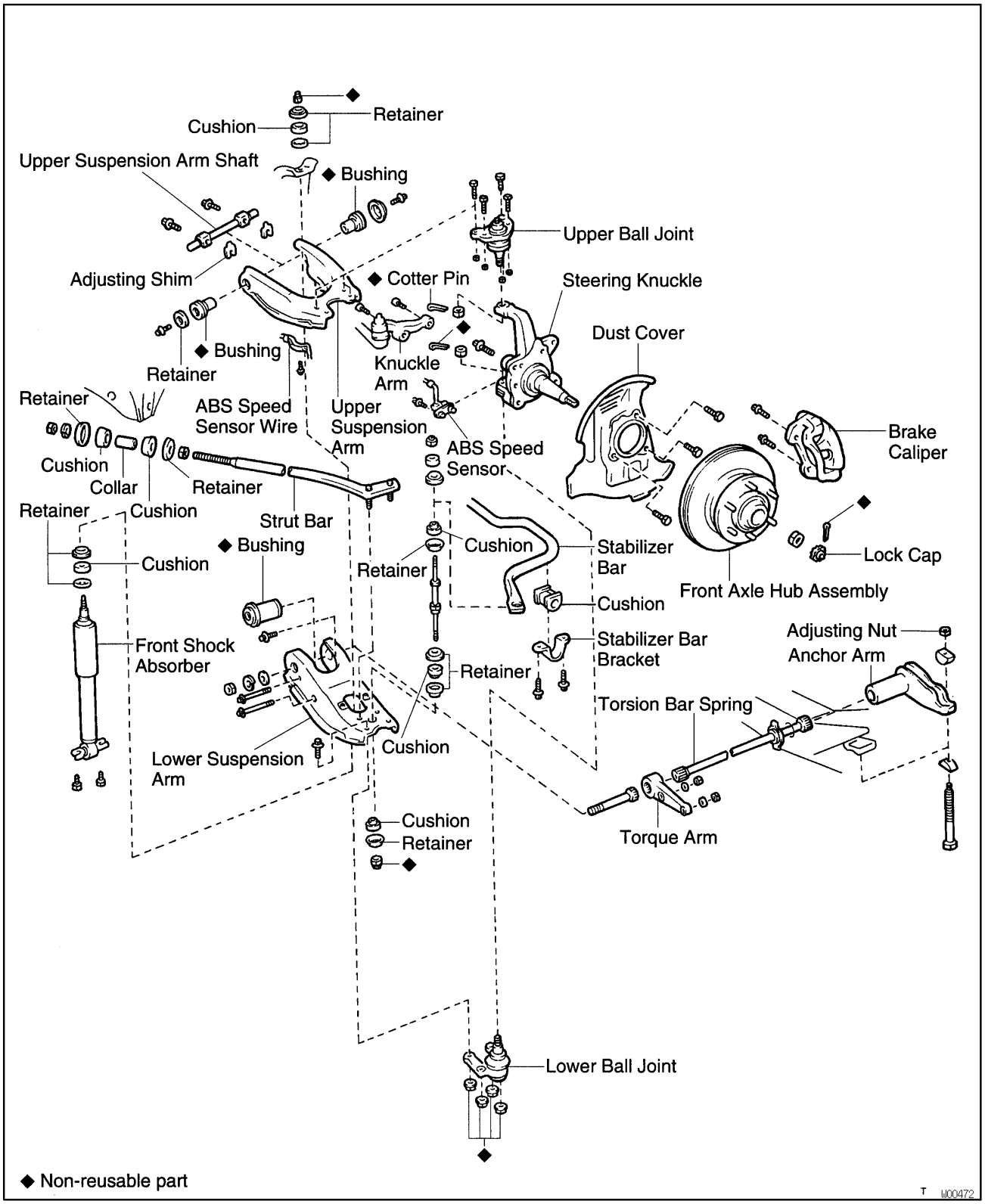
Installation is in the reverse order of removal (See page SA–104).
AFTER INSTALLATION, CHECK FRONT WHEEL ALIGNMENT (See page SA–10)

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FRONT UPPER BALL JOINT (2WD)

COMPONENTS

SA0HB–08

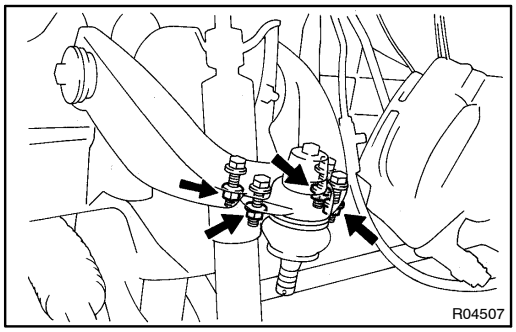


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SA0HC–01

REMOVAL

1. **REMOVE FRONT WHEEL**
   Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
2. **REMOVE STEERING KNUCKLE (See page SA–16)**



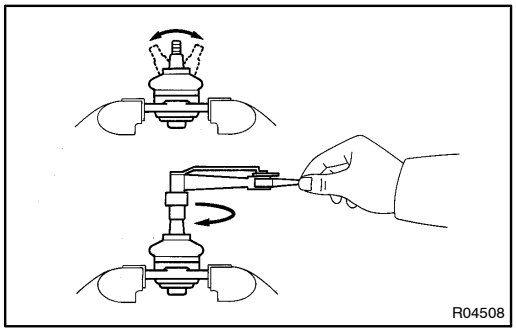
3. **REMOVE UPPER BALL JOINT**

(a) Remove the 4 nuts and bolts.
Torque: 31 N·m (320 kgf·cm, 23 ft·lbf)

(b) Remove the upper ball joint from the upper suspension arm.

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SA0HD–01



INSPECTION

INSPECT UPPER BALL JOINT FOR ROTATION CONDITION

(a) As shown in the illustration, flip the ball joint stud back and forth 5 times, before installing the nut.

(b) Using a torque wrench, turn the nut continuously one turn each 2 – 4 seconds and take the torque reading on the 5th turn.

Turning torque:
2.0 – 3.9 N·m (20 – 40 kgf·cm, 17 – 34 in.·lbf)

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SA0HE–01

INSTALLATION

Installation is in the reverse order of removal (See page SA–108).

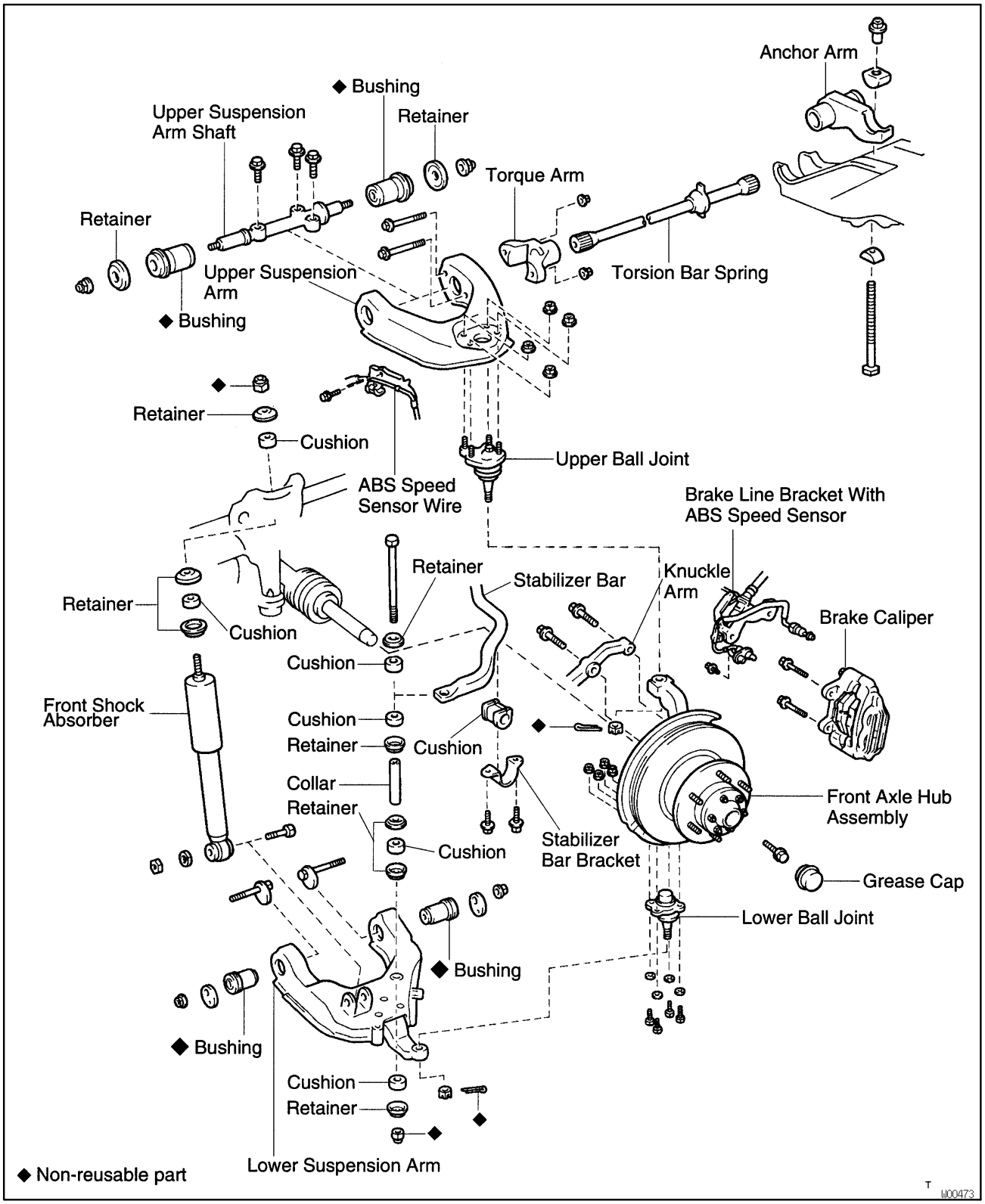
AFTER INSTALLATION, CHECK ABS SPEED SENSOR SIGNAL (See page DI–321) AND FRONT WHEEL ALIGNMENT (See page SA–7)

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FRONT UPPER BALL JOINT (4WD)

COMPONENTS

SA0HF–02



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SA0HG–01

REMOVAL

1. REMOVE FRONT WHEEL
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

2. DISCONNECT UPPER AND LOWER BALL JOINT FROM STEERING KNUCKLE
(See page SA–23)

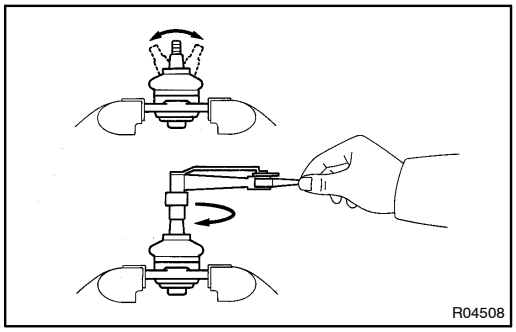
3. REMOVE UPPER BALL JOINT

(a) Remove the 4 nuts.
Torque: 33 N·m (340 kgf·cm, 25 ft·lbf)

(b) Remove the upper ball joint from the upper suspension arm.

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SA0HH–01



INSPECTION

INSPECT UPPER BALL JOINT FOR ROTATION CONDITION

(a) As shown in the illustration, flip the ball joint stud back and forth 5 times, before installing the nut.

(b) Using a torque wrench, turn the nut continuously one turn each 2 – 4 seconds and take the torque reading on the 5th turn.

Turning torque:
0.5 – 2.4 N·m (5 – 25 kgf·cm, 4 – 22 in.·lbf)

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SA0HI–01

INSTALLATION

Installation is in the reverse order of removal (See page SA–112).

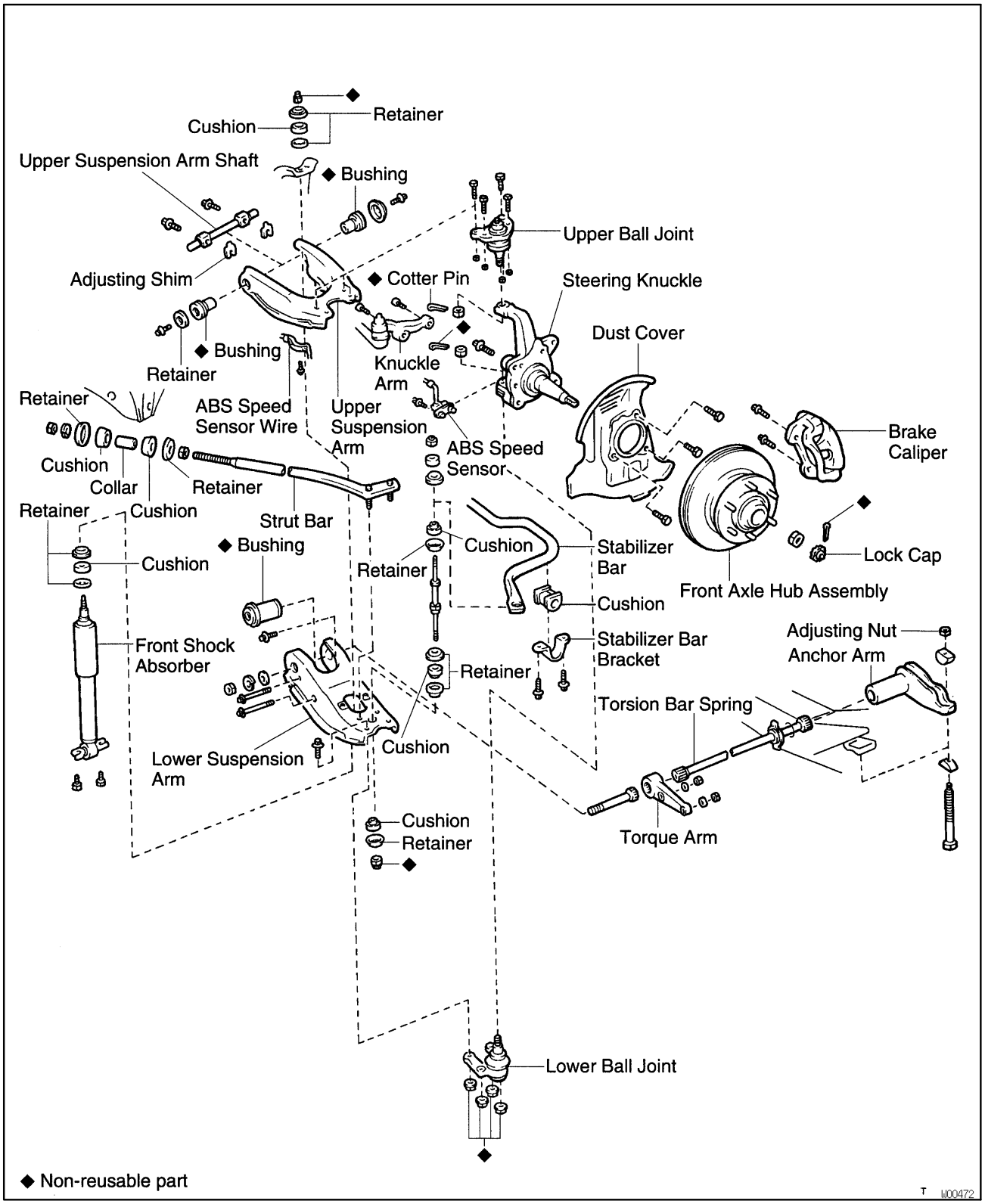
AFTER INSTALLATION, CHECK ABS SPEED SENSOR SIGNAL (See page DI–321) AND FRONT WHEEL ALIGNMENT (See page SA–10)

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FRONT LOWER BALL JOINT (2WD)

COMPONENTS

SA0HJ–08

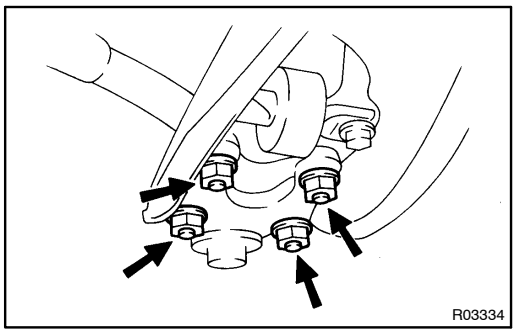


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SA0HK–01

REMOVAL

1. **REMOVE FRONT WHEEL**
   Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
2. **REMOVE STEERING KNUCKLE (See page SA–16)**



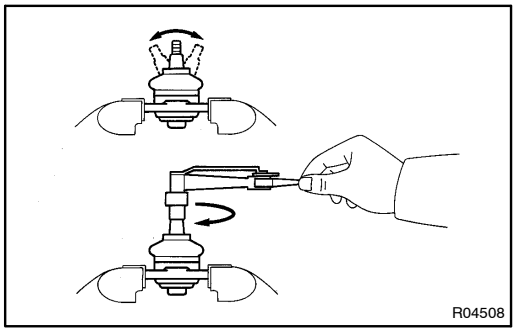
3. **REMOVE LOWER BALL JOINT**

(a) Remove the 4 nuts.
Torque: 75 N·m (760 kgf·cm, 55 ft·lbf)

(b) Remove the lower ball joint from the lower suspension arm.

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SA0HL–01



INSPECTION

INSPECT LOWER BALL JOINT FOR ROTATION CONDITION

(a) As shown in the illustration, flip the ball joint stud back and forth 5 times, before installing the nut.

(b) Using a torque wrench, turn the nut continuously one turn each 2 – 4 seconds and take the torque reading on the 5th turn.

Turning torque :
2.0 – 7.0 N·m (20 – 70 kgf·cm, 17 – 61 in.·lbf)

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SA0HM–01

INSTALLATION

Installation is in the reverse order of removal (See page SA–116).

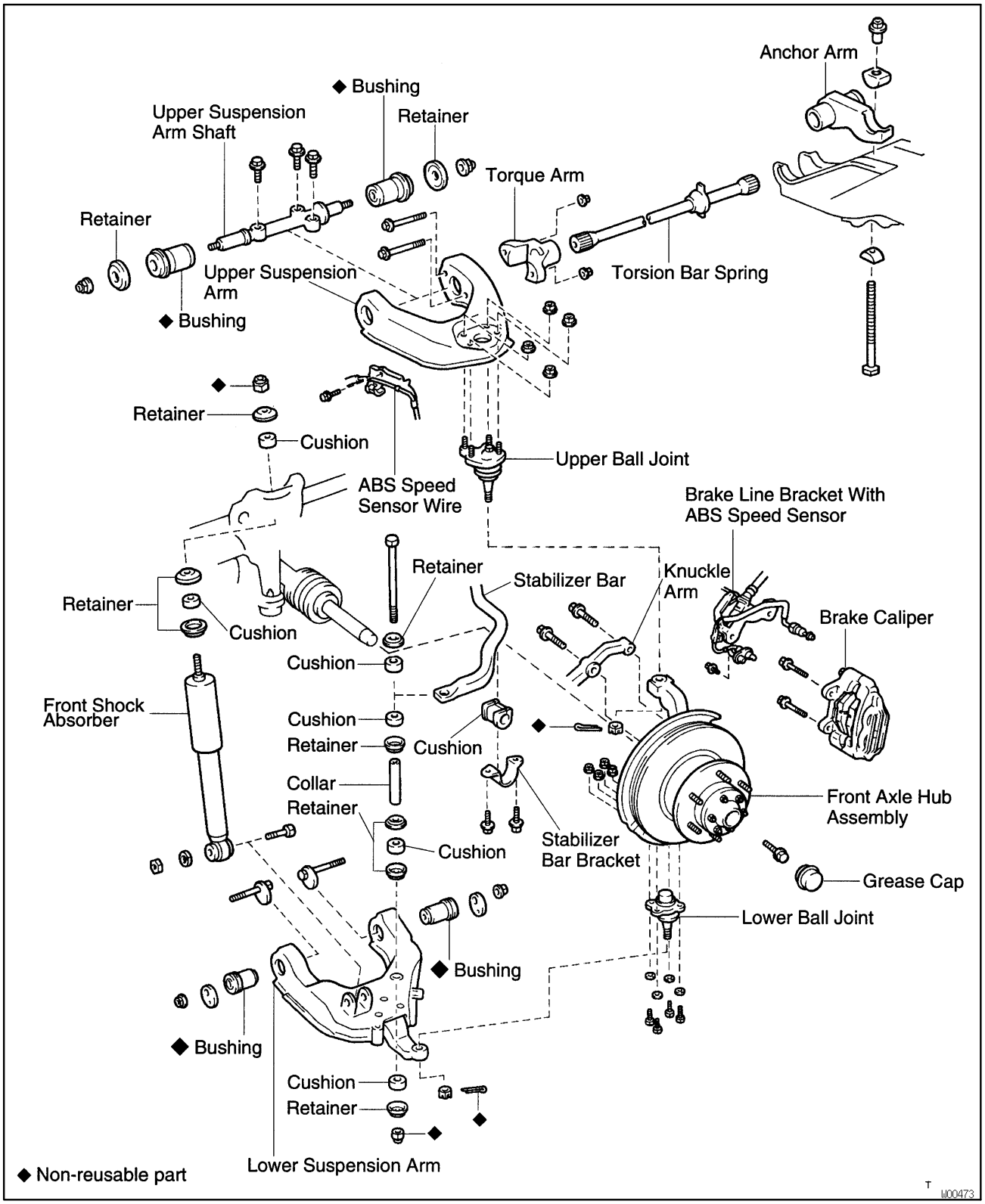
AFTER INSTALLATION, CHECK ABS SPEED SENSOR SIGNAL (See page DI–321) AND FRONT WHEEL ALIGNMENT (See page SA–7)

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FRONT LOWER BALL JOINT (4WD)

COMPONENTS

SA0HN–03

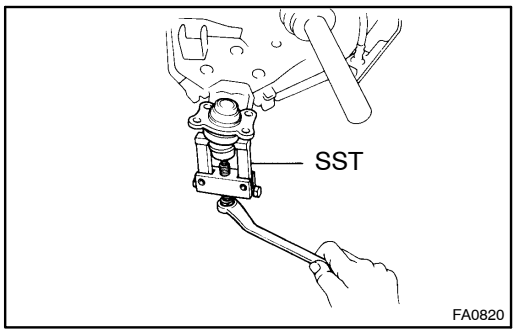


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SA0HO–01

REMOVAL

1. **REMOVE FRONT WHEEL**
   Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
2. **DISCONNECT UPPER AND LOWER BALL JOINT FROM STEERING KNUCKLE (See page SA–23)**



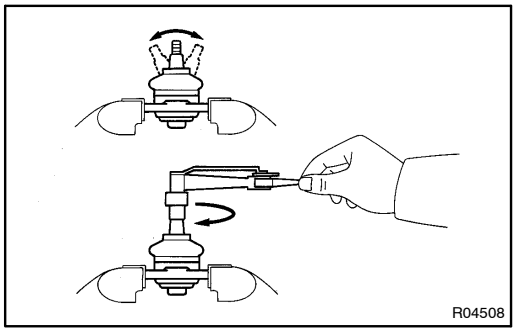
3. **REMOVE LOWER BALL JOINT FROM STEERING KNUCKLE**

(a) Remove the cotter pin and nut from the lower ball joint.
Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)

(b) Using SST, disconnect the steering knuckle from the lower ball joint.
SST 09628–62011

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SA0HP–01



INSPECTION

INSPECT LOWER BALL JOINT FOR ROTATION CONDITION

(a) As shown in the illustration, flip the ball joint stud back and forth 5 times, before installing the nut.

(b) Using a torque wrench, turn the nut continuously one turn each 2 – 4 seconds and take the torque reading on the 5th turn.

Turning torque :
2.0 – 3.9 N·m (20 – 40 kgf·cm, 17 – 34 in.·lbf)

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SA0HQ–01

INSTALLATION

Installation is in the reverse order of removal (See page SA–120).

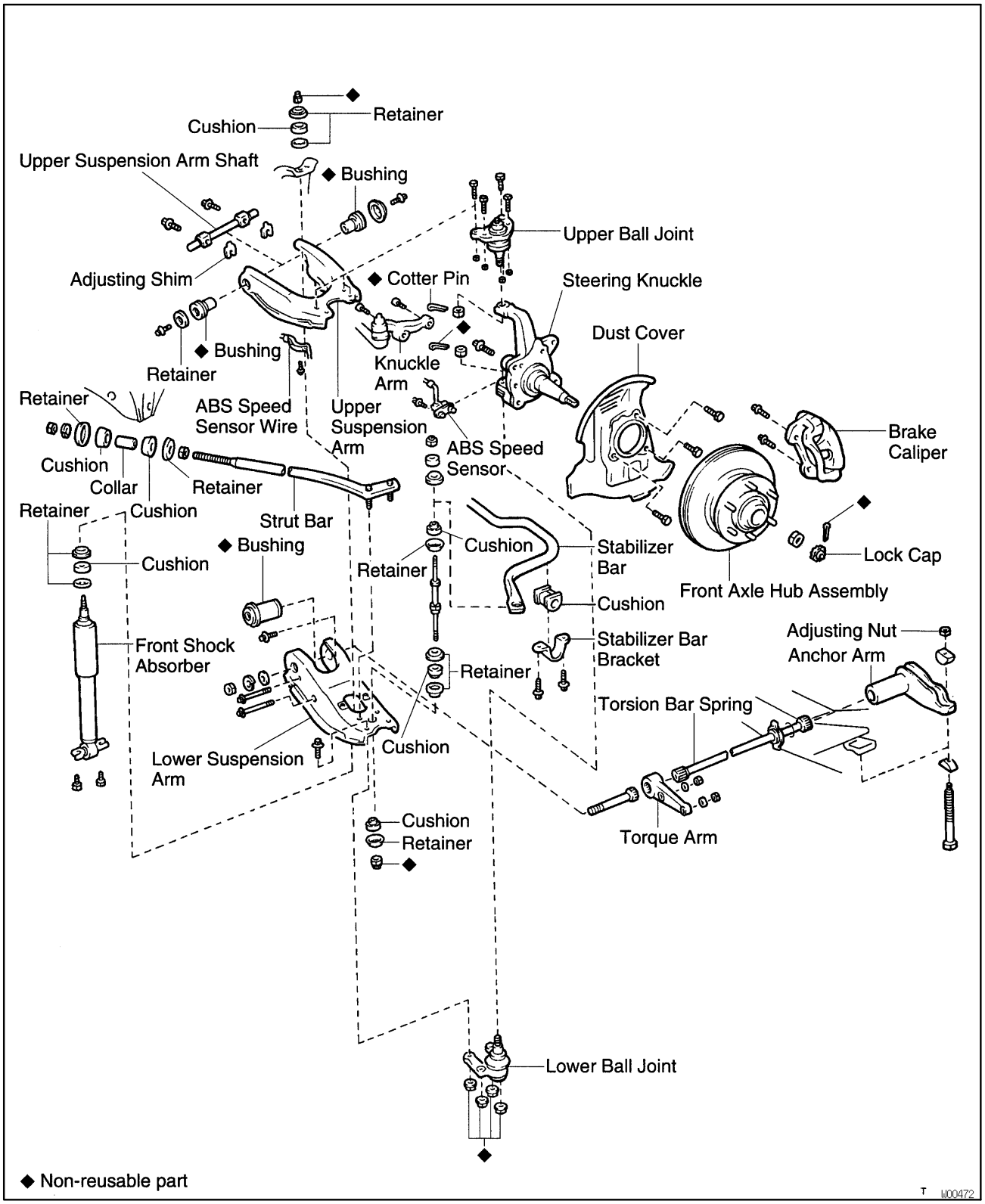
AFTER INSTALLATION, CHECK ABS SPEED SENSOR SIGNAL (See page DI–321) AND FRONT WHEEL ALIGNMENT (See page SA–10)

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FRONT STABILIZER BAR (2WD)

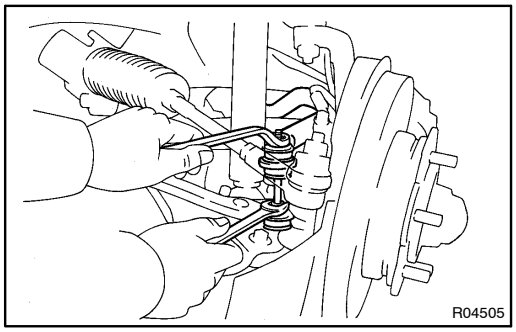
COMPONENTS

SA0HR–07



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SA0HS–01



REMOVAL

1. REMOVE FRONT WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

2. REMOVE STABILIZER BAR

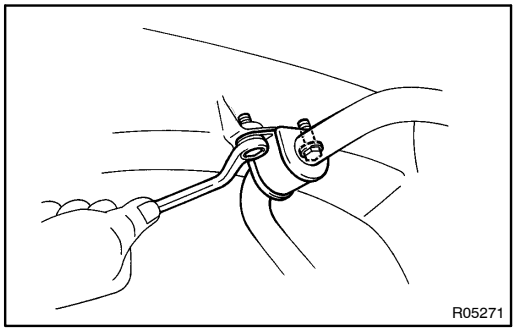
(a) Remove the nut, 3 retainers, 2 cushions and stabilizer bar from the lower suspension arm.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(b) Remove the nut, 2 cushions, 2 retainers and disconnect the stabilizer bar.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(c) Employ the same manner described above to the other side.



(d) Remove the 4 bolts, stabilizer bar brackets, bushings and remove the stabilizer bar.

Torque: 30 N·m (306 kgf·cm, 22 ft·lbf)

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SA0HT–01

INSTALLATION

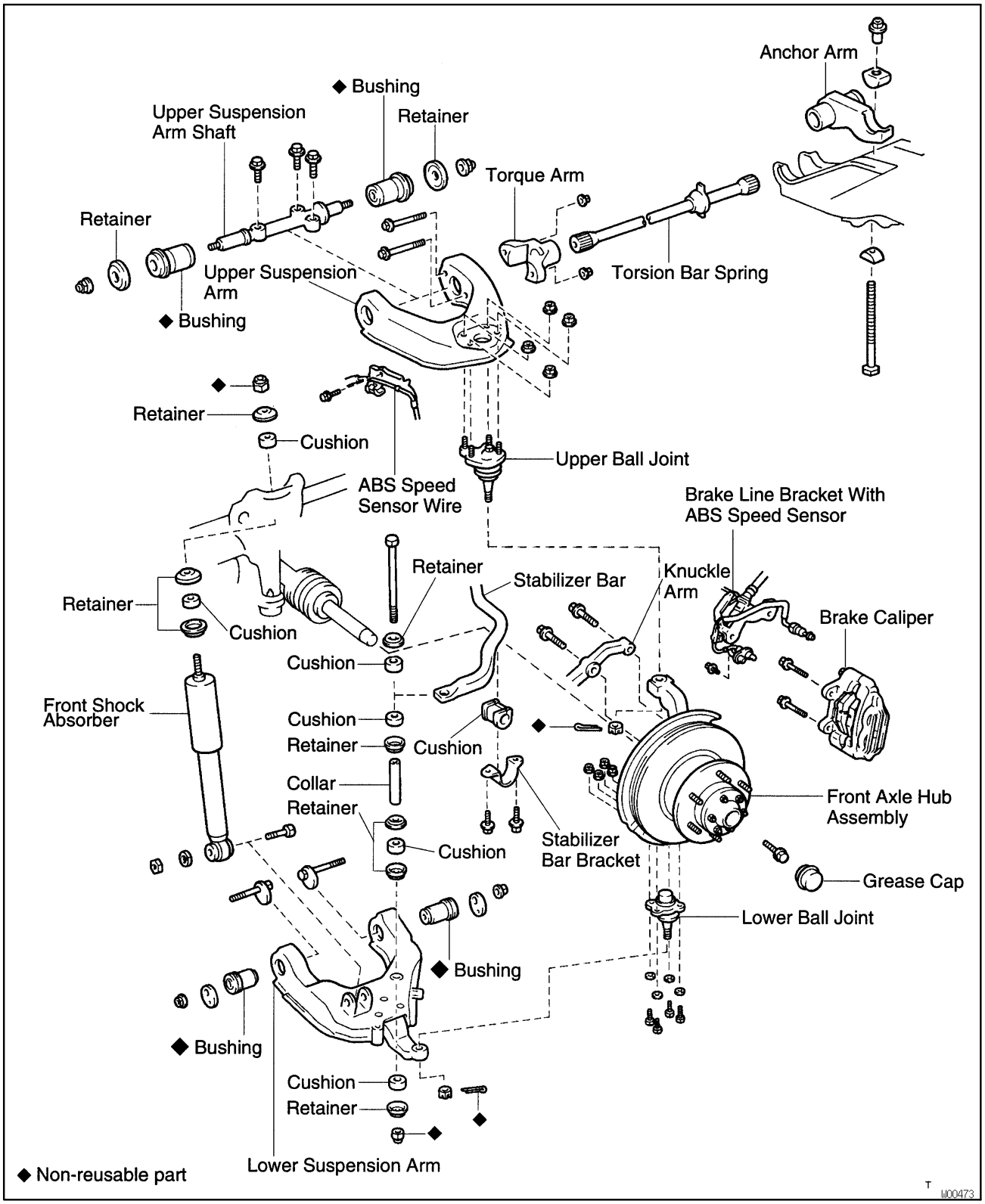
Installation is in the reverse order of removal (See page SA–124).

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FRONT STABILIZER BAR (4WD)

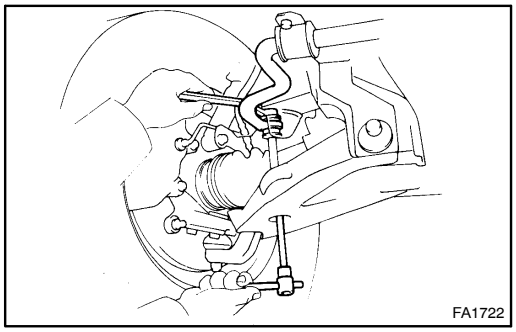
COMPONENTS

SA0HU–02



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SA0HV–01

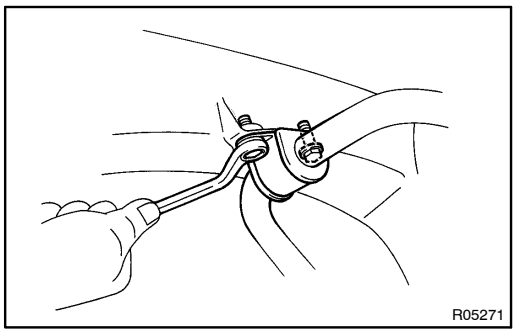

FA1722

REMOVAL

REMOVE STABILIZER BAR

(a) Remove the nut, 4 cushions, 5 retainers, collar and stabilizer bar from the lower suspension arms.
Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)

(b) Employ the same manner described above to the other side.


R05271

(c) Remove the 4 bolts, 2 stabilizer bar brackets, 2 cushions and remove the stabilizer bar.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

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SA0HW–01

INSTALLATION

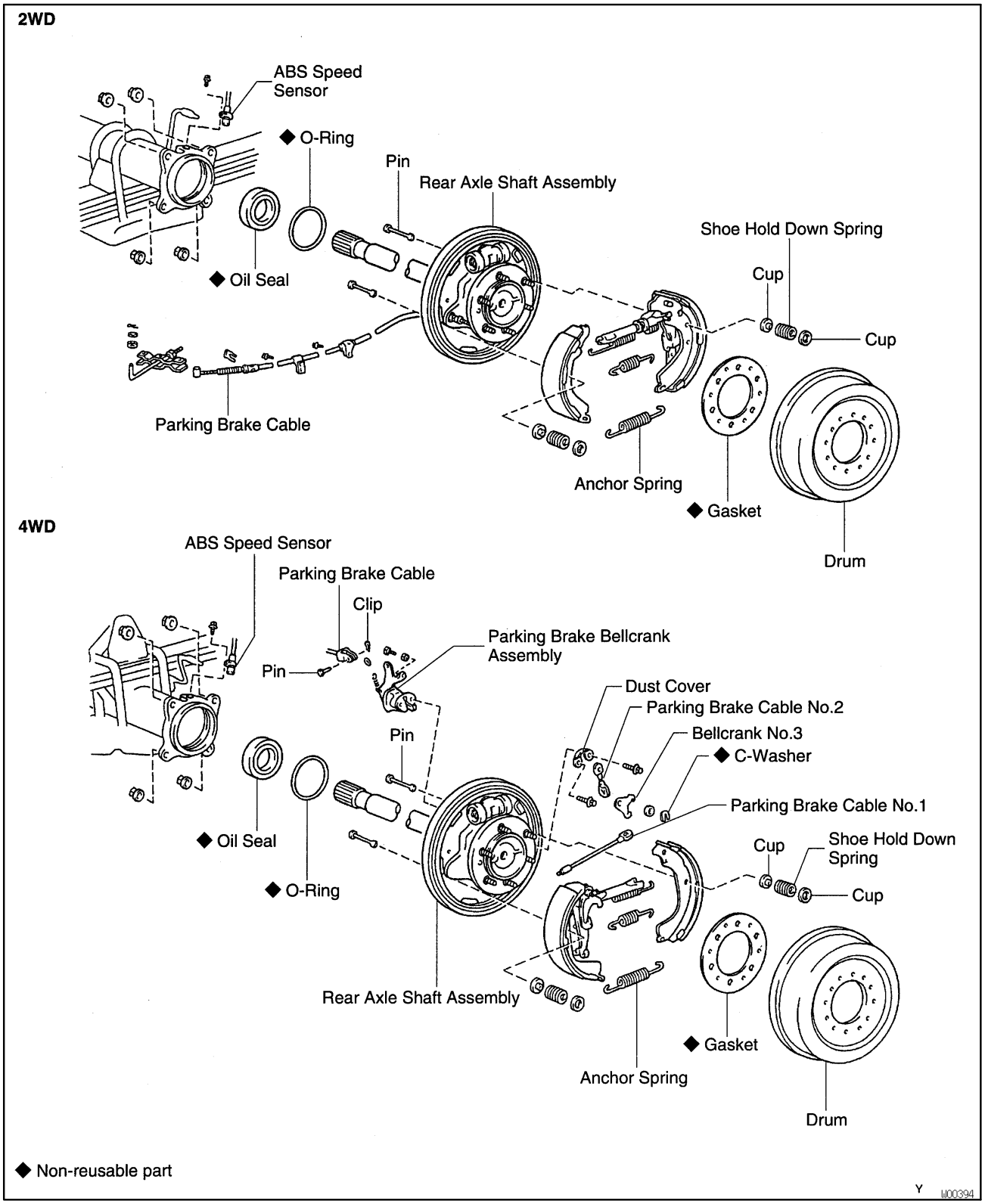
Installation is in the reverse order of removal (See page SA–127).

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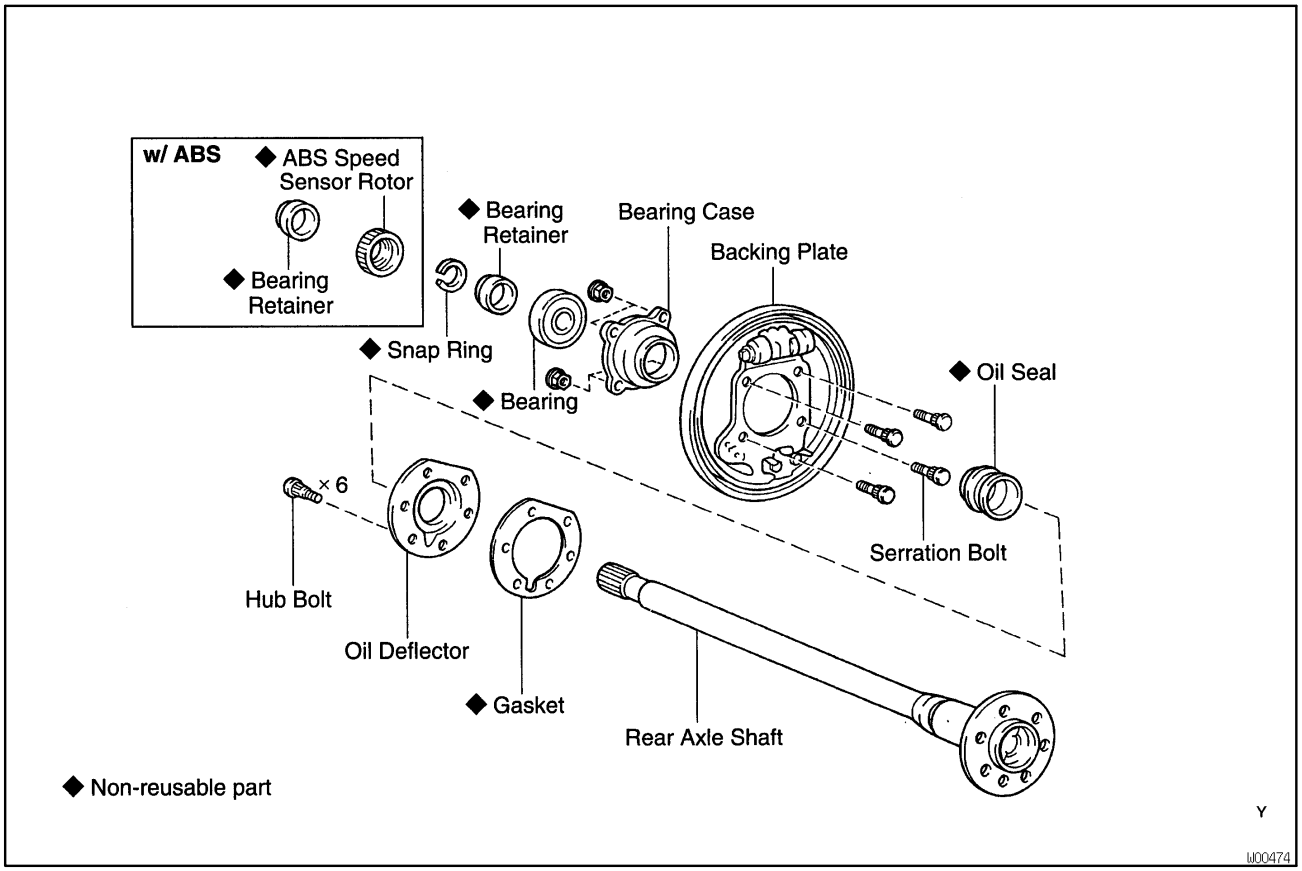
REAR AXLE SHAFT

COMPONENTS

SA0HX–03



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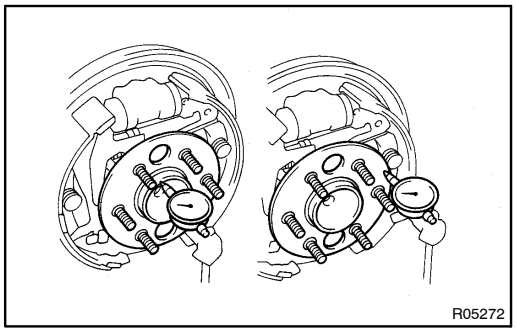


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SA0HY–07

REMOVAL

1. **REMOVE REAR WHEEL**
   Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)
2. **REMOVE BRAKE DRUM**


R05272

3. **CHECK BEARING BACKLASH AND AXLE SHAFT DEVIATION**

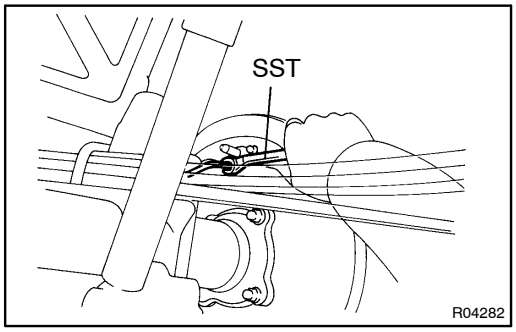
(a) Using a dial indicator, check the backlash in the bearing shaft direction.
Maximum: 0.7 mm (0.027 in.)

If the backlash exceeds the maximum, replace the bearing.

(b) Using a dial indicator, check the deviation at the surface of the axle shaft outside the hub bolt.
Maximum: 0.1 mm (0.0039 in.)

If the deviation exceeds the maximum, replace the axle shaft.

4. **REMOVE REAR BRAKE ASSEMBLY**
   2WD: See page BR–40
   4WD: See page BR–45
5. **w/ ABS:**
   REMOVE ABS SPEED SENSOR FROM REAR AXLE HOUSING
   Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)



R04282

6. **DISCONNECT BRAKE LINE**

Using SST, disconnect the brake line from the wheel cylinder.
SST 09751–36011
Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

7. **DISCONNECT PARKING BRAKE CABLE**
8. **REMOVE REAR AXLE SHAFT ASSEMBLY**

(a) Remove the 4 backing plate mounting nuts.
Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)

(b) Pull out the rear axle shaft assembly from the rear axle housing.

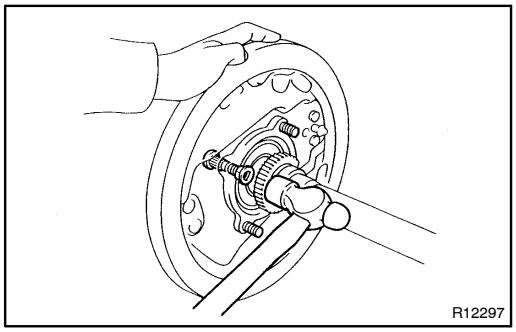
NOTICE:
Be careful not to damage the oil seal.

9. **REMOVE O–RING FROM REAR AXLE HOUSING**

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SA0HZ–01

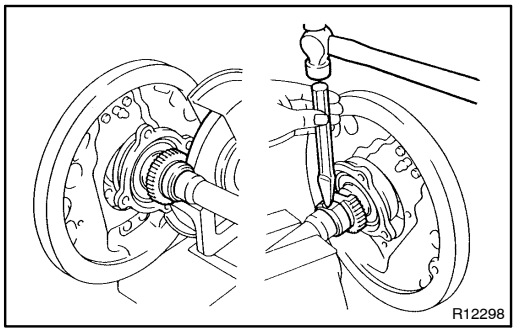
INSPECTION


R12297

1. w/ ABS:
REMOVE BEARING RETAINER (DIFFERENTIAL SIDE) AND ABS SPEED SENSOR ROTOR

(a) Attach 4 nuts to the serration bolts and remove the serration bolts from the backing plate using a hammer.

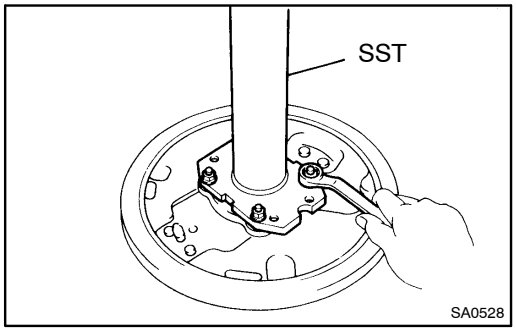
NOTICE:
Do not reuse the nuts previously removed from the vehicle.


R12298

(b) Grind the retainer and sensor rotor surfaces using a grinder, then chisel them out with a chisel.

2. REMOVE SNAP RING FROM AXLE SHAFT

Using a snap ring expander, remove the snap ring.



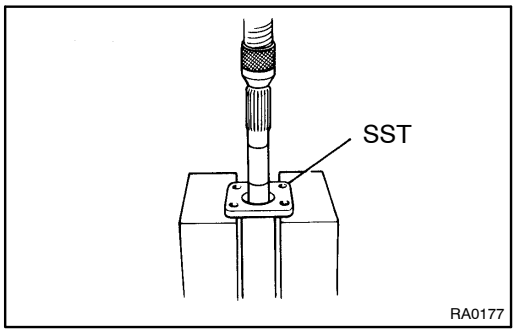
SA0528

3. REMOVE REAR AXLE SHAFT FROM BACKING PLATE

(a) Attach 4 washers and nuts to the serration bolts, then torque the nuts to install the serration bolts to the backing plate.

(b) Remove the 4 nuts from the serration bolts.

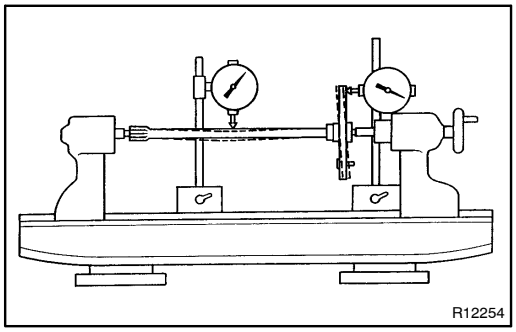
(c) Position SST on the backing plate with 4 nuts.
SST 09521–25011



RA0177

(d) Using a press, remove the rear axle shaft with bearing retainer from the backing plate.

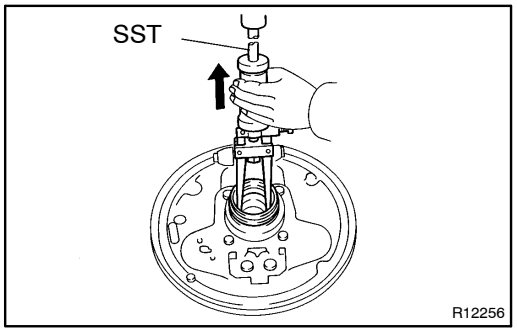
(e) Remove the SST.


R12254

4. INSPECT AXLE SHAFT AND FLANGE FOR RUNOUT FOR WEAR, DAMAGE OR RUNOUT
Maximum:
Shaft runout: 2.0 mm (0.079 in.)
Flange runout: 0.1 mm (0.004 in.)

If the rear axle shaft or flange are damaged or worn, or if runout is greater than the maximum, replace the rear axle shaft.

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5. INSPECT OUTER OIL SEAL

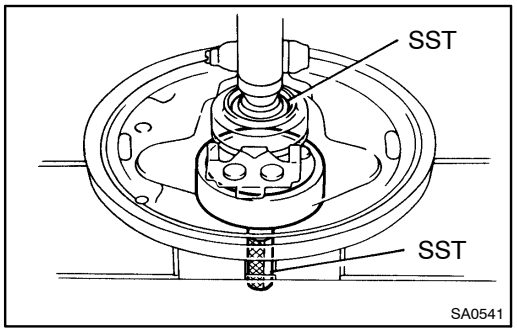
(a) Check for damage.

(b) Check the oil seal lip for wear or damage.

6. REMOVE OUTER OIL SEAL

Using SST, remove the oil seal.

SST 09308–00010



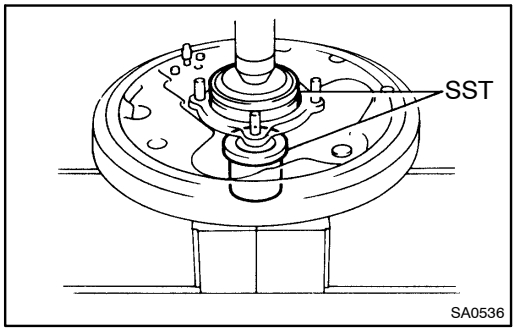
7. INSPECT REAR AXLE BEARING

Check for wear or damage.

8. REPLACE REAR AXLE BEARING

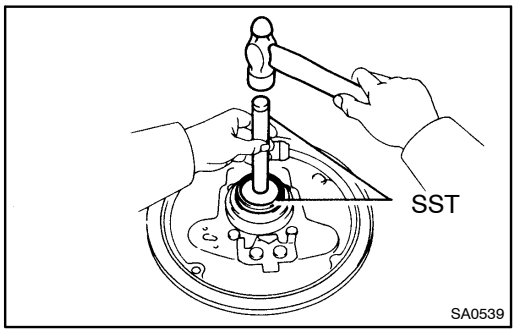
(a) Using SST and a press, remove the bearing.

SST 09223–56010, 09950–60010 (09951–00560)



(b) Using SST and a press, install a new bearing.

SST 09950–60010 (09951–00610),
09950–70010 (09951–07150)



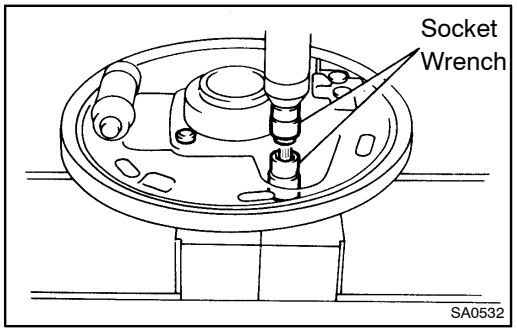
9. INSTALL NEW OUTER OIL SEAL

Using SST and a hammer, install a new oil seal.

SST 09950–60010 (09951–00610),
09950–70010 (09951–07150)

10. INSPECT BEARING CASE

Check for wear or damage.



11. REPLACE BEARING CASE

(a) Remove the oil seal (outer side) and bearing.

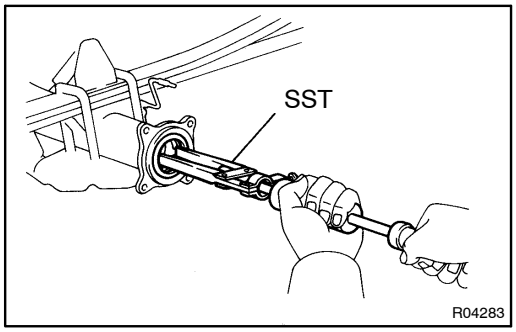
(b) Install nuts to the serration bolts.

(c) Using a hammer, remove the serration bolts and bearing case.

(d) Position the backing plate on the new bearing case and using 2 socket wrenches and a press, install the serration bolts.

(e) Install a new bearing and oil seal (outer side).

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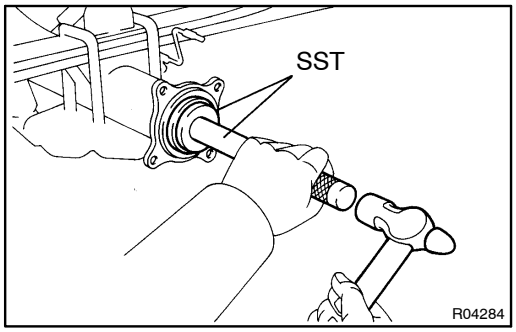


12. INSPECT OIL SEAL (INNER SIDE)

Check for wear or damage.

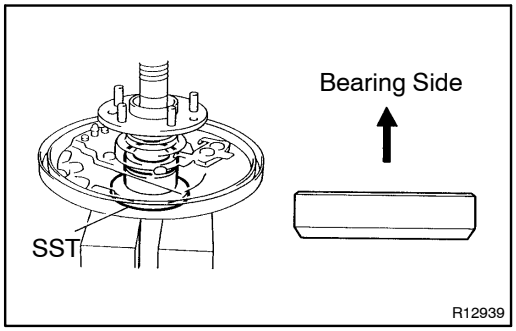
13. REPLACE OIL SEAL (INNER SIDE)

(a) Using SST, remove the oil seal.
SST 09308–00010



(b) Using SST and a hammer, install a new oil seal.
SST 09950–60020 (09951–00890),
09950–70010 (09951–07150)

(c) Apply MP grease to the oil seal lip.



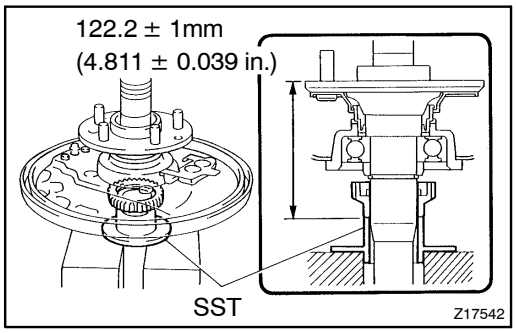
14. INSTALL REAR AXLE SHAFT IN BACKING PLATE

(a) Apply MP grease to the oil seal lip.

(b) Install the backing plate and bearing retainer on the rear axle shaft.

(c) Using SST and a press, install the rear axle shaft into the backing plate.
SST 09316–60011 (09316–00051)

(d) Using snap ring pliers, install a new snap ring.



15. w/ ABS:
INSTALL ABS SPEED SENSOR ROTOR AND BEARING RETAINER (DIFFERENTIAL SIDE)

Using SST and a press, install a new sensor rotor and a new bearing retainer to the axle shaft.
SST 09316–60011 (09316–00051)
Standard length: 122.2 ± 1 mm (4.811 ± 0.039 in.)

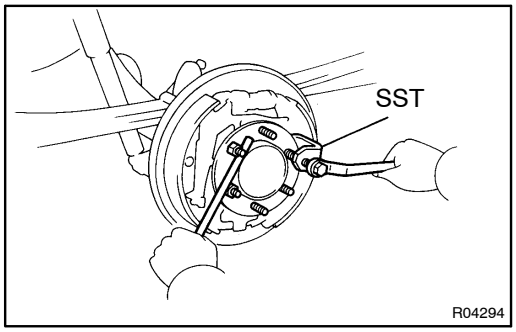
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SA0I0–01

INSTALLATION

Installation is in the reverse order of removal (See page SA–131).
AFTER INSTALLATION, BLEED BRAKE SYSTEM (See page BR–4), CHECK FOR LEAKS AND ABS SPEED SENSOR SIGNAL (See page DI–321)

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REAR WHEEL HUB BOLT

SA0I1–01

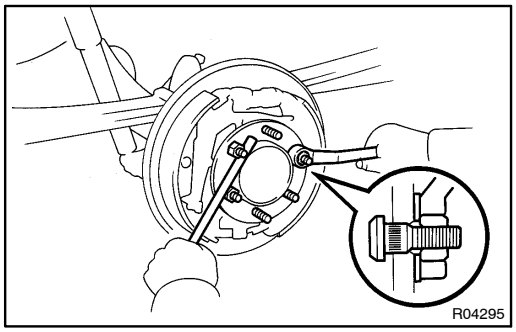
REPLACEMENT

1. REMOVE REAR WHEEL AND BRAKE DRUM

2. REMOVE HUB BOLT

Using SST, remove the hub bolt.

SST 09650–17011



3. INSTALL HUB BOLT

Hold the axle shaft, using plate washer and nut, install a new hub bolt.

4. INSTALL REAR BRAKE DRUM AND WHEEL

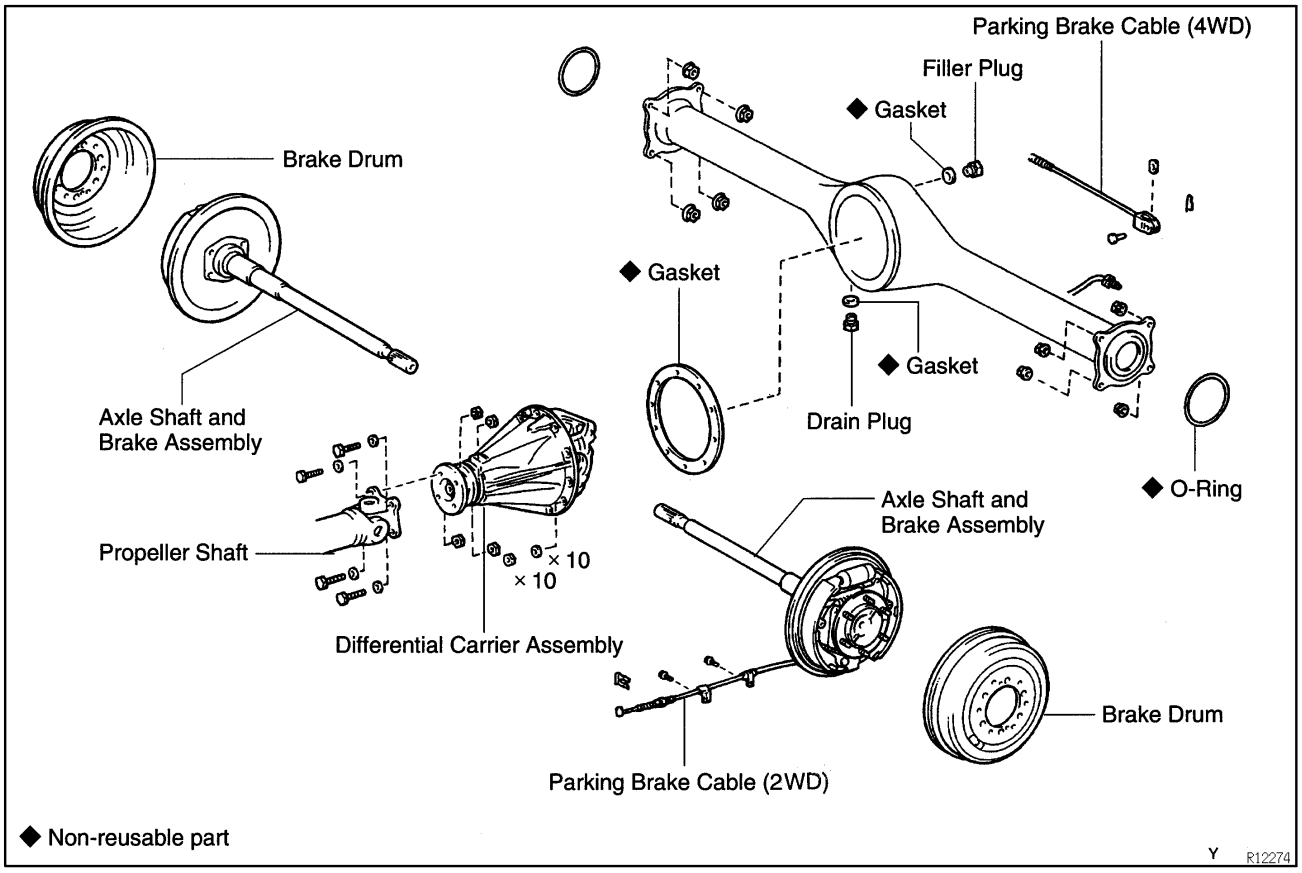
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

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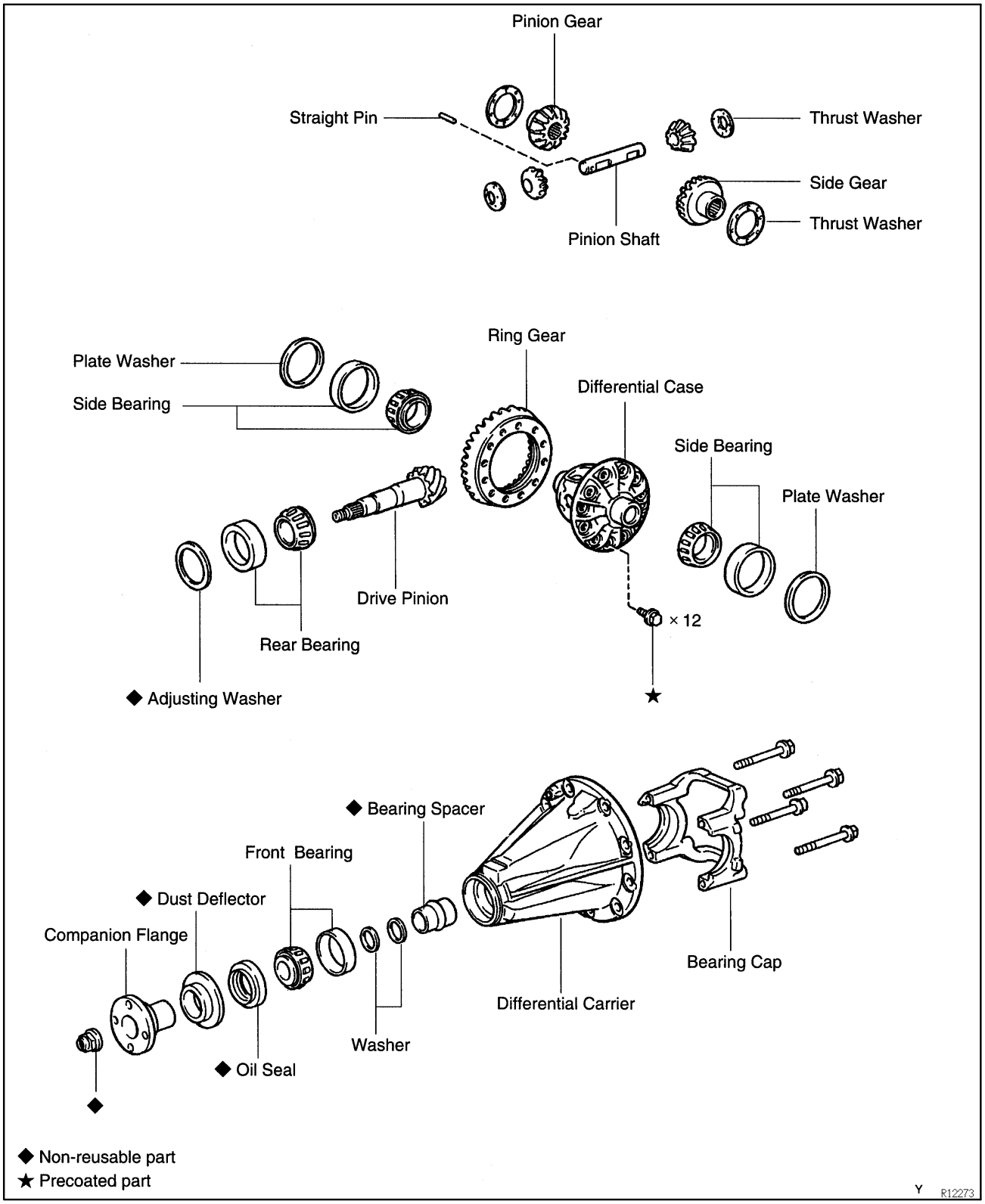
REAR DIFFERENTIAL CARRIER

COMPONENTS

SA0I2–08



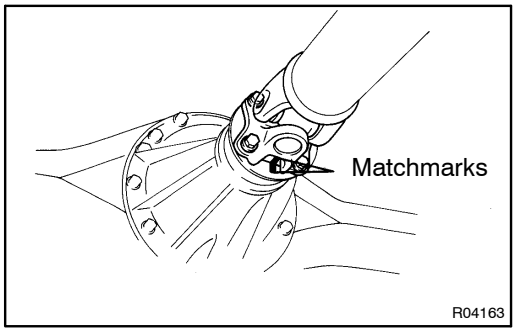
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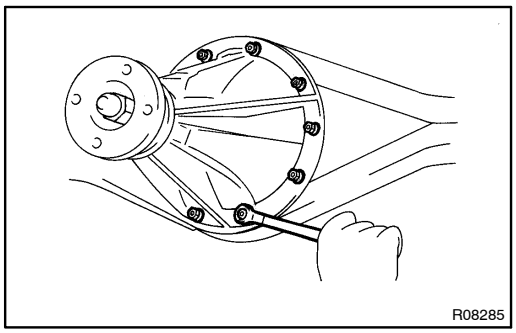
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SA0I3–01

REMOVAL



1. **DRAIN HYPOID GEAR OIL**
2. **REMOVE REAR AXLE SHAFTS (See page SA–131)**
3. **REMOVE PROPELLER SHAFT**
   (2WD: See page PR–3)
   (4WD: See page PR–11)



4. **REMOVE DIFFERENTIAL CARRIER ASSEMBLY**

(a) Remove the 10 nuts, washers and differential carrier assembly.

Torque: 73 N·m (740 kgf·cm, 54 ft·lbf)

NOTICE:

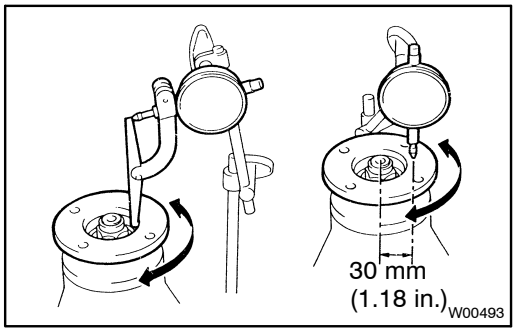
Be careful not to damage the installation surface.

(b) Remove the gasket.

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SA259–01

DISASSEMBLY

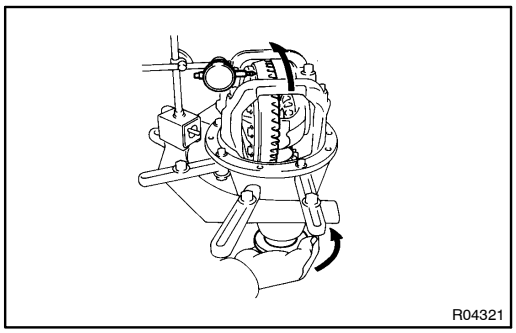


1. CHECK RUNOUT OF COMPANION FLANGE

Using a dial indicator, measure the runout of the companion flange vertical and lateral.

Maximum
Vertical runout: 0.09 mm (0.0035 in.)
Lateral runout: 0.09 mm (0.0035 in.)

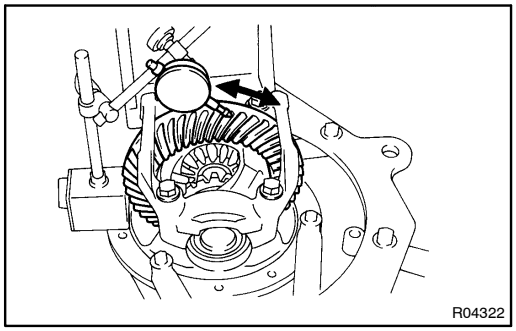
If the runout is greater than the maximum, replace the companion flange.



2. CHECK RING GEAR RUNOUT

Using a dial indicator, measure the ring gear runout.

Maximum runout: 0.05 mm (0.0020 in.)



3. CHECK RING GEAR BACKLASH

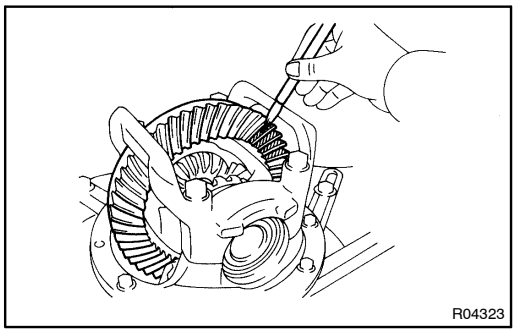
Using a dial indicator, measure the ring gear backlash.

Backlash:
2WD: 0.08 – 0.13 mm (0.0031 – 0.0051 in.)
4WD: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

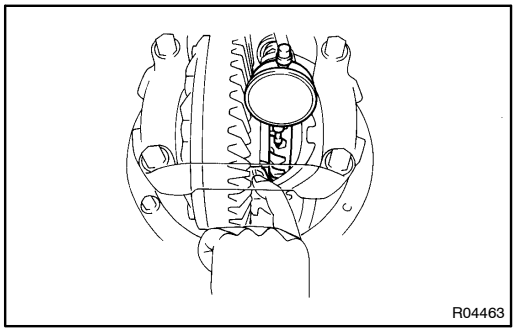
If the backlash is not within specification, adjust the side bearing preload or repair if necessary.

HINT:

Measure from 3 or more places on the circumference of the ring gear.



4. CHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See page SA–145)



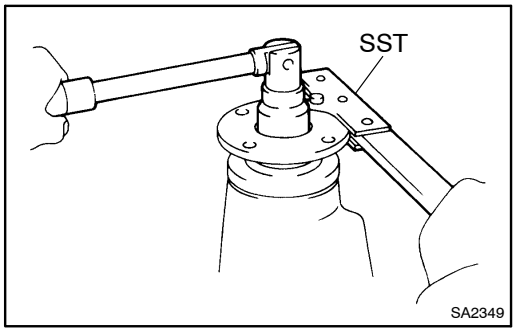
5. CHECK SIDE GEAR BACKLASH

Using a dial indicator, measure the side gear backlash with holding one pinion gear toward the case.

Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

If the backlash is not within the specification, install the side gear thrust washers of differential thickness.

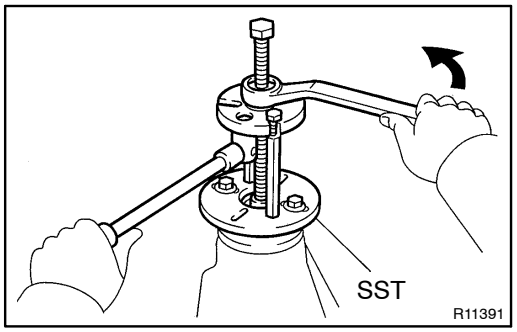
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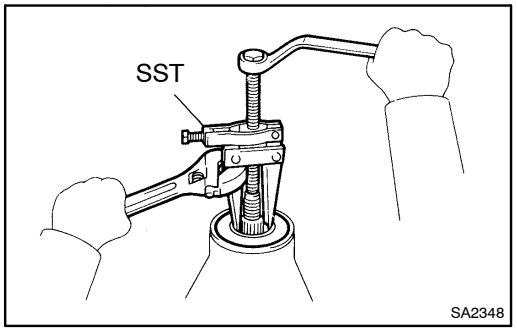
6. REMOVE COMPANION FLANGE

(a) Using a chisel and hammer, unstake the staked part of the nut.

(b) Using SST to hold the flange, remove the nut.
SST 09330–00021

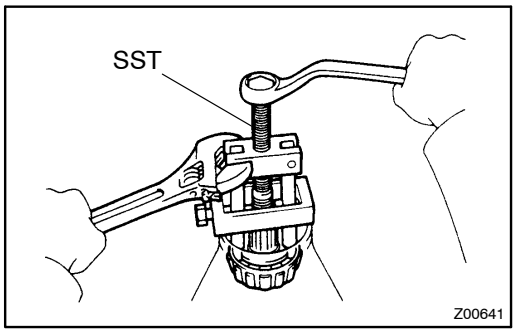


(c) Using SST, remove the companion flange.
SST 09950–30010



7. REMOVE FRONT OIL SEAL

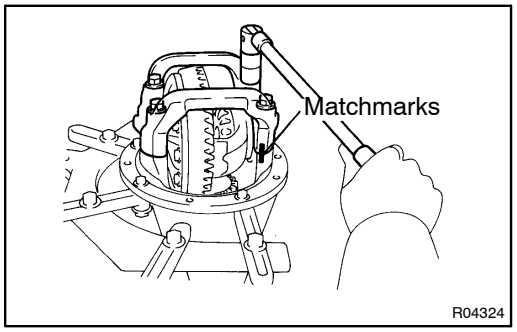
Using SST, remove the oil seal from the differential carrier.
SST 09308–10010



8. REMOVE FRONT BEARING AND BEARING SPECER

(a) Using SST, remove the bearing from the drive pinion.
SST 09556–22010

(b) Remove the 2 washers and bearing spacer. If the front bearing is damaged or worn, replace the bearing.

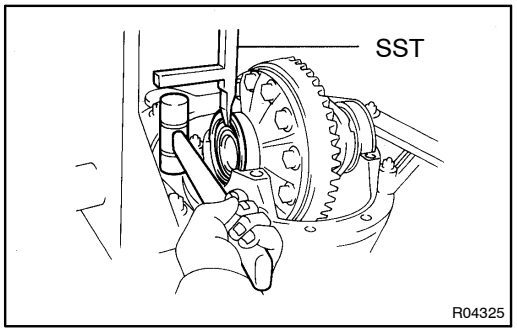


9. REMOVE DIFFERENTIAL CASE

(a) Place matchmarks on the bearing cap and differential carrier.

(b) Remove the 4 bolts and bearing cap.

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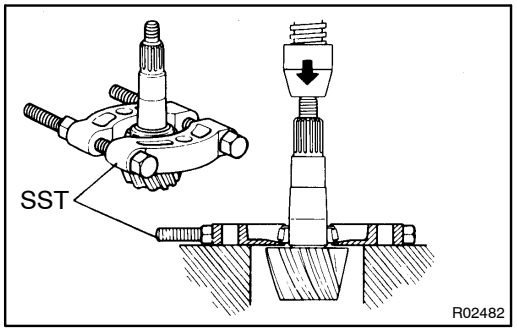
(c) Using SST and a hammer, remove the 2 side bearing plate washers.
SST 09504–22011

HINT:
Measure the plate washer and note down the thickness.

(d) Remove the differential case and bearing outer race from the carrier.

HINT:
Tag the bearing outer races to show the location for reassembling.

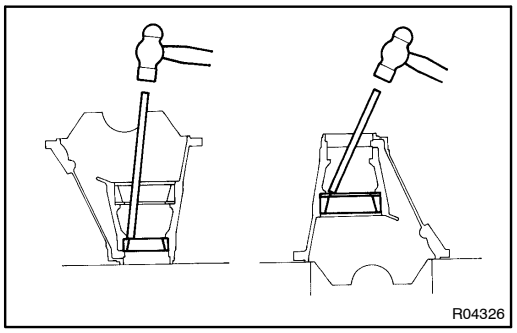
10. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER



11. REMOVE DRIVE PINION REAR BEARING

Using SST and a press, remove the bearing from the drive pinion.
SST 09950–00020

HINT:
If the drive pinion or ring gear are damaged replace them as a set.

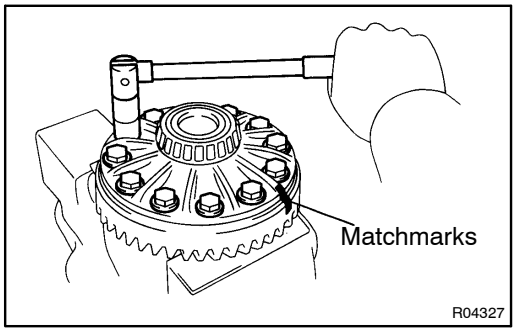


12. REMOVE FRONT AND REAR BEARING OUTER RACES

NOTICE:
Do not remove the outer races except when replacing the bearings.

Using a brass bar and hammer, remove the 2 outer races and adjusting washer from the carrier.

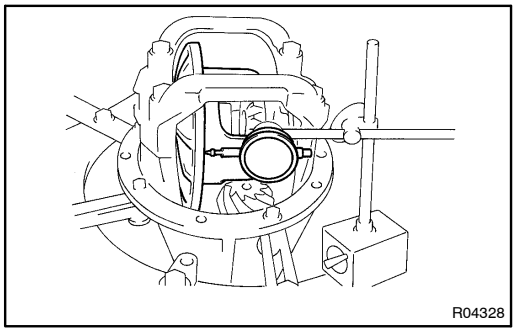
HINT:
Measure the adjusting washer and note down the thickness.



13. REMOVE RING GEAR

(a) Place matchmarks on the ring gear and differential case.
(b) Remove the 12 ring gear set bolts.
(c) Using a plastic hammer, tap on the ring gear to separate it from the differential case.

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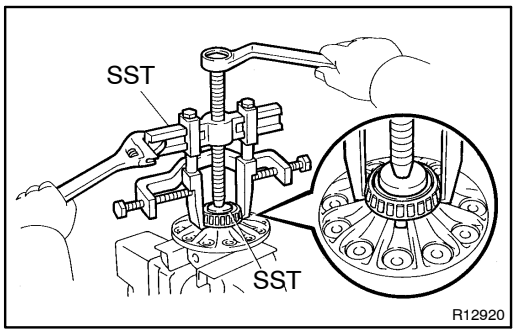
14. CHECK DIFFERENTIAL CASE RUNOUT

(a) Install the differential case in the differential carrier (See page SA–145).

(b) Using a dial indicator, measure the differential case runout.

Maximum case runout: 0.04 mm (0.0016 in.)

(c) Remove the differential case.



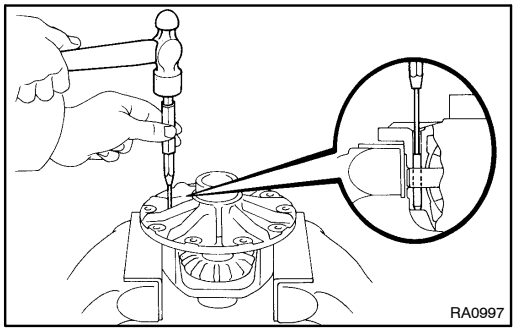
15. REMOVE SIDE BEARINGS

Using SST, remove the 2 side bearings from the differential case.

SST 09950–40010, 09950–60010 (09951–00450)

HINT:

Fix the claws of SST to the notch in the differential case.



16. DISASSEMBLE DIFFERENTIAL CASE ASSEMBLY

(a) Using a pin punch and hammer, remove the straight pin.

(b) Remove these parts from the differential case:

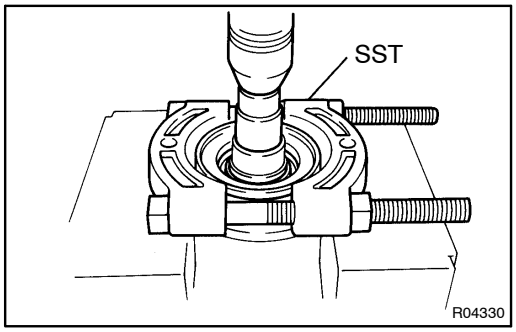
- Pinion shaft
- 2 pinion gears
- 2 pinion gear thrust washers
- 2 side gears
- 2 side gear thrust washers

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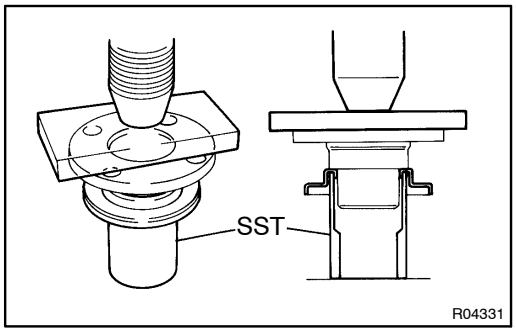
SA0I5–01

REPLACEMENT

REPLACE COMPANION FLANGE DUST DEFLECTOR



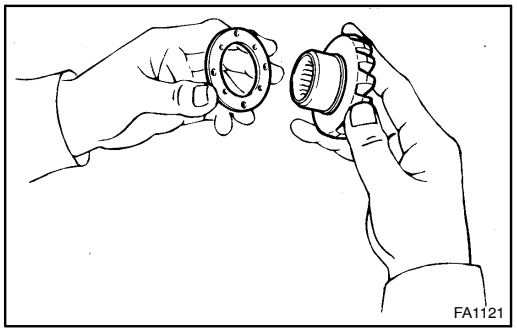
(a) Using SST and a press, remove the dust deflector.
SST 09950–00020



(b) Using SST and a press, install a new dust deflector.
SST 09523–36010

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SA0I6–02


FA1121

REASSEMBLY

1. ASSEMBLE DIFFERENTIAL CASE

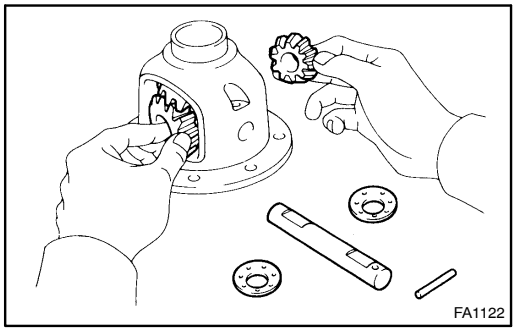
(a) Install the 2 proper thrust washers to the side gears.

HINT:

Refer to the table below to select thrust washers which will ensure that the backlash is within specifications.

Washer thickness

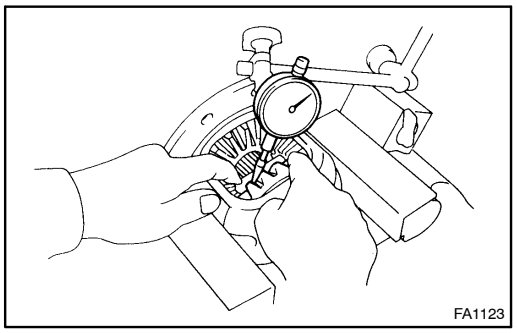
Thickness mm (in.)	Thickness mm (in.)
1.50 (0.0590)	1.75 (0.0689)
1.55 (0.0610)	1.80 (0.0709)
1.60 (0.0630)	1.85 (0.0728)
1.65 (0.0650)	1.90 (0.0748)
1.70 (0.0669)	–


FA1122

(b) Install the 2 side gears with the thrust washers, pinion gears, pinion gear thrust washers and pinion shaft.

HINT:

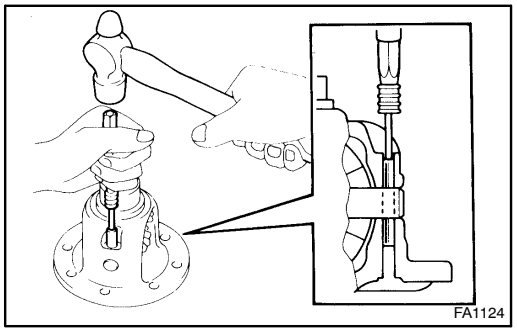
Align the holes of the differential case and pinion shaft.


FA1123

(c) Using a dial indicator, measure the side gear backlash with holding one pinion gear toward the case.

Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

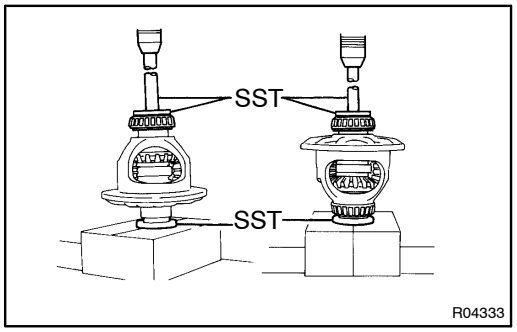
If the backlash is not within specification, replace the thrust washers.


FA1124

(d) Using a pin punch and hammer, install the straight pin through the holes in the differential case and pinion shaft.

(e) Using a chisel and hammer, stake the out side of the differential case pin hole.

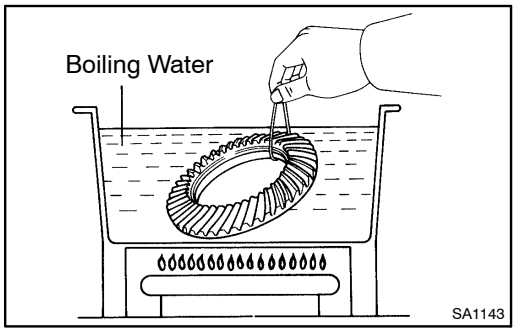
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2. INSTALL SIDE BEARINGS

Using SST and a press, install the 2 side bearings into the differential case.

SST 09506–35010, 09950–60010 (09951–00480), 09950–70010 (09951–07150)



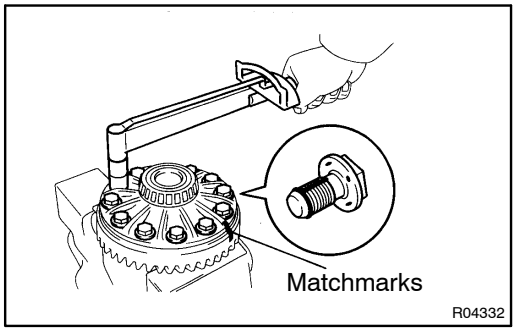
3. INSTALL RING GEAR ON DIFFERENTIAL CASE

(a) Clean the contact surfaces of the differential case and ring gear.

(b) Heat the ring gear to about 100°C (212°F) in boiling water.

(c) Carefully take the ring gear out of the boiling water.

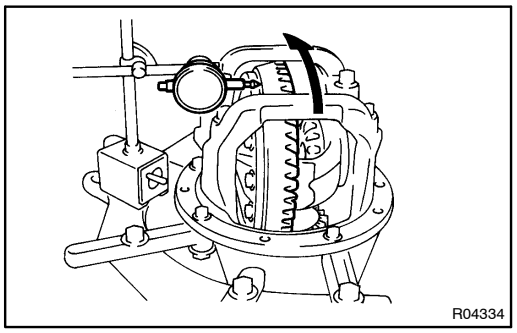
(d) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case.



(e) Align the matchmarks on the ring gear and differential case.

(f) After the ring gear cools down enough, torque the set bolts to which thread lock has been applied.

Thread lock:
Part No. 08833–00100, THREE BOND 1360K or equivalent.
Torque: 125 N·m (1,270 kgf·cm, 92 ft·lbf)



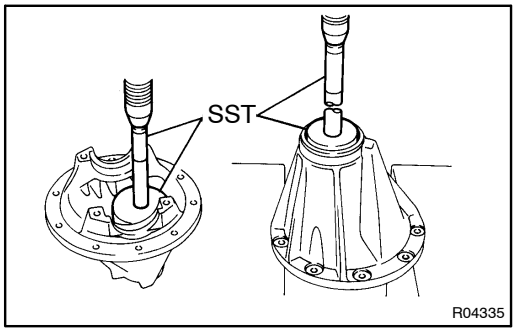
4. INSPECT RING GEAR RUNOUT

(a) Install the differential case into the carrier and install the plate washers to make sure the play in the bearing (See page SA–57).

(b) Install bearing cap (See page SA–57).

(c) Using a dial indicator, measure the runout of ring gear.

Maximum runout: 0.05 mm (0.0020 in.)



5. INSTALL DRIVE PINION BEARING OUTER RACES AND ADJUSTING WASHER

(a) Using SST, install a new front bearing outer race to the carrier.

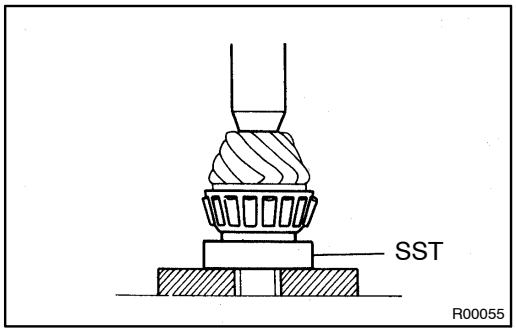
SST 09950–60020 (09951–00710), 09950–70010 (09951–07150)

(b) Using SST, install a new adjusting washer and install a new rear bearing outer race to the carrier.

SST 09950–60020 (09951–00910), 09950–70010 (09951–07150)

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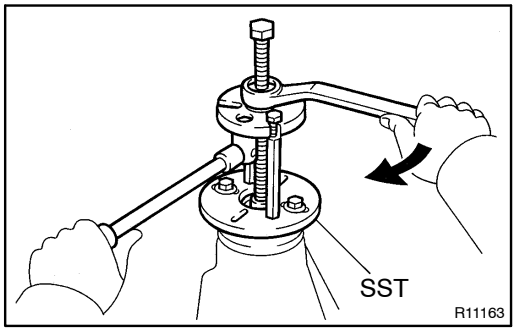
HINT:
First fit a washer with the same thickness as the washer which was removed, then after checking the tooth contact pattern, replace the washer with one of a different thickness if necessary.



6. INSTALL DRIVE PINION REAR BEARING

Using SST and a press, install the rear bearing onto the drive pinion.

SST 09506–35010

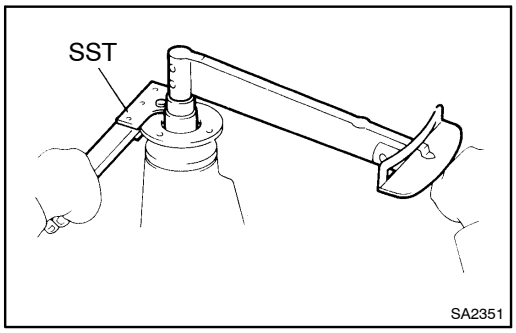


7. TEMPORARILY ADJUST DRIVE PINION PRELOAD

(a) Install the drive pinion and front bearing.

HINT:
Assemble the spacer, washers and oil seal after adjusting the gear contact pattern.

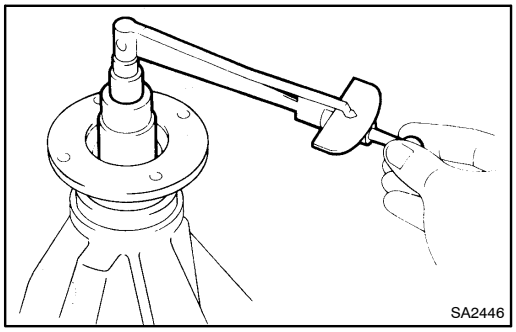
(b) Using SST, install the companion flange.
SST 09950–30010



(c) Coat the threads of the nut with hypoid gear oil.

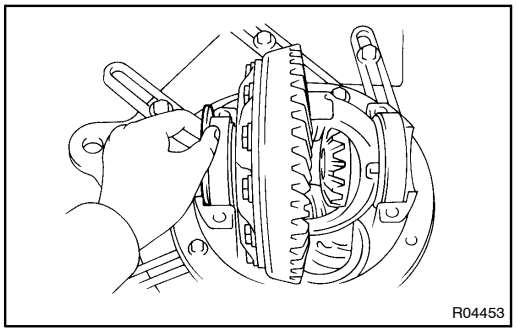
(d) Adjust the drive pinion preload by tightening the companion flange nut.
Using SST to hold the flange, torque the nut.
SST 09330–00021

NOTICE:
As there is no spacer, tighten the nut a little at a time, being careful not to overtighten it.



(e) Using a torque wrench, measure the preload.
Preload (at starting):
New bearing:
1.0 – 1.6 N·m (10 – 16 kgf·cm, 8.7 – 13.9 in.·lbf)
Reused bearing:
0.5 – 0.8 N·m (5 – 8 kgf·cm, 4.3 – 6.9 in.·lbf)

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8. INSTALL DIFFERENTIAL CASE IN CARRIER

(a) Place the bearing outer races on their respective bearings. Make sure the left and right races are not interchanged.

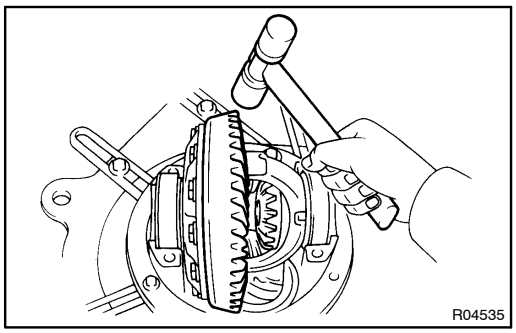
(b) Install the differential case in the carrier.

9. ADJUST RING GEAR BACKLASH

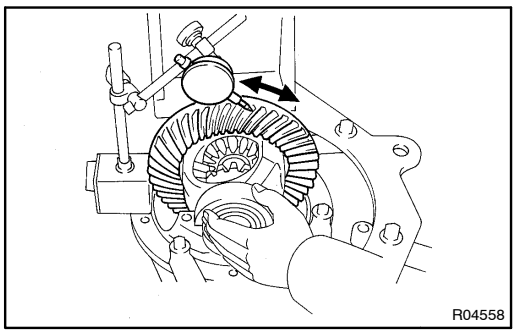
(a) Only install the plate washer on the ring gear back side.

HINT:

Makes that the ring gear has a backlash.



(b) Tap on the ring gear with a plastic hammer so that the washer fit to the bearing.

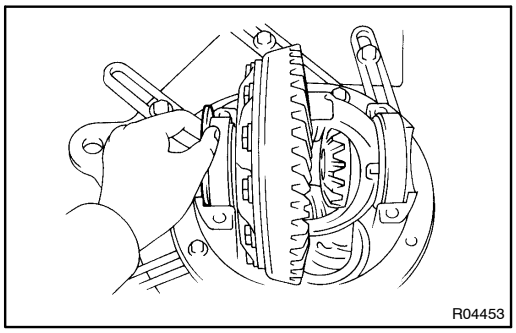


(c) Using a dial indicator, measure the side gear backlash with holding one pinion gear toward the differential case.

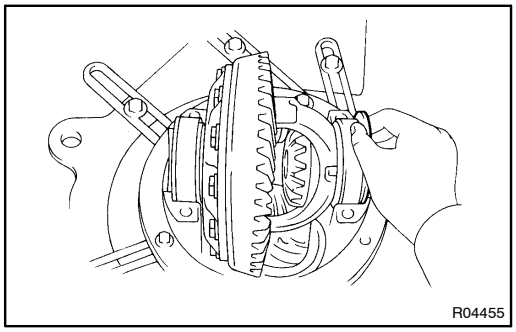
Backlash (reference):

2WD: 0.08 – 0.13 mm (0.0031 – 0.0051 in.)

4WD: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

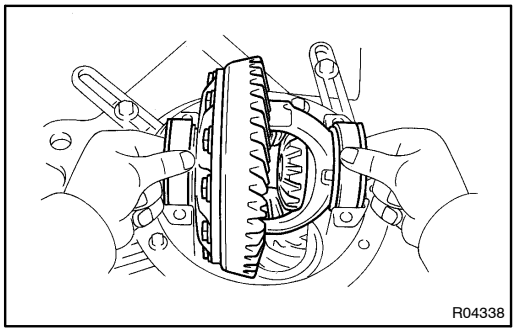


(d) Select a plate washer for back side ring gear, using the backlash as reference (See page SA–145).

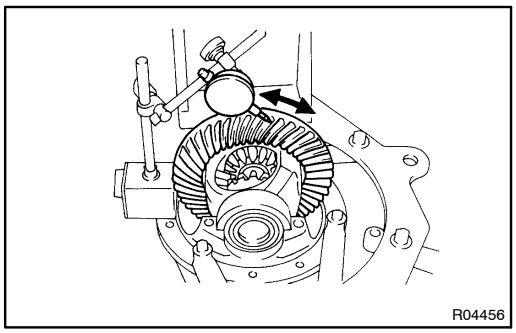


(e) Select a ring gear teeth side plate washer of a thickness which eliminates any clearance between the outer race and case.

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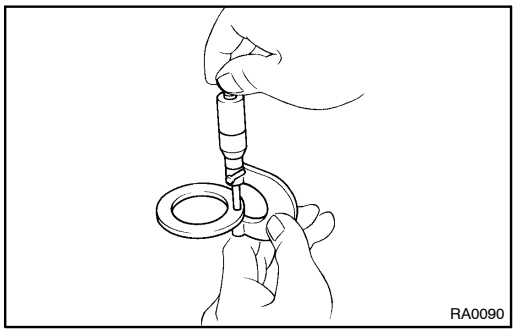

R04338

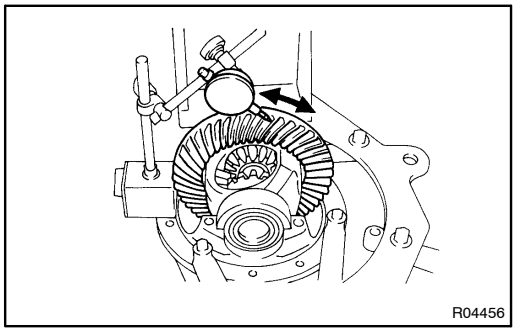
(f) Remove the plate washers and differential case.
(g) Install the plate washer into the ring gear back side of the carrier.
(h) Place the other plate washer onto the differential case together with the outer race, and install the differential case with the outer race into the carrier.
(i) Tap on the ring gear with a plastic hammer so that the washer fit to the bearing.


R04456

(j) Using a dial indicator, measure the ring gear backlash.
Backlash:
2WD: 0.08 – 0.13 mm (0.0031 – 0.0051 in.)
4WD: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)
(k) If the backlash not within specification, adjust by either increasing or decreasing the thickness of washers on both sides by an equal amount.

HINT:
- There should be no clearance between the plate washer and case.
- Make sure that there is ring gear backlash.


RA0090


R04456

10. ADJUST SIDE BEARING PRELOAD
(a) After adjustment with the backlash as reference, remove the ring gear teeth side plate washer and measure the thickness.
(b) Install a new washer of 0.06 – 0.09 mm (0.00024 – 0.0035 in.) thicker than the washer removed.

HINT:
Select a washer which can be pressed in 2/3 of the way by finger.

(c) Using a plastic hammer, tap in the plate washer.
(d) Recheck the ring gear backlash.
Backlash:
2WD: 0.08 – 0.13 mm (0.0031 – 0.0051 in.)
4WD: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)
(e) If the backlash is not within specification, adjust by either increasing or decreasing the thickness washers on both sides by equal amount.

HINT:
The backlash will change by about 0.20 mm (0.0008 in.) with every 0.03 mm (0.0012 in.) change in the side washer.

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Washer thickness

Thickness		Thickness		Thickness	
Mark	mm (in.)	Mark	mm (in.)	Mark	mm (in.)
58	2.58 (0.1015)	90	2.90 (0.1142)	22	3.22 (0.1268)
60	2.60 (0.1024)	92	2.92 (0.1150)	24	3.24 (0.1276)
62	2.62 (0.1031)	94	2.94 (0.1157)	26	3.26 (0.1283)
64	2.64 (0.1039)	96	2.96 (0.1165)	28	3.28 (0.1291)
66	2.66 (0.1047)	98	2.98 (0.1173)	30	3.30 (0.1299)
68	2.68 (0.1055)	00	3.00 (0.1181)	32	3.32 (0.1307)
70	2.70 (0.1063)	02	3.02 (0.1189)	34	3.34 (0.1315)
72	2.72 (0.1071)	04	3.04 (0.1197)	36	3.36 (0.1323)
74	2.74 (0.1079)	06	3.06 (0.1205)	38	3.38 (0.1331)
76	2.76 (0.1087)	08	3.08 (0.1213)	40	3.40 (0.1339)
78	2.78 (0.1094)	10	3.10 (0.1220)	42	3.42 (0.1346)
80	2.80 (0.1102)	12	3.12 (0.1228)	44	3.44 (0.1354)
82	2.82 (0.1110)	14	3.14 (0.1236)	46	3.46 (0.1362)
84	2.84 (0.1118)	16	3.16 (0.1244)	48	3.48 (0.1370)
86	2.86 (0.1126)	18	3.18 (0.1252)	–	
88	2.88 (0.1134)	20	3.20 (0.1260)	–	

11. INSTALL BEARING CAPS

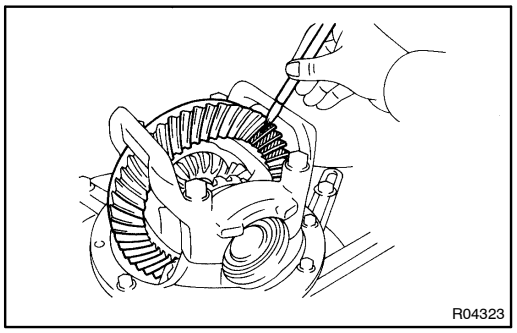
Align the matchmarks on the 2 caps and carrier and torque the 4 bolts.

Torque: 113 N·m (1,150 kgf·cm, 83 ft·lbf)

12. MEASURE TOTAL PRELOAD

Using a torque wrench, measure the total preload.

Total preload (at starting):
Drive pinion preload plus
0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.·lbf)

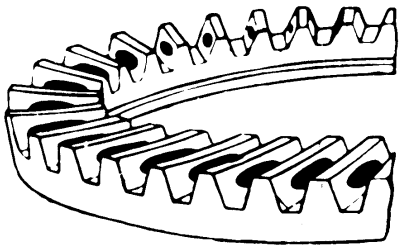


13. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead primer.

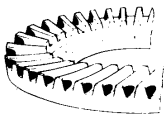
(b) Turn the companion flange in both directions to inspect the ring gear for proper tooth contact.

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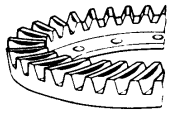


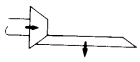
Proper Contact

Heel Contact



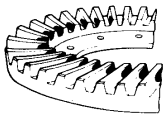
Face Contact



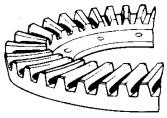


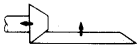
Select an adjusting shim that will bring the drive pinion closer to the ring gear.

Toe Contact



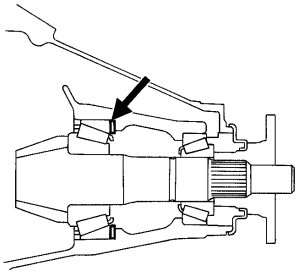
Flank Contact





Select an adjusting shim that will shift the drive pinion away from the gear.

R02495



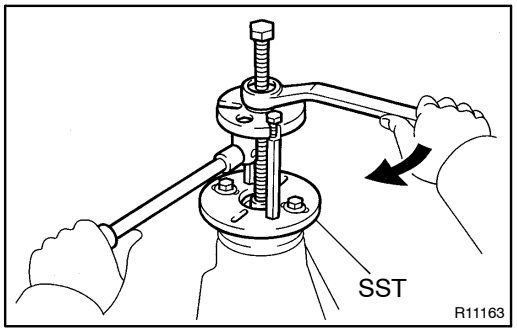
R04554

If the teeth are not contacting properly, use the following chart to select a proper washer for correction.

Washer thickness

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
87	1.87 (0.0736)	01	2.01 (0.0791)	15	2.15 (0.0846)
88	1.88 (0.0740)	02	2.02 (0.0795)	16	2.16 (0.0850)
89	1.89 (0.0744)	03	2.03 (0.0799)	17	2.17 (0.0854)
90	1.90 (0.0748)	04	2.04 (0.0803)	18	2.18 (0.0858)
91	1.91 (0.0752)	05	2.05 (0.0807)	19	2.19 (0.0862)
92	1.92 (0.0756)	06	2.06 (0.0811)	20	2.20 (0.0866)
93	1.93 (0.0760)	07	2.07 (0.0815)	21	2.21 (0.0870)
94	1.94 (0.0764)	08	2.08 (0.0819)	22	2.22 (0.0874)
95	1.95 (0.0768)	09	2.09 (0.0823)	23	2.23 (0.0878)
96	1.96 (0.0772)	10	2.10 (0.0827)	24	2.24 (0.0882)
97	1.97 (0.0776)	11	2.11 (0.0831)	25	2.25 (0.0886)
98	1.98 (0.0780)	12	2.12 (0.0835)	26	2.26 (0.0890)
99	1.99 (0.0783)	13	2.13 (0.0839)	27	2.27 (0.0894)
00	2.00 (0.0787)	14	2.14 (0.0843)	28	2.28 (0.0898)

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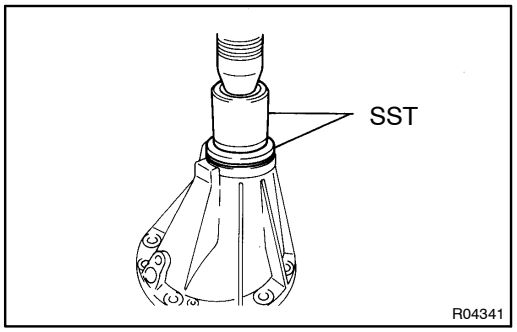
14. REMOVE COMPANION FLANGE (See page SA–140)

15. REMOVE FRONT BEARING (See page SA–140)

16. INSTALL NEW BEARING SPACER, WASHERS AND FRONT BEARING

(a) Install a new bearing spacer and 2 washers, and place the front bearing.

(b) Using SST and the companion flange, install the front bearing then remove the companion flange.
SST 09950–30010

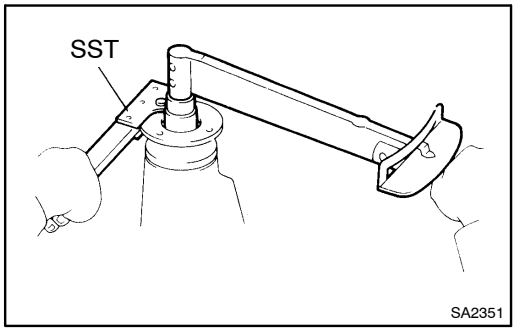


17. INSTALL NEW OIL SEAL

(a) Coat a new oil seal lip with MP grease.

(b) Using SST and a press, tap in the oil seal until its surface with the differential carrier end.
SST 09316–12010, 09649–17010,

HINT:
Connect SST with vinyl tape.

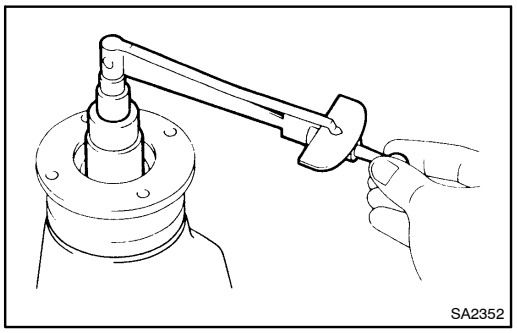


18. INSTALL COMPANION FLANGE

(a) Install the companion flange on the shaft.

(b) Coat the threads of a new nut with hypoid gear oil.

(c) Using SST to hold the flange, torque the nut.
SST 09330–00021
Torque: 147 N·m (1,500 kgf·cm, 109 ft·lbf)



19. ADJUST DRIVE PINION PRELOAD

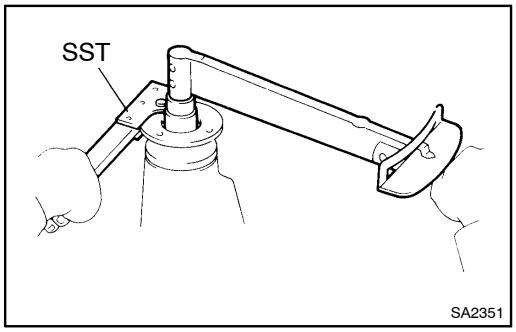
Using a torque wrench, measure the preload of the backlash between the drive pinion and ring gear.

Preload (at starting):
New bearing:
1.0 – 1.6 N·m (10 – 16 kgf·cm, 8.7 – 13.9 in.·lbf)
Reused bearing:
0.5 – 0.8 N·m (5 – 8 kgf·cm, 4.3 – 6.9 in.·lbf)

If preload is greater than the specification, replace the bearing spacer.

If preload is less than specification, retorque the nut a little at a time with a torque of 13 N·m (130 kgf·cm, 9 ft·lbf) until the specified preload is reached.

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Torque: 451 N·m (4,600 kgf·cm, 333 ft·lbf) or less

If the maximum torque is exceeded with retightening the nut, replace the bearing spacer and repeat the preload adjusting procedure. Do not loosen the pinion nut to reduce the preload.

20. **INSTALL DIFFERENTIAL CASE IN CARRIER (See page SA–145)**
21. **RECHECK TOTAL PRELOAD (See page SA–145)**
22. **RECHECK RING GEAR BACKLASH (See page SA–145)**
23. **RECHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See page SA–145)**
24. **CHECK RUNOUT OF COMPANION FLANGE (See page SA–140)**
25. **STAKE DRIVE PINION NUT**

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SA017–02

INSTALLATION

1. **INSTALL NEW GASKET TO AXLE HOUSING**
2. **INSTALL DIFFERENTIAL CARRIER ASSEMBLY**

Install the differential carrier assembly in the axle housing.

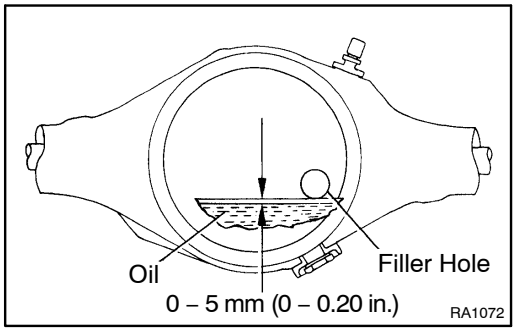
Torque: 73 N·m (740 kgf·cm, 54 ft·lbf)

3. **INSTALL PROPELLER SHAFT**

2WD: See page PR–9
4WD: See page PR–16

4. **INSTALL REAR AXLE SHAFTS**

(See page SA–135)



5. **FILL DIFFERENTIAL WITH DIFFERENTIAL OIL**

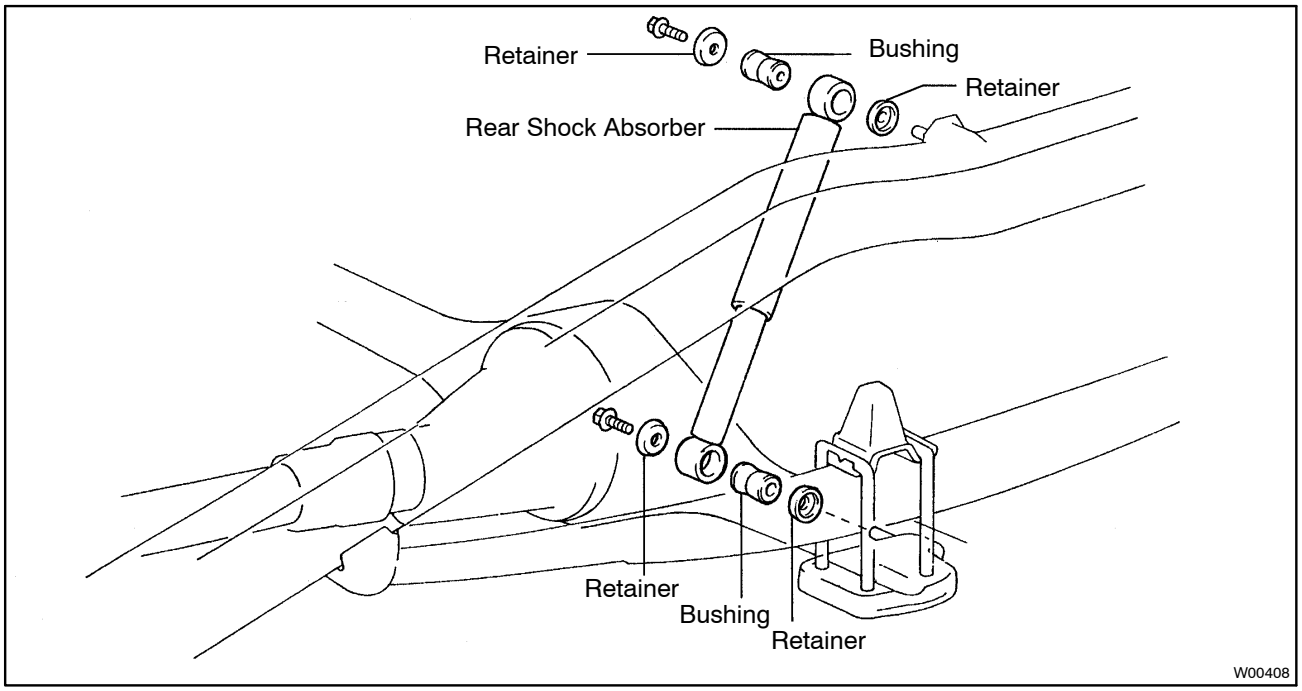
Torque:
Drain plug: 49 N·m (500 kgf·cm, 39 ft·lbf)
Filler plug: 39 N·m (400 kgf·cm, 29 ft·lbf)
Oil type: Hypoid gear oil API GL–5
Recommended oil viscosity:
Above –18°C (0°F) SAE 90
Below –18°C (0°F) SAE 80W or 80W – 90
Capacity: 2.35 liters (2.22 US qts, 2.67 Imp.qts)

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REAR SHOCK ABSORBER

COMPONENTS

SA0I8–07



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SA0I9–01

REMOVAL

1. SUPPORT BODY WITH STANDS

(a) Jack up and support the body on stands.

(b) Lower the axle housing until the leaf spring tension is free and keep it at this position.

2. REMOVE REAR SHOCK ABSORBER

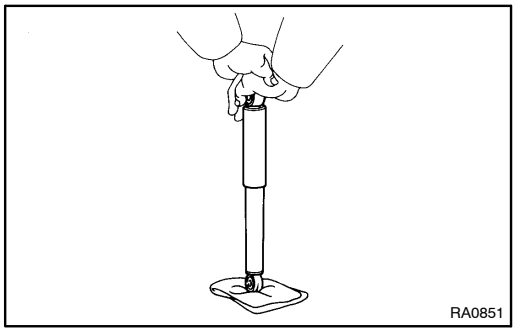
(a) Remove the 2 rear shock absorber set bolts.

Torque: 26 N·m (260 kgf·cm, 19 ft·lbf)

(b) Remove the rear shock absorber.

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SA0IA–01


RA0851

INSPECTION

INSPECT SHOCK ABSORBER

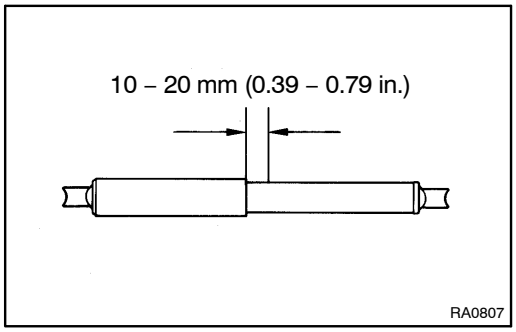
Compress and extend the shock absorber rod and check that there is no abnormal resistance or unusual operation sounds. If there is any abnormality, replace the shock absorber with a new one.

NOTICE:

When discarding the shock absorber, use the following procedure.

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SA0IB–01



DISPOSAL

1. FULLY EXTEND SHOCK ABSORBER ROD

2. DRILL HOLE TO REMOVE GAS FROM CYLINDER

Using a drill, make a hole in the cylinder, as shown to remove the gas inside.

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SA0IC–01

INSTALLATION

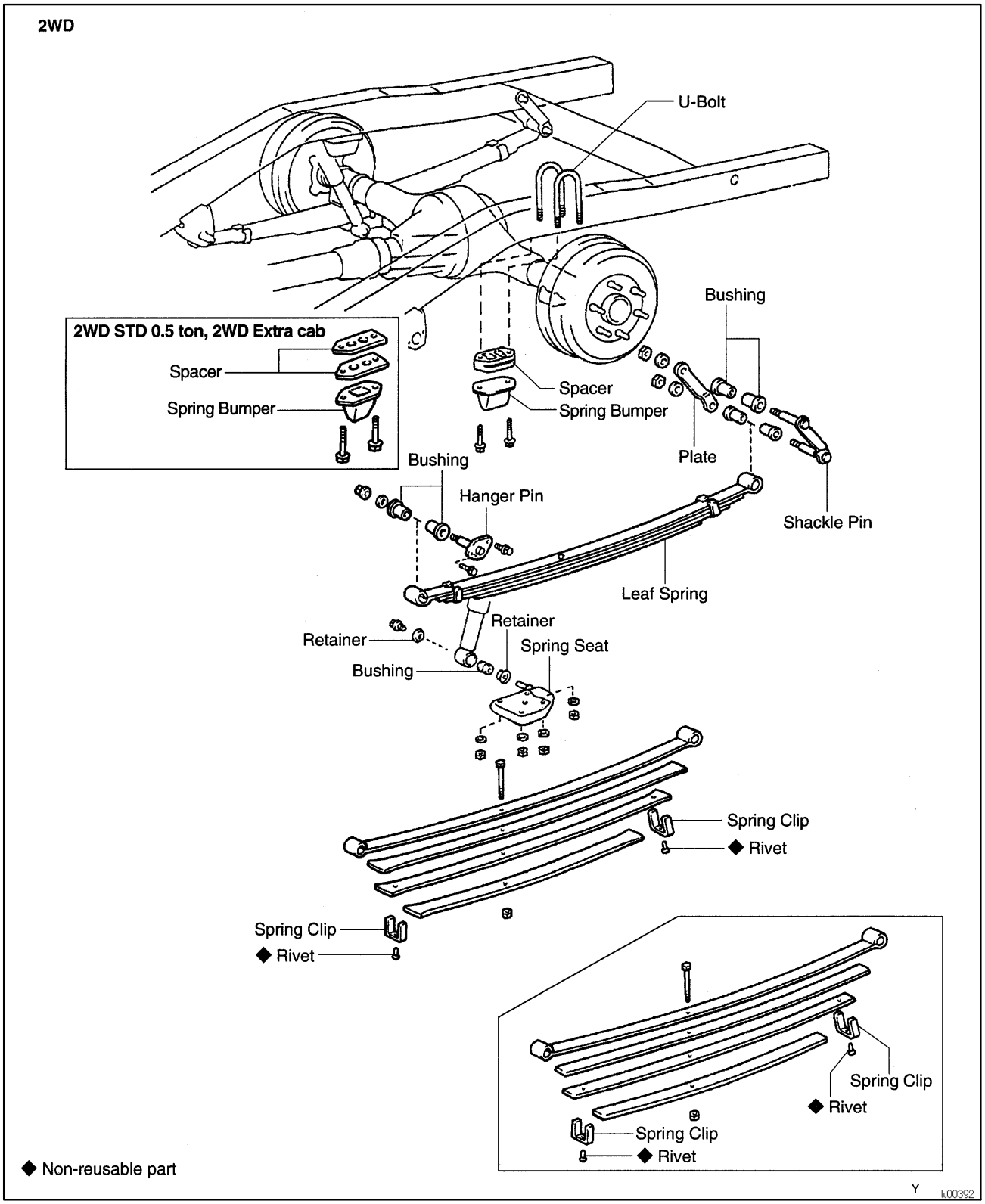
Installation is in the reverse order of removal (See page SA–156).

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REAR LEAF SPRING

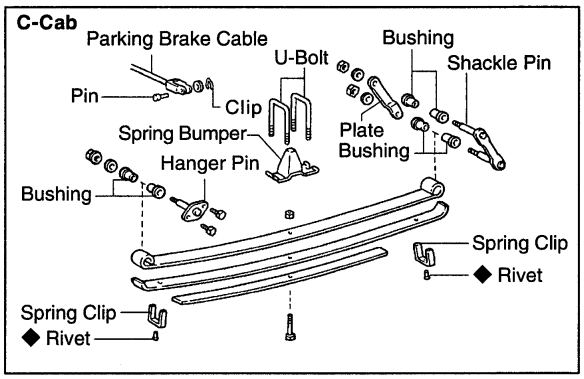
COMPONENTS

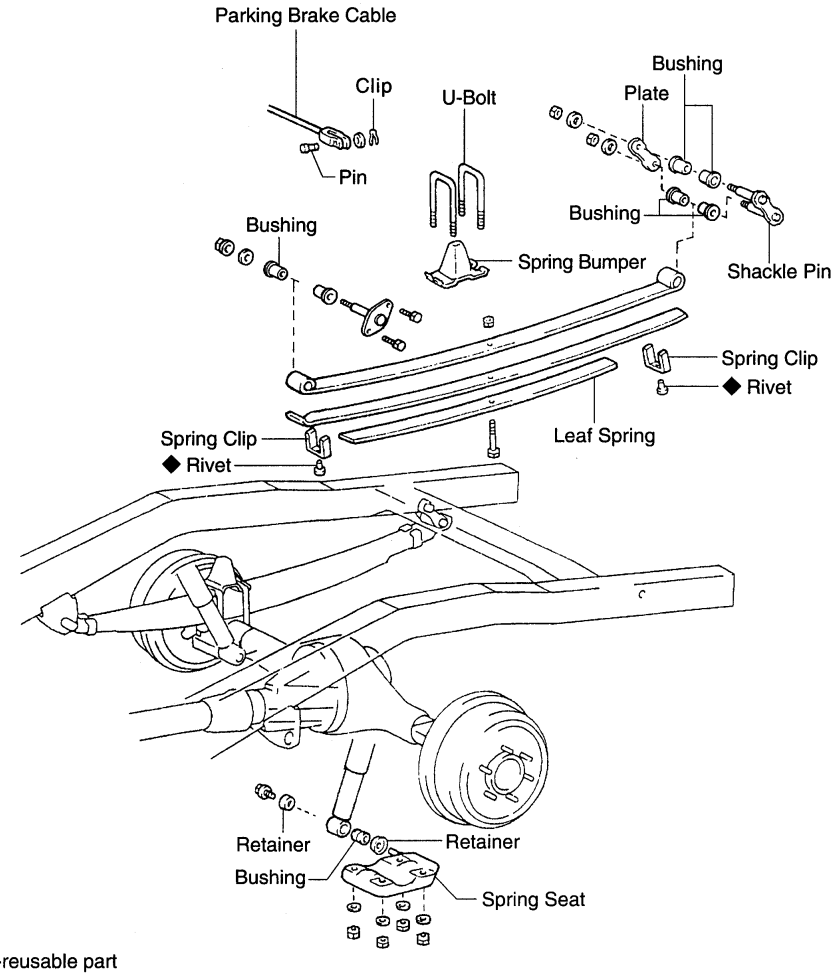
SA0ID–02



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4WD





◆ Non-reusable part

Y W00393

Author : Date : 1600

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SA0IE–01

REMOVAL

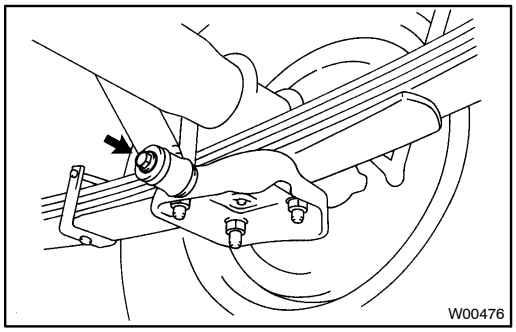
1. SUPPORT BODY

(a) Jack up and support the body on the stands.

(b) Lower the axle housing until the leaf spring tension is free, and keep it at this position.

2. REMOVE REAR WHEEL

Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)



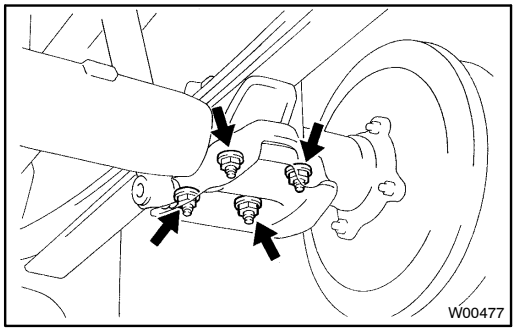
3. 4WD:

DISCONNECT PARKING BRAKE CABLE

4. DISCONNECT REAR SHOCK ABSORBER

Remove the bolt and disconnect the rear shock absorber lower side from the spring seat.

Torque: 26 N·m (260 kgf·cm, 19 ft·lbf)



5. REMOVE U–BOLTS

(a) Remove the 4 U–bolt mounting nuts and washer.

Torque: 132 N·m (1,350 kgf·cm, 97 ft·lbf)

(b) Remove the spring seat and 2 retainers.

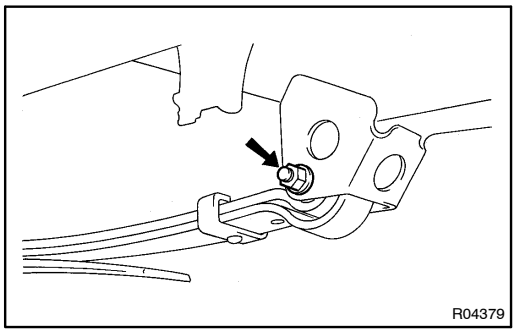
(c) Remove the U–bolts.

HINT:

At the time of installation, tighten the U–bolts so that the length of all the U–bolts under the spring seat is the same.

(d) 4WD:

Remove the spring bumper.



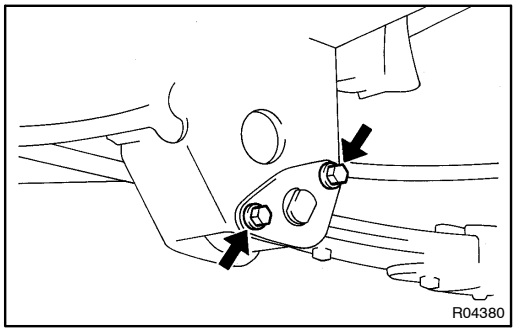
6. REMOVE REAR LEAF SPRING

(a) Remove the hanger pin nut.

Torque: 91 N·m (930 kgf·cm, 67 ft·lbf)

HINT:

At the time of installation, after stabilizing the suspension, torque the bolt.

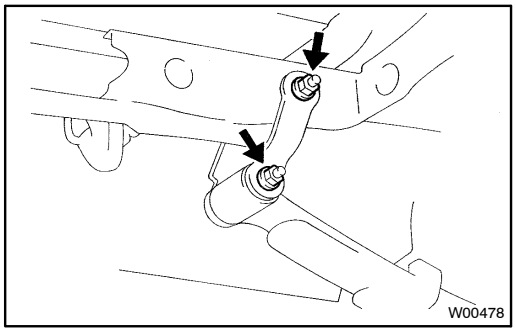


(b) Remove the 2 hanger pin lock bolts.

Torque: 26 N·m (260 kgf·cm, 19 ft·lbf)

(c) Remove the nut, washer and 2 bushings.

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(d) Remove the 2 shackle pin mounting nuts and washers.
Torque: 91 N·m (930 kgf·cm, 67 ft·lbf)

HINT:
At the time of installation, after stabilizing the suspension, torque the nut.

(e) Remove the shackle pin, plate and bushings and rear leaf spring.

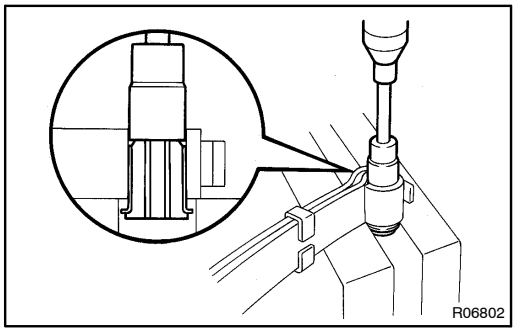
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SA0IF–01

REPLACEMENT

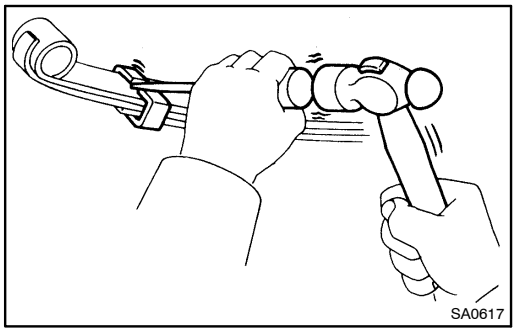
1. REPLACE BUSHING

Using a socket wrench and press, replace the bushing.

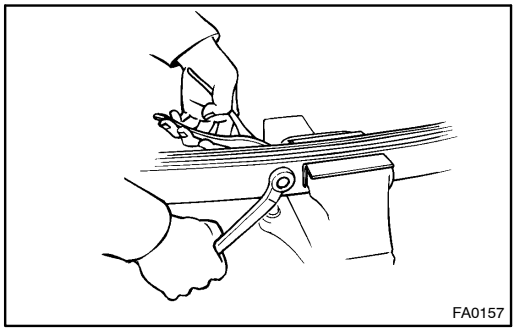


2. REPLACE LEAF SPRING

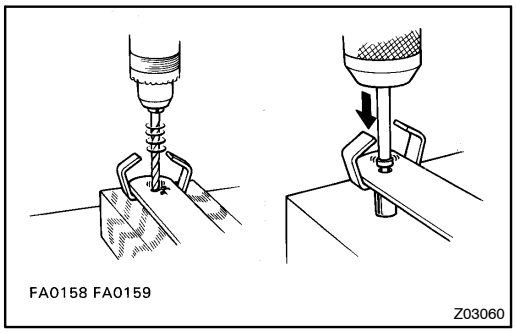
(a) Bend to open the spring clip.
Using a chisel and hammer, pry up the spring clip.



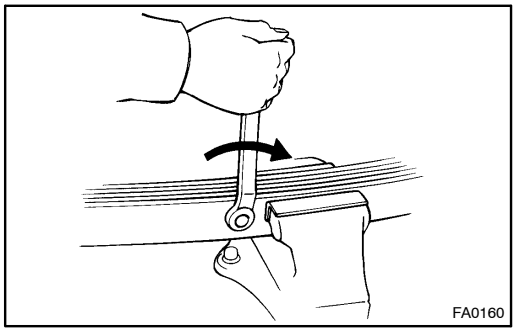
(b) Remove the center bolt.
Hold the spring near the center bolt in a vise and remove the center bolt.



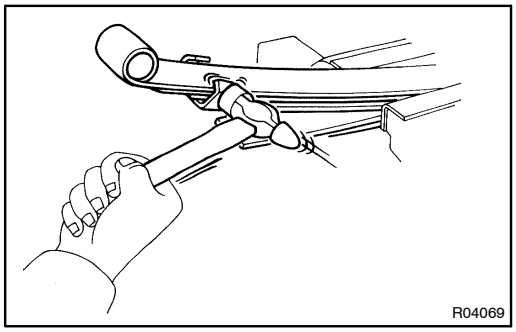
(c) Replace the spring clip.
(1) Drill off the head of the rivet and drive it out.
(2) Install a new rivet into the holes of the leaf spring and clip. Then rivet with a press.



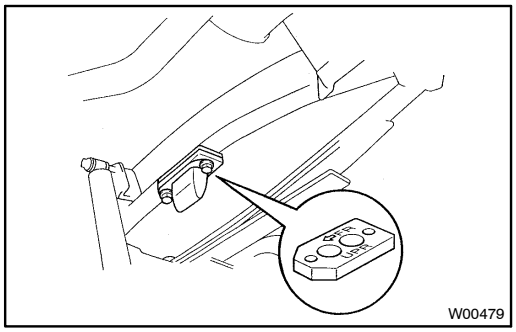
(d) Install the center bolt.
(1) Align the leaf spring holes and secure the leaves with a vise.
(2) Install the spring center bolt.
Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)



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(e) Bend the spring clip.
Using a hammer, bend the spring clip into the position.



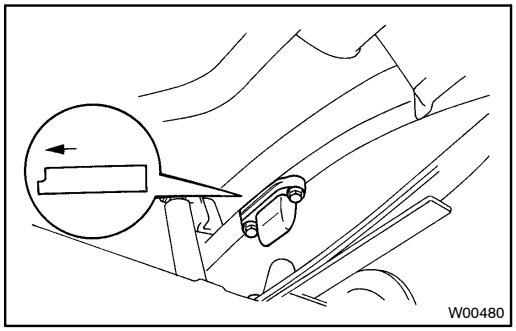
3. REPLACE SPRING BUMPER

(a) Remove rear wheel.
Torque: 103 N·m (1,050 kgf·cm, 76 ft·lbf)

(b) Remove spring bumper.

(1) STD 0.5 ton, Extra cab:
Remove the 2 bolts, spring bumper and spacers.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

HINT:
At the time of installation, install the spacers, as shown in the illustration.



(2) STD 1.0 ton:
Remove the 2 bolts, spring bumper and bumper block spacers.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

HINT:
At the time of installation, install the spacers, as shown in the illustration.

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SA0IG–01

INSTALLATION

Installation is in the reverse order of removal (See page SA–162).

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BR – BRAKE

BRAKE SYSTEM	BR-1
TROUBLESHOOTING	BR-2
BRAKE FLUID	BR-4
BRAKE PEDAL	BR-6
PARKING BRAKE LEVER	BR-8
BRAKE MASTER CYLINDER	BR-9
BRAKE BOOSTER ASSEMBLY	BR-17
FRONT BRAKE PAD (2WD)	BR-21
FRONT BRAKE PAD (4WD)	BR-24
FRONT BRAKE CALIPER (2WD)	BR-26
FRONT BRAKE CALIPER (4WD)	BR-33
REAR DRUM BRAKE (2WD)	BR-39
REAR DRUM BRAKE (4WD)	BR-44
LEAD SENSING PROPORTIONING AND BY-PASS VALVE (LSP & BV)	BR-50
ABS ACTUATOR	BR-58
FRONT SPEED SENSOR	BR-64
REAR SPEED SENSOR	BR-67

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BRAKE SYSTEM

GENERAL DESCRIPTION

BR08O–01

- **Care must be taken to replace each part properly as it could affect the performance of the brake system and result in a driving hazard. Replace the parts with parts having the same part number or equivalent.**
- **It is very important to keep parts and the area clean when repairing the brake system.**
- **If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.**

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TROUBLESHOOTING

PROBLEM SYMPTOMS TABLE

BR08P–03

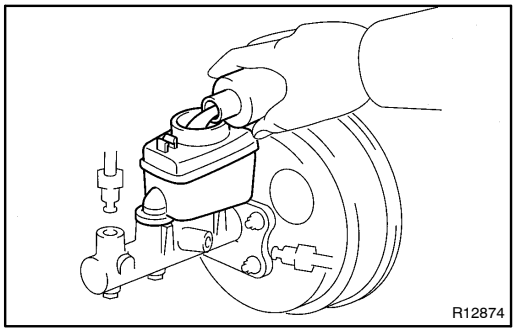
Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspect Area	See page
Low pedal or spongy pedal	1. Fluid leaks for brake system	DI–362
	2. Air in brake system	BR–4
	3. Piston seals (Worn or damaged)	BR–26 BR–33
	4. Rear brake shoe clearance (Out of adjustment)	BR–39 BR–44
	5. Master cylinder (Fauly)	BR–9
	6. Booster push rod (Out of adjustment)	BR–20
Brake drag	1. Brake pedal freeplay (Minimum)	BR–6
	2. Parking brake lever travel (Out of adjustment)	BR–8
	3. Parking brake wire (Sticking)	–
	4. Rear brake shoe clearance (Out of adjustment)	BR–39 BR–44
	5. Pad or lining (Cracked or distorted)	BR–26 BR–33 BR–39 BR–44
	6. Piston (Stuck)	BR–26 BR–33 BR–39 BR–44
	7. Piston (Frozen)	BR–26 BR–33 BR–39 BR–44
	8. Anchor or return spring (Faulty)	BR–39 BR–44
	9. Booster push rod (Out adjustment)	BR–20
	10. Vacuum leaks for booster system	BR–17
	11. Master cylinder (Faulty)	BR–9
Brake pull	1. Piston (Stuck)	BR–26 BR–33 BR–39 BR–44
	2. Pad or lining (Cracked or distorted)	BR–26 BR–33 BR–39 BR–44
	3. Piston (Frozen)	BR–26 BR–33 BR–39 BR–44
	4. Disk (Scored)	BR–26 BR–33
	5. Pad or lining (Cracked or distorted)	BR–26 BR–33 BR–39 BR–44

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Hard pedal but brake inefficient	1. Fluid leaks for brake system	DI–362
	2. Air in brake system	BR–4
	3. Pad or lining (Worn)	BR–26 BR–33 BR–39 BR–44
	4. Pad or lining (Cracked or distorted)	BR–26 BR–33 BR–39 BR–44
	5. Rear brake shoe clearance (Out of adjustment)	BR–39 BR–44
	6. Pad or lining (Oily)	BR–26 BR–33 BR–39 BR–44
	7. Pad or lining (Glazed)	BR–26 BR–33 BR–39 BR–44
	8. Disk (Scored)	BR–26 BR–33
	9. Booster push rod (Out of adjustment)	BR–20
	10. Vacuum leaks for booster system	BR–17
Noise from brakes	1. Pad or lining (Cracked or distorted)	BR–26 BR–33 BR–39 BR–44
	2. Installation bolt (Loose)	BR–26 BR–33
	3. Disk (Scored)	BR–26 BR–33
	4. Pad support plate (Loose)	
	5. Sliding pin (Worn)	
	6. Pad or lining (Dirty)	BR–26 BR–33 BR–39 BR–44
	7. Pad or lining (Glazed)	BR–26 BR–33 BR–39 BR–44
	8. Anchor or return spring (Faulty)	BR–39 BR–44
	9. Anti–squeal shim (Damaged)	BR–26 BR–33
	10. Shoe hold–down spring (Damaged)	BR–39 BR–44

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R12874

BRAKE FLUID

BLEEDING

BR08Q–01

HINT:

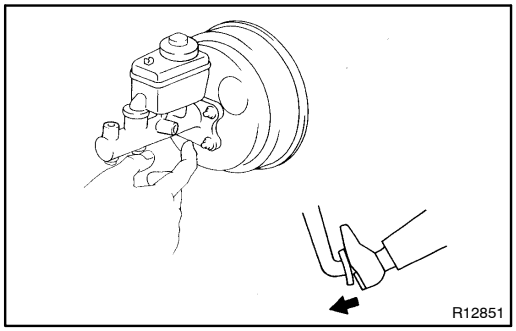
If any work is done on the brake system or if air is suspected in the brake lines, bleed the system of air.

NOTICE:

Do not let brake fluid remain on a painted surface. Wash it off immediately.

1. FILL BRAKE RESERVOIR WITH BRAKE FLUID

Check the fluid level in the reservoir after bleeding each wheel. Add fluid, if necessary.


R12851

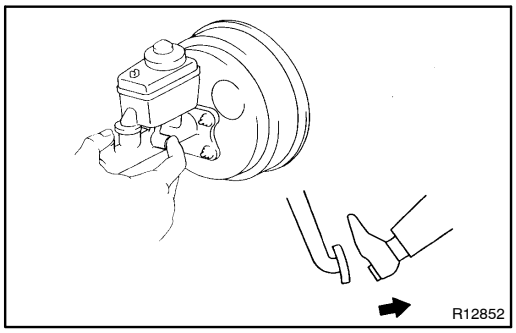
2. BLEED MASTER CYLINDER

HINT:

If the master cylinder was disassembled or if the reservoir becomes empty, bleed the air from the master cylinder.

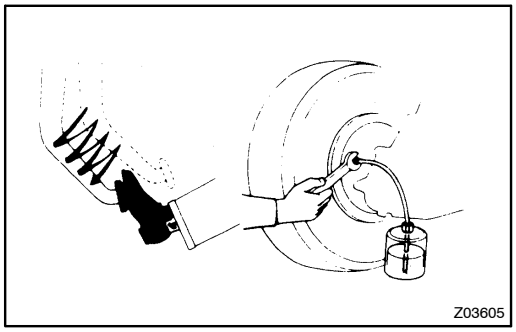
(a) Disconnect the brake lines from the master cylinder.

(b) Slowly depress the brake pedal and hold it.


R12852

(c) Block off the outlet plug with your finger, and release the brake pedal.

(d) Repeat (b) and (c) 3 or 4 times.


Z03605

3. CONNECT VINYL TUBE TO WHEEL CYLINDER BLEEDER PLUG

Insert the other end of the tube in a half–full container of brake fluid.

HINT:

Begin air bleeding from the wheel cylinder with the longest hydraulic line.

4. BLEED BRAKE LINE

(a) Slowly depress the brake pedal several times.

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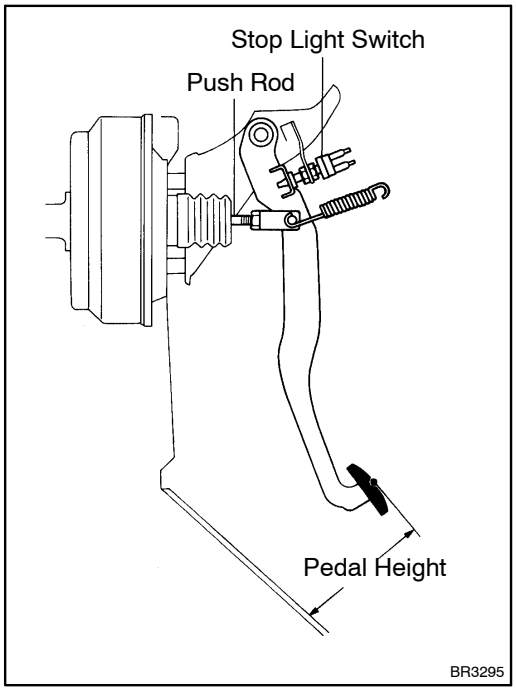
(b) While an assistant depresses the pedal, loosen the bleeder plug until fluid starts to run out. Then close the bleeder plug.
Torque: (bleeder plug) 11 N·m (110 kgf·cm, 8 ft·lbf)

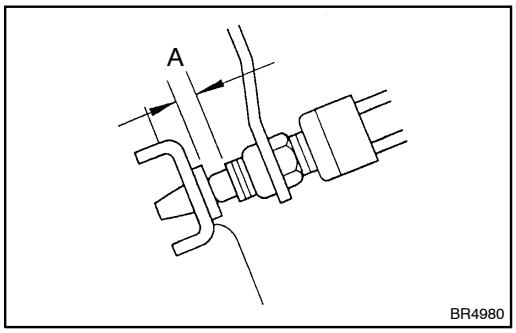
(c) Repeat this procedure until there are no more air bubbles in the fluid.

5. REPEAT PROCEDURE FOR EACH WHEEL

6. BLEED LSP & BV

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BRAKE PEDAL

BR08R–01

ON–VEHICLE INSPECTION

1. CHECK PEDAL HEIGHT

Pedal height from asphalt sheet:

Extra cab 4WD:

146.7 – 156.7 mm (5.776 – 6.169 in.)

Except extra cab 4WD:

149.7 – 159.7 mm (5.894 – 6.287 in.)

2. IF NECESSARY, ADJUST PEDAL HEIGHT

(a) Disconnect the connector from the stop light switch.

(b) Loosen the stop light switch lock nut and remove the stop light switch.

(c) Loosen the push rod lock nut.

(d) Adjust the pedal height by turning the pedal push rod.

(e) Tighten the push rod lock nut.

Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)

(f) Install the stop light switch and turn it until it lightly contacts the pedal stopper.

(g) Turn the stop light switch back one turn.

(h) Check the clearance (A) between stop light switch and pedal.

Clearance: 0.5 – 2.4 mm (0.020 – 0.094 in.)

(i) Tighten the stop light switch lock nut.

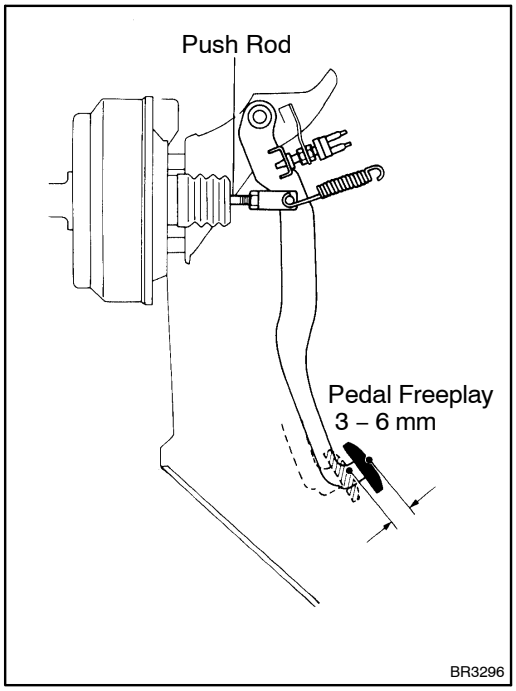
(j) Check the stop lights come on when the brake pedal is depressed, and go off when the brake pedal is released.

(k) After adjusting the pedal height, check the pedal freeplay.

HINT:

If clearance (A) between the stop light switch and the pedal stopper has been adjusted correctly, the pedal freeplay will meet the specifications.

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3. CHECK PEDAL FREEPLAY

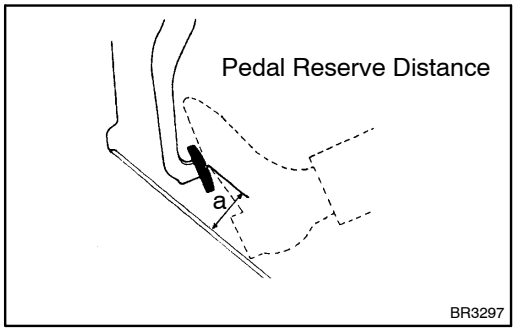
(a) Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster.

(b) Push in the pedal by hand until the second resistance begins to be felt. Measure the distance as shown in the illustration.

Pedal freeplay: 3 – 6 mm (0.12 – 0.24 in.)

HINT:

The freeplay to the 1st resistance is due to the play between the clevis and pin. This is magnified up to 1 – 3 mm (0.04 – 0.12 in.) at the pedal.



4. CHECK PEDAL RESERVE DISTANCE

Release the parking brake.

With the engine running, depress the pedal and measure the pedal reserve distance, as shown.

Pedal reserve distance, 'a', at 490 N (50 kgf, 110.2 lbf):
2WD 1 ton (STD cab): More than 78 mm (3.07 in.)
2WD 0.5 ton/4WD (STD cab):
More than 73 mm (2.87 in.)
4WD (Extra cab): More than 70 mm (2.76 in.)

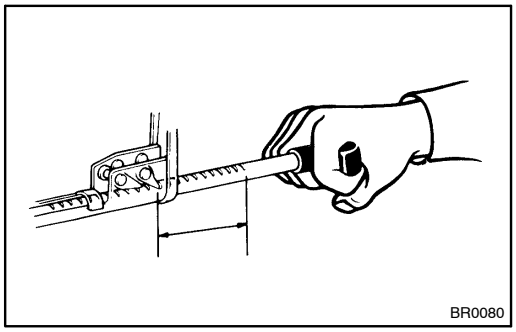
If incorrect, troubleshoot the brake system.

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PARKING BRAKE LEVER

BR08S–02

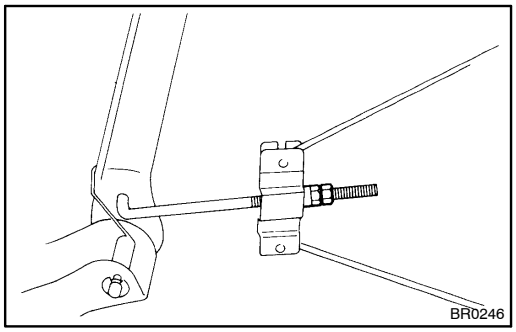
ON–VEHICLE INSPECTION



1. CHECK PARKING BRAKE LEVER TRAVEL

Pull the parking brake lever all the way up, and count the number of clicks.

Parking brake lever travel at 196 N (20 kgf, 44.1 lbf):
11 – 17 clicks



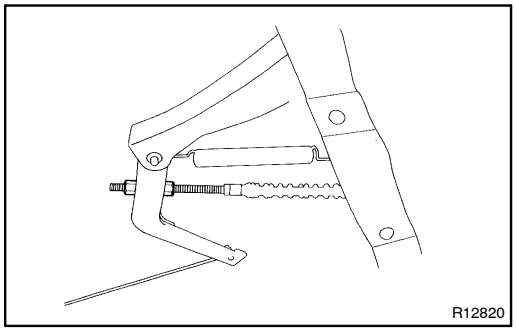
2. 2WD:
IF NECESSARY, ADJUST PARKING BRAKE

HINT:

Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted.

(a) Tighten the adjusting nut until the travel is correct. Then tighten the lock nut.

(b) After adjusting the parking brake, confirm that the rear brakes are not dragging.



3. 4WD:
IF NECESSARY, ADJUST PARKING BRAKE

HINT:

Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted.

(a) Tighten 1 of the adjusting nuts of the intermediate lever while loosening the other one until the travel is correct. Tighten the 2 adjusting nuts.

(b) After adjusting the parking brake, confirm that the bell-crank stopper screw comes into contact with the backing plate.

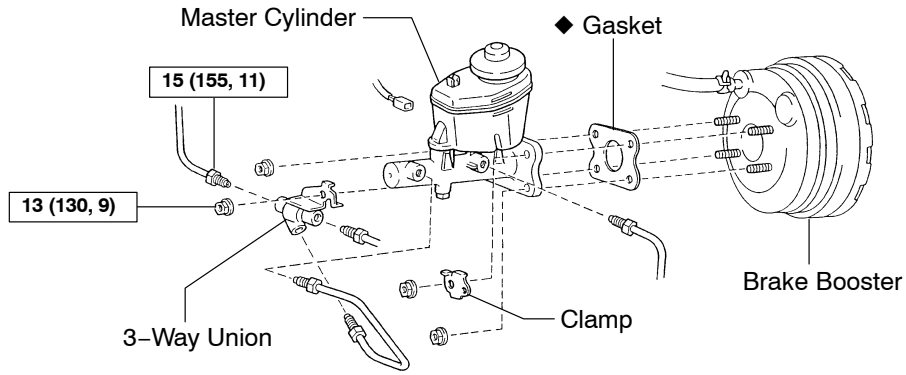
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BRAKE MASTER CYLINDER

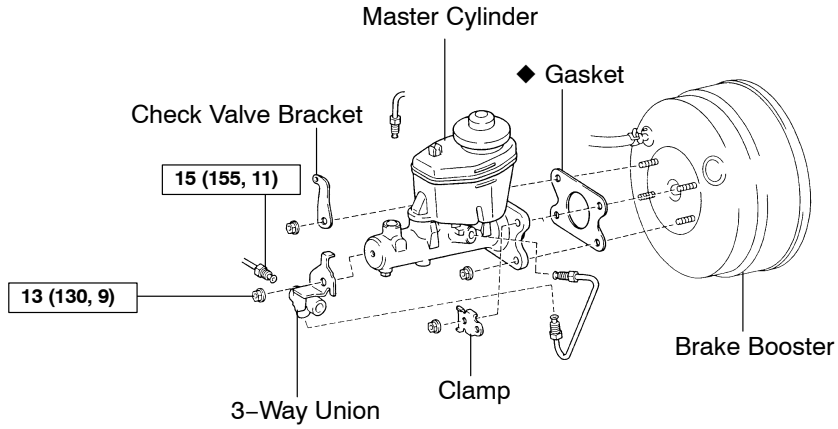
COMPONENTS

BR08T–02

w/o ABS:



w/ ABS:

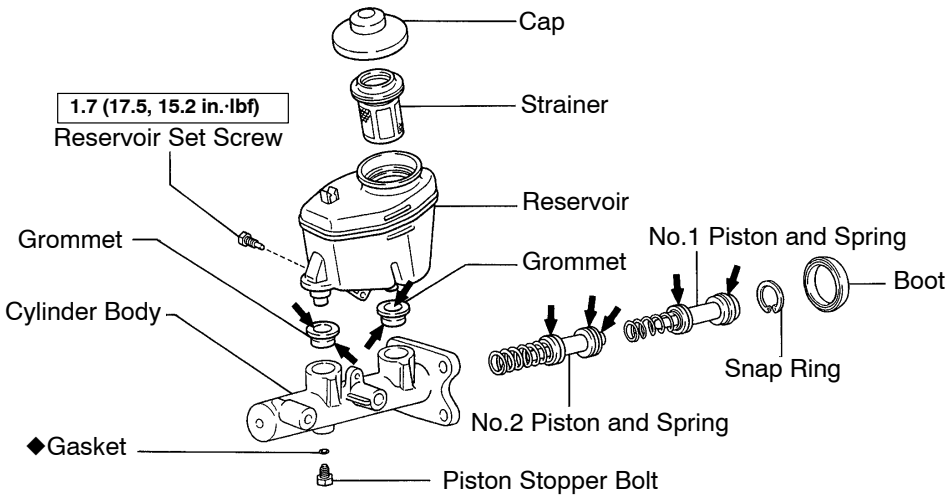


N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part

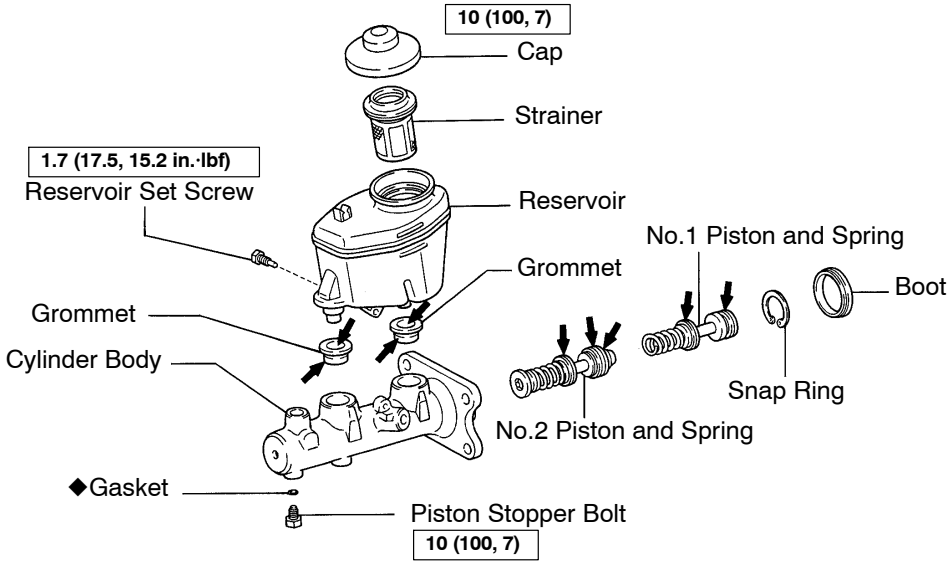
F00667

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w/o ABS:



w/ ABS:



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

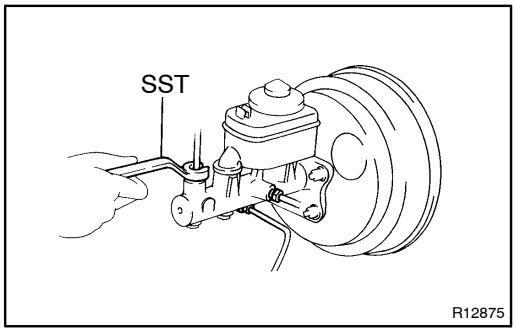
➡ Lithium soap base glycol grease

R14642

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BR08U–01

REMOVAL



1. DISCONNECT LEVEL WARNING SWITCH CONNECTOR

2. TAKE OUT FLUID WITH SYRINGE

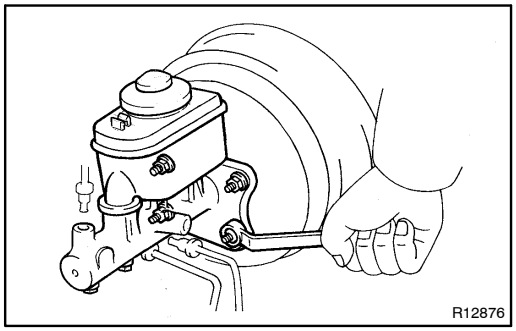
NOTICE:

Do not let brake fluid remain on a painted surface. Wash it off immediately.

3. DISCONNECT BRAKE LINES

Using SST, disconnect the brake lines from the master cylinder and 3–way union.

SST 09751–36011



4. REMOVE MASTER CYLINDER

(a) Remove the 4 nuts and 3–way union.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(b) Remove the clamp.

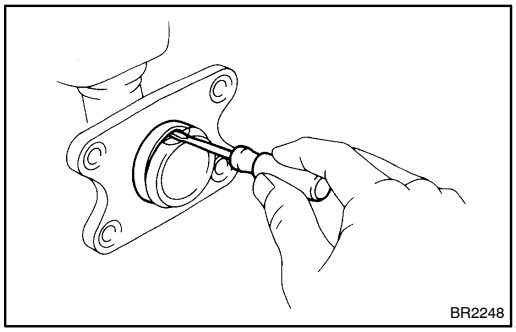
(c) w/ ABS:
Remove the check valve bracket.

(d) Remove the master cylinder and gasket from the brake booster.

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BR08V–02

DISASSEMBLY



1. REMOVE MASTER CYLINDER BOOT

Using a screwdriver, remove the master cylinder boot.

NOTICE:

At the time of reassembly, please refer to the following item.

Facing the UP mark on the master cylinder boot upwards, install the cylinder boot to the master cylinder.

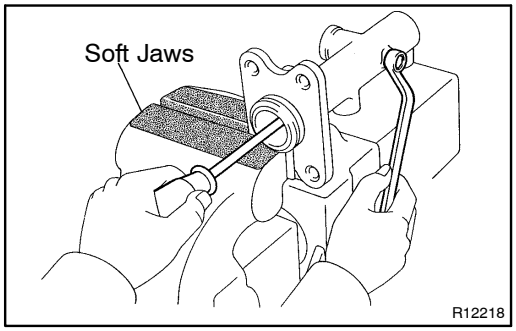
2. REMOVE RESERVOIR

(a) Remove the set screw and pull out the reservoir.
Torque: 1.7 N·m (17.5 kgf·cm, 15.2 in.·lbf)

(b) Remove the cap and strainer from the reservoir.

3. REMOVE 2 GROMMETS

4. PLACE CYLINDER IN VISE



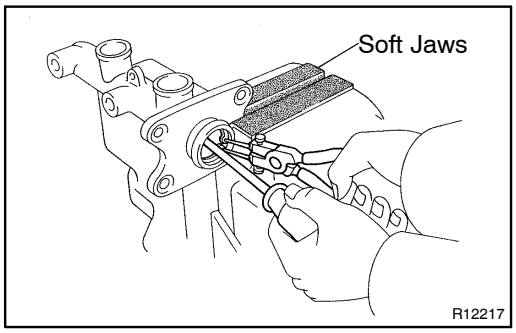
5. REMOVE PISTON STOPPER BOLT

Using a screwdriver, push the pistons in all the way and remove the piston stopper bolt and gasket.

HINT:

Tape the screwdriver tip before use.

Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)



6. REMOVE 2 PISTONS AND SPRINGS

(a) Push in the piston with a screwdriver and remove the snap ring with snap ring pliers.

HINT:

Tape the screwdriver tip before use.

(b) Remove the No.1 piston and spring by hand, pulling straight out, not at an angle.

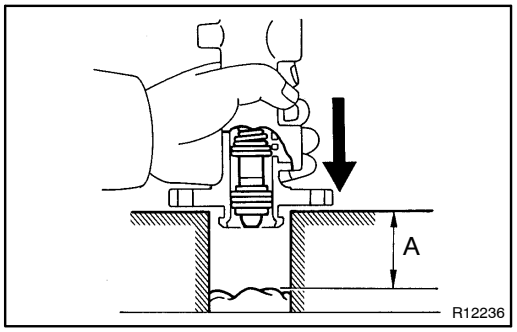
NOTICE:

If pulled out and installed at an angle, there is a possibility that the cylinder bore could be damaged.

NOTICE:

At the time of reassembly, please refer to the following item. Be careful not to damage the rubber lips on the pistons.

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(c) Place a rag and 2 wooden blocks on the work table, and lightly tap the cylinder flange against the block edges until the No.2 piston drops out of cylinder.

HINT:

Make sure the distance (A) from the rag to the top of the blocks is at least 100 mm (3.94 in.).

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BR08W–01

INSPECTION

HINT:

Clean the disassembled parts with compressed air.

1. INSPECT CYLINDER BORE FOR RUST OR SCORING

2. INSPECT CYLINDER FOR WEAR OR DAMAGE

If necessary, clean or replace the cylinder.

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BR08X–01

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page BR–12).

NOTICE:

Apply lithium soap base glycol grease to the rubber parts indicated by the arrows (See page BR–9).

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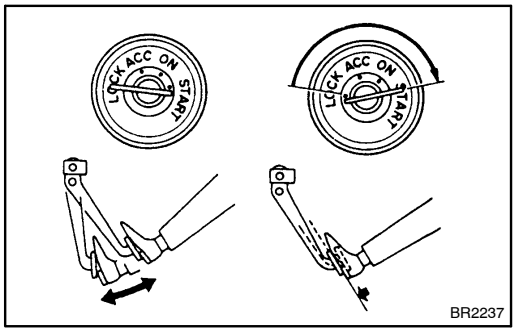
BR08Y–01

INSTALLATION

Installation is in the reverse order of removal (See page BR–11).

1. **BEFORE INSTALLATION, ADJUST LENGTH OF BRAKE BOOSTER PUSH ROD (See page BR–20)**
2. **AFTER INSTALLATION, FILL BRAKE RESERVOIR WITH BRAKE FLUID. AND BLEED BRAKE SYSTEM (See page BR–4)**
3. **CHECK FOR LEAKS, CHECK AND ADJUST BRAKE PEDAL (See page BR–6)**

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BRAKE BOOSTER ASSEMBLY

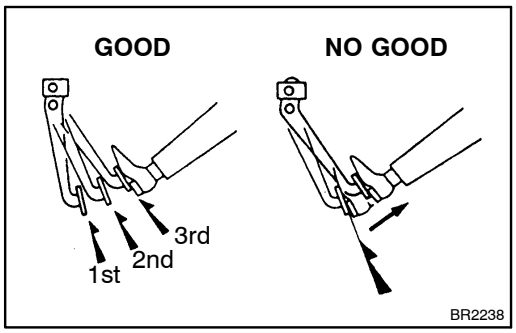
BR08Z–01

ON–VEHICLE INSPECTION

1. OPERATING CHECK

(a) Depress the brake pedal several times with the engine off, and check that there is no change in the pedal reserve distance.

(b) Depress the brake pedal and start engine. If the pedal goes down slightly, operation is normal.



2. AIR TIGHTNESS CHECK

(a) Start the engine and stop it after 1 or 2 minutes. Depress the brake pedal several times slowly.

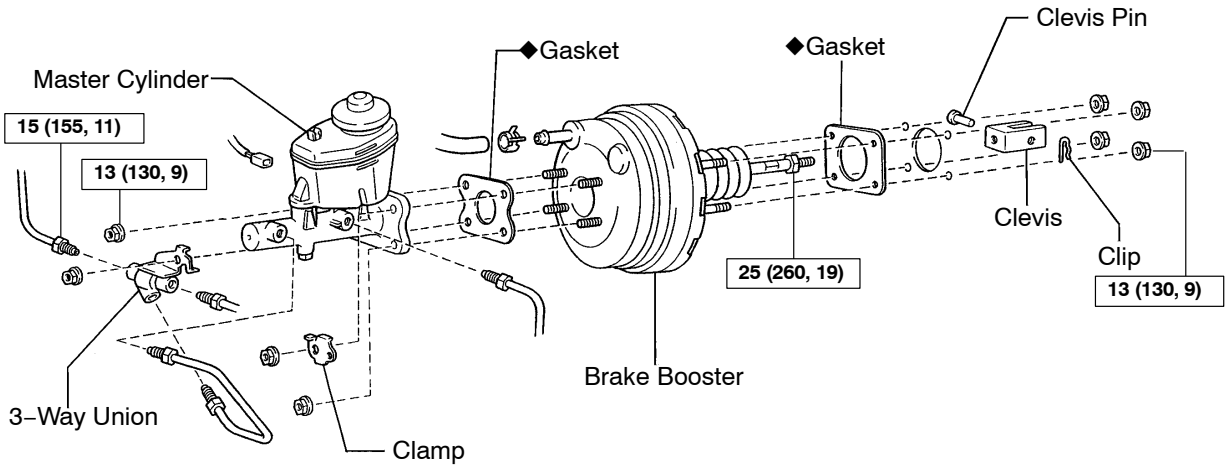
If the pedal goes down furthest the 1st time, but gradually rises after the 2nd or 3rd time, the booster is air tight.

(b) Depress the brake pedal while the engine is running, and stop it with the pedal depressed. If there is no change in pedal reserve travel after holding the pedal for 30 seconds, the booster is air tight.

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BR090–02

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆Non–reusable part

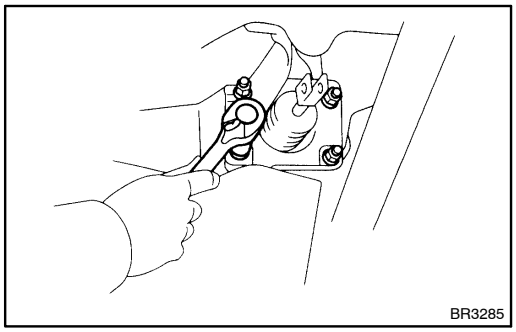
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BR091–01

REMOVAL

1. **REMOVE MASTER CYLINDER (See page BR–11)**
2. **DISCONNECT VACUUM HOSE FROM BRAKE BOOSTER**
3. **REMOVE PEDAL RETURN SPRING**
4. **REMOVE CLIP AND CLEVIS PIN**



5. **REMOVE BRAKE BOOSTER**

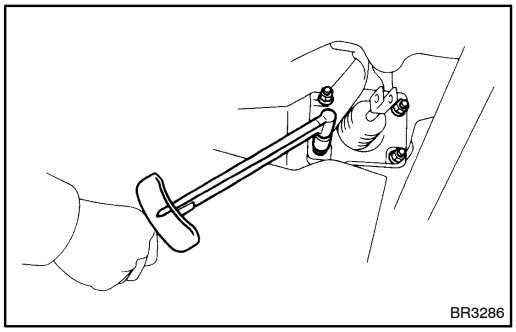
(a) Remove the 4 nuts and clevis.

(b) Pull out the brake booster and gasket.

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BR092–01

INSTALLATION



1. INSTALL BRAKE BOOSTER

(a) Install the booster and a new gasket.

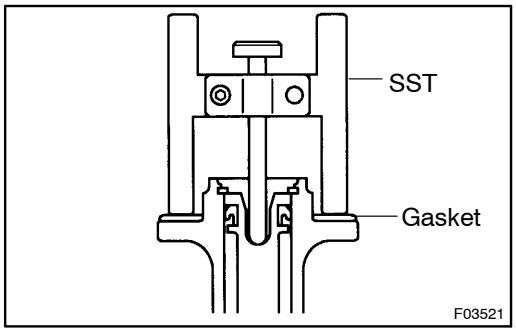
(b) Install the clevis to the operating rod.

(c) Install and torque the booster installation nuts.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(d) Install the clevis pin into the clevis and brake pedal, and install the clip to the clevis pin.

(e) Install the pedal return spring.

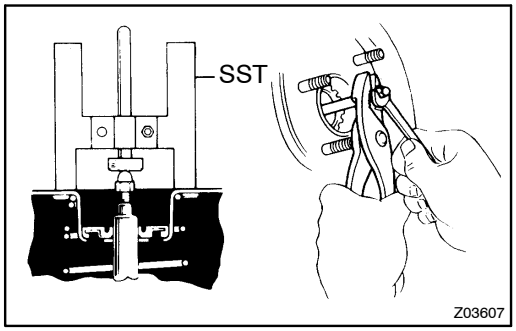


2. ADJUST LENGTH OF BOOSTER PUSH ROD

(a) Install a new gasket on the master cylinder.

(b) Set the SST on the gasket, and lower the pin until its tip slightly touches the piston.

SST 09737–00010



(c) Turn the SST upside down, and set it on the booster.

SST 09737–00010

(d) Measure the clearance between the booster push rod and pin head (SST).

Clearance: 0 mm (0 in.)

(e) Adjust the booster push rod length until the push rod lightly touches the pin head.

3. INSTALL MASTER CYLINDER (See page BR–16)

4. CONNECT VACUUM HOSE TO BRAKE BOOSTER

5. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM (See page BR–4)

6. CHECK FOR FLUID LEAKAGE

7. CHECK AND ADJUST BRAKE PEDAL (See page BR–6)

Check and adjust the brake pedal, then tighten the clevis lock nut.

Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)

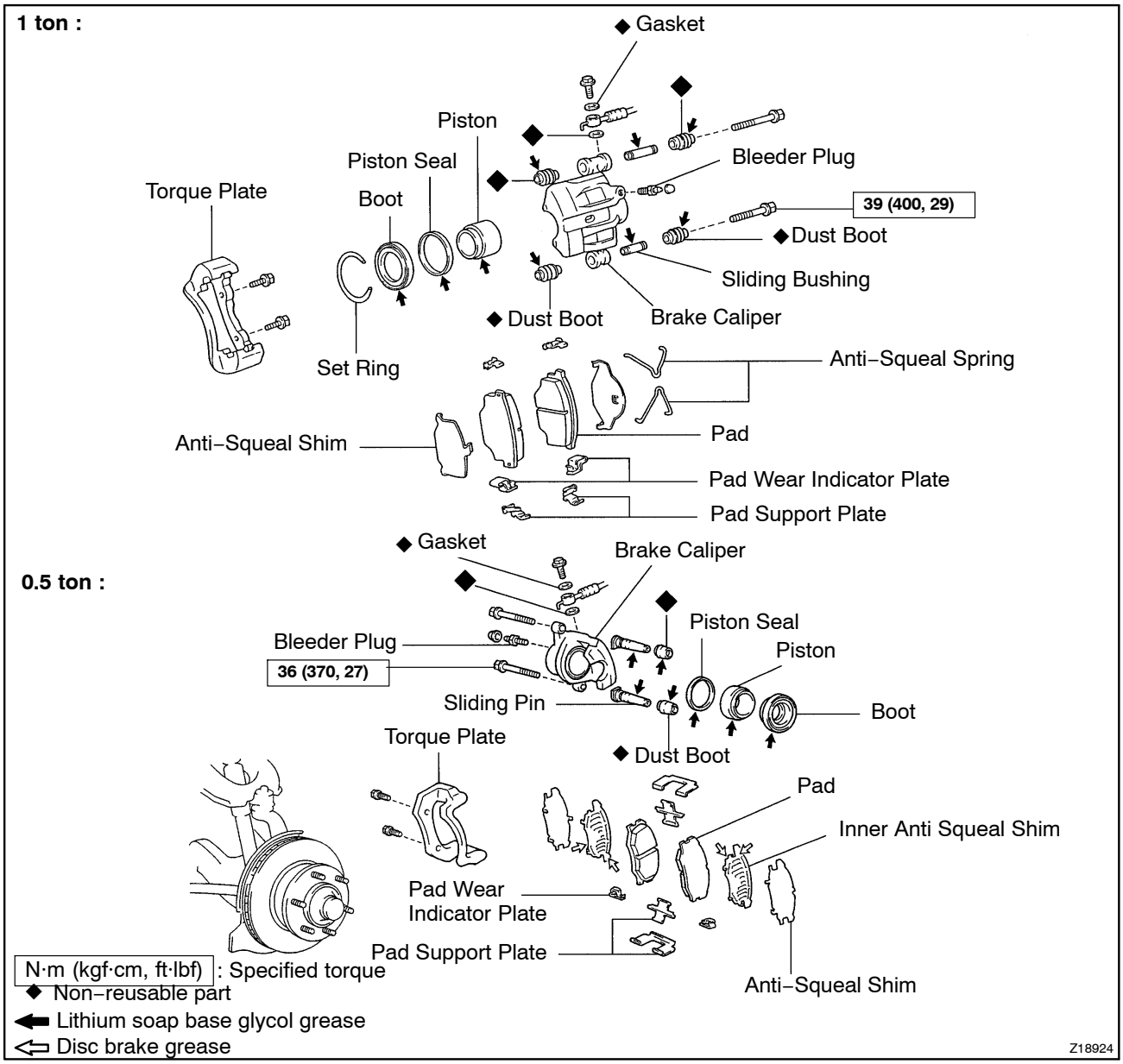
8. DO OPERATIONAL CHECK (See page BR–17)

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FRONT BRAKE PAD (2WD)

COMPONENTS

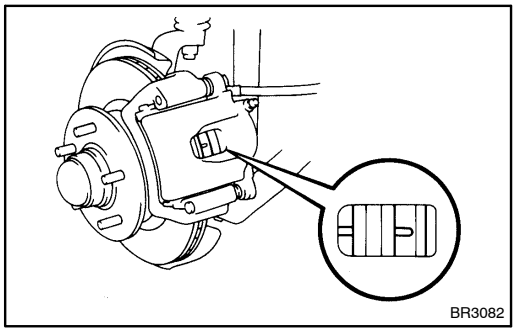
BR093–03



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BR094–01

REPLACEMENT


BR3082

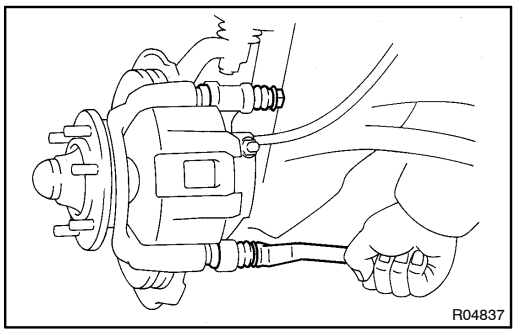
1. REMOVE FRONT WHEEL

Remove the wheel and temporarily fasten the disc with hub nuts.

2. INSPECT PAD LINING THICKNESS

Check the pad thickness through the caliper inspection hole and replace pads if not within specification.

Minimum thickness: 1.0 mm (0.039 in.)


R04837

3. LIFT UP CALIPER

(a) Remove the installation bolt.

(b) Lift up the caliper and suspend it securely.

HINT:

Do not disconnect the flexible hose from the caliper.

4. REMOVE THESE PARTS:

- 1 ton:
  2 anti–squeal springs
- 2 brake pads
- 2 (1 ton) / 4 (0.5 ton) anti–squeal shims
- 2 pad wear indicator plates
- 4 pad support plates

NOTICE:

The anti–squeal springs (1 ton) and support plates can be used again provided that they have sufficient rebound, no deformation, cracks or wear, and have had all rust, dirt and foreign particles cleaned off.

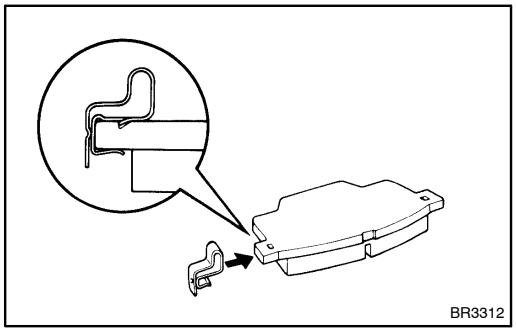
5. CHECK DISC THICKNESS AND RUNOUT
(See page BR–30)

6. INSTALL 4 PAD SUPPORT PLATES

7. INSTALL NEW PADS

NOTICE:

When replacing worn pads, the anti–squeal shims and wear indicator plates must be replaced together with the pads.


BR3312

(a) Install a pad wear indicator plate to the pad.

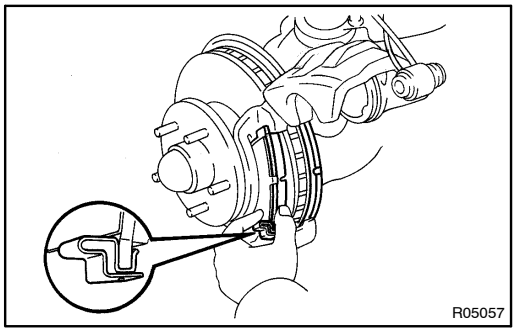
(b) 1 ton:
Install the anti–squeal shim to each pad.

(c) 0.5 ton:
Install the 4 anti–squeal shims to each pad.

HINT:

Apply disc brake grease to both sides of inner anti–squeal shims (See page BR–21).

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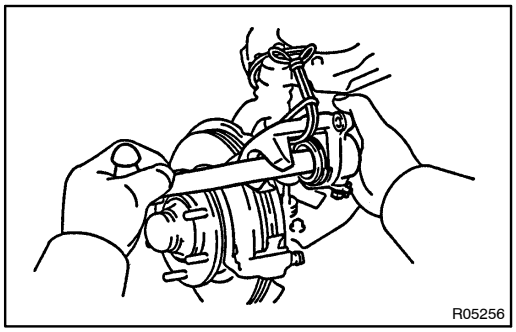
(d) Install the 2 pads so that the wear indicator plate is facing underneath.

NOTICE:

Do not allow oil or grease on the rubbing face.

8. INSTALL CALIPER

(a) Draw out a small amount of brake fluid from the reservoir.



(b) Press in piston with a hammer handle or equivalent.

HINT:

If the piston is difficult to push in, loosen the bleeder plug and push in the piston while letting some brake fluid escape.

(c) Insert the brake caliper carefully so the boot is not wedged.

(d) Install and torque the installation bolts.

Torque:

1 ton: 39 N·m (400 kgf·cm, 29 ft·lbf)

Torque:

0.5 ton: 36 N·m (370 kgf·cm, 27 ft·lbf)

9. INSTALL FRONT WHEEL

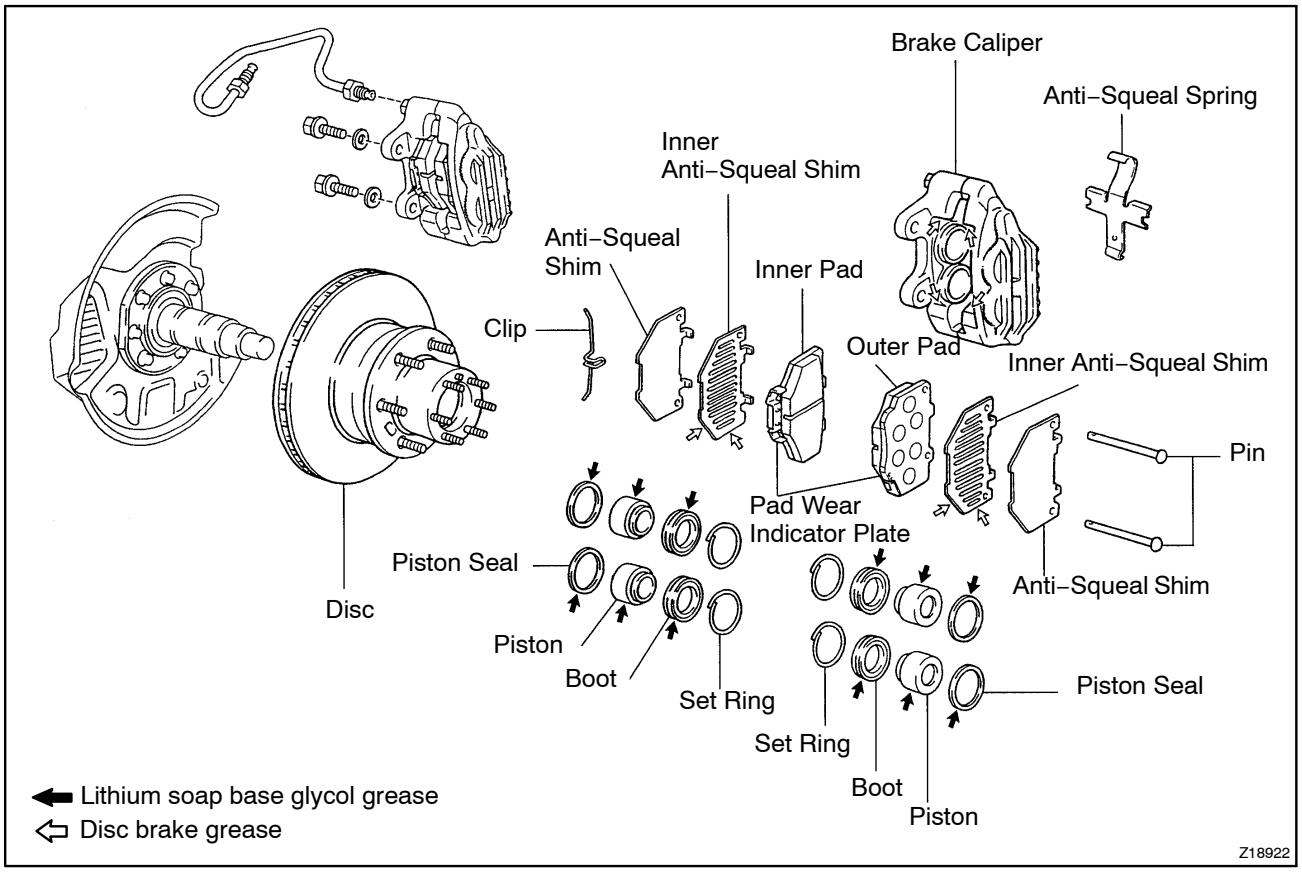
10. CHECK THAT FLUID LEVEL IS AT MAX LINE

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FRONT BRAKE PAD (4WD)

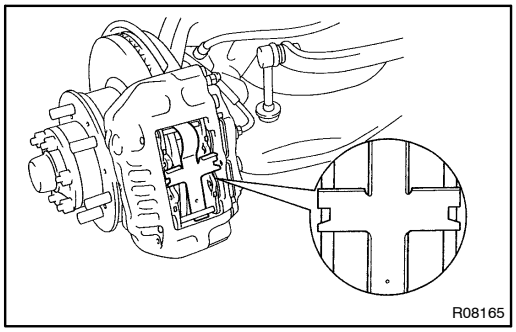
COMPONENTS

BR095–02



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BR096–01


R08165

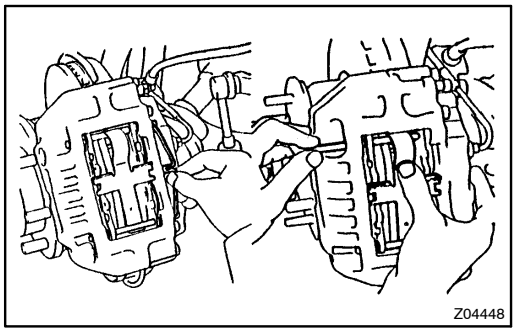
REPLACEMENT

1. REMOVE FRONT WHEEL

2. INSPECT PAD LINING THICKNESS

Check the pad thickness and replace pads if not within specification.

Minimum thickness: 1.0 mm (0.039 in.)


Z04448

3. REMOVE THESE PARTS:

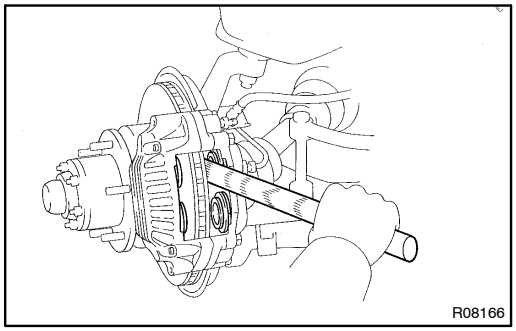
- Clip
- 2 pins
- Anti–rattle spring
- 2 pads
- 4 anti–squeal shims

NOTICE:

The anti–rattle spring can be used again provided that they have sufficient rebound, no deformation, cracks or wear, and have had all rust, dirt and foreign particles cleaned off.

4. CHECK DISC THICKNESS AND RUNOUT

(See page BR–36)


R08166

5. INSTALL NEW PADS

NOTICE:

When replacing worn pads, the anti–squeal shims must be replaced together with the pads.

(a) Draw out a small amount of brake fluid from the reservoir.

(b) Press in the pistons with a hammer handle or equivalent.

HINT:

- Always change the pad on one wheel at a time as there is a possibility of the opposite piston flying out.
- If the piston is difficult to push in, loosen the bleeder plug and push in the piston while letting some brake fluid escape.

(c) Install the 4 anti–squeal shims to new pads.

HINT:

Apply disc brake grease to the inner anti–squeal shims (See page BR–24).

(d) Install the 2 pads.

NOTICE:

Do not allow oil or grease on the rubbing face.

6. INSTALL ANTI–RATTLE SPRING AND 2 PINS

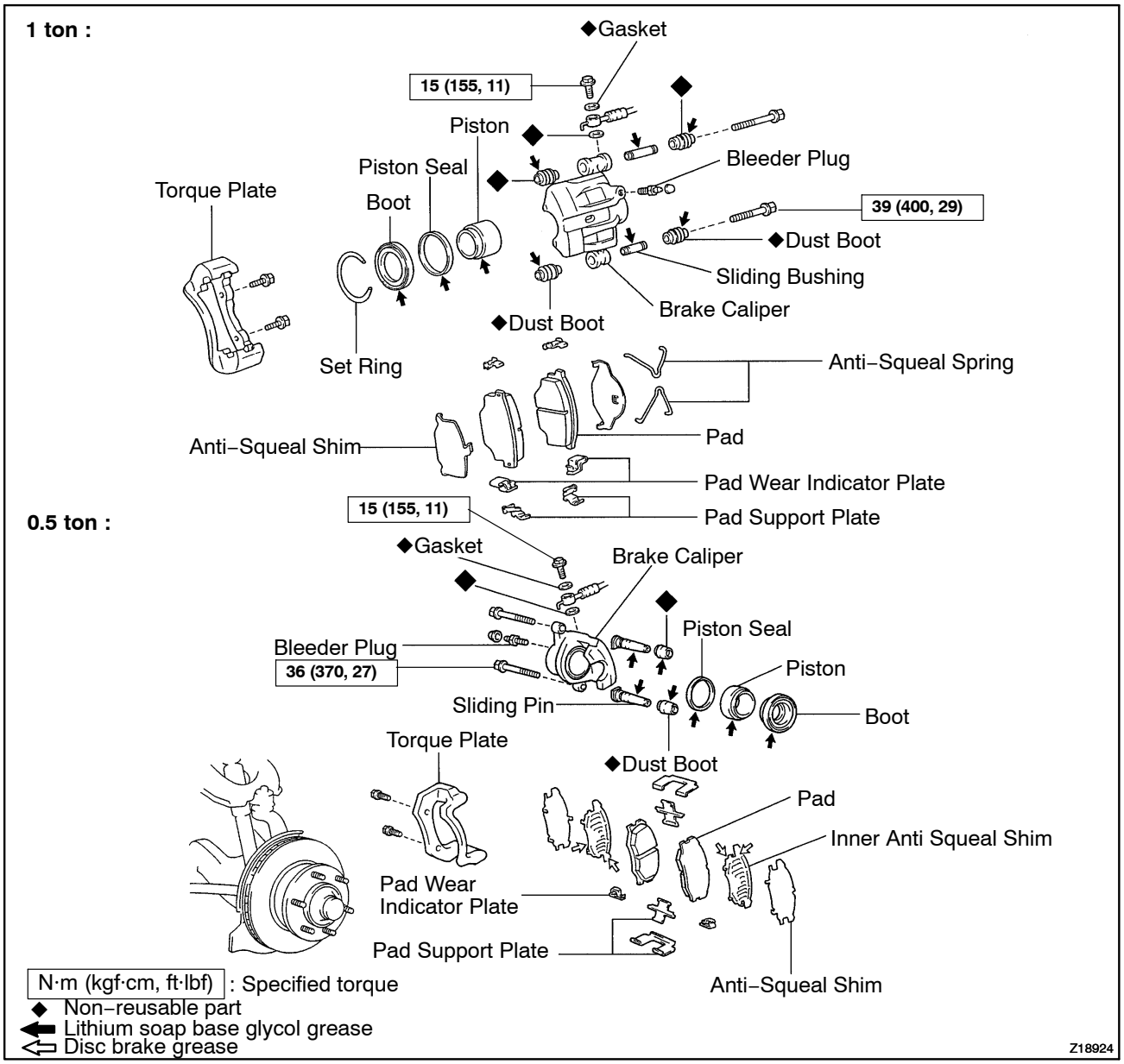
7. INSTALL CLIP

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FRONT BRAKE CALIPER (2WD)

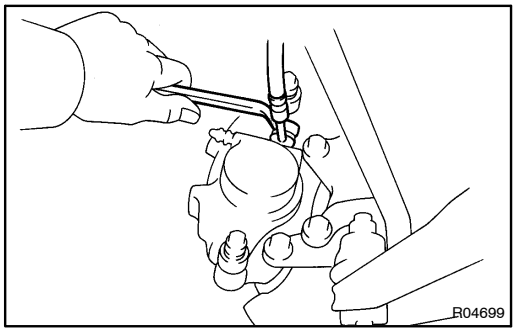
COMPONENTS

BR097–03



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BR098–03



REMOVAL

1. DISCONNECT FLEXIBLE HOSE

(a) Remove the union bolt and disconnect the flexible hose.

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

NOTICE:

At the time of installation, please refer to the following item. For correct brake hose routing, ensure that the hose hangs down before installing hose to caliper.

(b) Use a container to catch the brake fluid.

2. REMOVE CALIPER FROM TORQUE PLATE

Remove the 2 installation bolts and caliper.

Torque:
1 ton: 39 N·m (400 kgf·cm, 29 ft·lbf)
Torque:
0.5 ton: 36 N·m (370 kgf·cm, 27 ft·lbf)

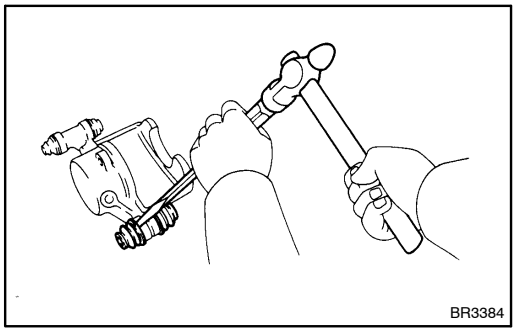
3. REMOVE THESE PARTS:

- 1 ton:
  2 anti–squeal springs
- 2 brake pads with anti–squeal shims
- 4 pads support plates

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BR099–02

DISASSEMBLY


BR3384

1. 1 ton:
REMOVE CALIPER SLIDING BUSHINGS AND DUST BOOTS

(a) Remove the sliding bushings.

HINT:

At the time of reassembly, please refer to the following item.

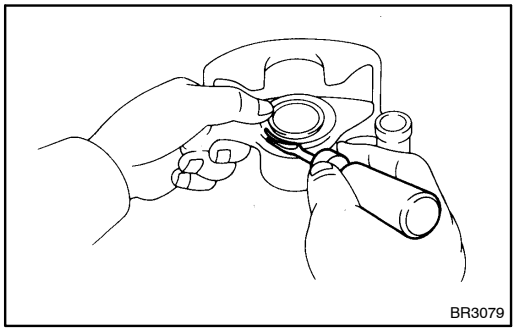
Ensure that the boots are secured firmly to the caliper grooves.

(b) Using a screwdriver and a hammer, remove the dust boots.

HINT:

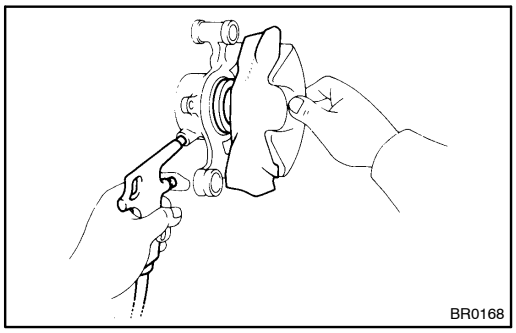
At the time of reassembly, please refer to the following item.

Use 2 socket wrenches and a vise, press in new dust boots.


BR3079

2. REMOVE CYLINDER BOOT SET RING (1 ton) AND CYLINDER BOOT

Using a screwdriver, remove the cylinder boot set ring (1 ton) and cylinder boot.


BR0168

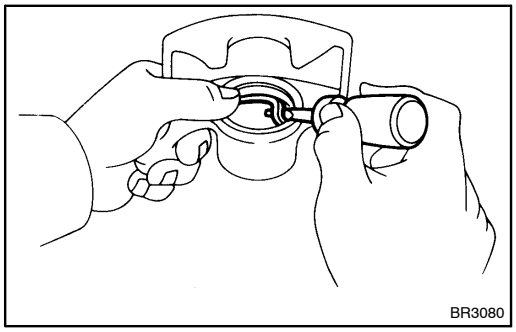
3. REMOVE PISTON FROM CYLINDER

(a) Put a piece of cloth or an equivalent between the piston and caliper.

(b) Use compressed air to remove the piston from the cylinder.

CAUTION:

Do not place your fingers in front of the piston when using compressed air.


BR3080

4. REMOVE PISTON SEAL FROM BRAKE CYLINDER

Using a screwdriver, remove the piston seal.

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5. 0.5 ton:
REMOVE SLIDING PINS AND DUST BOOTS

(a) Remove the 2 sliding pins from the torque plate.

(b) Using a screwdriver and hammer, tap out the 2 dust boots.

HINT:

At the time of reassembly, please refer to the following item.

Using a 19 mm socket and hammer, tap in 2 new dust boots into the torque plate.

NOTICE:

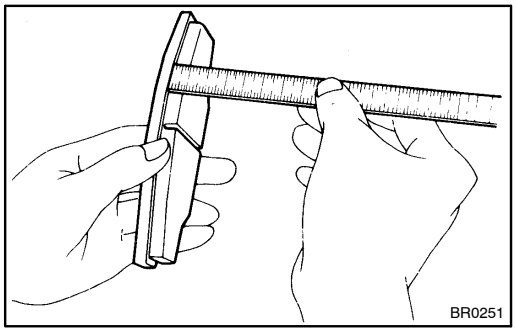
At the time of reassembly, please refer to the following item.

Confirm that the metal plate portion of the dust boot fits snugly in the torque plate.

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BR09A–01

INSPECTION

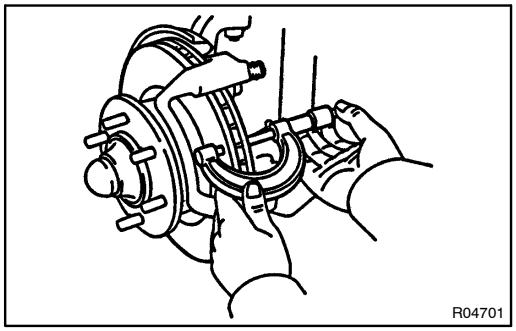


1. MEASURE PAD LINING THICKNESS

Using a ruler, measure the pad lining thickness.

Standard thickness:
1 ton: 9.5 mm (0.374 in.)
Standard thickness:
0.5 ton: 11.0 mm (0.433 in.)
Minimum thickness:
1.0 mm (0.039 in.)

Replace the pad if the thickness is less than the minimum (the 1.0 mm slit is no longer visible), or if it shows signs of uneven wear.

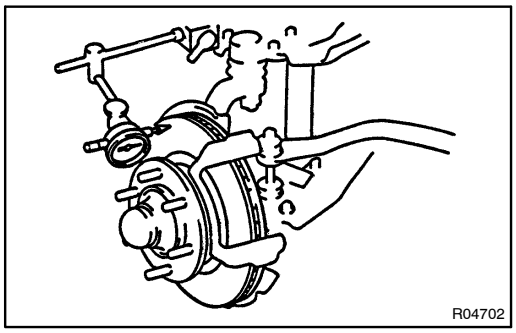


2. MEASURE DISC THICKNESS

Using a micrometer, measure the disc thickness.

Standard thickness: 25.0 mm (0.984 in.)
Minimum thickness: 23.0 mm (0.906 in.)

Replace the disc if the thickness of the disc is at the minimum thickness or less. Replace the disc or grind it on a lathe if it is scored or is worn unevenly.



3. MEASURE DISC RUNOUT

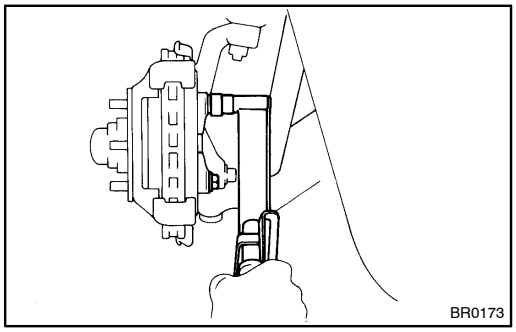
Using a dial indicator, measure the disc runout 10 mm (0.39 in.) from the outside edge of the disc.

Maximum disc runout: 0.07 mm (0.0028 in.)

If the runout is greater than the maximum, replace the disc or grind it on a "On–Car" brake lathe.

HINT:

Before measuring the runout, check that the front hub bearing play is within specification.



4. IF NECESSARY, REPLACE DISC

(a) Remove the torque plate from the knuckle.
(b) Remove the axle hub (See page SA–16).
(c) Remove the disc from the axle hub.
(d) Install a new disc. Torque the bolts.
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)
(e) Install the axle hub and adjust the front bearing preload (See page SA–19).
(f) Install the torque plate onto the knuckle.
Torque: 108 N·m (1,100 kgf·cm, 80 ft·lbf)

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BR09B–01

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page BR–28).

NOTICE:

Apply lithium soap base glycol grease to the parts indicated by the arrows (See page BR–26).

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BR09C–01

INSTALLATION

Installation is in the reverse order of removal (See page BR–34).

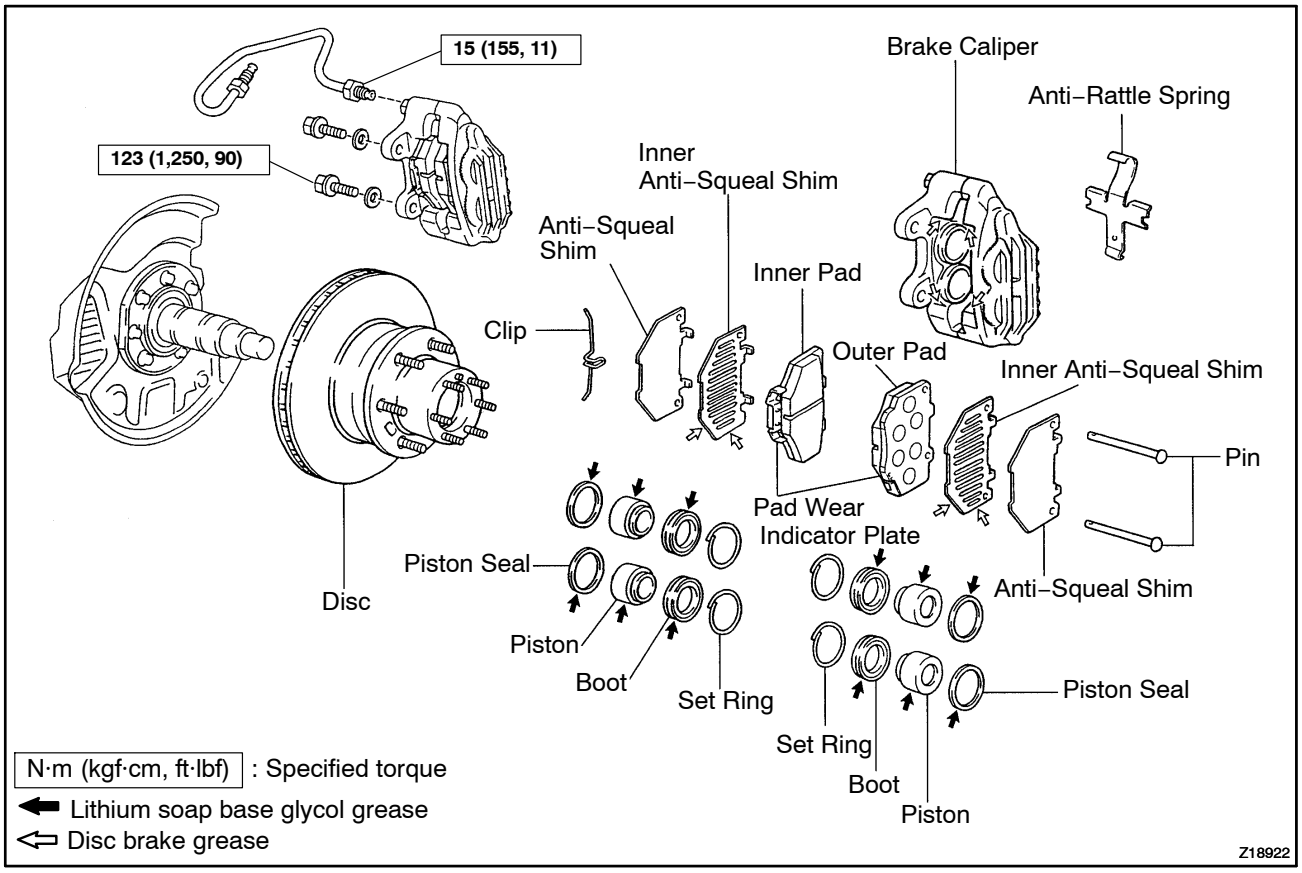
1. **AFTER INSTALLATION, FILL BRAKE RESERVOIR BRAKE FLUID AND BLEED BRAKE SYSTEM (See page BR–4)**
2. **CHECK FOR LEAKS.**

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FRONT BRAKE CALIPER (4WD)

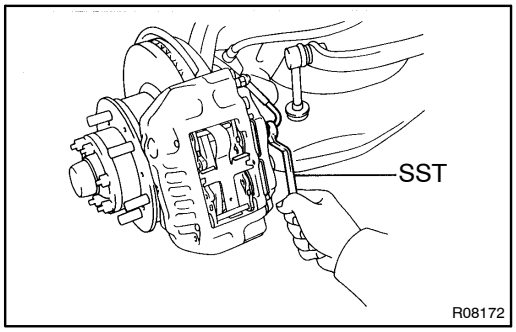
COMPONENTS

BR09D–02



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BR09E–01



REMOVAL

1. REMOVE FRONT WHEEL

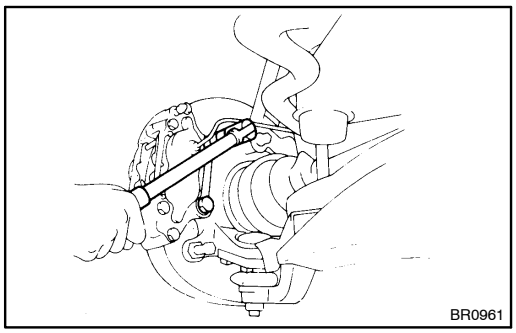
2. DISCONNECT BRAKE LINE

Using SST, disconnect the brake line.

Use a container to catch the brake fluid.

SST 09751–36011

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)



3. REMOVE CALIPER

Remove the 2 mounting bolts and remove the caliper.

Torque: 123 N·m (1,250 kgf·cm, 90 ft·lbf)

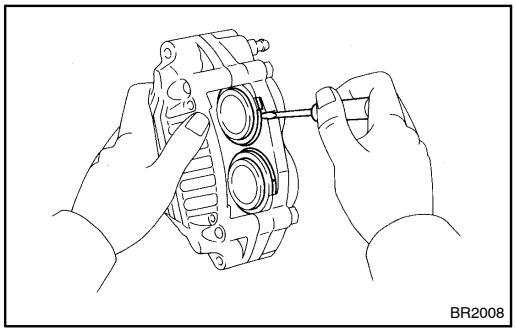
4. REMOVE THESE PARTS:

- Clip
- 2 pins
- Anti–rattle spring
- 2 pads
- 4 anti–squeal shims

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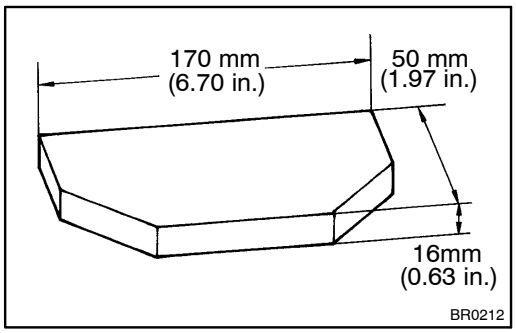
BR09F–01

DISASSEMBLY



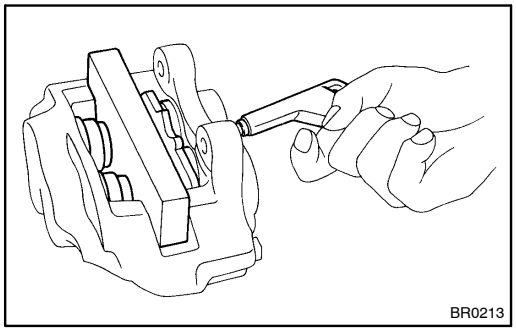
1. REMOVE CYLINDER BOOT SET RINGS AND BOOTS

Using a screwdriver, remove the 4 cylinder boot set rings and 4 boots.



2. REMOVE PISTONS FROM CYLINDER

(a) Prepare the wooden plate to hold the pistons.

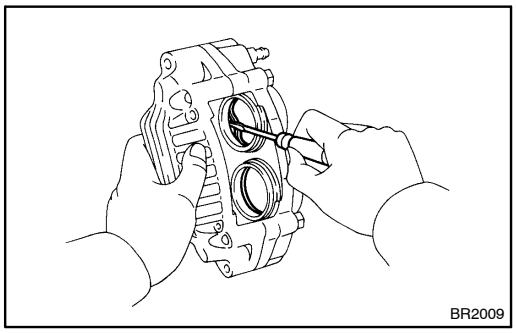


(b) Place the plate between the pistons and insert a pad at one side.

(c) Use compressed air to remove the pistons alternately from the cylinder.

CAUTION:

Do not place your fingers in front of the pistons when using compressed air.



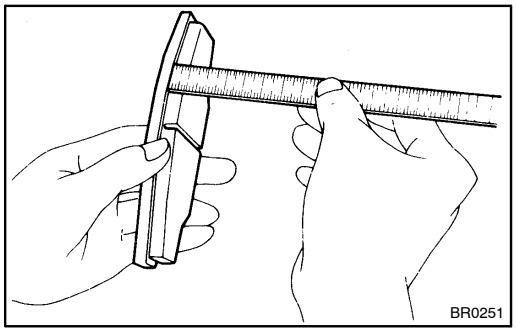
3. REMOVE PISTON SEALS

Using a screwdriver, remove the 4 seals from the cylinder.

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BR09G–01

INSPECTION



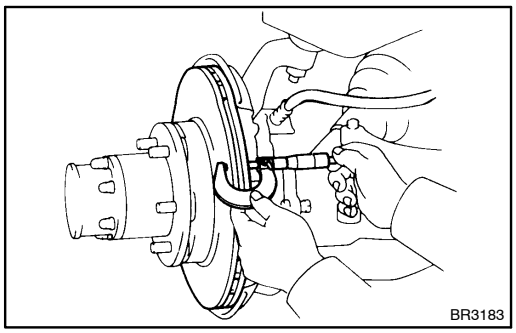
1. MEASURE PAD LINING THICKNESS

Using a ruler, measure the pad lining thickness.

Standard thickness: 9.5 mm (0.374 in.)

Minimum thickness: 1.0 mm (0.039 in.)

Replace the pad if the thickness is less than the minimum (the 1.0 mm slit is no longer visible), or if it shows signs of uneven wear.



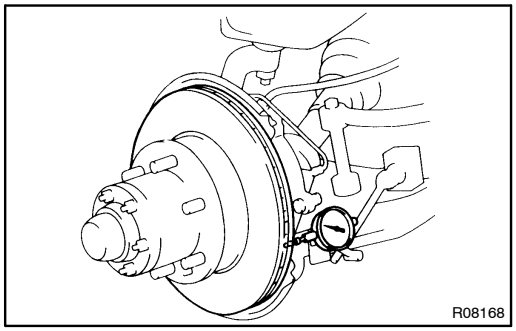
2. MEASURE DISC THICKNESS

Using a micrometer, measure the disc thickness.

Standard thickness: 25.0 mm (0.984 in.)

Minimum thickness: 23.0 mm (0.906 in.)

Replace the disc if the thickness of the disc is at the minimum thickness or less. Replace the disc or grind it on a lathe if it is scored or is worn unevenly.



3. MEASURE DISC RUNOUT

Using a dial indicator, measure the disc runout 10 mm (0.39 in.) from the outside edge of the disc.

Maximum disc runout: 0.07 mm (0.0028 in.)

If the runout is greater than the maximum, replace the disc or grind it on a ”On–Car” brake lathe.

HINT:

Before measuring the runout, check that the front hub bearing play is within specification.

4. IF NECESSARY, REPLACE DISC

(a) Remove the front axle hub (See page SA–23).

(b) Install the new axle hub with disc and adjust the front bearing preload (See page SA–25).

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BR09H–01

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page BR–35).

NOTICE:

Apply lithium soap base glycol grease to the parts indicated by the arrows (See page BR–33).

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BR09I–01

INSTALLATION

Installation is in the reverse order of removal (See page BR–34).

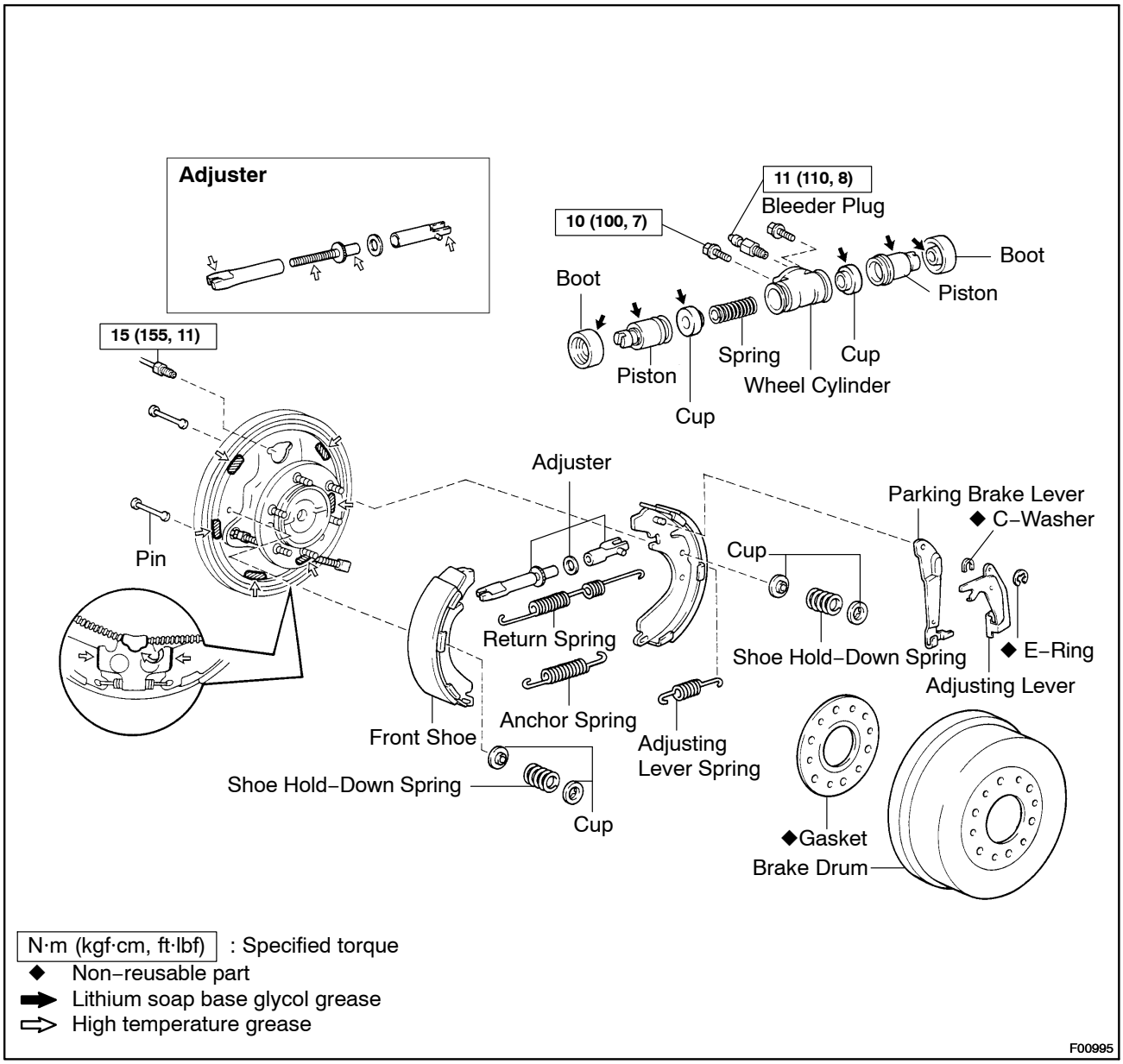
1. **AFTER INSTALLATION, FILL BRAKE RESERVOIR BRAKE FLUID AND BLEED BRAKE SYSTEM (See page BR–4)**
2. **CHECK FOR LEAKS.**

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REAR DRUM BRAKE (2WD)

COMPONENTS

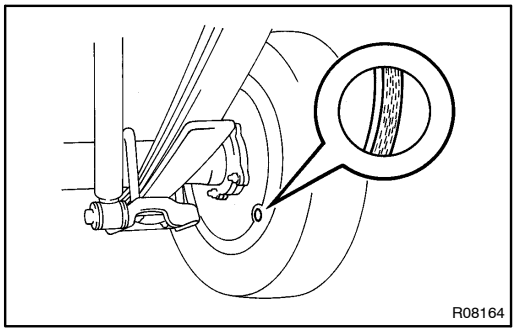
BR09J–02



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BR09K–01

REMOVAL



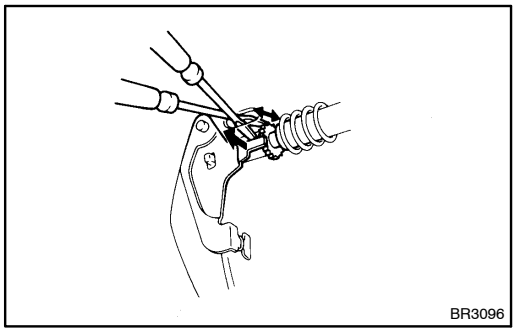
1. INSPECT SHOE LINING THICKNESS

Remove the inspection hole plug, and check the shoe lining thickness through the hole.

If less than minimum, replace the shoes.

Minimum thickness: 1.0 mm (0.039 in.)

2. REMOVE REAR WHEEL



3. REMOVE BRAKE DRUM

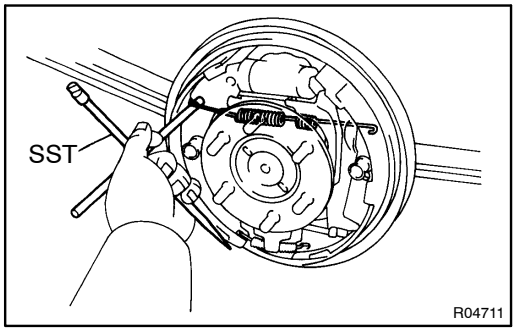
HINT:

If the brake drum cannot be removed easily, do the following steps.

(a) Remove the adjusting hole plug in the backing plate.

(b) Insert a screwdriver through the hole in the backing plate, and hold the automatic adjusting lever away from the adjusting bolt.

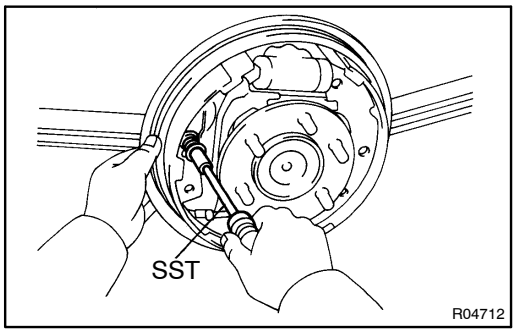
(c) Using another screwdriver, reduce the brake shoe adjustment by turning the adjusting bolt.



4. REMOVE FRONT SHOE

(a) Using SST, disconnect the return spring.

SST 09703–30010

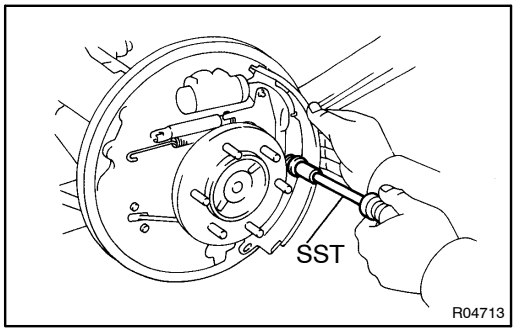


(b) Using SST, remove the shoe hold–down spring, cups and pin.

SST 09718–00010

(c) Disconnect the anchor spring from the front shoe and remove the front shoe.

(d) Remove the anchor spring from the rear shoe.



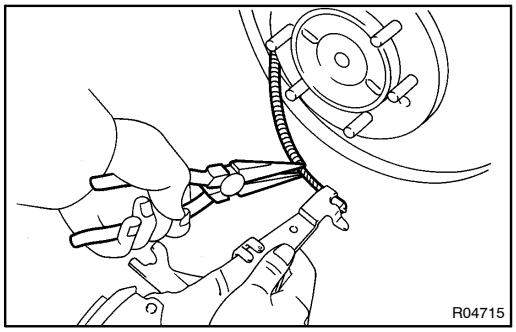
5. REMOVE ADJUSTER AND REAR SHOE

(a) Using SST, remove the shoe hold–down spring, cups and pin.

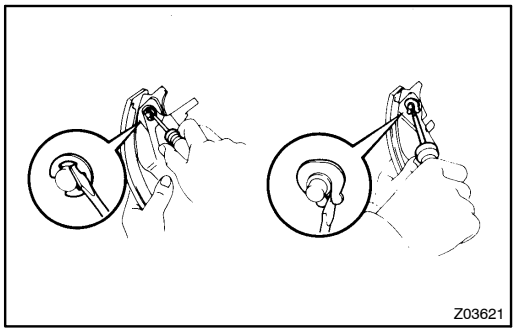
SST 09718–00010

(b) Remove the adjusting lever spring.

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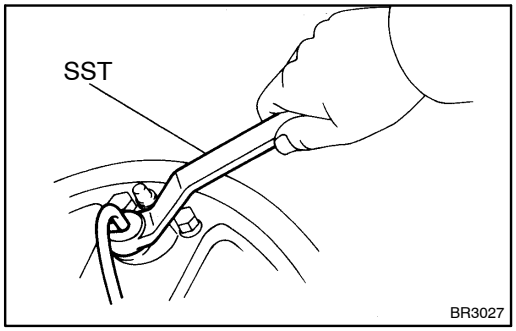


(c) Remove the adjuster with the return spring together.
(d) Using pliers, disconnect the parking brake cable from the lever and remove the rear shoe.



6. REMOVE AUTOMATIC ADJUSTING LEVER AND PARKING BRAKE LEVER

(a) Remove the E–ring.
(b) Remove the automatic adjusting lever.
(c) Remove the C–washer.
(d) Remove the parking brake lever.



7. REMOVE WHEEL CYLINDER

(a) Using SST, disconnect the brake line from the cylinder. Use a container to catch the brake fluid.
SST 09751–36011
Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)
(b) Remove the 2 bolts and wheel cylinder.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

8. DISASSEMBLE WHEEL CYLINDER

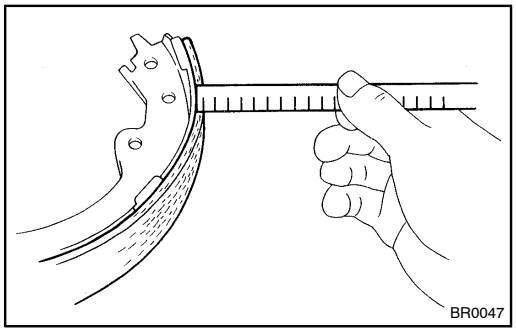
Remove these parts from the wheel cylinder.

- 2 boots
- 2 pistons
- 2 piston cups
- Spring

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BR09L–01

INSPECTION



1. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage.

2. MEASURE BRAKE SHOE LINING THICKNESS

Using a ruler, measure the shoe lining thickness.

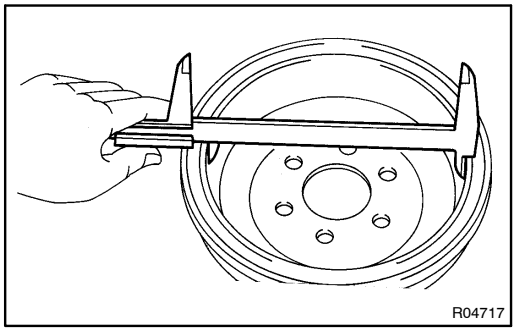
Standard thickness: 6.0 mm (0.236 in.)

Minimum thickness: 1.0 mm (0.039 in.)

If the shoe lining is less than the minimum or shows signs of uneven wear, replace the brake shoes.

HINT:

If any of the brake shoes have to be replaced, replace all of the rear brake shoes in order to maintain even braking.



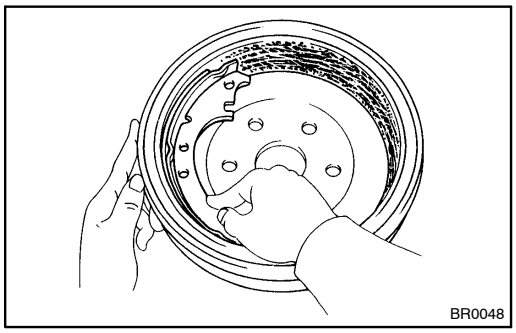
3. MEASURE BRAKE DRUM INSIDE DIAMETER

Using a vernier calipers, measure the inside diameter of drum.

Standard inside diameter: 295.0 mm (11.614 in.)

Maximum inside diameter: 297.0 mm (11.693 in.)

If the drum is scored or worn, the brake drum may be lathed to the maximum inside diameter.



4. INSPECT BRAKE LINING AND DRUM FOR PROPER CONTACT

If the contact between the brake lining and drum is improper, repair the lining with a brake shoe grinder, or replace the brake shoe assembly.

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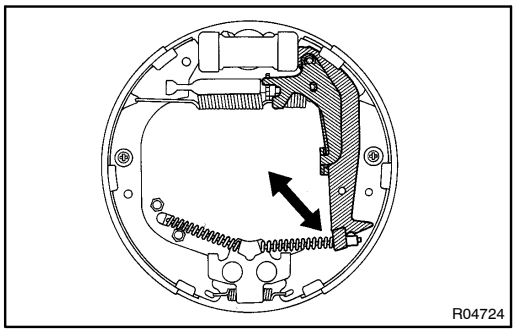
BR09M–01

INSTALLATION

Installation is in the reverse order of removal (See page BR–40).

NOTICE:

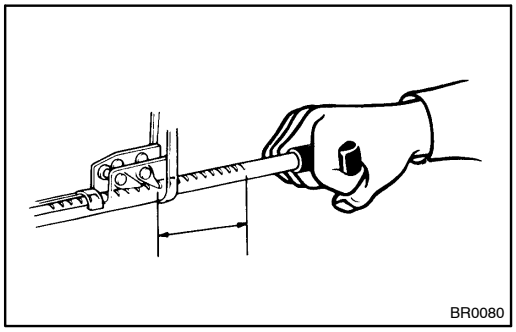
Apply lithium soap base glycol grease and high temperature grease to the parts indicated by the arrows (See page BR–39).


R04724

1. CHECK OPERATION OF AUTOMATIC ADJUSTER MECHANISM

(a) Move the parking brake lever of the rear shoe back and forth, as shown. Check that the adjusting bolt turns.

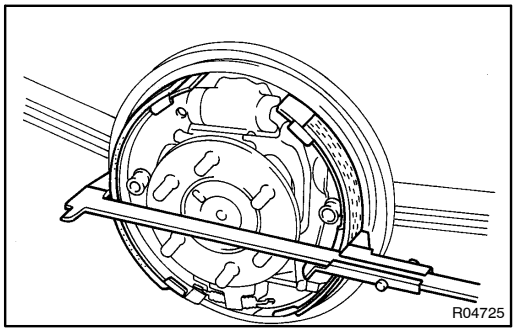
If the adjuster does not turn, check for incorrect installation of the rear brakes.


BR0080

(b) Adjust the adjuster length to the shortest possible amount.

(c) Install the drum.

(d) Pull the parking brake lever all the way up until a clicking sound can no longer be heard.


R04725

2. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

(a) Remove the drum.

(b) Measure the brake drum inside diameter.

(c) Measure the distance between brake shoes. Check that the difference between the diameters is the correct shoe clearance.

Shoe clearance: 0.6 mm (0.024 in.)

If incorrect, check the parking brake system.

3. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM (See Page BR–4)

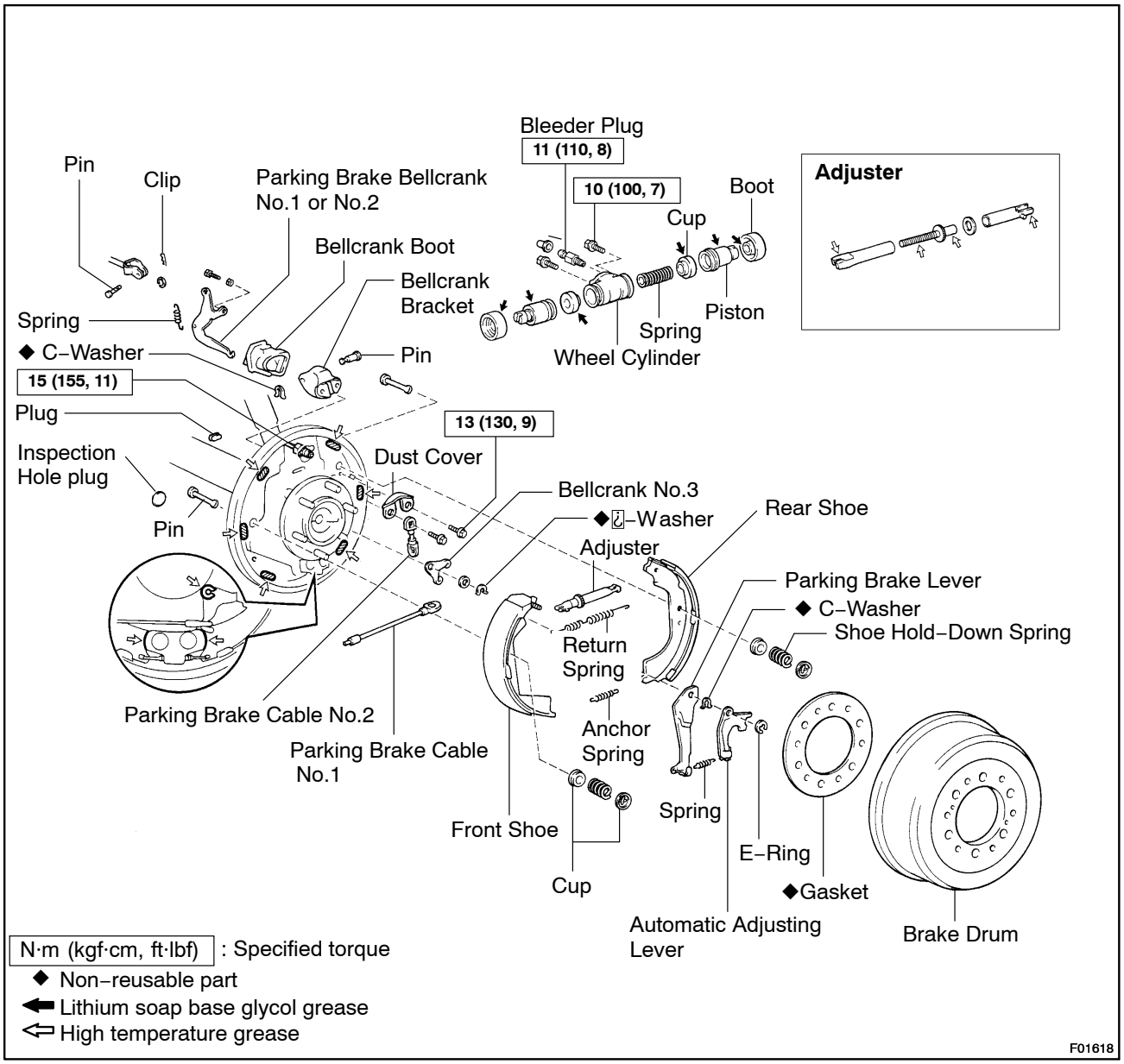
4. CHECK FOR LEAKS

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REAR DRUM BRAKE (4WD)

COMPONENTS

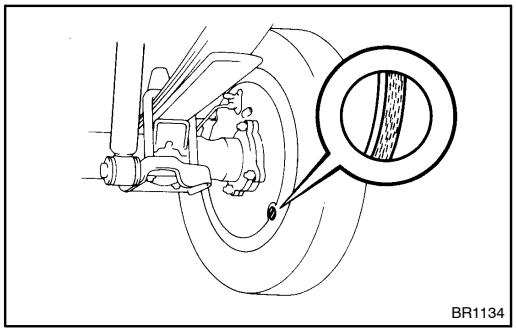
BR09N–02



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BR09O–01

REMOVAL


BR1134

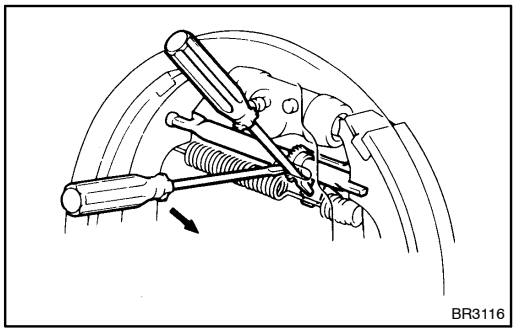
1. INSPECT SHOE LINING THICKNESS

Remove the inspection hole plug, and check the shoe lining thickness through the hole.

If it is less than the minimum, replace the shoes.

Minimum thickness: 1.0 mm (0.03. in.)

2. REMOVE REAR WHEEL


BR3116

3. REMOVE BRAKE DRUM

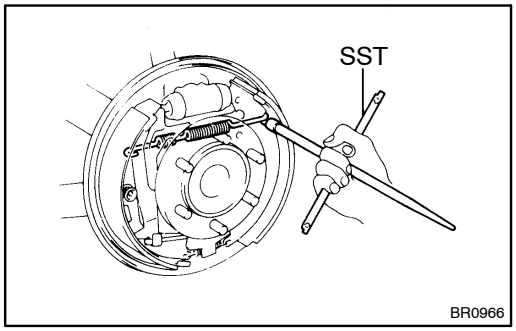
HINT:

If the brake drum cannot be removed easily, do the following steps.

(a) Remove the adjusting hole plug in the backing plate.

(b) Insert a screwdriver through the hole in the backing plate, and hold the automatic adjusting lever away from the adjusting bolt.

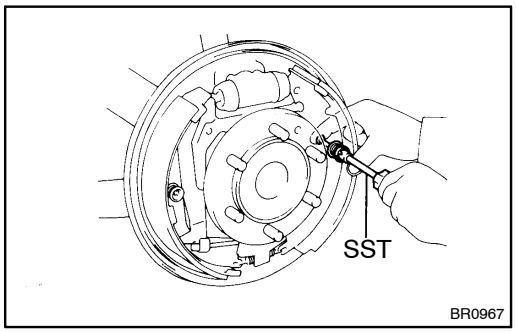
(c) Using another screwdriver, reduce the brake shoe adjustment by turning the adjusting bolt.



BR0966

4. REMOVE REAR SHOE

(a) Using SST, disconnect the return spring.
SST 09703–30010

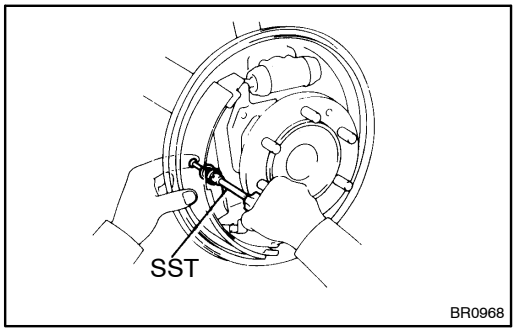


BR0967

(b) Using SST, remove the shoe hold–down spring, cups and pin.
SST 09718–00010

(c) Disconnect the anchor spring from the rear shoe and remove the rear shoe.

(d) Remove the anchor spring from the front shoe.



BR0968

5. REMOVE FRONT SHOE

(a) Using SST, remove the shoe hold–down spring, cups and pin.
SST 09718–00010

(b) Remove the return spring from the front shoe.

(c) Disconnect the parking brake cable No.1 from the parking brake bellcrank No.3.

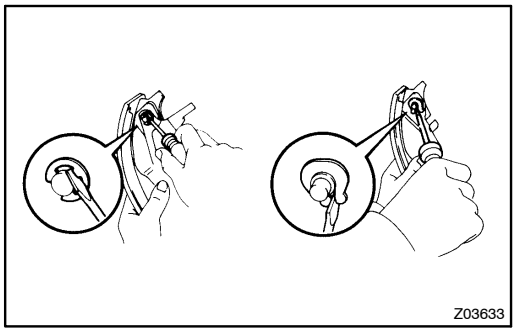
(d) Remove the front shoe with adjuster.

(e) Disconnect the parking brake cable from the front shoe.

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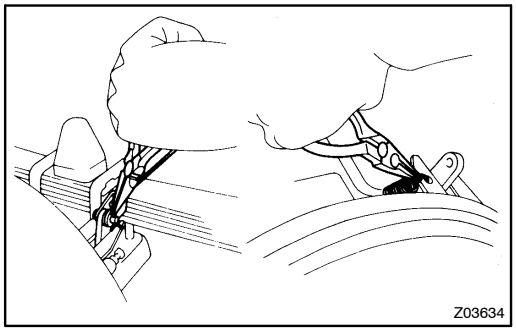
6. REMOVE ADJUSTER FROM FRONT SHOE

(a) Remove the adjusting lever spring.
(b) Remove the adjuster.



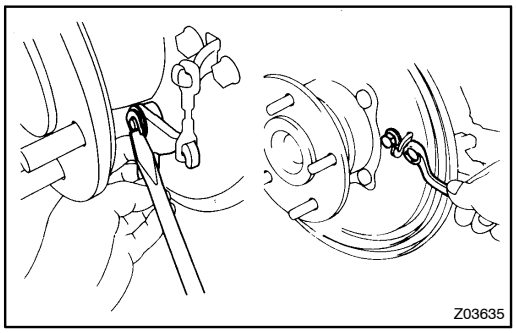
7. REMOVE AUTOMATIC ADJUSTING LEVER AND PARKING BRAKE LEVER

(a) Remove the E–ring.
(b) Remove the automatic adjusting lever.
(c) Remove the C–washer.
(d) Remove the parking brake lever.

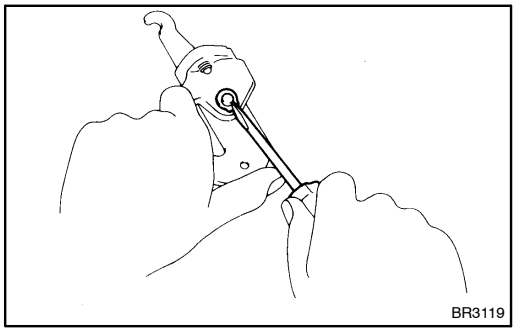


8. REMOVE AND DISASSEMBLE PARKING BRAKE BELLCRANK

(a) Remove the clip and disconnect the parking brake cable.
(b) Remove the tension spring.

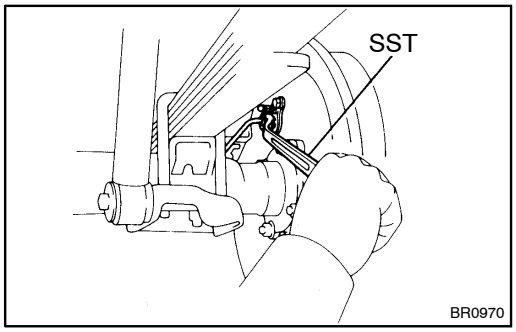


(c) Using a screwdriver, remove the bellcrank No.3 from the backing plate with the parking brake cable No.2.
(d) Remove the parking brake bellcrank No.1 or No.2 and dust cover with the 2 bolts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)
(e) Remove the bellcrank boot from the bellcrank bracket.



(f) Remove the C–washer and pin.
(g) Remove the parking brake bellcrank from the bellcrank bracket.

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9. REMOVE WHEEL CYLINDER

(a) Using SST, disconnect the brake line. Use a container to catch the brake fluid.
SST 09751–36011
Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

(b) Remove the 2 bolts and the wheel cylinder.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

10. DISASSEMBLE WHEEL CYLINDER

Remove these parts from the wheel cylinder.

- 2 boots
- 2 pistons
- 2 piston cups
- Spring

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BR09P–01

INSPECTION

1. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage.

2. MEASURE BRAKE SHOE LINING THICKNESS

Using a ruler, measure the shoe lining thickness.

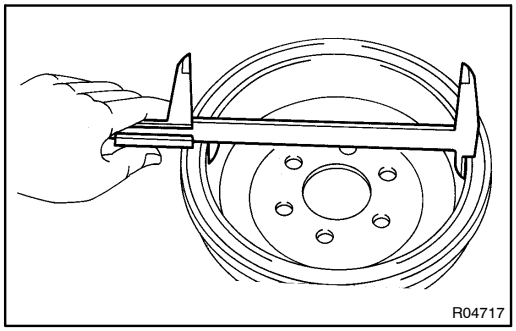
Standard thickness: 6.0 mm (0.236 in.)

Minimum thickness: 1.0 mm (0.039 in.)

If the shoe lining is less than the minimum or shows signs of uneven wear, replace the brake shoes.

HINT:

If any of the brake shoes have to be replaced, replace all of the rear brake shoes in order to maintain even braking.



R04717

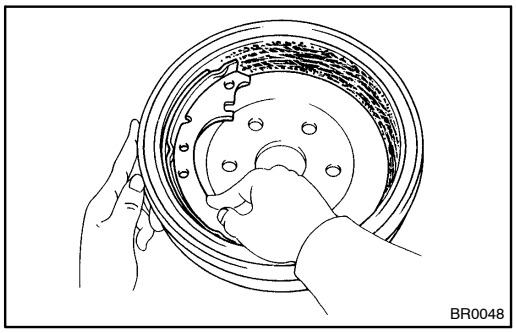
3. MEASURE BRAKE DRUM INSIDE DIAMETER

Using vernier calipers, measure the inside diameter of drum.

Standard inside diameter: 295.0 mm (11.614 in.)

Maximum inside diameter: 297.0 mm (11.693 in.)

If the drum is scored or worn, the brake drum may be lathed to the maximum inside diameter.



BR0048

4. INSPECT BRAKE LINING AND DRUM FOR PROPER CONTACT

If the contact between the brake lining and drum is improper, repair the lining with a brake shoe grinder, or replace the brake shoe assembly.

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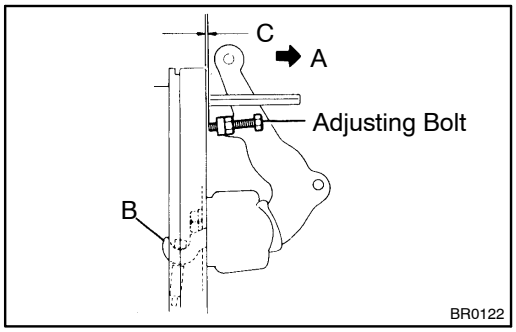
BR09Q–01

INSTALLATION

Installation is in the reverse order of removal (See page BR–45).

NOTICE:

Apply lithium soap base glycol grease and high temperature grease to the parts indicated by the arrows (See page BR–44).

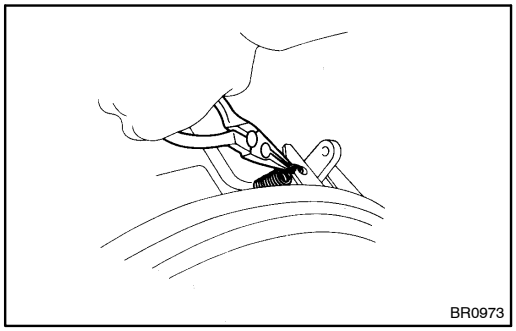


1. ADJUST BELLCRANK

(a) Lightly pull the bellcrank in direction A until there is no slack at part B.

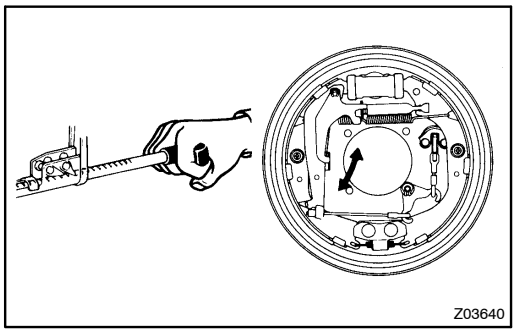
(b) In this condition, turn the adjusting bolt so that dimension C will be 0.4 – 0.8 mm (0.016 – 0.031 in.).

(c) Lock the adjusting bolt with the lock nut.



(d) Connect the parking brake cable to the parking brake bellcrank and install the clip.

(e) Install the tension spring.



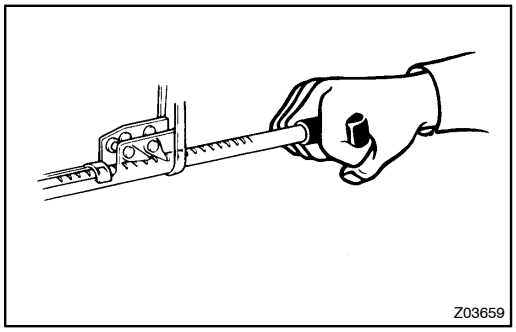
2. CHECK OPERATION OF AUTOMATIC ADJUSTING MECHANISM

(a) Move the parking brake lever of the front shoe back and forth. Check that the adjuster turns.

If the adjuster does not turn, check for incorrect installation of the rear brakes.

(b) Adjust the adjuster length as short as possible.

(c) Install the brake drum.



(d) Pull the parking brake lever all the way up until a clicking sound can no longer be heard.

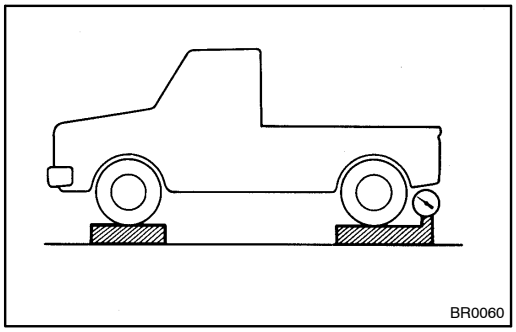
3. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM (See page BR–43)

Shoe clearance: 0.6 mm (0.024 in.)

4. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM (See Page BR–4)

5. CHECK FOR LEAKS

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LOAD SENSING PROPORTIONING AND BY–PASS VALVE (LSP & BV)

BR09R–11

ON–VEHICLE INSPECTION

1. SET REAR AXLE LOAD

Rear axle load (includes vehicle weight):

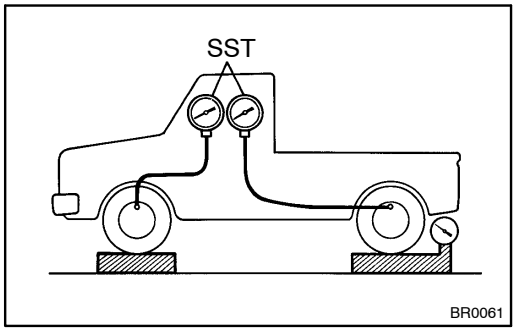
2WD:

1 ton: 850 kg (1,874 lb)

0.5 ton std: 800 kg (1,764 lb)

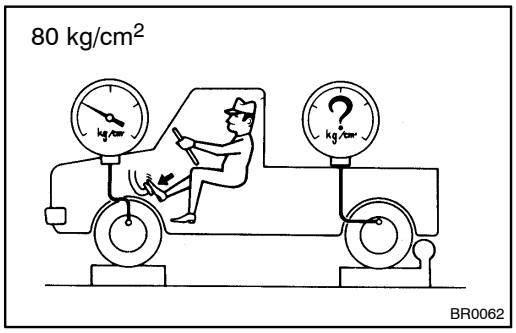
0.5 ton opt (soft ride): 850 kg (1,874 lb)

4WD: 1,050 kg (2,315 lb)



2. INSTALL LSPV GAUGE (SST) AND BLEED AIR

SST 09709–29017



3. RAISE FRONT BRAKE PRESSURE TO 7,845 kPa (80 kgf/cm^2, 1,138 psi) AND CHECK REAR BRAKE PRESSURE

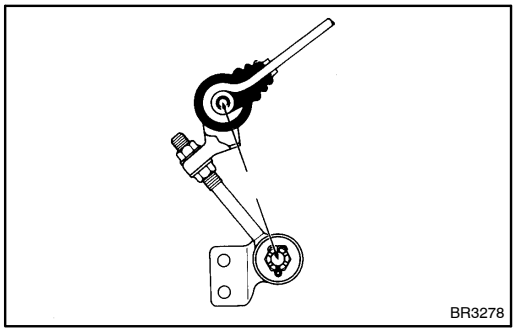
Rear brake pressure:

5,325 ± 490 kPa (54.3 ± 5 kgf/cm^2, 772 ± 71 psi)

HINT:

The brake pedal should not be depressed twice and/or returned while setting to the specified pressure. Read the value of rear brake pressure after holding the specified fluid pressure for 2 seconds. If the brake pressure is incorrect, adjust the fluid pressure.

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BR3278

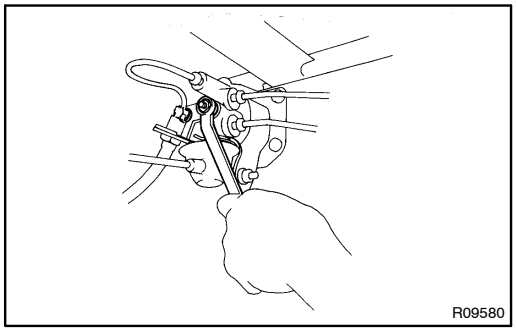
4. IF NECESSARY, ADJUST FLUID PRESSURE

(a) Loosen the lock nut.

(b) Adjust the length of the No.2 shackle.
Low pressure: Lengthen A
High pressure: Shorten A
Initial set: 120 mm (4.72 in.)
Adjustment range: 114 – 126 mm (4.49 – 4.96 in.)

HINT:
One turn of the nut changes the fluid pressure as shown in the following specification.
7.5 kPa (0.77 kgf/cm, 11 psi)

(c) Torque the lock nut.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

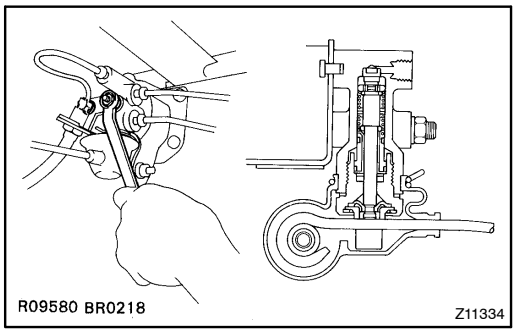

R09580

(d) If the pressure cannot be adjusted by the No.2 shackle, raise or lower the valve body. (2WD shown, for 4WD refer to component illustration on next page.)
Low pressure–Lower body
High pressure–Raise body

(e) Torque the nuts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(f) Adjust the length of the No.2 shackle again.

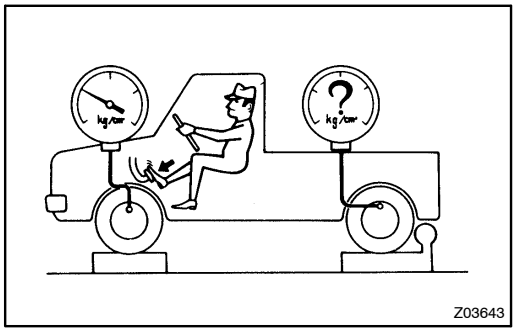
If it cannot be adjusted, inspect the valve housing.


R09580 BR0218 Z11334

5. IF NECESSARY, CHECK VALVE BODY

(a) Assemble the valve body in the uppermost position.

HINT:
When the brakes are applied, the piston will move down about 0.8 mm (0.03 in.). Even at this time, the piston should not make contact with or move the load sensing spring.


Z03643

(b) In this position, check the rear brake pressure.

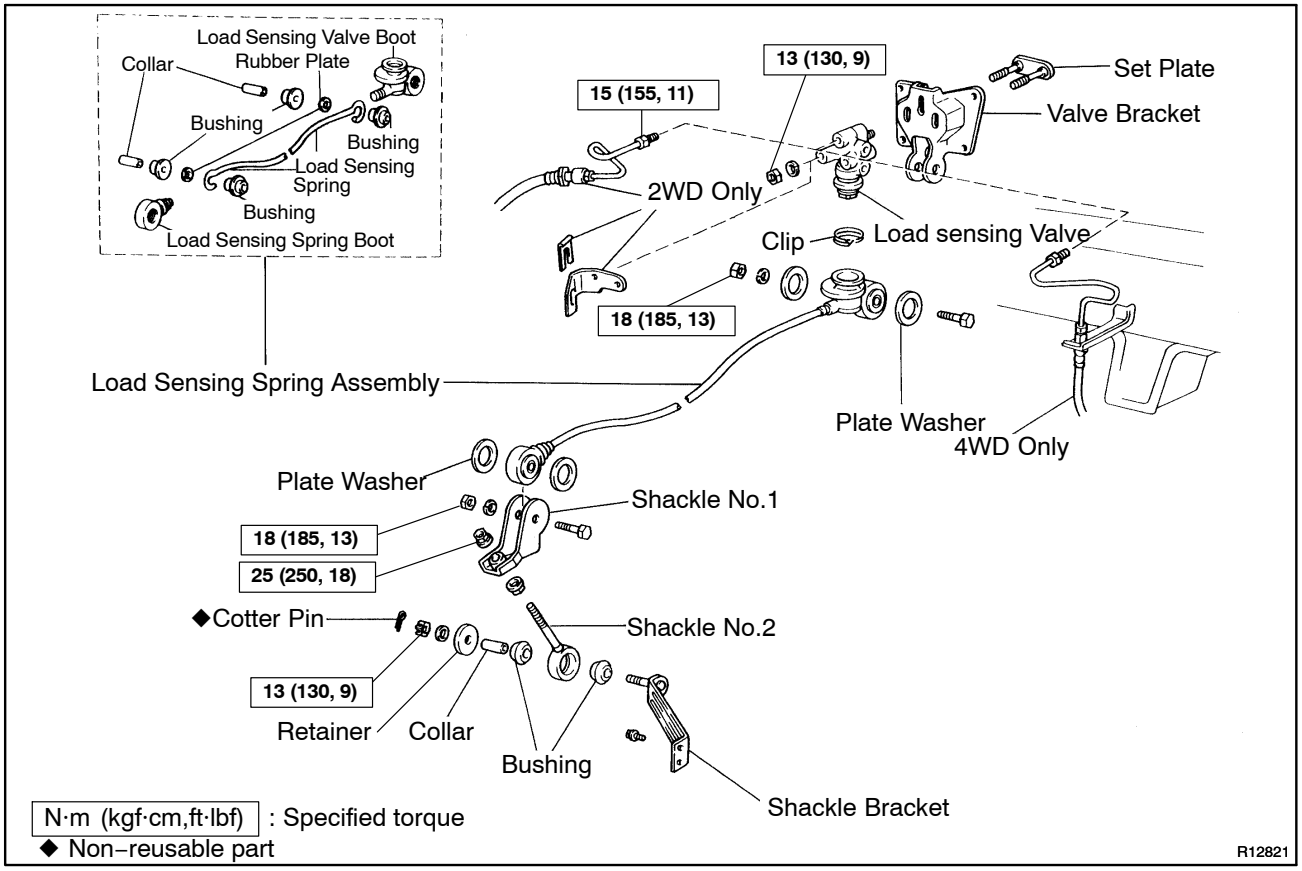
Front brake pressure kPa (kgf/cm^2, psi)	Rear brake pressure kPa (kgf/cm^2, psi)
1,960 (20, 285)	1,960 (20, 285)
3,920 (40, 570)	2,352 ± 196 (24 ± 2, 342 ± 28.5)
6,860 (70, 997.5)	2,940 ± 343 (30 ± 3.5, 427.5 ± 50)

If the measured value is not within the standard, replace the valve body.

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BR09S–08

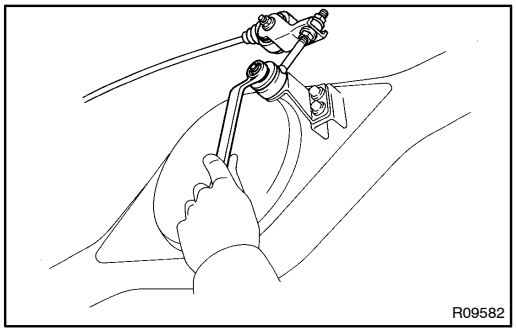
COMPONENTS



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BR09T–01

REMOVAL

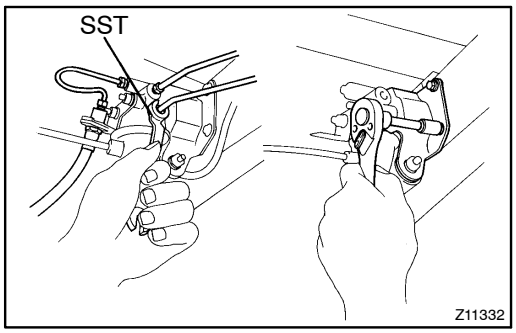


1. DISCONNECT SHACKLE NO.2 FROM BRACKET

(a) Remove the cotter pin.

(b) Remove the nut and cushion retainer, and disconnect the shackle No.2.

(c) Remove the 2 bushings and collar.



2. REMOVE LSP & BV ASSEMBLY

(a) Using SST, disconnect the brake lines from the valve body.

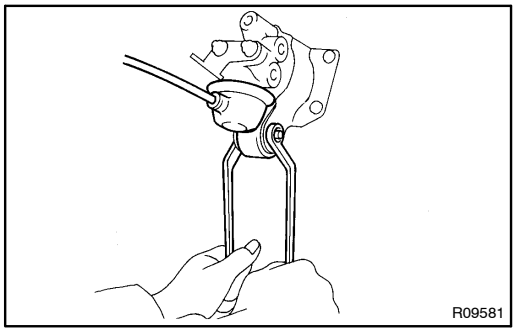
SST 09751–36011

(b) Remove the valve bracket mounting bolts and the LSP & BV assembly.

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BR09U–02

DISASSEMBLY



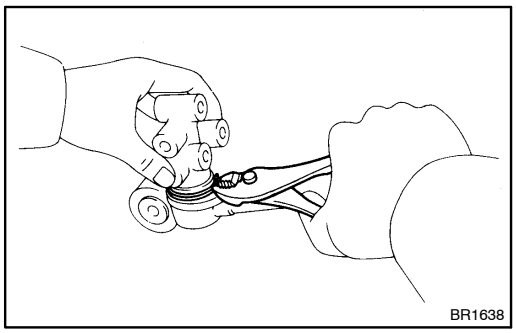
1. REMOVE VALVE BRACKET

(a) Remove the nut and bolt.

CAUTION:

At the time of reassembly, please refer to the following item. When connecting the shackle to the load sensing with a bolt and nut, insert the bolt from the front side of vehicle.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



(b) Remove the 2 nuts, and remove the bracket and set plate from the valve body.

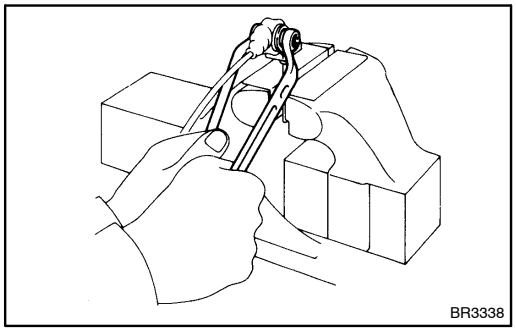
HINT:

At the time of reassembly, please refer to the following item.

Finger tighten the valve body mounting nuts.

2. DISCONNECT SPRING FROM VALVE

Using pliers, remove the clip and the spring from the valve.

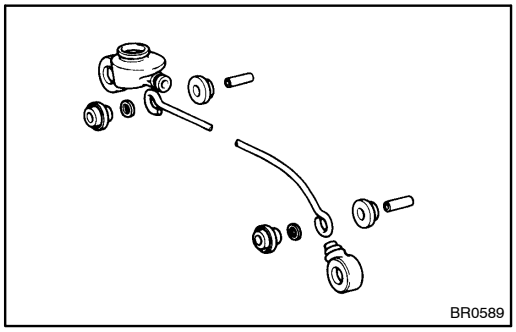


3. REMOVE SHACKLES NO.1 AND NO.2

(a) Remove the nuts and bolts, and then remove No.1 and No.2 shackles and 2 plate washers from the load sensing spring assembly.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

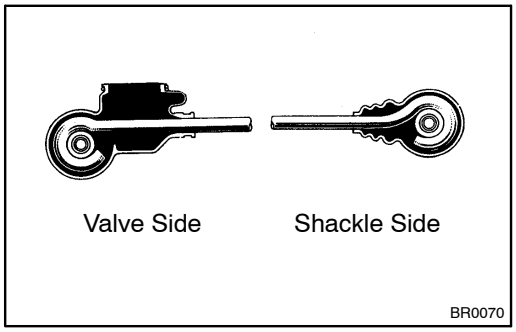
(b) Loosen the 2 nuts, remove the nut and shackle No.1 from the shackle No.2.



4. DISASSEMBLE LOAD SENSING SPRING

Disassemble these parts:

- 4 Bushings
- 2 Collars
- 2 Rubber plates
- Load sensing valve boot
- Load sensing spring boot



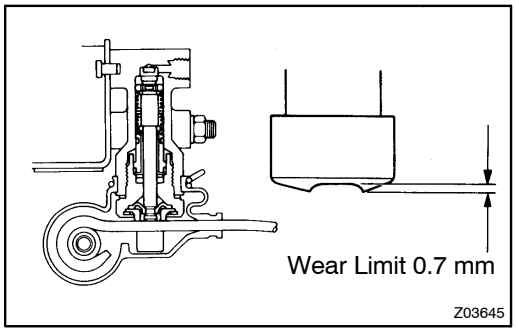
HINT:

At the time of reassembly, please refer to the following items.

- Apply lithium soap–base glycol grease to all rubbing areas.
- Do not mistake the valve side for the shackle side of the load sensing spring.

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BR09V–01



INSPECTION

INSPECT VALVE PISTON PIN AND LOAD SENSING CONTACT SURFACE FOR WEAR

Wear limit: 0.7 mm (0.028 in.)

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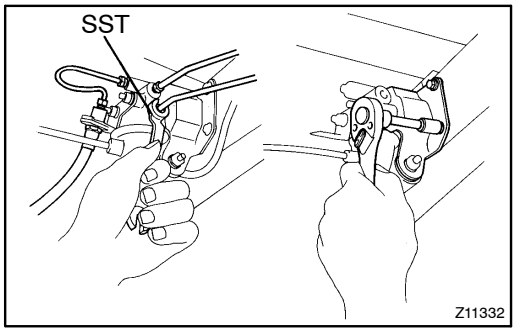
BR09W–01

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page BR–54).

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BR09X–01



INSTALLATION

1. INSTALL LSP & BV ASSEMBLY TO FRAME

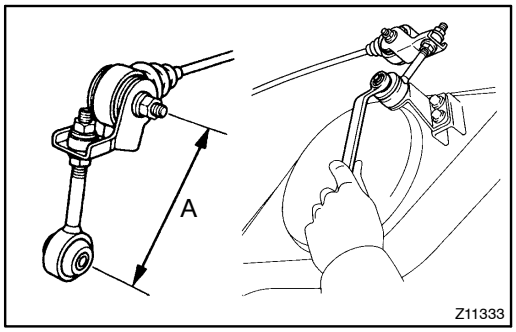
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

2. CONNECT BRAKE LINE

Using SST, connect the brake lines.

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

SST 09751–36011



3. CONNECT SHACKLE NO.2 BRACKET

(a) Install the shackle No.2 to the load sensing spring.

(b) Set dimension A and torque the lock nut.

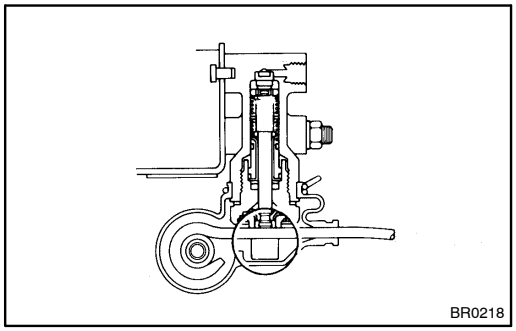
Initial set: 120 mm (4.72 in.)

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(c) Connect the shackle No.2 to the shackle bracket.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(d) Install a new cotter pin.



4. SET REAR AXLE LOAD

(See page BR–50)

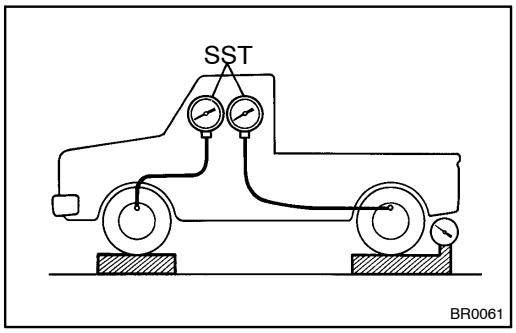
5. SET VALVE BODY

(a) When pulling down the load sensing spring, check that the valve piston moves down smoothly.

(b) Position the valve body so that the valve piston lightly contacts with the load sensing spring.

(c) Tighten the valve body mounting nuts.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)



6. BLEED BRAKE LINE (See page BR–4)

7. CHECK AND ADJUST LSP & BV FLUID PRESSURE (See page BR–50)

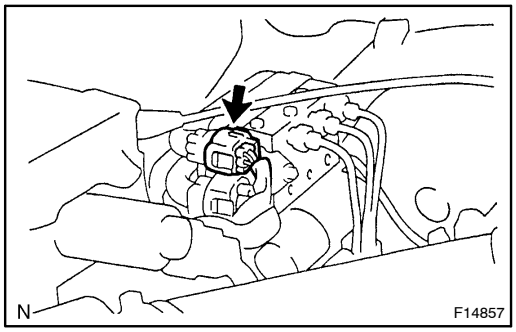
8. APPLY SEALANT TO SHACKLE No.2

Apply sealant to the top portion of the shackle No.2 bolt threads not to lose the upper lock nut.

Sealant:

Part No. 08833–00070, THREE BOND 1324 or equivalent

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ABS ACTUATOR

BR1NW–01

ON–VEHICLE INSPECTION

1. INSPECT BATTERY POSITIVE VOLTAGE

Battery positive voltage: 10 – 14 V

2. DISCONNECT CONNECTORS

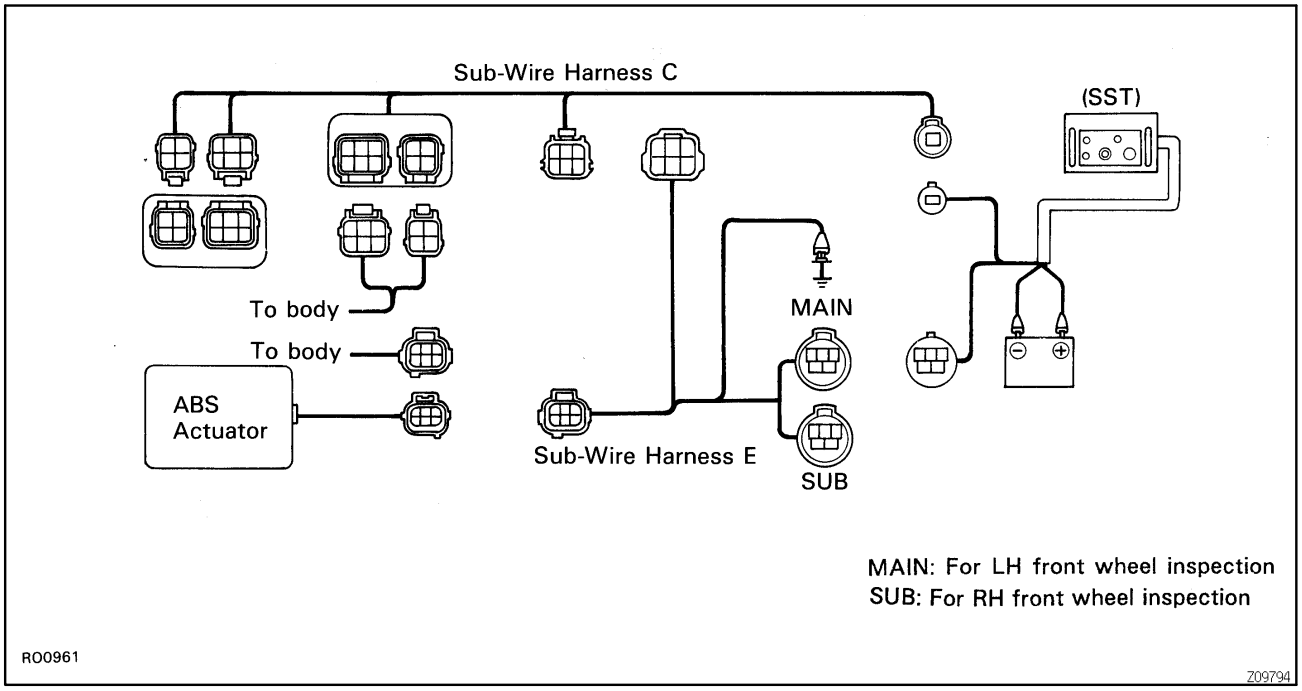
(a) Disconnect the 2 connectors from the control relay.

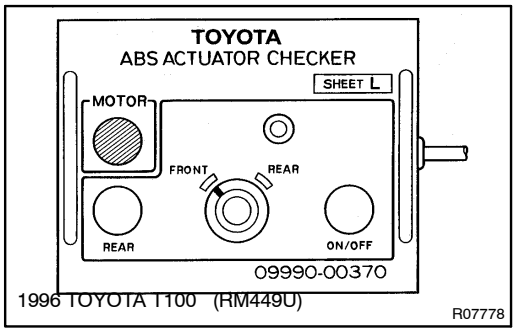
(b) Disconnect the connector from the actuator.

3. CONNECT ACTUATOR CHECKER (SST) TO ACTUATOR

(a) Connect the actuator checker (SST) to the actuator, control relay and body side wire harness through the sub–wire harness C and E (SST) as shown in the illustration.
SST 09990–00150, 09990–00200, 09990–00210

(b) Connect the red cable of the checker to the battery positive (+) terminal and black cable to the negative (–) terminal. Connect the black cable of the sub–wire harnesses to the battery negative (–) terminal or body ground.





(c) Place the "SHEET L" (SST) on the actuator checker.
SST 09990–00370

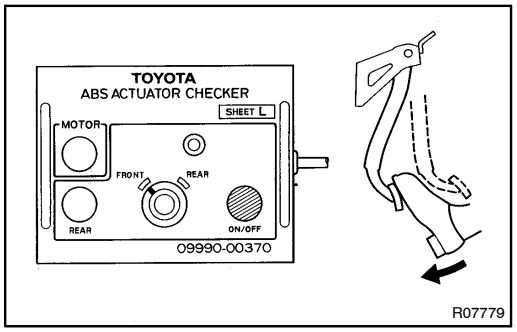
4. INSPECT BRAKE ACTUATOR OPERATION

(a) Start the engine, and run it at idle.

(b) Turn the selector switch of the actuator checker in "FRONT" position.

(c) Push and hold in the MOTOR switch for a few seconds. Make sure that you can hear the motor running.

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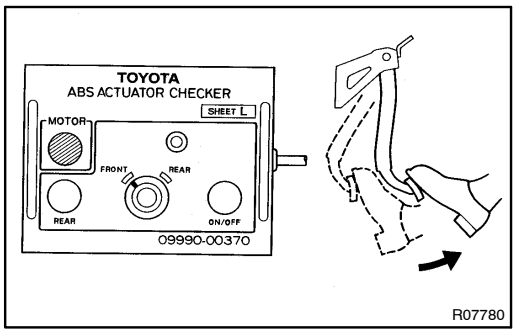
(d) Depress the brake pedal and hold it until the step (g) is completed.

(e) Push the POWER SWITCH, and check that the brake pedal does not go down.

NOTICE:

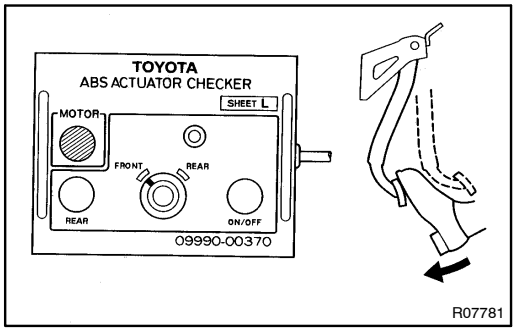
Do not keep the POWER SWITCH pushed down for more than 10 seconds.

(f) Release the switch, and check that the pedal goes down.



(g) Push and hold in the MOTOR switch for a few seconds, and check that the pedal returns.

(h) Release the brake pedal.



(i) Push and hold in the MOTOR switch for a few seconds.

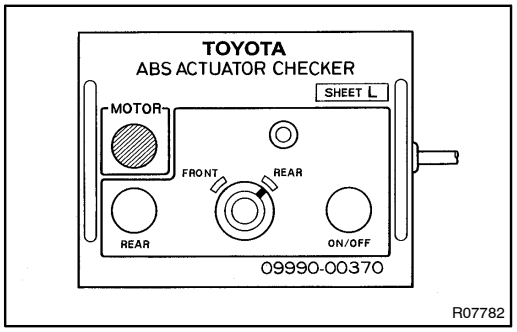
(j) Depress the brake pedal and hold it for about 15 seconds. As you hold the pedal down, push the MOTOR switch for a few seconds. Check that the brake pedal does not pulsate.

(k) Release the brake pedal.

5. INSPECT FOR OTHER WHEELS

(a) Change the connection of the actuator checker (SST) to the sub – wire harness E (SST) – from the sub – wire harness MAIN connector to the SUB connector, or vice versa.

(b) Repeating (c) to (i) of the step 4, check the actuator operation same way.



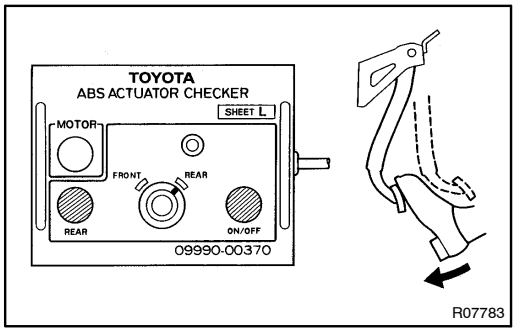
6. INSPECT FOR REAR WHEEL

(a) Turn the selector switch to the ”REAR” position.

(b) Push and hold in the MOTOR switch for a few seconds.

(c) Depress the brake pedal and hold it until the step (g) is completed.

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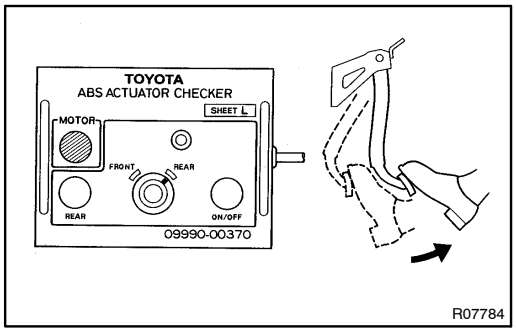


(d) Push the REAR switch while pressing the POWER SWITCH, and check that the brake pedal cannot be depressed.

NOTICE:

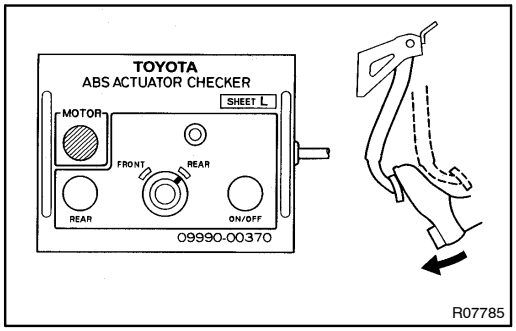
Do not keep the POWER SWITCH pushed down for more than 10 seconds.

(e) Release the REAR switch then the POWER SWITCH, and check that the brake pedal can be depressed.



(f) Push and hold in the MOTOR switch for a few seconds, and check that the pedal returns.

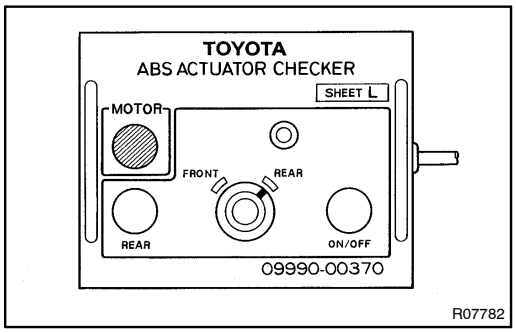
(g) Release the brake pedal.



(h) Push and hold in the MOTOR switch for a few seconds.

(i) Depress the brake pedal and hold it for about 15 seconds. As you hold the pedal down, push the MOTOR switch for a few seconds. Check that the brake pedal does not pulsate.

(j) Release the brake pedal.



7. PUSH MOTOR SWITCH

(a) Push and hold on the MOTOR switch for a few seconds.

(b) Stop the engine.

8. DISCONNECT ACTUATOR CHECKER (SST) FROM ACTUATOR

Remove the "SHEET L" (SST) and disconnect the actuator checker (SST) and sub–wire harness (SST) from the actuator, control relay and body side wire harness.

SST 09990–00150, 09990–00200, 09990–00210, 09990–00370

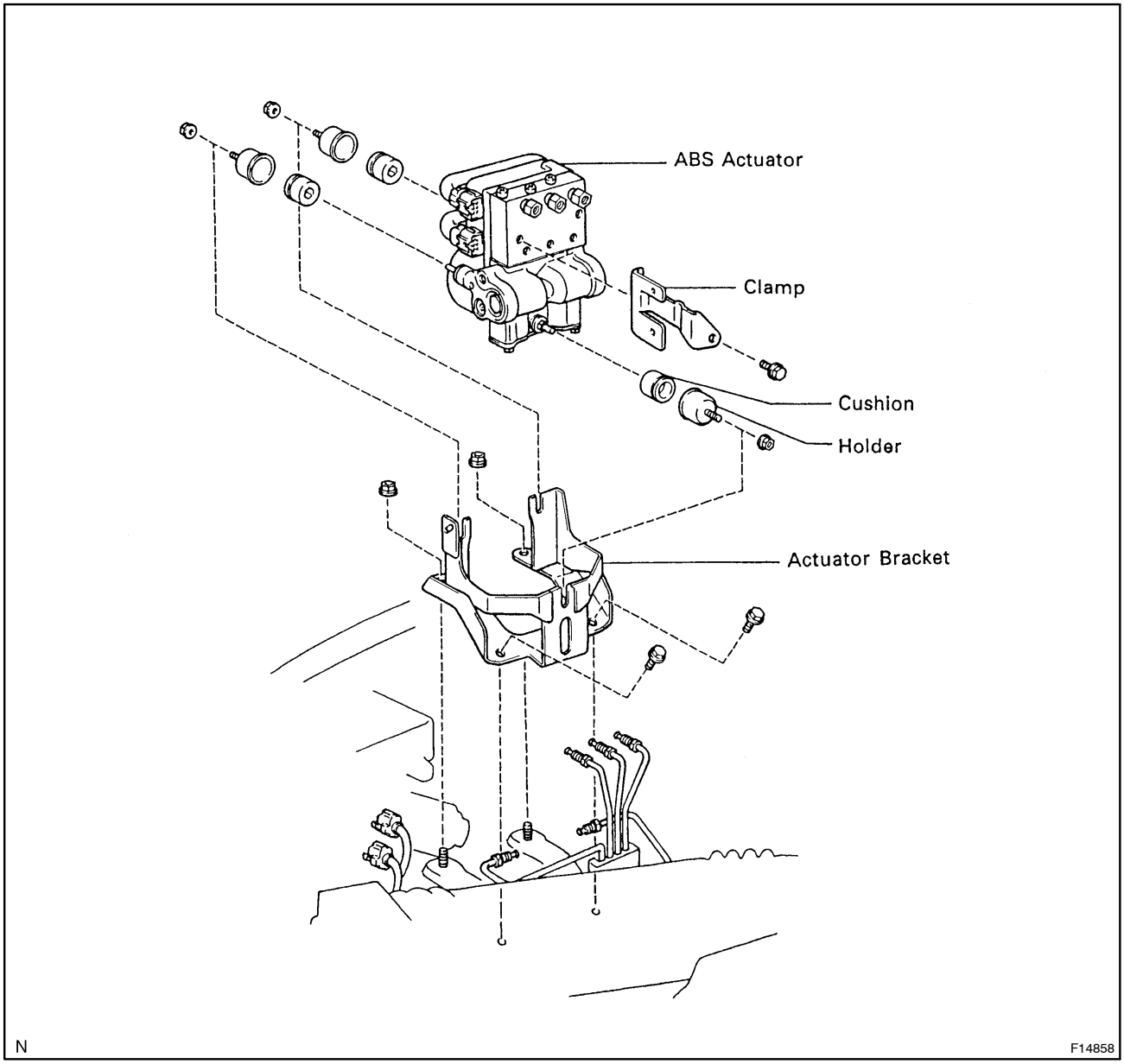
9. CONNECT CONNECTOR TO ACTUATOR

10. CLEAR DTC (See page DI–321)

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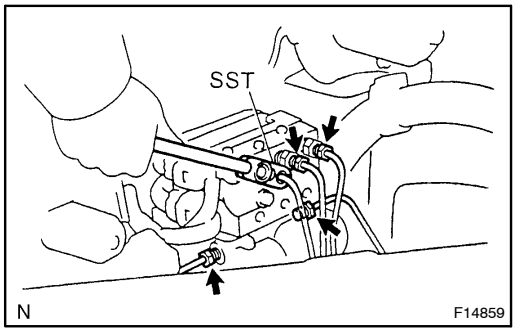
BR09Z–02

COMPONENTS



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BR0A0–02



REMOVAL

1. DISCONNECT BRAKE LINES

Using SST, disconnect the 5 brake lines from the ABS actuator.

SST 09023–00100

Torque: 15 N·m (155 kgf·cm, 11 ft·lbf)

2. REMOVE ABS ACTUATOR ASSEMBLY

(a) Disconnect the 2 connectors from the actuator.

(b) Remove the 2 bolts, 2 nuts and ABS actuator assembly.

Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

3. REMOVE ABS ACTUATOR

(a) Remove the 3 nuts and ABS actuator from the actuator bracket.

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

(b) Remove the 3 holders and cushions from the ABS actuator.

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BR0A1–01

INSTALLATION

Installation is in the reverse order of removal (See page BR–62).

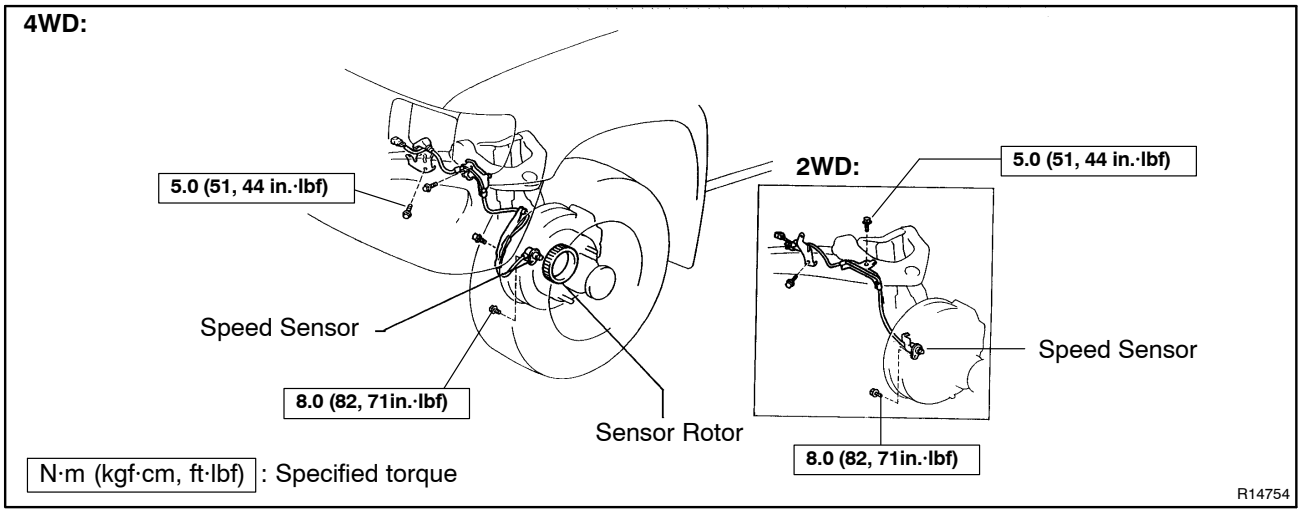
1. **AFTER INSTALLATION, FILL BRAKE RESERVOIR BRAKE FLUID AND BLEED BRAKE SYSTEM (See page BR–4)**
2. **CHECK FOR LEAKS.**

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FRONT SPEED SENSOR

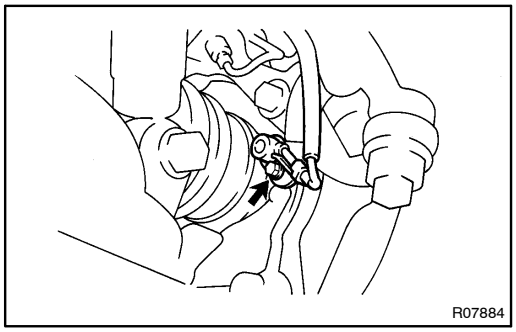
COMPONENTS

BR0A2–04



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BR0A3–01



REMOVAL

1. DISCONNECT SPEED SENSOR CONNECTOR

2. REMOVE SPEED SENSOR

(a) 4WD:
Remove the 3 clamp bolts holding the sensor harness from the frame, upper arm and steering knuckle.

(b) 2WD:
Remove the 2 clamp bolts holding the sensor harness from the frame and upper arm.
Torque: 5.0 N·m (51 kgf·cm, 44 in.·lbf)

(c) Remove the speed sensor from the steering knuckle.
Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

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BR0A4–03

INSTALLATION

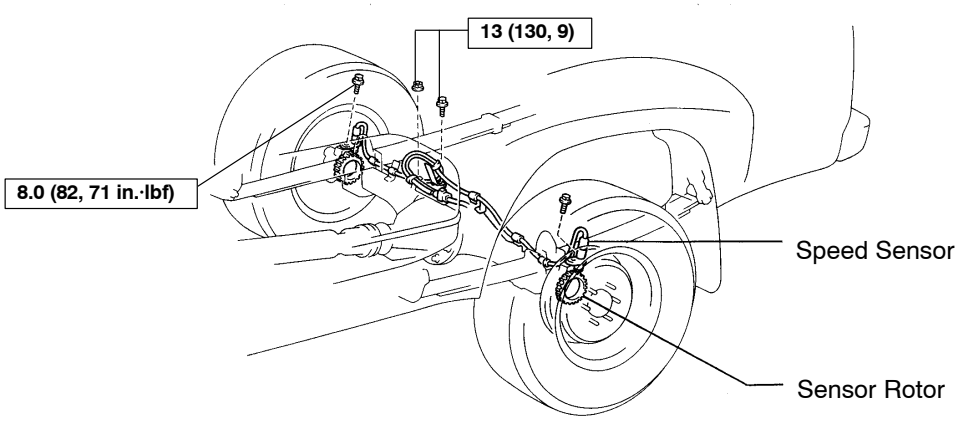
Installation is reverse in the order of removal (See page BR–65).
AFTER INSTALLATION, CHECK SPEED SENSOR SIGNAL (See page DI–341)

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REAR SPEED SENSOR

COMPONENTS

BR0A5–04

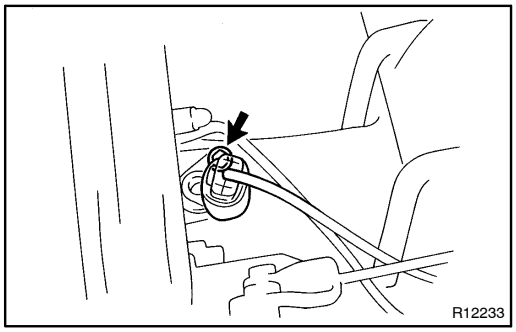


N·m (kgf·cm, ft·lbf) : Specified torque

R14755

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BR0A6–01



REMOVAL

1. DISCONNECT SPEED SENSOR CONNECTOR

2. REMOVE SPEED SENSOR

(a) Remove the clamp bolt, the clamp nut and the 5 clips holding the sensor wire harness from the axle and the fuel tank.

HINT:

- When installing the rear sensor wire harness, never use the removed resin clips, which are service parts.
- When replacing clips, set up new resin clips at the same angle of the removed resin clips.
- When removing a resin clip, take care so that the removing tool is not caught on the grommet or wire.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(b) Remove the speed sensor from the axle carrier.

Torque: 8.0 N·m (82 kgf·cm, 71 in.·lbf)

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BR0A7–03

INSTALLATION

Installation is in the reverse order of removal (See page BR–68).
AFTER INSTALLATION, CHECK SPEED SENSOR SIGNAL (See page DI–341)

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SR – STEERING

STEERING SYSTEM	SR-1
TROUBLESHOOTING	SR-2
DRIVE BELT	SR-3
POWER STEERING FLUID	SR-4
AIR CONTROL VALVE	SR-8
STEERING WHEEL	SR-9
NON-TILT STEERING COLUMN	SR-10
TILT STEERING COLUMN	SR-23
POWER STEERING VANE PUMP (3RZ-FE)	SR-34
POWER STEERING VANE PUMP (5VZ-FE)	SR-44
POWER STEERING GEAR (2WD)	SR-54
POWER STEERING GEAR (2WD)	SR-72
STEERING LINKAGE	SR-84
IDLER ARM	SR-89

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STEERING SYSTEM

PRECAUTION

SR06Z–01

- **Care must be taken to replace parts properly because they could affect the performance of the steering system and result in a driving hazard.**
- **The TOYOTA T100 is equipped with SRS (Supplemental Restraint System) such as the driver airbag. Failure to carry out service operation in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notices in the RS section.**

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TROUBLESHOOTING

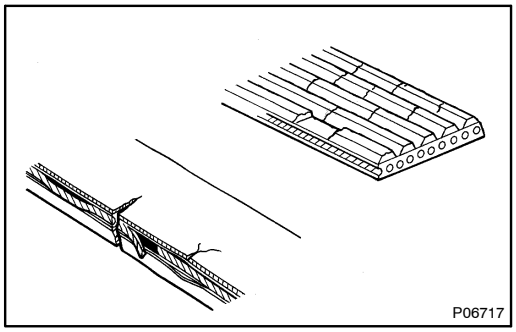
PROBLEM SYMPTOMS TABLE

SR070–01

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, repair or replace these parts.

Symptom	Suspect Area	See page
Hard steering	1. Tires (Improperly inflated)	SA–3 SA–5
	2. Power steering fluid level (Low)	SR–5
	3. Drive belt (Loose)	SR–3
	4. Front wheel alignment (Incorrect)	SA–7 SA–10
	5. Steering system joints (Worn)	–
	6. Suspension arm ball joints	SA–109 SA–113 SA–117 SA–121
	7. Steering column (Binding)	–
	8.Power steering gear	SR–54 SR–72
Poor return	1. Tires (Improperly inflated)	SA–3 SA–5
	2. Front wheel alignment (Incorrect)	SA–7 SA–10
	3. Steering column (Binding)	–
	4. Power steering gear	SR–54 SR–72
Excessive play	1. Steering system joints (Worn)	–
	2. Suspension arm ball joints (Worn)	SA–109 SA–113 SA–117 SA–121
	3. Universal joint, Intermediate shaft, Sliding yoke (Worn)	–
	4. Front wheel bearing (Worn)	SA–16
	5. Power steering gear	SR–54 SR–72
Abnormal noise	1. Power steering fluid level (Low)	SR–5
	2. Steering system joints (Worn)	–
	3. Power steering gear	SR–54 SR–72

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DRIVE BELT

SR071–02

INSPECTION

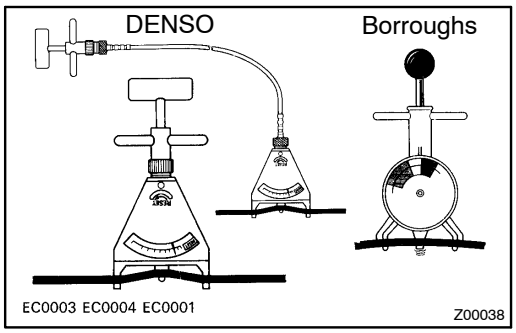
1. INSPECT DRIVE BELT

(a) Visually check the belt for excessive wear, frayed cords etc.

If any defect has been found, replace the drive belt.

HINT:

Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



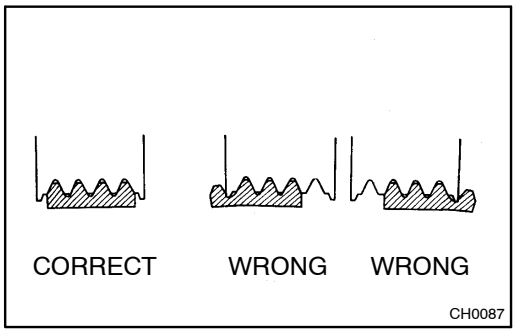
(b) Using a belt tension gauge, measure the belt tension.

Belt tension gauge:
DENSO BTG–20 (95506–00020)
Borroughs No. BT–33–73F

3RZ–FE Engine:
Drive belt tension:
New belt: 135 – 185 lbf
Used belt: 80 – 120 lbf

5VZ–FE Engine:
Drive belt tension:
New belt: 135–180 lbf
Used belt: 85–120 lbf

If the best tension is not as specified, adjust it.



HINT:

- ”New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing a belt, check that it fits properly in the ribbed grooves.
- Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.

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POWER STEERING FLUID BLEEDING

SR072–01

1. **CHECK FLUID LEVEL (See page SR–5)**
2. **JACK UP FRONT OF VEHICLE AND SUPPORT IT WITH STANDS**
3. **TURN STEERING WHEEL**

With the engine stopped, turn the wheel slowly from lock to lock several times.

4. **LOWER VEHICLE**
5. **START ENGINE**

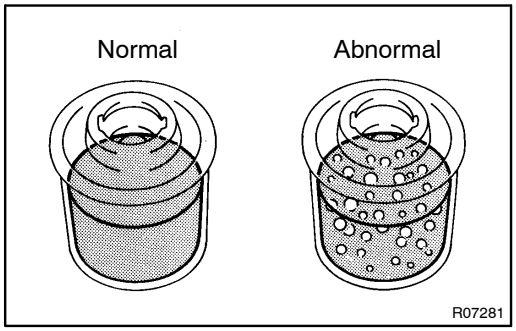
Run the engine at idle for a few minutes.

6. **TURN STEERING WHEEL**

(a) With the engine idling, turn the wheel to left or right full lock and keep it there for 2 – 3 seconds, then turn the wheel to the opposite full lock and keep it there for 2 – 3 seconds.

(b) Repeat (a) several times.

7. **STOP ENGINE**



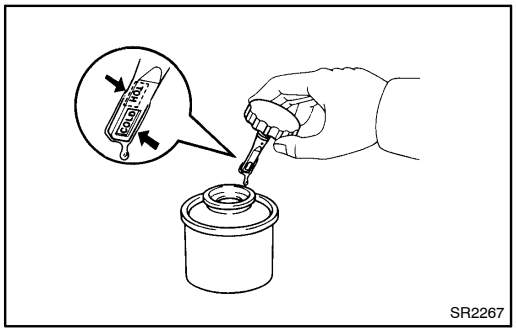
8. **CHECK FOR FOAMING OR EMULSIFICATION**

If the system has to be bled twice specifically because of foaming or emulsification, check for fluid leaks in the system.

9. **CHECK FLUID LEVEL (See page SR–5)**

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SR073-04



SR2267

INSPECTION

1. CHECK FLUID LEVEL

(a) Keep the vehicle level.

(b) With the engine stopped, check the fluid level in the oil reservoir.

If necessary, add fluid.

Fluid: ATF DEXRON®II or III

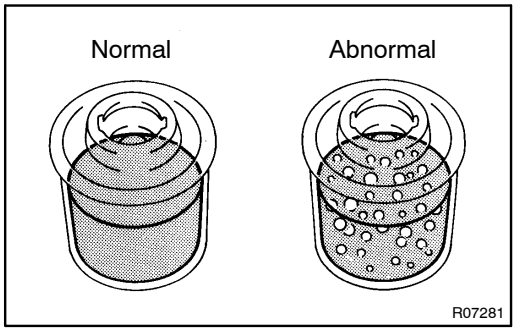
HINT:

Check that the fluid level is within the HOT LEVEL range on the reservoir cap dipstick. If the fluid is cold, check that it is within the COLD LEVEL range.

(c) Start the engine and run it at idle.

(d) Turn the steering wheel from lock to lock several times to boost fluid temperature.

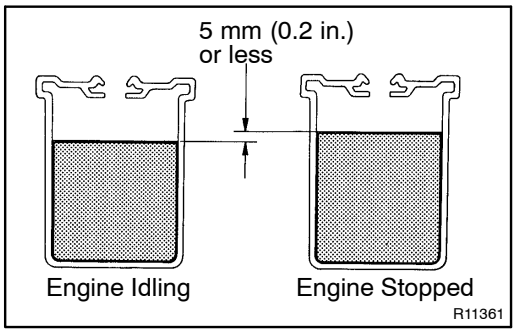
Fluid temperature: 80°C (176°F)



R07281

(e) Check for foaming or emulsification.

If there is foaming or emulsification, bleed power steering system.



R11361

(f) With the engine idling, measure the fluid level in the oil reservoir.

(g) Stop the engine.

(h) Wait a few minutes and remeasure the fluid level in the reservoir.

Maximum fluid level rise: 5 mm (0.20 in.)

If a problem is found, bleed power steering system.

(i) Check the fluid level.

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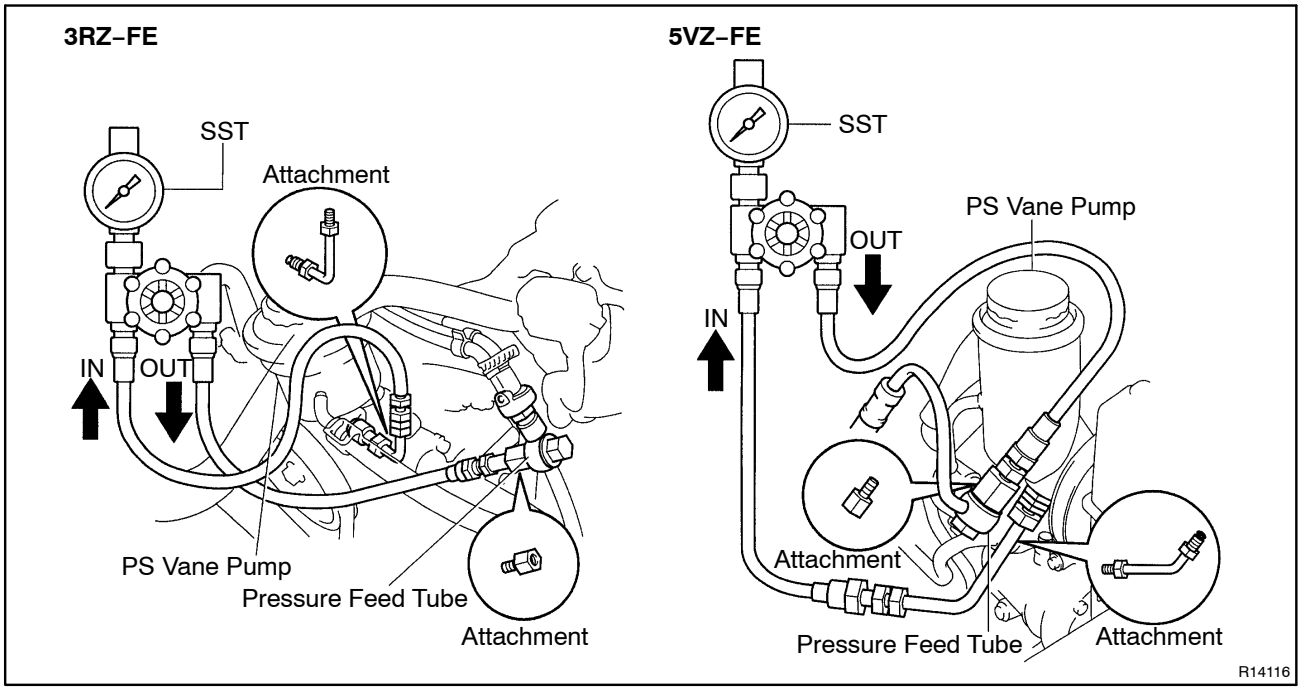
2. CHECK STEERING FLUID PRESSURE

(a) 5VZ–FE Engine:
Remove the 5 bolts and air cleaner assembly.

(b) Disconnect the pressure feed tube from the PS vane pump.
(3RZ–FE Engine: See page SR–36)
(5VZ–FE Engine: See page SR–46)

(c) Connect SST, as shown bellow.
SST 09640–10010 (09641–01010, 09641–01030, 09641–01060)

NOTICE:
Check that the valve of the SST is in the open position.

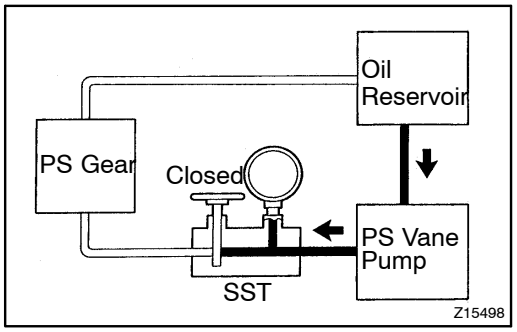


(d) Bleed the power steering system.
(See page SR–4)

(e) Start the engine and run it at idle.

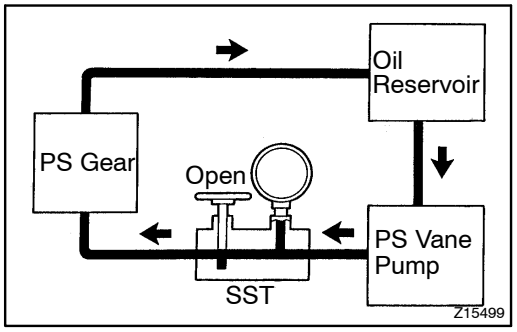
(f) Turn the steering wheel from lock to lock several times to boost fluid temperature.
Fluid temperature: 80°C (176°F)

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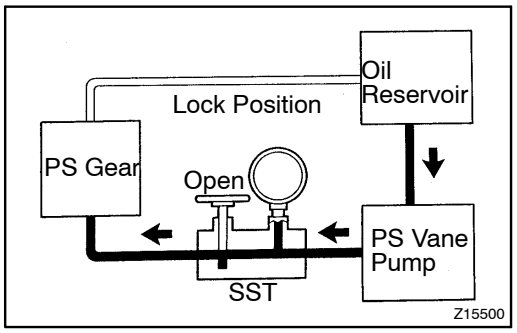
(g) With the engine idling, close the valve of the SST and observe the reading on the SST.
3RZ–FE and 5VZ–FE (2WD) Engines:
Minimum fluid pressure:
7,845 kPa (80 kgf/cm^2, 1138 psi)
5VZ–FE (4WD) Engine:
Minimum fluid pressure:
8,336 kPa (85 kgf/cm^2, 1209 psi)

NOTICE:
- **Do not keep the valve closed for more than 10 seconds.**
- **Do not let the fluid temperature become too high.**



(h) With the engine idling, open the valve fully.
(i) Measure the fluid pressure at engine speeds of 1,000 rpm and 3,000 rpm.
3RZ–FE and 5VZ–FE Engines:
Difference fluid pressure:
490 kPa (5 kgf/cm^2, 71 psi) or less

NOTICE:
Do not turn the steering wheel.

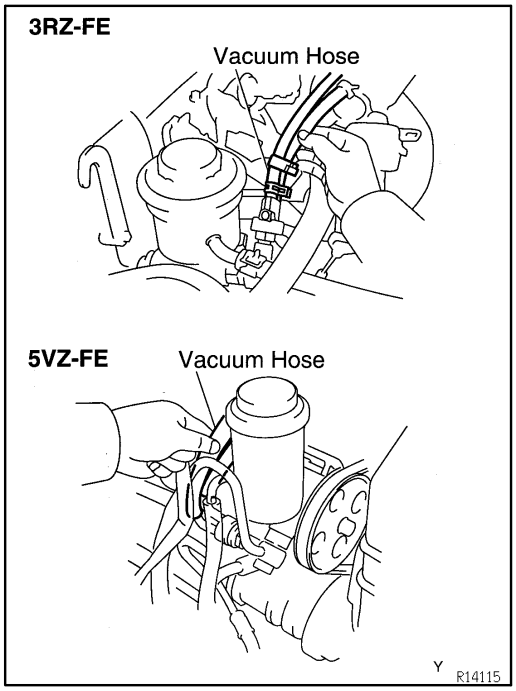


(j) With the engine idling and valve fully opened, turn the wheel to full lock.
3RZ–FE and 5VZ–FE (2WD) Engines:
Minimum fluid pressure:
7,845 kPa (80 kgf/cm^2, 1138 psi)
5VZ–FE (4WD) Engine:
Minimum fluid pressure:
8,336 kPa (85 kgf/cm^2, 1209 psi)

NOTICE:
- **Do not maintain lock position for more than 10 seconds.**
- **Do not let the fluid temperature become too high.**

(k) Disconnect the SST.
(l) Connect the pressure feed tube.
(3RZ–FE Engine: SR–43)
(5VZ–FE Engine: SR–53)
(m) 5VZ–FE Engine:
Install the air cleaner and 3 bolts.
(n) Bleed the power steering system.
(See page SR–4)

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AIR CONTROL VALVE

SR074–04

INSPECTION

1. TURN AIR CONDITIONING SWITCH OFF

2. CHECK IDLE–UP

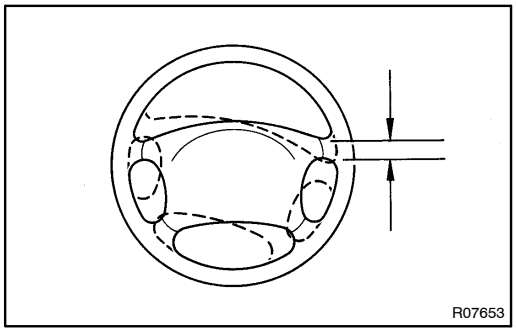
(a) Start the engine and run it at idle.

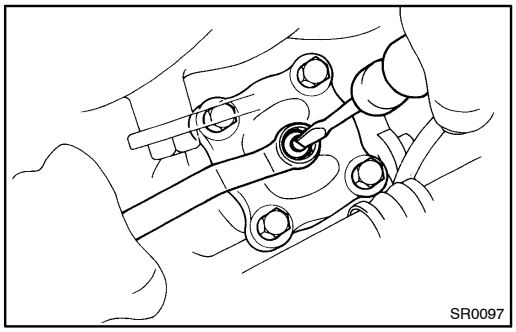
(b) Fully turn the steering wheel.

(c) Check that the engine rpm decreases when the vacuum hose is pinched.

(d) Check that the engine rpm increases when the hose is released.

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STEERING WHEEL

INSPECTION

SR075–01

1. CHECK THAT STEERING WHEEL FREEPLAY IS CORRECT

With the vehicle stopped and tires pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure.

Freeplay should not exceed the maximum.

Maimum freeplay: 30 mm (1.18 in.)

4WD:

If the freeplay exceeds the maximum, adjust it in the following procedure.

2. 4WD:

ADJUST STEERING GEAR

(a) Point the front wheels straight ahead.

(b) Loosen the adjusting screw lock nut.

(c) Turn the sector shaft adjusting screw clockwise to decrease steering wheel freeplay and counterclockwise to increase it.

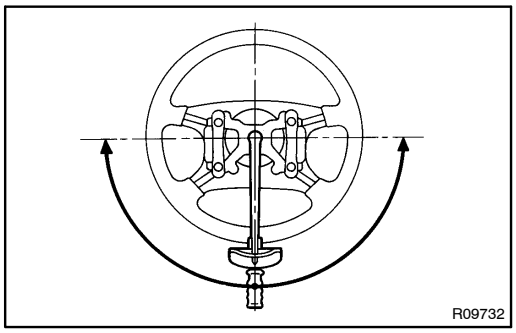
HINT:

Turn the adjusting screw in small increments and check the freeplay between each adjustment.

(d) Turn the steering wheel half way around in both directions.

Check the the freeplay is correct and steering is smooth and without rough spots.

(e) Torque the adjusting screw lock nut (See page SR–80).



3. CHECK STEERING EFFORT

(a) Center the steering wheel.

(b) Remove the steering wheel pad (See page SR–13).

(c) Start the engine and run it at idle.

(d) Measure the steering effort in both directions.

Reference: 8.3 N·m (85 kgf·cm, 73 in.·lbf)

HINT:

Be sure to consider the tire type, pressure and contact surface before making your diagnosis.

(e) Torque the steering wheel set nut.

Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

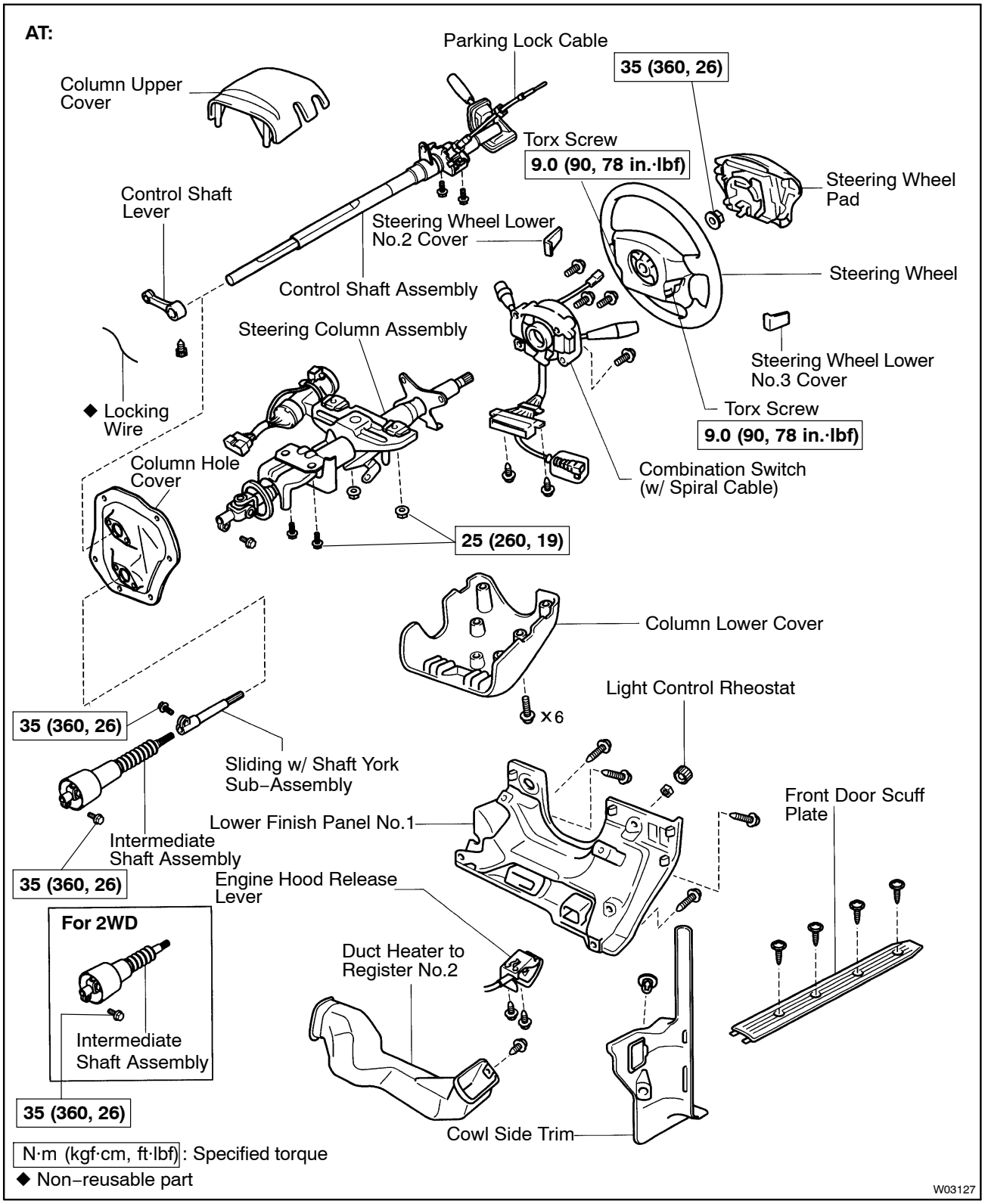
(f) Install the steering wheel pad (See page SR–20).

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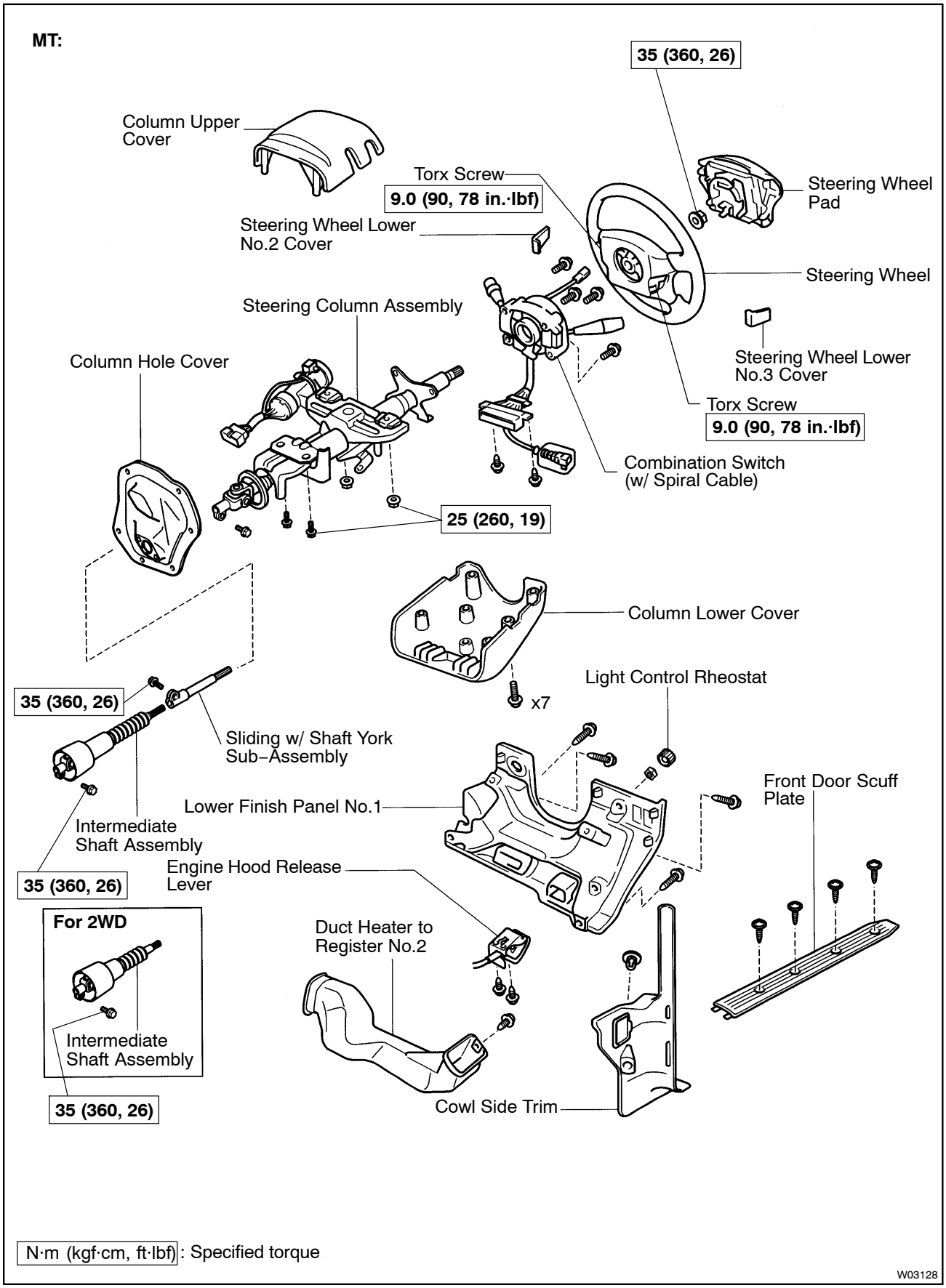
NON–TILT STEERING COLUMN

COMPONENTS

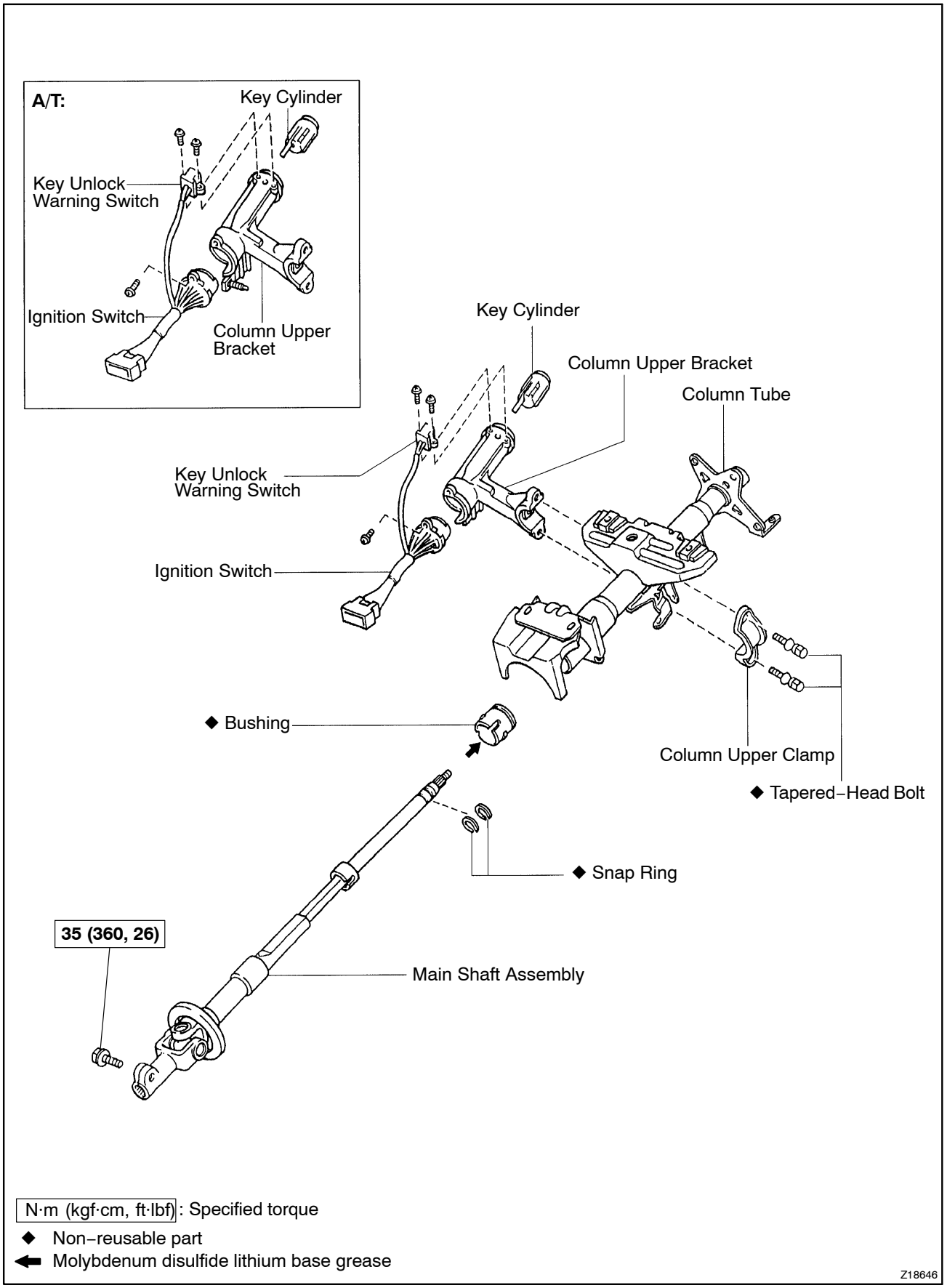
SR076–01



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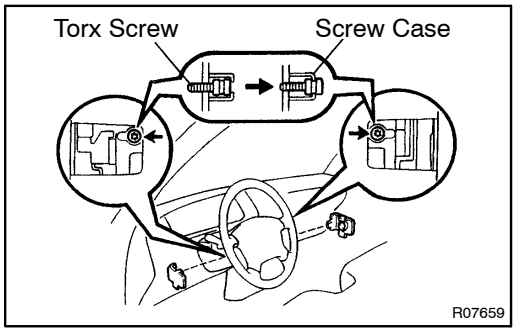
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SR077–01

REMOVAL



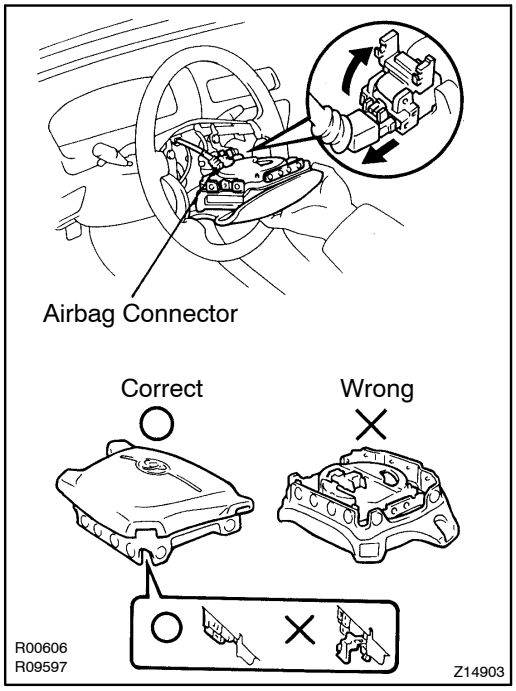
1. REMOVE STEERING WHEEL PAD

NOTICE:

- **If the airbag connector is disconnected with the ignition switch at ON or ACC, DTCs will be recorded.**
- **Never use airbag parts from another vehicle. When replacing parts, replace with new parts.**

(a) Place the front wheels facing straight ahead.
(b) Remove the steering wheel lower No.2 and No.3 covers.
(c) Using a torx socket wrench, loosen the 2 torx screws.

HINT:
Loosen the 2 screws until the groove along the screw circumference catches on the screw case.



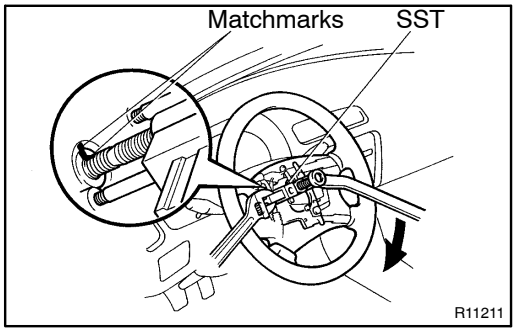
(d) Pull the wheel pad out from the steering wheel and disconnect the airbag connector.

CAUTION:

- **When storing the wheel pad, keep the upper surface of the pad facing upward.**
- **Never disassemble the wheel pad.**

NOTICE:

When removing the wheel pad, take care not to pull the airbag wire harness.



2. REMOVE STEERING WHEEL

(a) Disconnect the connector.
(b) Remove the steering wheel set nut.
(c) Place matchmarks on the steering wheel and main shaft.
(d) Using SST, remove the wheel.
SST 09950–50010 (09951–05010, 09952–05010, 09953–05020, 09954–05020)

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3. A/T:
REMOVE UPPER AND LOWER COLUMN COVERS

Remove the 6 screws.

4. M/T:
REMOVE UPPER AND LOWER COLUMN COVERS

Remove the 7 screws.

5. REMOVE LOWER FINISH PANEL NO.1

(a) Remove the 2 screws and disconnect the engine hood release lever from the panel.
(b) Remove the 4 screws and front door scuff plate.
(c) Remove the clip and cowl side trim.
(d) Remove the 4 panel set bolts.
(e) Remove the light control rheostat and lock nut.

6. REMOVE DUCT HEATER TO REGISTER NO.2

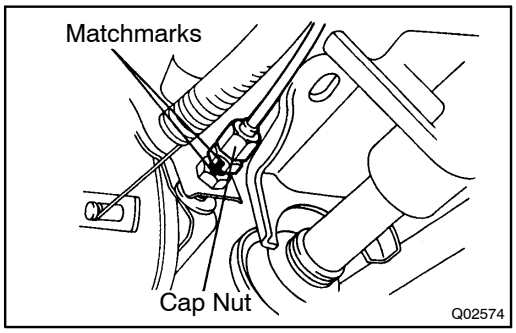
Remove the screw.

7. REMOVE COMBINATION SWITCH WITH SPIRAL CABLE

(a) Remove the 2 screws.
(b) Disconnect the connectors.
(c) Disconnect the airbag connector.
(d) Remove the 4 screws.

8. REMOVE SPIRAL CABLE
(See page BE–15)

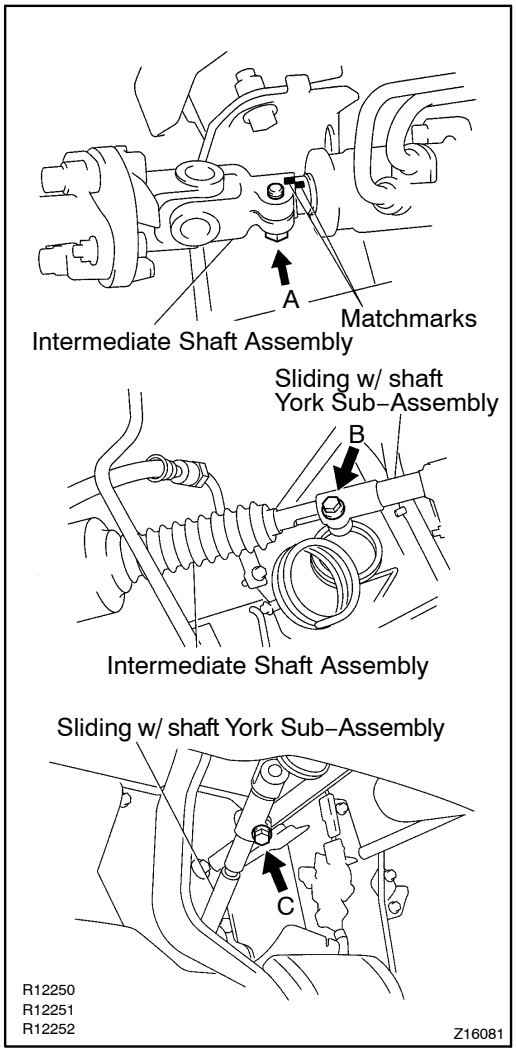
NOTICE:
Do not disassemble the cable or apply oil to it.



9. A/T:
DISCONNECT PARKING LOCK CABLE

(a) Place the matchmarks on the cap nut and parking lock cable.
(b) Loosen the cap nut.
(c) Disconnect the parking lock cable.

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10. DISCONNECT INTERMEDIATE SHAFT ASSEMBLY

(a) 2WD:
Place matchmarks on the intermediate shaft and control valve shaft.

(b) 4WD:
Place matchmarks on the intermediate shaft and worm gear valve shaft.

(c) Remove the bolt A, B and C.

11. REMOVE INTERMEDIATE SHAFT ASSEMBLY AND SLIDING w/ SHAFT YORK SUB–ASSEMBLY

12. A/T:
REMOVE STEERING COLUMN ASSEMBLY

(a) Remove the locking wire.

(b) Remove the bolt and control shaft lever.

(c) Remove the 2 control shaft assembly mounting bolts from the steering column assembly.

(d) Remove the 2 column assembly set bolts and nuts.

(e) Remove the steering column assembly with the control shaft assembly.

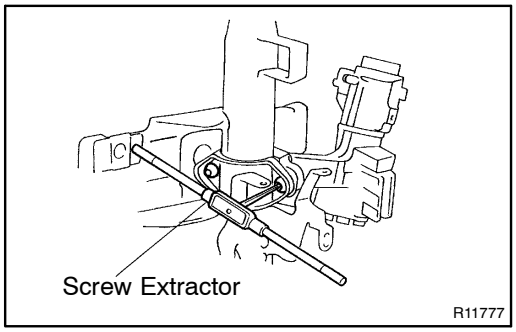
(f) Remove the control shaft assembly from the steering column assembly.

13. M/T:
REMOVE STEERING COLUMN ASSEMBLY

Remove the 2 steering column assembly set bolts and nuts.

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SR078–01



DISASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. REMOVE COLUMN UPPER BRACKET AND COLUMN UPPER CLAMP

(a) Using a centering punch, mark the center of the 2 tapered–head bolts.

(b) Using a 3 – 4 mm (0.12 – 0.16 in.) drill, drill into the 2 bolts.

(c) Using a screw extractor, remove the 2 bolts.

2. REMOVE MAIN SHAFT ASSEMBLY

(a) Using a snap ring expander, remove the snap ring from the shaft assembly.

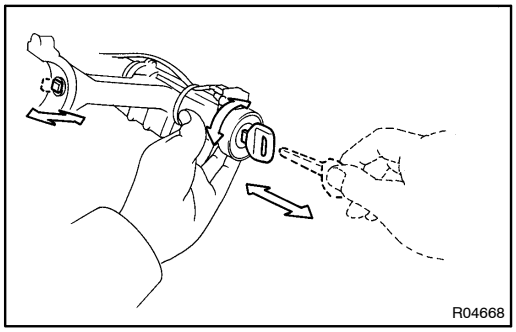
(b) Tap out the shaft assembly from the column tube.

(c) Using a snap ring expander, remove the snap ring from the shaft assembly.

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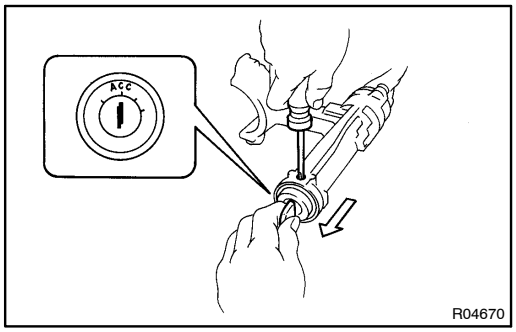
SR079–01

INSPECTION



1. INSPECT COLUMN UPPER BRACKET

Check that the steering lock mechanism operates properly.



2. IF NECESSARY, REPLACE KEY CYLINDER

(a) Place the ignition key at the ACC position.

(b) Push down the stop pin with a thin rod, and pull out the key cylinder.

(c) Install a new key cylinder.

HINT:

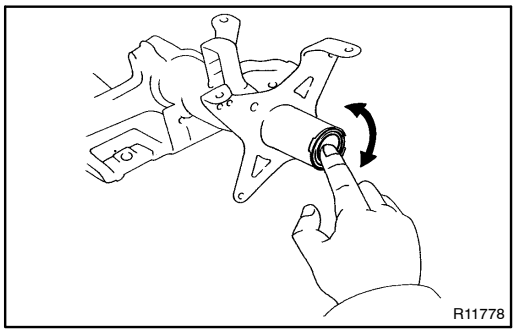
Make sure the ignition key is at the ACC position.

3. INSPECT IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH (See page BE–12)

4. IF NECESSARY, REPLACE IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH

(a) Remove the 3 screws.

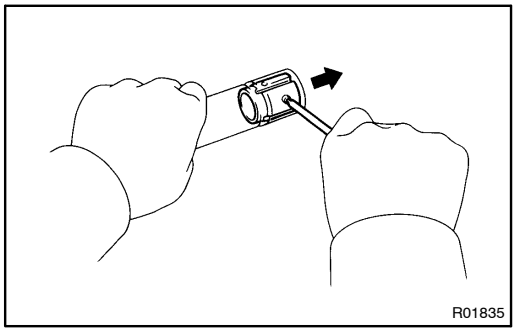
(b) Install a new switches with the 3 screws.



5. INSPECT BEARING

Check the bearing rotation condition and check for abnormal noise.

If the bearing is worn or damaged, replace the column tube/column upper tube.



6. IF NECESSARY, REPLACE BUSHING

(a) TILT STEERING COLUMN:
Remove the snap ring from the column lower tube.

(b) Using a screwdriver, remove the bushing from the column tube/column lower tube.

NOTICE:

Be careful not to damage the column tube.

(c) Coat the inside of new bushing with molybdenum disulfide lithium base grease.

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(d) Align the holes of the tube and the projections of the bushing, and install the bushing into the column tube/column lower tube.

(e) TILT STEERING COLUMN:
Install a new snap ring.

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SR07A–01

REASSEMBLY

NOTICE:

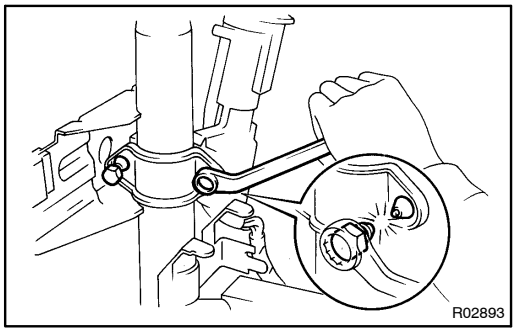
When using a vise, do not overtighten it.

1. INSTALL MAIN SHAFT ASSEMBLY

(a) Using a snap ring expander, install a new snap ring to the shaft assembly.

(b) Install the shaft assembly into the column tube.

(c) Using a snap ring expander, install a new snap ring to the shaft assembly.



2. INSTALL COLUMN UPPER BRACKET AND COLUMN UPPER CLAMP

Tighten the 2 new tapered–head bolts until the bolt heads break off.

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SR07B–01

INSTALLATION

1. A/T:
INSTALL STEERING COLUMN ASSEMBLY

(a) Install the control shaft assembly to the steering column assembly.

(b) Torque the 2 steering column assembly set bolts and nuts.
Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)

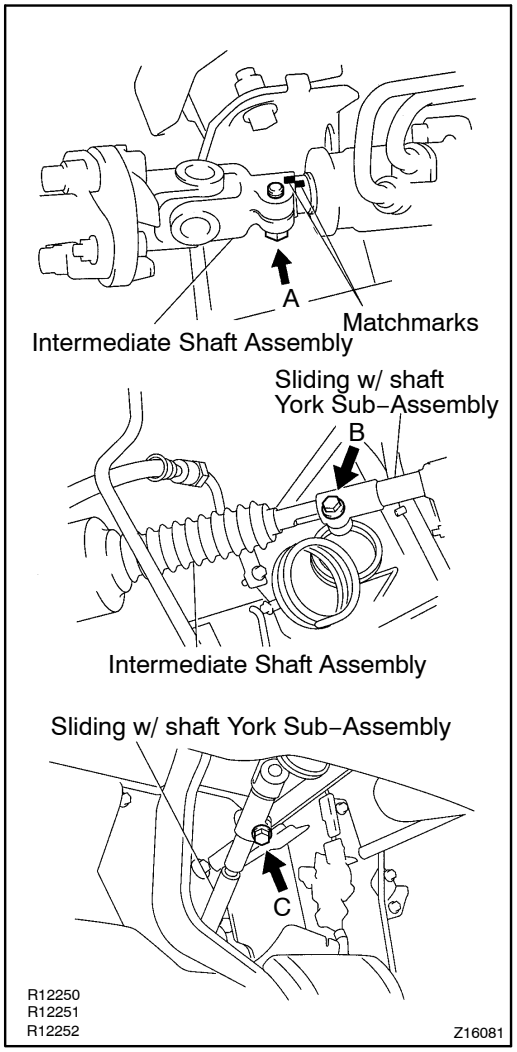
(c) Temporarily install the 2 control shaft assembly set bolts.

(d) Install the control shaft lever with the bolt.
Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

(e) Install a new locking wire.

2. M/T:
INSTALL STEERING COLUMN ASSEMBLY

Torque the 2 steering column assembly set bolts and nuts.
Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)



3. INSTALL INTERMEDIATE SHAFT ASSEMBLY AND SLIDING w/ SHAFT YORK SUB–ASSEMBLY

Temporarily install the bolt B and C.

4. CONNECT INTERMEDIATE SHAFT ASSEMBLY

(a) 2WD:
Align the matchmarks on the intermediate shaft and control valve assembly.

(b) 4WD:
Align the matchmarks on the intermediate shaft and worm gear valve body assembly.

(c) Torque the bolt C.
Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

(d) Torque the bolt A.
Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

(e) Torque the bolt B.
Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

5. A/T:
CONNECT AND ADJUST INTER LOCK (See page AT–25)

6. A/T:
TORQUE 2 CONTROL SHAFT ASSEMBLY MOUNTING BOLTS
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

7. A/T:
CONNECT PARKING LOCK CABLE (See page AT–23)

8. INSTALL SPIRAL CABLE (See page BE–15)

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9. INSTALL COMBINATION SWITCH WITH SPIRAL CABLE

(a) Install the 4 screws.
(b) Connect the airbag connector.
(c) Connect the connectors.
(d) Install the 2 screws.

10. INSTALL DUCT HEATER TO REGISTER NO.2

Install the screw.

11. INSTALL LOWER FINISH PANEL NO.1

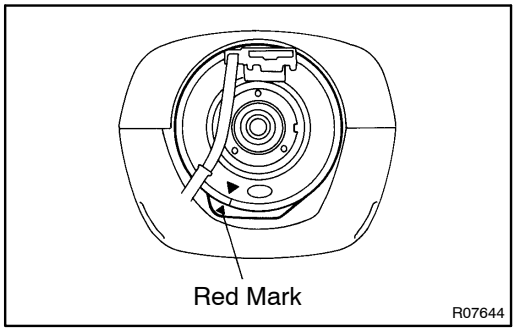
(a) Install the lock nuts and light control rheostat.
(b) Tighten the 4 panel set bolts.
(c) Install the cowl side trim and clip.
(d) Install the front door scuff plate with the 4 screws.
(e) Install the engine hood release lever with the 2 screws.

12. A/T:
INSTALL UPPER AND LOWER COLUMN COVERS

Install the 6 screws.

13. M/T:
INSTALL UPPER AND LOWER COLUMN COVERS

Install the 7 screws.



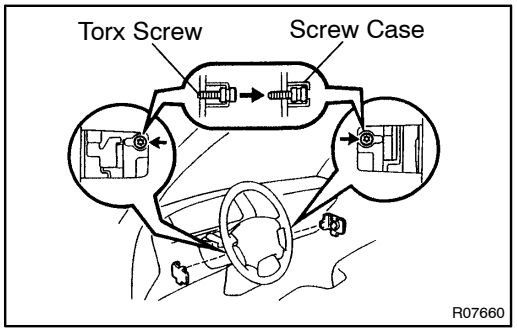
14. CENTER SPIRAL CABLE

(a) Check that the front wheels are facing straight ahead.
(b) Turn the spiral counterclockwise by hand until it becomes harder to turn the cable.
(c) Then turn the spiral cable clockwise about 3 turns to align the red mark.

HINT:
The spiral cable turns clockwise about 3 turns to either left or right of the center.

15. INSTALL STEERING WHEEL

(a) Align the matchmarks on the wheel and main shaft.
(b) Torque the set nut.
Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)
(c) Connect the connector.



16. INSTALL STEERING WHEEL PAD

NOTICE:

- **Make sure the wheel pad is installed to the specified torque.**
- **If the wheel pad has been dropped, or there are cracks, dents in the case or connector, replace the wheel pad with a new one.**
- **When installing the wheel pad, take care that the wirings do not interfere with other parts and are not pinched between other parts.**

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(a) Connect the airbag connector.
(b) Install the wheel pad after confirming that the circumference groove of the torx screws is caught on the screw case.
(c) Using a torx wrench, torque the 2 screws.
Torque: 9.0 N·m (90 kgf·cm, 78 in.·lbf)

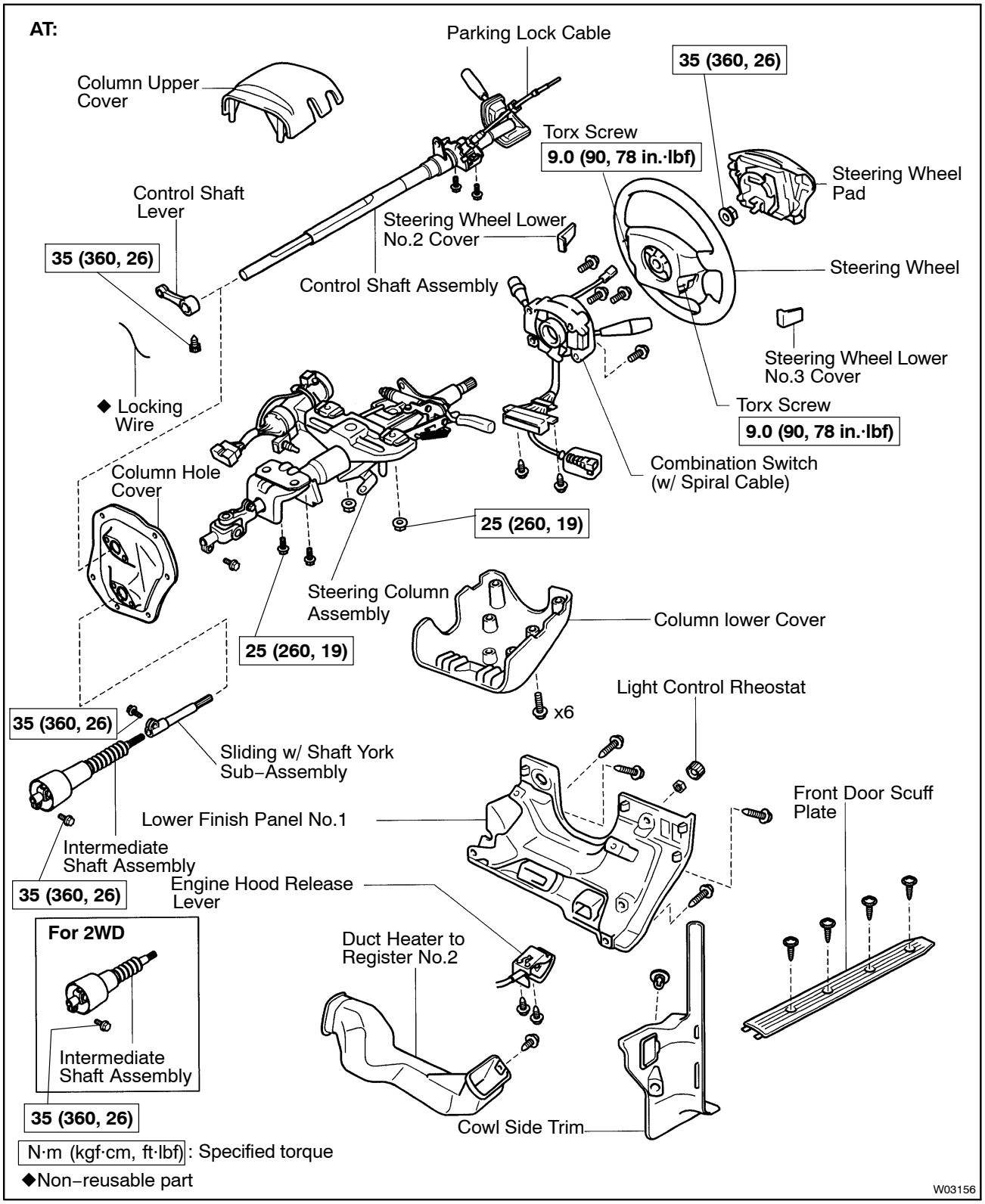
17. CHECK STEERING WHEEL CENTER POINT

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TILT STEERING COLUMN

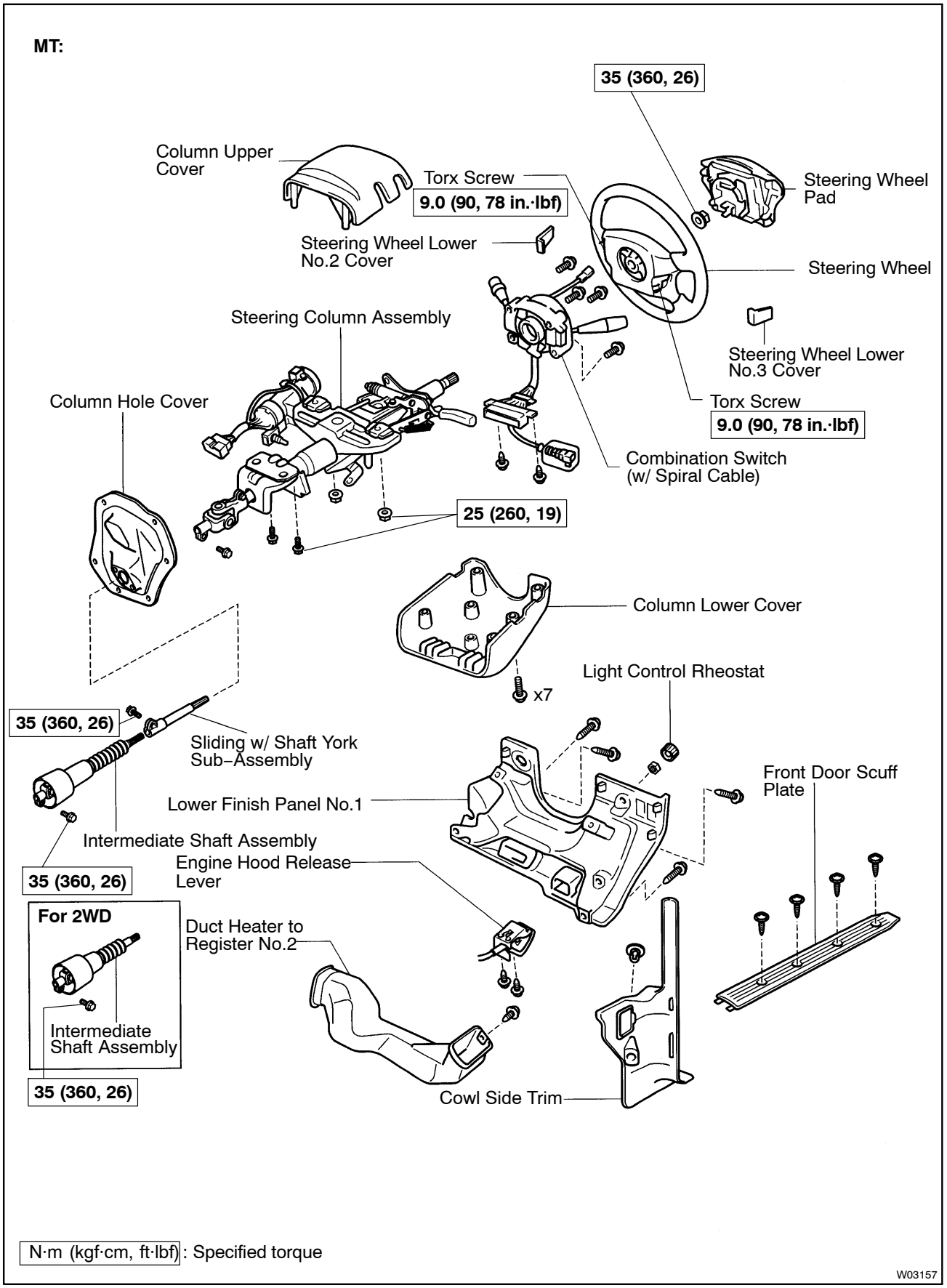
COMPONENTS

SR07C–01



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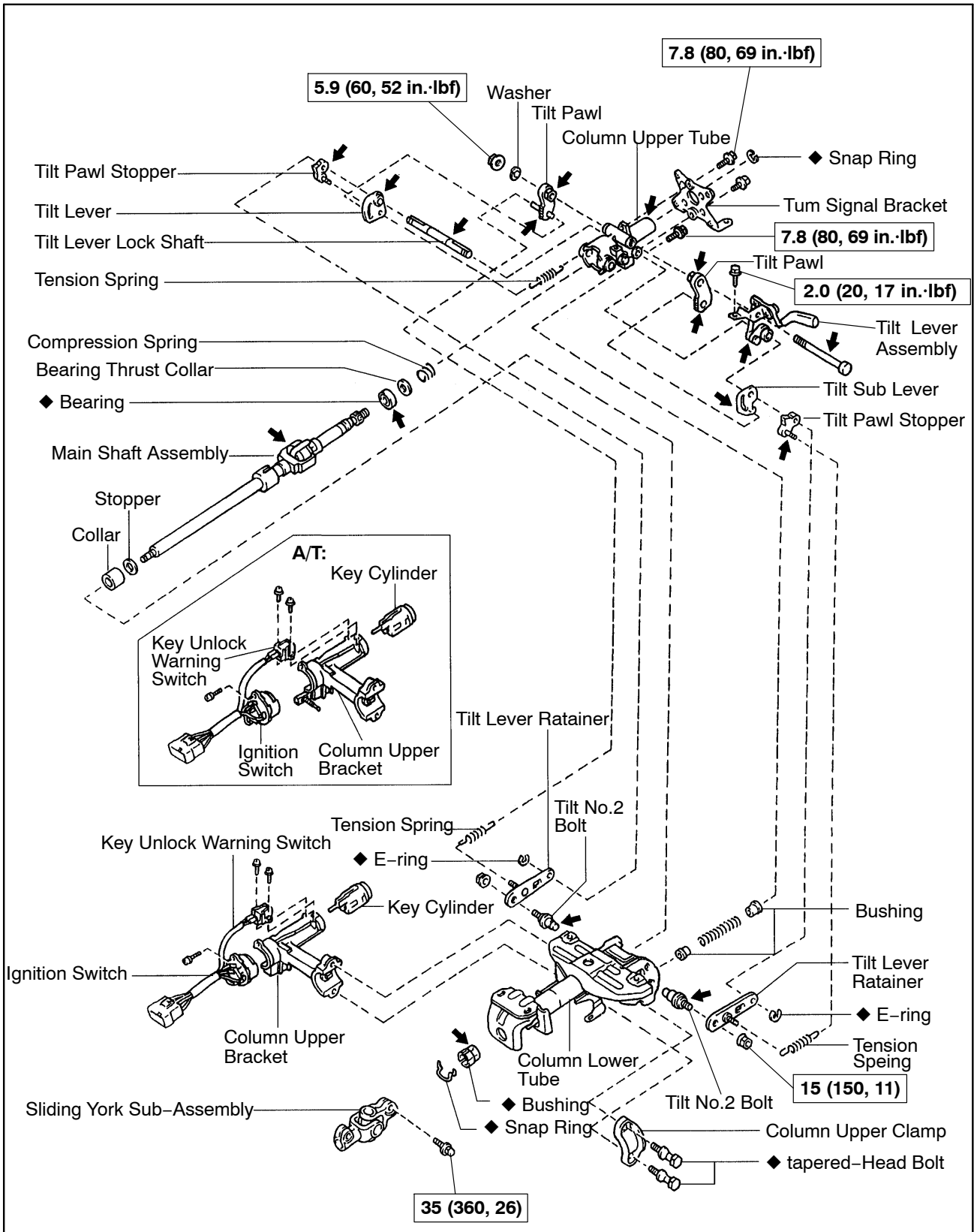
MT:



N·m (kgf·cm, ft·lbf): Specified torque

W03157

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N·m (kgf·cm, ft·lbf): Specified torque
◆ Non–reusable part
⬅ Molybdenum disulfide lithium base grease

W03536

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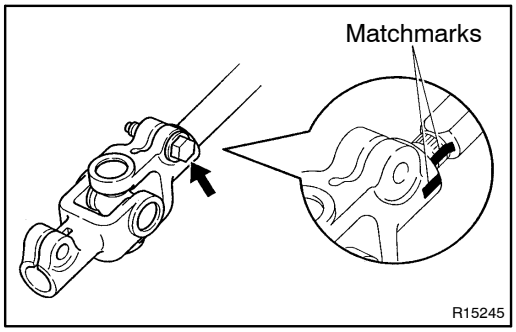
SR07D–01

REMOVAL

(See page SR–13)

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SR07E–01



DISASSEMBLY

NOTICE:

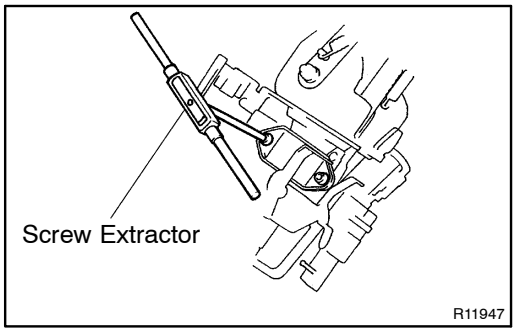
When using a vise, do not overtighten it.

1. REMOVE SLIDING YOKE SUB–ASSEMBLY

(a) Remove the bolt.

(b) Shift the yoke.

(c) Place matchmarks on the sliding yoke and main shaft.



2. REMOVE COLUMN UPPER BRACKET AND COLUMN UPPER CLAMP

(a) Using a centering punch, mark the center of the 2 tapered–head bolts.

(b) Using a 3 – 4 mm (0.12 – 0.16 in.) drill, drill into the 2 bolts.

(c) Using a screw extractor, remove the 2 bolts.

3. REMOVE 3 TENSION SPRINGS

4. REMOVE COMPRESSION SPRING

(a) Remove the bolt with the spring.

(b) Remove the 2 bushings from the spring.

5. REMOVE 2 TILT LEVER RETAINERS

(a) Remove the E–ring from the tilt lever lock shaft.

(b) Remove the nut and retainer.

6. REMOVE 2 TILT PAWL STOPPERS

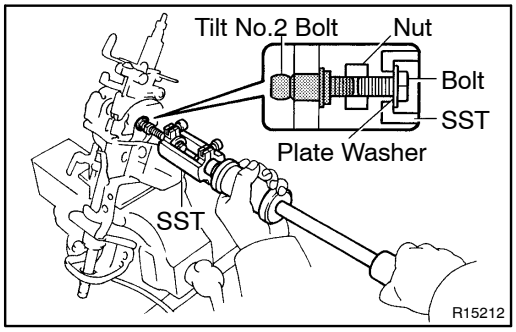
7. REMOVE 2 TILT PAWLS

(a) Remove the tilt lever assembly set bolt.

(b) Remove the nut and bolt.

(c) Remove the washer.

8. REMOVE TILT LEVER ASSEMBLY, TILT SUB LEVER, TILT LEVER AND TILT LEVER LOCK SHAFT



9. REMOVE COLUMN UPPER TUBE WITH MAIN SHAFT ASSEMBLY

(a) Set SST, the nut (10 mm nominal diameter, 1.25 mm pitch), plate washer (36 mm outer diameter) and bolt (10 mm nominal diameter, 1.25 mm pitch, 50 mm length), as shown in the illustration.

SST 09910–00015 (09911–00011, 09912–00010)

Reference

Nut: 90170–10004

Plate washer: 90201–10201

Bolt: 91111–51050

(b) Remove the 2 tilt No.2 bolts by using the sliding hammer on SST.

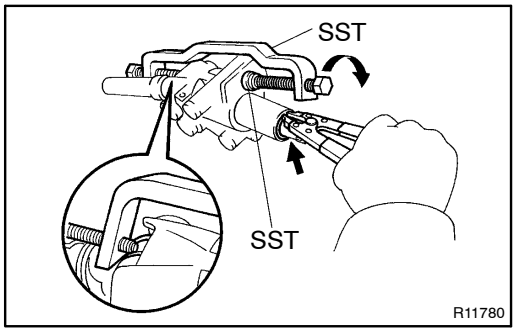
(c) Remove the upper tube with the shaft assembly from the lower tube.

(d) Remove the collar and stopper from the shaft assembly.

10. REMOVE TURN SIGNAL BRACKET

Remove the 2 bolts.

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11. REMOVE MAIN SHAFT ASSEMBLY

(a) Using SST, compress the compression spring.
SST 09950–40010 (09957–04010, 09958–04010)

NOTICE:

Do not bend the universal joint of the main shaft more than 20°.

(b) Using a snap ring expander, remove the snap ring from the shaft assembly.

(c) Remove the main shaft from the column upper tube.

(d) Remove the compression spring, bearing thrust collar and bearing from the shaft assembly.

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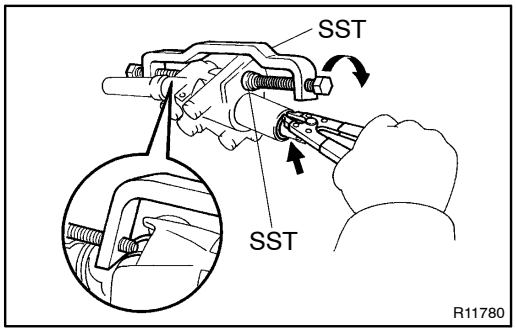
SR07F–01

INSPECTION

(See page SR–17)

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SR07G–01



REASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. COAT WITH MOLYBDENUM DISULFIDE LITHIUM BASE GREASE

(See pages SR–23)

2. INSTALL MAIN SHAFT ASSEMBLY

(a) Install the bearing, bearing thrust collar and compression spring to the main shaft.

(b) Install the main shaft into the column upper tube.

(c) Using SST, compress the compression spring.

SST 09950–40010 (09957–04010, 09958–04010)

NOTICE:

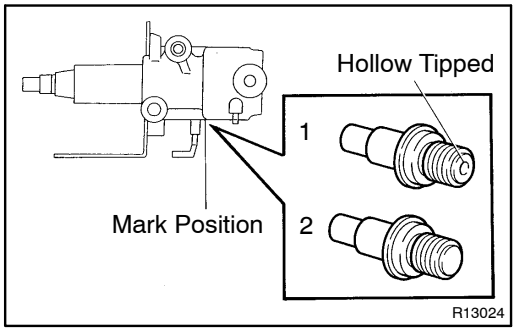
Do not bend the universal joint of the main shaft more than 20°.

(d) Using a snap ring expander, install a new snap ring.

3. INSTALL TURN SIGNAL BRACKET

Torque the 2 bolts.

Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

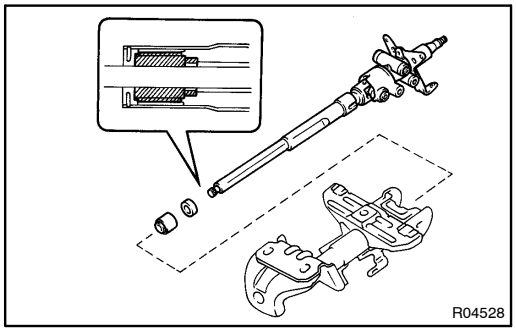


4. SELECT 2 TILT NO.2 BOLTS

Select the bolt with the hollow–tipped thread end when the column upper tube mark is 1, and the bolt with the plain thread end when the mark is 2.

NOTICE:

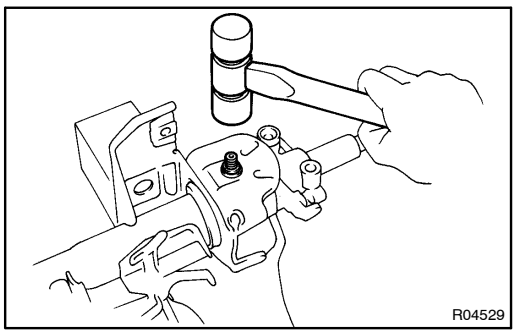
Select the bolt type to match each number marked in the squares on the upper tube.



5. INSTALL COLUMN UPPER TUBE WITH MAIN SHAFT ASSEMBLY

(a) Install the stopper and collar to the shaft assembly.

(b) Install the upper tube with the shaft assembly to the column lower tube.



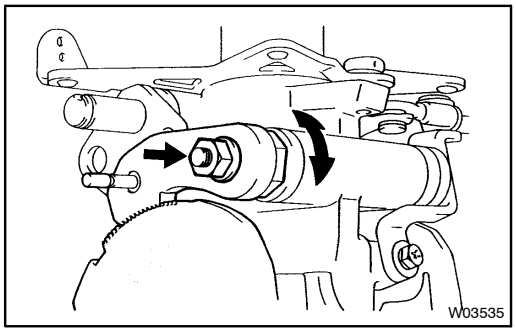
(c) Using a plastic hammer, drive in the 2 tilt No.2 bolts.

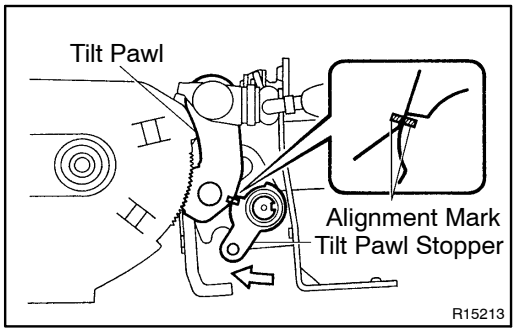
6. INSTALL TILT LEVER LOCK SHAFT, TILT LEVER ASSEMBLY AND TILT SUB LEVER, TILT LEVER

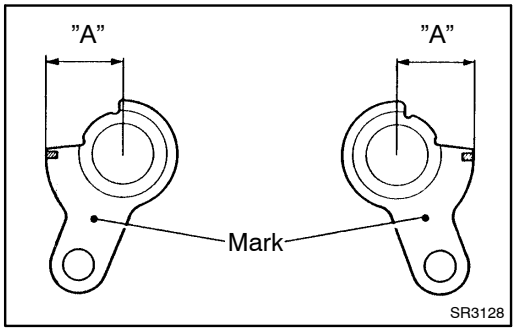
Torque the tilt lever assembly set bolt.

Torque: 2 N·m (20 kgf·cm, 17 in.·lbf)

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7. INSTALL 2 TILT PAWLS

Install the pawl to the column upper tube and temporarily install the washer with the bolt and nut.

HINT:

Install the pawl pin into the long hole of the tilt lever/tilt sub lever.

8. ENGAGE AND ADJUST 2 TILT PAWLS

(a) Engage the tilt sub lever side pawl to the center of the ratchet.

(b) While turning the tilt lever side collar, engage the tilt lever side pawl to the ratchet completely.

(c) Torque the nut.

Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)

(d) Check that the pawls rotate smoothly.

9. SELECT 2 TILT PAWL STOPPERS

(a) With the tilt pawl and ratchet engaged, install the 2 pawl stoppers.

(b) Check that the alignment marks on the stopper and pawl align when the stopper is lightly rotated to the pawl side.

(c) If the alignment marks are not align, select pawl stopper according to the following table.

Right pawl stopper	Left pawl stopper	Dimension "A" mm (in.)
1	A	12.68 – 12.74 (0.4992 – 0.5016)
2	B	12.61 – 12.67 (0.4965 – 0.4988)
3	C	12.54 – 12.60 (0.4937 – 0.4961)
4	D	12.47 – 12.53 (0.4909 – 0.4933)
5	E	12.40 – 12.46 (0.4882 – 0.4906)
6	F	12.33 – 12.39 (0.4854 – 0.4878)
7	G	12.26 – 12.32 (0.4827 – 0.4850)

(d) After selecting the stoppers, check that the pawl and ratchet are fully engaged.

10. INSTALL 2 TILT PAWL STOPPERS

11. INSTALL 2 TILT LEVER RETAINERS

(a) Install the tilt lever retainer and torque the nut.

Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)

(b) Install a new E–ring.

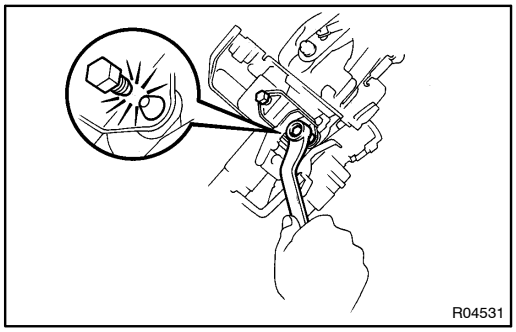
12. INSTALL COMPRESSION SPRING

(a) Install the 2 bushings to the compression spring.

(b) Install the spring with the bolt.

Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)

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13. INSTALL 3 TENSION SPRINGS

14. INSTALL COLUMN UPPER BRACKET AND COLUMN UPPER CLAMP

(a) Install the bracket with 2 new tapered–head bolts.

(b) Tighten the tapered–head bolts until the bolt heads break off.

15. INSTALL SLIDING YORK SUB–ASSEMBLY

(a) Align the matchmarks on the sliding york and main shaft.

(b) Torque the bolt.

Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

16. CHECK TILT STEERING OPERATION

(a) Check that there is no axial play at the end of the main shaft.

(b) With the main shaft in the neutral position, pull the tilt lever and check that the main shaft rises to the uppermost position.

(c) Lower the main shaft, and check that it locks in the lowermost position.

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SR07H–01

INSTALLATION

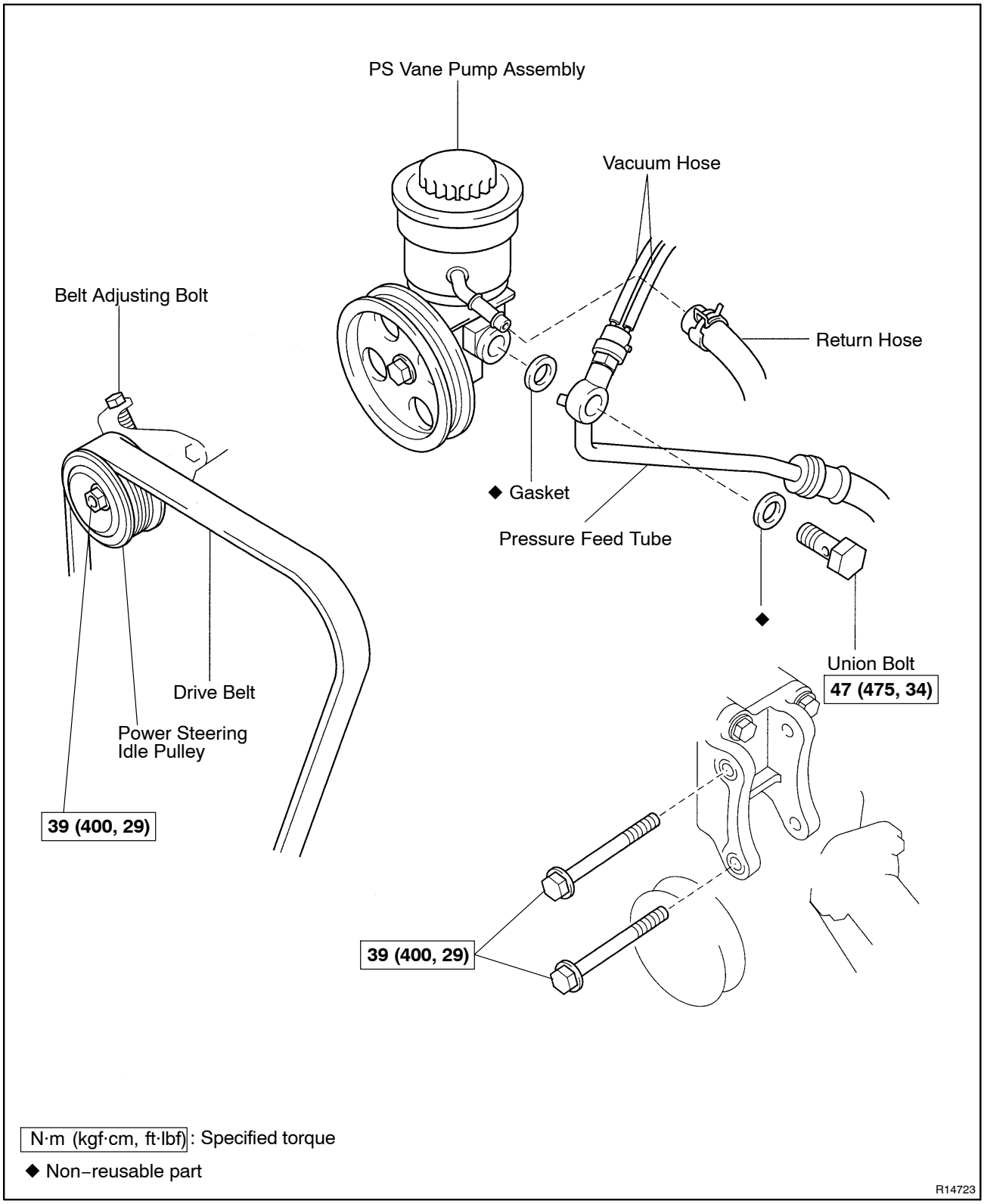
(See page SR–20)

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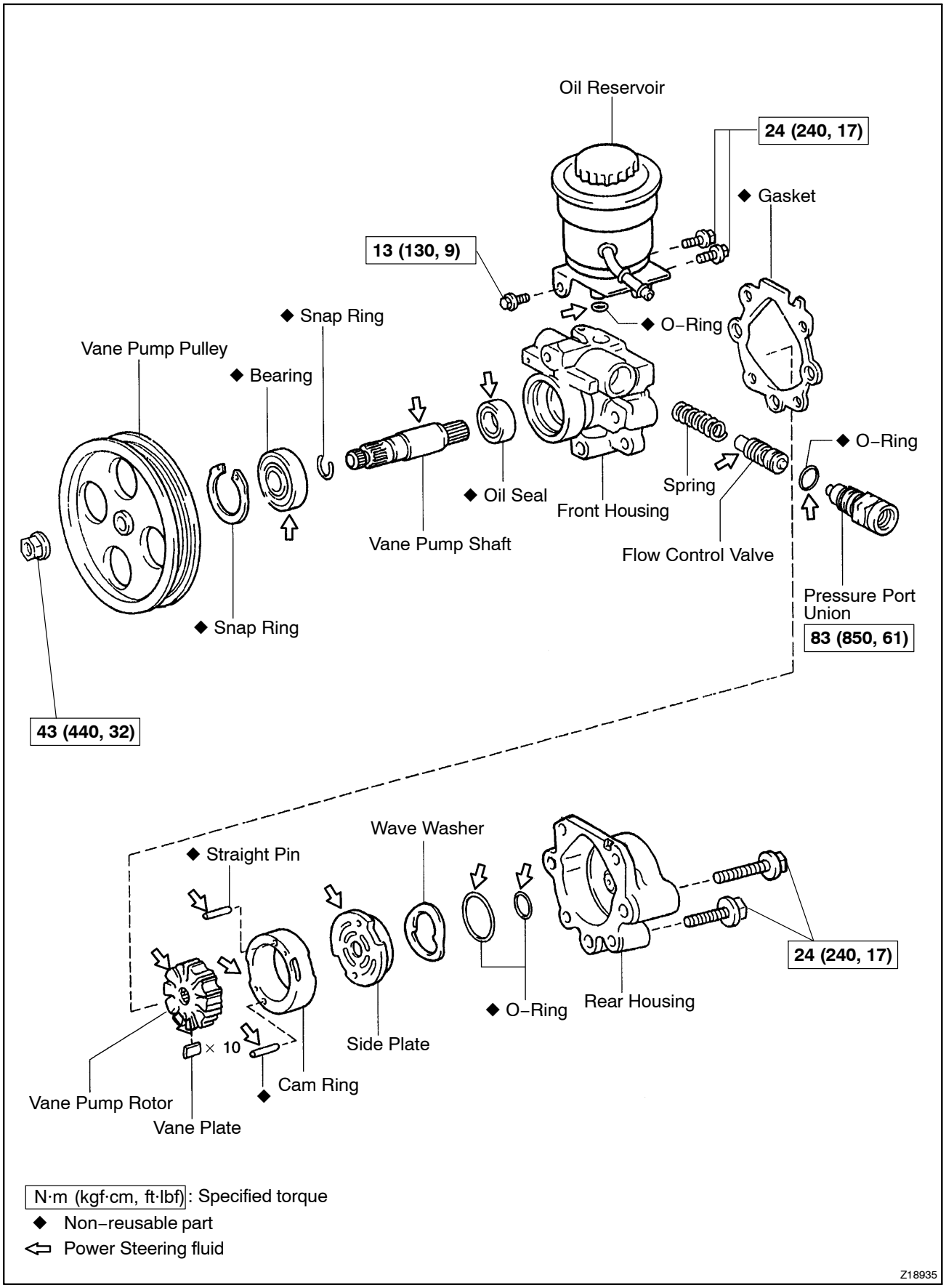
POWER STEERING VANE PUMP (3RZ–FE)

COMPONENTS

SR07I–01



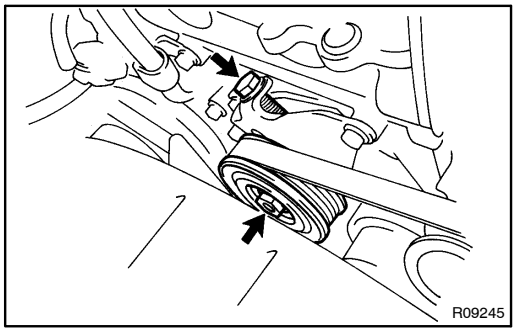
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SR07J–01

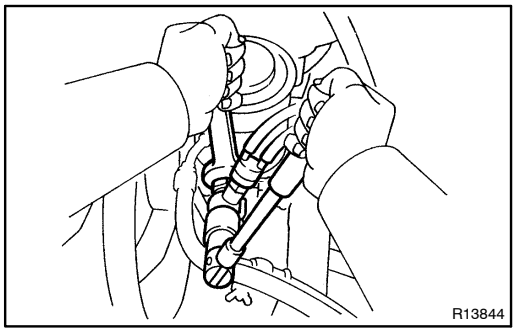
REMOVAL



1. REMOVE DRIVE BELT

(a) Loosen the power steering idle pulley set bolt.

(b) Loosen the belt adjusting bolt.



2. DISCONNECT PRESSURE FEED TUBE

Using a spanner (24 mm) to hold the pressure port union, remove the union bolt and the 2 gaskets.

3. DISCONNECT RETURN HOSE

NOTICE:

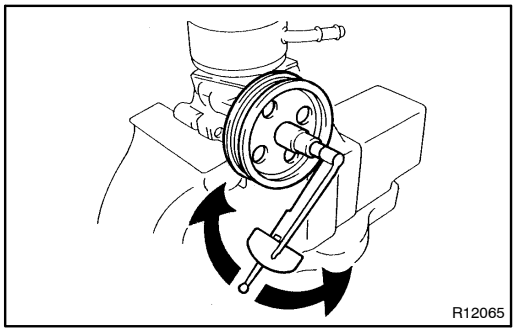
Take care not to spill fluid on the drive belt.

4. REMOVE PS VANE PUMP ASSEMBLY

Remove the 2 pump assembly set bolts.

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SR07K–01



DISASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

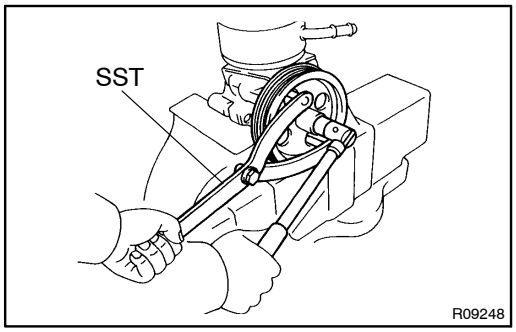
1. MEASURE PS VANE PUMP ROTATING TORQUE

(a) Check that the pump rotates smoothly without abnormal noise.

(b) Using a torque wrench, check the pump rotating torque.

Rotating torque:

0.25 N·m (2.5 kgf·cm, 2.2 in.·lbf) or less



2. REMOVE VANE PUMP PULLEY

Using SST to stop the pulley rotating, remove the pulley set nut.

SST 09960–10010 (09962–01000, 09963–01000)

3. REMOVE OIL RESERVOIR

(a) Remove the 3 bolts and oil reservoir.

(b) Remove the O–ring from the oil reservoir.

4. REMOVE PRESSURE PORT UNION, FLOW CONTROL VALVE AND SPRING

Remove the O–ring from the union.

5. REMOVE REAR HOUSING

(a) Remove the 2 bolts and rear housing.

(b) Remove the 2 O–rings from the housing.

6. REMOVE WAVE WASHER

7. REMOVE SIDE PLATE

8. REMOVE CAM RING, VANE PLATES AND VANE PUMP ROTOR

(a) Remove the 10 plates.

NOTICE:

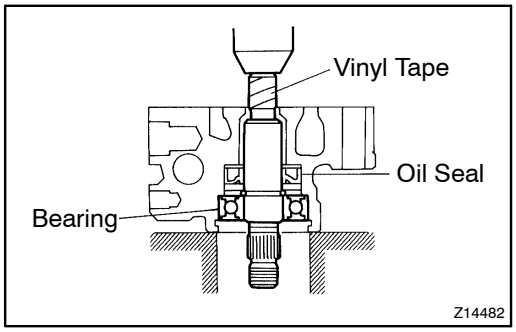
Take care not to drop the plate.

(b) Using a screwdriver, remove the snap ring from the vane pump shaft.

9. REMOVE STRAIGHT PINS

Remove the 2 pins from the front housing.

10. REMOVE GASKET



11. REMOVE VANE PUMP SHAFT WITH BEARING

(a) Using snap ring pliers, remove the snap ring from the front housing.

(b) Wind vinyl tape on the serrated part of the vane pump shaft.

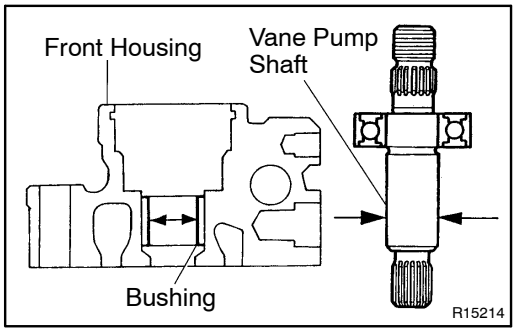
(c) Using a press, press out the shaft with the bearing.

NOTICE:

Be careful not to damage the oil seal lip.

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SR07L–02



INSPECTION

NOTICE:

When using a vise, do not overtighten it.

1. CHECK OIL CLEARANCE BETWEEN VANE PUMP SHAFT AND BUSHING

Using a micrometer and a caliper gauge, measure the oil clearance.

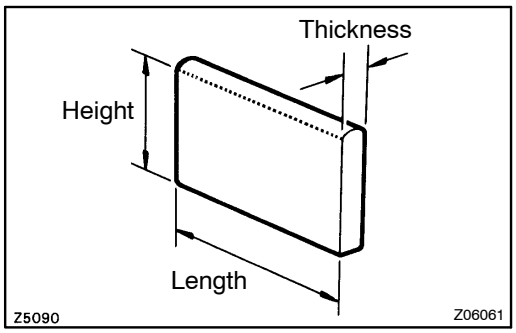
Standard Clearance:
0.03 – 0.05 mm (0.0012 – 0.0020 in.)
Maximum clearance: 0.007 mm (0.0028 in.)

If it is more than maximum, replace the front housing and vane pump shaft.

2. INSPECT VANE PUMP ROTOR AND VANE PLATES

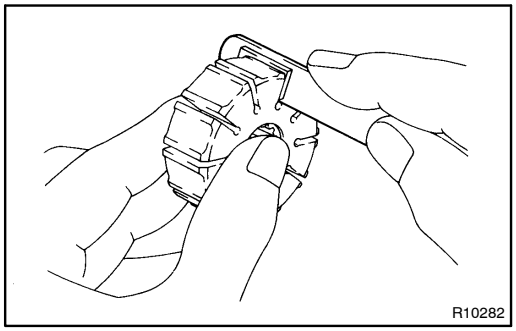
(a) Using a micrometer, measure the height, thickness and length of the 10 plates.

Minimum height: 8.6 mm (0.339 in.)
Minimum thickness: 1.397 mm (0.05500 in.)
Minimum length: 14.991 mm (0.59020 in.)



(b) Using a feeler gauge, measure the clearance between the rotor groove and plate.

Maximum clearance: 0.035 mm (0.00138 in.)

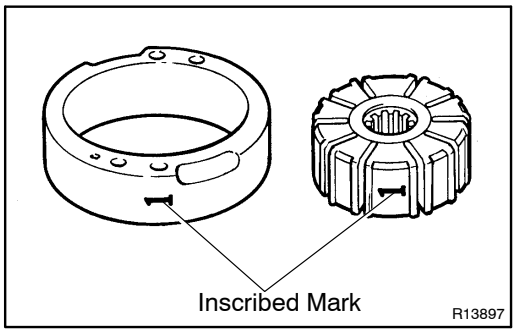


If it is more than maximum, replace the plate and/or rotor with one having the same mark stamped on the cam ring.

Inscribed mark: 1, 2, 3, 4 or None

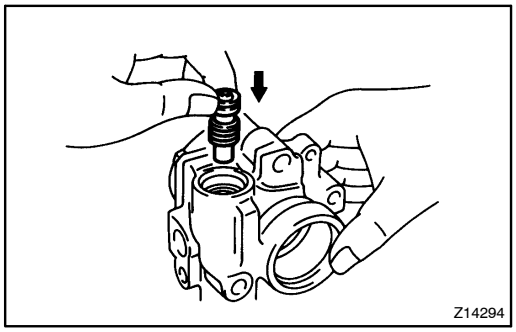
HINT:

There are 5 vane plate lengths with the following rotor and cam ring marks:



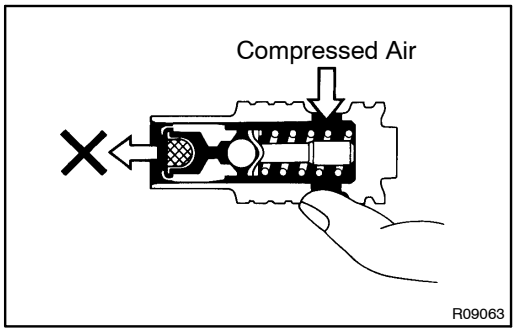
Rotor and cam ring mark	Vane plate part number	Vane plate length mm (in.)
None	44345–26010	14.999 – 15.001 (0.59051 – 0.59059)
1	44345–26020	14.997 – 14.999 (0.59043 – 0.59051)
2	44345–26030	14.995 – 14.997 (0.59035 – 0.59043)
3	44345–26040	14.993 – 14.995 (0.59027 – 0.59035)
4	44345–26050	14.991 – 14.993 (0.59020 – 0.59027)

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Z14294

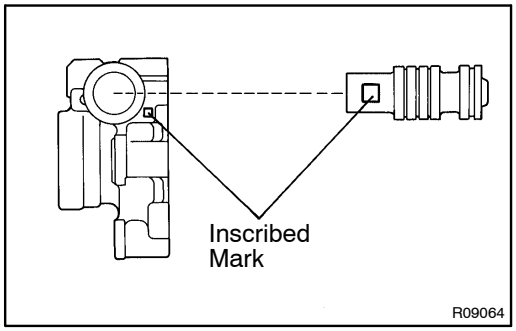
3. INSPECT FLOW CONTROL VALVE

(a) Coat the valve with power steering fluid and check that it falls smoothly into the valve hole by its own weight.



R09063

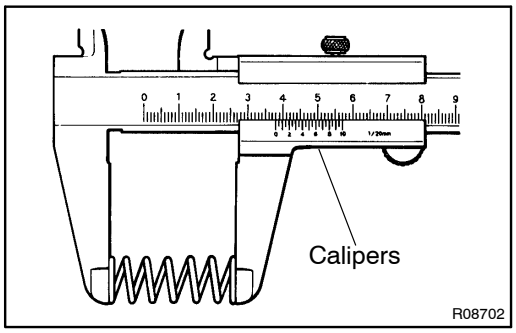
(b) Check the flow control valve for leakage.
Close one of the holes and apply compressed air 392 – 490 kPa (4 – 5 kgf/cm^2, 57 – 71 psi) into the opposite side, and confirm that air does not come out from the end hole.



R09064

If necessary, replace the valve with one having the same letter on the front housing.

Inscribed mark: A, B, C, D, E or F



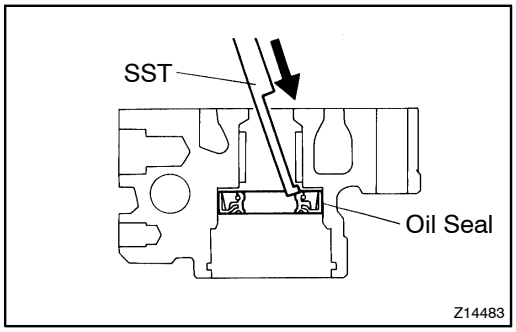
R08702

4. INSPECT SPRING

Using calipers, measure the free length of the spring.

Minimum free length: 32.3 mm(1.272 in.)

If it is not within the specification, replace the spring.



Z14483

5. IF NECESSARY, REPLACE OIL SEAL

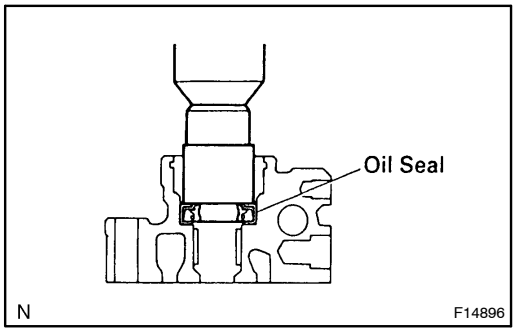
(a) Using SST, tap out the oil seal from the front housing.
SST 09631–10030

NOTICE:

Be careful not to damage the bushing of the front housing.

(b) Coat a new oil seal lip with power steering fluid.

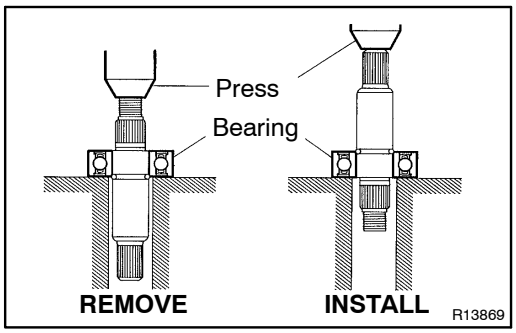
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(c) Using a socket wrench (24 mm), press in the oil seal.

NOTICE:

Make sure to install the oil seal facing the correct direction.



6. IF NECESSARY, REPLACE BEARING

(a) Press out the bearing from the vane pump shaft.

(b) Using a snap ring expander, remove the snap ring from the shaft.

NOTICE:

Be careful not to damage the shaft.

(c) Using a snap ring expander, install a new snap ring to the shaft.

NOTICE:

Be careful not to damage the shaft.

(d) Coat a new bearing with power steering fluid.

(e) Press in the bearing to the shaft.

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SR07M–01

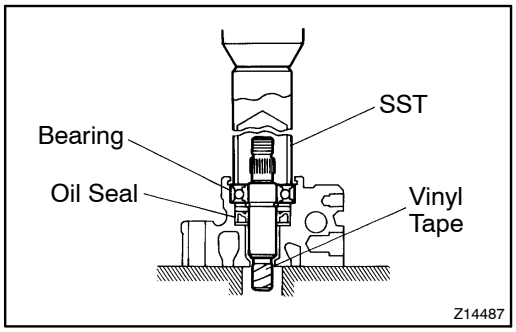
REASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. COAT WITH POWER STEERING FLUID

(See page SR–34)



2. INSTALL VANE PUMP SHAFT WITH BEARING

(a) Wind vinyl tape on the serrated part of the vane pump shaft.

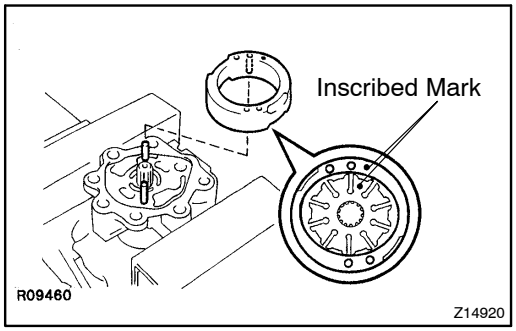
(b) Using SST, press in the shaft with the bearing.

SST 09608–04031

NOTICE:

Be careful not to damage the oil seal.

(c) Using snap ring pliers, install a new snap ring to the front housing.



3. INSTALL STRAIGHT PINS

Using a plastic hammer, tap in 2 new pins to the front housing.

NOTICE:

Be careful not to damage the pins.

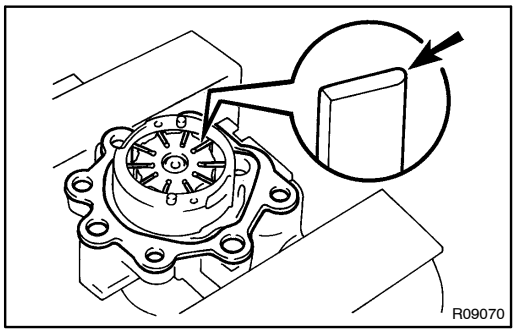
4. INSTALL CAM RING

Install the ring with the inscribed mark facing outward.

5. INSTALL VANE PUMP ROTOR

(a) Install the rotor with the inscribed mark facing outward.

(b) Install a new snap ring to the vane pump shaft.



6. INSTALL VANE PLATES AND GASKET

(a) Install the 10 plates with the round end facing outward.

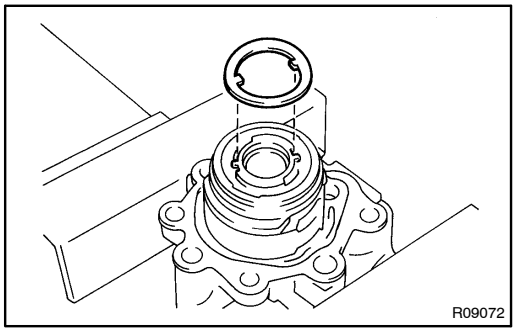
(b) Install a new gasket on the front housing.

NOTICE:

Be careful the direction of the gasket.

7. INSTALL SIDE PLATE

Align the holes of the side plate and straight pins, and install the plate.



8. INSTALL WAVE WASHER

Install the wave washer so that its protrusions fit into the slots in the side plate.

9. INSTALL REAR HOUSING

(a) Coat 2 new O–rings with power steering fluid and install them to the housing.

(b) Torque the 2 bolts.

Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)

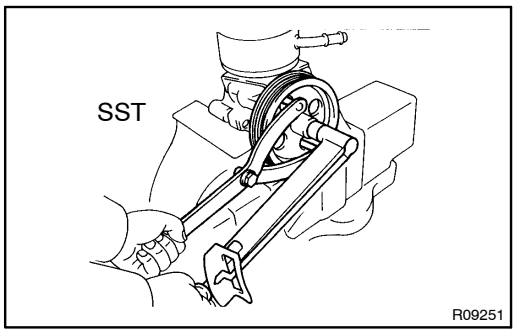
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10. INSTALL SPRING, FLOW CONTROL VALVE AND PRESSURE PORT UNION

(a) Install the valve facing the correct direction.
(See page SR–34)

(b) Coat a new O–ring with power steering fluid and install it to the union.

(c) Torque the union.
Torque: 83 N·m (850 kgf·cm, 61 ft·lbf)



11. INSTALL OIL RESERVOIR

(a) Coat a new O–ring with power steering fluid and install it to the oil reservoir.

(b) Install the oil reservoir with the 3 bolts.
Torque:
Front side bolt: 13 N·m (130 kgf·cm, 9 ft·lbf)
Rear side bolts: 24 N·m (240 kgf·cm, 17 ft·lbf)

12. INSTALL VANE PUMP PULLEY

Using SST to stop the pulley rotating, torque the nut.
SST 09960–10010 (09962–01000, 09963–01000)
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

13. MEASURE PS VANE PUMP ROTATING TORQUE
(See page SR–37)

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SR07N–01

INSTALLATION

1. INSTALL PS VANE PUMP ASSEMBLY

Torque the 2 pump assembly set bolts.

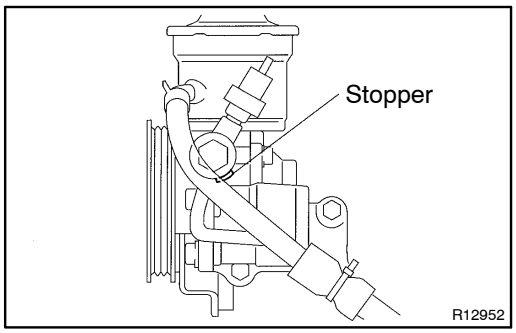
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

2. CONNECT RETURN HOSE

3. CONNECT PRESSURE FEED TUBE

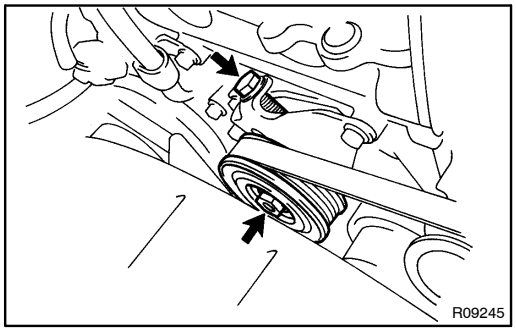
Torque the union bolt with a new gasket on each side of the tube.

Torque: 47 N·m (475 kgf·cm, 34 ft·lbf)



HINT:

Make sure the stopper of the tube is touching the PS pump body as shown, then torque the union bolt.



4. INSTALL DRIVE BELT

(a) Tighten the belt adjusting bolt, adjust drive belt tension. (See page SR–3)

(b) Torque the power steering idle pulley set nut.

Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

5. BLEED POWER STEERING SYSTEM

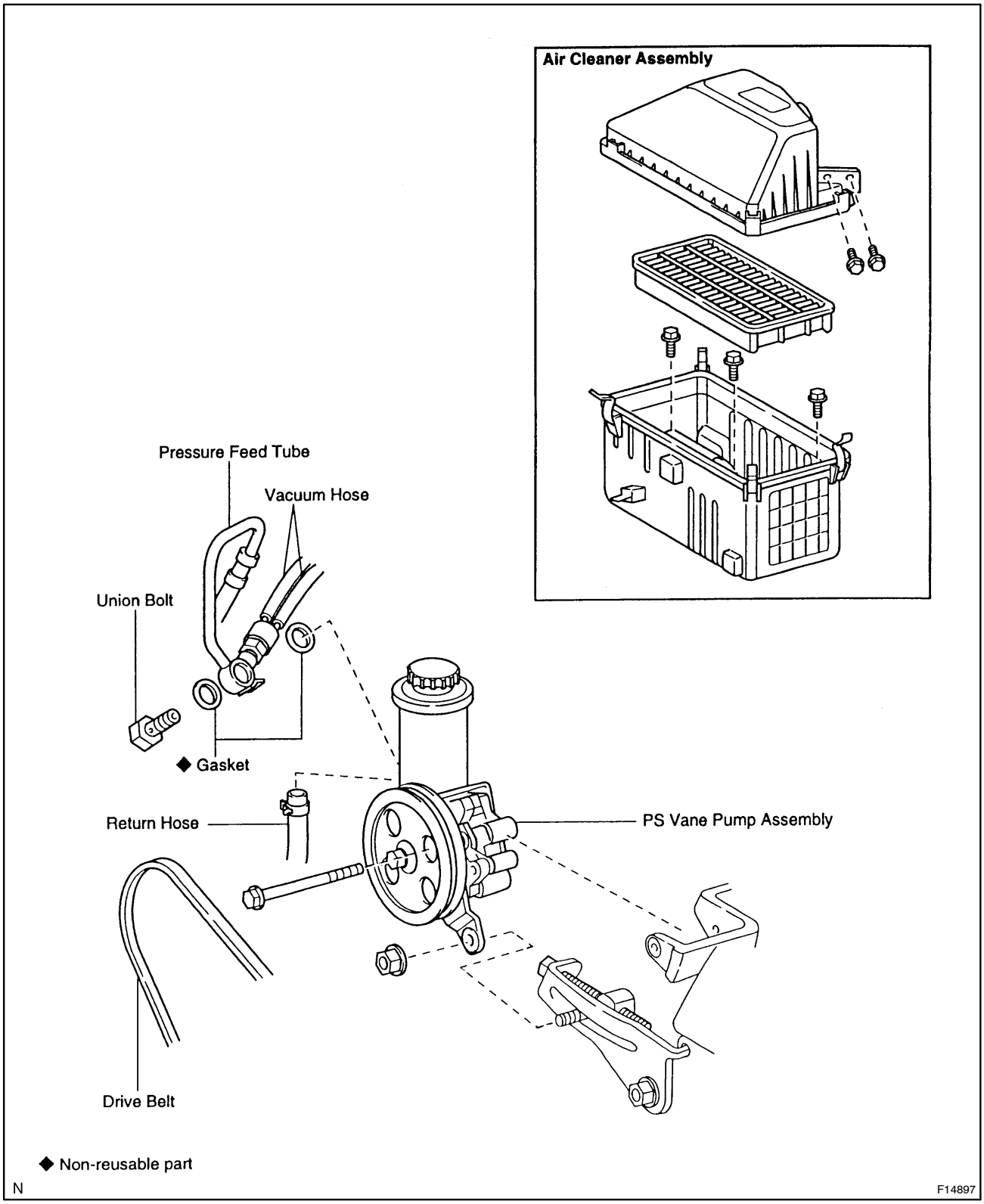
(See page SR–4)

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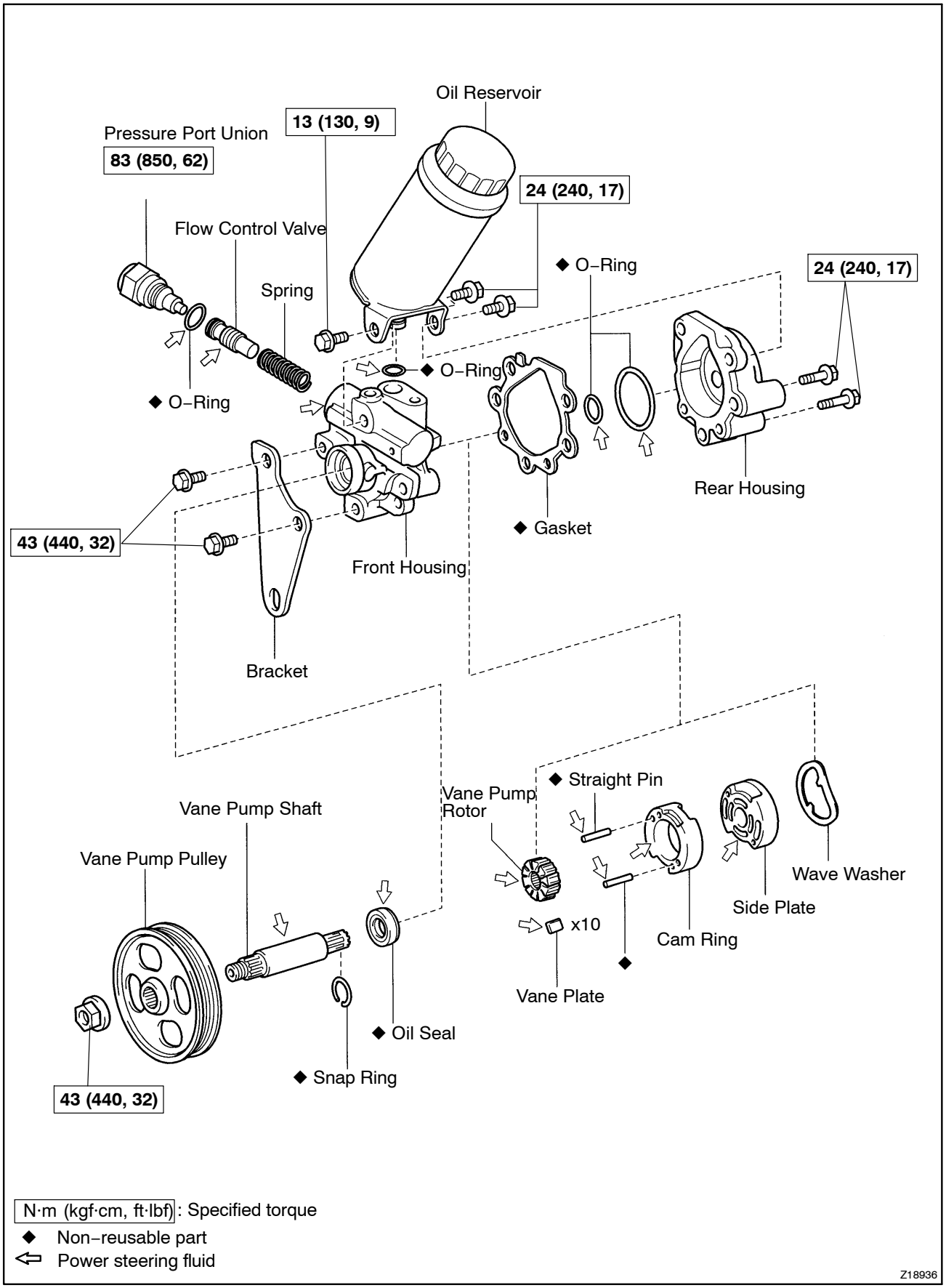
POWER STEERING VANE PUMP (5VZ–FE)

COMPONENTS

SR07O–02

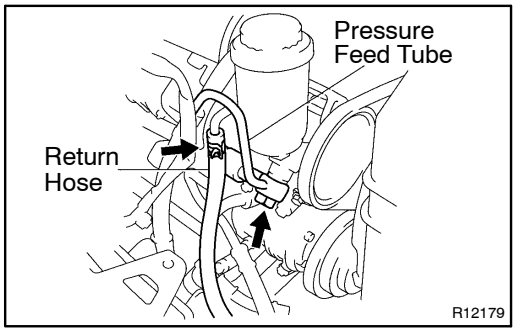


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SR07P–01



REMOVAL

1. REMOVE AIR CLEANER ASSEMBLY

Remove the 5 bolts.

2. DISCONNECT RETURN HOSE

NOTICE:

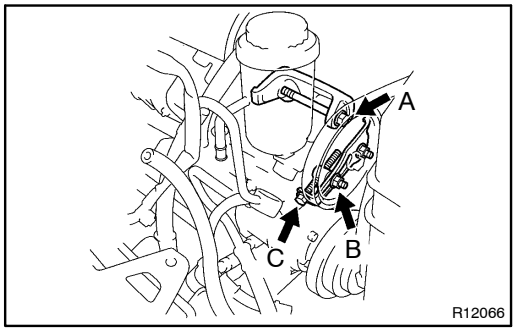
Take care not to spill fluid on the drive belt.

3. DISCONNECT PRESSURE FEED TUBE

(a) Disconnect the connector from the oil pressure switch.

(b) Remove the oil pressure switch from the pressure feed tube.

(c) Remove the union bolt and 2 gaskets, and disconnect the tube from the PS vane pump assembly.



4. REMOVE DRIVE BELT

(a) Loosen the bolt A and nut B.

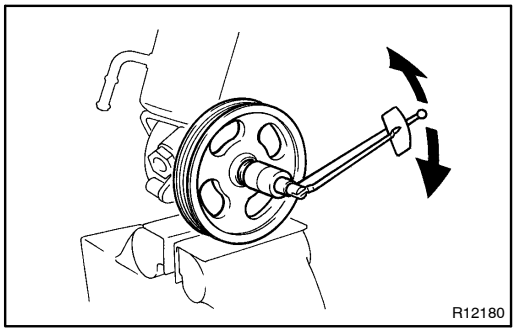
(b) Loosen the bolt C.

5. REMOVE PS VANE PUMP ASSEMBLY

Remove the bolt A and nut B.

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SR07Q–01



DISASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

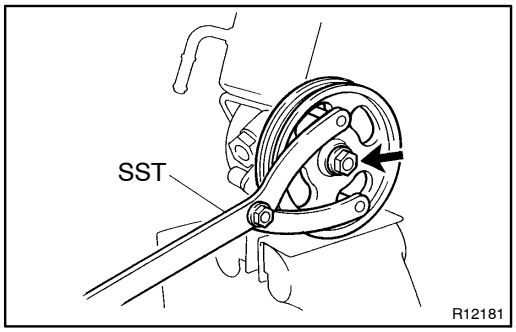
1. MEASURE PS VANE PUMP ROTATING TORQUE

(a) Check that the pump rotates smoothly without abnormal noise.

(b) Using a torque wrench, check the pump rotating torque.

Rotating torque:

0.25 N·m (2.5 kgf·cm, 2.2 in.·lbf) or less



2. REMOVE VANE PUMP PULLEY

Using SST to stop the pulley rotating, remove the pulley set nut.

SST 09960–10010 (09962–01000, 09963–01000)

3. REMOVE OIL RESERVOIR

(a) Remove the 3 bolts and oil reservoir.

(b) Remove the O–ring from the oil reservoir.

4. REMOVE PRESSURE PORT UNION, FLOW CONTROL VALVE AND SPRING

Remove the O–ring from the union.

5. REMOVE BRACKET

Remove the 2 bolts.

6. REMOVE REAR HOUSING

(a) Remove the 2 bolts.

(b) Remove the 2 O–rings from the housing.

7. REMOVE WAVE WASHER

8. REMOVE SIDE PLATE

9. REMOVE GASKET

10. REMOVE CAM RING, VANE PLATES AND VANE PUMP ROTOR

(a) Remove the 10 plates.

NOTICE:

Take care not to drop the plate.

(b) Using a screwdriver, remove the snap ring from the vane pump shaft.

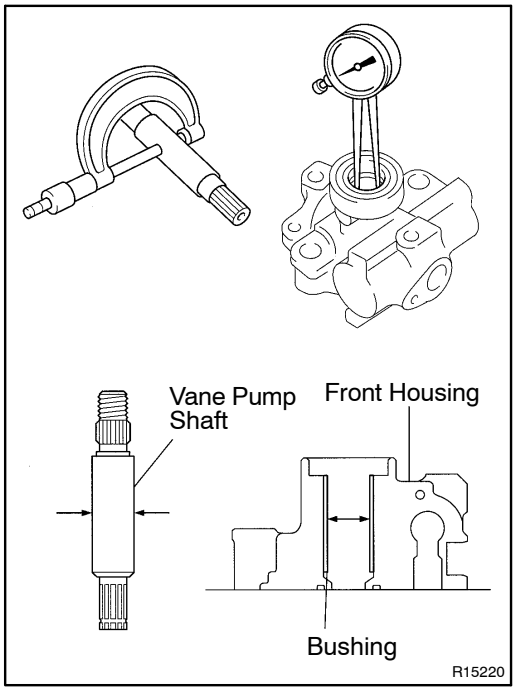
11. REMOVE VANE PUMP SHAFT

12. REMOVE STRAIGHT PINS

Remove the 2 pins from the front housing.

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SR07R–03



INSPECTION

NOTICE:

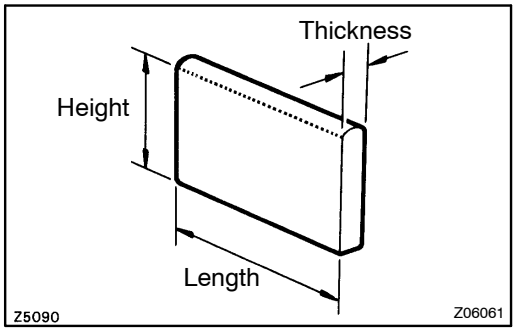
When using a vise, do not overtighten it.

1. CHECK OIL CLEARANCE BETWEEN VANE PUMP SHAFT AND BUSHING

Using a micrometer and caliper gauge, measure the oil clearance.

Standard clearance:
0.003 – 0.005 mm (0.0012 – 0.0020 in.)
Maximum clearance: 0.07 mm (0.0028 in.)

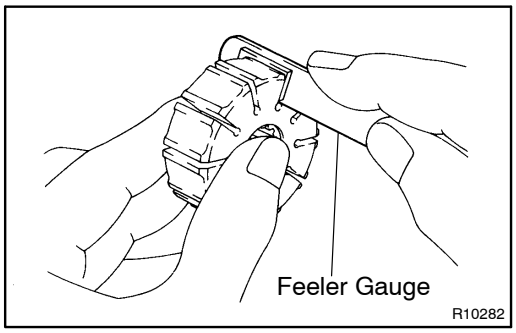
If it is more than maximum, replace the front housing and vane pump shaft.



2. INSPECT VANE PUMP ROTOR AND VANE PLATES

(a) Using a micrometer, measure the height, thickness and length of the 10 plates.

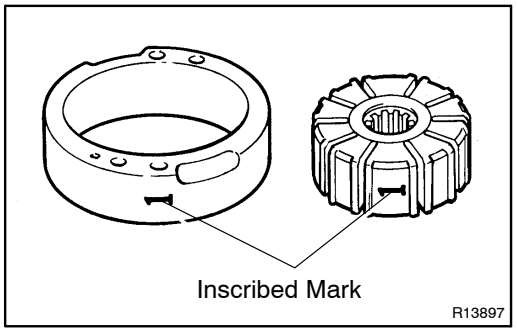
Minimum height: 8.6 mm (0.339 in.)
Minimum thickness: 1,397 mm (0.05500 in.)
Minimum length: 14,991 mm (0.59020 in.)



(b) Using a feeler gauge, measure the clearance between the rotor groove and plate.

Maximum clearance: 0.035 mm (0.00138 in.)

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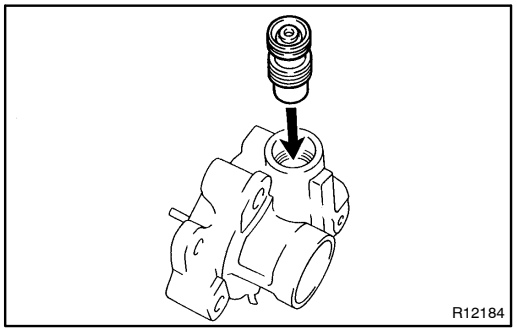
If it is more than maximum, replace the plate and/or rotor with one having the same mark stamped on the cam ring.

Inscribed mark: 1, 2, 3, 4 or None

HINT:

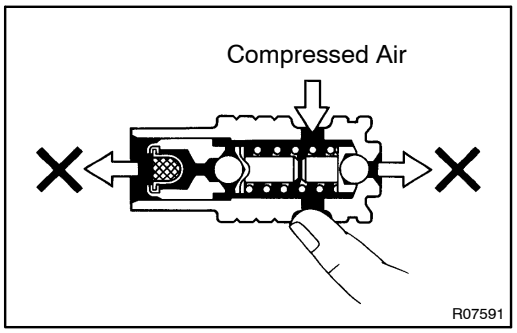
There are 5 vane plate lengths with the following rotor and cam ring marks:

Rotor and cam ring mark	Vane plate part number	Vane plate length mm (in.)
None	44345–26010	14.999 – 15.001 (0.59051 – 0.59059)
1	44345–26020	14.997 – 14.999 (0.59043 – 0.59051)
2	44345–26030	14.995 – 14.997 (0.59035 – 0.59043)
3	44345–26040	14.993 – 14.995 (0.59027 – 0.59035)
4	44345–26050	14.991 – 14.993 (0.59020 – 0.59027)

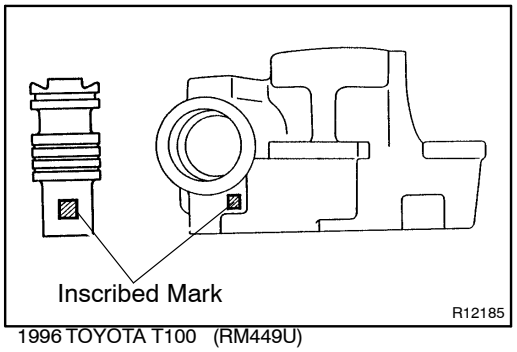


3. INSPECT FLOW CONTROL VALVE

(a) Coat the valve with power steering fluid and check that it falls smoothly into the valve hole by its own weight.



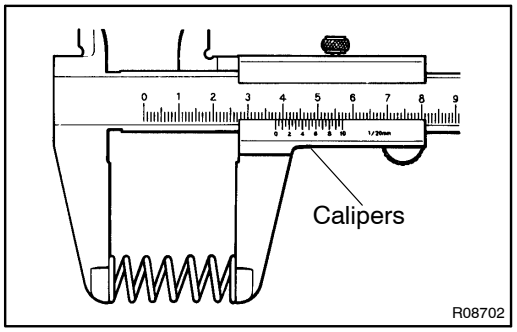
(b) Check the flow control valve for leakage.
Close one of the holes and apply compressed air 392 – 490 kPa (4 – 5 kgf/cm^2, 57 – 71 psi) into the opposite side, and confirm that air does not come out from the end holes.



If necessary, replace the valve with one having the same letter as inscribed on the front housing.

Inscribed mark: A, B, C, D, E or F

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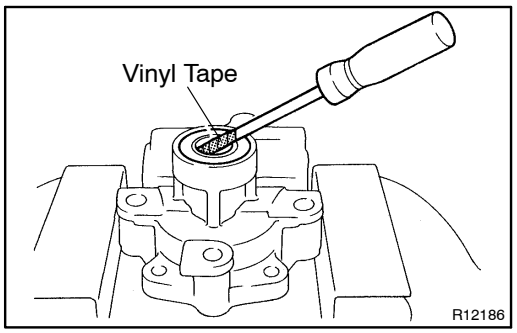


4. INSPECT SPRING

Using calipers, measure the free length of the spring.

Minimum free length: 32.3 mm (1.272 in.)

If it is not within the specification, replace the spring.

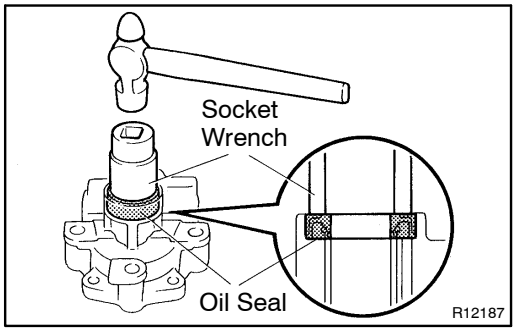


5. IF NECESSARY, REPLACE OIL SEAL

(a) Using a screwdriver with vinyl tape wound around its tip, remove the oil seal.

NOTICE:

Be careful not to damage the bushing of the front housing.



(b) Coat a new oil seal lip with power steering fluid.

(c) Using a socket wrench (24 mm) and a hammer, tap in the oil seal.

NOTICE:

Make sure to install the oil seal facing the correct direction.

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SR07S–01

REASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. COAT WITH POWER STEERING FLUID

(See page SR–44)

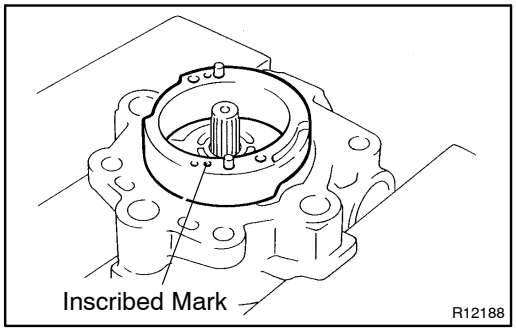
2. INSTALL STRAIGHT PINS

Using a plastic hammer, tap in 2 new pins to the front housing.

NOTICE:

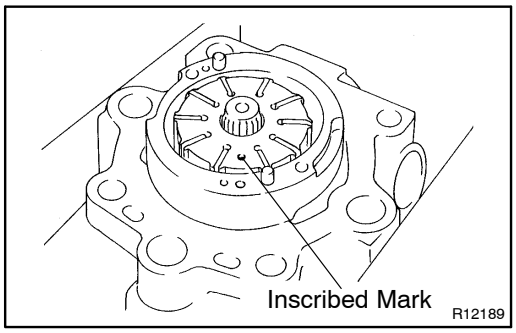
Be careful not to damage the pins.

3. INSTALL VANE PUMP SHAFT



4. INSTALL CAM RING

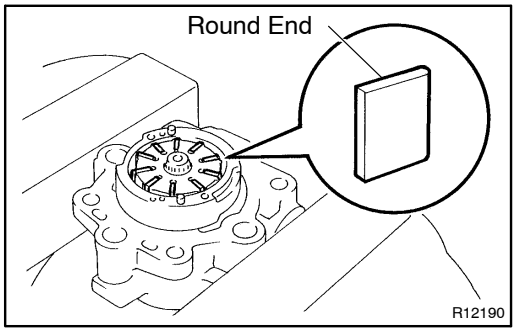
Install the ring with the inscribed mark facing outward.



5. INSTALL VANE PUMP ROTOR

(a) Install the rotor with the inscribed mark facing outward.

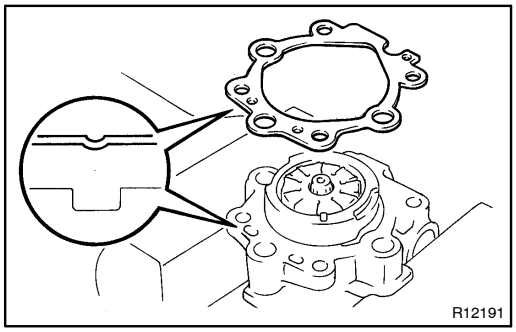
(b) Install a new snap ring to the vane pump shaft.



6. INSTALL VANE PLATES

Install the 10 plates with the round end facing outward.

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7. INSTALL GASKET

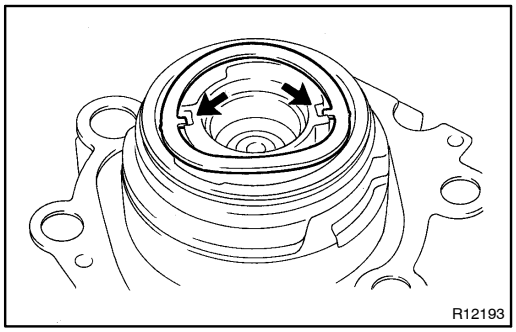
Install a new gasket on the front housing.

NOTICE:

Be careful the direction of the gasket.

8. INSTALL SIDE PLATE

Align the 2 straight pins and holes of the plate.



9. INSTALL WAVE WASHER

Install the washer so that its protrusions fit into the slots in the side plate.

10. INSTALL REAR HOUSING

(a) Coat 2 new O–rings with power steering fluid and install them to the housing.

(b) Torque the 2 bolts.

Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)

11. INSTALL SPRING, FLOW CONTROL VALVE AND PRESSURE PORT UNION

(a) Install the valve facing the correct direction.
(See page SR–44)

(b) Coat a new O–ring with power steering fluid and install it to the union.

(c) Torque the union.

Torque: 83 N·m (850 kgf·cm, 62 ft·lbf)

12. INSTALL BRACKET

Torque the 2 bolts.

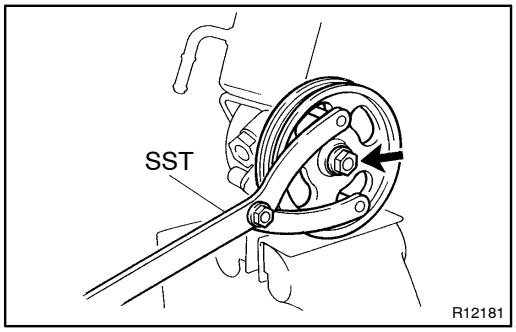
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

13. INSTALL OIL RESERVOIR

(a) Coat a new O–ring with power steering fluid and install it to the oil reservoir.

(b) Install the oil reservoir with the 3 bolts.

Torque:
Front side bolt: 13 N·m (130 kgf·cm, 9 ft·lbf)
Rear side bolts: 24 N·m (240 kgf·cm, 17 ft·lbf)



14. INSTALL VANE PUMP PULLEY

Using SST to stop the pulley rotating, torque the nut.

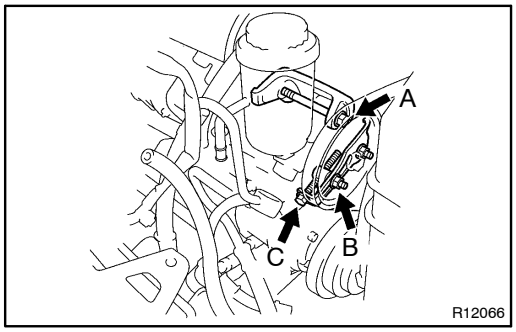
SST 09960–10010 (09962–01000, 09963–01000)

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

15. MEASURE PS VANE PUMP ROTATING TORQUE
(See page SR–47)

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SR07T–01



INSTALLATION

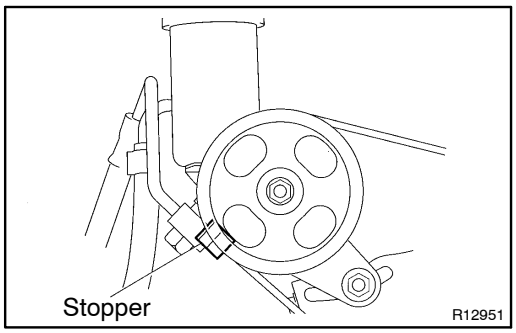
1. INSTALL PS VANE PUMP ASSEMBLY

Temporarily tighten the bolt A and nut B.

2. INSTALL DRIVE BELT

(a) Tighten the bolt C, adjust drive belt tension.
(See page SR–3)

(b) Torque the bolt A and nut B.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)



3. CONNECT PRESSURE FEED TUBE

(a) Torque the union bolt with a new gasket on each side of the tube.
Torque: 47 N·m (475 kgf·cm, 34 ft·lbf)

HINT:
Make sure the stopper of the tube is touching the PS pump body as shown, then torque the union bolt.

(b) Install the oil pressure switch.

(c) Connect the connector.

4. CONNECT RETURN HOSE

5. INSTALL AIR CLEANER ASSEMBLY

Install the 5 bolts.

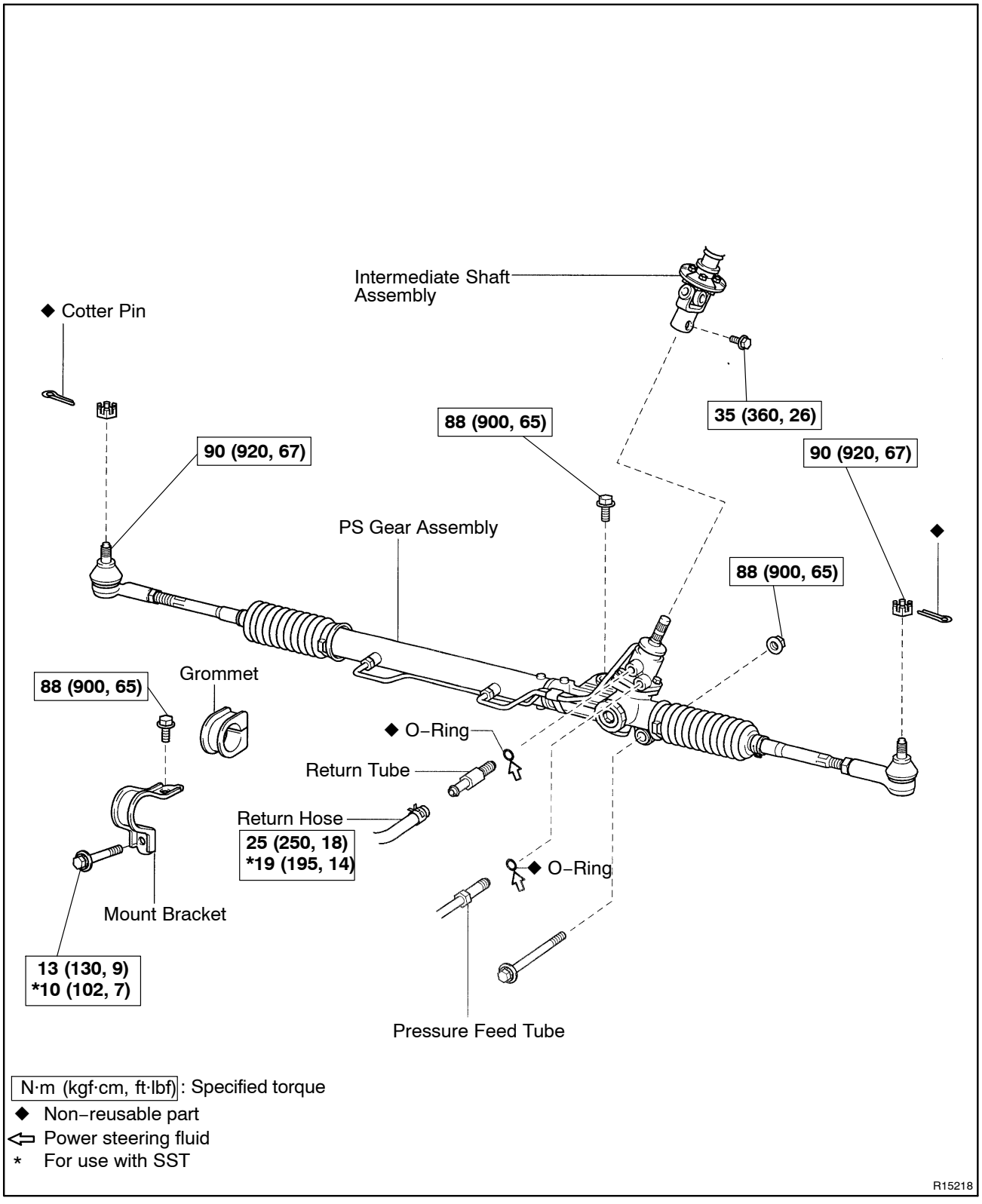
6. BLEED POWER STEERING SYSTEM
(See page SR–4)

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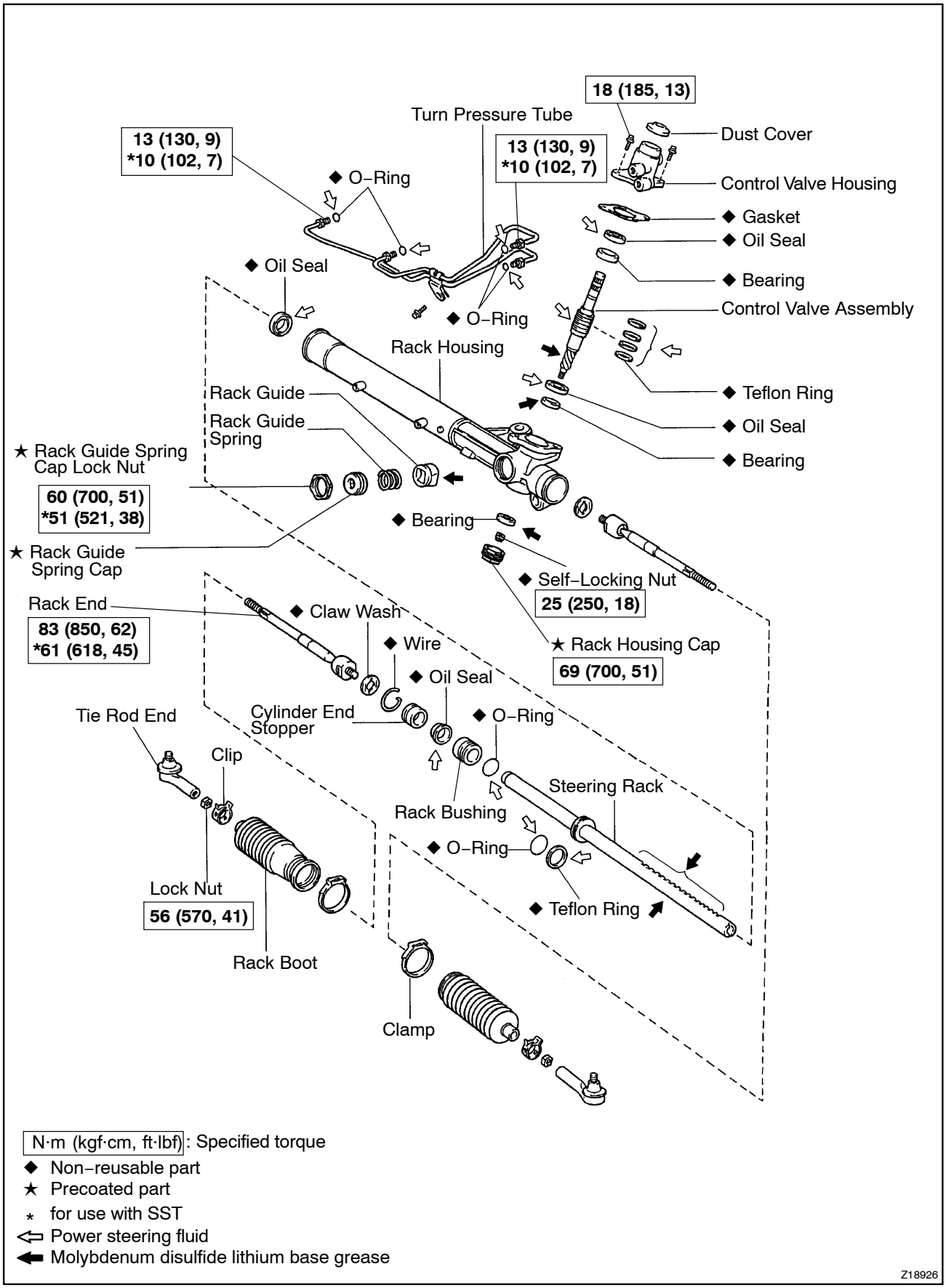
POWER STEERING GEAR (2WD)

COMPONENTS

SR07U–01



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N·m (kgf·cm, ft·lbf): Specified torque
◆ Non–reusable part
★ Precoated part
* for use with SST
⇦ Power steering fluid
⬅ Molybdenum disulfide lithium base grease

Z18926

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SR07V–01

REMOVAL

1. PLACE FRONT WHEELS FACING STRAIGHT AHEAD

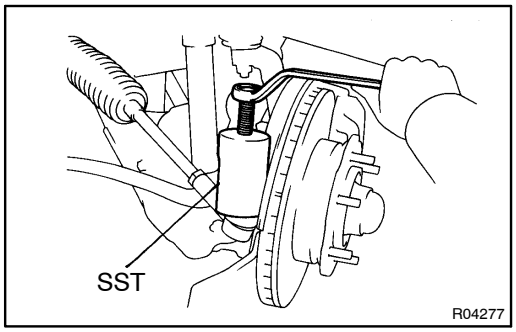
2. REMOVE STEERING WHEEL PAD
(See page SR–13)

3. REMOVE STEERING WHEEL
(See page SR–13)

4. DISCONNECT RH AND LH TIE ROD ENDS

(a) Remove the cotter pin and nut.

(b) Using SST, disconnect the tie rod end from the knuckle arm.
SST 09610–20012



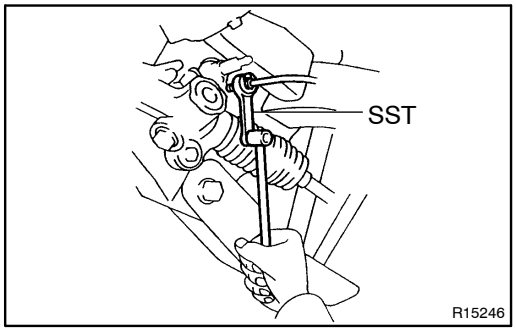
5. DISCONNECT INTERMEDIATE SHAFT ASSEMBLY
(See page SR–13)

6. DISCONNECT RETURN HOSE

7. DISCONNECT PRESSURE FEED TUBE AND REMOVE RETURN TUBE

(a) Using SST, disconnect the pressure feed tube and remove the return tube.
SST 09631–22020

(b) Remove the O–ring from the tube.



8. REMOVE MOUNT BRACKET AND GROMMET

(a) Remove the 2 bolts.

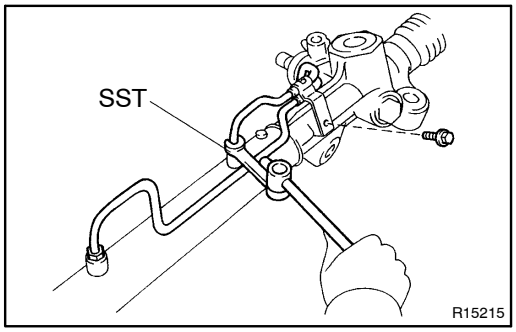
(b) Remove the mount bracket and grommet from the PS gear assembly.

9. REMOVE PS GEAR ASSEMBLY

Remove the 2 gear assembly set bolts and nut.

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SR07W–01



DISASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

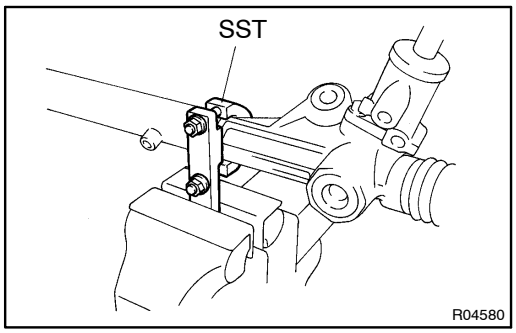
1. REMOVE 2 TURN PRESSURE TUBES

(a) Remove the bolt and clamp plate.

(b) Using SST, remove the tube.

SST 09633–00020

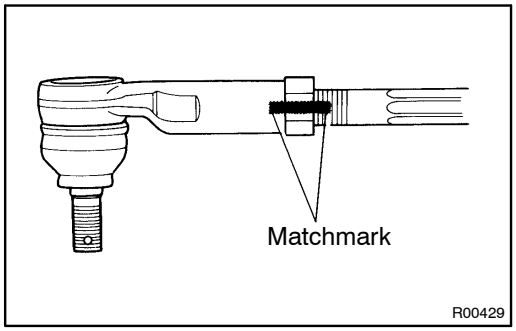
(c) Remove the 2 O–rings from the tube.



2. SECURE PS GEAR ASSEMBLY IN VISE

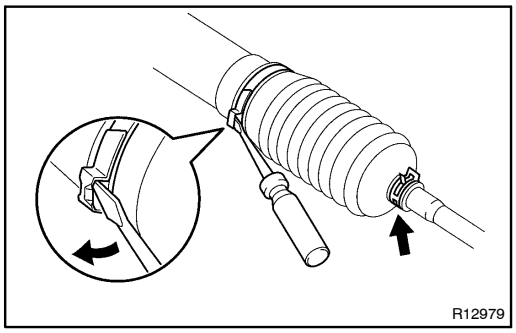
Using SST, secure the gear assembly in a vise.

SST 09612–00012



3. REMOVE RH AND LH TIE ROD ENDS AND LOCK NUTS

Place matchmarks on the tie rod end and rack end.

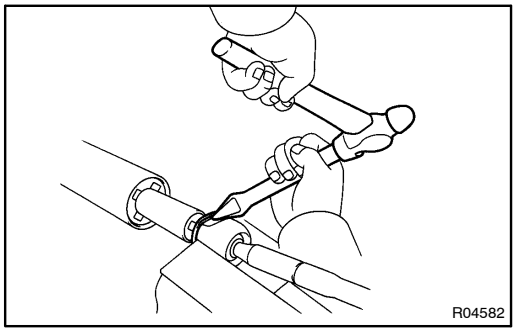


4. REMOVE RH AND LH CLIPS, RACK BOOTS AND CLAMPS

Using a screwdriver, loosen the clamp.

NOTICE:

- **Be careful not to damage the boot.**
- **Mark the RH and LH boots.**



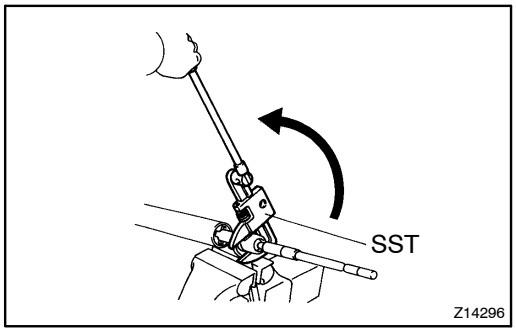
5. REMOVE RH AND LH RACK ENDS AND CLAW WASHERS

(a) Using a chisel and a hammer, unstake the washer.

NOTICE:

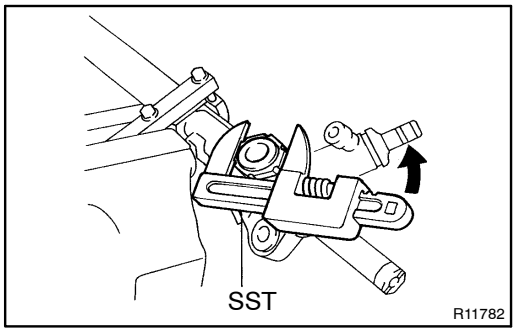
Avoid any impact to the steering rack.

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(b) Using a spanner to hold the steering rack steady, and using SST, remove the rack end.
SST 09922–10010

NOTICE:
- **Use SST 09922–10010 in the direction shown in the illustration.**
- **Mark the RH and LH rack ends.**



6. REMOVE RACK GUIDE SPRING CAP LOCK NUT

Using SST, remove the nut.
SST 09922–10010

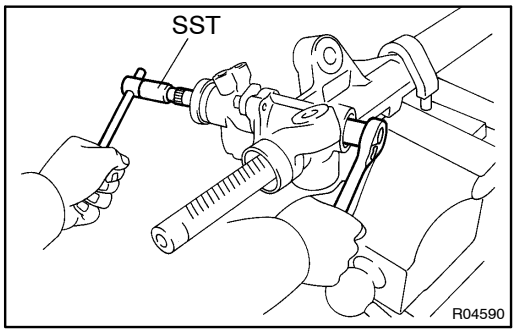
NOTICE:
Use SST 09922–10010 in the direction shown in the illustration.

7. REMOVE RACK GUIDE SPRING CAP

Using a hexagon wrench (21 mm), remove the cap.

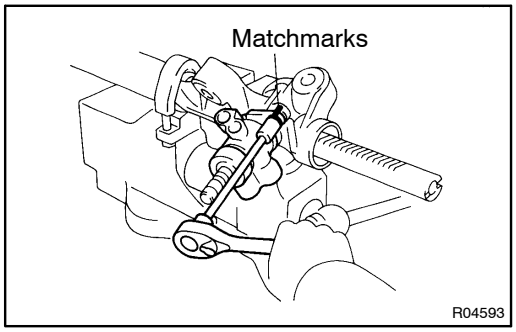
8. REMOVE RACK GUIDE SPRING AND RACK GUIDE

9. REMOVE RACK HOUSING CAP



10. REMOVE SELF–LOCKING NUT

Using SST to stop the control valve assembly rotating, remove the nut.
SST 09616–00010

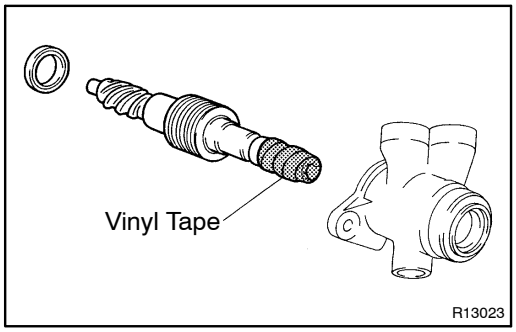


11. REMOVE DUST COVER

12. REMOVE CONTROL VALVE HOUSING WITH CONTROL VALVE ASSEMBLY

(a) Place matchmarks on the valve housing and rack housing.
(b) Remove the 2 bolts.
(c) Pull out the control valve assembly with the valve housing.
(d) Remove the gasket from the rack housing.

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13. REMOVE CONTROL VALVE ASSEMBLY

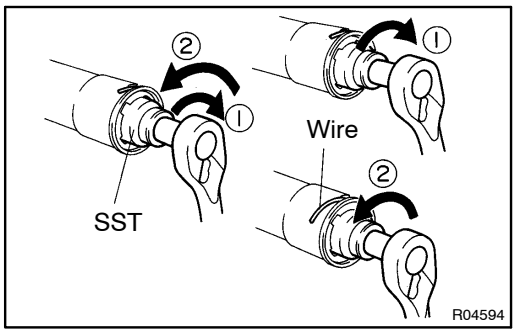
(a) To prevent oil seal lip damage, wind vinyl tape on the serrated part of the valve shaft.

(b) Using a plastic hammer, tap out the valve with the oil seal from the control valve housing.

NOTICE:

Be careful not to damage the oil seal lip.

(c) Remove the oil seal from the valve assembly.



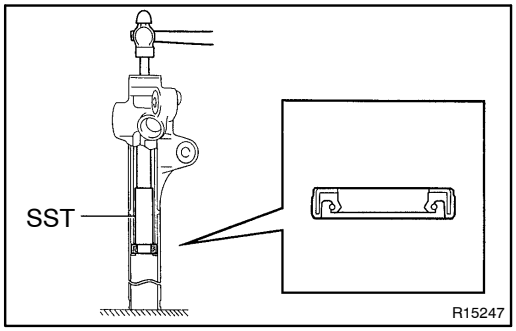
14. REMOVE CYLINDER END STOPPER

(a) Using SST, turn the stopper clockwise until the wire end comes out.

SST 09631–10021

(b) Using SST, turn the stopper counterclockwise, and remove the wire.

SST 09631–10021



15. REMOVE STEERING RACK AND RACK BUSHING

(a) Using a brass bar and a hammer, tap out the rack with the rack busing.

(b) Remove the O–ring from the bushing.

16. REMOVE OIL SEAL

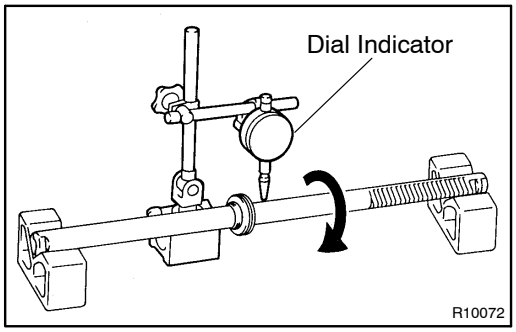
Using SST and a brass bar, drive out the oil seal from the rack housing.

SST 09623–30011

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SR1FE–01

INSPECTION

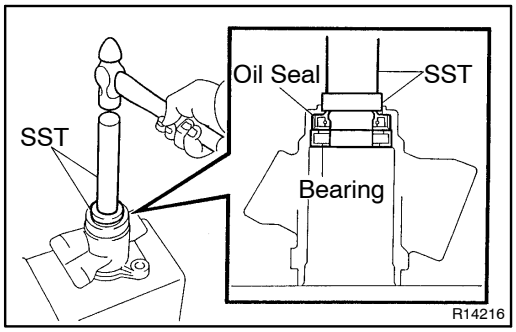


1. INSPECT STEERING RACK

(a) Using a dial indicator, check the rack for runout and for teeth wear or damage.

Maximum runout: 0.03 (0.0012 in.)

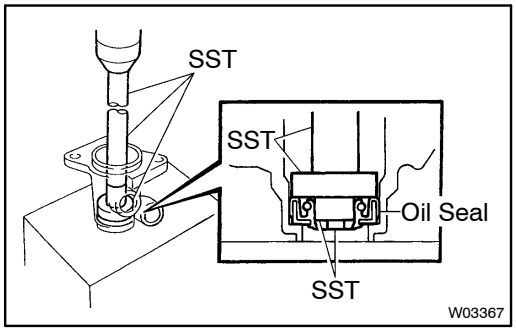
(b) Check the back surface for wear or damage.



2. IF NECESSARY, REPLACE OIL SEAL AND BEARING

(a) Using SST, tap out the oil seal and bearing from the control valve housing.

SST 09950–60010 (09951–00250), 09950–70010 (09951–07150)



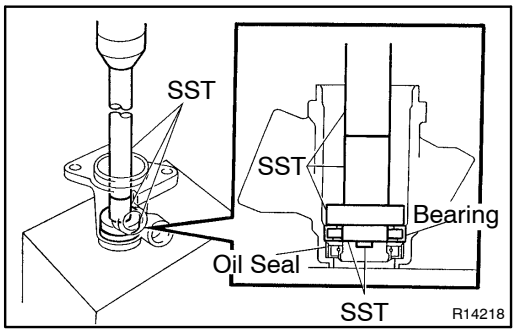
(b) Coat a new oil seal lip with power steering fluid.

(c) Using SST, press in the oil seal.

SST 09950–60010 (09951–00180, 09951–00320, 09952–06010), 09950–70010 (09951–07200)

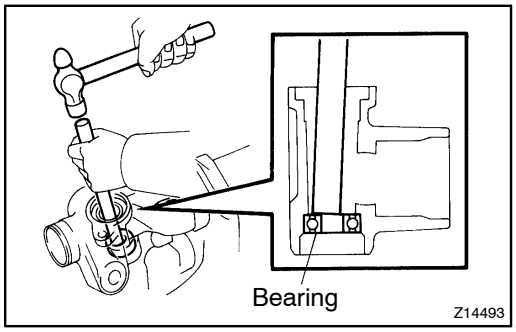
NOTICE:

Make sure to install the oil seal facing the correct direction.



(d) Using SST, press in a new bearing.

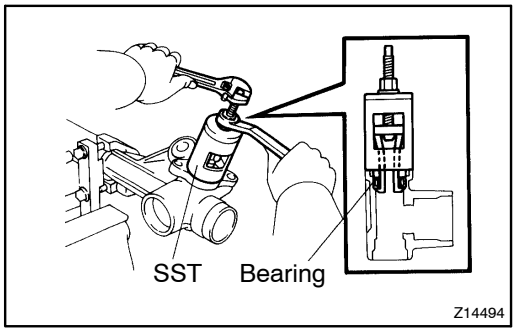
SST 09950–60010 (09951–00180, 09951–00340, 09952–06010), 09950–70010 (09951–07200)



3. IF NECESSARY, REPLACE 2 BEARINGS

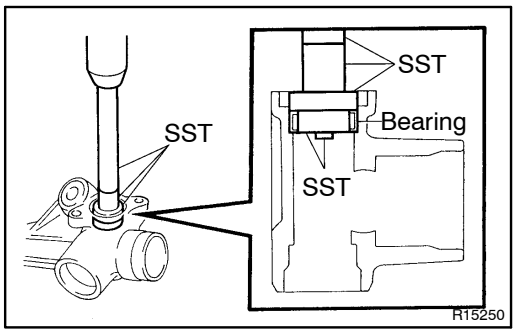
(a) Using a brass bar, drive out the bearing from the rack housing.

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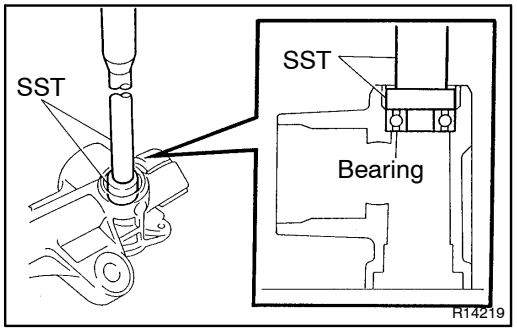


(b) Using SST, remove the bearing from the rack housing.
SST 09612–24014 (09613–22011)

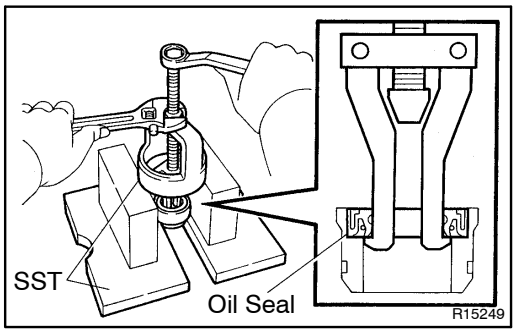
NOTICE:
Be careful not to damage the rack housing.



(c) Coat a new bearing with molybdenum disulfide lithunm base grease.
(d) Using SST, press in the bearing.
SST 09950–60010 (09951–00250, 09951–00310, 09952–06010), 09950–70010 (09951–07150)



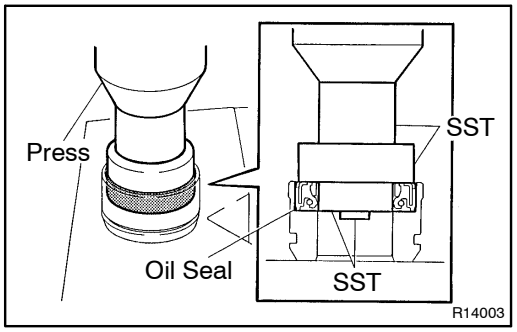
(e) Coat a new bearing with molybdenum disulfide lithunm base grease.
(f) Using SST, press in the bearing.
SST 09950–60010 (09951–00310), 09950–70010 (09951–07150)



4. IF NECESSARY, REPLACE OIL SEAL

(a) Using SST, remove the oil seal from the rack bushing.
SST 09236–00101 (09237–00010), 09612–65014 (09612–01060)

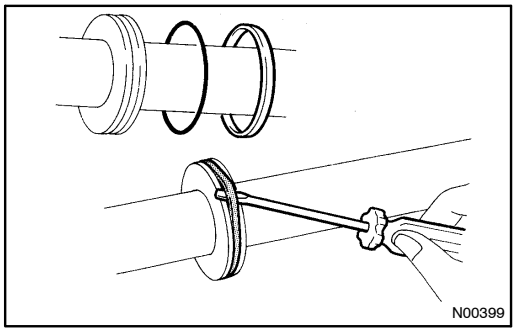
NOTICE:
- **As shown, from the opposite side of SST confirm that its claw is firmly caught on the bushing.**
- **Be careful not to damage the bushing.**



(b) Coat a new oil seal lip with power steering fluid.
(c) Using SST, press in the oil seal to the rack bushing.
SST 09950–60010 (09951–00260, 09951–00410, 09952–06010)

NOTICE:
Make sure to install the oil seal facing the correct direction.

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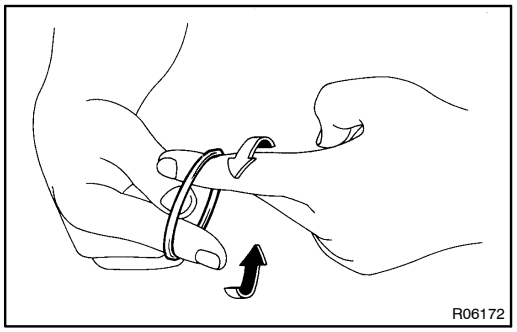
5. IF NECESSARY, REPLACE TEFLON RING AND O–RING

(a) Using a screwdriver, remove the teflon ring and O–ring from the steering rack.

NOTICE:

Be careful not to damage the groove of the ring.

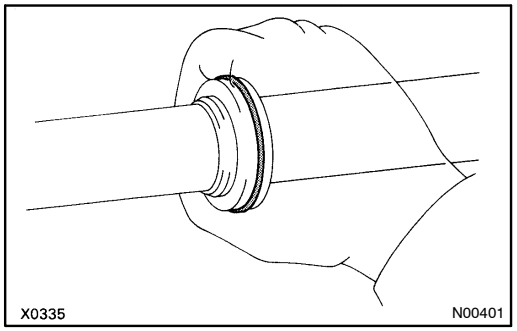
(b) Coat a new O–ring with power steering fluid and install it.



(c) Expand a new teflon ring with your fingers.

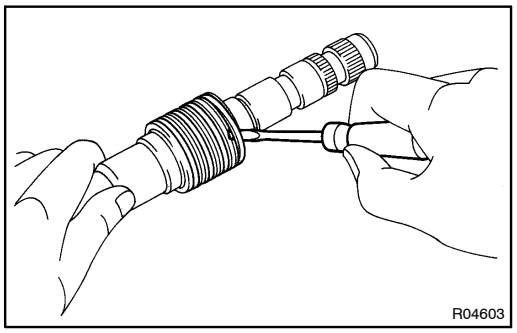
NOTICE:

Be careful not to overexpand the ring.



(d) Coat the ring with power steering fluid.

(e) Install the ring to the rack, and snug it down with your fingers.

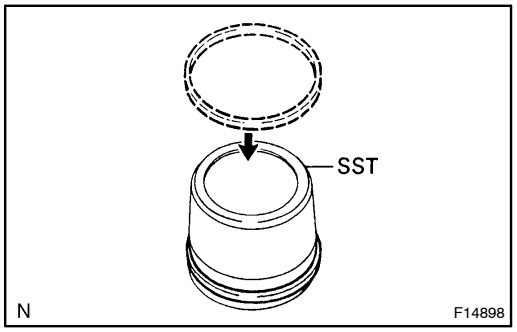


6. IF NECESSARY, REPLACE TEFLON RINGS

(a) Using a screwdriver, remove the 4 rings from the control valve assembly.

NOTICE:

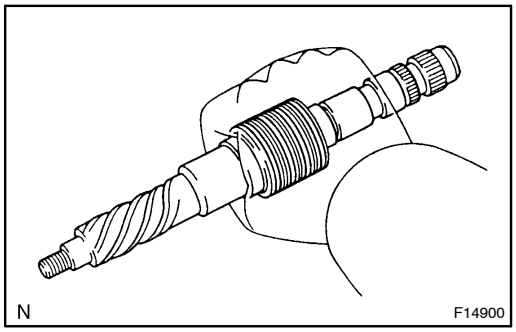
Be careful not to damage the grooves for the ring.



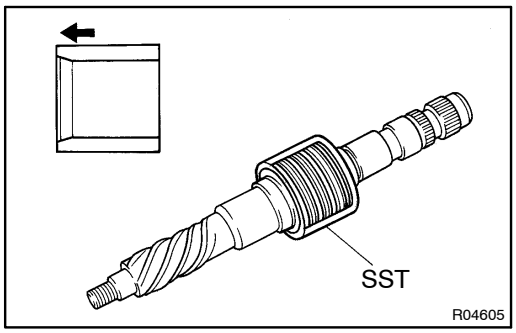
(b) Install 4 new teflon rings to SST, and expand them.
SST 09631–20070

(c) Coat the rings with power steering fluid.

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(d) Install the expanded teflon rings to the control valve and snug them down with your fingers.



(e) Carefully slide the tapered end of SST over the rings to seat the rings.
SST 09631–20081

NOTICE:
Be careful not to damage the rings.

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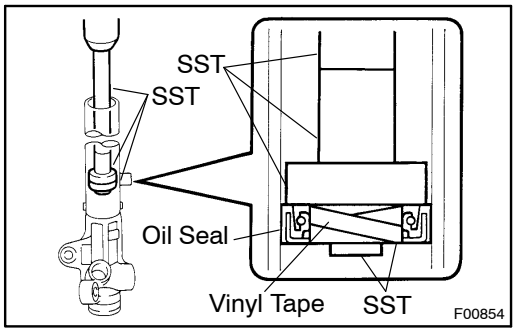
SR07Y–01

REASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. COAT WITH POWER STEERING FLUID OR MOLYBDENUM DISULFIDE LITHIUM BASE GREASE (See page SR–54)



2. INSTALL OIL SEAL

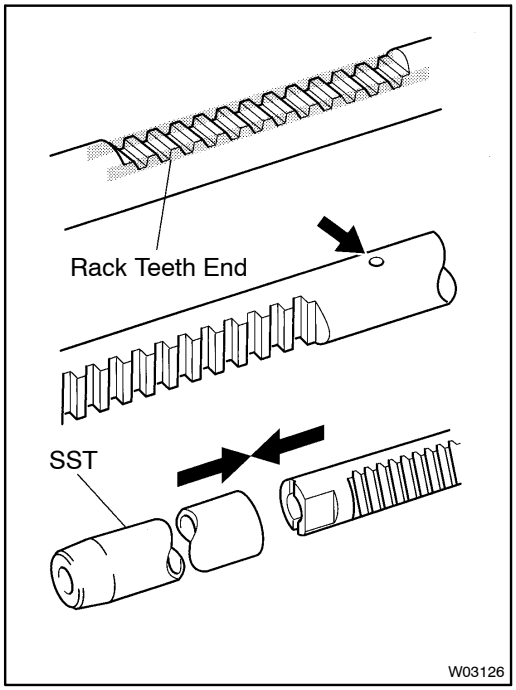
(a) Coat a new oil seal lip with power steering fluid.

(b) Using SST, press in the oil seal.

SST 09950–60010 (09951–00240, 09951–00430, 09952–06010), 09950–70010 (09951–07360)

NOTICE:

- **Make sure to install the oil seal facing the correct direction.**
- **Take care that the oil seal does not get reversed as you install it.**



3. INSTALL STEERING RACK

HINT:

If necessary, scrape the burrs off the rack teeth end then clean and burnish before installation.

(a) Make sure that the tube hole is not clogged with grease.

HINT:

If the tube hole is clogged, the pressure inside the boot will change after it is assembled and the steering wheel turned.

(b) Install SST to the rack.

SST 09631–33010

(c) Coat SST with power steering fluid.

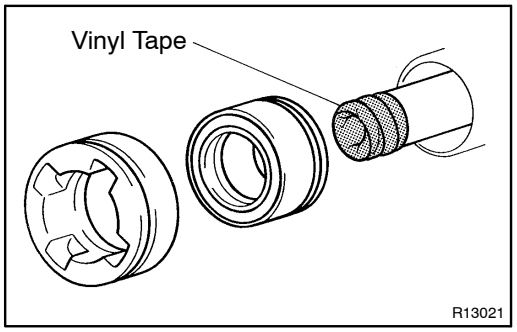
(d) Insert the rack into the rack housing.

NOTICE:

Be careful not to damage the oil seal lip.

(e) Remove the SST.

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4. INSTALL RACK BUSHING AND CYLINDER END STOPPER

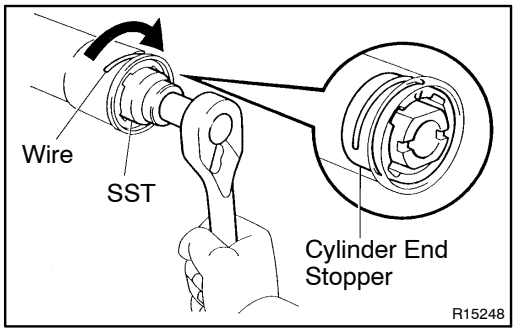
(a) To prevent oil seal lip damage, wind vinyl tape on the steering rack end, and apply power steering fluid.

(b) Coat a new O–ring with power steering fluid and install it to the bushing.

(c) Push in the bushing.

NOTICE:

Make sure to install the bushing facing the correct direction.



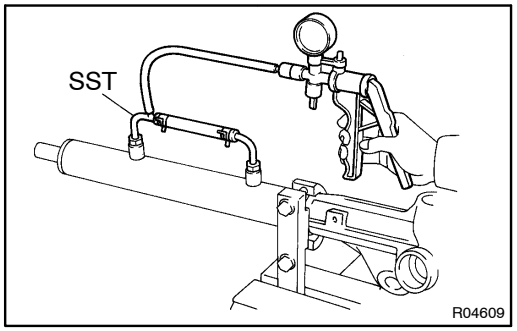
(d) Push in the cylinder end stopper until the wire installation hole appears.

5. INSTALL WIRE

(a) Insert a new wire end into the hole of the rack housing.

(b) Using SST, turn the cylinder end stopper clockwise until the wire end disappears.

SST 09631–10021



6. AIR TIGHTNESS TEST

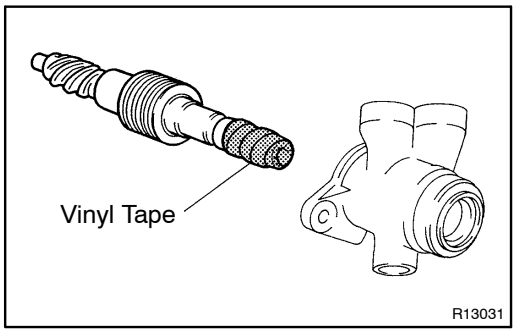
(a) Install SST to the rack housing.

SST 09631–12071

(b) Apply 53.3 kPa (400 mmHg, 15.75 in.Hg) of vacuum for about 30 seconds.

(c) Check that there is no change in the vacuum.

If there is change in the vacuum, check the installation of the oil seals.



7. INSTALL CONTROL VALVE ASSEMBLY

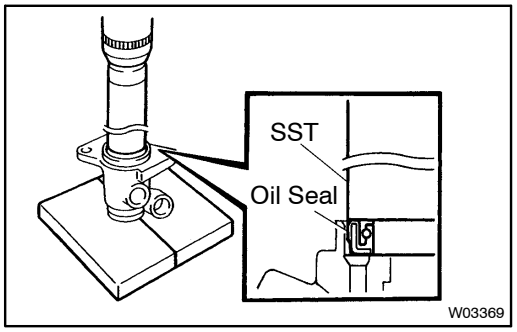
(a) Coat the teflon rings with power steering fluid.

(b) To prevent oil seal lip damage, wind vinyl tape on the serrated part of the valve shaft.

(c) Install the valve assembly into the control valve housing.

NOTICE:

Be careful not to damage the teflon rings and oil seal.



8. INSTALL OIL SEAL

(a) Coat a new oil seal lip with power steering fluid.

(b) Using SST, press in the oil seal.

SST 09612–22011

NOTICE:

Make sure to install the oil seal facing the correct direction.

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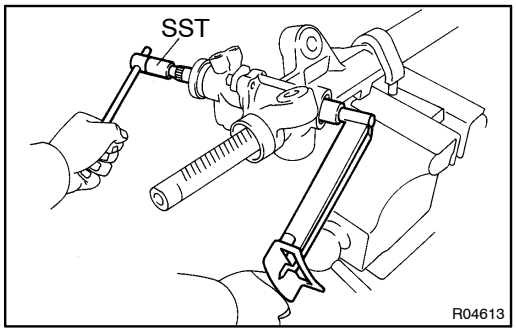
9. INSTALL CONTROL VALVE HOUSING WITH CONTROL VALVE ASSEMBLY

(a) Place a new gasket on the rack housing.

(b) Torque the 2 bolts.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

10. INSTALL DUST COVER



11. INSTALL SELF–LOCKING NUT

Using SST to stop the control valve assembly, install a new self–locking nut.

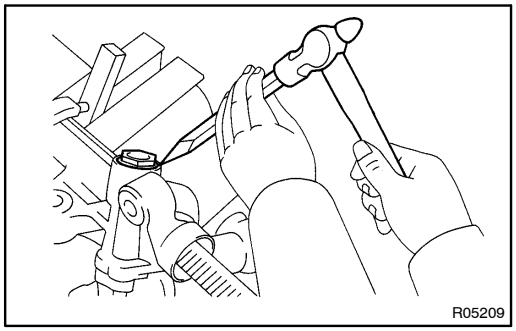
SST 09616–00010

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

12. INSTALL RACK HOUSING CAP

(a) Apply sealant to 2 or 3 threads of the cap.

Sealant: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent



(b) Install the rack housing cap.

Torque: 69 N·m (700 kgf·cm, 51 ft·lbf)

(c) Using a center punch, stake the cap at 2 places.

13. INSTALL RACK GUIDE, RACK GUIDE SPRING AND RACK GUIDE SPRING CAP

(a) Apply sealant to 2 or 3 threads of the spring cap.

Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Temporarily install the spring cap.

14. ADJUST TOTAL PRELOAD

(a) To prevent the steering rack teeth from damaging the oil seal lip, temporariry install the RH and LH rack ends.

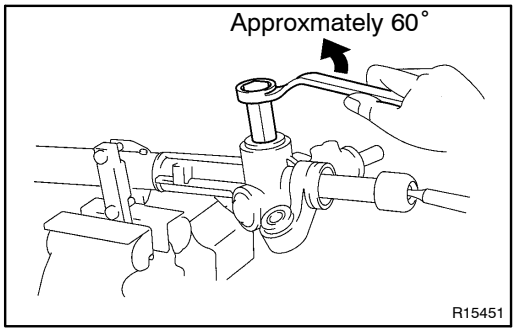
(b) Set the steering rack at the rack stroke center.

(c) Fix the steering gear in a vise so that the rack guide spring cap faces straight up.

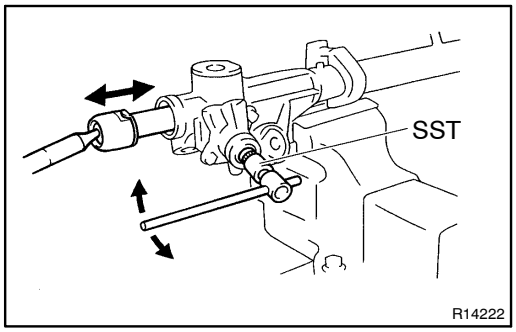
(d) Using a hexagon wrench (21 mm), torque the rack guide spring cap.

Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

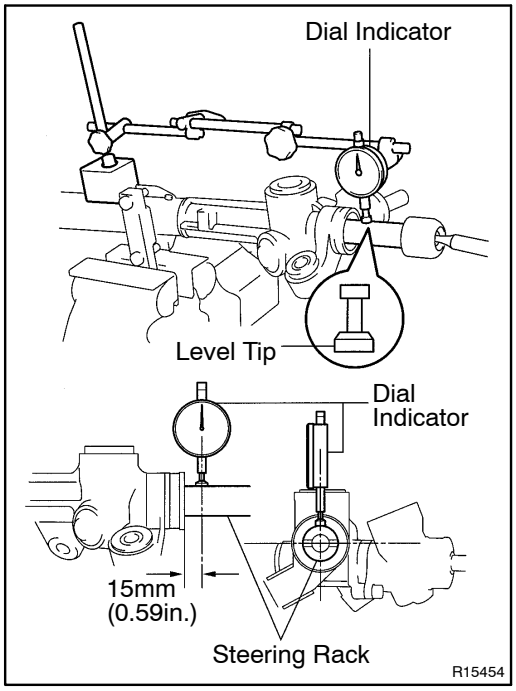
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(e) Using a hexagon wrench (21 mm), return the rack guide spring cap approximately 60˚.



(f) Using SST, rotate the control valve assembly to operate the steering rack 2 or 3 times through its full stroke.
SST 09616–00010



(g) Firmly fix the dial indicator in position so that the dial indicator tip touches the top of the steering rack, as shown.

HINT:

- Fix the magnetic stand of the dial indicator to the rack housing.
- Use a level tip for the dial indicator tip.

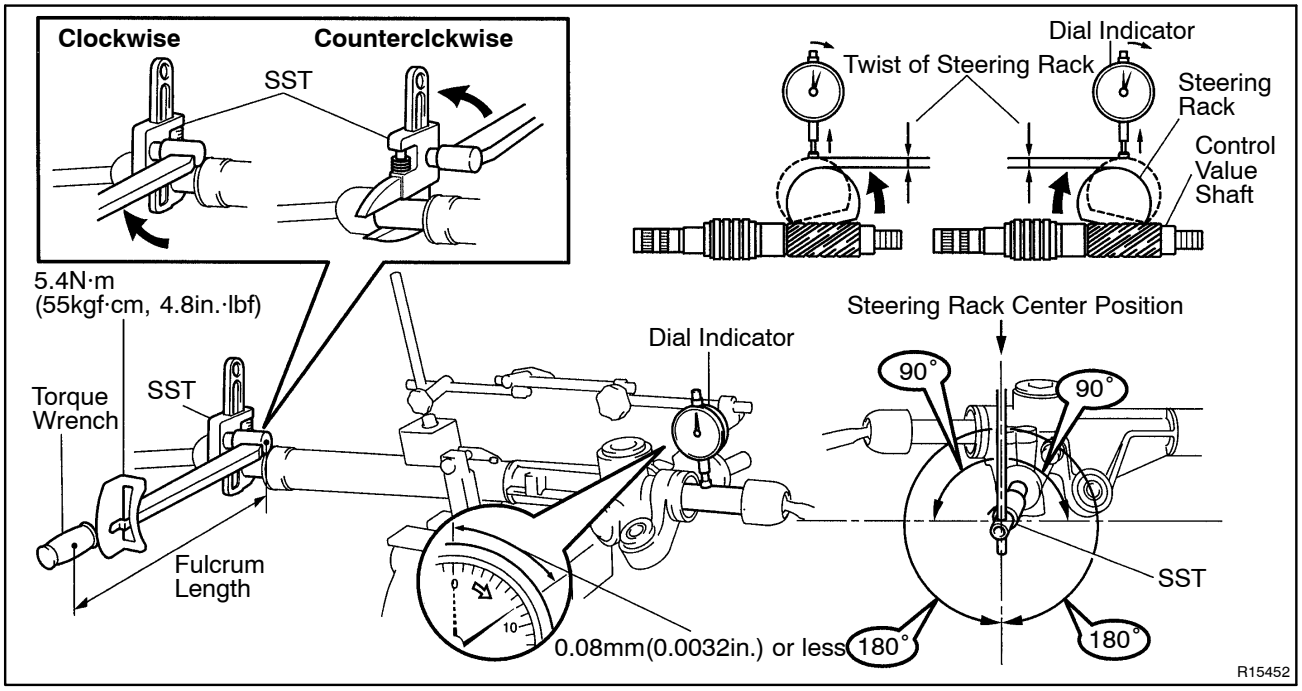
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(h) Using a hexagon wrench (21 mm), gradually tighten the rack guide spring cap and adjust the twist of the steering rack to 0.08 mm (0.0032 in.) or less when the rack is twisted clockwise and counterclockwise by SST and torque wrench with 5.4 N·m (55 kgf·cm, 48 in.·lbf) of torque applied.
SST 09922–10010

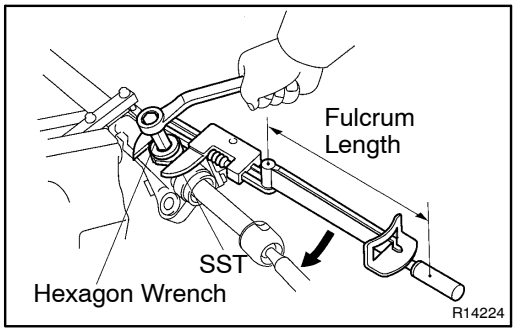
NOTICE:
Use SST 09922–10010 in the direction shown in the illustration

HINT:
Use a torque wrench with a fulcrum length of 250 mm (9.84 in.).

(i) Using SST to ratate the control valve shaft, adjust the twist of the rack so that it is within the above specifications at the following 5 points:
SST 09616–00010
(1) Steering rack at center position.
(2) Steering pinion shaft rotated 90° clockwise from the center position.
(3) Steering pinion shaft rotated 90° counterclockwise from the center position.
(4) Steering pinion shaft rotated 180° clockwise from the center position.
(5) Steering pinion shaft rotated 180° counterclockwise from the center position.



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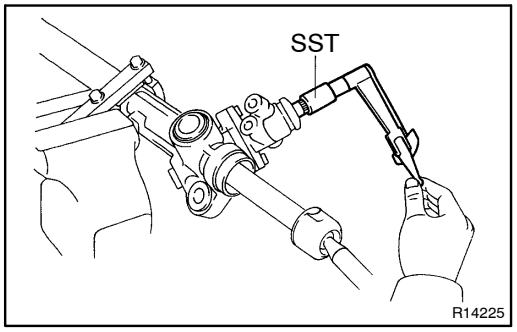
(j) Apply sealant to 2 or 3 threads of the rack guide spring cap lock nut.
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(k) Using a hexagon wrench (21 mm) to hold the rack guide spring cap, and using SST, install and torque the lock nut.
SST 09922–10010
Torque: 51 N·m (521 kgf·cm, 38 ft·lbf)

NOTICE:
Use SST 09922–10010 in the direction shown in the illustration.

HINT:
Use a torque wrench with a fulcrum length of 345 mm (13.58 in.).

(l) Repeat (h)



15. CHECK TOTAL PRELOAD

(a) Using SST and a torque wrench, check the total preload.
SST 09616–00010
Preload (turning):
0.5 – 1.4 N·m (5 – 14 kgf·cm, 4.3 – 12.2 in.·lbf)

HINT:
The total preload must be within the specification throughout the full stroke of the steering rack.
If it is not within specification, adjust the total preload again.

(b) Remove the RH and LH rack ends.

16. INSTALL RH AND LH CLAW WASHERS AND RACK ENDS

(a) Install a new washer, and temporarily tighten the rack end.

HINT:
Align the claws of the washer with the steering rack grooves.

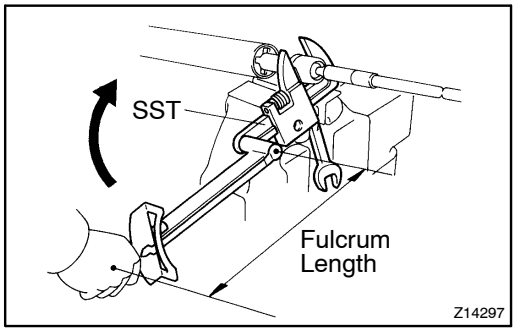
(b) Using a spanner to hold the steering rack steady, and using SST, torque the rack end.
SST 09922–10010
Torque: 61 N·m (618 kgf·cm, 45 ft·lbf)

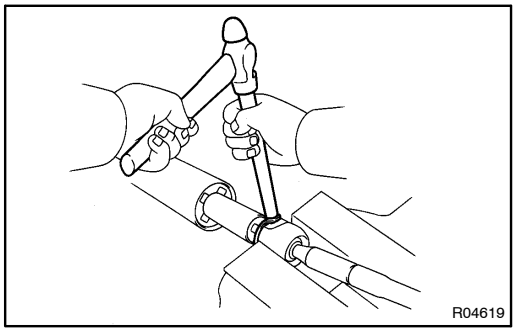
NOTICE:
Use SST 09922–10010 in the direction shown in the illustration.

HINT:
Use a torque wrench with a fulcrum length of 345 mm (13.58 in.).

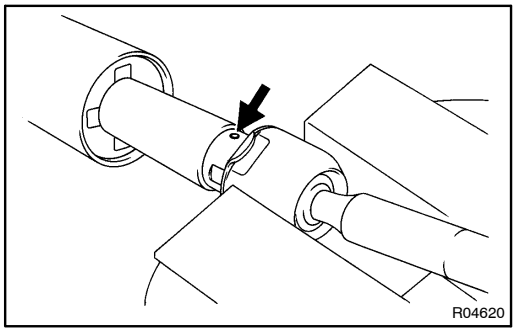
(c) Using a brass bar and hammer, stake the washer.

NOTICE:
Avoid any impact to the rack.





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17. INSTALL RH AND LH RACK BOOTS, CLAMPS AND CLIPS

(a) Make sure that the tube hole is not clogged with grease.

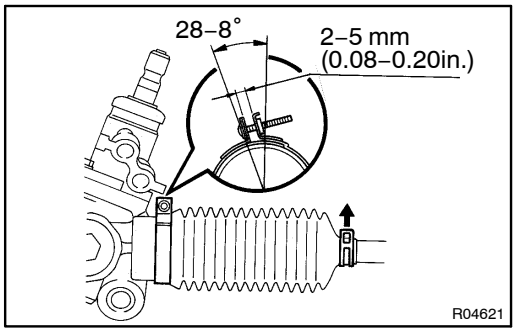
HINT:

If the tube hole is clogged, the pressure inside the boot will change after it is assembled and the steering wheel turned.

(b) Install the boot.

NOTICE:

Be careful not to damage or twist the boot.



(c) Tighten the clamp and clip, as shown in the illustration.

18. INSTALL RH AND LH TIE ROD ENDS AND LOCK NUTS

(a) Screw the lock nut and tie rod end onto the rack end until the matchmarks are aligned.

(b) After adjusting toe–in, torque the lock nut (See page SA–7).

Torque: 56 N·m (570 kgf·cm, 41 ft·lbf)

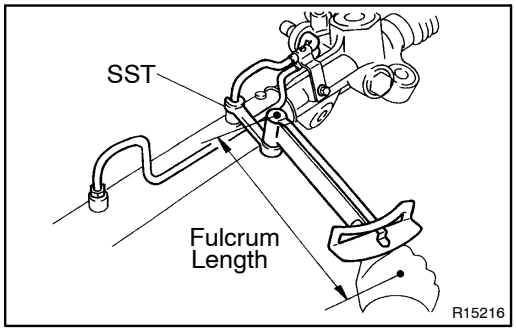
19. INSTALL 2 TURN PRESSURE TUBES

(a) Coat 2 new O–rings with power steering fluid and install them to the tube.

(b) Using SST, install and torque the tube.

SST 09633–00020

Torque: 10 N·m (102 kgf·cm, 7 ft·lbf)



HINT:

- Use a torque wrench with a fulcrum length of 250 mm (9.84 in.).
- This torque value is effective in case that SST is parallel to a torque wrench.

(c) Install the clamp plate with the bolt.

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SR07Z–01

INSTALLATION

1. INSTALL PS GEAR ASSEMBLY

Torque: 88 N·m (900 kgf·cm, 65 ft·lbf)

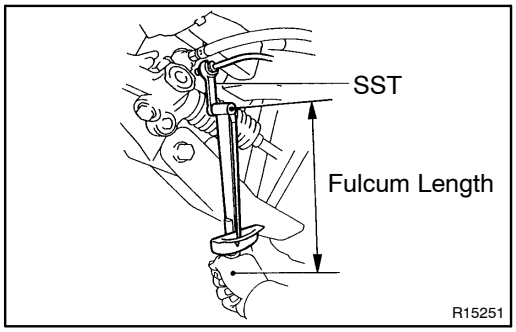
Torque the 2 gear assembly set bolts and nut.

2. INSTALL MOUNT BRACKET AND GROMMET

(a) Install the grommet and mount bracket to the PS gear assembly.

(b) Torque the 2 bolts.

Torque: 88 N·m (900 kgf·cm, 65 ft·lbf)



3. CONNECT PRESSURE FEED TUBE AND INSTALL RETRUN TUBE

(a) Coat a new O–ring with power steering fluid and install it to the tube.

(b) Using SST, connect the pressure feed tube and install the return tube.

SST 09631–22020

Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

HINT:

- Use a torque wrench with a fulcrum length of 250 mm (9.84 in.).
- This torque value is effective in case that SST is parallel to a torque wrench.

4. CONNECT RETURN HOSE

5. CONNECT INTERMEDIATE SHAFT ASSEMBLY

(See page SR–20)

6. CONNECT RH AND LH TIE ROD ENDS

Install the nut and a new cotter pin.

Torque: 90 N·m (920 kgf·cm, 67 ft·lbf)

7. POSITION FRONT WHEELS FACING STRAIGHT AHEAD

HINT:

Do it with the front of the vehicle jacked up.

8. CENTER SPIRAL CABLE

(See page SR–20)

9. INSTALL STEERING WHEEL

(a) Align the matchmarks on the wheel and steering column main shaft.

(b) Temporarily tighten the wheel set nut.

(c) Connect the connector.

10. BLEED POWER STEERING SYSTEM

(See page SR–4)

11. CHECK STEERING WHEEL CENTER POINT

12. TORQUE STEERING WHEEL SET NUT

Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

13. INSTALL STEERING WHEEL PAD

(See page SR–20)

14. CHECK FRONT WHEEL ALIGNMENT

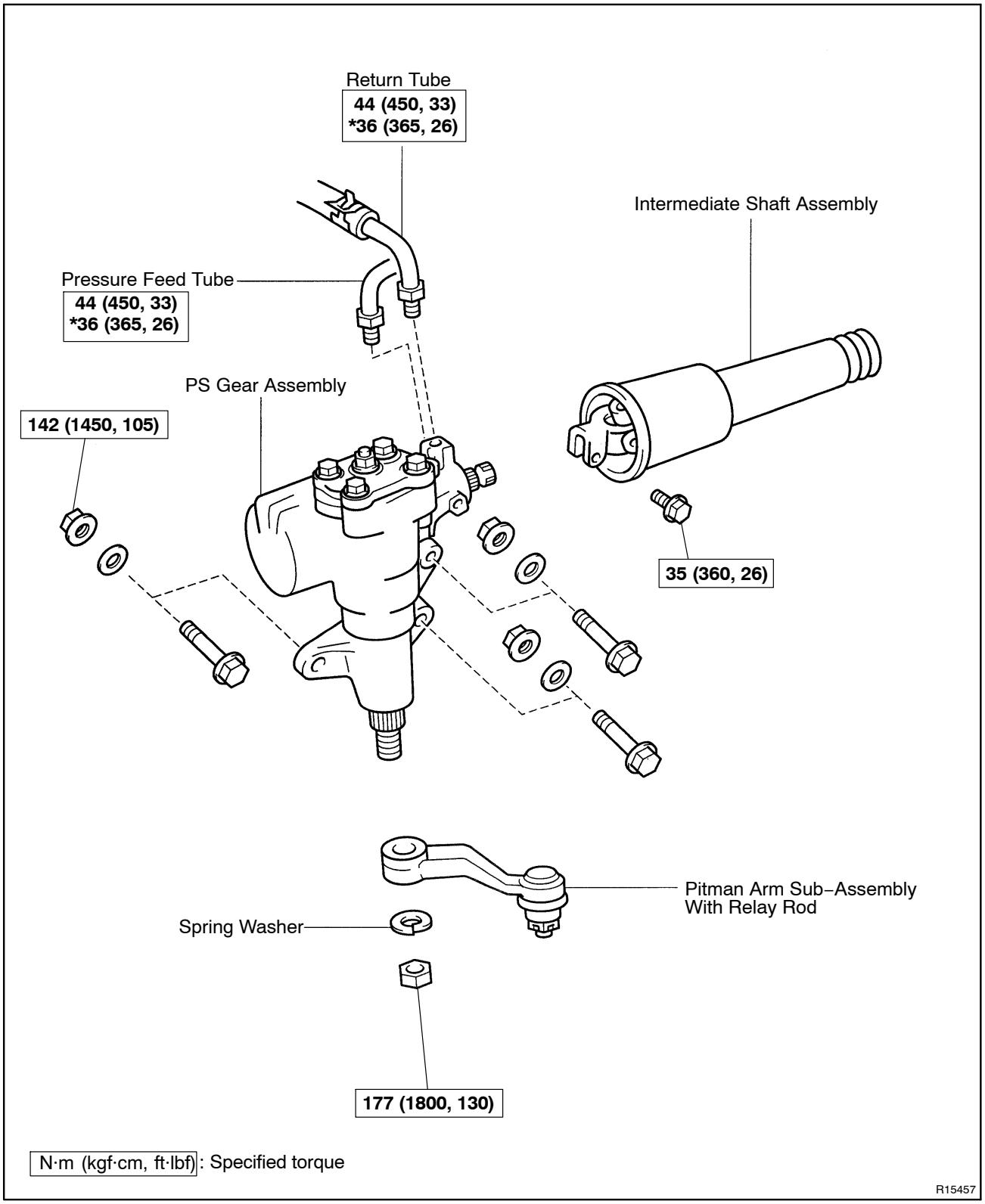
(See page SA–7)

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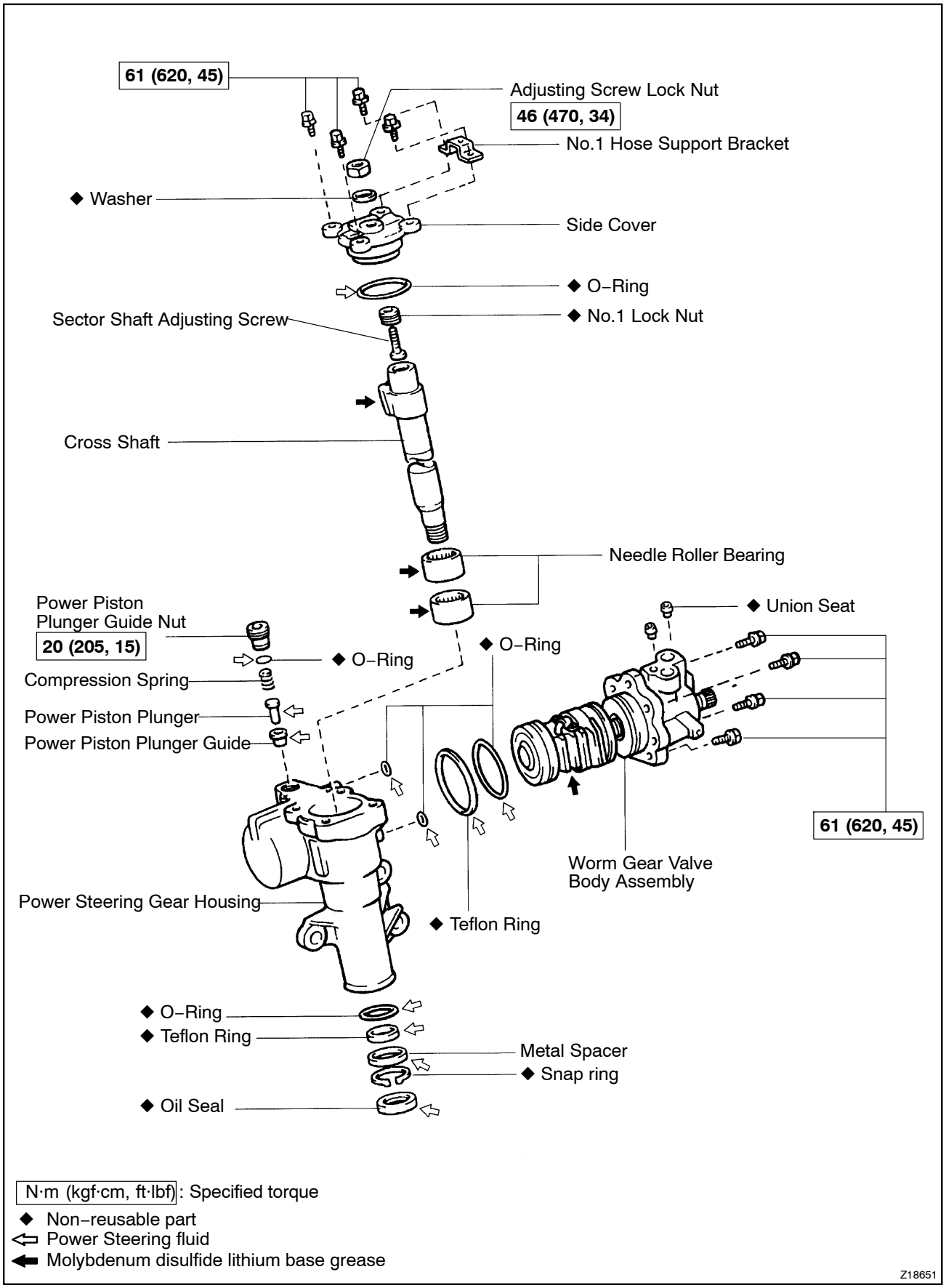
POWER STEERING GEAR (4WD)

COMPONENTS

SR080–01



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SR081–01

REMOVAL

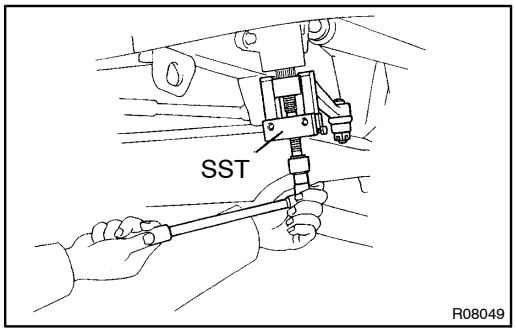
1. PLACE FRONT WHEELS FACING STRAIGHT AHEAD

2. REMOVE STEERING WHEEL PAD
(See page SR–13)

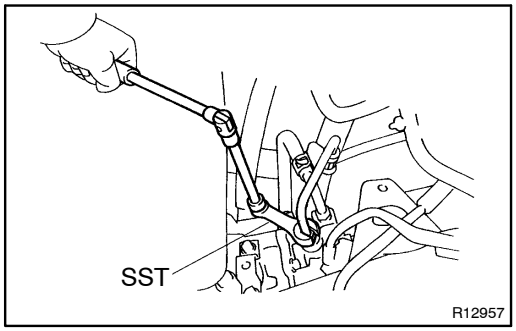
3. REMOVE STEERING WHEEL
(See page SR–13)

4. DISCONNECT PITMAN ARM SUB–ASSEMBLY WITH RELAY ROD

(a) Remove the pitman arm set nut and spring washer.



(b) Using SST, disconnect the pitman arm from the gear assembly.
SST 09628–62011



5. DISCONNECT PRESSURE FEED TUBE AND RETURN TUBE

Using SST, disconnect the tube.
SST 09631–22020

6. DISCONNECT INTERMEDIATE SHAFT ASSEMBLY
(See page SR–13)

7. REMOVE PS GEAR ASSEMBLY

Remove the 3 bolts, nuts and washers.

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SR082–01

DISASSEMBLY

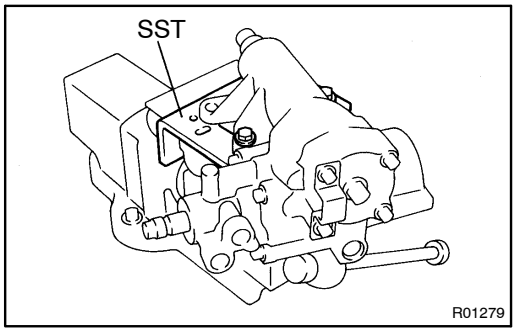
NOTICE:

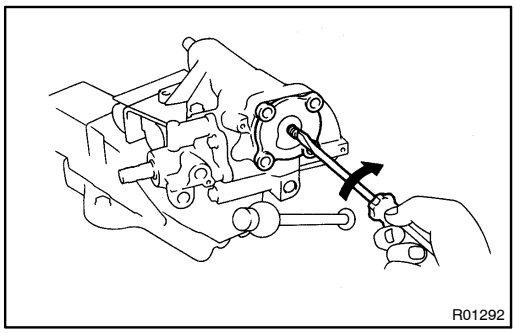
When using a vise, do not overtightn it.

1. SECURE PS GEAR ASSEMBLY IN VISE

Mount the gear assembly on SST and clamp SST in a vise.

SST 09630–00014 (09631–00142)





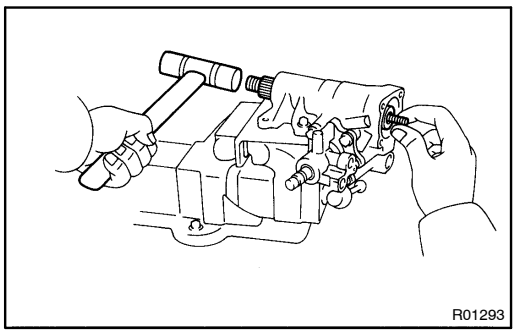
2. REMOVE ADJUSTING SCREW LOCK NUT AND SEAL WASHER

3. REMOVE SIDE COVER

(a) Remove the 4 bolts and No.1 hose support bracket.

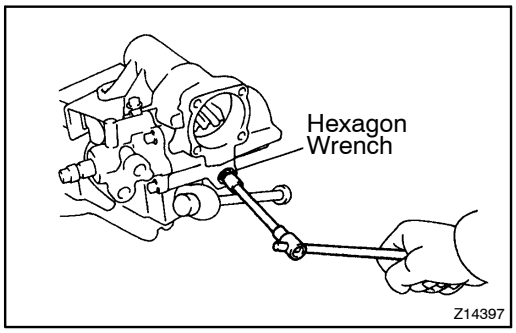
(b) Using a screwdriver, turn the sector shaft adjusting screw clockwise until the cover comes off.

(c) Remove the O–ring from the cover.



4. REMOVE SECTOR SHAFT

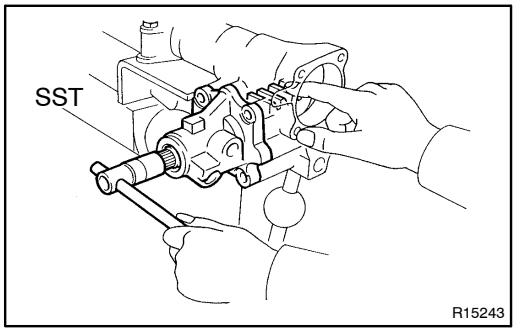
Using a plastic hammer, tap on the sector shaft end and pull out the shaft.



5. REMOVE POWER PISTON PLUNGER GUIDE NUT, COMPRESSION SPRING, POWER PISTON PLUNGER AND POWER PISTON PLUNGER GUIDE

(a) Using a hexagon wrench (10 mm), remove the plunger guide nut.

(b) Remove the O–ring from the plunger guide nut.



6. REMOVE WORM GEAR VALVE BODY ASSEMBLY

(a) Remove the 4 bolts.

(b) Using SST, turn the valve body shaft clockwise with holding the power piston nut by your finger so it cannot move.

SST 09616–00010

(c) Pull out the valve body assembly.

NOTICE:

Ensure that the power piston nut does not come off the worm shaft.

(d) Remove the 2 O–rings from the gear housing.

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SR083–01

INSPECTION

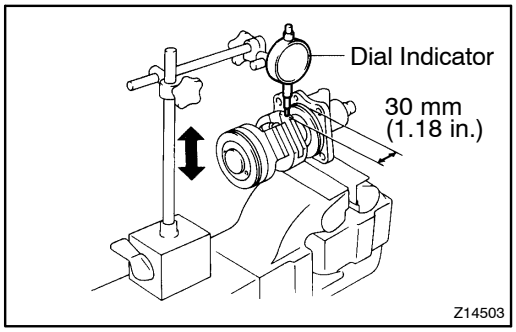
NOTICE:

When using a vise, do not overtighten it.

1. INSPECT BALL CLEARANCE

Using a dial indicator, check the ball clearance. Move the power piston nut up and down.

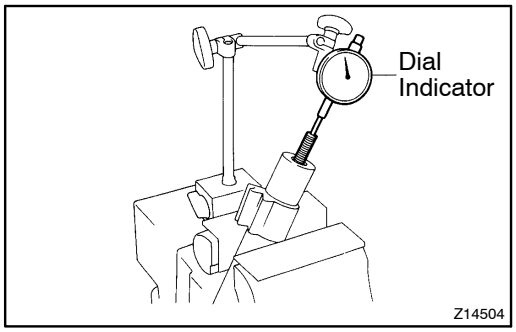
Maximum clearance: 0.15 mm (0.0059 in.)



2. INSPECT SECTOR SHAFT ADJUSTING SCREW THRUST CLEARANCE

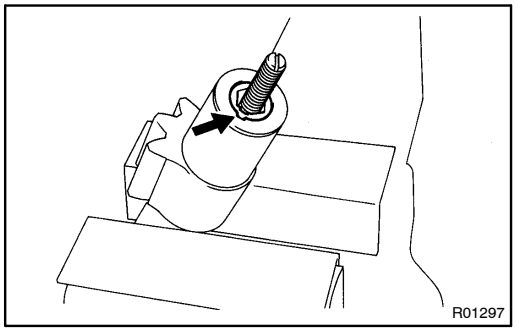
Using a dial indicator, measure the thrust clearance.

Standard clearance:
0.03 – 0.05 mm (0.0012 – 0.0020 in.)
Maximum clearance: 0.05 mm (0.0020 in.)



3. IF NECESSARY, ADJUST SECTOR SHAFT ADJUSTING SCREW THRUST CLEARANCE

(a) Using a chisel and hammer, unstake the No.1 lock nut.

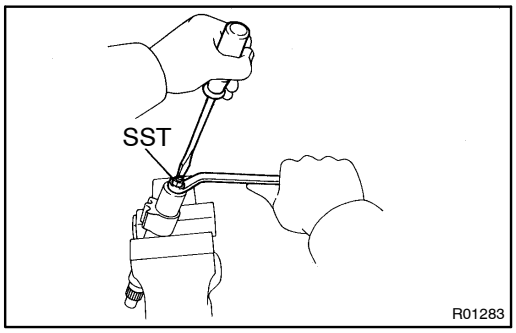


(b) Using SST, remove the No.1 lock nut.
SST 09630–00014 (09631–00051)

(c) Using a screwdriver, adjust the adjusting screw for the correct thrust clearance.

(d) Tighten a new lock nut.

(e) Stake the lock nut.

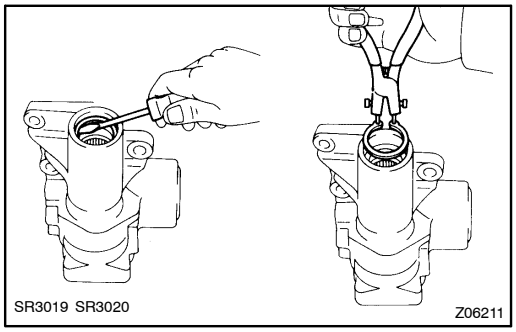


4. IF NECESSARY, REPLACE 2 NEEDLE ROLLER BEARINGS

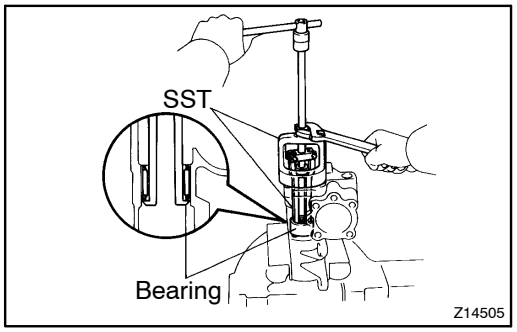
(a) Using a screwdriver, pry out the oil seal from the gear housing.

(b) Using snap ring pliers, remove the snap ring from the gear housing.

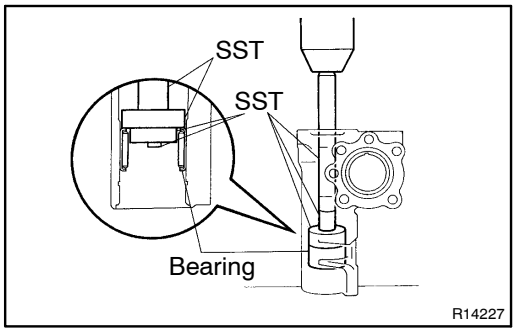
(c) Remove the metal spacer, teflon ring and O–ring from the gear housing.



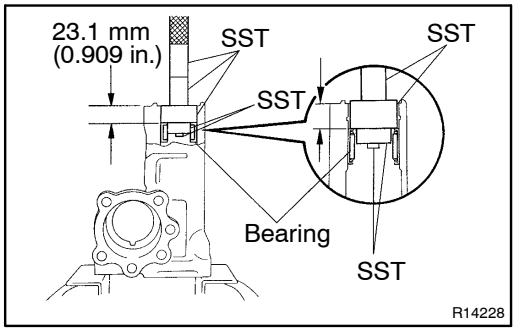
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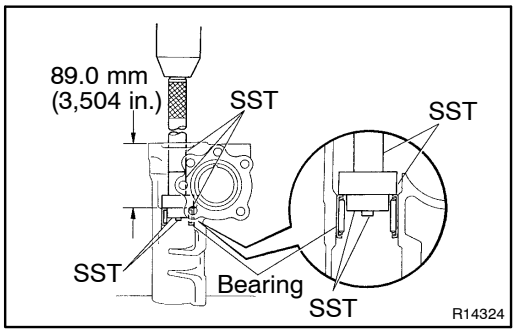
(d) Using SST, remove the bearing from the gear housing.
SST 09612–65014 (09612–01030)



(e) Using SST, press out the bearing from the gear housing.
SST 09950–60010 (09951–00360, 09951–00420, 09952–06010), 09950–70010 (09951–07200)

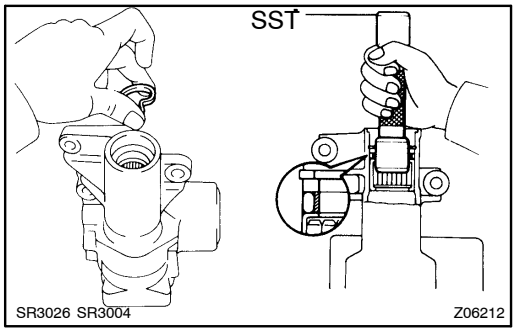


(f) Coat a new bearing with molybdenum disulfide lithium base grease.
(g) Using SST, press in the bearing, as shown in the illustration.
SST 09950–60010 (09951–00360, 09951–00420, 09952–06010), 09950–70010 (09951–07200)



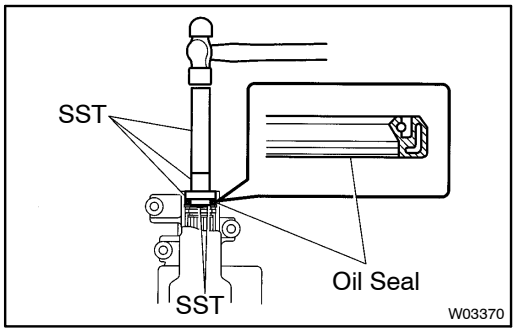
(h) Coat a new bearing with molybdenum disulfide lithium base grease.
(i) Using SST, press in the bearing, as shown in the illustration.
SST 09950–60010 (09951–00360, 09951–00420, 09952–06010), 09950–70010 (09951–07200)
(j) Coat a new O–ring and metal spacer with power steering fluid.
(k) Install the O–ring and metal spacer.
(l) Using snap ring pliers, install a new snap ring.
(m) Coat a new teflon ring with power steering fluid.
(n) Form the teflon ring into a heart shape and install it by hand.

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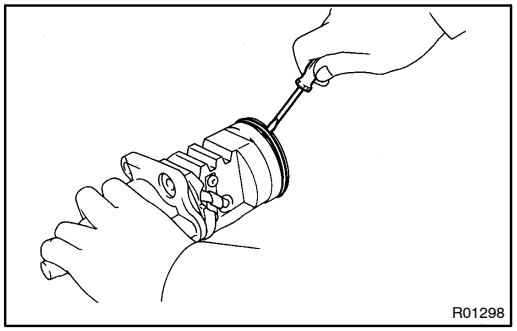
(o) Using SST, form the teflon ring.
SST 09630–00014 (09631–00121)

NOTICE:
The teflon ring must be squeezed before inserting the sector shaft or damage will result.



(p) Coat a new oil seal lip with power steering fluid.
(q) Using SST, drive the oil seal into the gear housing.
SST 09950–60010 (09951–00340, 09951–00430, 09952–06010), 09950–70010 (09951–07200)

NOTICE:
Make sure to install the oil seal facing the correct direction.



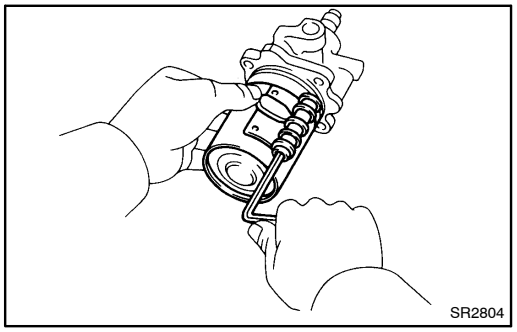
5. IF NECESSARY, REPLACE TEFLON RING AND O–RING

(a) Using a screwdriver, remove the teflon ring and O–ring from the worm gear valve body assembly.

NOTICE:
Be careful not to damage the worm gear valve body assembly.

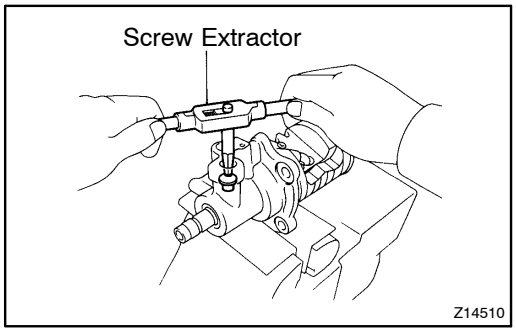
(b) Coat a new O–ring with power steering fluid and install it.
(c) Expand a new teflon ring with your fingers.

NOTICE:
Be careful not to overexpand the teflon ring.



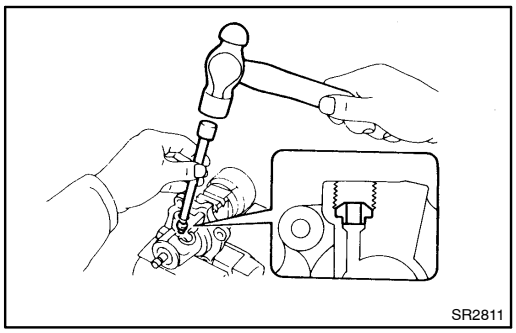
(d) Install the teflon ring.
(e) Coat the teflon ring with power steering fluid and snug it down with a piston ring compressor for 5 – 7 minutes.

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6. IF NECESSARY, REPLACE UNION SEATS

(a) Using a screw extractor, remove the 2 union seats from the worm gear valve body assembly.



(b) Using a hammer and an extension bar, tap in 2 new union seats.

NOTICE:

Before installing the union seat, remove dust sticking to the worm gear valve body assembly.

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SR084–01

REASSEMBLY

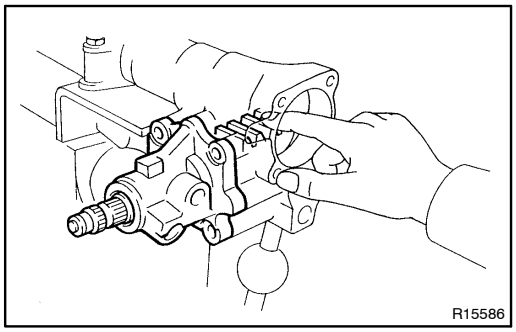
NOTICE:

When using a vise, do not overtighten it.

1. COAT WITH POWER STEERING FLUID OR MOLYBDENUM DISULFIDE LITHIUM BASE GREASE (See page SR–72)

2. INSTALL WORM GEAR VALVE BODY ASSEMBLY

(a) Coat 2 new O–rings with power steering fluid and install them to the gear housing.



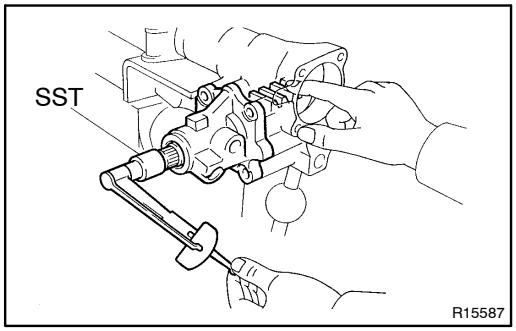
(b) Install the valve body assembly into the gear housing.

NOTICE:

- **Ensure that the power piston nut does not come off the worm shaft.**
- **Be careful not to damage the teflon ring.**

(c) Torque the 4 bolts.

Torque: 61 N·m (620 kgf·cm, 45 ft·lbf)



(d) Using SST and a torque wrench, check the valve body assembly rotating torque.

SST 09616–00010

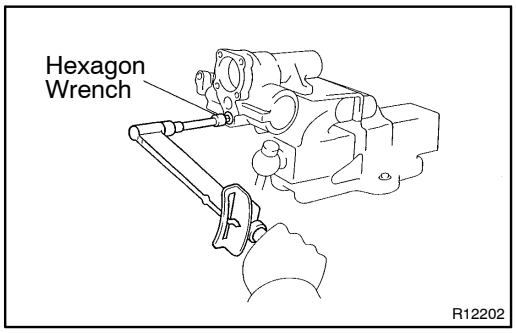
Rotating torque:

0.3 – 0.5 N·m (3 – 5.5 kgf·cm, 2.6 – 4.8 in.·lbf)

HINT:

Hold the worm gear to prevent it from turning.

If rotating torque is not correct, replace the worm gear valve body assembly.



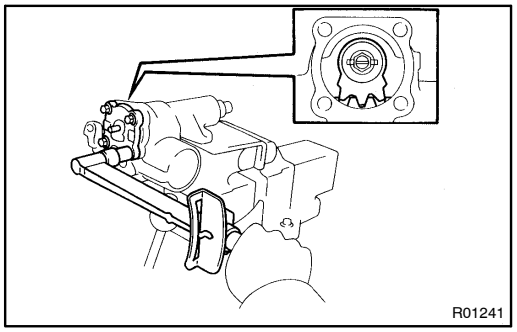
3. INSTALL POWER PISTON PLUNGER GUIDE, POWER PISTON PLUNGER, COMPRESSION SPRING AND POWER PISTON PLUNGER GUIDE NUT

(a) Coat a new O–ring with power steering fluid and install it to the plunger guide nut.

(b) Install the plunger guide nut with a hexagon wrench (10 mm).

Torque: 20 N·m (205 kgf·cm, 15 ft·lbf)

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4. INSTALL SECTOR SHAFT AND SIDE COVER

(a) Coat a new O–ring with power steering fluid and install it the side cover.

(b) Assemble the sector shaft to the side cover.

HINT:

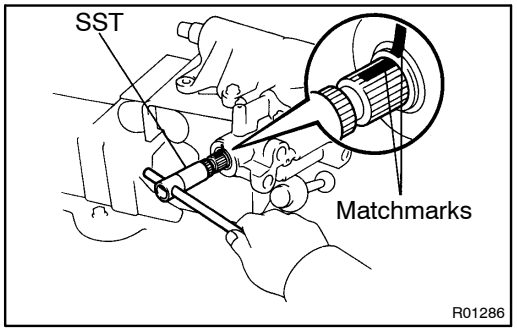
Fully loosen the sector shaft adjusting screw.

(c) Set the power piston nut at the center of the gear housing.

(d) Install and push the sector shaft into the gear housing so that the center teeth mesh together.

(e) Torque the 4 bolts in a diagonal pattern.

Torque: 61 N·m (620 kgf·cm, 45 ft·lbf)

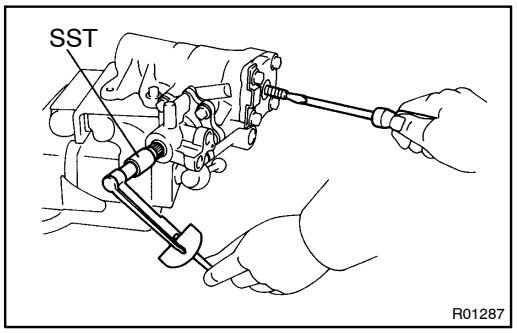


5. DETERMINE CENTER POSITION

(a) Using SST, turn the worm gear valve body shaft so full lock in both directions and determine the exact center.

SST 09616–00010

(b) Place matchmarks on the worm gear valve body shaft and gear housing to show neutral position.



6. ADJUST SECTOR SHAFT ADJUSTING SCREW

(a) Install SST with a torque wrench on the worm gear valve body shaft.

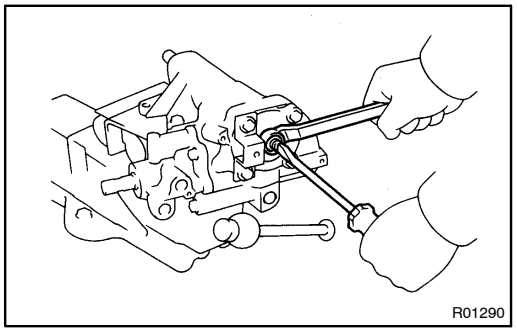
SST 09616–00010

(b) Turn the adjusting screw until the preload is within the specification.

Preload (Turning):

0.2 – 0.4 N·m (2 – 4 kgf·cm, 1.7 – 3.5 in.·lbf)

7. INSTALL NEW SEAL WASHER

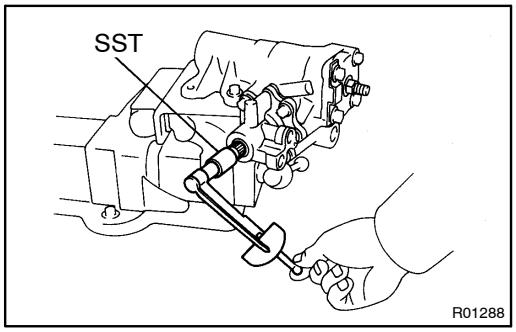


8. INSTALL ADJUSTING SCREW LOCK NUT

Torque the lock nut while holding the sector shaft adjusting screw.

Torque: 46 N·m (470 kgf·cm, 34 ft·lbf)

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9. CHECK TOTAL PRELOAD

Using SST and a torque wrench, check total preload.

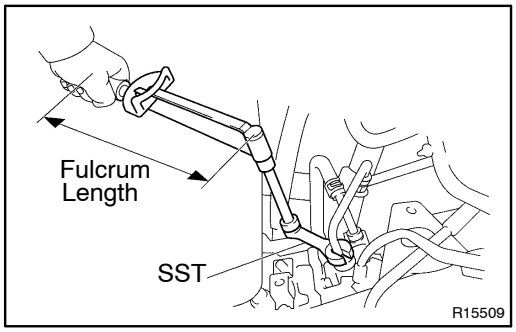
SST 09616–00010

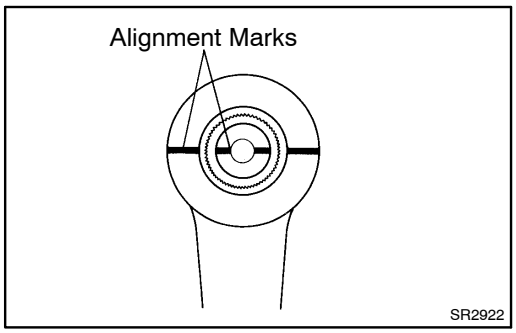
Total preload (Turning):

0.5 – 0.9 N·m (5 – 9.5 kgf·cm, 4.3 – 8.3 in.·lbf)

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SR085–01





INSTALLATION

1. INSTALL PS GEAR ASSEMBLY

Install the 3 bolts, washers and nuts.

Torque: 142 N·m (1,450 kgf·cm, 105 ft·lbf)

2. CONNECT INTERMEDIATE SHAFT ASSEMBLY

(See page SR–20)

3. CONNECT PRESSURE FEED TUBE AND RETURN TUBE

Using SST, connect the tube.

SST 09631–22020

Torque: 36 N·m (365 kgf·cm, 26 ft·lbf)

HINT:

- Use a torque wrench with a fulcrum length of 300 mm (11.81 in.).
- This torque value is effective in case that SST is parallel to a torque wrench.

4. CONNECT PITMAN ARM SUB–ASSEMBLY WITH RELAY ROD

(a) Align the alignment marks on the pitman arm and sector shaft, and connect the pitman arm.

(b) Install the spring washer and pitman arm set nut.

Torque: 177 N·m (1,800 kgf·cm, 130 ft·lbf)

5. POSITION FRONT WHEELS FACING STRAIGHT AHEAD

HINT:

Do it with the front of the vehicle jacked up.

6. CENTER SPIRAL CABLE

(See page SR–20)

7. INSTALL STEERING WHEEL

(a) Align the matchmarks on the wheel and steering column main shaft.

(b) Temporarily tighten the wheel set nut.

(c) Connect the connector.

8. BLEED POWER STEERING SYSTEM

(See page SR–4)

9. CHECK STEERING WHEEL CENTER POINT

10. TORQUE STEERING WHEEL SET NUT

Torque: 35 N·m (360 kgf·cm, 26 ft·lbf)

11. INSTALL STEERING WHEEL PAD

(See page SR–20)

12. CHECK FRONT WHEEL ALIGNMENT

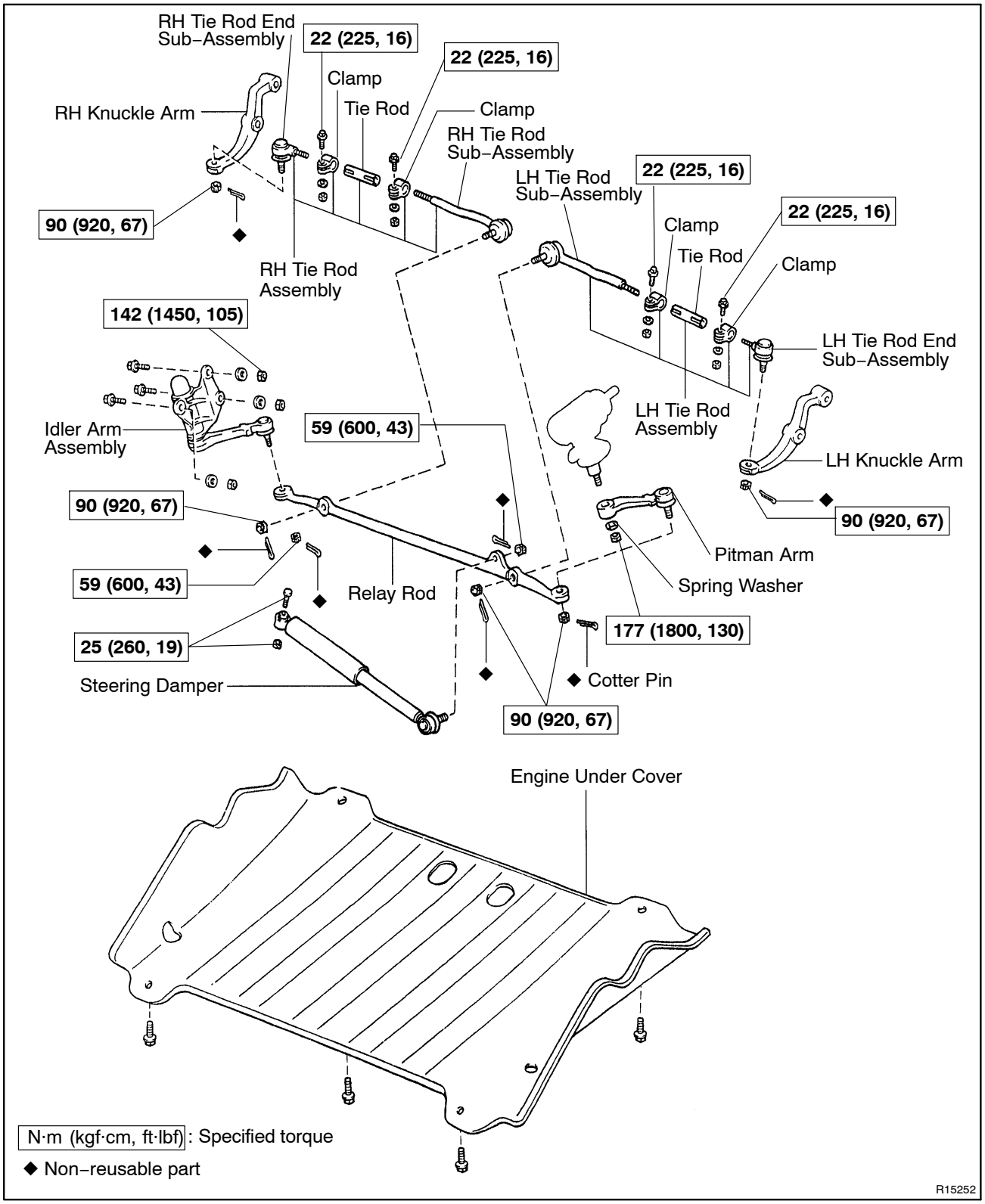
(See page SA–10)

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STEERING LINKAGE

COMPONENTS

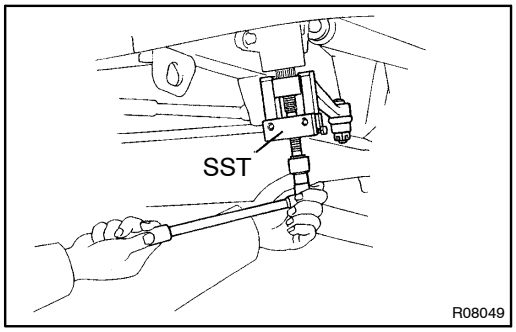
SR086–01



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SR087–01

REMOVAL



1. REMOVE ENGINE UNDER COVER

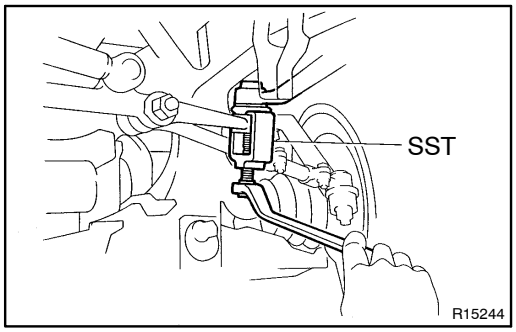
Remove the 4 bolts.

2. REMOVE PITMAN ARM

(a) Remove the pitman arm set nut and spring washer.

(b) Using SST, disconnect the pitman arm from the cross shaft.

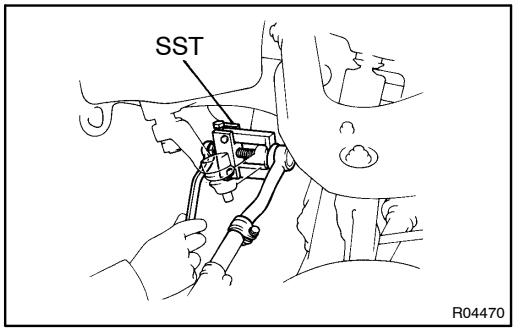
SST 09628–62011



(c) Remove the cotter pin and nut.

(d) Using SST, disconnect the pitman arm from the relay rod.

SST 09611–22012

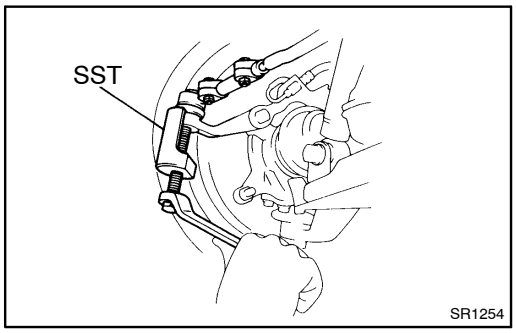


3. REMOVE LH AND RH TIE ROD ASSEMBLIE

(a) Remove the cotter pin and nut.

(b) Using SST, disconnect the tie rod assembly from the relay rod.

SST 09628–62011



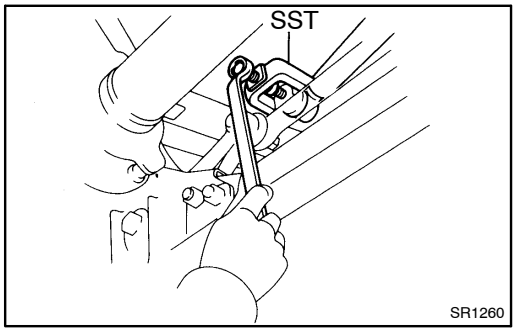
(c) Remove the cotter pin and nut.

(d) Using SST, disconnect the tie rod assembly from the knuckle arm.

SST 09610–20012

4. REMOVE RH AND LH TIE ROD SUB–ASSEMBLIES, TIE ROD END SUB–ASSEMBLIES, TIE RODS AND 2 CLAMPS

Remove the 2 bolts, washers and nuts.



5. REMOVE STEERING DAMPER

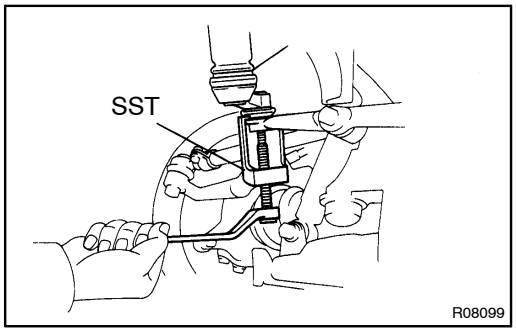
(a) Remove the cotter pin and nut.

(b) Using SST, disconnect the steering damper from the relay rod.

SST 09611–22012

(c) Remove the bolt and nut.

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6. REMOVE IDLER ARM ASSEMBLY

(a) Remove the cotter pin and nut.

(b) Using SST, disconnect the idler arm from the relay rod.
SST 09610–20012

(c) Remove the 3 bolts, washers and nuts.

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SR088–02

INSTALLATION

HINT:

When connecting the ball stud to the arm or rod, remove the grease on the joint surfaces.

1. INSTALL IDLER ARM ASSEMBLY

(a) Install the 3 bolts, washers and nuts.
Torque: 142 N·m (1,450 kgf·cm, 105 ft·lbf)

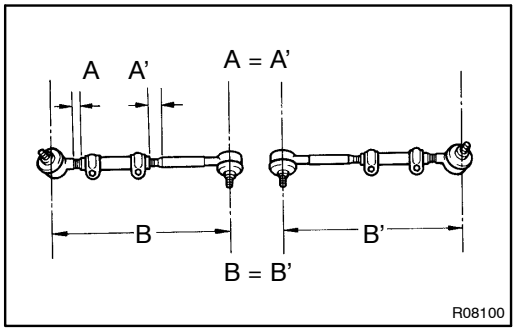
(b) Connect the idler arm to the relay rod.

(c) Install the nut and a new cotter pin.
Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)

2. INSTALL STEERING DAMPER

(a) Torque the bolt and nut.
Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)

(b) Install the nut and a new cotter pin.
Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)

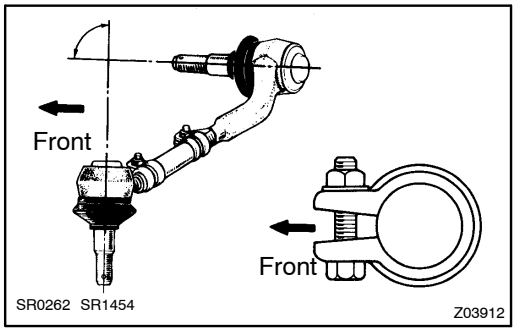


3. INSTALL RH AND LH TIE ROD SUB–ASSEMBLIES, TIE ROD END SUB–ASSEMBLIES, TIE ROD AND 2 CLAMPS

(a) Screw the tie rod end sub–assembly and tie rod sub–assembly into the tie rod.

HINT:

The tie rod assembly length should be approximately 329.2 mm (12.961 in.), and the remaining length of threads on both RH and LH tie rod assemblies should be equal.



(b) Turn the tie rod end sub–assembly so that they cross at about 90 degrees.

(c) After adjusting toe–in, torque the bolt.
(See page SA–10)
Torque: 22 N·m (225 kgf·cm, 16 ft·lbf)

4. INSTALL RH AND LH TIE ROD ASSEMBLIES

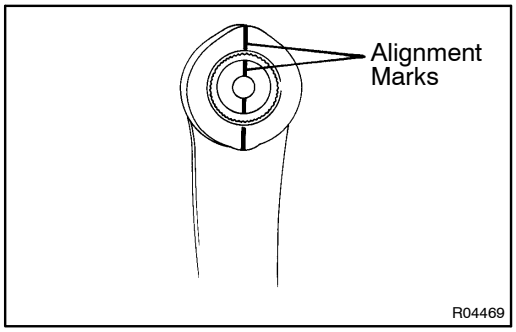
(a) Connect the tie rod assembly to the knuckle arm.

(b) Install the nut and a new cotter pin.
Torque: 90 N·m (920 kgf·cm, 67 ft·lbf)

(c) Connect the tie rod assembly to the relay rod.

(d) Install the nut and a new cotter pin.
Torque: 90 N·m (920 kgf·cm, 67 ft·lbf)

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5. INSTALL PITMAN ARM

(a) Align the alignment marks on the pitman arm and the cross shaft.

(b) Install the spring washer and pitman arm set nut.
Torque: 177 N·m (1,800 kgf·cm, 130 ft·lbf)

(c) Connect the pitman arm to the relay rod.

(d) Install the nut and a new cotter pin.
Torque: 90 N·m (920 kgf·cm, 67 ft·lbf)

6. INSTALL ENGINE UNDER COVER

Tighten the 4 bolts.

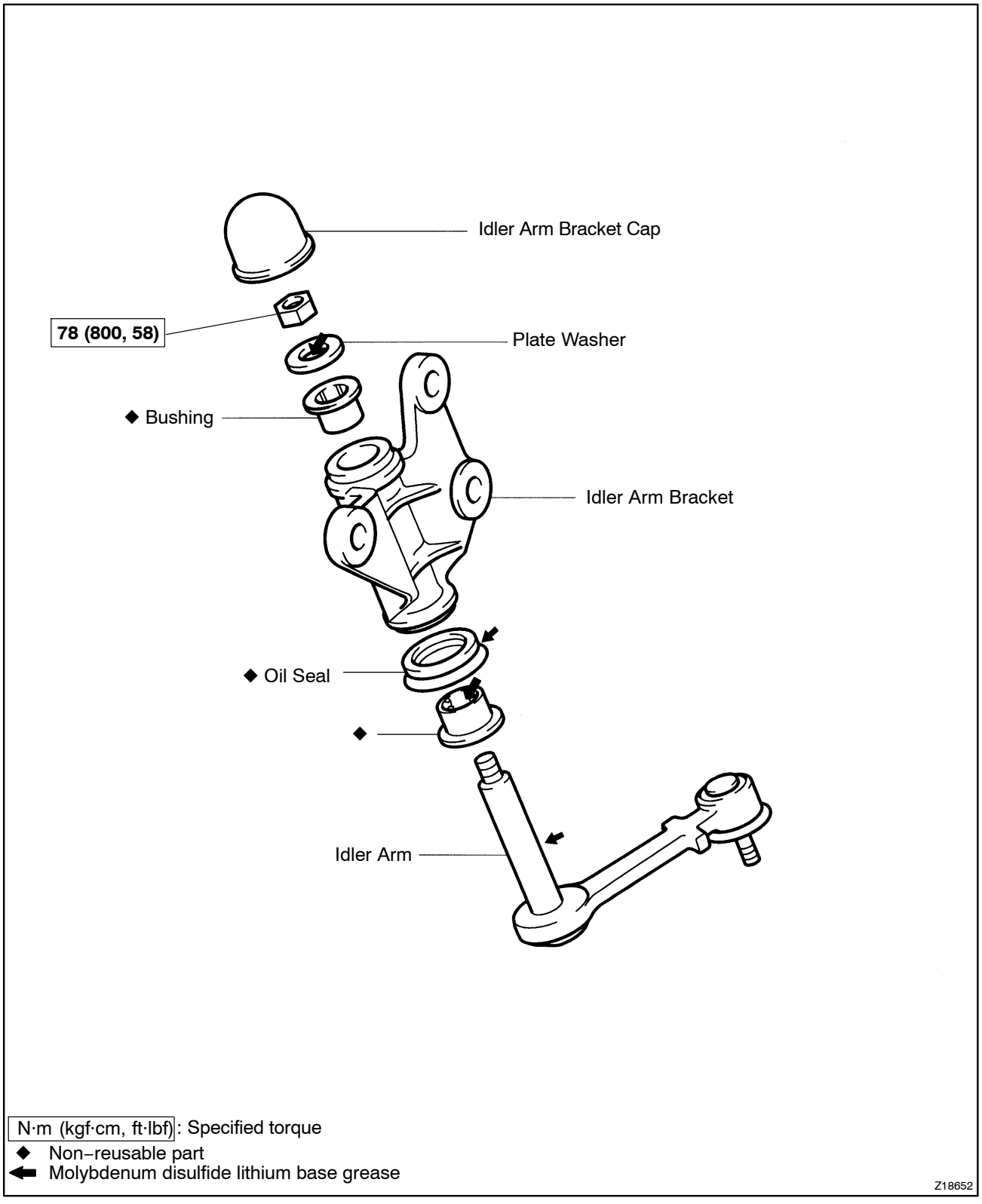
7. CHECK FRONT WHEEL ALIGNMENT
(See page SA–10)

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IDLER ARM

COMPONENTS

SR089–02



N·m (kgf·cm, ft·lbf): Specified torque
◆ Non–reusable part
⬅ Molybdenum disulfide lithium base grease

Z18652

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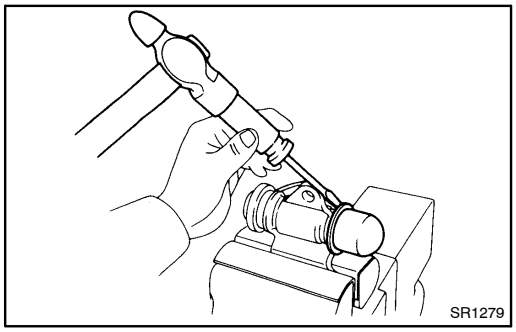
SR08A–01

REMOVAL

(See page SR–85)

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SR08B–01


SR1279

DISASSEMBLY

NOTICE:

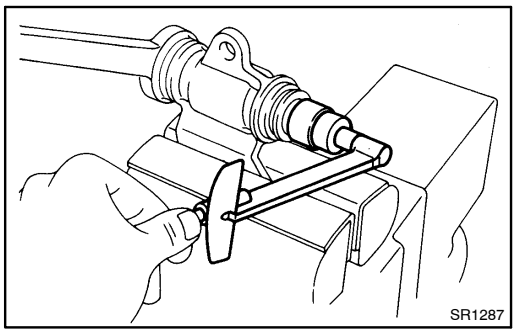
When using a vise, do not overtighten it.

1. REMOVE IDLER ARM BRACKET CAP

Using a screwdriver and a hammer, remove the idler arm bracket cap.

NOTICE:

Be careful not to damage the idler arm bracket.


SR1287

2. MEASURE IDLER ARM ROTATING TORQUE

(a) Check that the arm rotates smoothly without abnormal noise.

(b) Using a torque wrench, check the arm rotating torque.

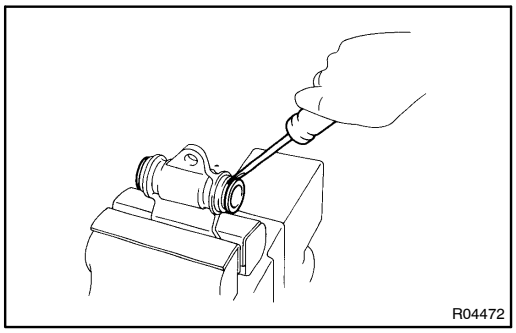
Rotating torque:

0.5 – 2.9 N·m (5 – 30 kgf·cm, 5 – 26 in.·lbf)

3. REMOVE IDLER ARM

Remove the nut and plate washer, and pull the idler arm off the idler arm bracket.

4. REMOVE OIL SEAL


R04472

5. REMOVE 2 BUSHINGS

Using a screwdriver, remove the bushing.

NOTICE:

Be careful not to damage the idler arm bracket.

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SR08C–01

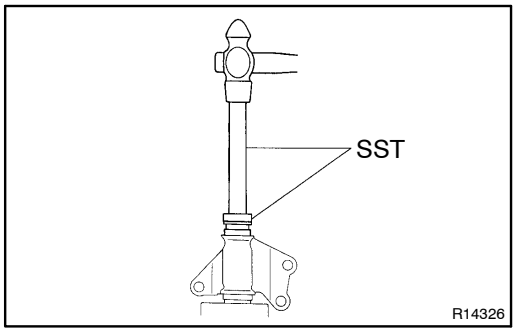
REASSEMBLY

NOTICE:

When using a vise, do not overtighten it.

1. COAT WITH MOLYBDENUM DISULFIDE LITHIUM BASE GREASE

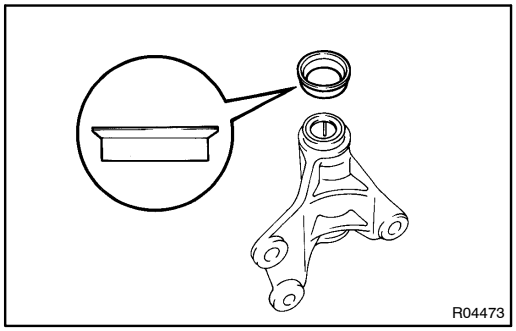
(See page SR–89)



2. INSTALL 2 BUSHINGS

Using SST and a hammer, tap in a new bushing to the idler arm braket.

SST 09950–60010 (09951–00300), 09950–70010 (09951–07200)



3. INSTALL OIL SEAL

(a) Coat a new oil seal lip with molybdenum disulfide lithium base grease.

(b) Install the oil seal.

NOTICE:

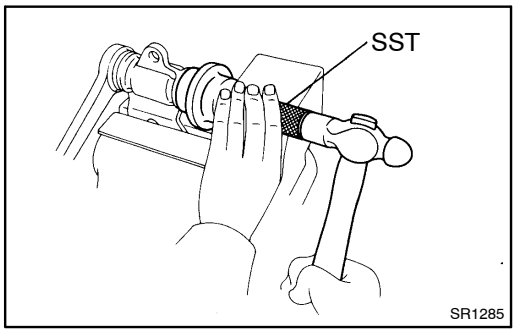
Make sure to install the oil seal facing the correct direction.

4. INSTALL IDLER ARM

(a) Install the idler arm to the bracket.

(b) Install the plate washer and nut.

Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)



5. MEASURE IDLER ARM ROTATING TORQUE

(See page SR–91)

6. INSTALL IDLER ARM BRACKET CAP

(a) Apply sealant to a new cap end.

Sealant: Part No.08826–00090, THREE BOND 1281 or equivalent

(b) Using SST, tap in the idler arm bracket cap.

SST 09223–46011

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SR08D–01

INSTALLATION

(See page SR–87)

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RS – SUPPLEMENTAL RESTRAINT SYSTEM

SRS AIRBAG	RS-1
STEERING WHEEL PAD AND SPIRAL CABLE	RS-7
AIRBAG SENSOR ASSEMBLY	RS-21
FRONT AIRBAG SENSOR	RS-26
WIRE HARNESS AND CONNECTOR	RS-31

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SRS AIRBAG

PRECAUTION

RS03H–01

NOTICE:

- **The TOYOTA T100 is equipped with SRS, which comprises a driver airbag. Failure to carry out service operations in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Further, if a mistake is made in servicing the SRS, it is possible that the SRS may fail to operate when required. Before performing servicing (including removal or installation of parts, inspection or replacement), be sure to read the following items carefully, then follow the correct procedures described in the repair manual.**
- **Malfunction symptoms of the SRS are difficult to confirm, so the DTCs become the most important source of information when troubleshooting. When troubleshooting the SRS, always inspect the DTCs before disconnecting the battery.**
- **Even in cases of a minor collision where the SRS does not deploy, the steering wheel pad, airbag sensor assembly and front airbag sensor should be inspected (See page RS–9, RS–23 and RS–28).**
- **Never use SRS parts from another vehicle. When replacing parts, replace them with new parts.**
- **Never disassemble and repair the steering wheel pad, airbag sensor assembly or front airbag sensor in order to reuse it.**
- **If the steering wheel pad, airbag sensor assembly or front airbag sensor has been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.**
- **Use a volt/ohmmeter with high impedance (10 kΩ/V minimum) for troubleshooting the system's electrical circuits.**
- **Information labels are attached to the periphery of the SRS components. Follow the instructions on the notices.**
- **After work on the SRS is completed, perform the SRS warning light check or SRS side airbag warning light check (See page DI–365).**
- **If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.**

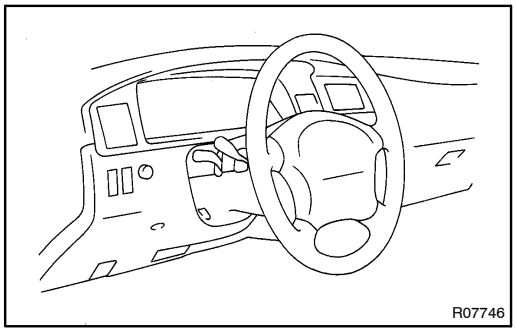
CAUTION:

- **Work must be started after 90 seconds from when the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.**
  (The SRS is equipped with a back–up power source so that if work is started within 90 seconds from disconnecting the negative (–) terminal cable of the battery, the SRS may be deployed.)
- **When the negative (–) terminal cable is disconnected from the battery, the memory of the clock and audio system will be canceled. So before starting work, make a record of the contents memorized in the audio memory system. When work is finished, reset the audio systems as they were before and adjust the clock. To avoid erasing the memory in each memory system, never use a back– up power supply from outside the vehicle.**
- **Before repairs, remove the airbag sensor if shocks are likely to be applied to the sensor during repairs.**
- **Do not expose the steering wheel pad, airbag sensor assembly or front airbag sensor directly to hot air or flames.**

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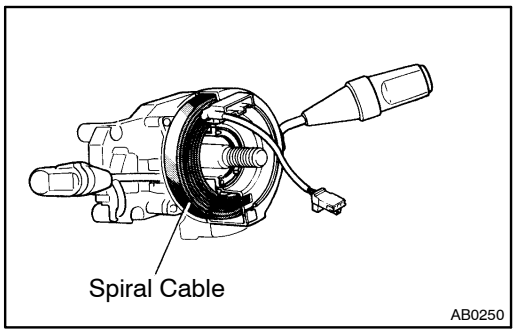
RS03I–03

OPERATION


R07746

1. STEERING WHEEL PAD (with AIRBAG)

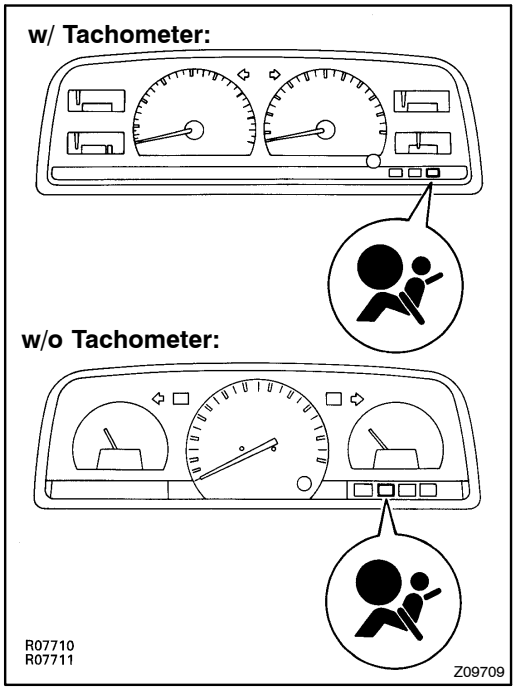
The inflater and bag of the SRS are stored in the steering wheel pad and cannot be disassembled. The inflater contains a squib, igniter charge, gas generant, etc., and inflates the bag when instructed by the airbag sensor assembly.



AB0250

2. SPIRAL CABLE (in COMBINATION SWITCH)

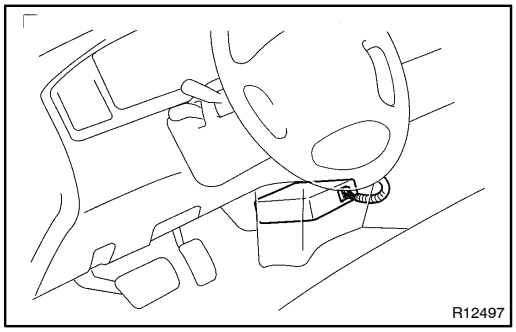
A spiral cable is used as an electrical joint from the vehicle body side to the steering wheel.



R07710
R07711
Z09709

3. SRS WARNING LIGHT

The SRS warning light is located on the combination meter. It goes on to alert the driver of trouble in the system when a malfunction is detected in the airbag sensor assembly. In normal operation conditions when the ignition switch is turned to the ACC or ON position, the light goes on for about 6 seconds and then goes off.

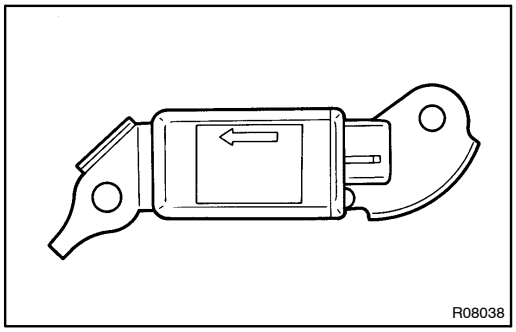

R12497

4. AIRBAG SENSOR ASSEMBLY

The airbag sensor assembly is mounted on the floor inside the lower center cover. The airbag sensor assembly consists of an airbag sensor, safing sensor, diagnosis circuit, ignition control, drive and circuit, etc.

It receives signals from the airbag sensor and judges whether the SRS must be activated or not.

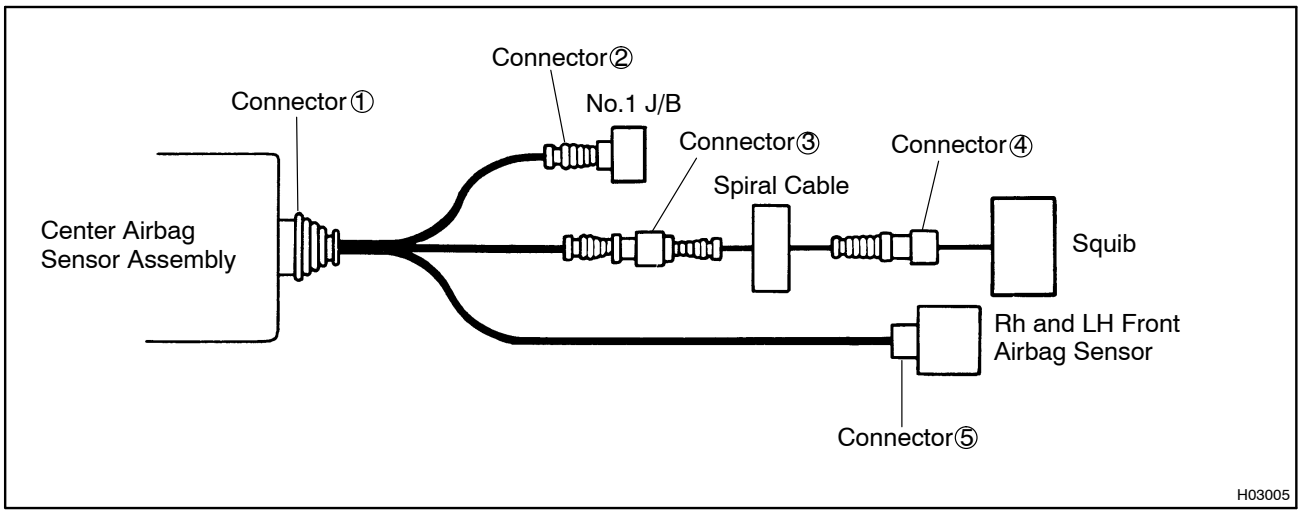
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5. FRONT AIRBAG SENSOR

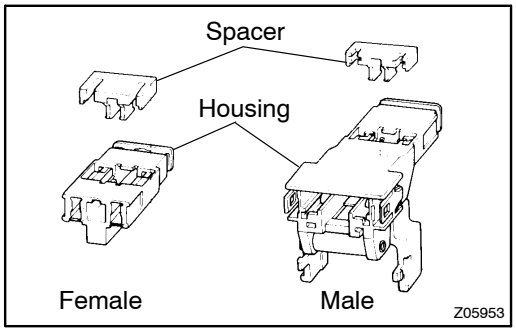
The front airbag sensor is mounted inside each of the front members. The sensor unit is a mechanical type. When the sensor detects deceleration force above a predetermined limit, contact is made in the sensor, sending a signal to the airbag sensor assembly. The sensor cannot be disassembled.

6. SRS CONNECTORS



No.	Item	Application
(1)	Terminal Twin–Lock Mechanism	Connectors 2, 3, 4
(2)	Airbag Activation Prevention Mechanism	Connectors 1, 3, 4
(3)	Electrical Connection Check Mechanism	Connectors 1, 5
(4)	Connector Twin–Lock Mechanism	Connectors 3, 4

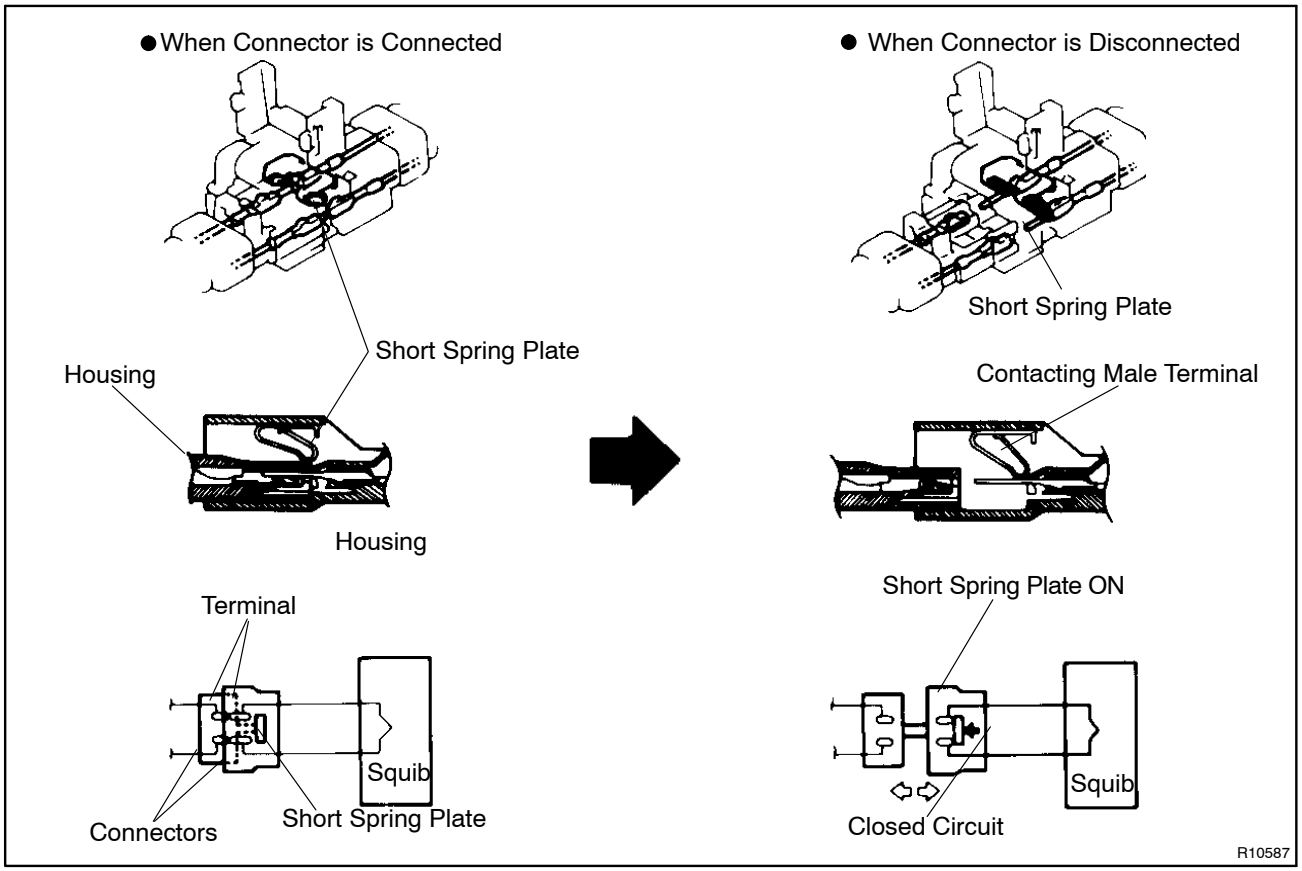
(a) All connectors in the SRS are colored yellow to distinguish them from other connectors. Connectors having special functions and specifically designed for the SRS are used in the locations shown above to ensure high reliability. These connectors use durable gold–plated terminals.



(1) Terminal Twin–Lock Mechanism
Each connector has a two–piece component consisting of a housing and a spacer. This design secures the locking of the terminal by two locking devices (the retainer and the lance) to prevent terminals from coming out.

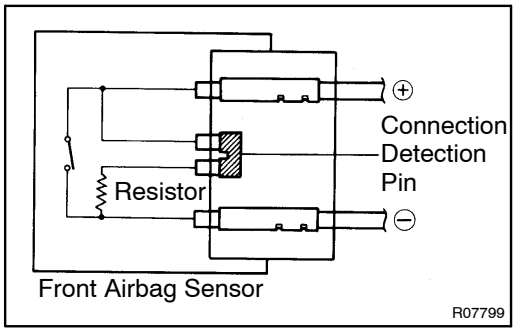
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(2) Airbag Activation Prevention Mechanism
Each connector contains a short spring plate. When the connector is disconnected, the short spring plate automatically connects the power source and grounding terminals of the squib.

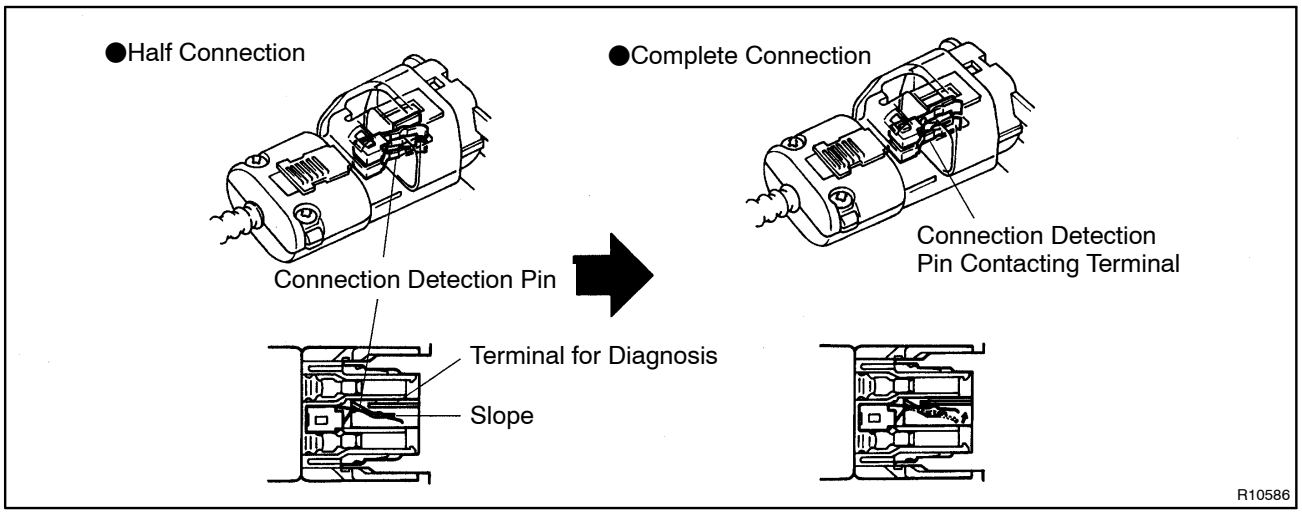


HINT:
The illustration on the previous page shows connectors ”3” and ”4”.

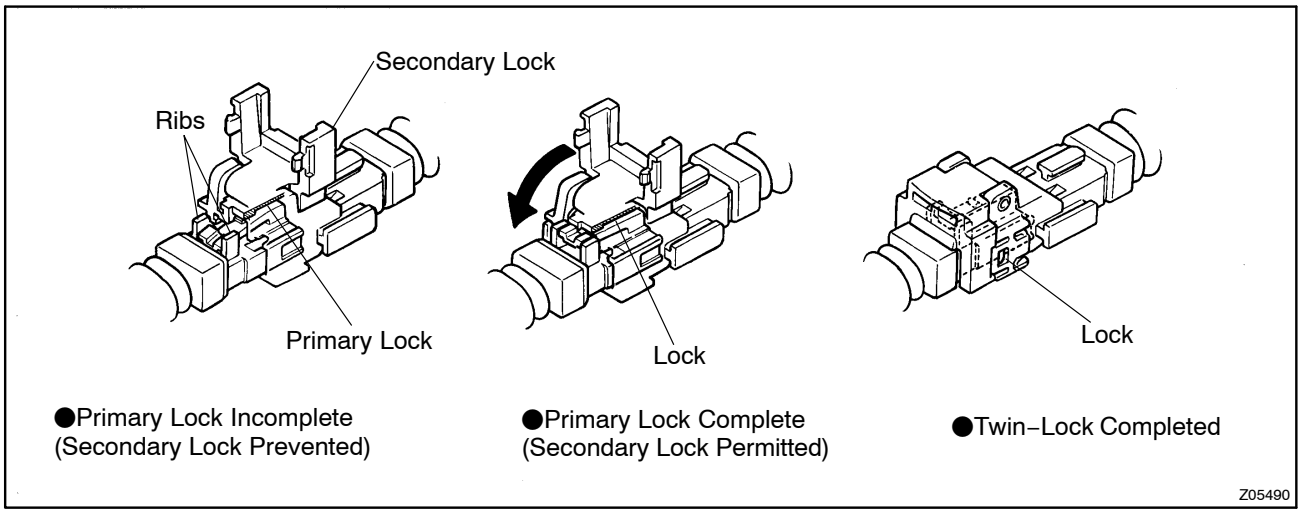
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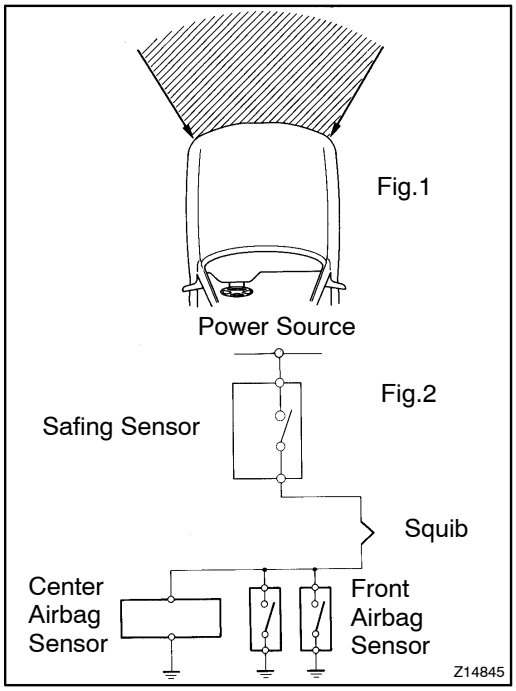
(3) Electrical Connection Check Mechanism
This mechanism electrically checks if connectors are connected correctly and completely. The electrical connection check mechanism is designed so that the disconnection detection pin connects with the diagnosis terminals when the connector housing lock is locked.



(4) Connector Twin–Lock Mechanism
With this mechanism connectors (male and female connectors) are locked by 2 locking devices to increase the connection reliability. If the primary lock is incomplete, ribs interfere and prevent the secondary lock.



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(b) When the vehicle is involved in a frontal collision in the hatched area (Fig. 1) and the shock is larger than the predetermined level, the SRS is activated automatically. A safing sensor is designed to go on at a smaller deceleration rate than the airbag sensor. As illustrated in Fig. 2, ignition is caused when current flows to the squib, which happens when a safing sensor and the airbag sensor go on simultaneously. When deceleration force acts on the sensors, squib in the driver airbag ignite and generate gas. The gas discharging into the driver airbag rapidly increases the pressure inside the bags, breaking open the steering wheel pad.

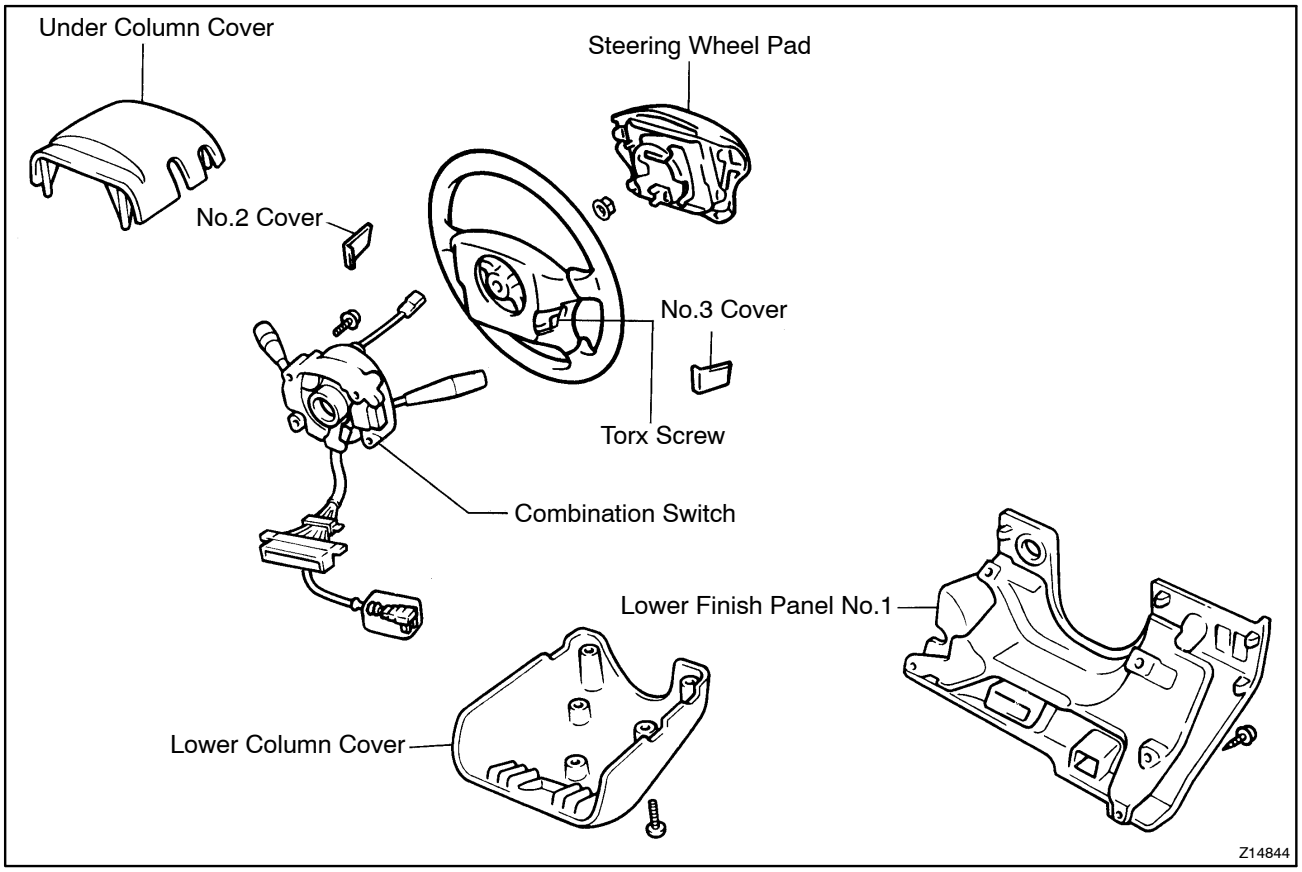
Bag inflation then ends, and the bags deflate as the gas is discharged through discharge holes at the bag's rear or side.

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STEERING WHEEL PAD AND SPIRAL CABLE

COMPONENTS

RS03J–01



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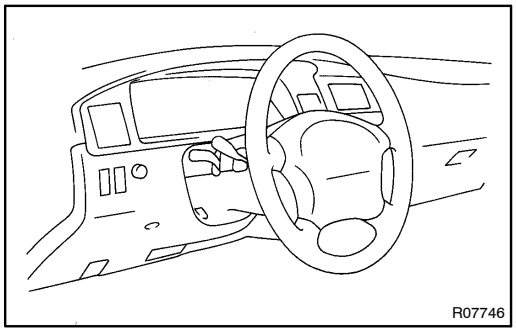
RS03K–01

REMOVAL

(See page SR–13 or SR–33)

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RS03L–02

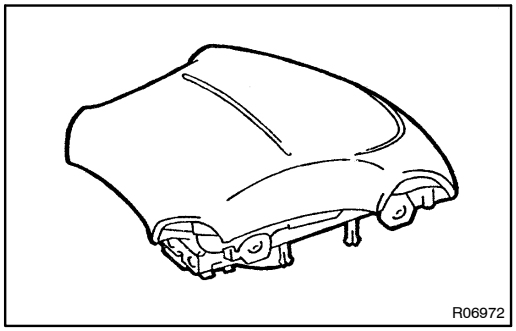

R07746

INSPECTION

1. VEHICLES NOT INVOLVED IN A COLLISION

(a) Do a diagnostic system check.
(See page DI–365)

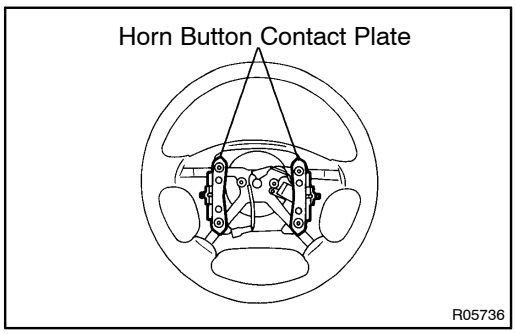
(b) Do a visual check which includes the following items with the steering wheel pad (with airbag) installed in the vehicle.
Check for cuts, minute cracks or marked discoloration on the steering wheel pad top surface and in the grooved portion.


R06972

2. VEHICLE INVOLVED IN A COLLISION AND AIRBAG IS NOT DEPLOYED

(a) Do a diagnostic system check.
(See page DI–365)

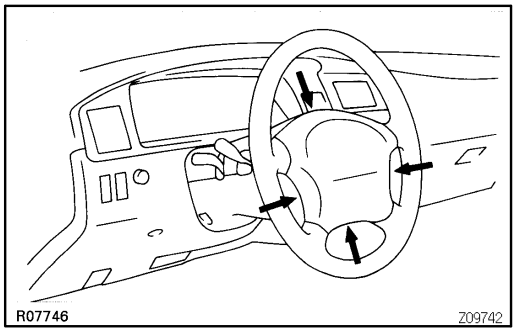
(b) Do a visual check which includes the following items with the steering wheel pad (with airbag) removed from the vehicle.
- Check for cuts, minute cracks or marked discoloration on the steering wheel pad top surface and in the grooved portion.
- Check for cuts and cracks in wire harness, and chipping in connectors.
- Check for the deformation of the horn button contact plate of the steering wheel.



R05736

HINT:
- If the horn button contact plate of the steering wheel is deformed, never repair it. Always replace the steering wheel assembly with a new one.

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- There should be no interference between the steering wheel pad and steering wheel, and the clearance should be uniform all the way around when the new steering wheel pad is installed on the steering wheel.

CAUTION:
For removal and installation of the steering wheel pad, see the SR section and be sure to follow the correct procedure.

3. VEHICLE INVOLVED IN A COLLISION AND AIRBAG IS DEPLOYED

(a) Do a diagnostic system check.
(See page DI–365)

(b) Do a visual check which includes the following items with the steering wheel pad (with airbag) removed from the vehicle.
- Check for the deformation on the horn button contact plate of the steering wheel.
- Check for the damage to the spiral cable connector and wire harness.

HINT:
- If the horn button contact plate of the steering wheel is deformed, never repair it. Always replace the steering wheel assembly with a new one.
- There should be no interference between the steering wheel pad and steering wheel, and the clearance should be uniform all the way around when the new steering wheel pad is installed on the steering wheel.

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RS03M–02

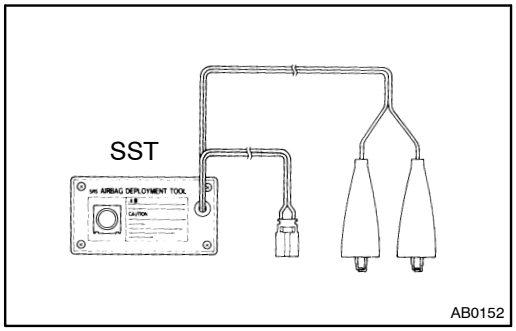
DISPOSAL

HINT:

When scrapping vehicle equipped with an SRS or disposing of a steering wheel pad (with airbag), always first deploy the airbag in accordance with the procedure described below. If any abnormality occurs with the airbag deployment, contact the SERVICE DEPT. of TOYOTA MOTOR SALES, U.S.A., INC.. When disposing of a steering wheel pad with an airbag deployed in a collision, follow the same procedure given in step 1–(c) in "DISPOSAL".

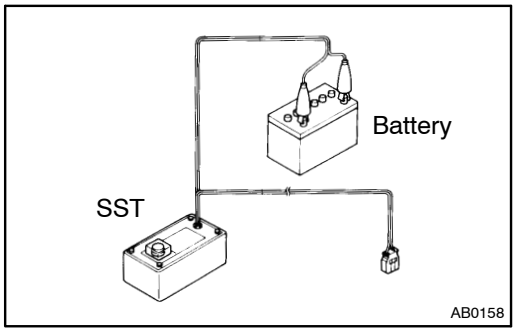
CAUTION:

- **Never dispose of a steering wheel pad which has an undeployed airbag.**
- **The airbag produces a sizeable exploding sound when it deploys, so perform the operation out–of–doors and where it will not create a nuisance to nearby residents.**



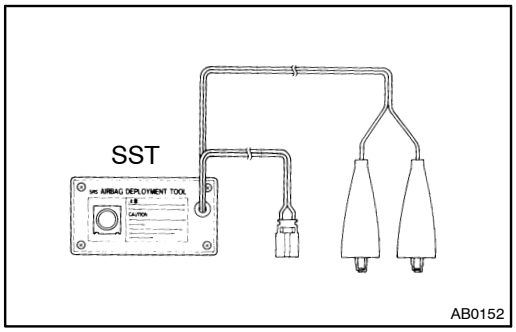
- **When deploying the airbag, always use the specified SST (SRS Airbag Deployment Tool). Perform the operation in a place away from electrical noise.**
  SST 09082–00700
- **When deploying an airbag, perform the operation at least 10 m (33 ft) away from the steering wheel pad.**
- **The steering wheel pad is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a steering wheel pad with the deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a steering wheel pad with the deployed airbag.**

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1. AIRBAG DEPLOYMENT WHEN SCRAPPING VEHICLE

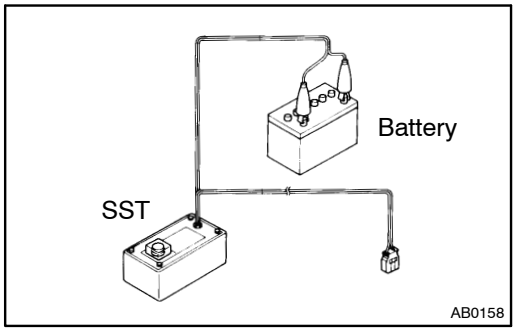
HINT:
Have a battery ready as the power source to deploy the airbag.



(a) Check functioning of SST

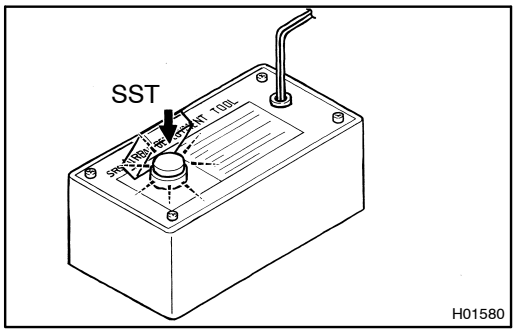
CAUTION:
When deploying the airbag, always use the specified SST: SRS Airbag Deployment Tool.

SST 09082–00700



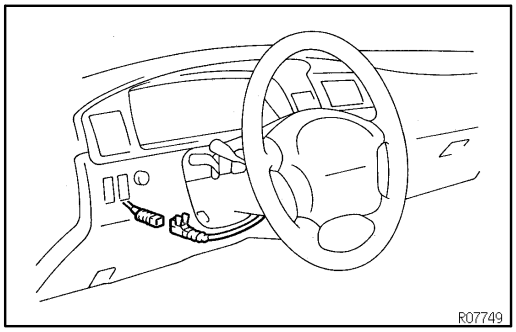
(1) Connect the SST battery.
Connect the red clip of the SST to the battery positive (+) terminal and the black clip to the battery negative (–) terminal.

HINT:
Do not connect the yellow connector which will be connected with the supplemental restraint system.



(2) Check functioning of SST.
Press the SST activation switch, and check that the LED of the SST activation switch lights up.

CAUTION:
If the LED lights up when the activation switch is not being pressed, SST malfunction is probable, so definitely do not use the SST.

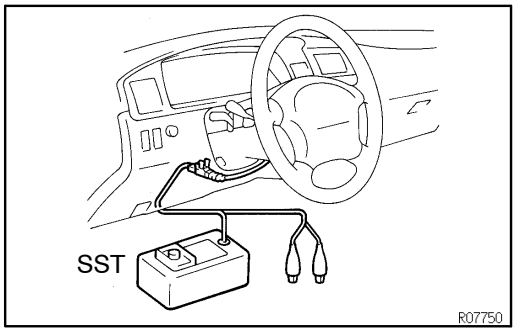


(b) Install the SST.

CAUTION:
Check that there is no looseness in the steering wheel and steering wheel pad.

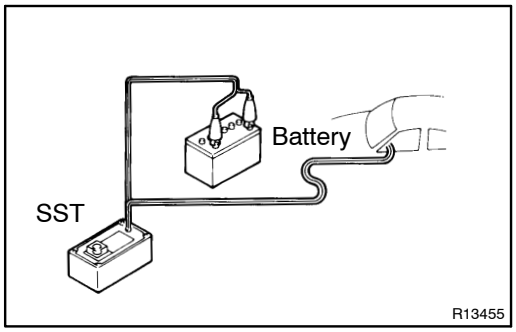
(1) Disconnect the airbag connector of the spiral cable.

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(2) Connect the SST connector to the airbag connector of the spiral cable.

SST 09082–00700



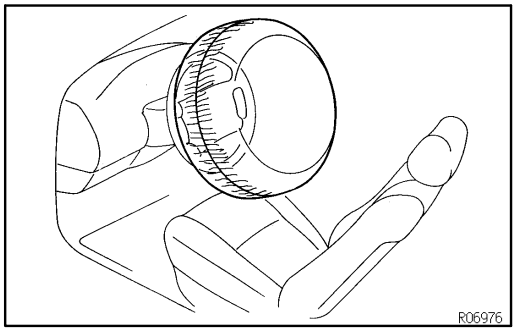
(3) Move the SST at least 10 m (33 ft) away from the front of the vehicle.

(4) Close all the doors and windows of the vehicle.

NOTICE:

Take care not to damage the SST wire harness.

(5) Connect the SST red clip to the battery positive (+) terminal and the black clip to the negative (–) terminal.



(c) Deploy the airbag.

(1) Check that no one is inside the vehicle or within 10 m (33 ft) area around the vehicle.

(2) Press the SST activation switch and deploy the airbag.

HINT:

The airbag deploys simultaneously as the LED of the SST activation switch lights up.

(d) Dispose of steering wheel pad (with airbag).

CAUTION:

- **The steering wheel pad is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a steering wheel pad with deployed airbag.**
- **Always wash your hands with water after completing the operation.**
- **Do not apply water, etc. to a steering wheel pad with deployed airbag.**

(1) When scrapping a vehicle, deploy the airbag and scrap the vehicle with the steering wheel pad still installed.

(2) When moving a vehicle for scrapping which has a steering wheel pad with deployed airbag, use gloves and safety glasses.

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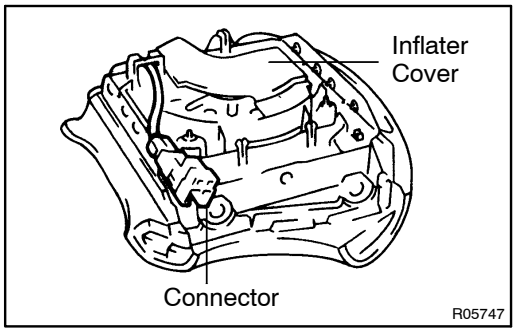
2. DEPLOYMENT WHEN DISPOSING OF STEERING WHEEL PAD ONLY

NOTICE:

- **When disposing of the steering wheel pad (with airbag) only, never use the customers vehicle to deploy the airbag.**
- **Be sure to follow the procedure given below when deploying the airbag.**

HINT:

Have a battery ready as the power source to deploy the airbag.

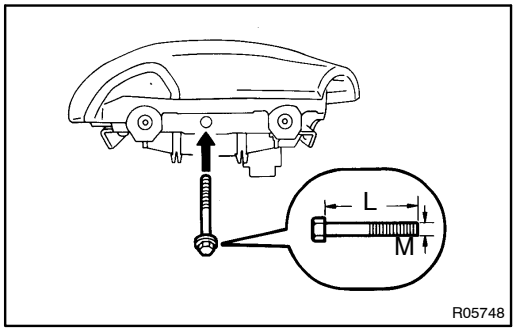


(a) Remove the steering wheel pad.
(See page SR–13 or SR–26)

CAUTION:

When storing the steering wheel pad, keep the upper surface of the pad facing upward.

(b) Remove the steering wheel pad connector.
Remove the connector on the rear surface of the steering wheel pad from the bracket.

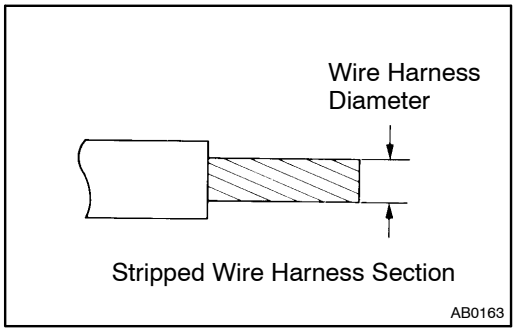


(c) Fix steering wheel pad to disc wheel with tire.
(1) Install the 2 bolt with washers in the 2 bolt holes in the steering wheel pad.

Bolt:
L: 35. mm (1.387 in.)
M: 6.0 mm (0.236 in.)
Pitch: 1.0 mm (0.039 in.)

NOTICE:

- **Tighten the bolts by hand until the bolts become difficult to turn.**
- **Do not tighten the bolts too much.**



(2) Using a service–purpose wire harness tie down the steering wheel pad to the disc wheel.

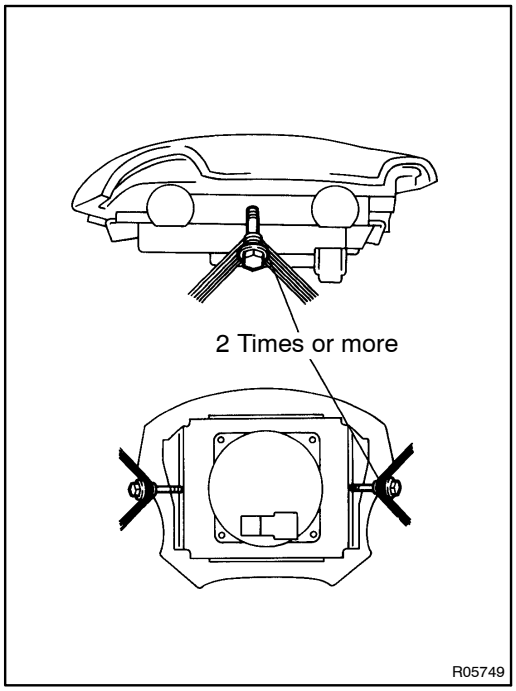
Wire harness: Stripped wire harness section 1.25 mm^2 or more (0.0019 in^2. or more).

HINT:

To calculate the square of the stripped wire harness section:
Square = 3.14 x $(Diameter)^2$ divided by 4

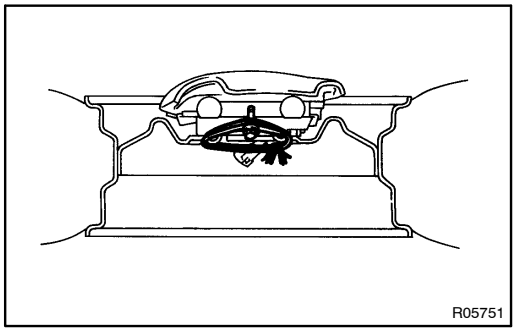
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CAUTION:
If a wire harness which is too thin or some other thing is used to tie down the steering wheel pad, it may be snapped by the shock when the airbag is deployed. This is highly dangerous. Always use a wire harness for vehicle use which is at least 1.25 mm^2 (0.0019 in^2).



(3) Using 3 wire harness, wind the wire harness at least 2 times each around the bolts installed on the left and right sides of the steering wheel pad.

CAUTION:
- **Tightly wind the wire harness around the bolts so that there is no slack.**
- **If there is slackness in the wire harness, the steering wheel pad may come loose due to the shock when the airbag is deployed. This is highly dangerous.**

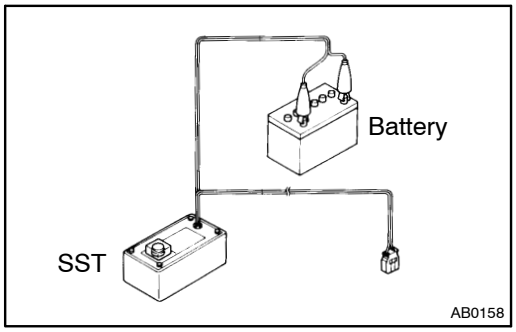


(4) Face the upper surface of the steering wheel pad upward. Separately tie the left and right sides of the steering wheel pad to the disc wheel through the hub nut holes. Position the steering wheel pad connector so that it hangs downward through a hub hole in the disc wheel.

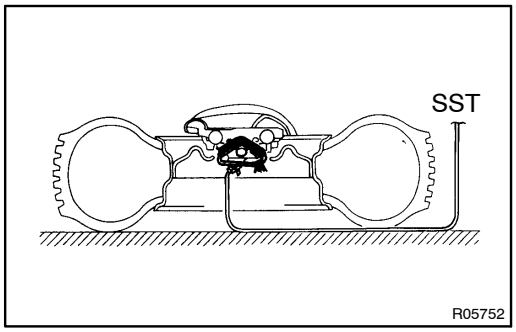
CAUTION:
- **Make sure that the wire harness is tight. It is very dangerous when looseness in the wire harness results in the steering wheel pad coming free through the shock from the airbag deploying.**
- **Always tie down the steering wheel pad with the pad side facing upward. It is very dangerous when the steering wheel pad is tied down with the metal surface facing upward and the steering wheel pad will be thrown into the air.**

NOTICE:
The disc wheel will be marked by airbag deployment, so use the spare disc wheel.

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(d) Check functioning of SST.
SST 09082–00700



(e) Install the SST

CAUTION:

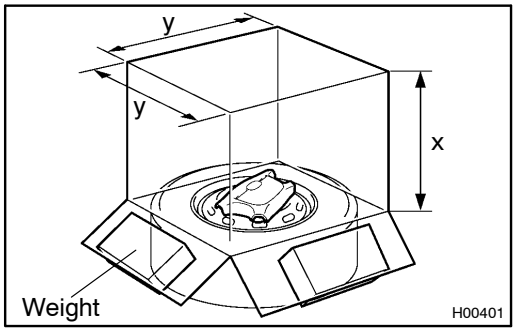
Place the disc wheel on the level ground.

(1) Connect the SST connector to the steering wheel pad connector.
SST 09082–00700

NOTICE:

To avoid damaging the SST connector and wire harness, do not lock the secondary lock of the twin lock. Also, secure some slack for the SST wire harness inside the disc wheel.

(2) Move the SST to at least 10 m (33 ft) away from steering wheel pad tied down on the disc wheel.



(f) Cover steering wheel pad with cardboard box or tires.

- Covering method using cardboard box:
  Cover the steering wheel pad with the cardboard box and weight the cardboard box down in 4 places with at least 190 N (20 kg, 44 lb).

Size of cardboard box:

Must exceed the following dimensions:

x=460 mm (18.11 in.)

When dimension of the cardboard box exceeds the diameter of the disc wheel with the tire which the steering wheel pad is tied to–

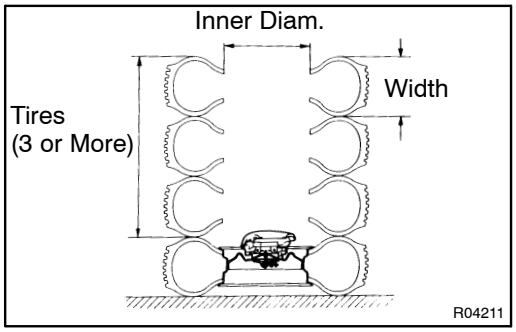
x=460 mm (18.11 in.) + width of tire

y= 650 mm (25.59 in.)

NOTICE:

If a cardboard box smaller than the specified size is used, the cardboard box will be broken by the shock from the airbag deployment.

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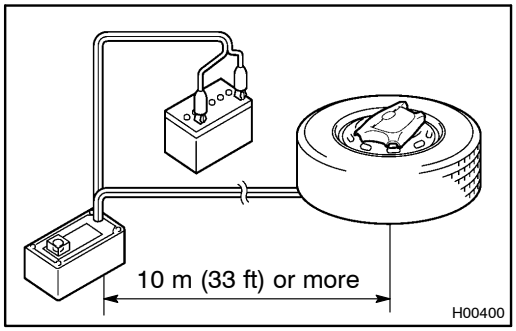


- Covering method using tires:
  Place at least 3 tires without disc wheel on top of the disc wheel with the tire to which the steering wheel pad is tied.

Tire size: Must exceed the following dimensions–
Width: 185 mm (7.87 in.)
Inner diameter: 360 mm (14.17 in.)

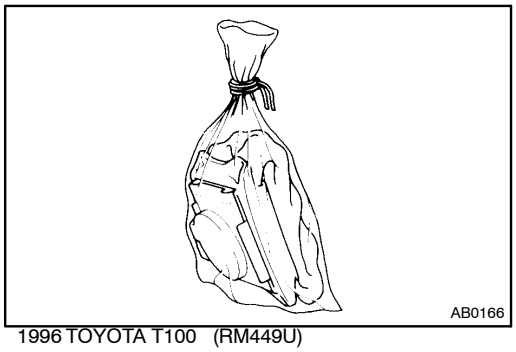
CAUTION:
Do not use tires with disc wheels.

NOTICE:
The tires may be marked by the airbag deployment, so use the redundant tires.



(g) Deploy the airbag.
  (1) Connect the SST red clip to the battery positive (+) terminal and the black clip to the battery negative (–) terminal.
  (2) Check that no one is within 10 m (33 ft) area around the disc wheel which the steering wheel pad is tied to.
  (3) Press the SST activation switch and deploy the airbag.

HINT:
The airbag deploys simultaneously as the LED of the SST activation switch lights up.



(h) Dispose of the steering wheel pad (with airbag)

CAUTION:
- **The steering wheel pad is very hot when the airbag is deployed, so leave it alone for at least 30 minutes after deployment.**
- **Use gloves and safety glasses when handling a steering wheel pad with deployed airbag.**
- **Always wash your hands with water after completing the operation.**

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- **Do not apply water, etc. to a steering wheel pad with deployed airbag.**
  (1) Remove the steering wheel pad from the disc wheel.
  (2) Place the steering wheel pad in a vinyl bag, tie the end tightly and dispose of it in the same way as other general parts disposal.

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RS03N–01

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following case, replace the steering wheel pad, steering wheel or spiral cable.

- If the airbag has been deployed.
- If the steering wheel pad or spiral cable has been found to be faulty in troubleshooting.
- If the steering wheel pad, steering or spiral cable has been found to be faulty during the check in items (See page RS–9).
- If the steering wheel pad has been dropped.

CAUTION:

For removal and installation of the steering wheel pad, see SR section. Be sure to follow the correct procedure.

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RS03O–01

INSTALLATION

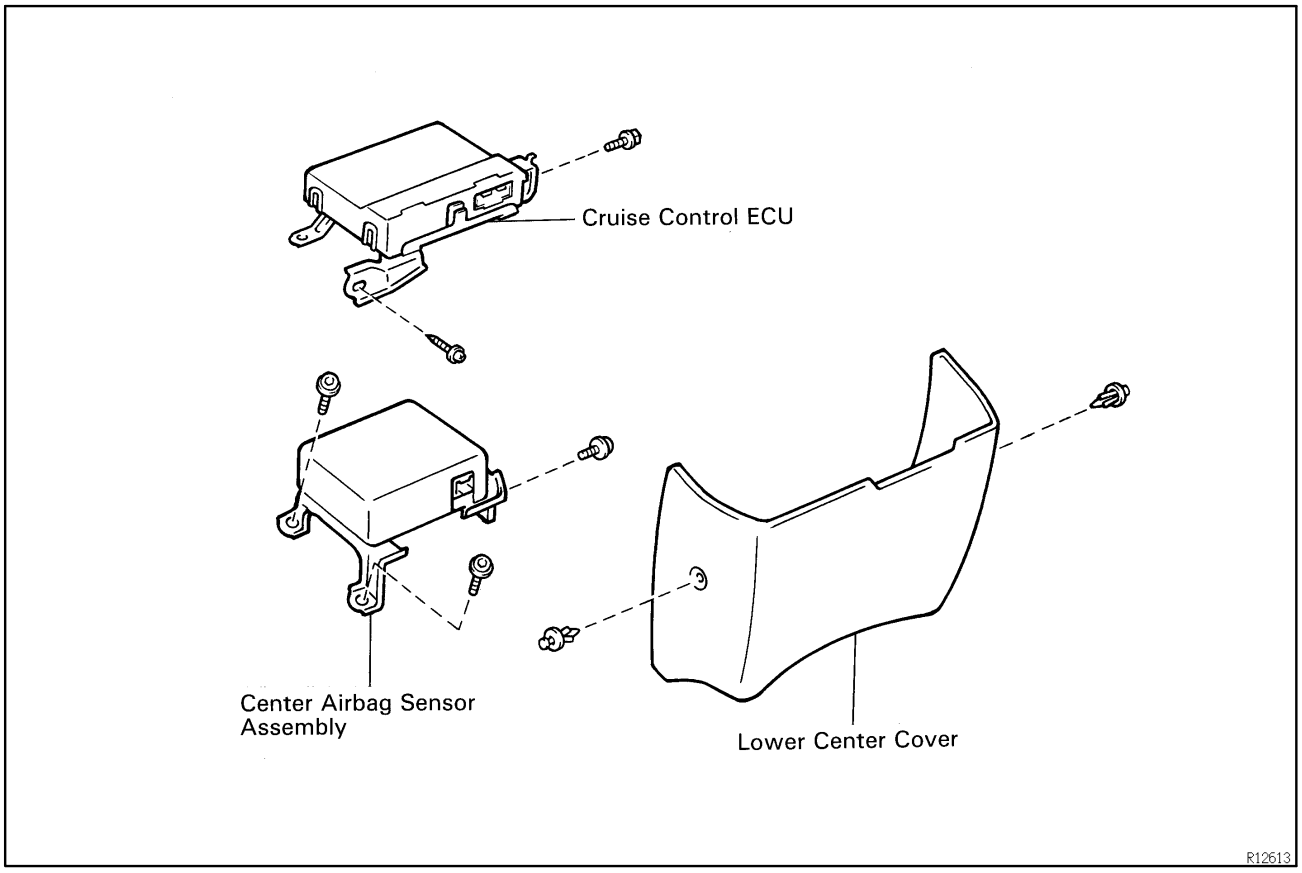
(See page SR–20 or SR–33)

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AIRBAG SENSOR ASSEMBLY

COMPONENTS

RS03P–03



Author : Date : 1788

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RS03Q–03

REMOVAL

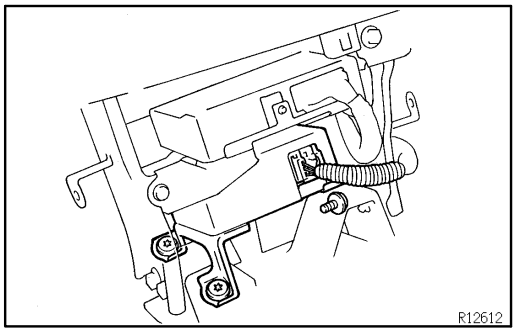
NOTICE:

Do not open the cover or the case of the ECU and various computers unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)

1. REMOVE THESE PARTS:

(a) Lower center cover

(b) Cruise control ECU



2. REMOVE AIRBAG SENSOR ASSEMBLY

(a) Disconnect the connector.

NOTICE:

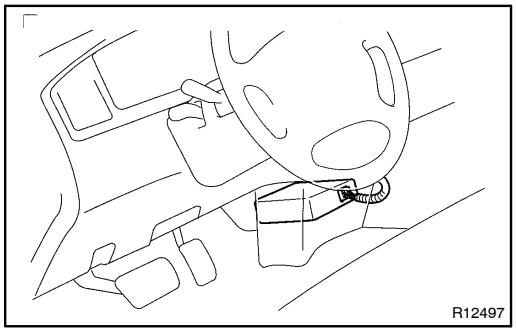
Removal of the connector is done with the sensor assembly installed.

(b) Using a torx wrench, remove the 3 screws and the airbag sensor assembly.

Torx wrench: T40 (Part No. 09042–00020 or locally manufactured tool)

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RS03R–01



INSPECTION

1. VEHICLE NOT INVOLVED IN COLLISION

Do a diagnostic system check.

(See page DI–365)

2. VEHICLE INVOLVED IN COLLISION AND AIRBAG IS NOT DEPLOYED

Do a diagnostic system check.

(See page DI–365)

3. VEHICLE INVOLVED IN COLLISION AND AIRBAG IS DEPLOYED

Replace the airbag sensor assembly.

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RS03S–01

REPLACEMENT

REPLACEMENT REQUIREMENTS

In the following cases, replace the airbag sensor assembly.

- If the SRS has been deployed in a collision.
- If the airbag sensor assembly has been found to be faulty in troubleshooting.
- If the airbag sensor assembly has been dropped.

CAUTION:

For removal and installation of the airbag sensor assembly, see page RS–22 and RS–25. Be sure to follow the correct procedure.

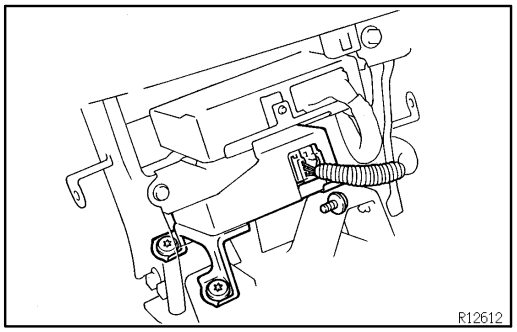
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RS03T–03

INSTALLATION

NOTICE:

- **Never use SRS parts from another vehicle. When replacing parts, replace with new ones.**
- **Never reuse the airbag sensor assembly involved in a collision when the airbag has deployed.**
- **Never repair a sensor in order to reuse it.**



1. INSTALL AIRBAG SENSOR ASSEMBLY

(a) Using a torx wrench, install the airbag sensor assembly with 3 screws.

Torx wrench: T40 (Part No. 09042–0020 or locally manufactured tool)

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

(b) Connect the connector.

NOTICE:

- **Installation of the connector is done with the sensor assembly installed. Make sure the sensor assembly is installed to the specified torque.**
- **If the sensor assembly has been dropped, or there are cracks, dents or other defects in the case, bracket or connector, replace the sensor assembly with a new one.**
- **When installing the sensor assembly, take care that the SRS wiring does not interfere with other parts and is not pinched between other parts.**
- **After installing, shake the sensor assembly to check that there is no looseness.**

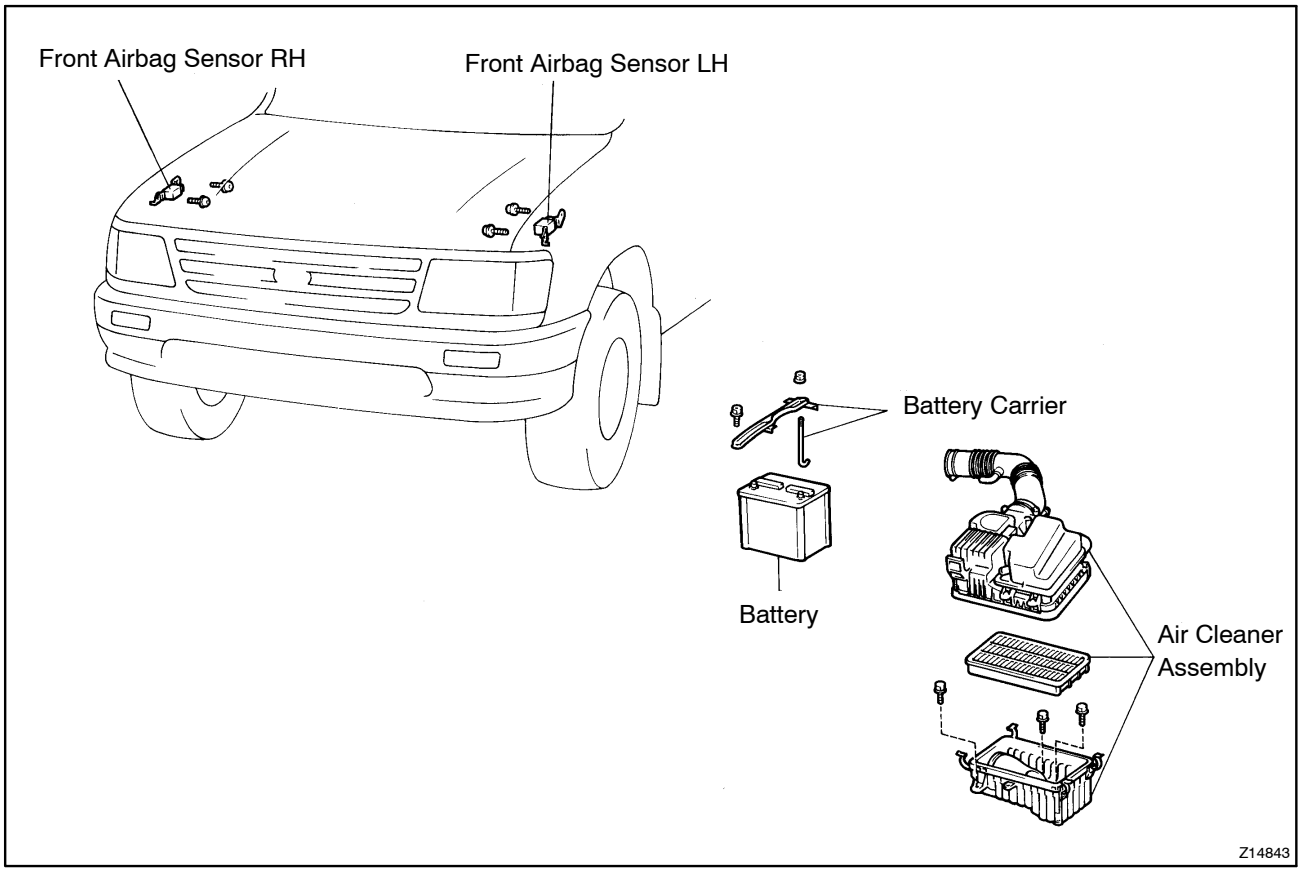
2. INSTALL REMOVED PARTS

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FRONT AIRBAG SENSOR

COMPONENTS

RS03U–03



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RS03V–01

REMOVAL

NOTICE:

- **If the wiring connector of the SRS is disconnected with the ignition switch at ON or ACC position, DTCs will be recorded.**
- **Never use SRS parts from another vehicle. When replacing parts, replace them with new ones.**
- **Never reuse the sensor involved in a collision when the SRS has been deployed.**
- **Never repair a sensor in order to reuse it.**

1. REMOVE THESE PARTS:

(a) Battery

(b) Air cleaner assembly

2. REMOVE FRONT AIRBAG SENSOR

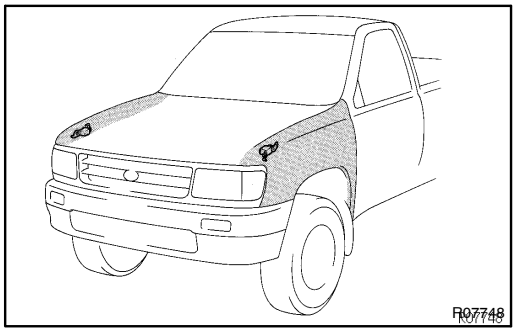
(a) Disconnect the connector.

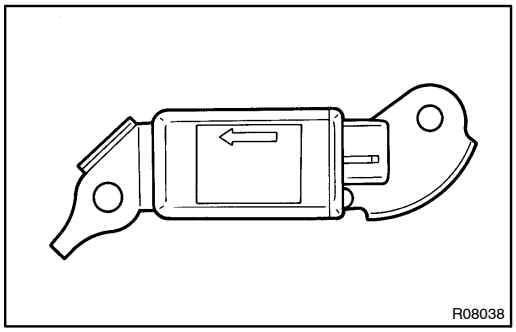
(b) Using a torx wrench, loosen the 2 screws and the sensor.

Torx wrench: T40 (Part No. 09042–00020 or locally manufactured tool)

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RS03W–02





INSPECTION

1. VEHICLES NOT INVOLVED IN A COLLISION

Do a diagnostic system check. (See page DI–365)

2. VEHICLES INVOLVED IN A COLLISION

(a) Do a diagnostic system check. (See page DI–365)

(b) If the front fender of the car or its periphery is damaged, do a visually check for damage to the front airbag sensor, which includes the following items even if the airbag was not deployed:

- Bracket deformation
- Peeling of paint off the bracket
- Cracks, dents or chips in the case
- Cracks, dents, chipping and scratches the connector
- Peeling of the label or damage to the series number

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RS03X–01

REPLACEMENT

REPLACEMENT REQUIREMENT

In the following cases, replace the front airbag sensor.

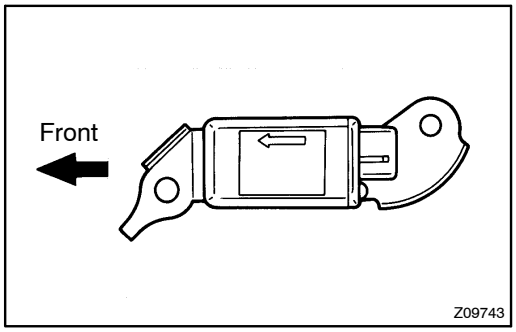
- If the SRS has been deployed in a collision. (Replace both the left and right airbag sensors.)
- If the front airbag sensor has been found to be faulty in troubleshooting.
- If the front airbag sensor has been found to be faulty during the check in item (See page RS–28).
- If the front airbag sensor has been dropped.

CAUTION:

For removal and installation of the front airbag sensor, see page RS–27 and RS–30.
Be sure to follow the correct procedure.

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RS03Y–02



INSTALLATION

1. INSTALL FRONT AIRBAG SENSOR

(a) Install the sensor so that the arrow on the sensor faces toward the front of the vehicle.

(b) Using a torx wrench, install the sensor with 2 screws.
Torx wrench: T40 (Part No. 09042–00020 or locally manufactured tool)
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

(c) Connect the connector.

NOTICE:

- **Make sure the sensor is installed to the specified torque.**
- **If the sensor has been dropped, or there are cracks, dents or other defects in the case, brackets or connector, replace the removed sensor, always replace the set bolts with new ones.**
- **The sensor set bolts which have been anti–rust treated. When the sensor is removed, always replace the set bolts with new ones.**
- **After installation, shake the sensor to check that there is no looseness.**
- **The front sensor is equipped with an electrical connection check mechanism. Be sure to lock this mechanism securely when connecting the connector . If the connector is not securely locked, a malfunction code will be detected by the diagnostic system.**

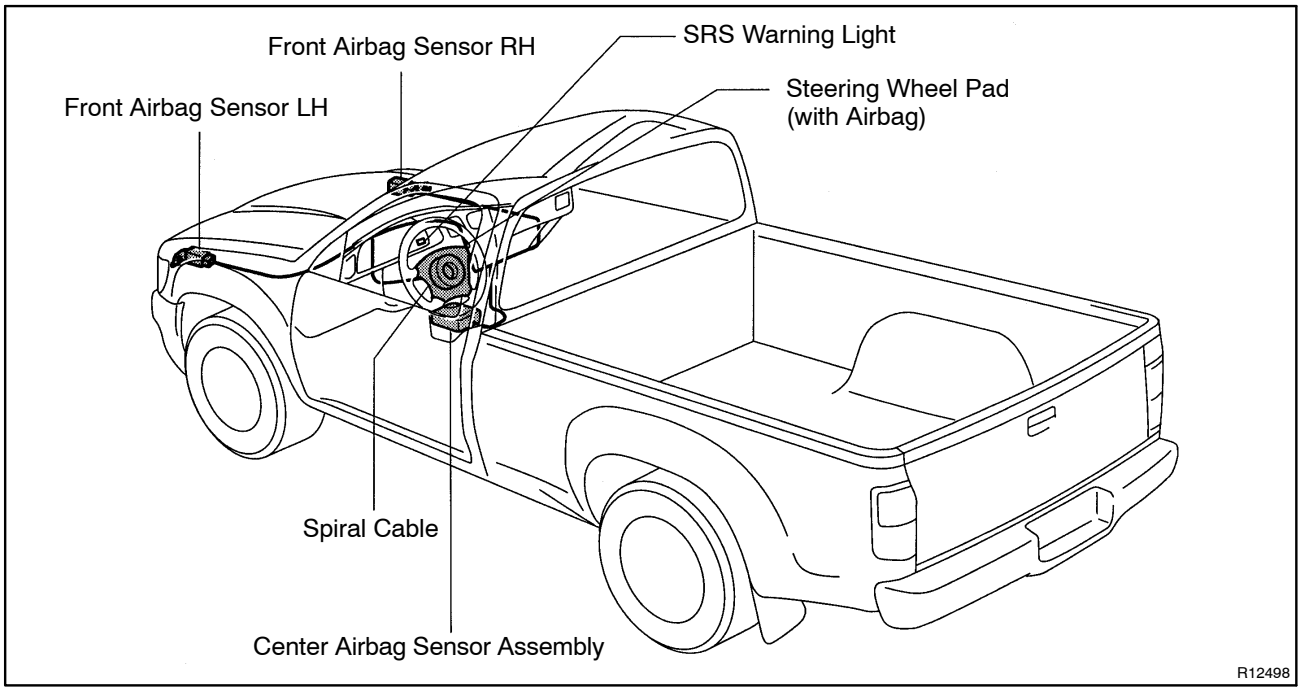
2. INSTALL REMOVED PARTS

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WIRE HARNESS AND CONNECTOR

LOCATION

RS03Z–02



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RS040–01

INSPECTION

HINT:

The SRS wire harness is integrated with the cowl wire harness assembly and floor wire harness assembly. The wires for the SRS wire harness are encased in a yellow corrugated tube and all the connectors in the system are a standard yellow color.

1. VEHICLES NOT INVOLVED IN COLLISION

Do a diagnostic system check.

(See page DI–365)

2. VEHICLES INVOLVED IN COLLISION

(a) Do a diagnostic system check.
(See page DI–365)

(b) Check for breaks in all wires of the SRS wire harness, and for exposed conductors.

(c) Check to see if the SRS wire harness connectors are cracked or chipped.

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RS041–01

REPLACEMENT

In the following cases,replace the wire harness or connector.

- If any part of the SRS wire harness or any connector has been found to be faulty in troubleshooting.
- If any part of the SRS wire harness or any connector has been found to be faulty during the check in items (See page RS–32).

CAUTION:

- **If the wire harness used in the SRS is damaged, replace the whole wire harness assembly.**
- **When the connector to the front airbag sensors can be repaired alone (when there is no damage to the wire harness), use the repair wire specially designed for this purpose.**

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BE – BODY ELECTRICAL

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BODY ELECTRICAL SYSTEM

BE01E–07

PRECAUTION

Take care to observe the following precautions when performing inspections or removal and replacement of body electrical related parts.

1. LIGHTING SYSTEM

Halogen bulbs have pressurized gas inside and require special handling.
They can burst or scatter if scratched or dropped. Hold a bulb only by its plastic or metal case.
Don't touch the glass part of a bulb with bare hands.

2. SRS (SUPPLEMENTAL RESTRAINT SYSTEM)

The TOYOTA T100 is equipped with an SRS (Supplemental Restraint System) such as the driver airbag. Failure to carry out service operations in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notices in the RS section.

3. AUDIO SYSTEM

- If the battery negative (–) terminal is disconnected, the preset AM, FM 1 and FM 2 stations stored in memory are erased, so be sure to note the stations and reset them after the battery terminal is reconnected.
- If the battery negative (–) terminal is disconnected, the "ANTI–THEFT SYSTEM" will operate when the terminal is reconnected, but the radio, tape player and CD player will not operate. Be sure to input the correct ID number so that the radio, tape player and CD player can be operated again.

4. MOBILE COMMUNICATION SYSTEM

If the vehicle is equipped with a mobile communication system, refer to precautions in the IN section.

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BE01F–10

PROBLEM SYMPTOMS TABLE

The table below will be useful for you in troubleshooting these electrical problems. The most likely causes of the malfunction are shown in the order of their probability. Inspect each part in the order shown, and replace the part when it is found to be faulty.

USA:

HEADLIGHT AND TAILLIGHT SYSTEM

Symptom	Suspect Area	See page
Headlight does not light up (Taillight is normal)	1. HEAD Fuse (Relay Block) 2. Light Control Switch 3. Headlight Dimmer Switch 4. Headlight Bulb	BE–14 BE–17 BE–17 BE–17
Headlight does not light up (Taillight does not light up)	1. Light Control Switch 2. Headlight Dimmer Switch 3. Wire Harness 4. Headlight Bulb	BE–17 BE–17 – –
Only one light comes on	1. HEAD Fuse (Relay Block) 2. Wire Harness 3. Headlight Bulb	BE–14 – –
”Lo–Beam” does not light up	1. Headlight Control Relay 2. Headlight Dimmer Relay 3. Headlight Dimmer Switch 4. Wire Harness 5. Headlight Bulb	BE–17 BE–17 BE–17 – –
”Hi–Beam” does not light up	1. Headlight Control Relay 2. Headlight Dimmer Relay 3. Headlight Dimmer Switch 4. Wire Harness 5. Headlight Bulb	BE–17 BE–17 BE–17 – –
”Flash” does not light up	1. Headlight Control Relay 2. Headlight Dimmer Relay 3. Headlight Dimmer Switch 4. Wire Harness 5. Headlight Bulb	BE–17 BE–17 BE–17 – –
Taillight does not light up (Headlight does not light up)	1. TAIL Fuse (Junction Block No.1) 2. Light Control Switch 3. Wire Harness 4. Headlight Bulb	BE–17 BE–17 – –
Taillight does not light up (Headlight is normal)	1. TAIL Fuse (Junction Block No.1) 2. Light Control Switch 3. Taillight Control Relay 4. Wire Harness 5. Taillight Bulb	BE–14 BE–17 BE–17 – –
Only one light goes out or does not light up	1. Wire Harness 2. Taillight Bulb	– –
Rear Combination light does not light up	1. TAIL Fuse (Junction Block No.1) 2. Wire Harness 3. Taillight Bulb	BE–14 – –
”Light–on warning system” does not operate.	1. Integration Relay 2. DOME Fuse (Relay Block) 3. GAUGE Fuse (Junction Block No.1) 4. Door Courtesy Switch 5. Wire Harness	BE–17 BE–14 BE–14 BE–25 –

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CANADA:
HEADLIGHT AND TAILLIGHT SYSTEM

Symptom	Suspect Area	See page
Only one side headlight does not light up.	1. Headlight Bulb 2. Wire Harness	– –
”Lo–Beam” does not light up. (ALL)	1. D.R.L. Relay 2. Headlight Dimmer Relay 3. Headlight Control Relay 4. Headlight Dimmer Switch 5. Wire Harness	BE–14 BE–17 BE–17 BE–17 –
”Lo–Beam” does not light up. (ONE SIDE)	1. HEAD LH–Lo Fuse (Relay Block) 2. HEAD RH–Lo Fuse (Relay Block) 3. Headlight Bulb 4. Wire Harness	BE–14 BE–14 – –
”Hi–Beam” does not light up. (ALL)	1. DRL Fuse (Junction Block No.1) 2. Headlight Dimmer Relay 3. Headlight Control Relay 4. Headlight Dimmer Switch 5. Wire Harness	BE–14 BE–17 BE–17 BE–17 –
”Hi–Beam” does not light up. (ONE SIDE)	1. HEAD LH–Hi Fuse (Relay Block) 2. HEAD RH–Hi Fuse (Relay Block) 3. Headlight Bulb 4. Wire Harness	BE–14 BE–14 – –
”Flash” does not light up.	1. Headlight Dimmer Switch 2. Wire Harness	BE–17 –
Headlight does not light up. (Taillight is normal)	1. Headlight Control Relay 2. D.R.L. Relay 3. D.R.L. No.4 Relay 4. D.R.L. Resistor 5. Headlight Dimmer Switch 6. Light Control Switch 7. Headlight Bulb 8. Wire Harness	BE–17 BE–17 BE–17 BE–17 BE–17 BE–17 – –
Headlight does not light up. (Taillight does not light up)	1. Headlight Control Relay 2. D.R.L. Relay 3. D.R.L. No.4 Relay 4. D.R.L. Resistor 5. Headlight Dimmer Switch 6. Light Control Switch 7. Headlight Bulb 8. Wire Harness	BE–17 BE–17 BE–17 BE–17 BE–17 BE–17 – –
Only one side taillight does not light up.	1. Taillight Bulb 2. Wire Harness	– –
Taillight does not light up. (Headlight is normal)	1. TAIL Fuse (Junction Block No.1) 2. Taillight Control Relay 3. Light Control Switch 4. Taillight Bulb 5. Wire Harness	BE–14 BE–17 BE–17 – –
Taillight does not light up. (Headlight does not light up)	1. Light Control Switch 2. Taillight Bulb 3. Wire Harness	BE–17 – –
Headlight does not light up with light control SW in HEAD.	1. Light Control Switch 2. D.R.L. Relay 3. D.R.L. No.4 Relay 4. Wire Harness	BE–17 BE–17 BE–17 –

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Headlight does not go out with light control SW in OFF.	1. Headlight Control Relay 2. Light Control Switch 3. Wire Harness	BE–17 BE–17 –
Taillight does not light up with light control SW in TAIL.	1. Taillight Control Relay 2. Light Control Switch 3. Wire Harness	BE–17 BE–17 –
Taillight does not go out with light control SW in OFF.	1. Taillight Control Relay 2. Light Control Switch 3. Wire Harness	BE–17 BE–17 –
Headlight do not light up with engine running, parking brake SW and light control SW in OFF.	1. ECU–B Fuse (Junction Block No.1) 2. GAUGE Fuse (Junction Block No.1) 3. DRL Fuse (Junction Block No.1) 4. D.R.L. Relay 5. D.R.L. No.4 Relay 6. D.R.L. Resistor 7. Wire Harness 8. Generator L Terminal 9. Parking Brake Switch	BE–14 BE–14 BE–14 BE–17 BE–17 BE–17 – – BE–38
”Light–on warning system” does not operate.	1. Integration Relay 2. DOME Fuse (Relay Block) 3. GAUGE Fuse (Junction Block No.1) 4. Door Courtesy Switch 5. Wire Harness	BE–17 BE–14 BE–14 BE–25 –

TURN SIGNAL AND HAZARD WARNING SYSTEM

Symptom	Suspect Area	See page
”Hazard” and ”Turn” do not light up	1. Hazard Warning Switch 2. Turn Signal Flasher 3. Wire Harness	BE–23 BE–23 –
The flashing frequency is abnormal	1. Bulb 2. Turn Signal Switch 3. Wire Harness	– BE–23 –
Hazard warning light does not light up (Turn signal is normal)	1. HAZ–HORN Fuse (Relay Block) 2. Wire Harness	BE–22 –
Hazard warning light does not light up in one direction	1. Hazard Warning Switch 2. Wire Harness	BE–23 –
*1 Turn signal does not light up	1. Ignition Switch 2. TURN Fuse (Junction Block No.1) 3. Turn Signal Switch 4. Wire Harness	BE–12 BE–22 BE–23 –
*2 Turn signal does not light up	1. TURN Fuse (Junction Block No.1) 2. Turn Signal Switch 3. Wire Harness	BE–22 BE–23 –
Turn signal does not light up in one direction	1. Turn Signal Switch 2. Wire Harness	BE–23 –
Only one bulb does not light up	1. Bulb 2. Wire Harness	– –

*1: Combination Meter, Wiper and Washer do not operate.
*2: Combination Meter, Wiper and Washer are normal.

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INTERIOR LIGHT SYSTEM

Symptom	Suspect Area	See page
Room light does not light up	1. DOME Fuse (Relay Block) 2. Room Light Switch 3. Door Courtesy Switch 4. Wire Harness 5. Bulb	BE–24 BE–25 BE–25 – –
Room light remains always on	1. Room Light Switch 2. Door Courtesy Switch 3. Wire Harness	BE–25 BE–25 –

BACK–UP LIGHT SYSTEM

Symptom	Suspect Area	See page
Back–Up Light does not light up	1. GAUGE Fuse (Junction Block No.1) 2. Ignition Switch 3. Back–Up Light Relay (Column A/T) 4. Back–Up Light Switch (M/T) 5. PNP Switch (A/T) 6. Bulb 7. Wire Harness	BE–26 BE–12 BE–28 BE–28 DI–306 – –
Back–Up Light remains always on	1.Wire Harness	–
Only one light does not light up	1. Bulb 2. Wire Harness	– –

STOP LIGHT SYSTEM

Symptom	Suspect Area	See page
Stop light does not light up	1. STOP Fuse (Junction Block No.1) 2. Stop Light Switch 3. Wire Harness 4. Bulb	BE–29 BE–30 – –
Stop light remains always on	1. Stop Light Switch 2. Wire Harness	BE–30 –
Only one light does not light up	1. Wire Harness 2. Bulb	– –

WIPER AND WASHER SYSTEM

Symptom	Suspect Area	See page
Wiper does not operate or turn to off position	1. WIPER Fuse (Junction Block No.1) 2. Ignition Switch 3. Wiper and Washer Switch 4. Wiper Motor 5. Wire Harness	BE–31 BE–12 BE–32 BE–32 –
Wiper does not operate in INT position	1. Wiper and Washer Switch 2. Wiper Motor 3. Wire Harness	BE–32 BE–32 –
Washer does not operate	1. Wiper and Washer Switch 2. Washer Hose and Nozzle 3. Washer Motor 4. Wire Harness	BE–32 – BE–32 –

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COMBINATION METER
Meter, Gauge and Illumination:

Symptom	Suspect Area	See page
Tachometer, fuel gauge oil Pressure and water temperature gauge do not operate	1. GAUGE Fuse (Junction Block No.1) 2. Combination Meter Wiring Circuit 3. Wire Harness 4. Meter Circuit Plate	– BE–36 – BE–36
Speedometer does not operate	1. Vehicle Speed Sensor 2. Speedometer Driven Gear and Drive Gear	BE–38 –
Tachometer does not operate	1. Combination Meter Wiring Circuit 2. Wire Harness 3. Igniter 4. Meter Circuit Plate	BE–36 – – – BE–36
Fuel gauge does not operate or abnormal operation	1. Fuel Receiver Gauge 2. Fuel Sender Gauge 3. Combination Meter Wiring Circuit 4. Wire Harness	BE–38 BE–38 BE–36 –
Engine coolant temperature gauge does not operate or abnormal operation	1. Engine Coolant Temperature Receiver Gauge 2. Engine Coolant Temperature Sender Gauge 3. Combination Meter Wiring Circuit 4. Wire Harness	BE–38 BE–38 BE–36 –
Oil pressure gauge does not operte or abnormal operation	1. Oil Pressure Receiver Gauge 2. Oil Pressure Sender Gauge 3. Combination Meter Wiring Circuit 4. Wire Harness	BE–38 BE–38 BE–36 –
All illumination lights do not light up	1. TAIL Fuse (Junction Block No.1) 2. Light Control Rheostat 3. Wire Harness	– BE–38 –
Brightness does not change even when rheostat turned	1. Bulb 2. Wire Harness	– –
Only one illumination light does not light up	1. Bulb 2. Wire Harness	– –

COMBINATION METER
Warning Lights:

Symptom	Suspect Area	See page
Warning light do not light up (Except Discharge)	1. GAUGE Fuse (Junction Block No.1) 2. Combination Meter Wiring Circuit 3. Wire Harness	– BE–36 –
Oil pressure warning light does not light up	1. Bulb 2. Combination Meter Wiring Circuit 3. Oil Pressure Warning Switch 4. Wire Harness	– BE–36 BE–38 –
Washer Fluid Level Warning light does not light up	1. Bulb 2. Combination Meter Wiring Circuit 3. Washer Fluid Level Warning Switch 4. Wire Harness	– BE–36 BE–38 –
Fuel level warning light does not light up	1. Bulb 2. Combination Meter Wiring Circuit 3. Fuel Level Warning Switch 4. Wire Harness	– BE–36 BE–38 –

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A/T Oil temperature warning indicator light does not light up	1. Bulb 2. Combination Meter Wiring Circuit 3. A/T Oil Temperature Sensor 4. Wire Harness	– BE–36 BE–38 –
SRS warning light does not light up	1. Bulb 2. Combination Meter Wiring Circuit 3. Center Airbag Sensor Assembly 4. Wire Harness	– BE–36 DI–372 –
Malfunction indicator does not light up	1. Bulb 2. ECM 3. Wire Harness	– – – –
Seat belt warning light does not light up	1. Bulb 2. Integration Relay 3. Wiring Harness	– – –
Discharge warning light does not light up	1. IGN Fuse (Junction Block No.1) 2. Bulb 3. Wire Harness 4. Generator	– – – –
Brake warning light does not light up	1. Bulb 2. Combination Meter Wiring Circuit 3. Parking Brake Switch 4. Brake Fluid Level Warning Switch	– BE–36 BE–38 BE–38

COMBINATION METER

Indicator Lights:

Symptom	Suspect Area	See page
O/D OFF indicator light does not light up	1. Bulb 2. Combination Meter Wiring Circuit 3. O/D OFF Switch 4. Wire Harness	– BE–36 DI–311 –
High beam indicator light does not light up	1. Bulb 2. Combination Meter Wiring Circuit 3. Wire Harness 4. Headlight System	– BE–36 – BE–2
Turn indicator light does not light up	1. Bulb 2. Combination Meter Wiring Circuit 3. Wire Harness 4. Turn Signal and Hazard Warning System	– BE–36 – BE–2
Shift indicator lights do not light up (ALL)	1. Bulb 2. Combination Meter Wiring Circuit 3. PNP Switch 4. Wire Harness	– BE–36 DI–306 –
Shift indicator lights do not light up (L, 2, D)	1. Bulb 2. Combination Meter Wiring Circuit 3. PNP Switch 4. Light Control Rheostat 5. Wire Harness	– BE–36 DI–306 BE–38 –
Only one shift indicator does not light up	1. Bulb 2. Combination Meter Wiring Circuit	– BE–36

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ndicator lights do not light up (Except. Turn, Hi–beam)	1. GAUGE Fuse (Junction Block No1.) 2. Wire Harness	– –
ABS indicator light does not light up	1. Bulb 2. Combination Meter Wiring Circuit 3. ABS ECU 4. Wire Harness	– BE–36 DI–331 –

POWER WINDOW CONTROL SYSTEM

Symptom	Suspect Area	See page
*1Power window does not operate	1. POWER WINDOW Fuse (Junction Block No.1) 2. GAUGE Fuse (Junction Block No.1) 3. Door Lock Control Relay 4. Ignition Switch 5. Power Window Master Switch 6. Wire Harness	BE–46 BE–46 BE–47 BE–12 BE–47 –
*2Power window does not operate	1. POWER WINDOW Fuse (Junction Block No.1) 2. GAUGE Fuse (Junction Block No.1) 3. Ignition Switch 4. Door Lock Control Relay 5. Power Window Master Switch 6. Wire Harness	BE–46 BE–46 BE–12 BE–47 BE–47 –
”One Touch Power Window System” does not operate	1. Power Window Master Switch	BE–47
Only one window glass does not move	1. Power Window Master Switch 2. Power Window Switch 3. Power Window Motor 4. Wire Harness	BE–47 BE–47 BE–47 –
”Window Lock System” does not operate	1. Power Window Master Switch	BE–47
”Window Lock Illumination” does not operate	1. Power Window Master Switch	BE–47

*1 Power door lock system does not operate

*2 Power door lock system is normal

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POWER DOOR LOCK CONTROL SYSTEM

Symptom	Suspect Area	See page
"Door lock control system" does not operate (All)	1. GAUGE Fuse (Junction Block No.1) 2. POWER WINDOW Fuse (Junction Block No.1) 3. Door Lock Control Relay 4. Wire Harness 5. Other Parts	BE–50 BE–50 BE–51 – –
Malfunction in Door Lock / Unlock (Using door manual switch)	1. Door Lock Manual Switch 2. Wire Harness 3. Door Lock Control Relay 4. Other Parts	BE–51 – BE–51 –
Mulfunction in Door Lock / Unlock (Using door manual switch and key)	1. Wire Harness 2. Other Parts	– –
Mulfunction in Door Lock / Unlock (Using Key)	1. Door Key Lock and Unlock Switch 2. Wire Harness 3. Door Lock Control Relay 4. Other Parts	BE–51 – BE–51 –
Fault in 2 – Operation unlock function of Driver's side door key Lock and Unlock switch	1. Door Key Lock and Unlock Switch 2. Wire Harness 3. Door Lock Control Relay 4. Other Parts	BE–51 – BE–51 –
Fault in key confine prevention operation	1. Key Unlock Warning Switch 2. Door Courtesy Switch 3. Door Lock Switch 4. Wire Harness 5. Door Lock Control Relay 6. Other Parts	BE–12 BE–25 BE–51 – BE–51 –
Only one door lock does not operate	1. Door Lock Motor 2. Wire Harness	BE–51 –

POWER MIRROR CONTROL SYSTEM

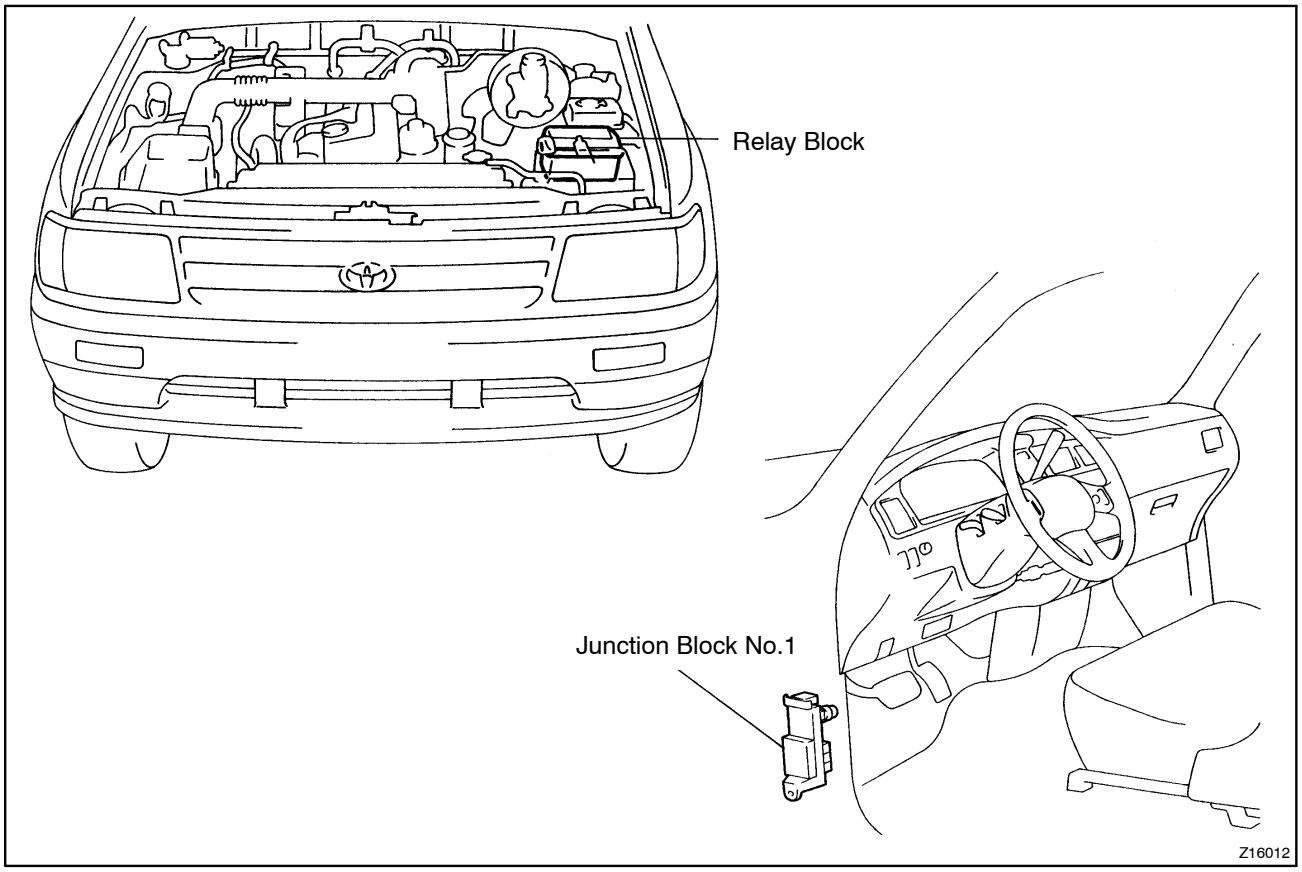
Symptom	Suspect Area	See page
Power mirror on each side does not operate at all	1. RADIO Fuse (Junction Block No.1) 2. Mirror Switch 3. Mirror Motor (Up/Down or Left/Right Control) 4. Wire Harness	BE–56 BE–57 BE–57 –
Left or Right power mirror does not operate at all	1. Mirror Switch 2. Mirror Motor (Up/Down or Left/Right Control) 3. Wire Harness	BE–57 BE–57 –
Up/Down Control of left or right power mirror does not operate	1. Mirror Motor (Up/Down Control) 2. Wire Harness	BE–57 –
Left/Right control of left or right power mirror does not operate	1. Mirror Motor (Left/Right Control) 2. Wire Harness	BE–57 –

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POWER SOURCE

LOCATION

BE02V–02

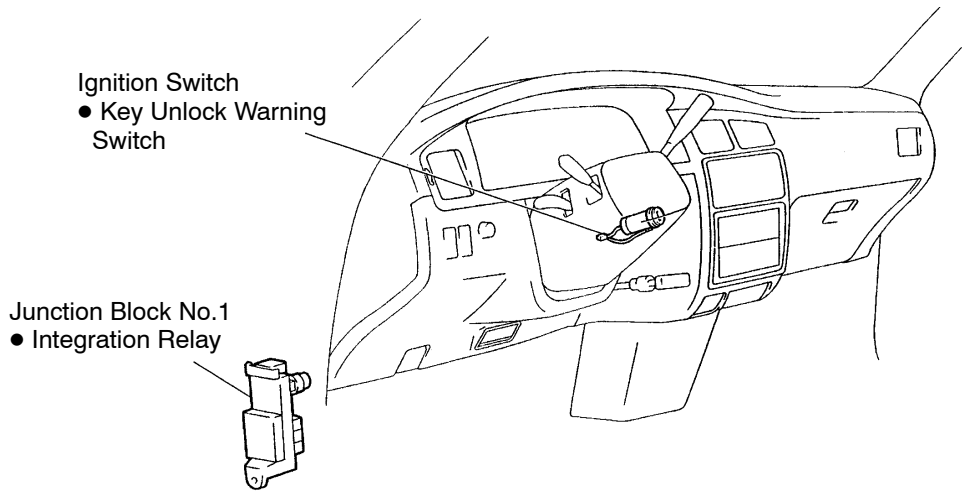


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IGNITION SWITCH AND KEY UNLOCK WARNING SWITCH

BE02W–03

LOCATION

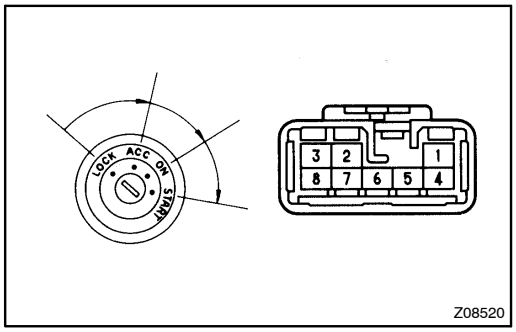


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BE02X–03

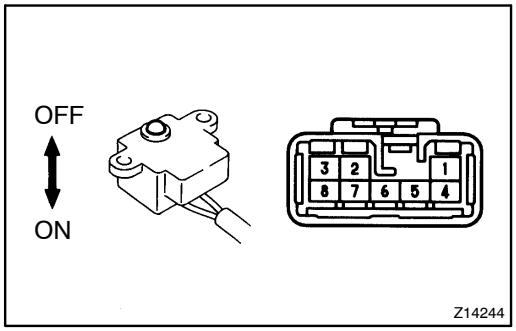
INSPECTION



1. INSPECT IGNITION SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
LOCK	–	No continuity
ACC	2 – 3	Continuity
ON	1 – 2 – 3 7 – 8	Continuity
START	1 – 3 – 6 7 – 8	Continuity

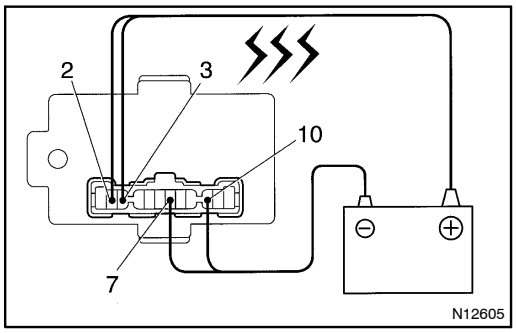
If continuity is not as specified, replace the switch.



2. INSPECT KEY UNLOCK WARNING SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
OFF (Key removed)	–	No continuity
ON (Key set)	4 – 5	Continuity

If continuity is not as specified, replace the switch.

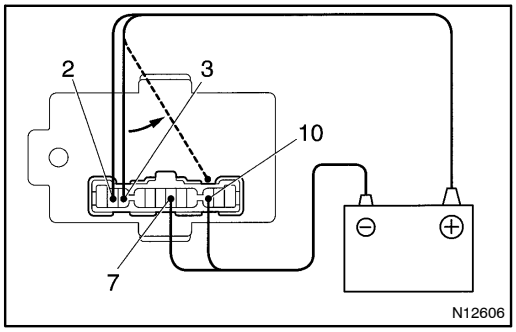


3. Key Unlock Warning System: INSPECT INTEGRATION RELAY OPERATION

(a) Connect the positive (+) lead from the battery to terminal 2 and 3.

(b) Connect the negative (–) lead from the battery to terminal 7 and 10.

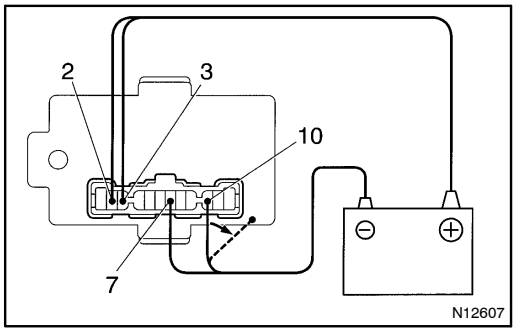
(c) Check the buzzer sounds.



(d) Disconnect the positive (+) lead from the battery to terminal 3.

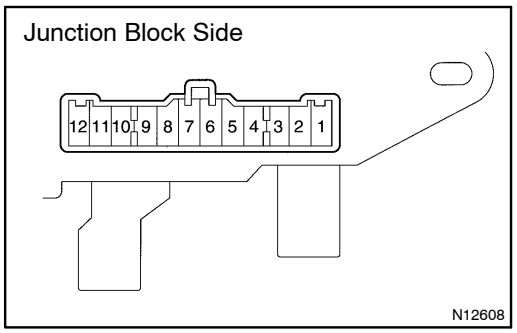
(e) Check that the buzzer stops sounding.

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(f) Connect the positive (+) lead from the battery to terminal 3.
(g) Disconnect the negative (–) lead from the battery to terminal 10.
(h) Check that the buzzer stops sounding.

If operation is not as specified, replace the relay.



4. INSPECT INTEGRATION RELAY CIRCUIT

Remove the relay from the junction block No.1 and inspect the connectors on the junction block side.

Tester connection	Condition	Specified condition
2 – Ground	Key unlock warning switch OFF	No continuity
2 – Ground	Key unlock warning switch ON	Continuity
*4 – Ground	Constant	Continuity
6 – Ground	Buckle switch OFF	No continuity
6 – Ground	Buckle switch ON	Continuity
7 – Ground	Constant	Continuity
10 – Ground	Driver's door courtesy switch OFF	No continuity
10 – Ground	Driver's door courtesy switch ON	Continuity
12 – Ground	Passenger's door courtesy switch OFF	No continuity
12 – Ground	Passenger's door courtesy switch ON	Continuity
1 – Ground	Ignition switch LOCK	No voltage
1 – Ground	Ignition switch ACC or ON	Battery positive voltage
3 – Ground	Constant	Battery positive voltage
5 – Ground	Ignition switch LOCK or ACC	No voltage
5 – Ground	Ignition switch ON	Battery positive voltage
8 – Ground	Ignition switch LOCK or ACC	No voltage
8 – Ground	Ignition switch ON	Battery positive voltage
9 – Ground	Ignition switch LOCK or ACC	No voltage
9 – Ground	Ignition switch ON	Battery positive voltage
11 – Ground	Light control switch OFF	No voltage
11 – Ground	Light control switch TAIL or HEAD	Battery positive voltage

*: SR5 Model

If circuit is as specified, trying replacing the relay with a new one.

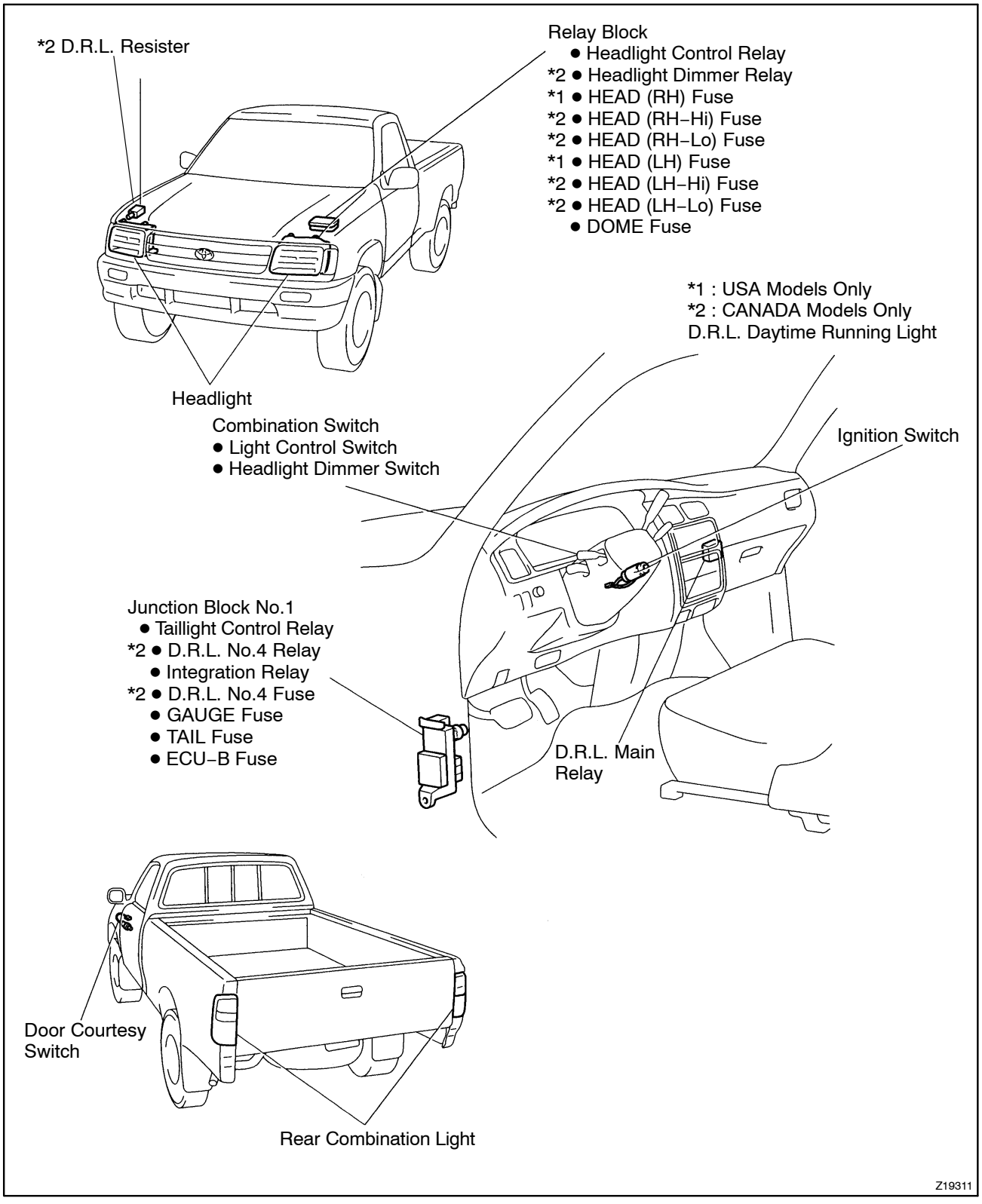
If circuit is not as specified, inspect the circuits connected to other parts.

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HEADLIGHT AND TAILLIGHT SYSTEM

LOCATION

BE02Z–03

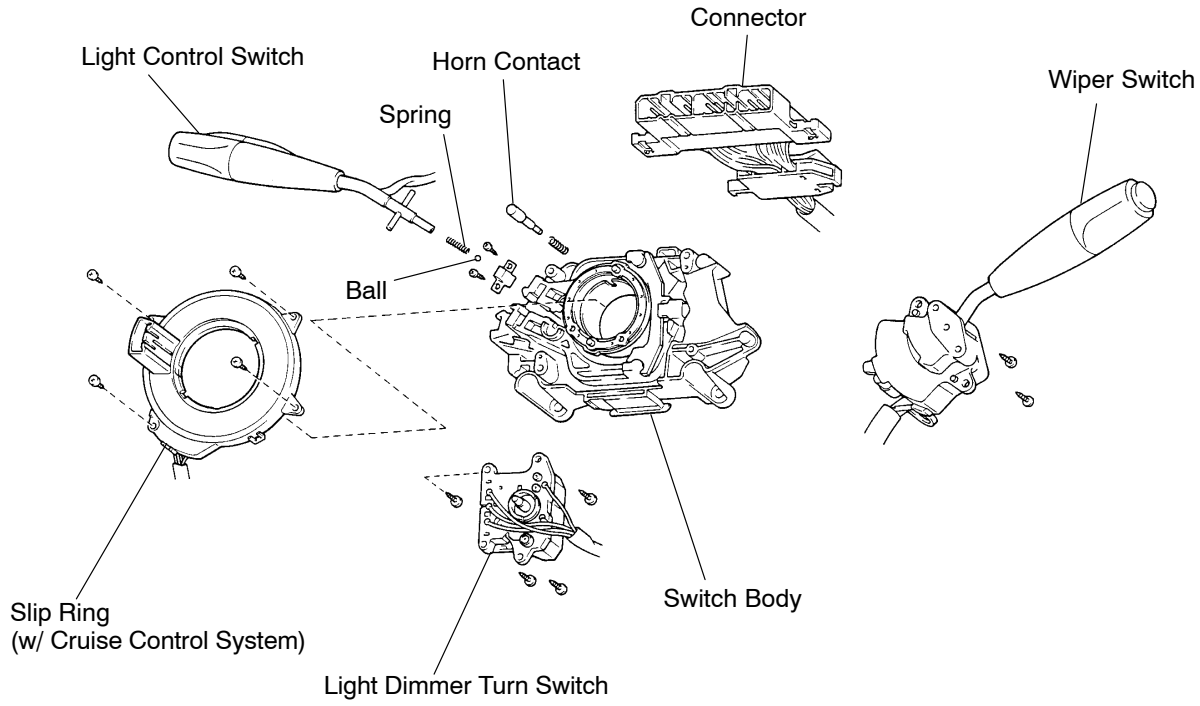


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BE030-02

COMPONENTS

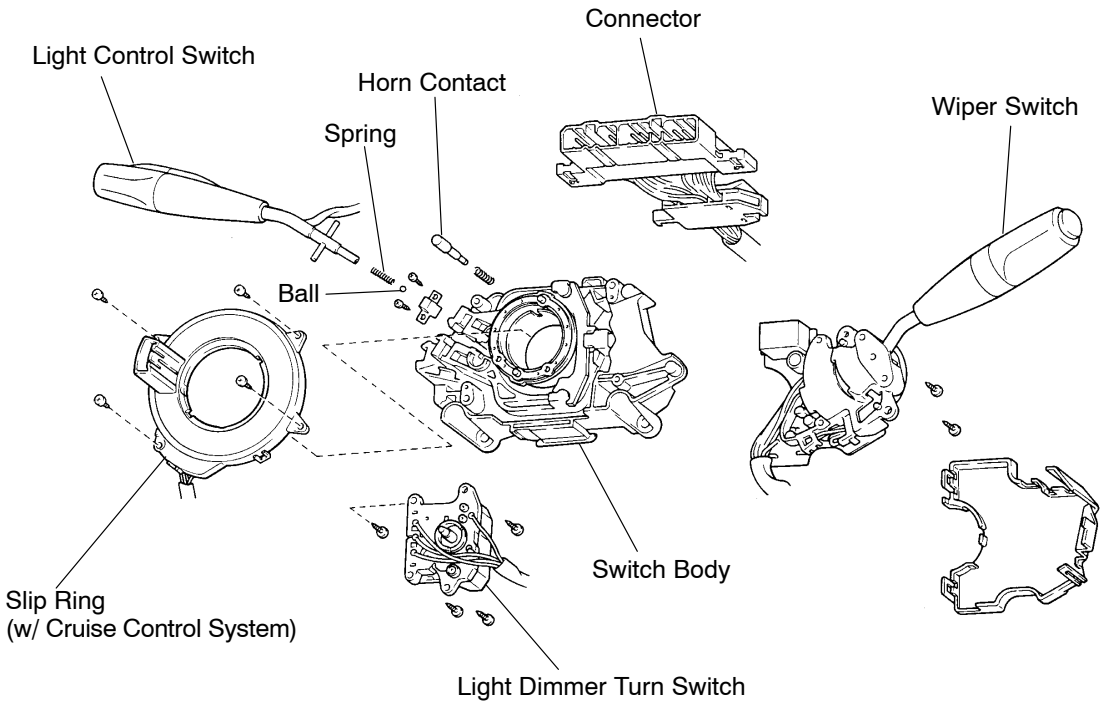
w/ Intermittent Wiper or Mist Wiper



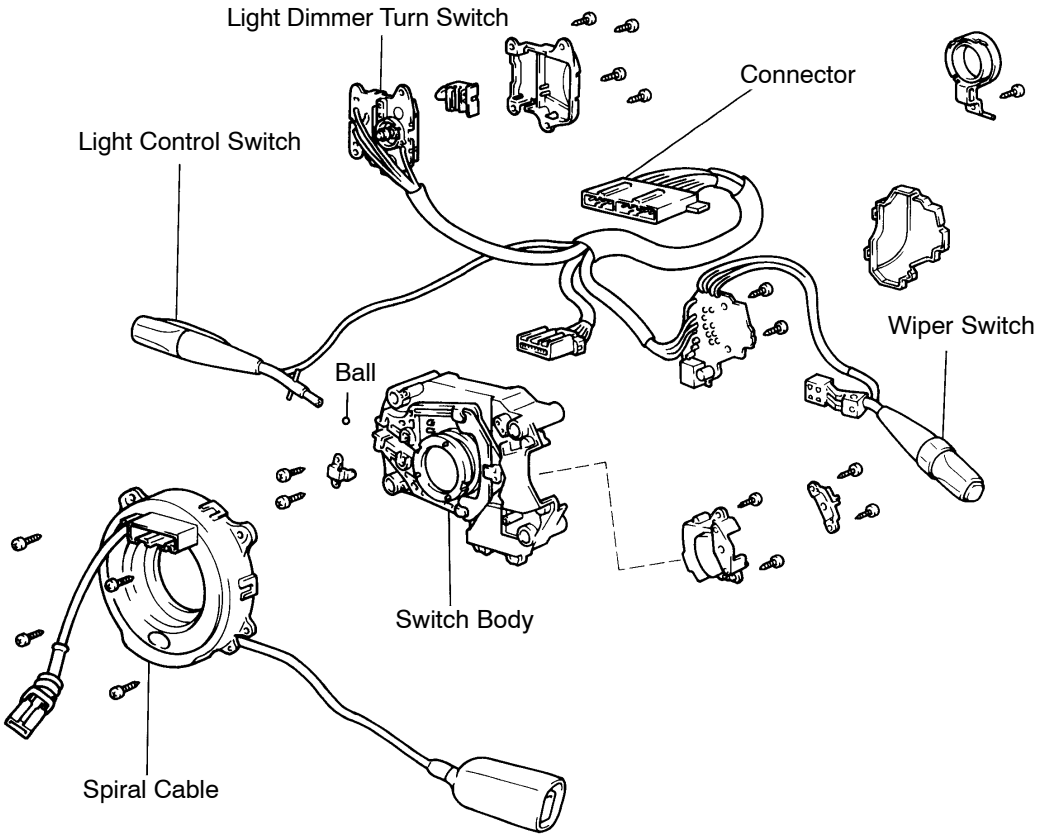
I01871

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w/ Intermittent Wiper and Mist Wiper



I01872



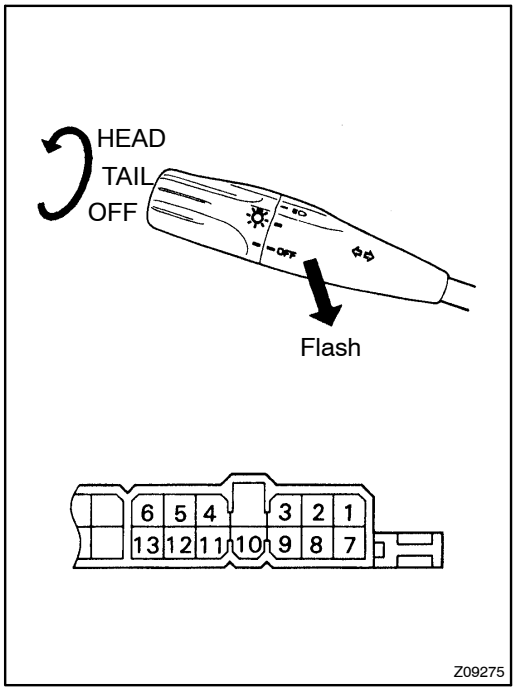
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BE031–02

INSPECTION

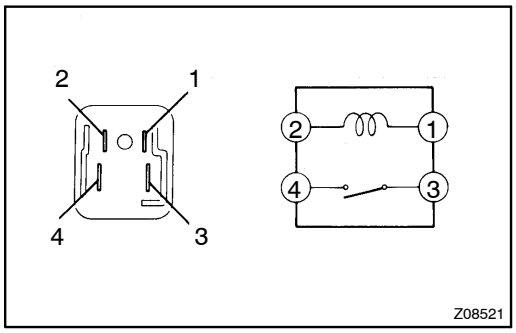
1. INSPECT LIGHT CONTROL SWITCH AND HEADLIGHT DIMMER SWITCH CONTINUITY



Switch position	Tester connection	Specified condition
OFF Low beam	–	No continuity
OFF High beam	–	No continuity
OFF Flash	5 – 12 – 13	Continuity
TAIL Low beam	10 – 11	Continuity
TAIL High beam	10 – 11	Continuity
TAIL Flash	10 – 11 5 – 12 – 13	Continuity
HEAD Low beam	4 – 10 – 11 6 – 13	Continuity
HEAD High beam	4 – 10 – 11 5 – 13	Continuity
HEAD Flash	4 – 10 – 11 5 – 12 – 13	Continuity

If continuity is not as specified, replace the switch.

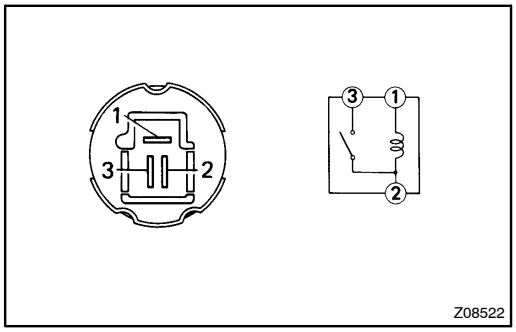
2. INSPECT HEADLIGHT CONTROL RELAY CONTINUITY



Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Apply B+ between terminals 1 and 2.	3 – 4	Continuity

If continuity is not as specified, replace the relay.

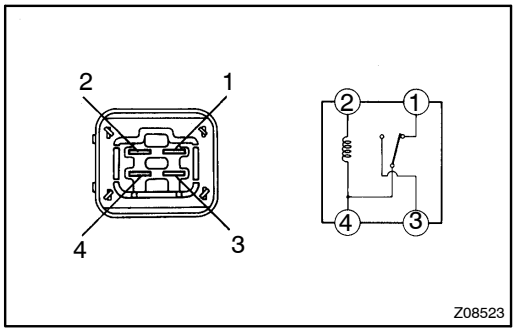
3. INSPECT TAILLIGHT CONTROL RELAY CONTINUITY



Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Apply B+ between terminals 1 and 2.	2 – 3	Continuity

If continuity is not as specified, replace the relay.

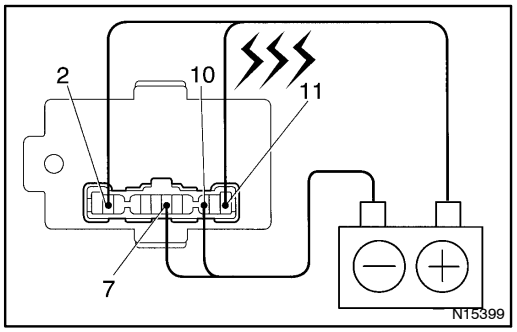
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4. INSPECT HEADLIGHT DIMMER RELAY CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 4 2 – 4	Continuity
Apply B+ between terminals 2 and 4.	3 – 4	Continuity

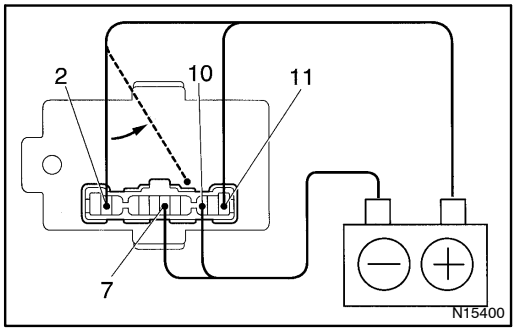
If continuity is not as specified, replace the relay.



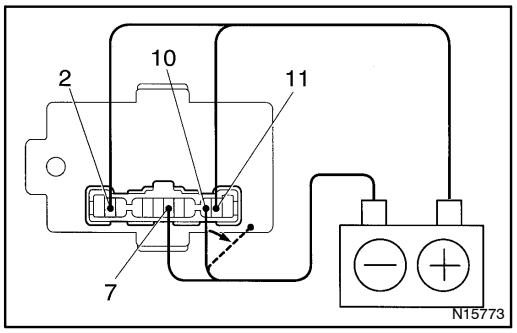
5. INSPECT DOOR COURTESY SWITCH
(See page BE–25)

6. Light–On Warning System:
INSPECT INTEGRATION RELAY OPERATION

(a) Connect the positive (+) lead from the battery to terminal 2 and 11.
(b) Connect the negative (–) lead from the battery to terminal 7 and 10.
(c) Check the buzzer sounds.

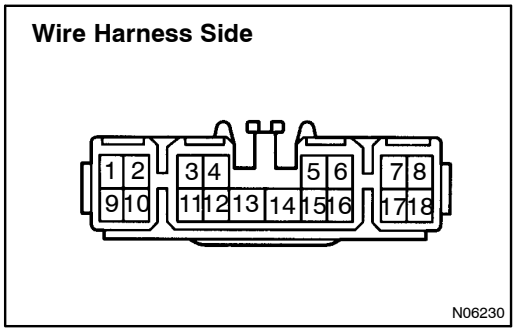


(d) Disconnect the positive (+) lead from the battery to terminal 2.
(e) Check that the buzzer stops sounding.
(f) Connect the positive (+) lead from the battery to terminal 2.



(g) Disconnect the negative (–) lead from the battery to terminal 10.
(h) Check that the buzzer stops sounding.

If operation is not as specified, replace the relay.



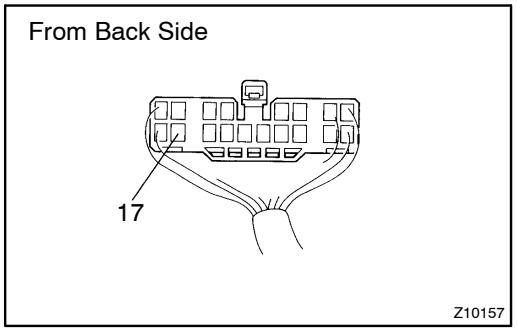
7. Connector Disconnected:
INSPECT DAYTIME RUNNING LIGHT RELAY CIRCUIT

Disconnect the connector from the relay and inspect the connector on the wire harness side.

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Tester connection	Condition	Specified condition
5 – Ground	Light control switch OFF or TAIL	No continuity
5 – Ground	Light control switch HEAD	Continuity
7 – Ground 16 – Ground	Headlight dimmer switch Low beam	No continuity
7 – Ground 16 – Ground	Headlight dimmer switch High beam or Flash	Continuity
8 – Ground	Parking brake switch OFF (Parking brake lever released)	No continuity
8 – Ground	Paring brake switch ON (Parking brake lever pulled up)	Continuity
12 – Ground	Constant	Continuity
13 – Ground	Constant	Continuity
2 – Ground	Ignition switch LOCK or ACC	No voltage
2 – Ground	Ignition switch ON or START	Battery positive voltage
6 – Ground	Constant	Battery positive voltage
11 – Ground	Engine Stop	No voltage
11 – Ground	Engine Running	Battery positive voltage

If circuit is as specified, perform inspections.

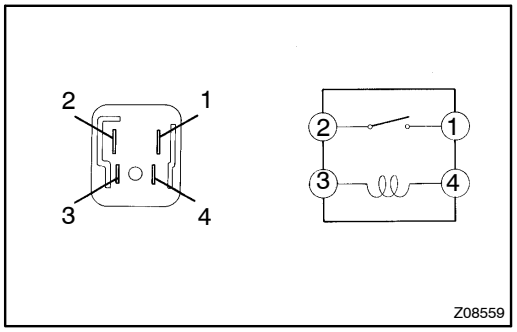


8. Connector Connected:
INSPECT DAYTIME RUNNING LIGHT RELAY CIRCUIT

Connect the wire harness side connector to the relay and inspect wire harness side connector from the back side, as shown.

Tester connection	Condition	Specified condition
17 – Ground	Headlight dimmer switch Low beam	No voltage
17 – Ground	Headlight dimmer switch High beam or Flash	Battery positive voltage

If circuit is as specified, trying replacing the relay with a new one.

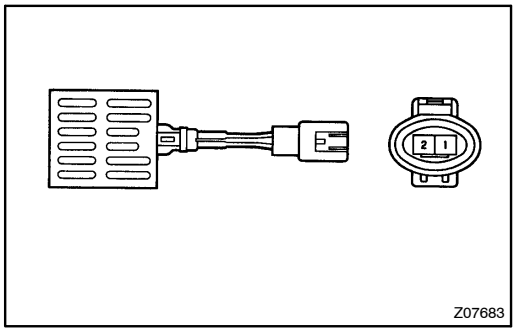


9. INSPECT DAYTIME RUNNING LIGHT RELAY NO.4 CONTINUITY

Condition	Tester connection	Specified condition
Constant	3 – 4	Continuity
Apply B+ between terminals 3 and 4.	1 – 2	Continuity

If continuity is not as specified, replace the relay.

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10. INSPECT DAYTIME RESISTOR CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 2	Approx. 337m Ω

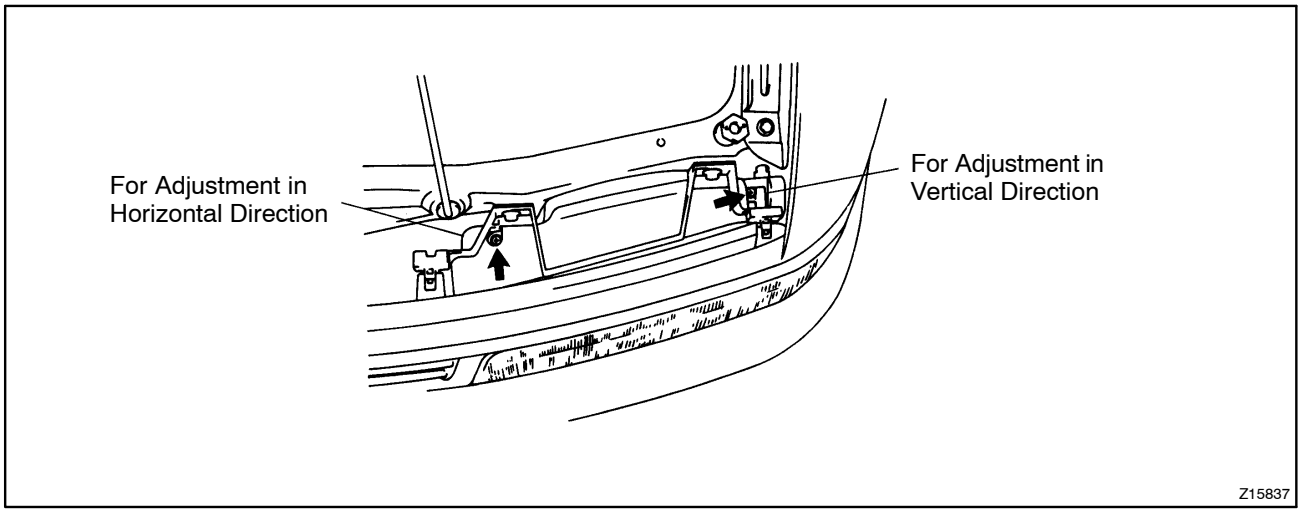
If continuity is not as specified, replace the resistor.

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BE032-02

ADJUSTMENT

1. ADJUST HEADLIGHT AIMING



2. ADJUST SPIRAL CABLE

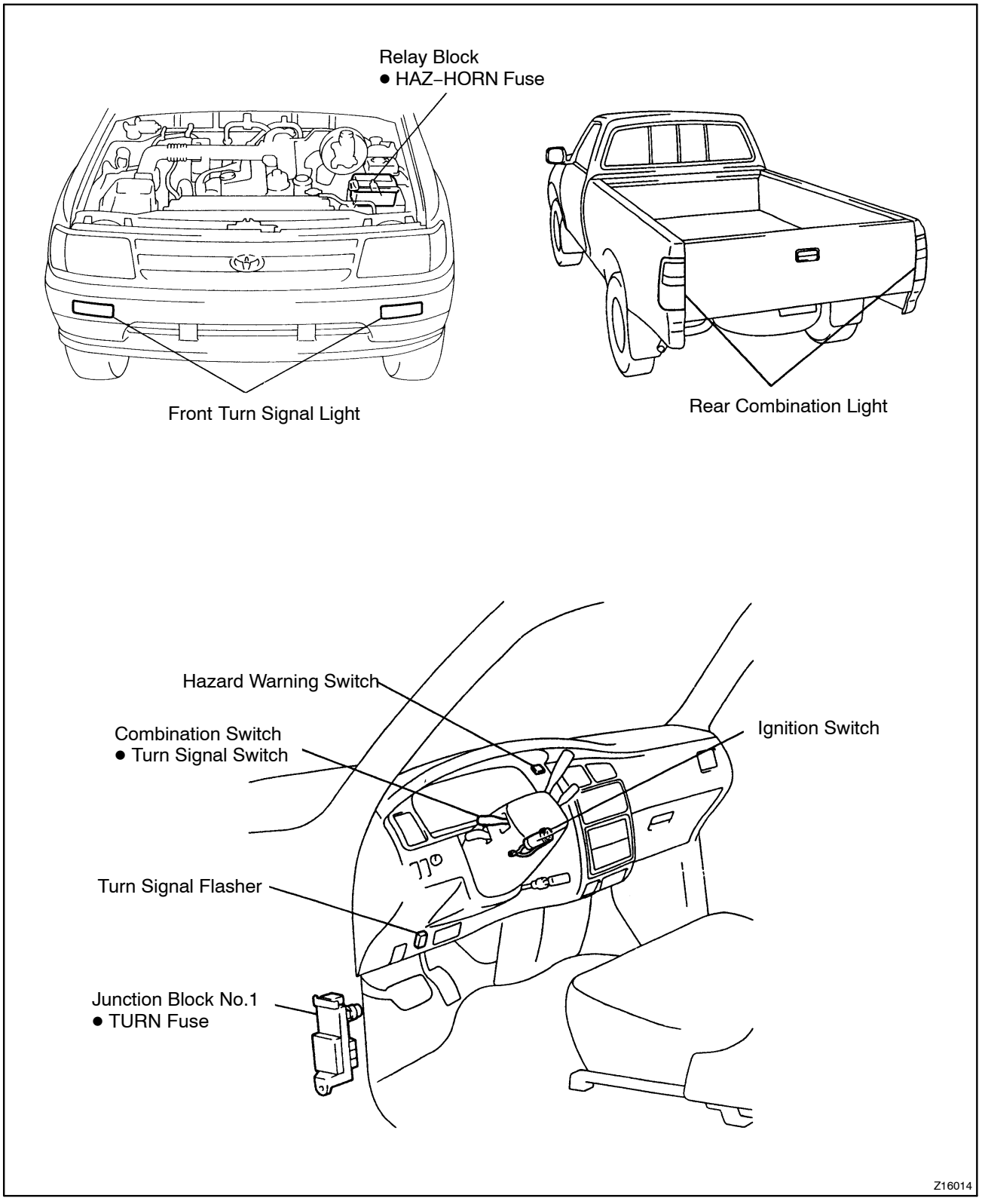
(See page SR–20)

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TURN SIGNAL AND HAZARD WARNING SYSTEM

LOCATION

BE033–04



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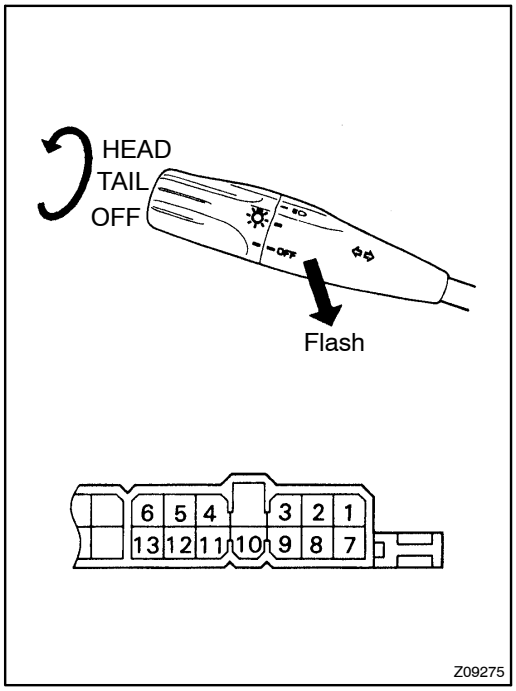
BE034–10

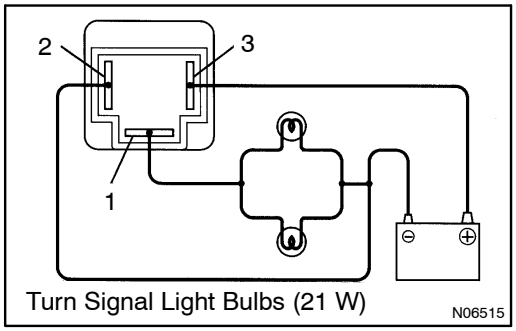
INSPECTION

1. INSPECT TURN SIGNAL SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
Left turn	3 – 9	Continuity
Neutral	–	No continuity
Right turn	3 – 8	Continuity

If continuity is not as specified, replace the switch.





2. INSPECT TURN SIGNAL FLASHER OPERATION

(a) Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 1.

(b) Connect the 2 turn signal light bulbs in parallel to each other to terminals 1 and 2, check that the bulbs flash.

HINT:

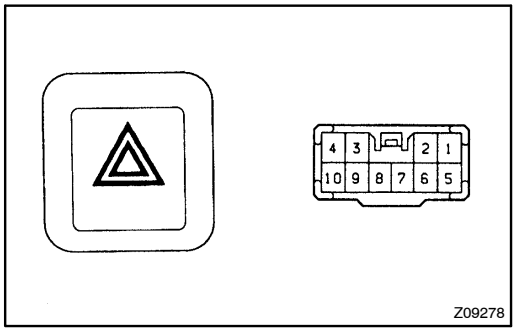
The turn signal lights should flash 60 to 120 times per minute. If one of the front or rear turn signal lights has an open circuit, the number of flashes will be more than 140 per minute.

If operation is not as specified, replace the flasher.

3. INSPECT HAZARD WARNING SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
Switch OFF	7 – 10	Continuity
Switch ON	4 – 5 – 6 – 9 7 – 8	Continuity
Illumination circuit	2 – 3	Continuity

If continuity is not as specified, replace the switch.

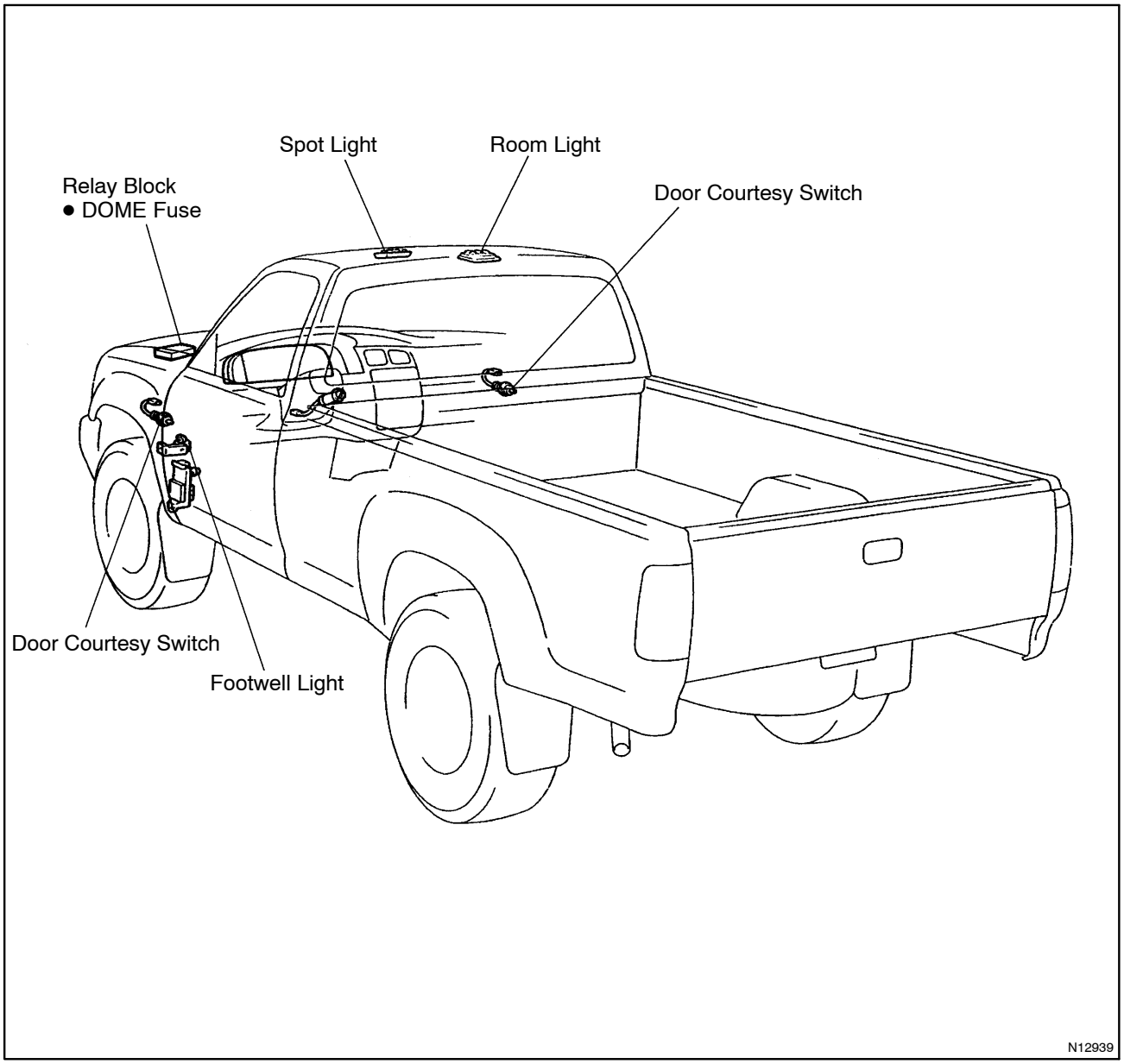


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INTERIOR LIGHT SYSTEM

LOCATION

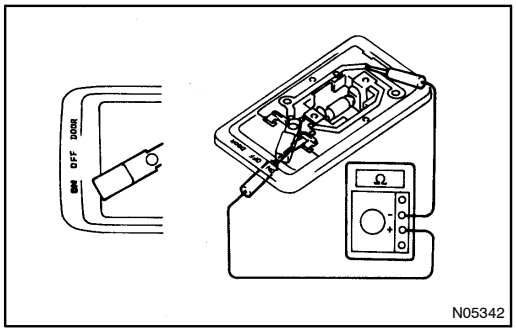
BE035-02



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BE036-02

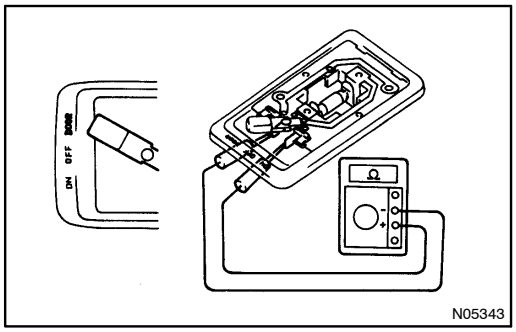
INSPECTION



1. INSPECT ROOM LIGHT ASSEMBLY CONTINUITY

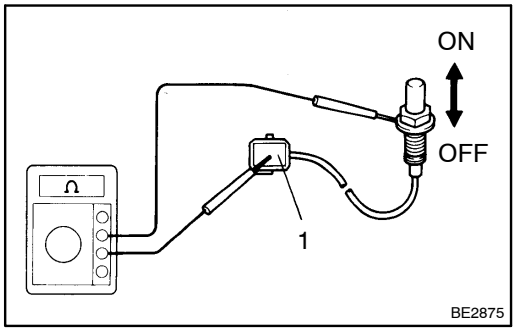
(a) Disconnect the connector from room light assembly.

(b) Turn the room light switch ON, check that the there is continuity between terminal 2 and body ground.



(c) Turn the room light switch DOOR, check that there is continuity between terminals 1 and 2.

If operation is not as specified, replace the switch.



2. INSPECT DOOR COURTESY SWITCH CONTINUITY

(a) Check that there is no continuity between terminal and the switch body in the ON position (switch pin released : opened door).

(b) Check that there is continuity between terminal and the switch body in the OFF position (switch pin pushed in : closed door).

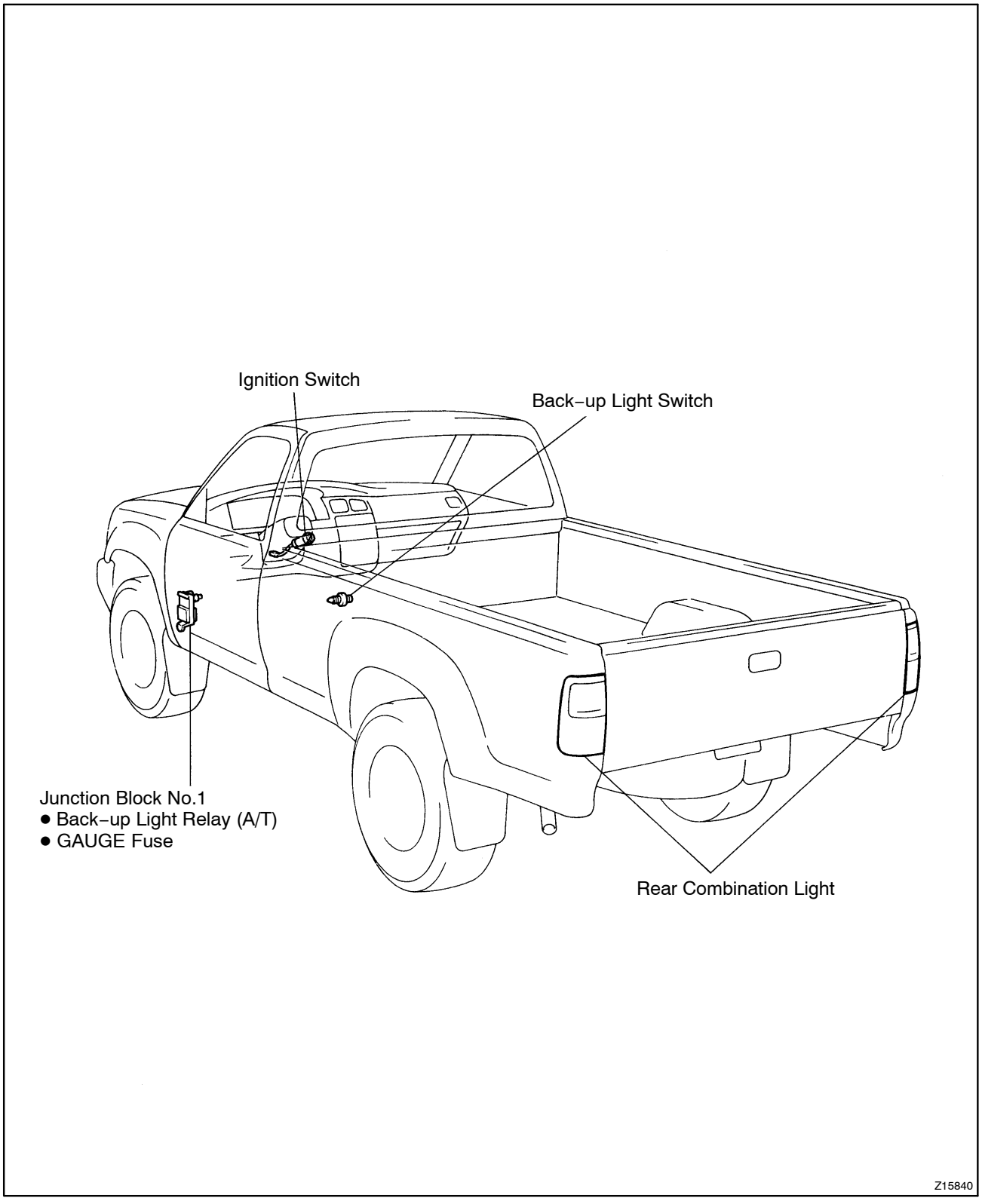
If operation is not as specified, replace the switch.

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BACK–UP LIGHT SYSTEM

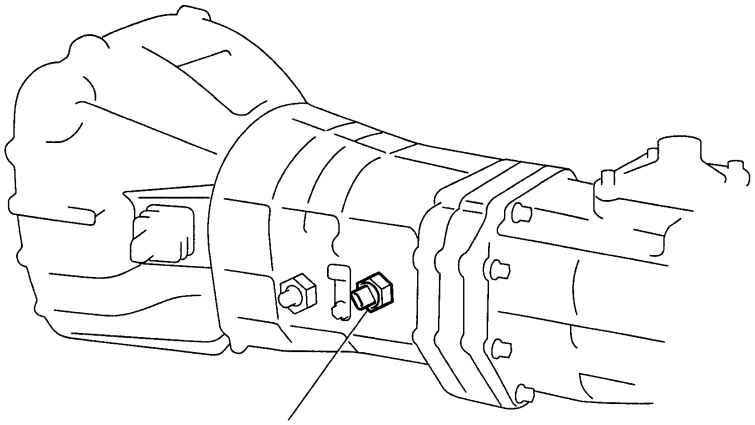
LOCATION

BE037–04



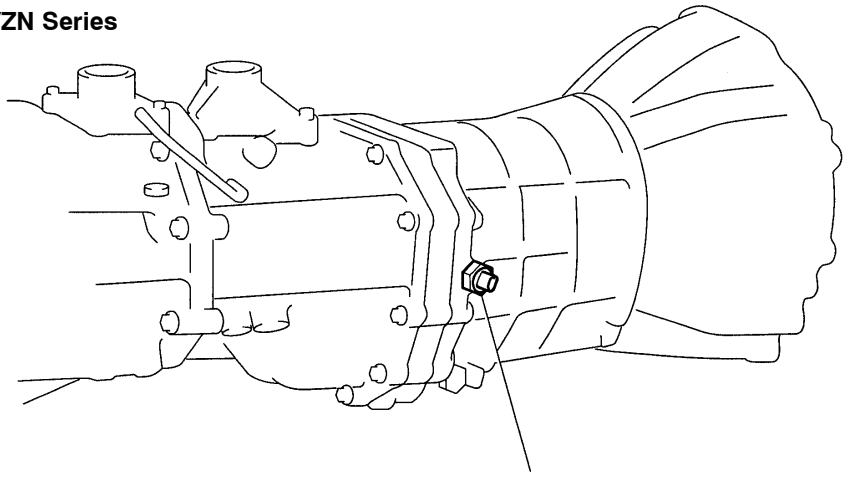
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RZN Series

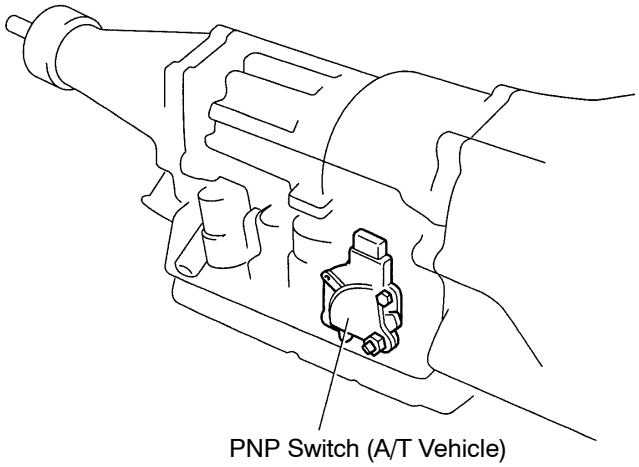


Back–up Light Switch (M/T Vehicle)

VZN Series



Back–up Light Switch (M/T Vehicle)



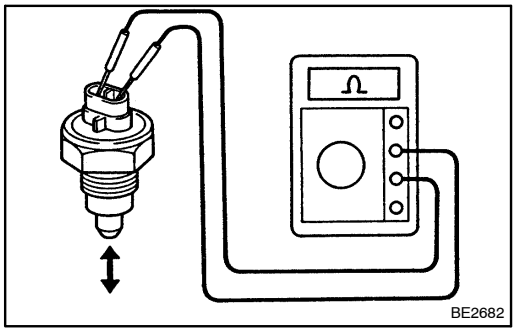
PNP Switch (A/T Vehicle)

Z15350

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BE038–03

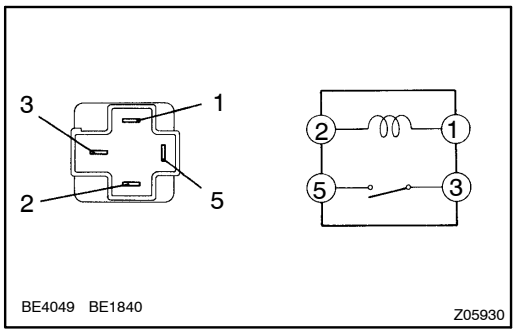
INSPECTION



1. INSPECT BACK–UP LIGHT SWITCH CONTINUITY

Condition	Tester connection	Specified condition
Free	–	No continuity
Push	1 – 2	Continuity

If continuity is not as specified, replace the switch.



2. INSPECT BACK–UP LIGHT RELAY CONTINUITY

Condition	Tester connection	Specified condition
Constant	1 – 2	Continuity
Apply B+ between terminals 1 and 2.	3 – 5	Continuity

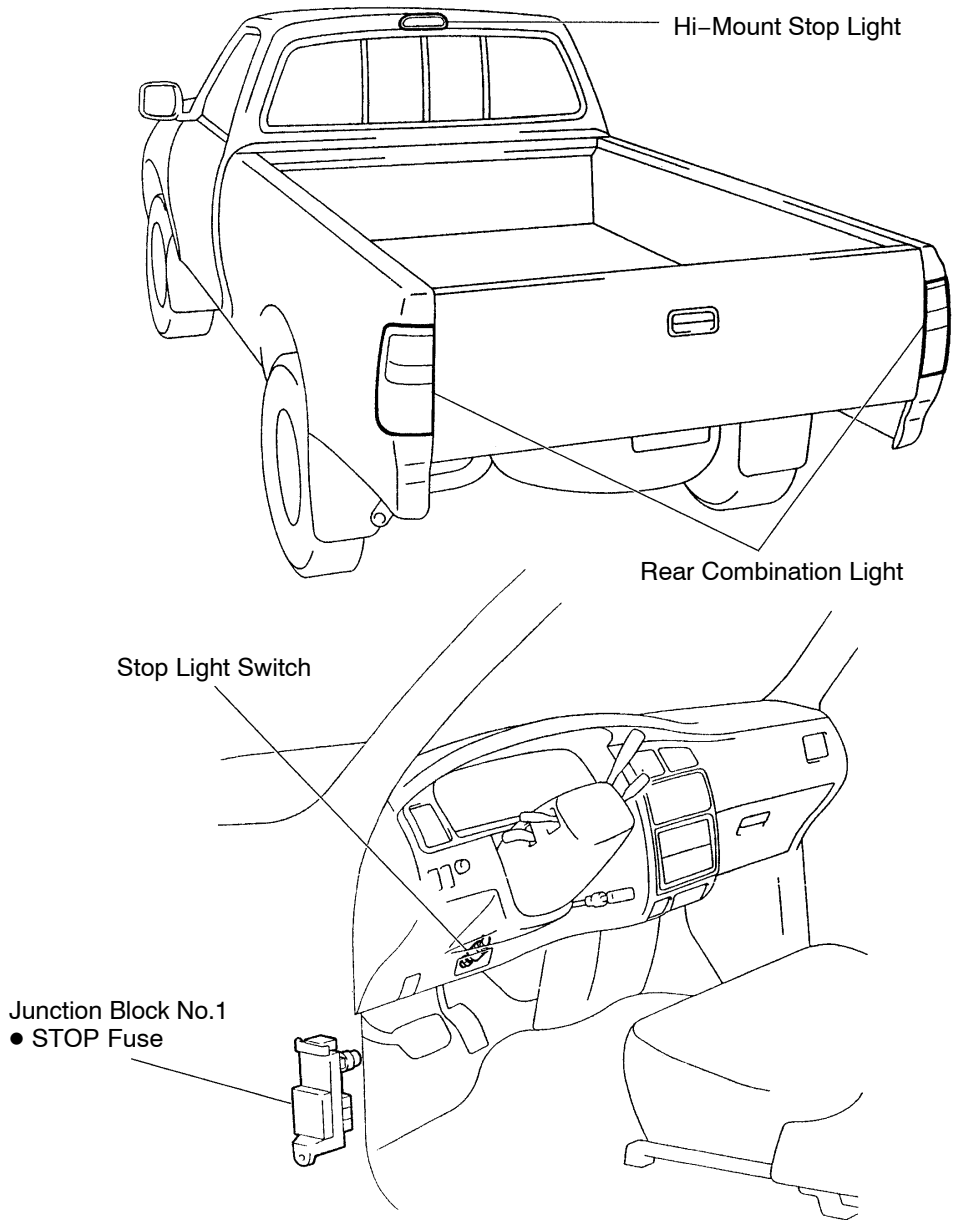
If continuity is not as specified, replace the relay.

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STOP LIGHT SYSTEM

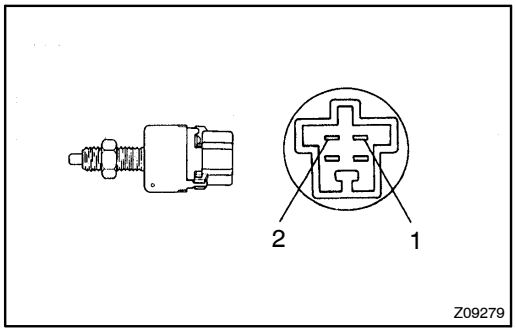
LOCATION

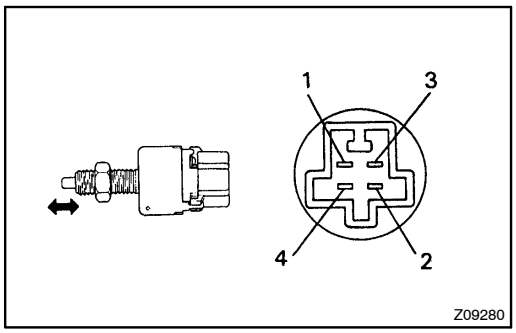
BE039-04



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BE03A–03





INSPECTION

INSPECT STOP LIGHT SWITCH CONTINUITY

w/o Cruise Control:

Switch position	Tester connection	Specified condition
Switch pin free (Brake pedal depressed)	1 – 2	Continuity
Switch pin pushed in (Brake pedal released)	–	No continuity

If continuity is not as specified, replace the switch.

w/ Cruise Control:

Switch position	Tester connection	Specified condition
Switch pin free (Brake pedal depressed)	2 – 4	Continuity
Switch pin pushed in (Brake pedal released)	1 – 3	Continuity

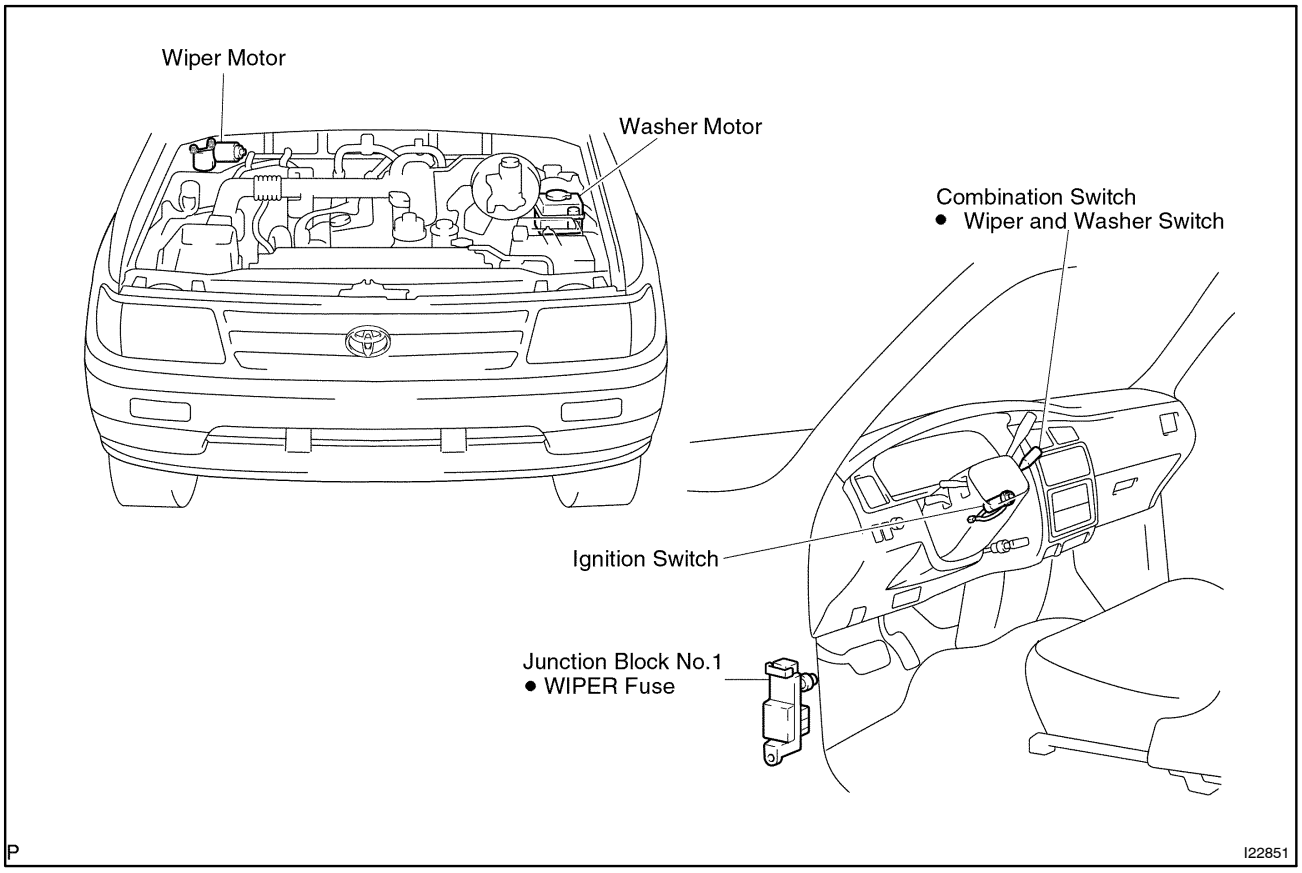
If continuity is not as specified, replace the switch.

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WIPER AND WASHER SYSTEM

BE03B–05

LOCATION



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BE03C–02

INSPECTION

1. INSPECT WIPER SWITCH CONTINUITY

w/ Mist Wiper:

Switch position	Tester connection	Specified condition
MIST	4 – 8	Continuity
OFF	7 – 8	Continuity
LO	4 – 8	Continuity
HI	4 – 9	Continuity

w/ Intermittent Wiper:

Switch position	Tester connection	Specified condition
OFF	7 – 8	Continuity
INT	7 – 8	Continuity
LO	4 – 8	Continuity
HI	4 – 9	Continuity

2. INSPECT WASHER SWITCH CONTINUITY

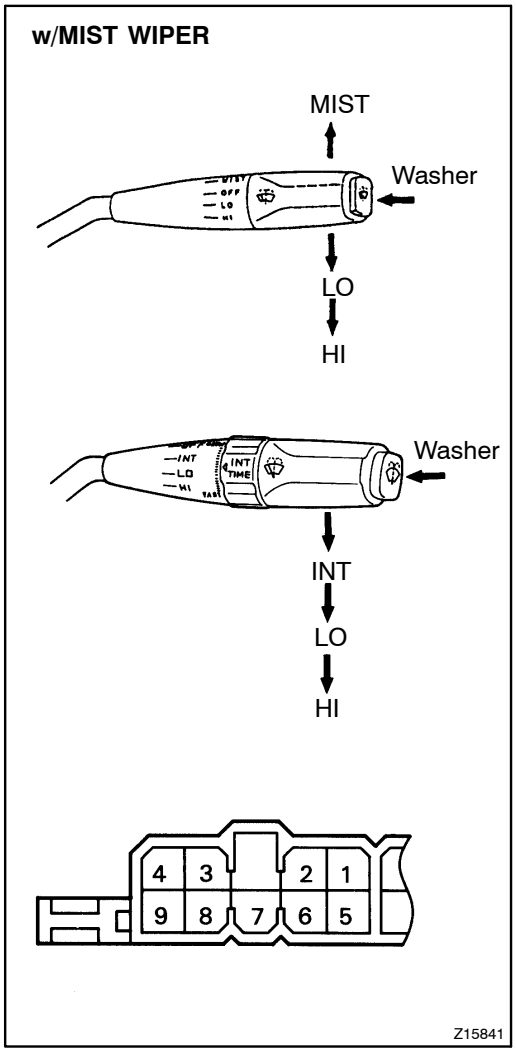
w/ Mist Wiper:

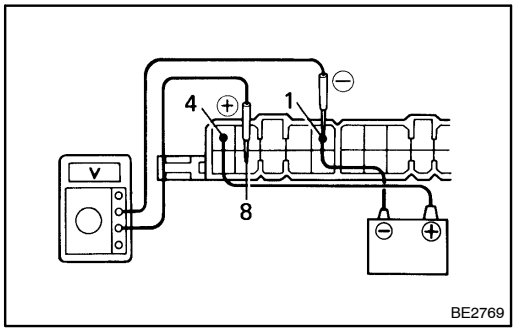
Switch position	Tester connection	Specified condition
OFF	–	No continuity
ON	1 – 2	Continuity

w/ Intermittent Wiper:

Switch position	Tester connection	Specified condition
OFF	–	No continuity
ON	1 – 2	Continuity

If continuity is not as specified, replace the switch.





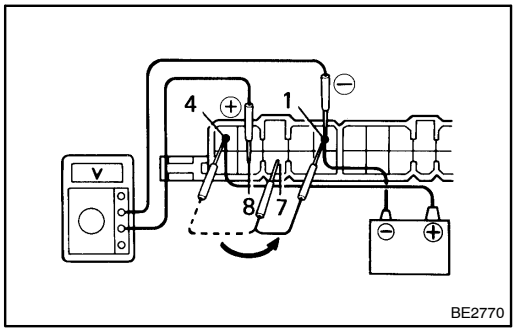
3. INSPECT INTERMITTENT WIPER OPERATION

(a) Turn the wiper switch to INT position.

(b) Variable Type:
Turn the intermittent time control switch to FAST position.

(c) Connect the positive (+) lead from the battery to terminal 4/9 and the negative (–) lead to terminal 1/9.

(d) Connect the positive (+) lead from the voltmeter to terminal 8/9 and the negative (–) lead to terminal 1/9, check that the meter needle indicates battery positive voltage.



(e) After connecting terminal 7/9 to terminal 4/9, connect to terminal 1/9.
Then, check that the voltage rises from 0 volts to battery positive voltage within the times, as shown in the table.

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Non Variable Type

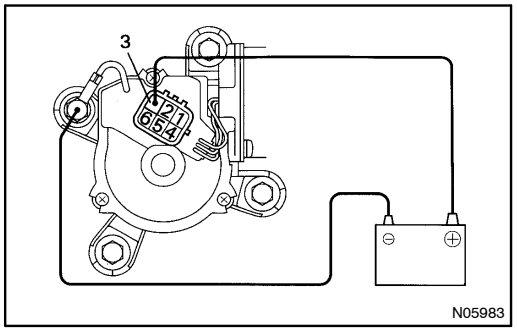
Switch position	Specified value
INT	3.3 ± 1 secs. Approx. 12 V 0 V

Variable Type

Switch position		Specified value
INT	FAST	1.6 ± 1 secs. Approx. 12 V 0 V
	LOW	10.7 ± 5 secs. Approx. 12 V 0 V

V06095

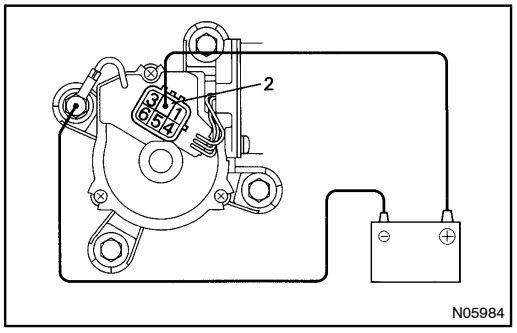
If operation is not as specified, replace the wiper and washer switch.



N05983

4. Low Speed:
INSPECT WIPER MOTOR OPERATION

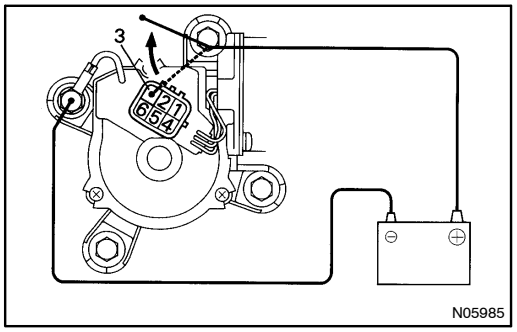
Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead from the battery to the motor body, check that the motor operates at low speed.
If operation is not as specified, replace the motor.



N05984

5. High Speed:
INSPECT WIPER MOTOR OPERATION

Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead from the battery to the motor body, check that the motor operates at high speed.
If operation is not as specified, replace the motor.

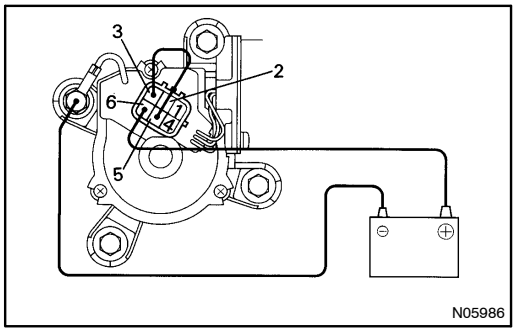


N05985

6. Stopping at Stop Position:
INSPECT WIPER MOTOR OPERATION

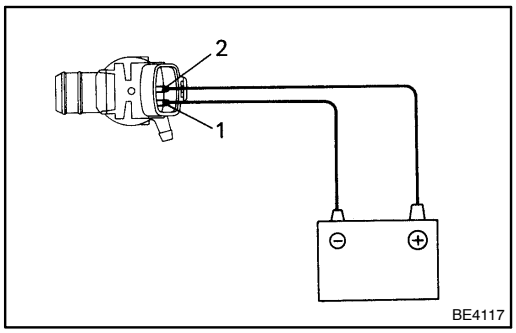
(a) Operate the motor at low speed and stop the motor operation anywhere except at the stop position by disconnecting positive (+) lead from terminal 3.

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(b) Connect terminals 3 and 5.
(c) Connect the positive (+) lead from the battery to terminal 6 and the negative (–) lead from the battery to the motor body, check that the motor stops running at the stop position after the motor operates again.

If operation is not as specified, replace the motor.



7. INSPECT WASHER MOTOR OPERATION

Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, check that the motor operates.

NOTICE:

These tests must be performed quickly (within 20 seconds) to prevent the coil from burning out.

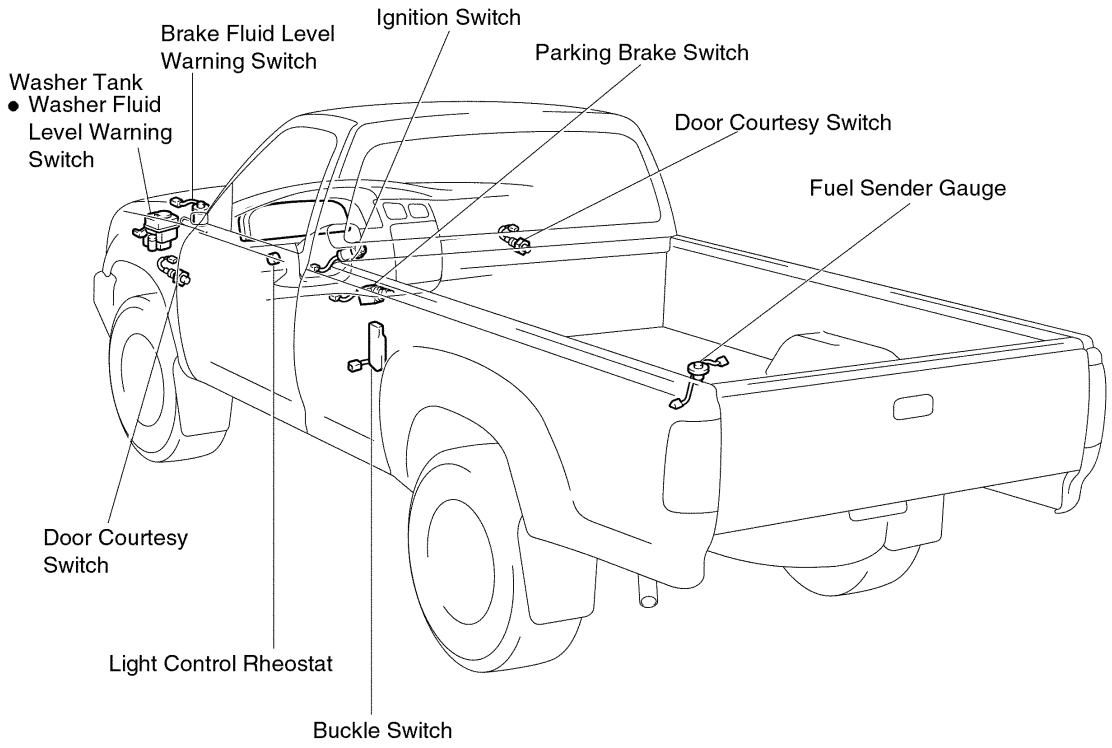
If operation is not as specified, replace the motor.

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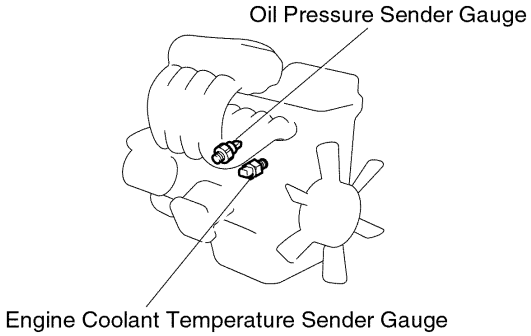
COMBINATION METER

LOCATION

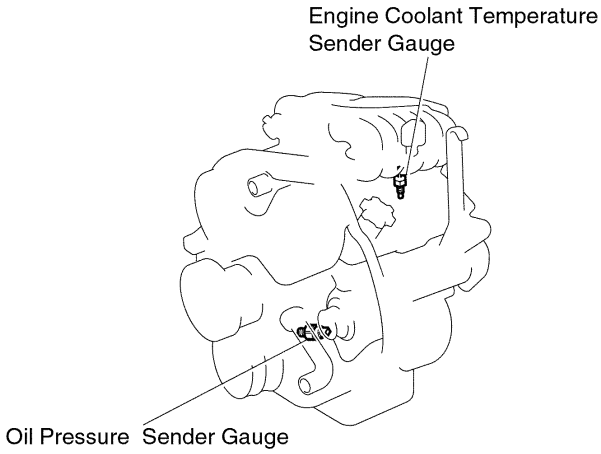
BE03D–02



3RZ-FE Engine



5VZ-FE Engine



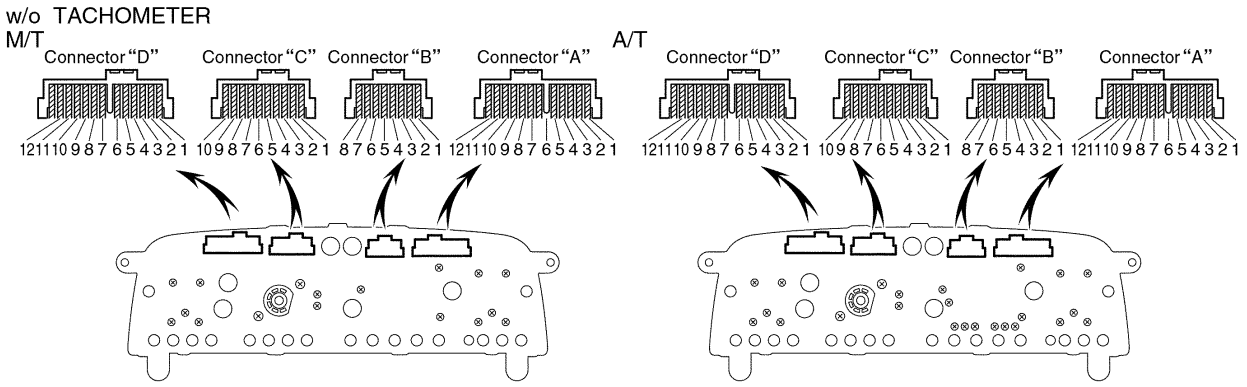
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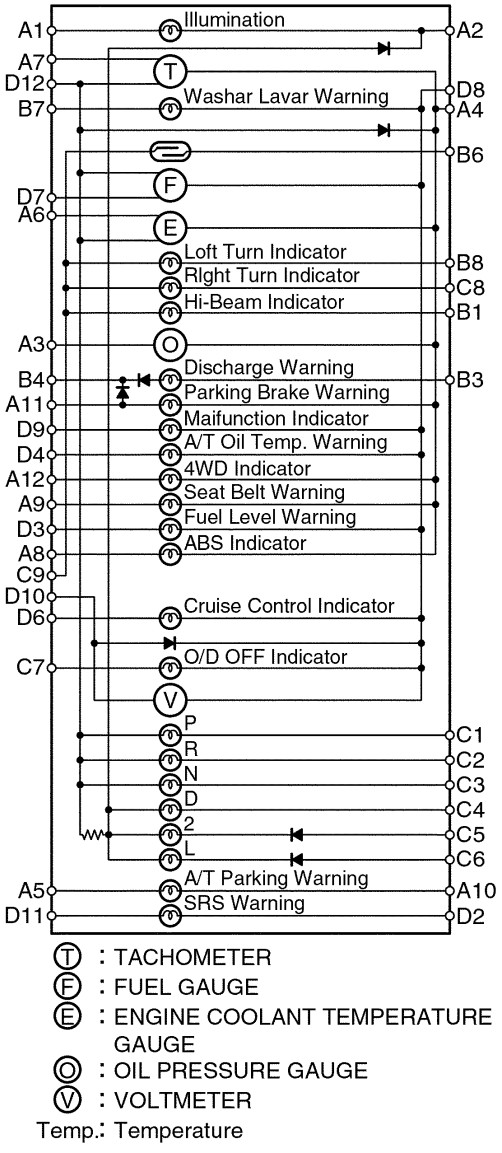
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BE03E–02

CIRCUIT





Ⓣ : TACHOMETER
Ⓕ : FUEL GAUGE
Ⓔ : ENGINE COOLANT TEMPERATURE GAUGE
Ⓞ : OIL PRESSURE GAUGE
Ⓥ : VOLTMETER
Temp.: Temperature

No.		Wiring Connector Side
A	1	Light control rheostat
	2	TAIL Fuse
	3	Oil pressure sender gauge
	4	GAUGE Fuse
	5	PNP switch (A/T)
	6	Engine coolant temperature sender gauge
	7	Igniter
	8	ABS ECU
	9	Seat Belt ECU
	10	PNP switch (A/T)
	11	Brake fluid level warning switch & Parking brake switch
	12	Transfer indicator switch
B	1	Headlight
	2	IGN Fuse
	4	ALT terminal L
	6	Speed control unit
	7	Washer level warning (CANADA)
	8	Turn signal switch
C	1	PNP switch (A/T)
	2	PNP switch (A/T)
	3	PNP switch (A/T)
	4	PNP switch (A/T)
	5	PNP switch (A/T)
	6	PNP switch (A/T)
	7	Over drive switch
	8	Turn signal switch
	9	Ground
D	2	ECU-B Fuse
	3	Fuel sender gauge
	4	A/T oil temperature switch
	6	Cruise control ECU
	7	Fuel sender gauge
	8	GAUGE Fuse
	9	ECM
	10	Ground
	11	Center airbag sensor assembly
	12	Ground

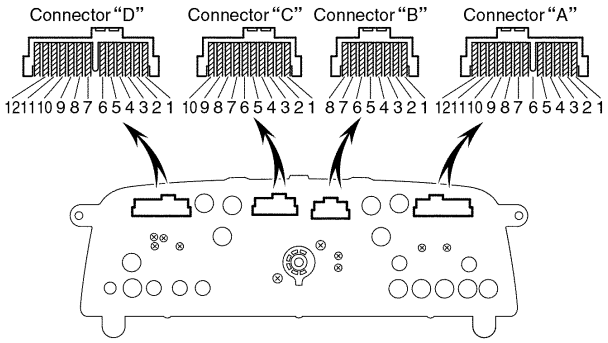
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I22850

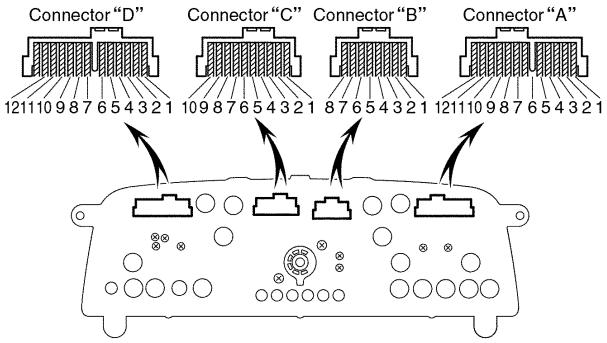
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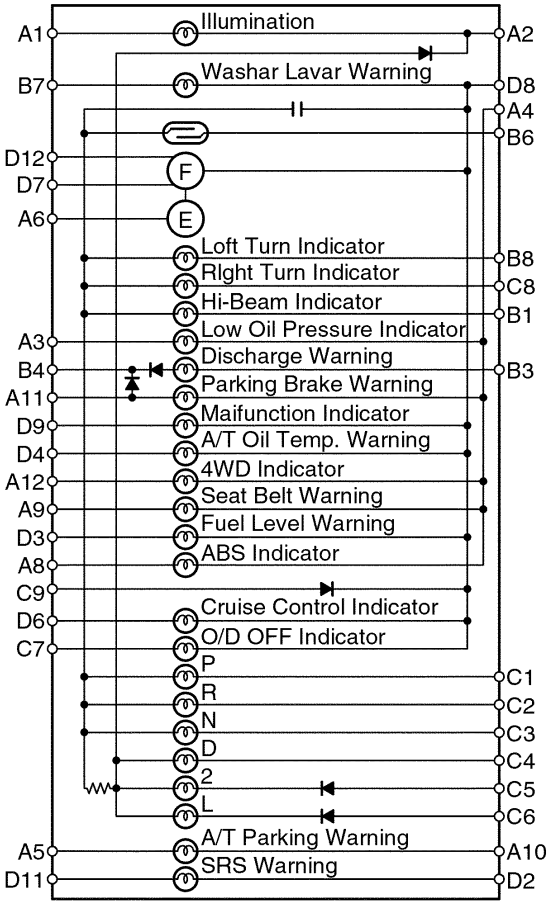
w/o TACHOMETER

M/T



A/T





(F) : FUEL GAUGE

(E) : ENGINE COOLANT TEMPERATURE GAUGE

Temp. : Temperature

No.		Wiring Connector Side
A	1	Light control rheostat
	2	TAIL Fuse
	3	Oil pressure sender gauge
	4	GAUGE Fuse
	5	PNP switch (A/T)
	6	Engine coolant temperature sender gauge
	8	ABS ECU
	9	Seat Belt ECU
	10	PNP switch (A/T)
	11	Brake fluid level warning switch & Parking brake switch
	12	Transfer indicator switch
B	1	Headlight
	2	IGN Fuse
	4	ALT Fuse
	6	Speed control unit
	7	Washer level warning (CANADA)
	8	Turn signal switch
C	1	PNP switch (A/T)
	2	PNP switch (A/T)
	3	PNP switch (A/T)
	4	PNP switch (A/T)
	5	PNP switch (A/T)
	6	PNP switch (A/T)
	7	Over drive switch
	8	Turn signal switch
	9	Ground
D	2	ECU-B Fuse
	3	Fuel sender gauge
	4	A/T oil temperature switch
	6	Cruise control ECU
	7	Fuel sender gauge
	8	GAUGE Fuse
	9	ECM
	11	Center airbag sensor assembly
	12	Ground

I22849

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BE03F–03

INSPECTION

1. INSPECT SPEEDOMETER ON–VEHICLE

(a) Using a speedometer tester, inspect the speedometer for allowable indication error and check the operation of the odometer.

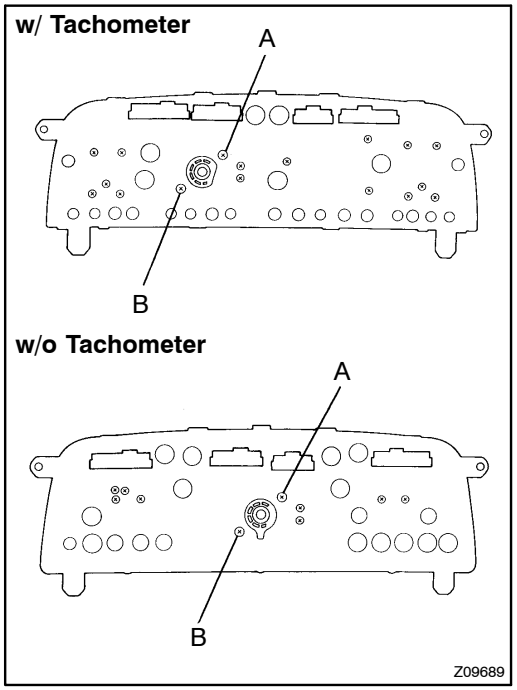
HINT:

Tire wear and tire over or under inflation will increase the indication error.

If error is excessive, replace the speedometer.

(b) Check the speedometer for pointer vibration and abnormal noise.

USA (mph)		CANADA (km/h)	
Standard indication	Allowable range	Standard indication	Allowable range
20	18 – 24	20	17 – 24
40	38 – 44	40	38 – 46
60	58 – 66	60	57.5 – 67
80	78 – 88	80	77 – 88
100	98 – 110	100	96 – 109
120	118 – 132	120	115 – 130
		140	134 – 151.5
		160	153 – 173



2. INSPECT VEHICLE SPEED SENSOR OPERATION

Check that there is continuity between terminals A and B four times for every revolution of the speedometer shaft.

If operation is not as specified, replace the speedometer.

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3. INSPECT TACHOMETER ON–VEHICLE

(a) Connect a tune–up test tachometer, and start the engine.

NOTICE:

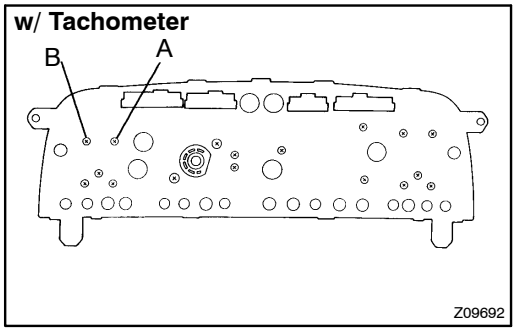
Reversing the connection of the tachometer will damage the transistors and diodes inside. When removing or installing the tachometer, be careful not to drop or subject it to heavy shocks.

(b) Compare the tester and tachometer indications.

DC 13.5 V 20˚C at (68˚F)

Standard indication (rpm)	Allowable range (rpm)
700	610 – 750
3,000	2,850 – 3,150
5,000	4,850 – 5,150
7,000	6,790 – 7,210

If error is excessive, replace the tachometer.

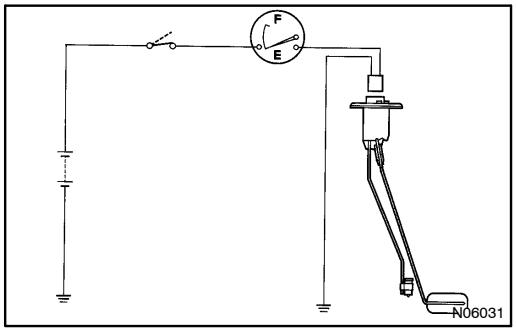


4. INSPECT VOLT GAUGE SYSTEM

Measure the resistance between terminals A and B.

Resistance: Approx. 347 Ω

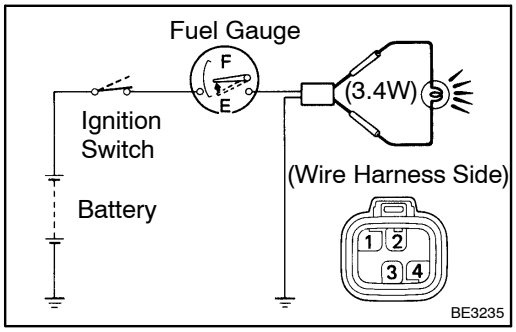
If resistance value is not as specified, replace the gauge.



5. INSPECT FUEL RECEIVER GAUGE OPERATION

(a) Disconnect the connector from the sender gauge.

(b) Turn the ignition switch ON, check that the receiver gauge needle indicates EMPTY.



(c) Connect terminals 1 and 3 on the wire harness side connector through a 3.4 watts test bulb.

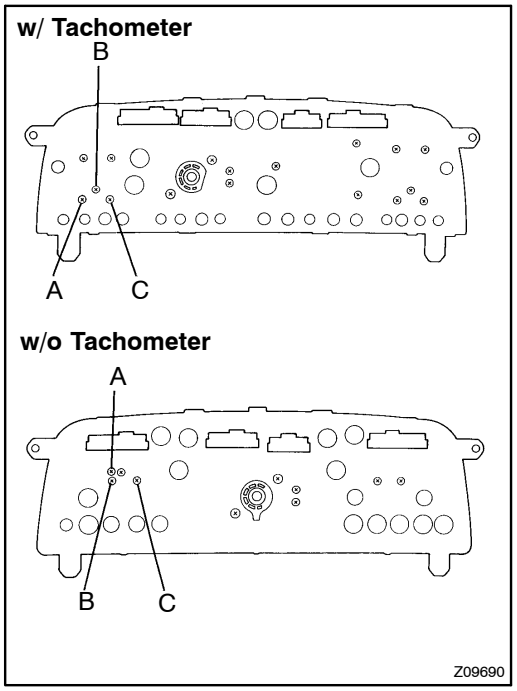
(d) Turn the ignition switch ON, check that the bulb lights up and the receiver gauge needle moves towards the full side.

HINT:

Because of the silicon oil in the gauge, it will take a short time for needle to stabilize.

If operation is not as specified, inspect the receiver gauge resistance.

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6. INSPECT FUEL RECEIVER GAUGE RESISTANCE

Measure the resistance between terminals.

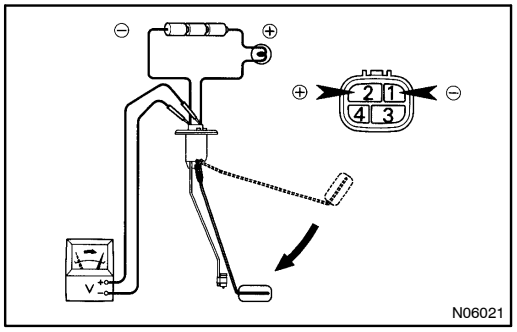
w/ Tachometer:

Between terminals	Resistance (Ω)
A – B	Approx. 137.0
A – C	Approx. 123.0
B – C	Approx. 260.0

w/o Tachometer:

Between terminals	Resistance (Ω)
A – B	Approx. 150.0
A – C	Approx. 80.0
B – C	Approx. 55.0

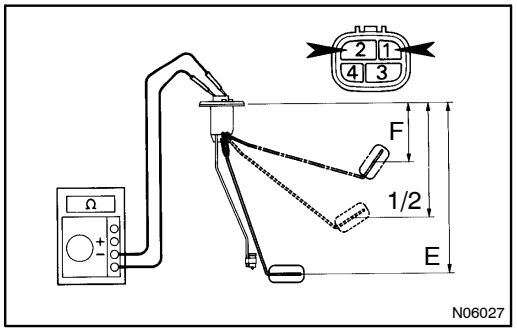
If resistance value is not as specified, replace the receiver gauge.



7. INSPECT FUEL SENDER GAUGE OPERATION

(a) Connect a series of three 1.5 V dry batteries.
(b) Connect the positive (+) lead from the dry cell batteries to terminal 2 through a 3.4 W test bulb and the negative (–) lead to terminal 1.
(c) Check the positive (+) lead from the voltmeter to terminal 2 and the negative (–) lead to terminal 1.
(d) Check that the voltage rises as the float is moved from the top to bottom position.

If operation is not as specified, replace the sender gauge.

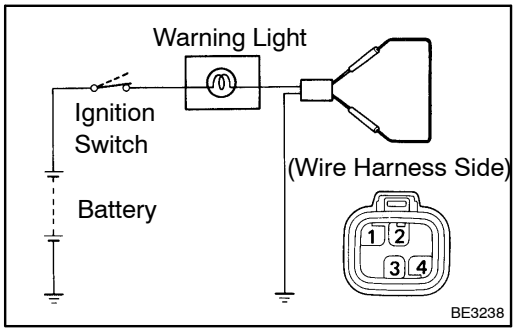


8. INSPECT FUEL SENDER GAUGE RESISTANCE

Measure the resistance between terminals 1 and 2.

Float position (mm)	Resistance (Ω)
F : Approx. 95.0	F : Approx. 3.0
1 / 2 : Approx. 188.0	1 / 2 : Approx. 32.5
E : Approx. 283.0	E : Approx. 110.0

If resistance value is not as specified, replace the sender gauge.

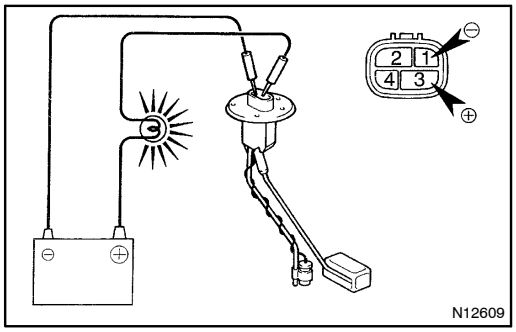


9. INSPECT FUEL LEVEL WARNING LIGHT

(a) Disconnect the connector from the sender gauge.
(b) Connect terminals 1 and 4 on the wire harness side connector.
(c) Turn the ignition switch ON, check that the warning light lights up.

If the warning light does no light up, test the bulb.

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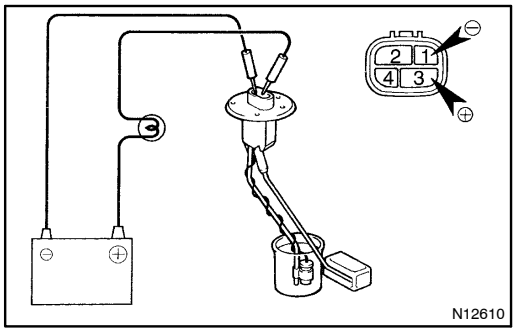


10. INSPECT FUEL LEVEL WARNING SWITCH

(a) Apply battery positive voltage between terminal 1 and 3, and through a 3.4 W test bulb, check the bulb lights up.

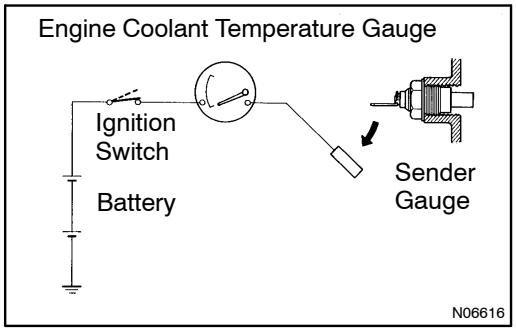
HINT:

It will take a short time for bulb to light up.



(b) Submerge the switch in fuel, check that the bulb goes out.

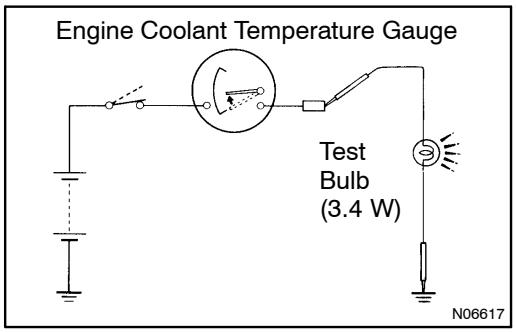
If operation is not as specified, replace the sender gauge.



11. INSPECT ENGINE COOLANT TEMPERATURE RECEIVER GAUGE OPERATION

(a) Disconnect the connector from the sender gauge.

(b) Turn the ignition switch ON, check that the receiver gauge needle indicates COOL.



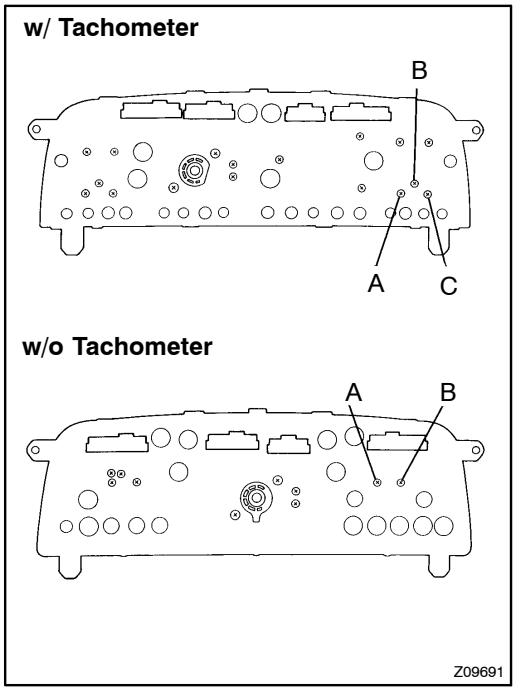
(c) Ground terminal on the wire harness side connecter through a 3.4 W test bulb.

(d) Turn the ignition switch ON, check that the bulb lights up and the receiver gauge needle moves to the hot side.

If operation is as specified, replace the sender gauge. Then, recheck the system.

If operation is not as specified, measure the receiver gauge resistance.

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12. INSPECT ENGINE COOLANT TEMPERATURE RECEIVER GAUGE RESISTANCE

Measure the resistance between terminals.

w/ Tachometer:

Between terminals	Resistance (Ω)
A – B	Approx. 150.0
A – C	Approx. 54.0
B – C	Approx. 138.0

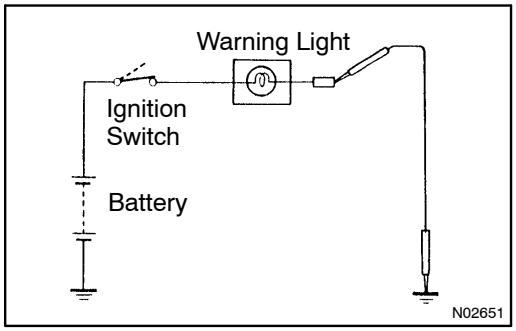
w/o Tachometer:

Between terminals	Resistance (Ω)
A – B	Approx. 25.0

HINT:

Connect the test leads so that the current from the ohmmeter can flow according to the above order. This circuit includes the diode.

If resistance value is not as specified, replace the receiver gauge.

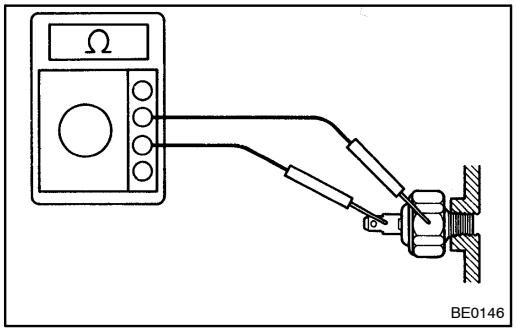


13. INSPECT OIL PRESSURE WARNING LIGHT

(a) Disconnect the connector from the warning switch and ground terminal on the wire harness side connector.

(b) Turn the ignition switch ON, check that the warning light lights up.

If the warning light does not light up, test the bulb.



14. INSPECT OIL PRESSURE SENDER GAUGE

(a) Disconnect the connector from the sender gauge.

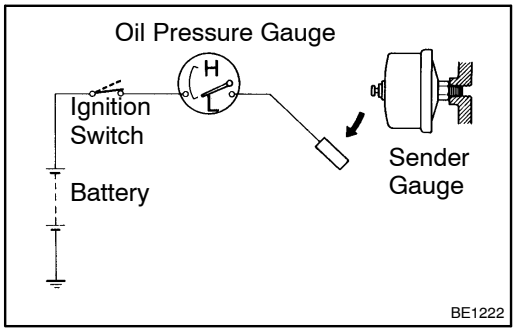
(b) Check that there is continuity between terminal and ground with the engine stopped.

(c) Check that there is no continuity between terminal and ground with the engine running.

HINT:

Oil pressure should be over 49 kPa (0.5 kgf/cm^2, 7.1 psi).

If operation is not as specified, replace the sender gauge.

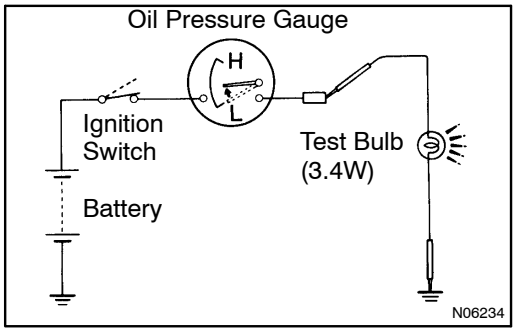


15. INSPECT RECEIVER OIL PRESSURE GAUGE OPERATION

(a) Disconnect the connector from the sender gauge.

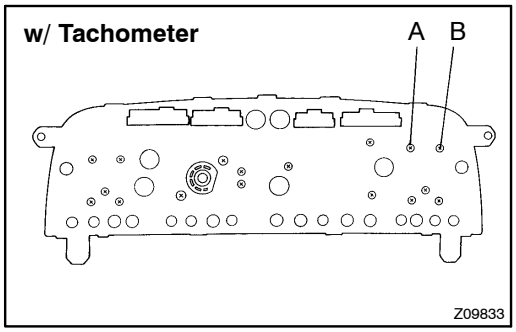
(b) Turn the ignition switch ON, check that the receiver gauge needle indicates LOW.

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(c) Ground terminal on the wire harness side connector through a 3.4 W test bulb.
(d) Turn the ignition ON, check that the bulb lights up and the receiver gauge needle moves to the high side.

If resistance value is not as specified, replace the receiver gauge.

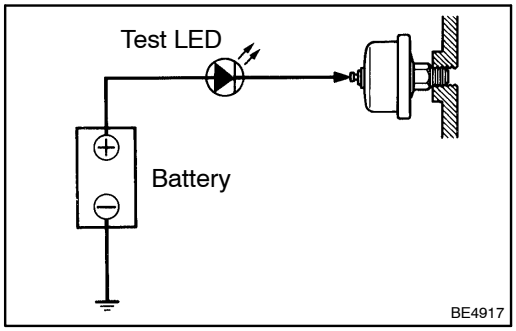


16. INSPECT OIL PRESSURE RECEIVER GAUGE RESISTANCE

Measure the resistance between terminals A and B.

Resistance: Approx. 25.0 Ω

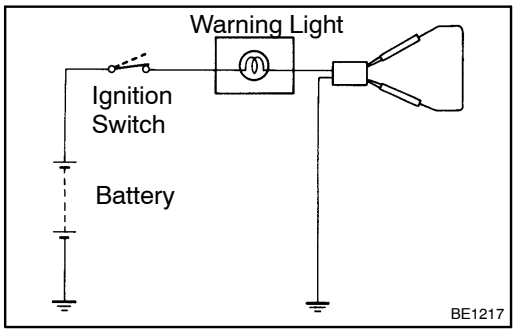
If resistance value is not as specified, replace the receiver gauge.



17. INSPECT OIL PRESSURE SENDER GAUGE OPERATION

(a) Disconnect the connector from the sender gauge.
(b) Apply battery positive voltage to the sender gauge terminal through a test LED.
(c) Check that the bulb does not light when the engine is stopped.
(d) Check that the LED flashes when the engine is running. The number of flashes should vary with the engine speed.

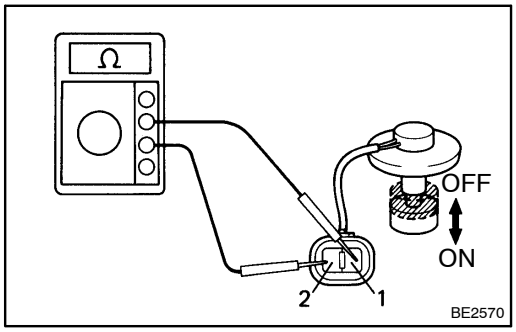
If operation is not as specified, replace the sender gauge.



18. INSPECT BRAKE WARNING LIGHT

(a) Disconnect the connectors from the level warning switch and parking brake switch.
(b) Connect terminals on the wire harness side connector of the level warning switch connector.
(c) Turn the ignition switch ON, check that the warning light lights up.

If the warning light does not light up, test the bulb.

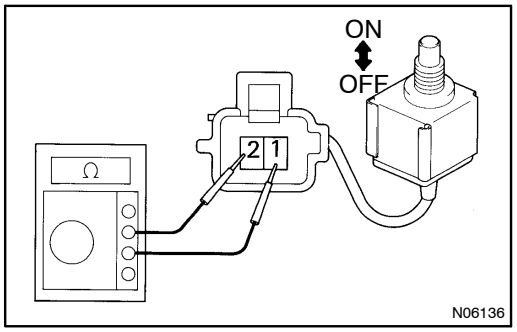


19. INSPECT BRAKE FLUID LEVEL WARNING SWITCH

(a) Check that there is no continuity between terminals with the switch OFF (float up).
(b) Check that there is continuity between terminals with the switch ON (float down).

If operation is not as specified, replace the switch.

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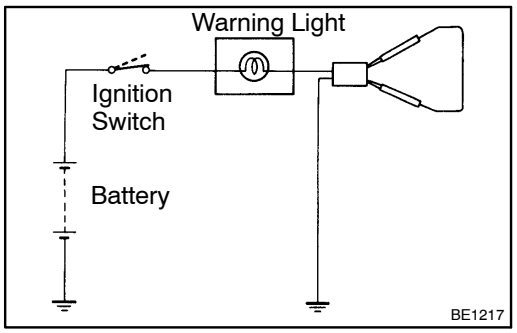


20. INSPECT PARKING BRAKE SWITCH

(a) Check that there is continuity between terminals with the switch ON (switch pin released).

(b) Check that there is no continuity between terminals with the switch OFF (switch pin pushed in).

If operation is not as specified, replace the switch.



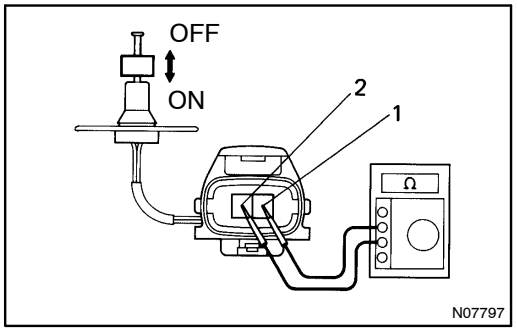
21. INSPECT WASHER LEVEL WARNING LIGHT

(a) Disconnect the connectors from the level warning switch and parking brake switch.

(b) Connect terminals on the wire harness side connector of the level warning switch connector.

(c) Remove the CHARGE fuse and turn the ignition switch ON, check that the warning light come on.

If the warning light does not light up, test the bulb.

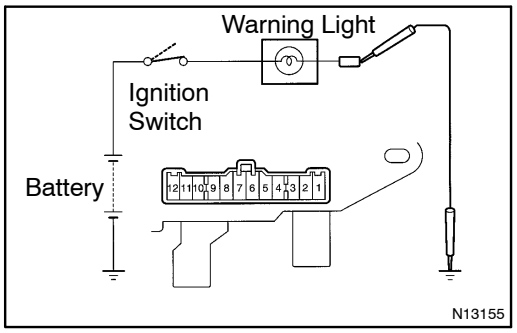


22. INSPECT WASHER LEVEL SWITCH

(a) Check that there is no continuity between terminals with the switch OFF (float up).

(b) Check that there is continuity between terminals with the switch ON (float down).

If operation is not as specified, replace the switch.



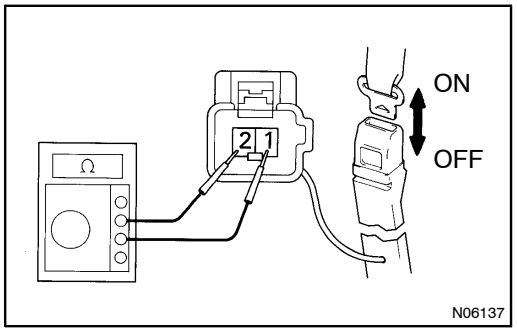
23. INSPECT SEAT BELT WARNING LIGHT

(a) Remove the integration relay from the junction block No.1.

(b) Ground terminal 9 on the junction block side connector.

(c) Turn the ignition switch ON, check that the warning light lights up.

If the warning light does not light up, inspect the bulb or wire harness.



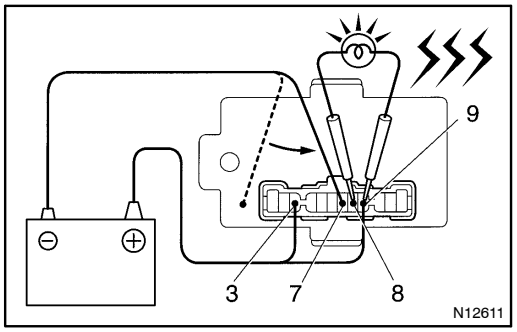
24. INSPECT BUCKLE SWITCH CONTINUITY

(a) Check that there is continuity between terminals on the switch side connector with the switch ON (belt unfastened).

(b) Check that there is no continuity between terminals on the switch side connector with the switch OFF (belt fastened).

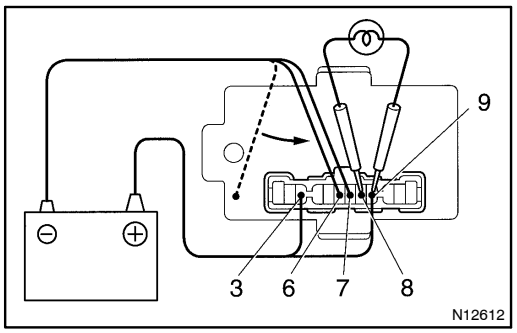
If operation is not as specified, replace the seat belt inner.

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25. INSPECT INTEGRATION RELAY SEAT BELT WARNING SYSTEM OPERATION

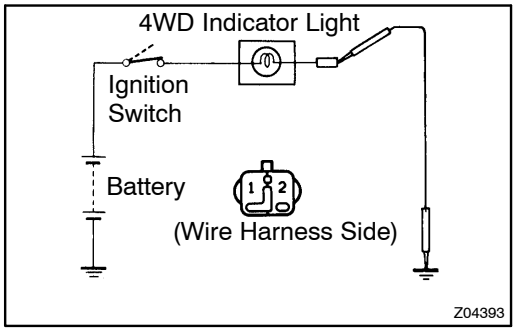
(a) Connect the positive (+) lead from the battery to terminals 3 and 9.
(b) Connect the terminal 8 to terminal 9 through the 3.4 W test bulb.
(c) Connect the negative (–) lead from the battery to terminal 7.
(d) Check that the bulb lights and the buzzer sounds.



(e) Return to step (a), and operate the buzzer again.
(f) Connect the negative (–) lead from the battery to terminal 6.
(g) Check that the buzzer stops sounding.

HINT:
Check the buzzer within a period of 4 to 8 seconds.
If operation is not as specified, replace the relay.

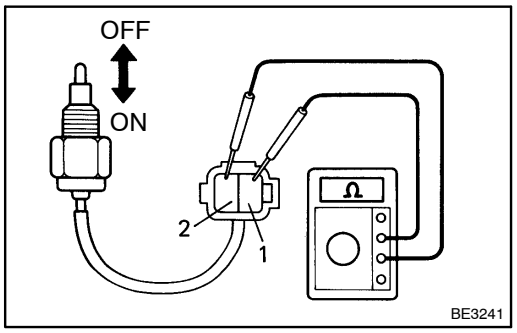
26. INSPECT INTEGRATION RELAY CIRCUIT (See page BE–12)



27. INSPECT 4WD INDICATOR LIGHT

(a) Disconnect the connector from the 4WD indicator switch. Connect the switch terminal 2 and body ground.
(b) Turn the ignition switch on. Check that the bulb lights up.

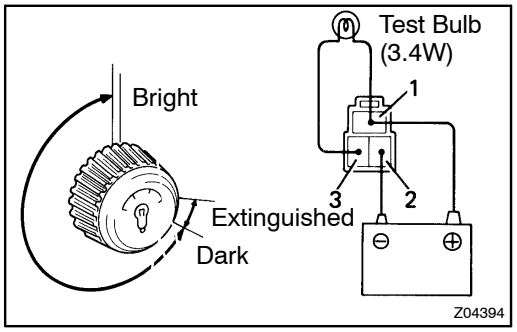
If operation is not as specified, remove and test the bulb.



28. INSPECT 4WD INDICATOR SWITCH

(a) Check that the there is continuity when the switch pin is pushed.
(b) Check that there is no continuity when the switch is free.

If operation is not as specified, replace the switch.



29. INSPECT LIGHT CONTROL RHEOSTAT

(a) Connect terminals 1 and 3 through a 3.4 W test bulb.
(b) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2.
(c) Turn the rheostat knob fully counterclockwise, check that the test bulb goes out.
(d) Gradually turn the rheostat knob clockwise, check that the test bulb brightness changes from dark to bright.

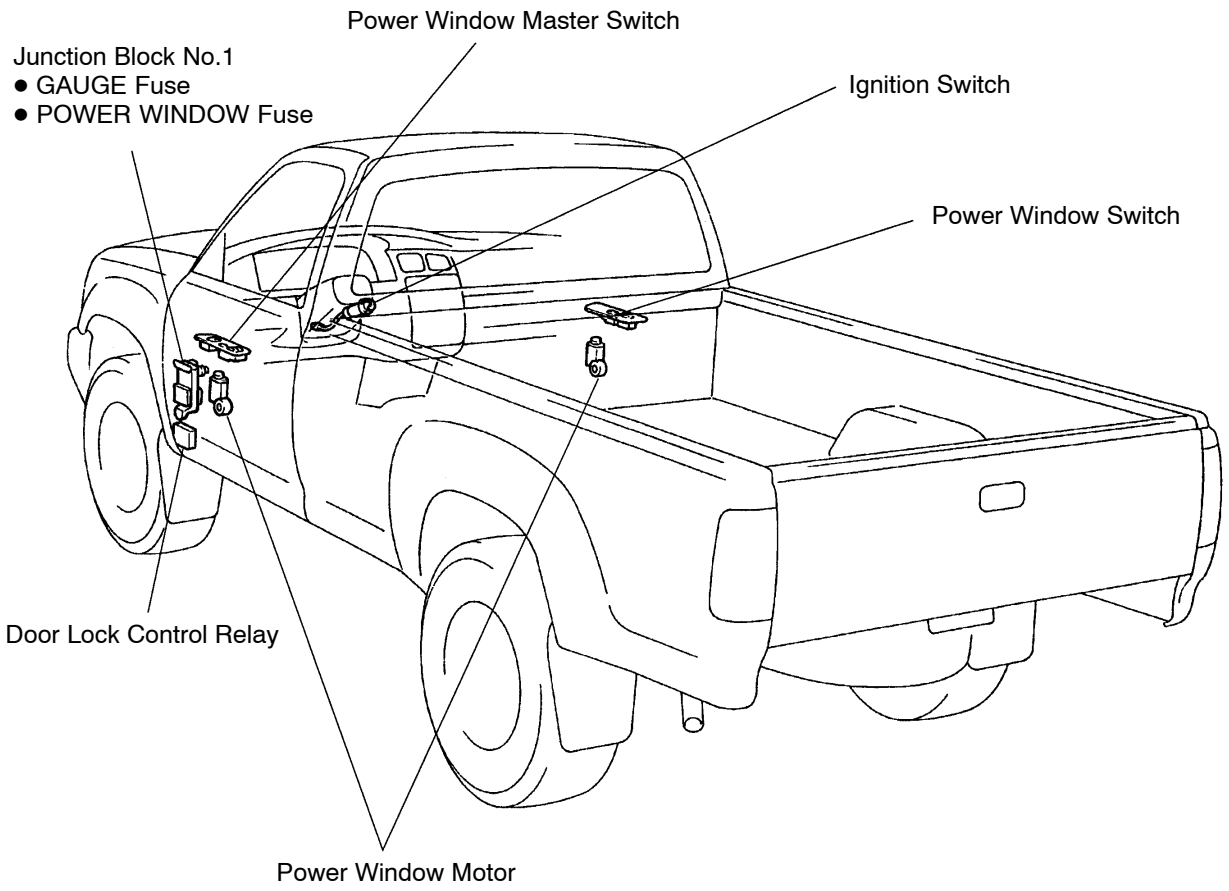
If operation is not as specified, replace the rheostat.

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POWER WINDOW CONTROL SYSTEM

LOCATION

BE03O–04

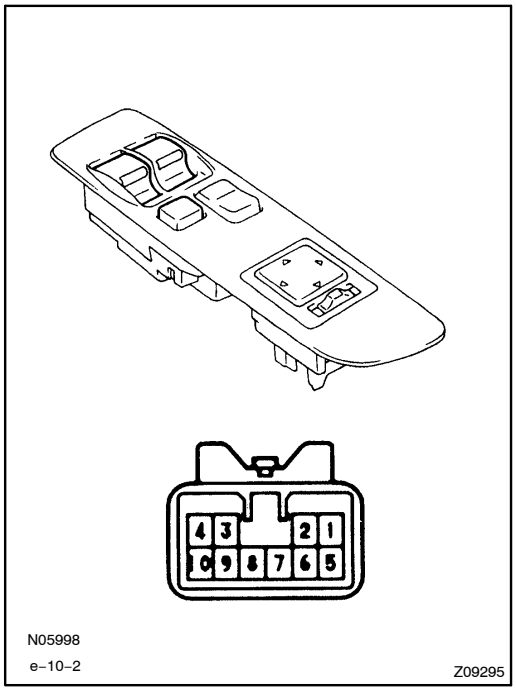


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BE03P–02

INSPECTION

1. INSPECT POWER WINDOW MASTER SWITCH CONTINUITY



Driver's switch: Window unlock

Switch position	Tester connection	Specified condition
UP	4 – 6, 3 – 9	Continuity
OFF	3 – 4 – 6	Continuity
DOWN	3 – 6, 4 – 9	Continuity

Driver's switch: Window lock

Switch position	Tester connection	Specified condition
UP	3 – 9, 4 – 6	Continuity
OFF	3 – 4 – 6	Continuity
DOWN	3 – 6, 4 – 9	Continuity

Passenger's switch: Window unlock

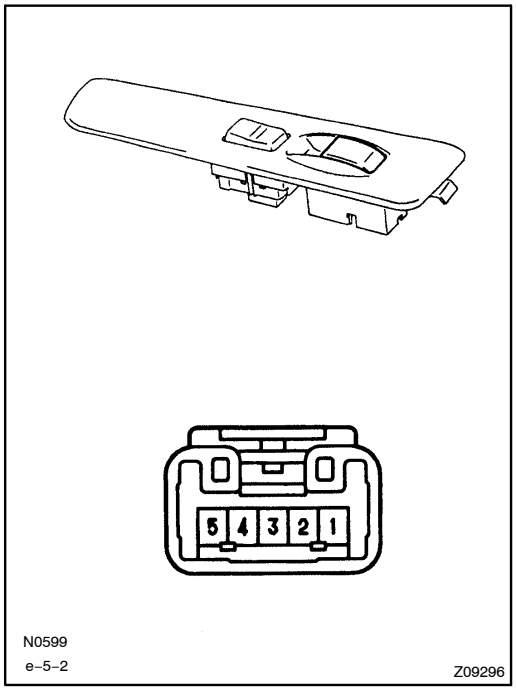
Switch position	Tester connection	Specified condition
UP	6 – 7, 9 – 10	Continuity
OFF	–	No continuity
DOWN	7 – 9, 6 – 10	Continuity

Passenger's switch: Window lock

Switch position	Tester connection	Specified condition
UP	9 – 10	Continuity
OFF	7 – 10	Continuity
DOWN	7 – 9	Continuity

If continuity is not as specified, replace the switch.

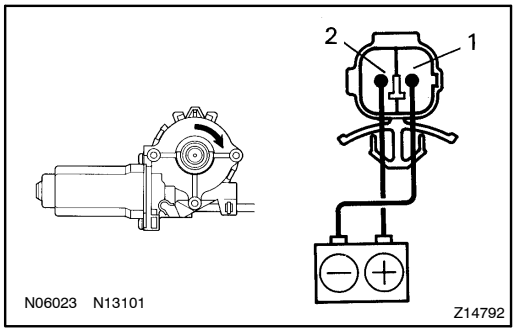
2. INSPECT POWER WINDOW SWITCH CONTINUITY



Switch position	Tester connection	Specified condition
UP	1 – 2, 3 – 4	Continuity
OFF	1 – 2, 3 – 5	Continuity
DOWN	3 – 5, 1 – 4	Continuity

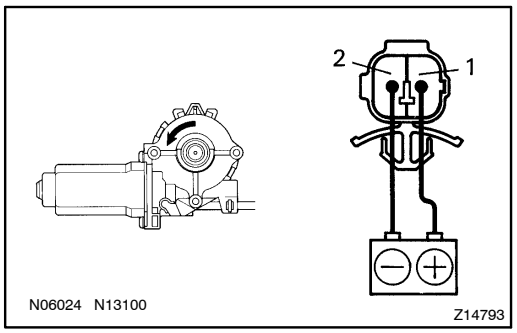
If continuity is not as specified, replace the switch.

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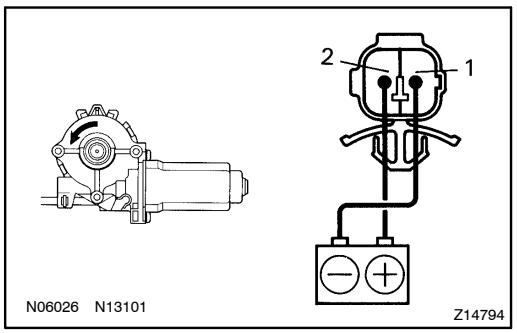
3. Driver's Side:
INSPECT POWER WINDOW MOTOR OPERATION

(a) Connect the positive (+) lead from the battery to terminal 2 and negative (–) lead to terminal 1. Check that the motor turns (moves upward).



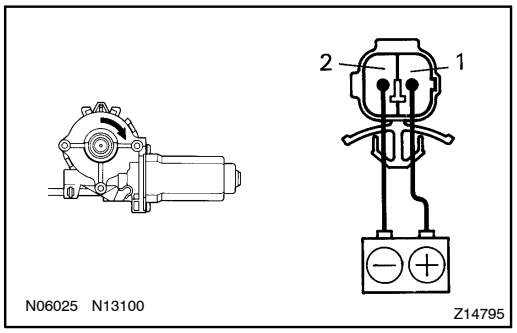
(b) Reverse the polarity, check that the motor turns the opposite way (moves downward).

If operation is not as specified, replace the motor.



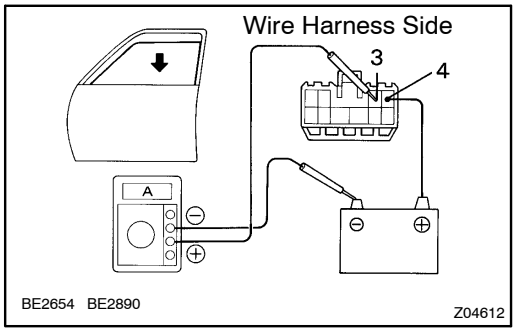
4. Passenger's Side:
INSPECT POWER WINDOW MOTOR OPERATION

(a) Connect the positive (+) lead from the battery to terminal 2 and negative (–) lead to terminal 1. Check that the motor turns (moves upward).



(b) Reverse the polarity, check that the motor turns the opposite way (moves downward).

If operation is not as specified, replace the motor.



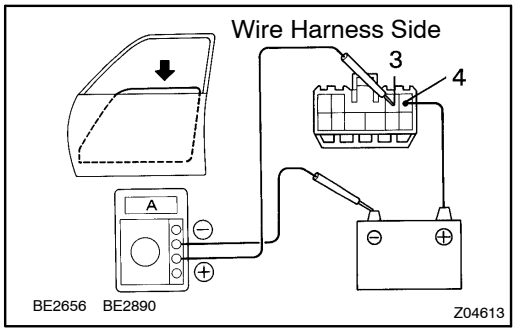
5. Using an ammeter:
INSPECT ONE TOUCH POWER WINDOW

(a) Disconnect the connector the master switch.

(b) Connect the positive (+) lead from the ammeter to terminal 3 on the wire harness side connector and the negative (–) lead to negative terminal of the battery.

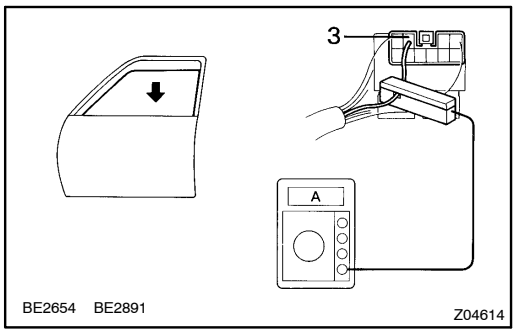
(c) Connect the positive (+) lead from the battery to terminal 4 on the wire harness side connector.

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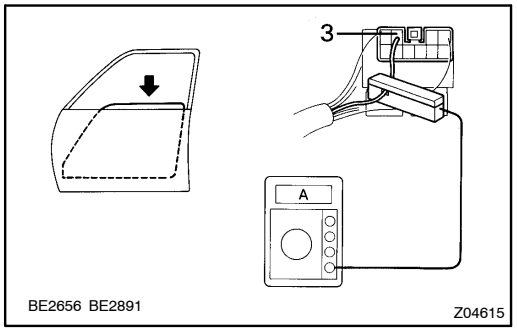
(d) As the window goes down, check that the current increases to approximately 7.0 A.
(e) Check that the current increases to approximately 14.5 A or more when the window stops going down.

HINT:
The circuit breaker opens some 4 – 40 seconds after the window stops going down, so that the check must be made before the circuit breaker operates.
If the operation is as specified, replace the master switch.



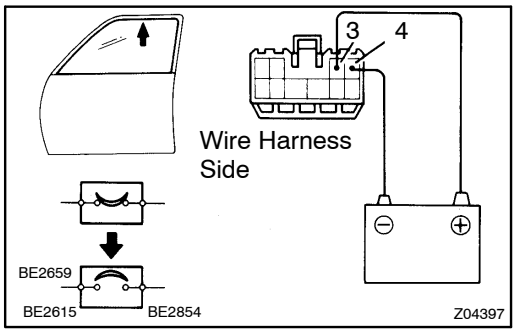
6. Using an ammeter with a current–measuring probe: INSPECT ONE TOUCH POWER WINDOW

(a) Remove the master switch with connector connected.
(b) Attach a current–measuring probe to terminal 3 of the wire harness.
(c) Turn the ignition switch ON and set the power window switch in the down position.
(d) As the window goes down, check that the current increases to approximately 7.0 A.



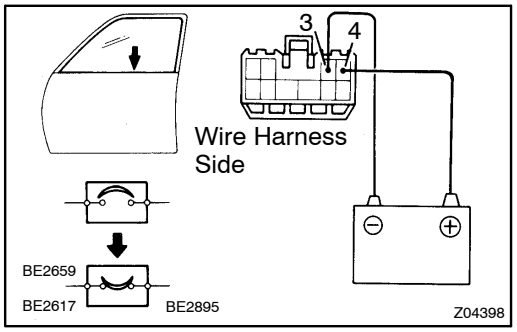
(e) Check that the current increases to approximately 14.5 A or more when the window stops going down.

HINT:
The circuit breaker opens some 4 – 40 seconds after the window stops going down, so that the check must be made before the circuit breaker operates.
If operation is as specified, replace master switch.



7. INSPECT CIRCUIT BREAKER OPERATION

(a) Disconnect the connector from the master switch.
(b) Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 4 on the wire harness side connector, and raise the window to full closed position.
(c) Continue to apply voltage, check that there is a circuit breaker operation noise within approximately 4 – 40 seconds.



(d) Reverse the polarity, check that the window begins to descend within approximately 60 seconds.

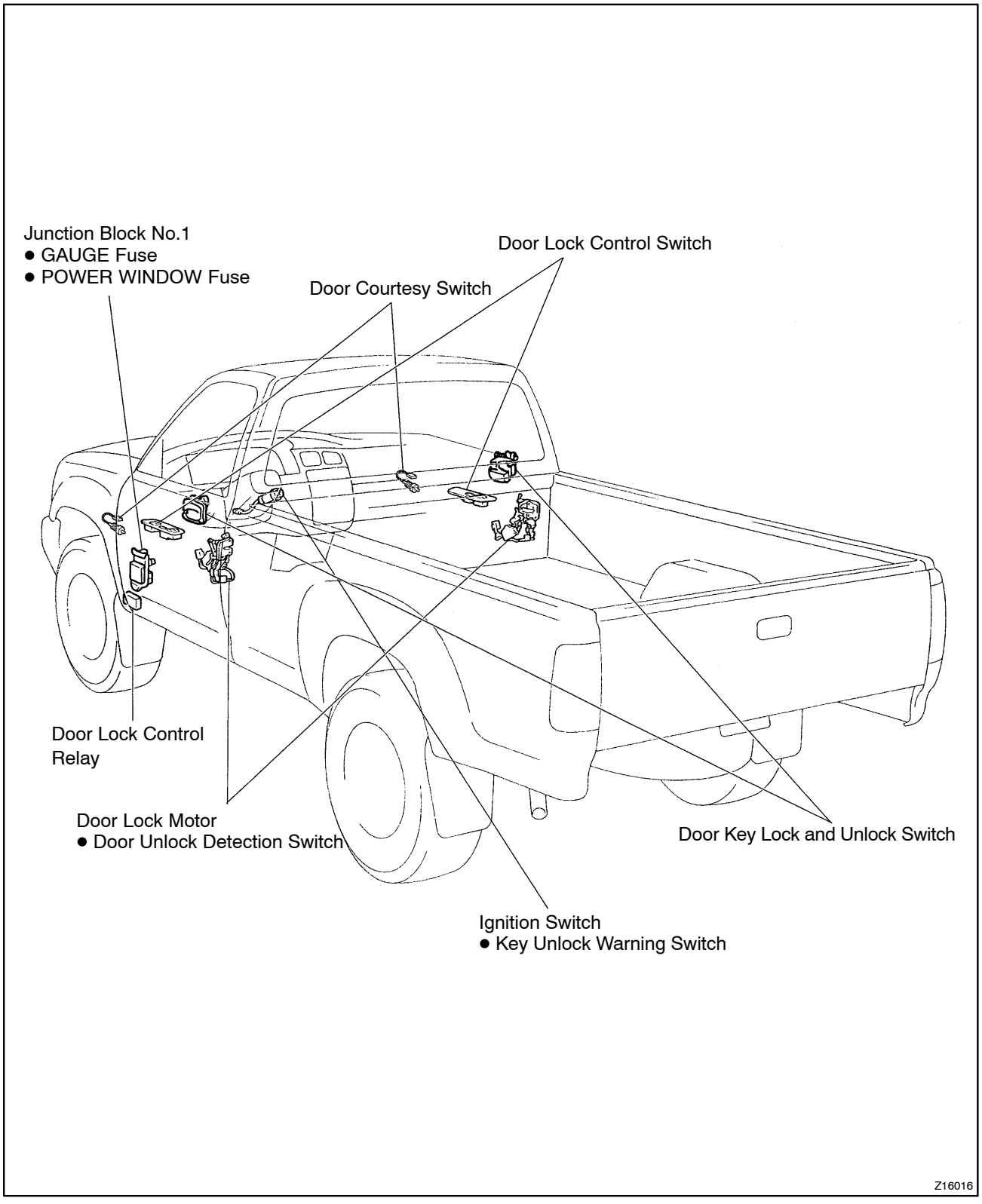
If operation is not as specified, replace the motor.

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POWER DOOR LOCK CONTROL SYSTEM

LOCATION

BE03I–03

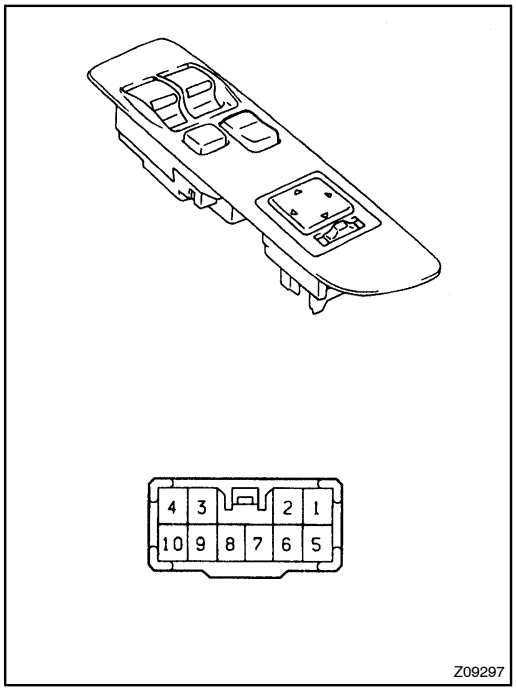


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BE03J–02

INSPECTION

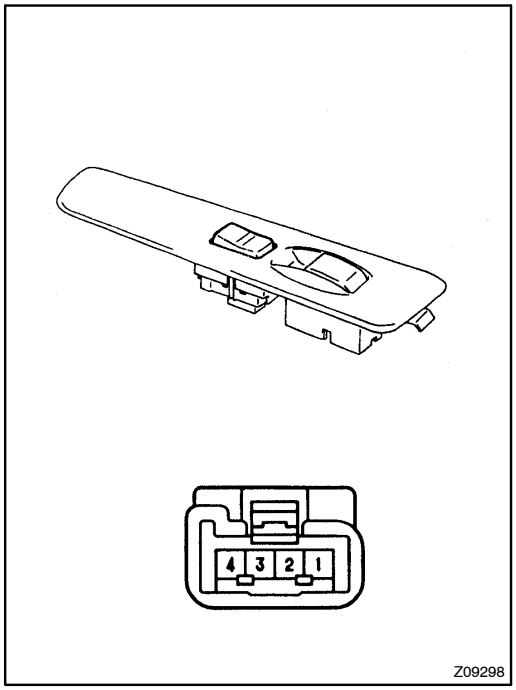
1. INSPECT DRIVER'S DOOR LOCK CONTROL SWITCH CONTINUITY



Switch position	Tester connection	Specified condition
LOCK	1 – 5 2 – 6	Continuity
OFF	–	No continuity
UNLOCK	2 – 5 1 – 6	Continuity

If continuity is not as specified, replace the switch.

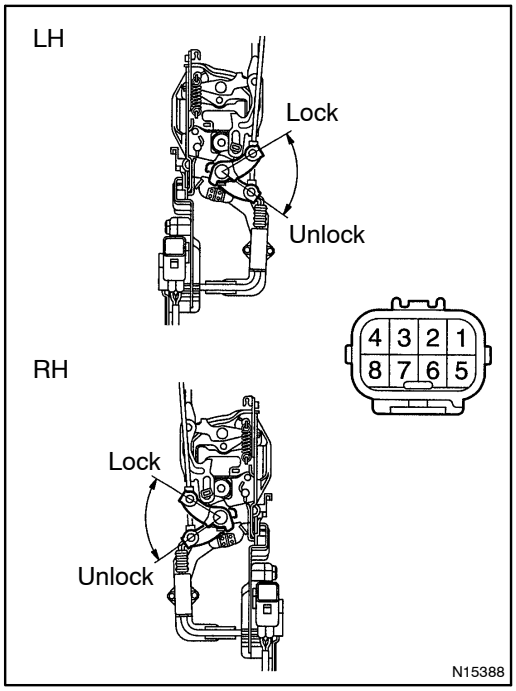
2. INSPECT PASSENGER'S DOOR LOCK CONTROL SWITCH CONTINUITY



Switch position	Tester connection	Specified condition
LOCK	3 – 4	Continuity
OFF	–	No continuity
UNLOCK	2 – 4	Continuity

If continuity is not as specified, replace the switch.

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3. INSPECT DOOR KEY LOCK AND UNLOCK SWITCH CONTINUITY

LH:

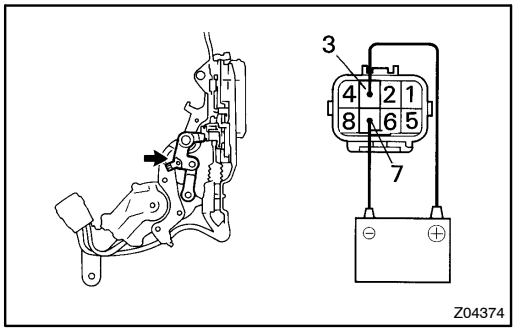
Switch position	Tester connection	Specified condition
LOCK	5 – 6	Continuity
OFF	–	No continuity
UNLOCK	1 – 5	Continuity

If continuity is not as specified, replace the switch.

RH:

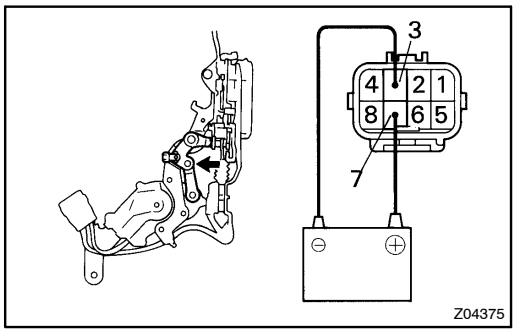
Switch position	Tester connection	Specified condition
LOCK	8 – 7	Continuity
OFF	–	No continuity
UNLOCK	4 – 8	Continuity

If continuity is not as specified, replace the switch.



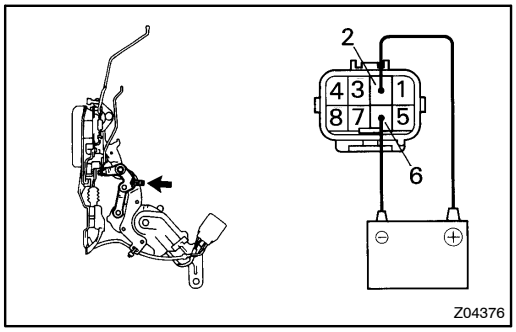
4. INSPECT DRIVER'S DOOR LOCK MOTOR OPERATION

(a) Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 7, check that the door lock link moves to UNLOCK position.



(b) Remove the polarity, check that the door lock link moves to LOCK position.

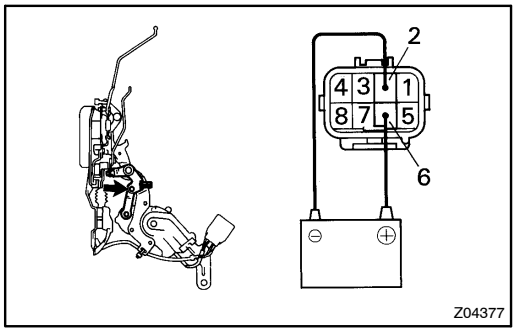
If operation is not as specified, replace the door lock assembly.



5. INSPECT PASSENGER'S DOOR LOCK MOTOR OPERATION

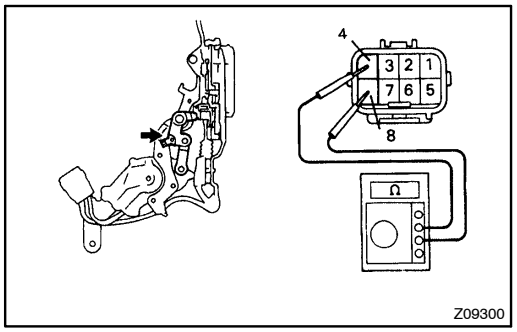
(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 6, check that the door lock moves to UNLOCK position.

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(b) Remove the polarity, check that the door lock link moves to LOCK position.

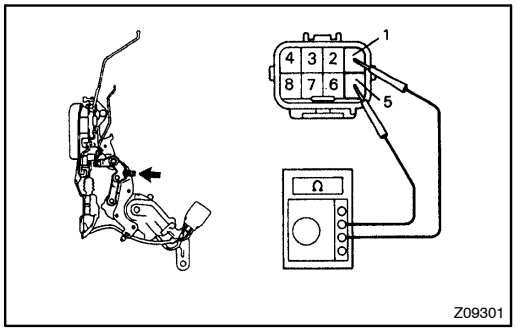
If operation is not as specified, replace the door lock assembly.



6. INSPECT DRIVER'S DOOR UNLOCK DETECTION SWITCH OPERATION

Switch position	Tester connection	Specified condition
OFF (Door Lock set to UNLOCK)	–	No continuity
ON (Door Lock set to UNLOCK)	4 – 8	Continuity

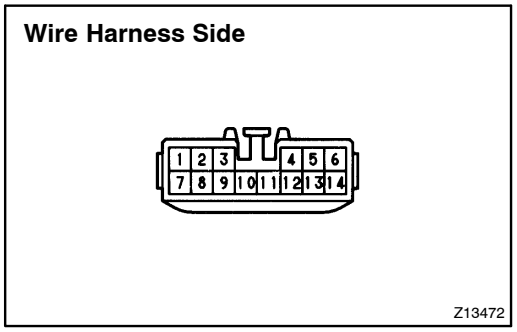
If continuity is not as specified, replace the switch.



7. INSPECT PASSENGER'S DOOR UNLOCK DETECTION SWITCH CONTINUITY

Switch position	Tester connection	Specified condition
OFF (Door Lock set to LOCK)	–	No continuity
ON (Door Lock set to UNLOCK)	1 – 5	Continuity

If continuity is not as specified, replace the switch.



8. INSPECT DOOR LOCK CONTROL RELAY CIRCUIT

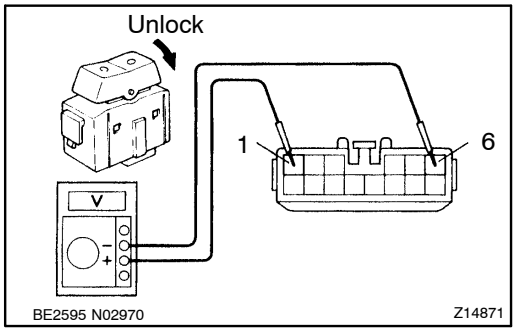
Disconnect the connector from the relay and inspect the connector on the wire harness side, as shown in the chart.

Tester connection	Condition	Specified condition
3 – Ground	Door lock control switch or passenger's door key lock and unlock switch LOCK or OFF	No continuity
3 – Ground	Door lock control switch or passenger's door key lock and unlock switch UNLOCK	Continuity
4 – Ground	Door lock control switch or door key lock and unlock switch UNLOCK or OFF	No continuity
4 – Ground	Door lock control switch or door key lock and unlock switch LOCK	Continuity

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7 – Ground	Passenger's door courtesy switch OFF (Door closed)	No continuity
7 – Ground	Passenger's door courtesy switch ON (Door opened)	Continuity
9 – Ground	Driver's door lock switch UNLOCK	Continuity
9 – Ground	Driver's door lock switch LOCK	No continuity
10 – Ground	Driver's key lock and unlock switch Lock or OFF	No countinuity
10 – Ground	Driver's key lock and unlock switch UNLOCK	Countinuity
11 – Ground	Constant	Continuity
12 – Ground	Passenger's door lock switch UNLOCK	Continuity
12 – Ground	Passenger's door lock switch LOCK	No continuity
14 – Ground	Driver's door courtesy switch OFF (Door closed)	No continuity
14 – Ground	Driver's door courtesy switch ON (Door opened)	Continuity
2 – Ground	Constant	Battery positive voltage
8 – Ground	Ignition switch LOCK or ACC	No voltage
8 – Ground	Ignition switch ON	Battery positive voltage
13 – Ground	Key unlock warning switch OFF (Ignition key removed)	No voltage
13 – Ground	Key unlock warning switch ON (Ignition key set)	Battery positive voltage

If circuit is as specified, inspect the door lock signal and key–off power window signal.

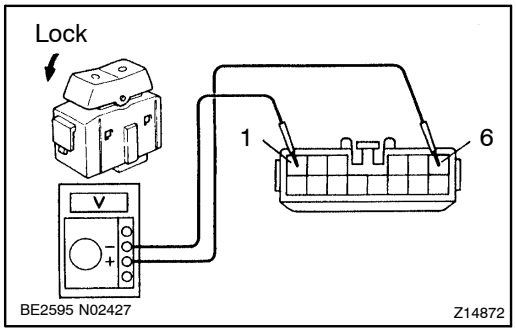


9. Door Lock Signal:
INSPECT DOOR LOCK CONTROL RELAY

HINT:
When the relay circuit is as specified, inspect the door lock signal.

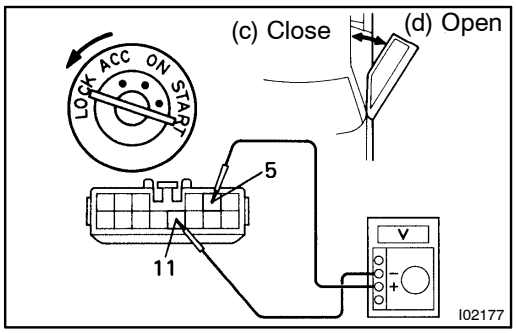
(a) Connect the connector to the relay.
(b) Connect the positive (+) lead from the voltmeter to terminal 1 and the negative (–) lead to terminal 6.
(c) Set the door lock control switch to UNLOCK, check that the voltage rises from 0 V to battery positive voltage for approximately 0.2 seconds.

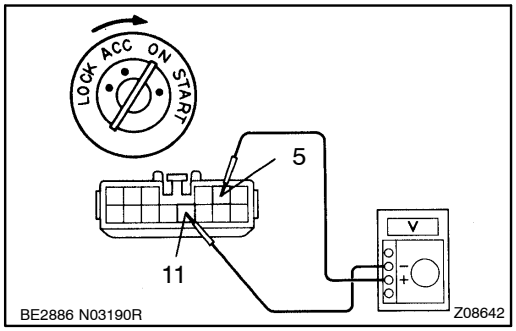
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(d) Reverse the polarity of the voltmeter leads.
(e) Set the door lock control switch to LOCK, check that the voltage rises from 0 V to battery positive voltage for approximately 0.2 seconds.

If operation is not as specified, replace the relay.





10. Key–off Power Window Signal: INSPECT DOOR LOCK CONTROL RELAY

HINT:
When the relay circuit is as specified, inspect the key–off power window signal.

(a) Connect the connector to the relay.
(b) Connect the positive (+) lead from the voltmeter to terminal 5 and the negative (–) lead to terminal 11.
(c) Close the door with ignition switch turned to LOCK or ACC, check that the meter needle indicates battery positive voltage.
(d) Open the door, check that the meter needle indicates 0 V.
(e) Turn the ignition switch ON, check that the meter needle indicate battery positive voltage again.

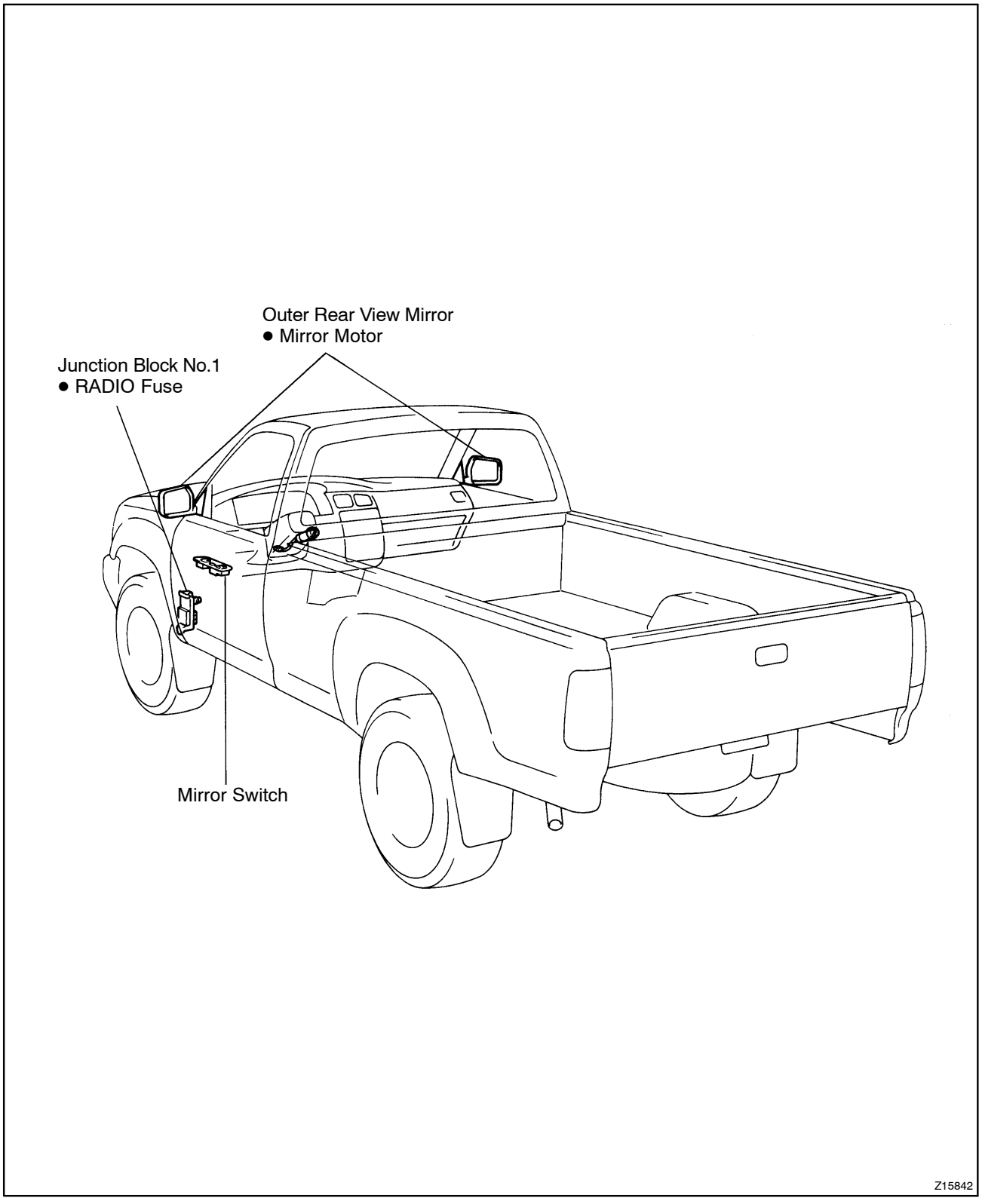
If operation is not as specified, replace the relay.

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POWER MIRROR CONTROL SYSTEM

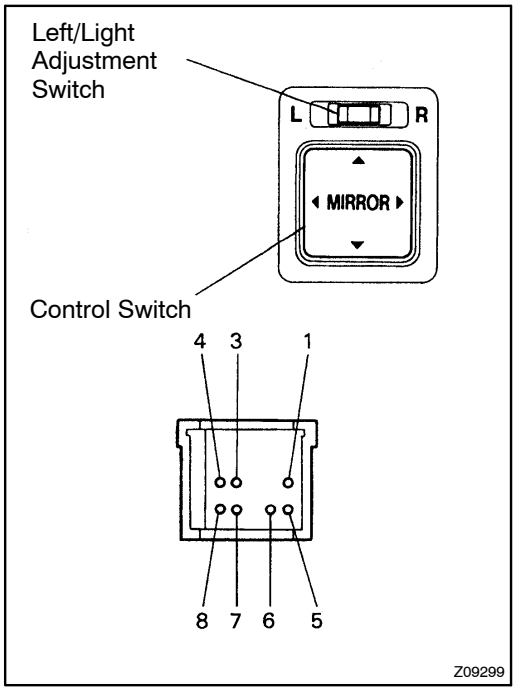
LOCATION

BE03G–04



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BE03H–03



INSPECTION

1. INSPECT MIRROR SWITCH CONTINUITY

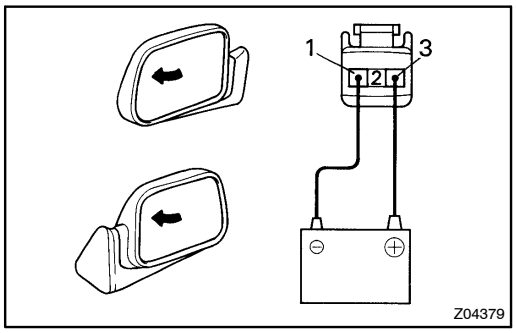
Left side:

Switch position	Tester connection	Specified condition
UP	3 – 4 1 – 8	Continuity
DOWN	1 – 3 4 – 8	Continuity
LEFT	3 – 4 1 – 7	Continuity
RIGHT	1 – 3 4 – 7	Continuity

Right side:

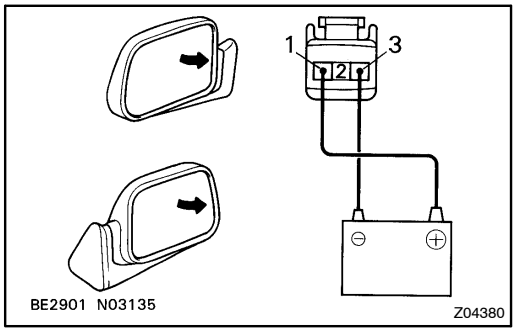
Switch position	Tester connection	Specified condition
UP	3 – 4 1 – 5	Continuity
DOWN	1 – 3 4 – 5	Continuity
LEFT	3 – 4 1 – 6	Continuity
RIGHT	1 – 3 4 – 6	Continuity

If continuity is not as specified, replace the switch.



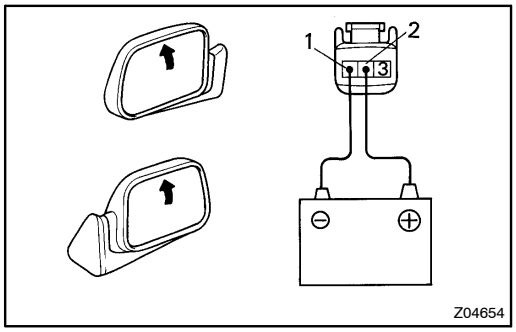
2. INSPECT MIRROR MOTOR OPERATION

(a) Connect the positive (+) lead from the battery to terminal 3 and negative (–) lead to terminal 1. Check that the mirror turns to left side.

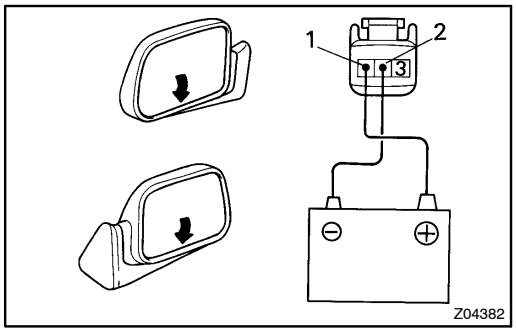


(b) Remove the polarity, check that the mirror turns to right side.

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(c) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1. Check that the mirror turns upward.



(d) Reverse the polarity, that the mirror turns downward.

If operation is not as specified, replace the mirror assembly.

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AUDIO SYSTEM

DESCRIPTION

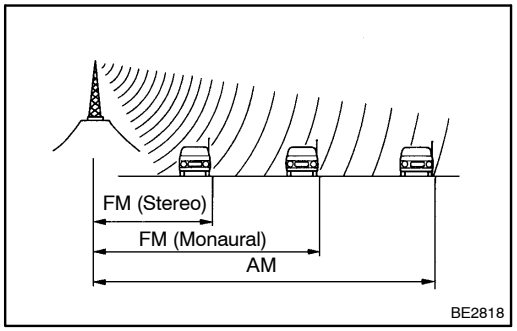
BE1PI–02

1. RADIO WAVE BAND

The radio wave bands used in radio broadcasting are as follows:

Frequency	30 kHz	300 kHz	3 MHz	30 MHz	300 MHz
Designation	LF	MF	HF	VHF	
Radio wave		AM ⟷		FM ⟷	
Modulation method	Amplitude modulation			Frequency modulation	

LF: Low frequency MF: Medium Frequency HF: High Frequency VHF: Very High Frequency



2. SERVICE AREA

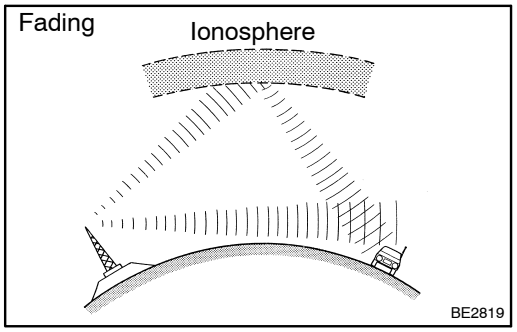
There are great differences in the size of the service area for AM and FM monaural. Sometimes FM stereo broadcasts cannot be received even though AM comes in very clearly at the same location.

Not only does FM stereo have the smallest service area, but it also picks up static and other types of interference (”noise”) easily if the vehicle is moving in a fringe area.

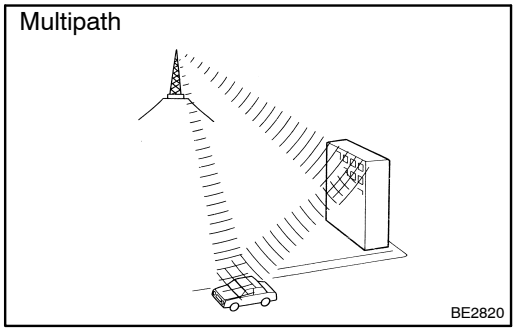
3. RECEPTION PROBLEMS

Besides the problem by static, there are also the problems called ”fading”, ”multipath” and ”fade out”. These problems are caused not by electrical noise but by the nature of the radio waves propagations.

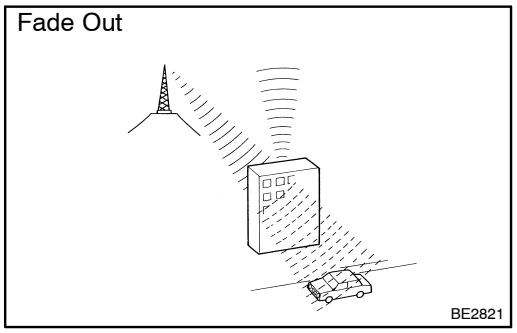
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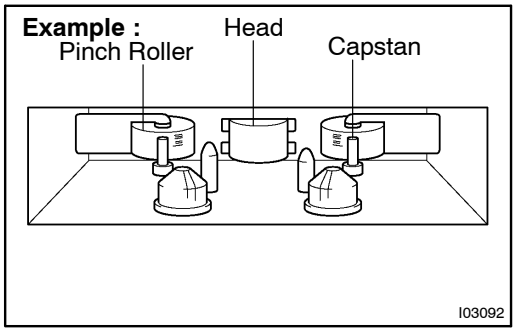
- Fading
  Besides electrical interference, AM broadcasts are also susceptible to other types of interference, especially at night. This is because AM radio waves bounce off the ionosphere at night.
  These radio waves then interfere with the signals from the same transmitter that reach the vehicle's antenna directly. This type of interference is called "fading", because the reflected indirect signal (which is off–phase in relation to the direct wave) sporadically strengthen or weaken the resultant signal at reception point.



- Multipath
  One type of interference caused by bouncing of radio waves off of obstructions is called "multipath". Multipath occurs when a signal from the broadcast transmitter antenna bounces off buildings, mountains and interference with the signal that is received directly.



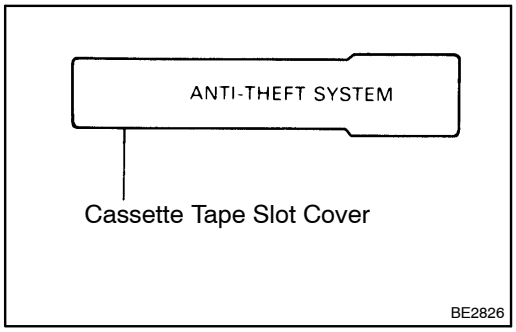
- Fade Out
  Because FM radio waves are of higher frequencies than those of AM, they bounce off buildings, mountains, and other obstructions. For this reason, FM signals often seem to gradually disappear or fade away as the vehicle goes behind a building or other obstruction. This is called "fade out".



4. Tape player / Tape head cleaning:
MAINTENANCE OF TAPE PLAYER

Using a moist–type cleaning tape, clean the head surface, pinch rollers and capstans (Never use "abrasive" type cassette–shaped cleaner.).

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5. ANTI–THEFT SYSTEM

HINT:

The words ”ANTI–THEFT SYSTEM” are displayed on the cassette tape slot cover.

For operation instructions for the anti–theft system, please consult the audio system section in the Owner’s Manual (hereafter called O/M).

(a) Setting system

The system is in operation once the customer has pushed the required buttons and entered the customer–selected 3–digit ID number.

(Refer to the O/M section, ”Setting the anti–theft system”)

HINT:

- When the audio system is shipped the ID number has not been input, so the anti–theft system is not in operation.
- If the ID number has not been input, the audio system remains the same as a normal audio system.

(b) Anti–theft system operation

If the normal electrical power source (connector or battery terminal) is cut off, the audio system becomes inoperable, even if the power supply resumes.

(c) Canceling system

The ID number chosen by the customer is input to cancel the anti–theft system.

(Refer to the O/M section, ”If the system is activated”)

HINT: To change or cancel the ID number, please refer to the O/M section ”Canceling the system”.

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BE27H–01

TROUBLESHOOTING

NOTICE:

When replacing the internal mechanism (computer part) of the audio system, be careful that no part of your body or clothing comes in contact with the terminals of the leads from the IC, etc. of the replacement part (spare part).

HINT:

This inspection procedure is a simple troubleshooting which should be carried out on the vehicle during system operation and was prepared on the assumption of system component troubles (except for the wires and connectors, etc.).

Always inspect the trouble taking the following items into consideration.

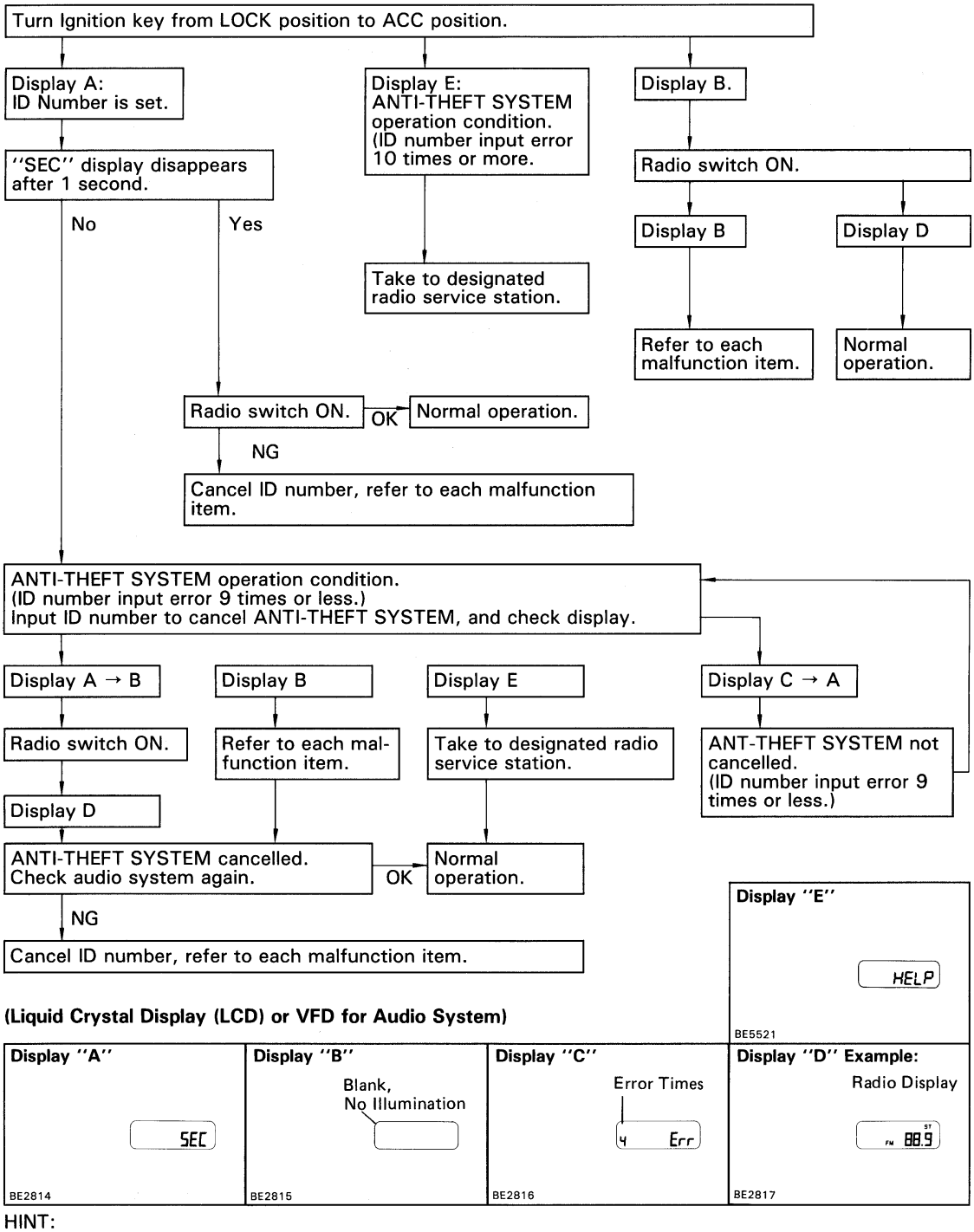
- Open or short circuit of the wire harness
- Connector or terminal connection fault
- For audio systems with anti–theft system, troubleshooting items marked (*) indicate that "Troubleshooting for ANTI–THEFT SYSTEM" should be carried out first.

	Problem	No.
Radio	No power coming in.	*1
	Power coming in, but radio not operating.	*2
	Noise present, but AM – FM not operating.	3
	Either speaker does not work.	4
	Either AM or FM does not work.	5
	Reception poor (Volume faint).	5
	Few preset tuning bands.	5
	Sound quality poor.	6
	Cannot set station select button.	6
	Preset memory disappears.	7
Tape Player	Cassette tape cannot be inserted.	8
	Cassette tape inserts, but no power.	*9
	Power coming in, but tape player not operating.	10
	Either speaker does not work.	11
	Sound quality poor (Volume faint).	12
	Tape jammed, malfunction with tape speed or auto–reverse.	13
	APS, SKIP, RPT buttons not operating.	14
	Cassette tape will not eject.	*15
Antenna	Antenna does not fully extened or fully retract.	16
	Antenna – related.	17
Noise	Noise produced by vibration or shock while driving.	18
	Noise produced when engine starts.	19

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1. ANTI–THEFT SYSTEM

Troubleshooting for ANTI-THEFT SYSTEM



(Liquid Crystal Display (LCD) or VFD for Audio System)

HINT:

- Refer to Owner's Manual for operation details of ANTI-THEFT SYSTEM.
- When the ID number has been cancelled, reset the same number after completing the operation, or inform the customer that it has been cancelled.

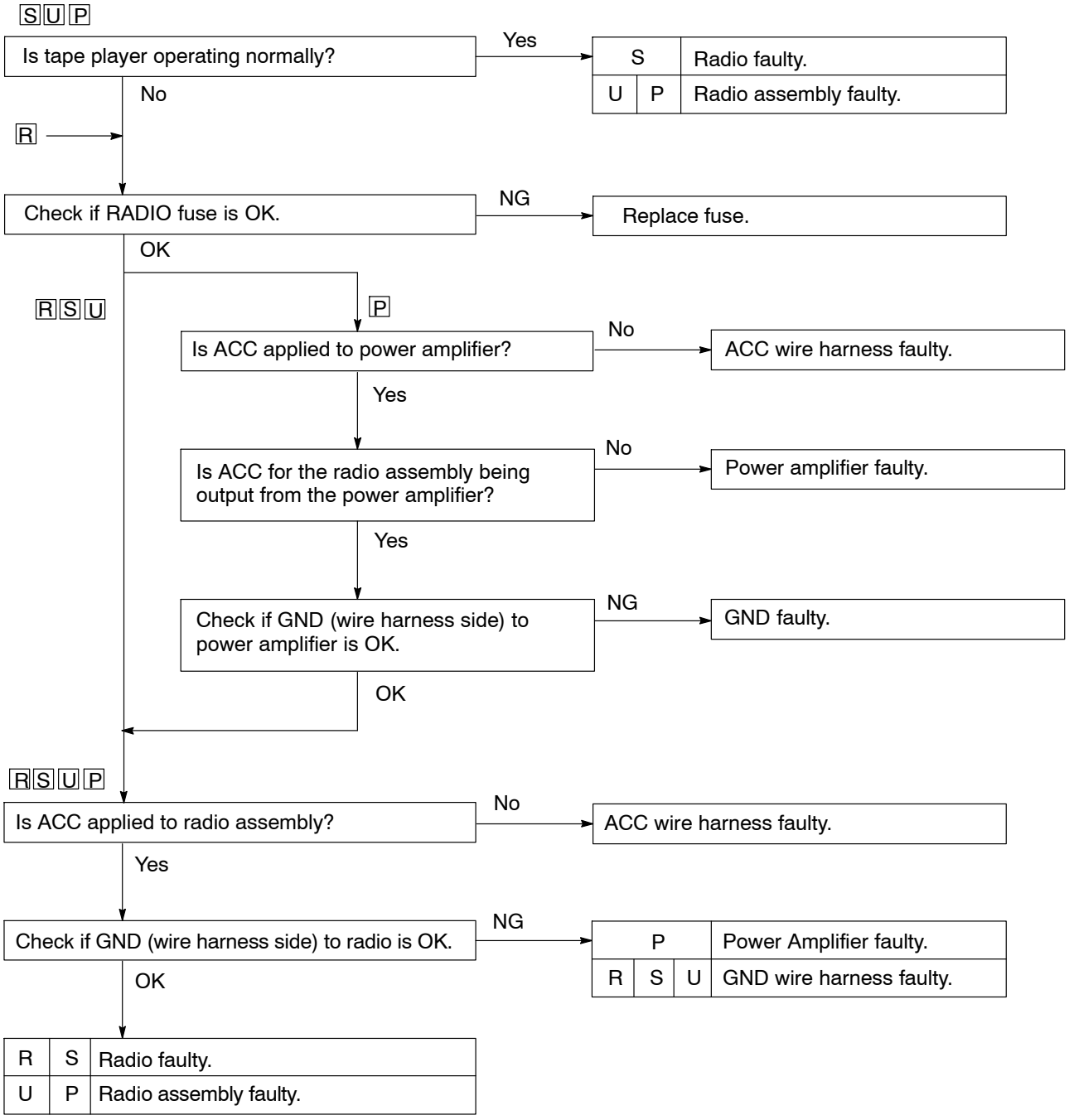
V01746

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2. AUDIO SYSTEM

1	Radio	NO POWER COMING IN

R: Radio S: Radio + Tape Player U: Radio – Tape Player (Built–in Power Amplifier)
P: Radio – Tape Player (Separate Power Amplifier)



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2	Radio	POWER COMING IN, BUT RADIO NOT OPERATING

[R] : Radio [S] : Radio + Tape Player [U] : Radio – Tape Player (Built–in Power Amplifier)
[P]: Radio – Tape Player (Separate Power Amplifier)

[S][U][P]

Is tape player operating normally?

Yes → Go to No. 17.

If radio side faulty:

S		Radio faulty.
U	P	Radio assembly faulty.

No

[R] →

[R][S][U][P]

Is there continuity in speaker wire harness?

No → Speaker wire harness faulty.

Yes

Temporarily install another speaker, Functions OK?

Yes → Speaker faulty.

No

[R][S][U]

R	S	Radio faulty.
U		Radio assembly faulty.

Hissing sound from speaker?

No → Power amplifier faulty, Recheck system after repair.

Yes

Radio assembly faulty. Recheck system after repair.

3	Radio	NOISE PRESENT, BUT AM–FM NOT OPERATING

[R]: Radio [S]: Radio + Tape Player [U] : Radio – Tape Player (Built–in Power Amplifier)
[P] : Radio – Tape Player (Separate Power Amplifier)

[S][U][P]

Is tape player operating normally?

Yes → Go to No. 17.

If radio side faulty:

R	S	Radio faulty.
U	P	Radio assembly faulty.

No

[R]

[S][U] →

[P]

Hissing sound from speaker?

No → Power amplifier faulty, Recheck system after repair.

Yes

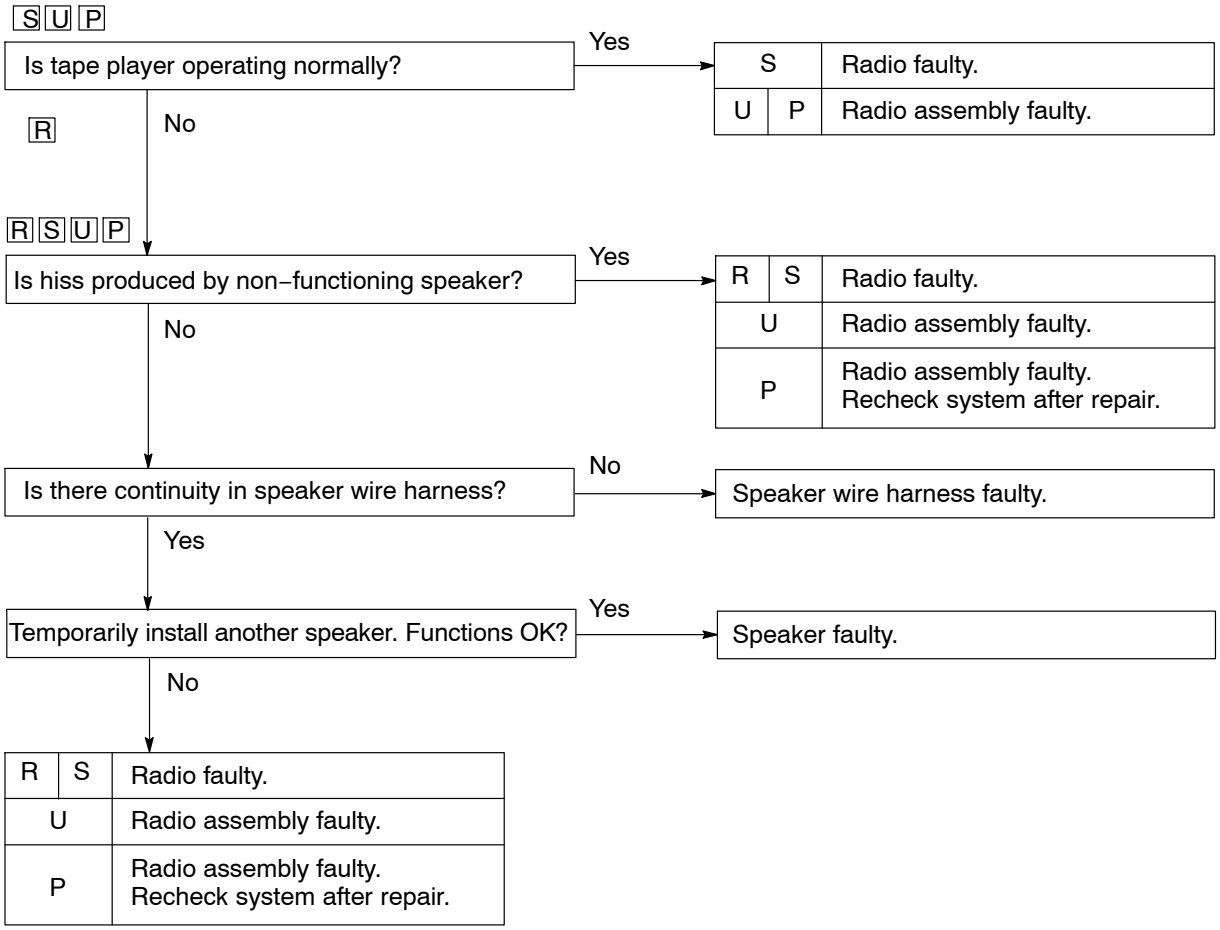
[S][U][P]

Radio assembly faulty.

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4	Radio	ANY SPEAKER DOES NOT WORK

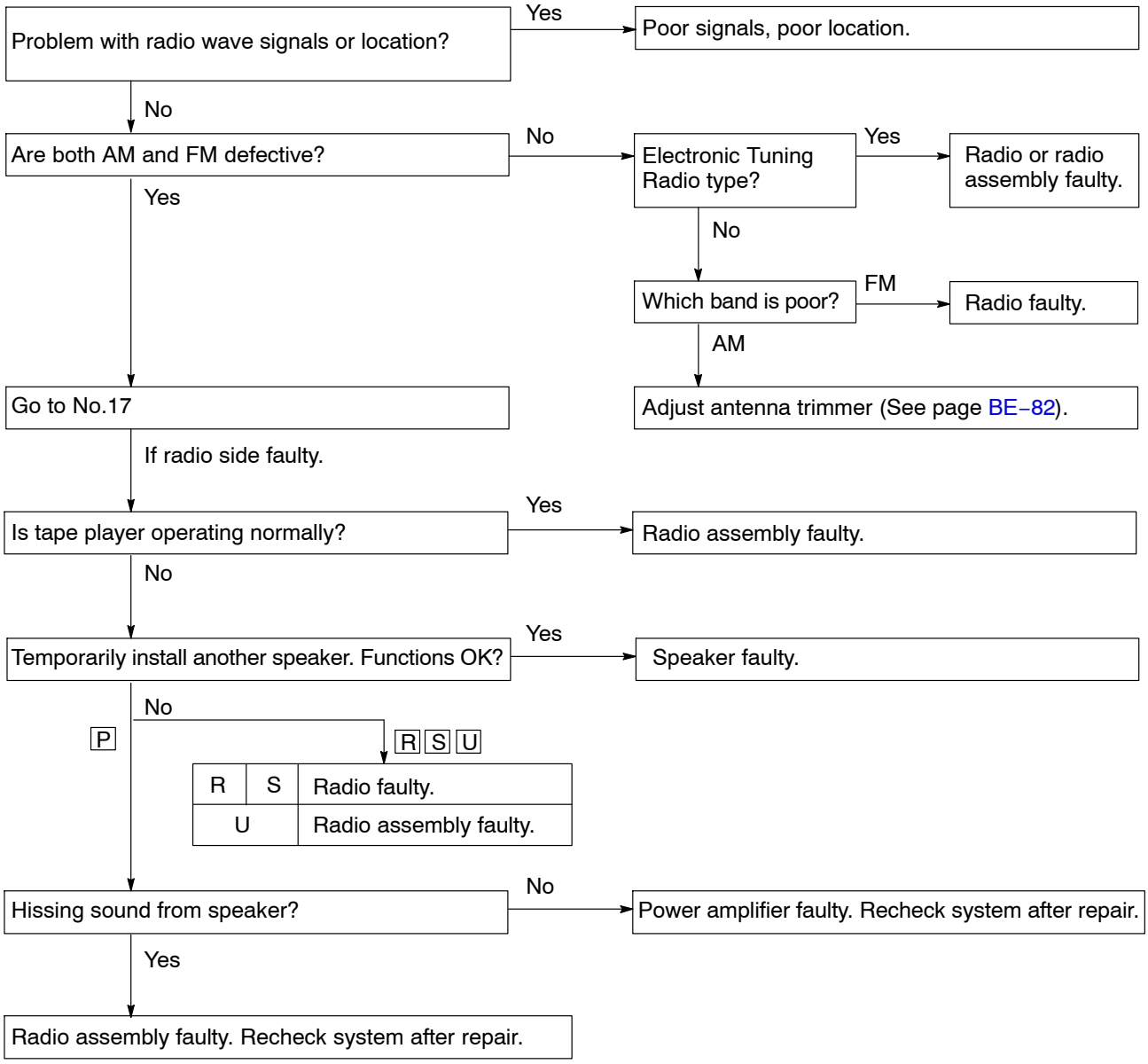
[R]: Radio [S]: Radio + Tape Player [U]: Radio – Tape Player (Built–in Power Amplifier)
[P]: Radio – Tape Player (Separate Power Amplifier)



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5	Radio	EITHER AM OR FM DOES NOT WORK, RECEPTION POOR (VOLUME FAINT), FEW PRESET TUNING BANDS

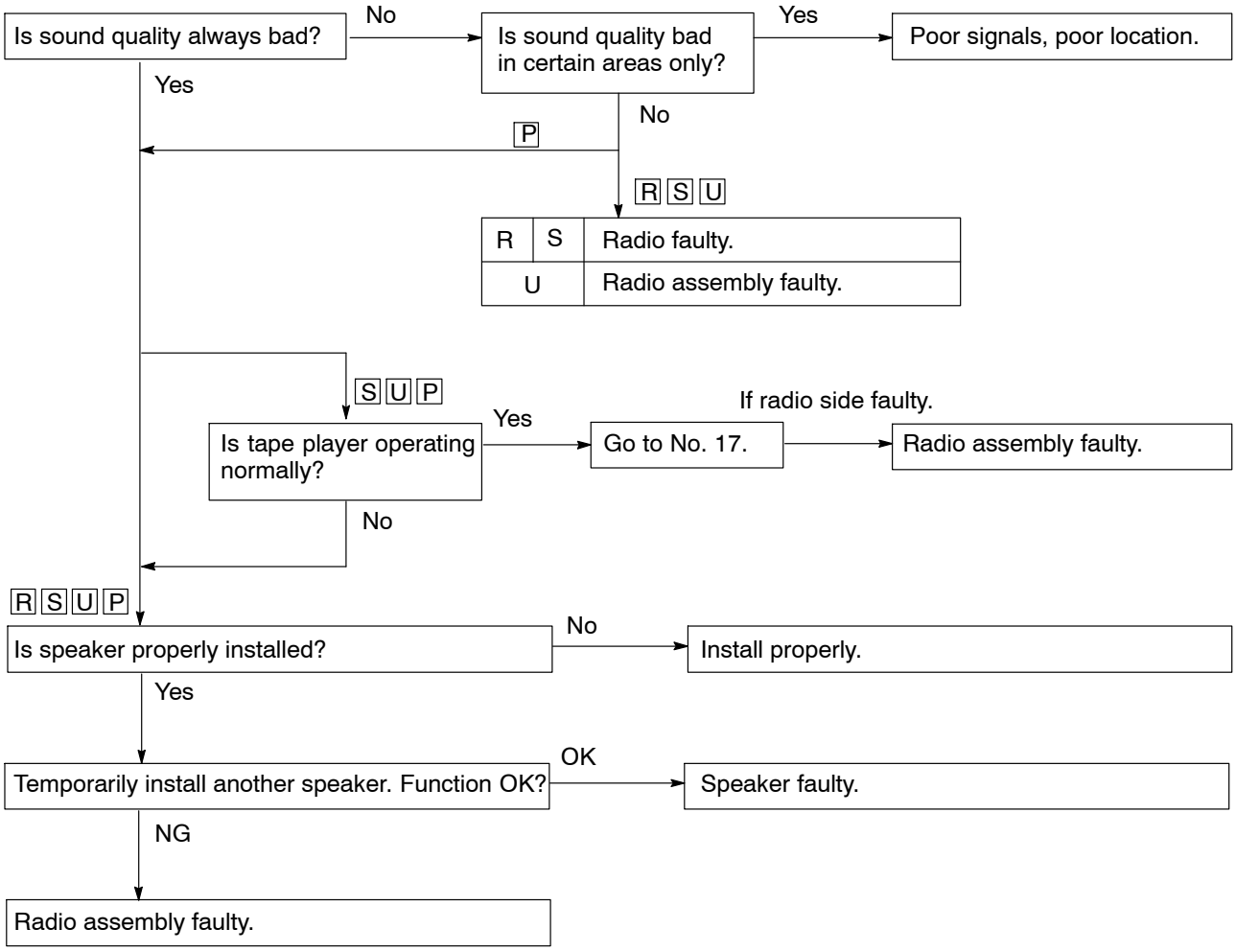
[R]: Radio [S]: Radio + Tape Player [U]: Radio – Tape player (Built–in Power Amplifier)
[P]: Radio – Tape Player (Separate Power Amplifier)



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6	Radio	SOUND QUALITY POOR

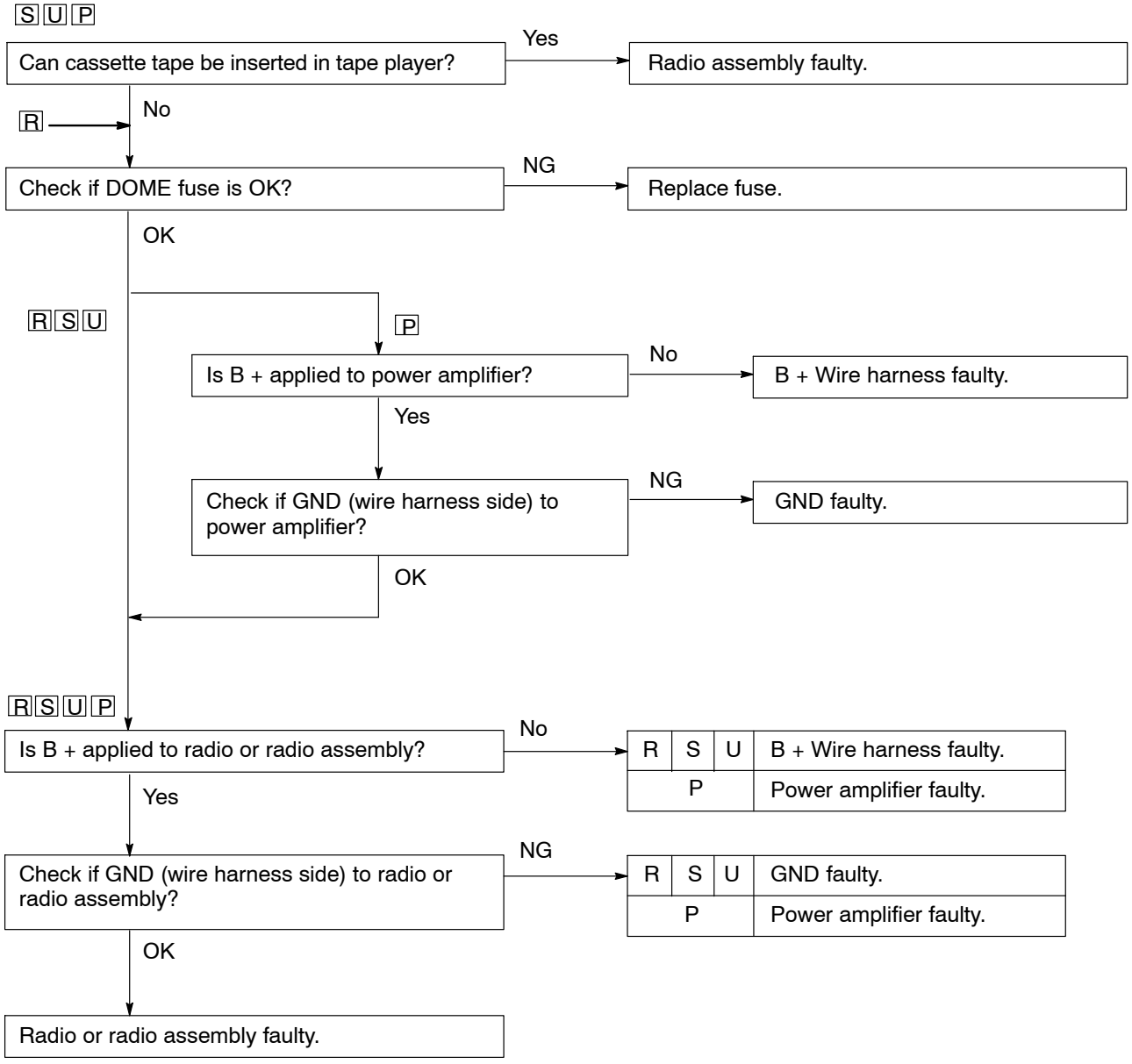
[R]: Radio [S]: Radio + Tape Player [U]: Radio – Tape Player (Built–in Power Amplifier)
[P]: Radio – Tape Player (Separate Power Amplifier)



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7	Radio	CANNOT SET STATION SELECT BUTTON, PRESET MEMORY DISAPPEARS

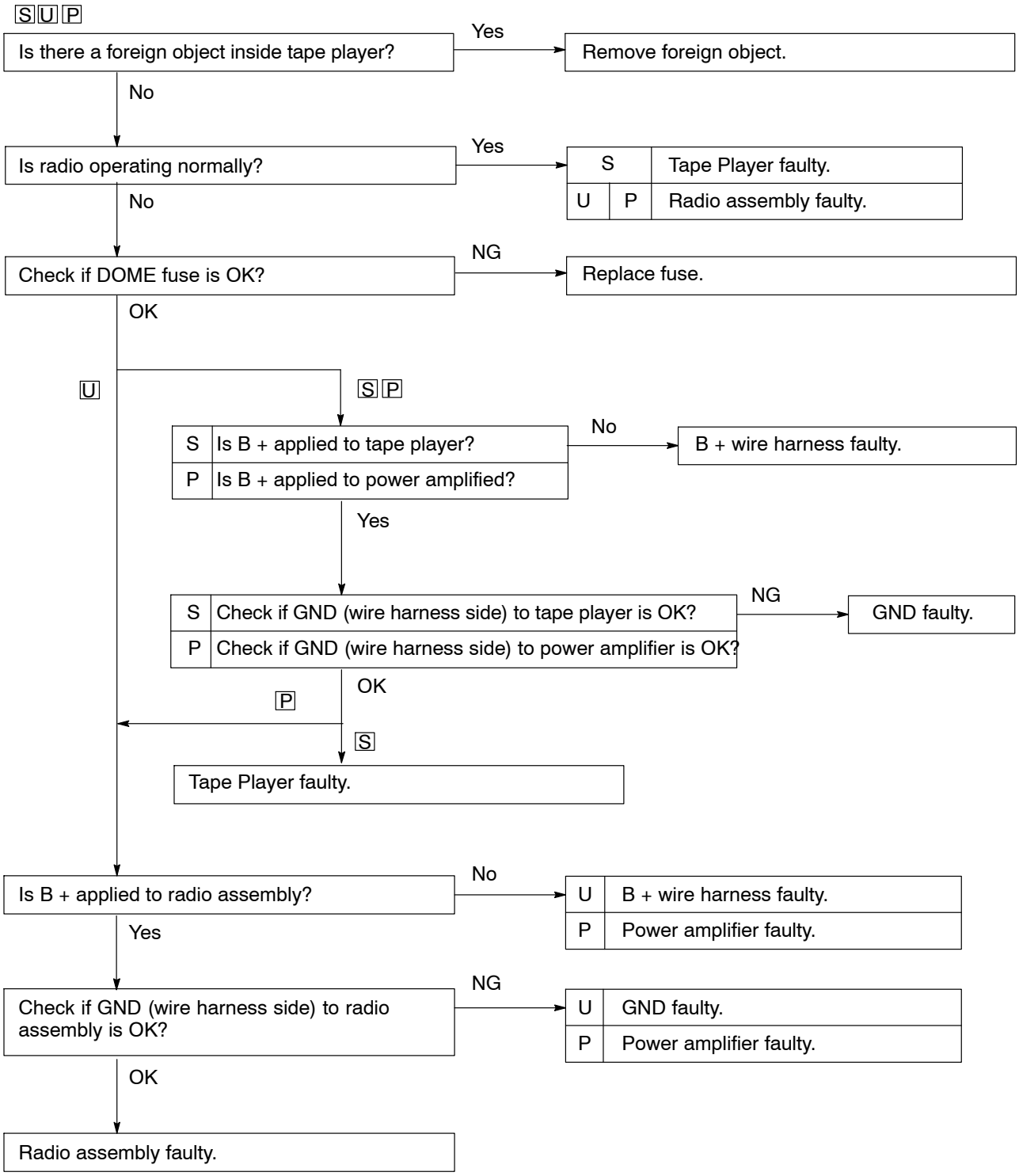
[R]: Radio [S]: Radio + Tape Player [U]: Radio – Tape Player (Built–in Power Amplifier)
[P]: Radio – Tape Player (Separate Power Amplifier)



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8	Tape Player	CASSETTE TAPE CANNOT BE INSERTED

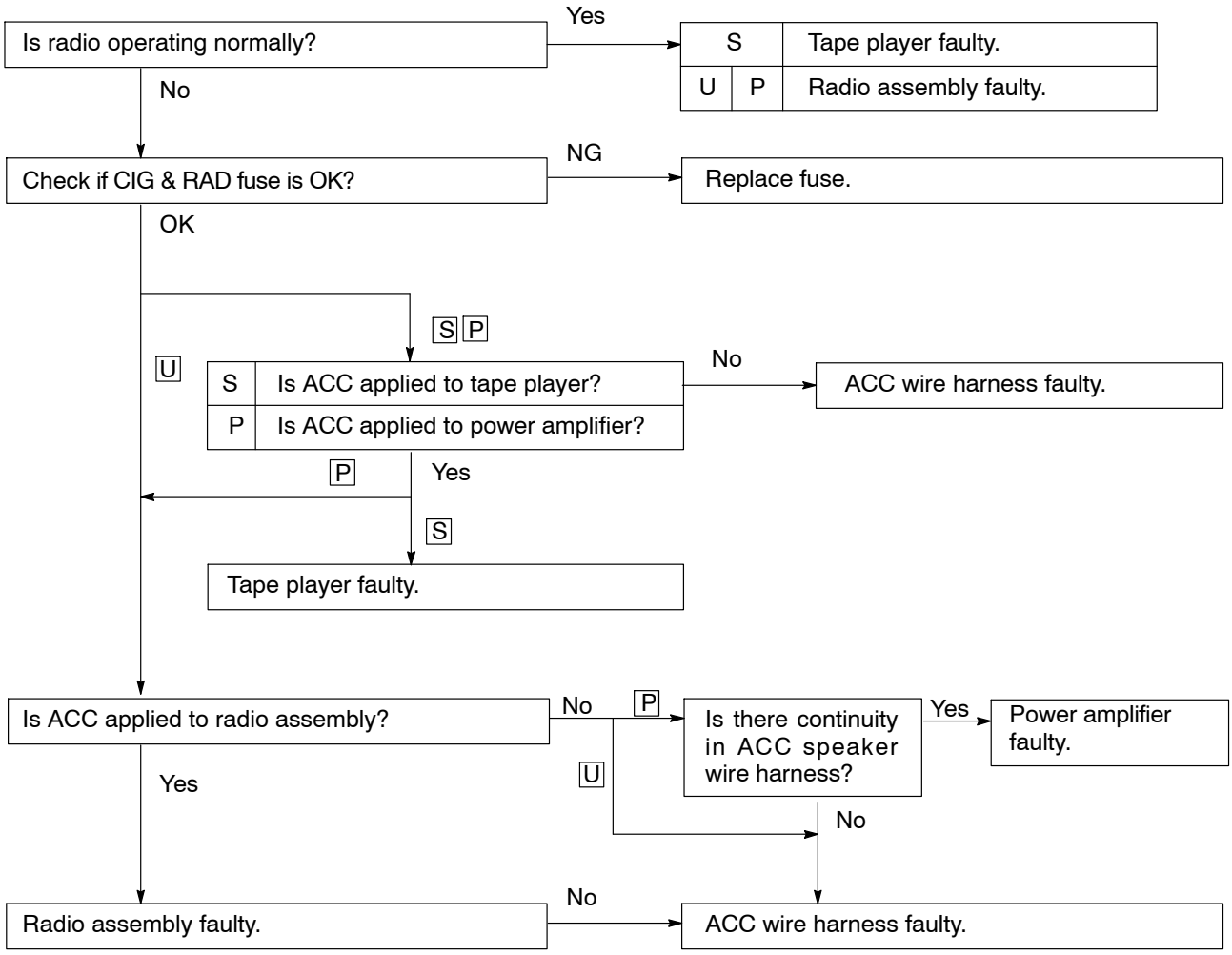
[S]: Radio + Tape Player [U]: Radio – Tape Player (Built–in Power Amplifier)
[P]: Radio – Tape Player (Separate Power Amplifier)



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9	Tape Player	CASSETTE TAPE INSERTS, BUT NO POWER

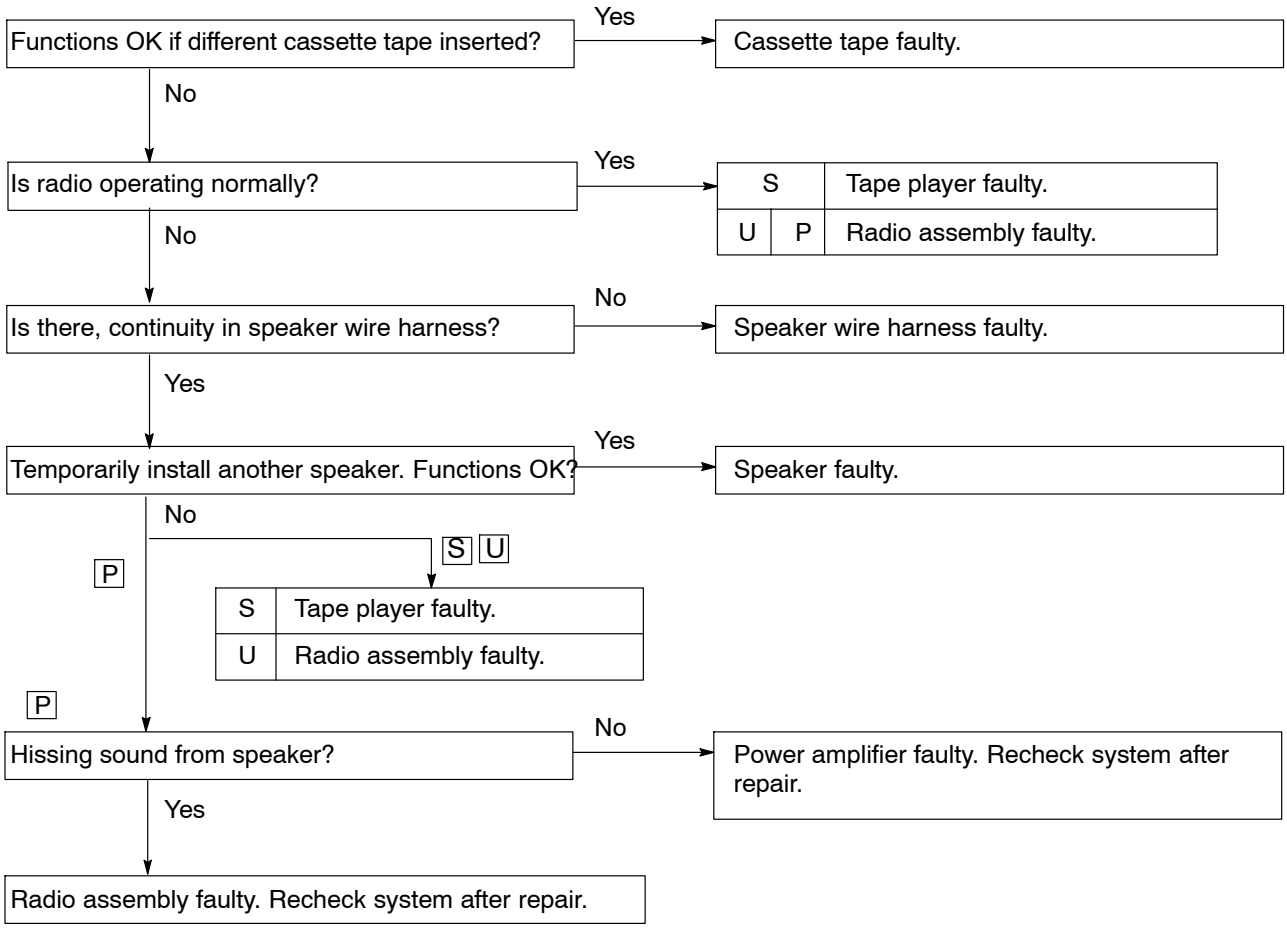
[S]: Radio + Tape player [U]: Radio – Tape Player (Built–in Power Amplifier)
[P]: Radio – Tape Player (Separate Power Amplifier)



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10	Tape Player	POWER COMING IN, BUT TAPE PLAYER NOT OPERATION

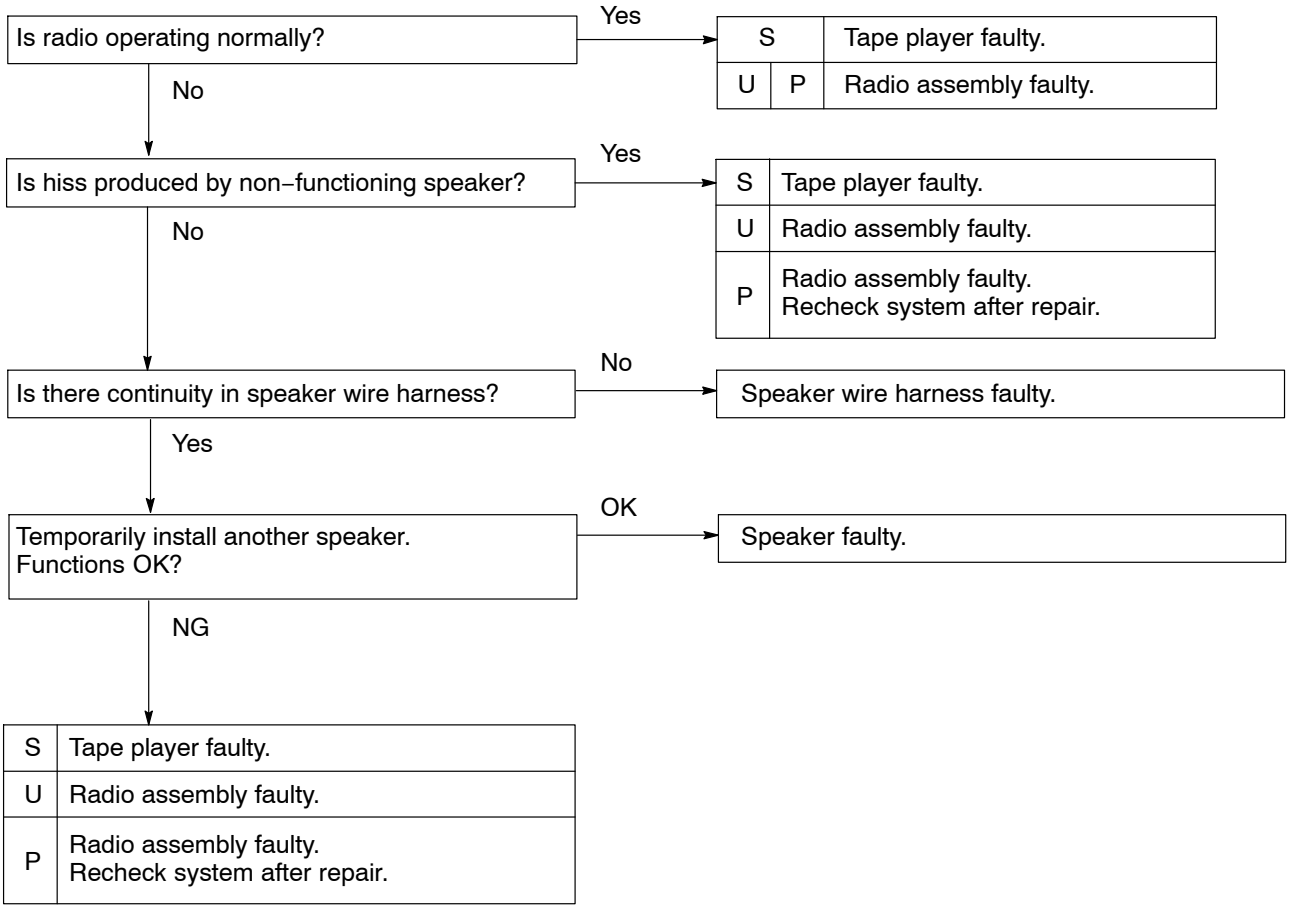
[S]: Radio + Tape player [U]: Radio – Tape Player (Built–in Power Amplifier)
[P]: Radio – Tape Player (Separate Power Amplifier)



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11	Tape player	ANY SPEAKER DOES NOT WORK

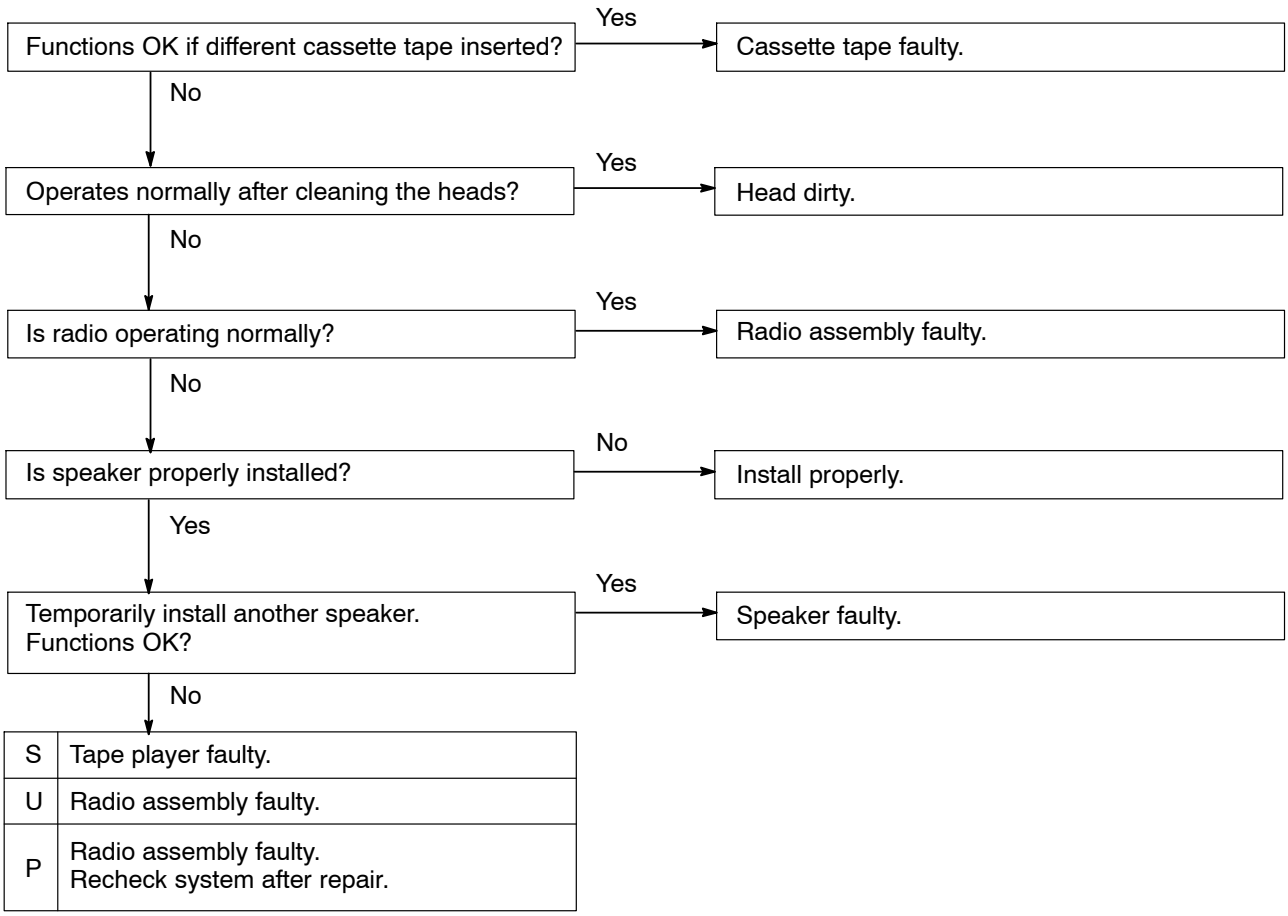
[S]: Radio + Tape Player [U]: Radio – Tape Player (Built–in Power Amplifier)
[P]: Radio – Tape Player (Separate Power Amplifier)



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12	Tape Player	SOUND QUALITY POOR (VOLUME FAINT)

S: Radio + Tape Player U: Radio – Tape Player (Built–in Power Amplifier)
P: Radio – Tape Player (Separate Power Amplifier)

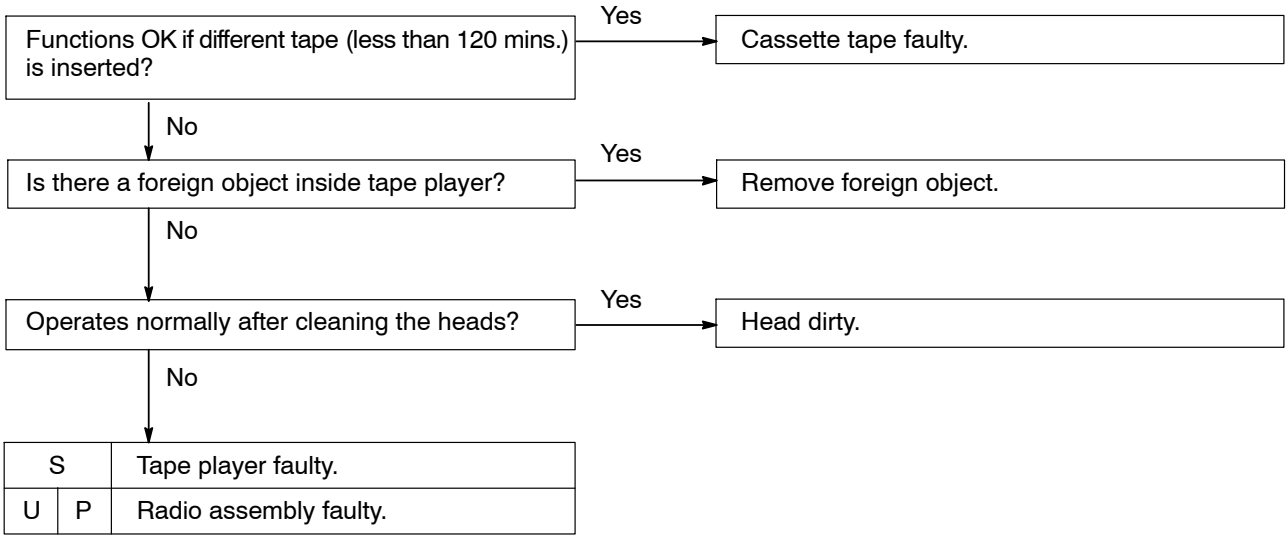


S	Tape player faulty.
U	Radio assembly faulty.
P	Radio assembly faulty. Recheck system after repair.

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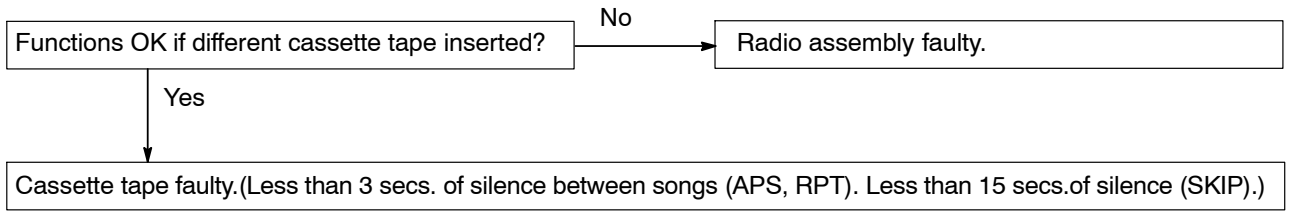
13	Tape Player	TAPE JAMMED, MALFUNCTION WITH TAPE SPEED OR AUTO–REVERSE

[S]: Radio + Tape Player [U]: Radio – Tape Player (Built–in Power Amplifier)
[P]: Radio – Tape Player (Separate Power Amplifier)



14	Tape Player	APS, SKIP, RPT BUTTONS NOT OPERATING

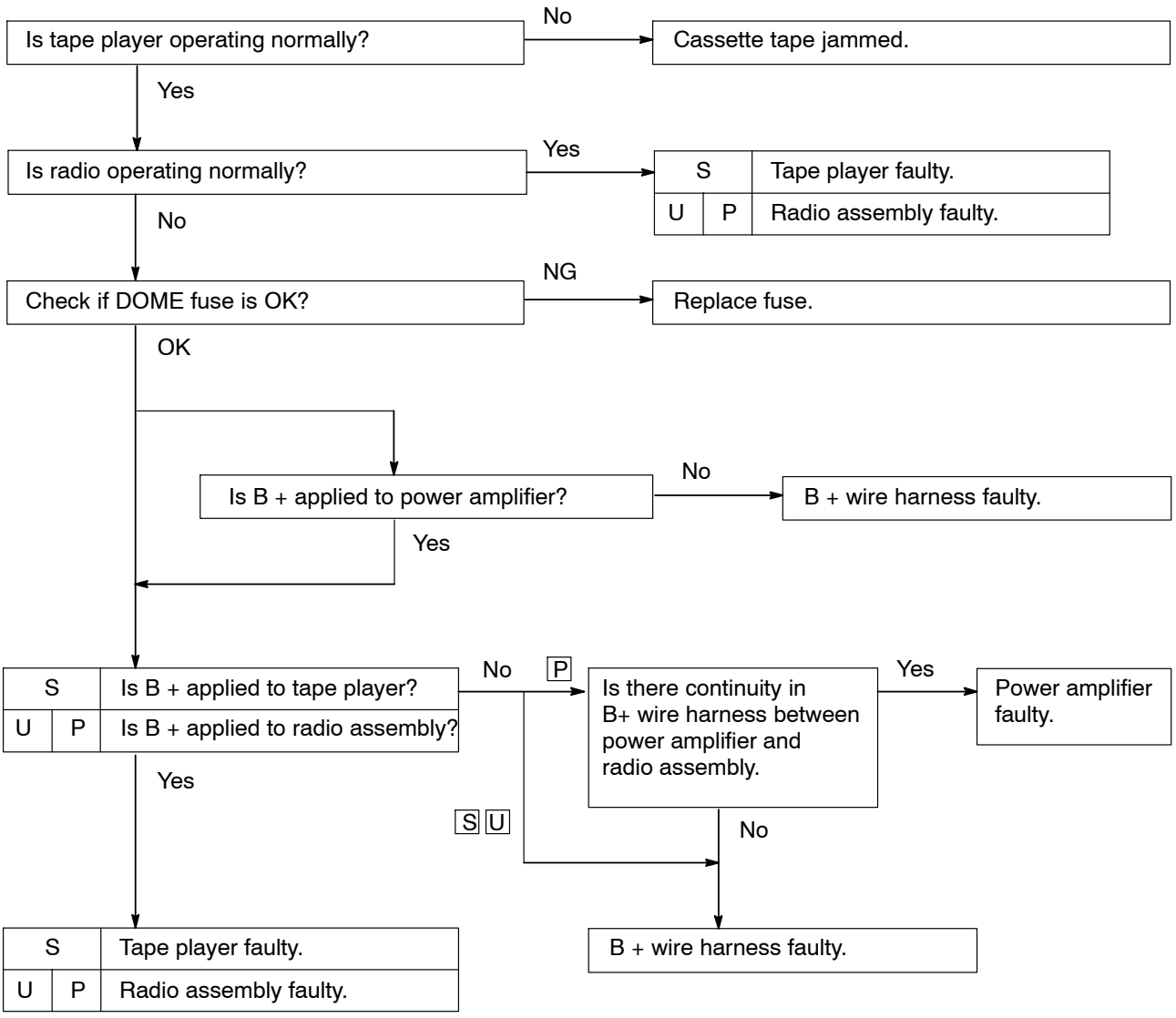
[S]: Radio + Tape Player [U]: Radio – Tape Player (Built–in Power Amplifier)
[P]: Radio – Tape Player (Separate Power Amplifier)



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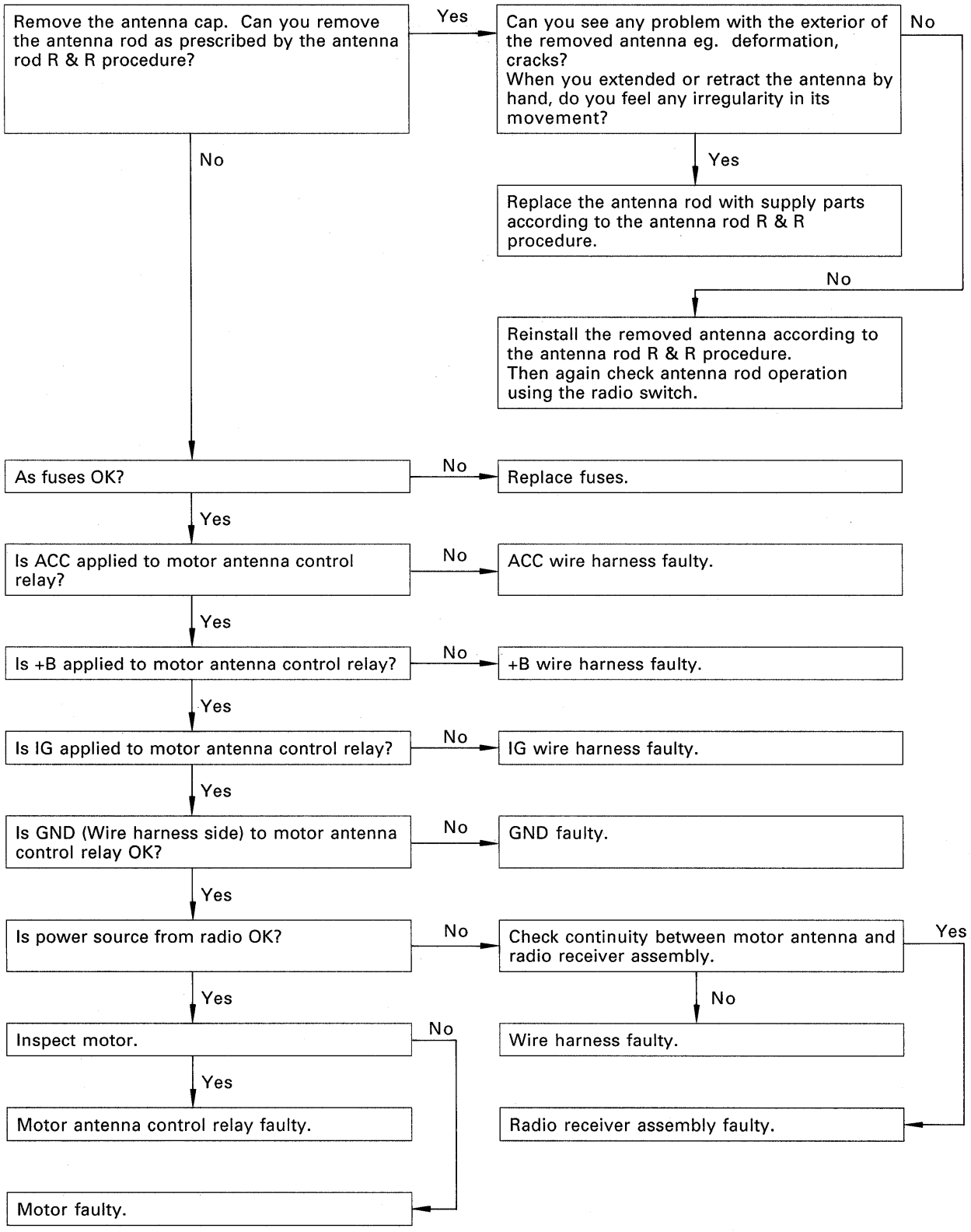
15	Tape Player	CASSETTE TAPE WILL NOT EJECT

[S]: Radio + Tape Player [U]: Radio – Tape Player (Built–in Power Amplifier)
[P]: Radio – Tape – CD Player (Separate Power Amplifier)



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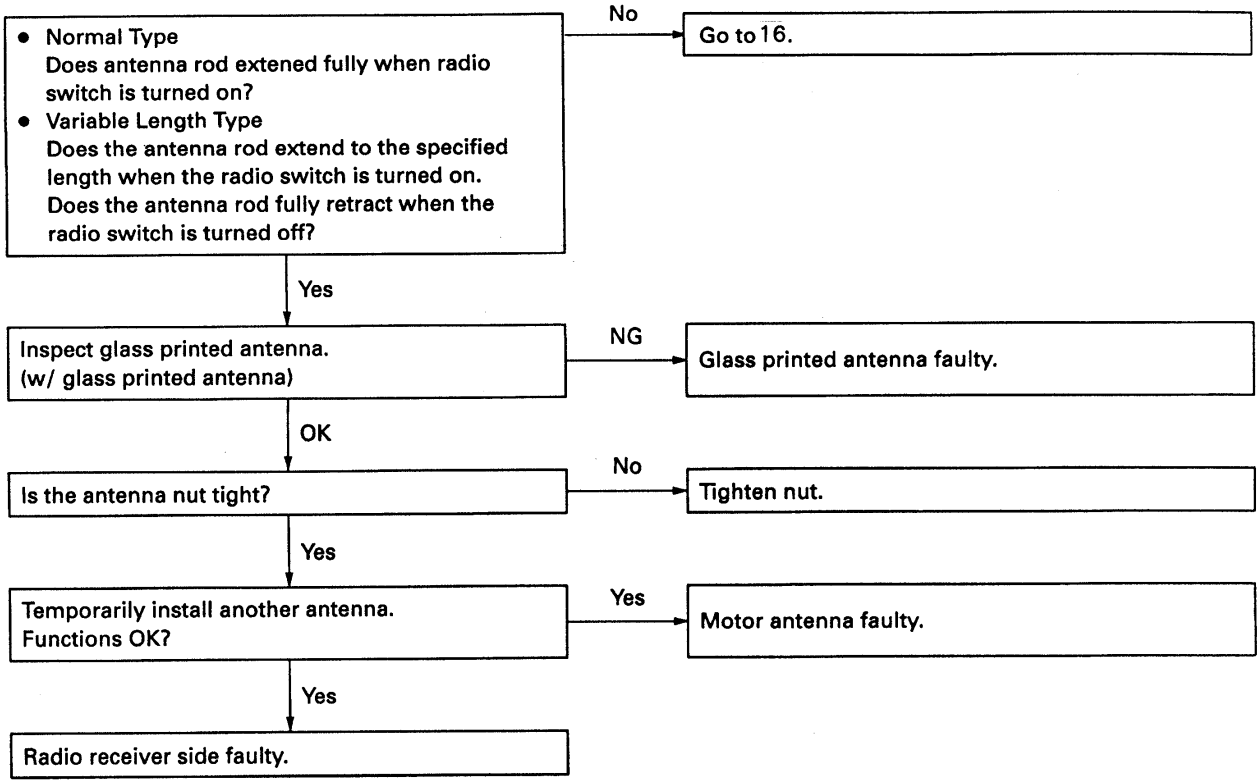
16	Antenna	ANTENNA DOES NOT FULLY EXTENED OR FULLY RETRACT



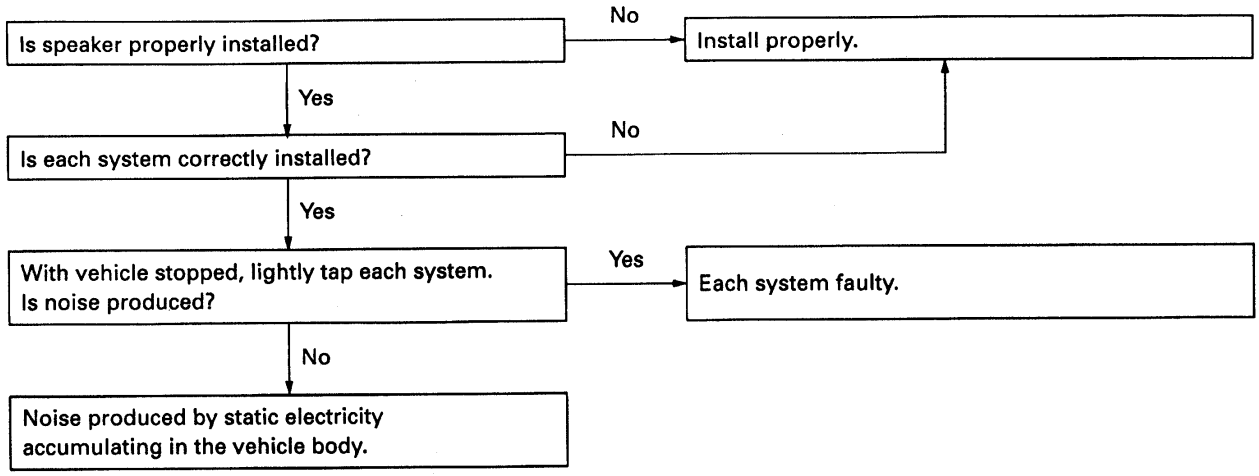
V06855

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17 Antenna — ANTENNA-RELATED



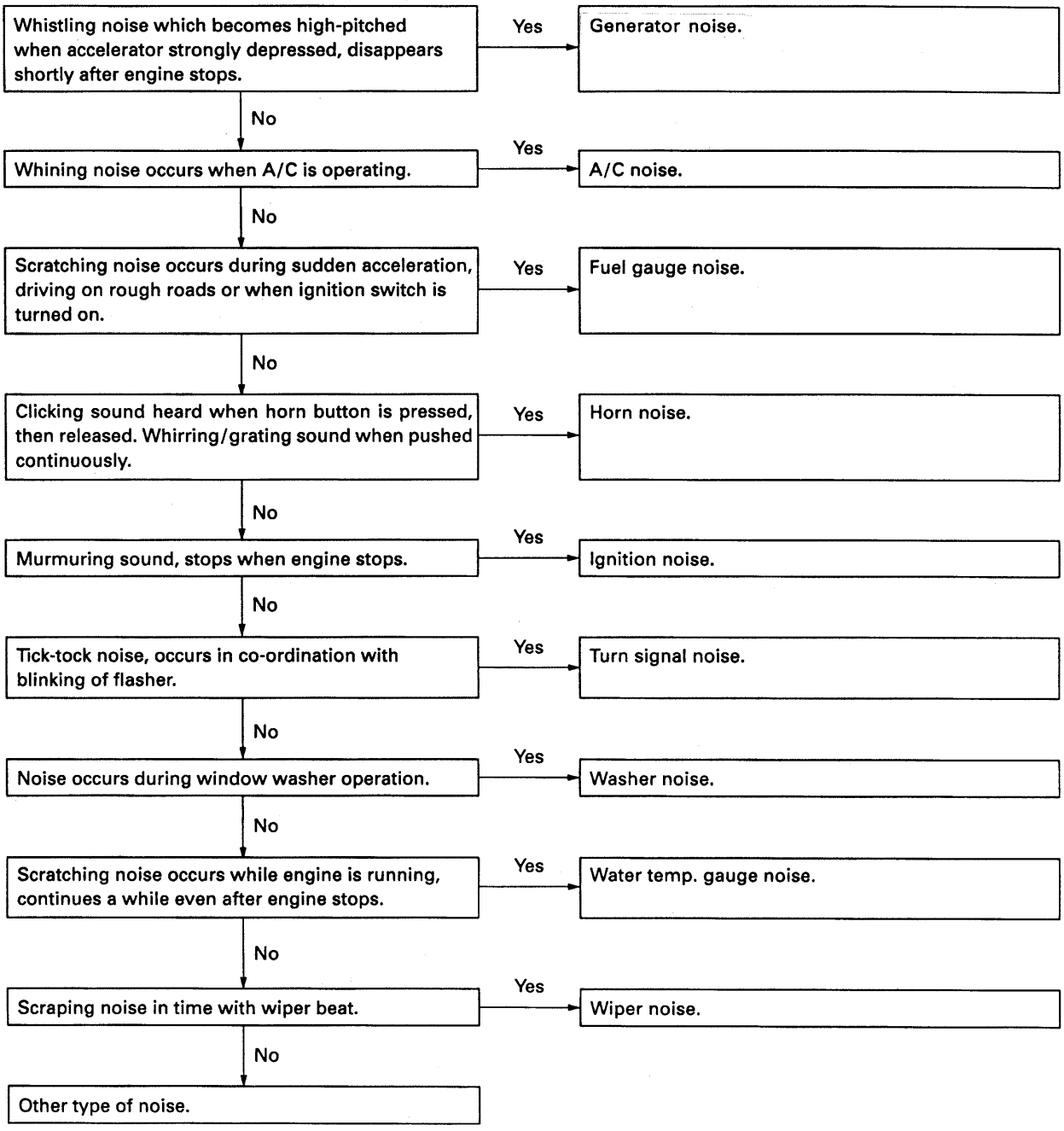
18 Noise — NOISE PRODUCED BY VIBRATION OR SHOCK WHILE DRIVING



V06789

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19	Noise	NOISE PRODUCED WHEN ENGINE STARTS

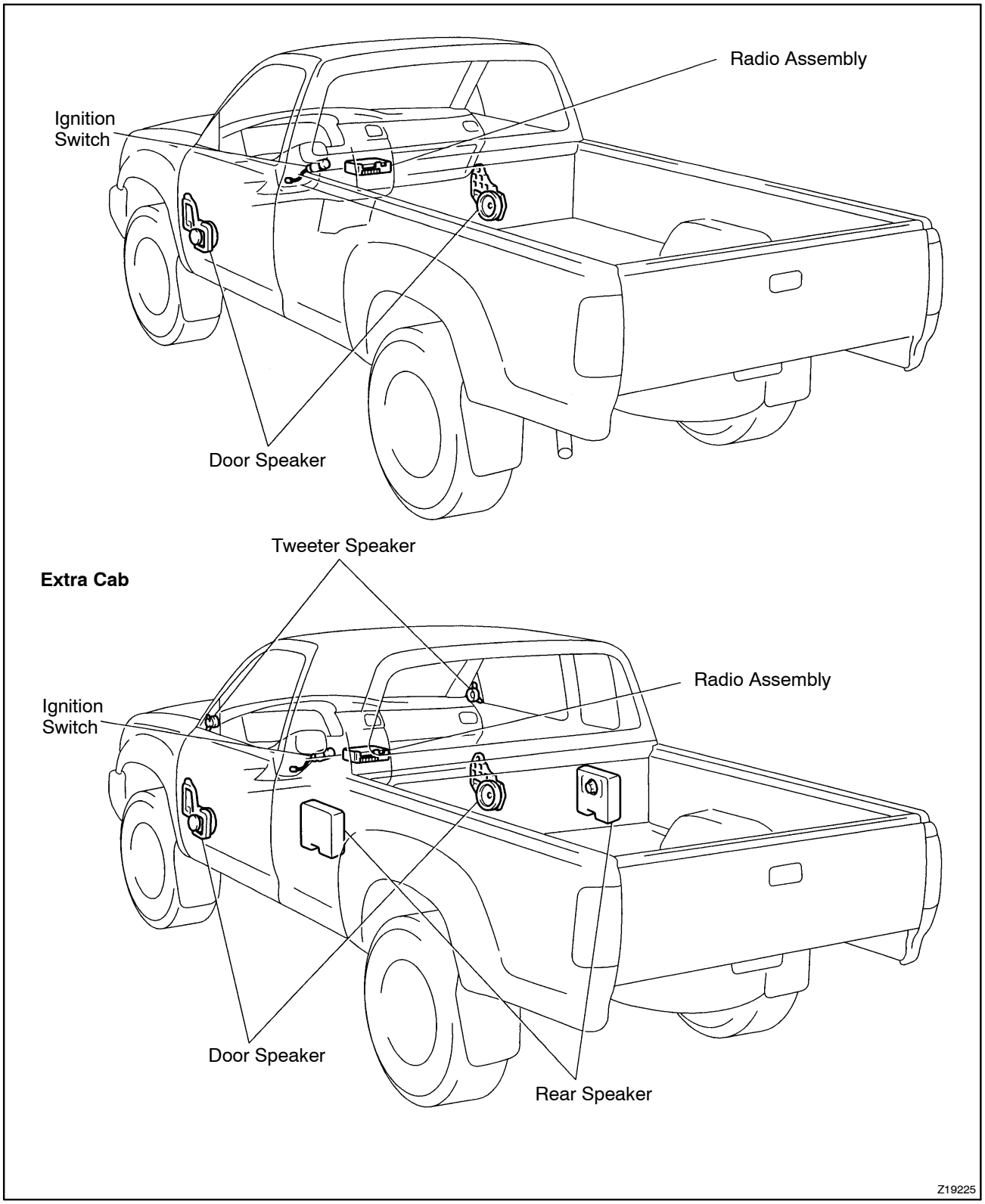


V06856

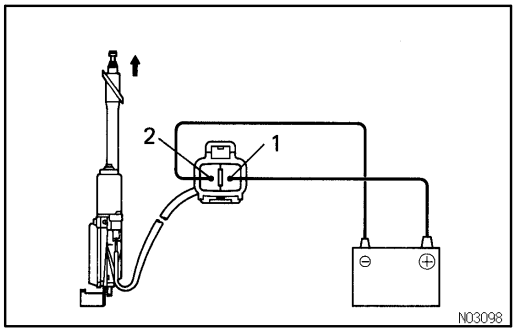
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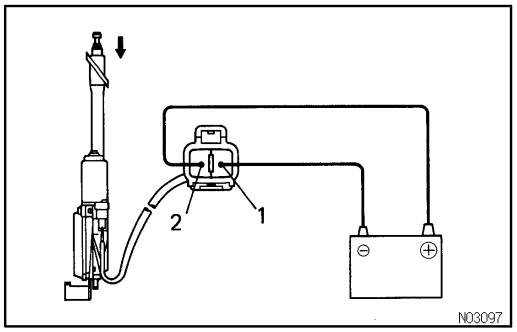
BE03K–02

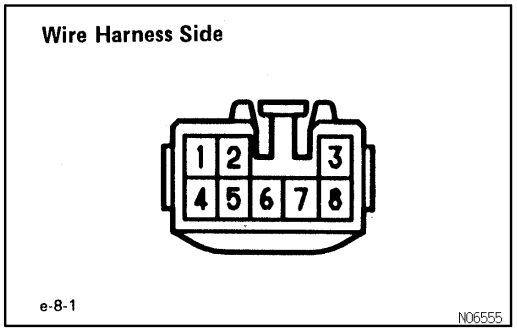
LOCATION



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ANTENNA

INSPECTION

BE1PK–02

1. INSPECT ANTENNA MOTOR

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2.

(b) Check that the motor turns (moves upward).

NOTICE:

These tests must be done quickly (within 3 – 5 seconds) to prevent the coil from burning out.

(c) Then, reverse the polarity, check that the motor turns the opposite way (moves downward).

NOTICE:

These tests must be done quickly (within 3 – 5 seconds) to prevent the coil from burning out.

2. INSPECT ANTENNA MOTOR CONTROL RELAY CIRCUIT

Disconnect the connector from the relay and inspect the connector on wire harness side, as shown in the chart below.

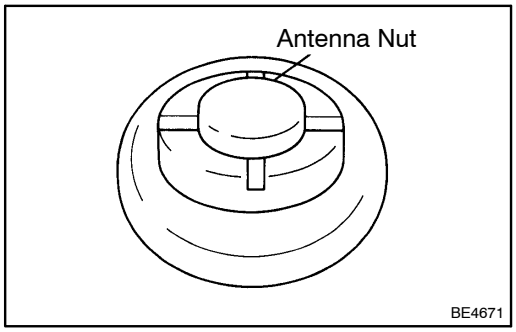
Tester connection	Condition	Specified condition
2 – 3	Constant	Continuity
6 – Ground	Constant	Continuity
1 – Ground	Constant	Battery positive voltage
4 – Ground	Ignition switch LOCK or ACC	No voltage
4 – Ground	Ignition switch ON	Battery positive voltage
5 – Ground	Ignition switch LOCK	No voltage
5 – Ground	Ignition switch ACC or ON	Battery positive voltage
7 – Ground	Ignition switch LOCK	No voltage
7 – Ground	Ignition switch ACC or ON (Radio switch and cassette OFF)	No voltage
7 – Ground	Ignition switch ACC or ON (Radio switch or cassette ON)	Battery positive voltage
8 – Ground	Ignition switch LOCK	No voltage

If circuit is as specified, replace the relay.

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BE1PL–02

REPLACEMENT



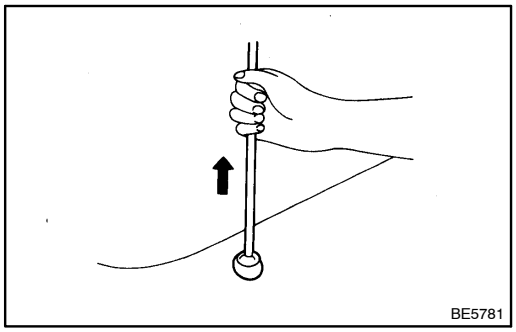
1. REMOVE ANTENNA ROD

HINT:

Perform this operation with negative (–) cable connected to the battery terminal.

(a) Turn the ignition switch to ”LOCK” position.

(b) Remove the antenna nut.



(c) Press the ”AM” buttons on the radio receiver, and simultaneously turn the ignition switch to ”ACC” position.

HINT:

- The rod will extend fully and be released from the motor antenna.
- After removing the antenna rod, leave the ignition switch as ”ACC”.

NOTICE:

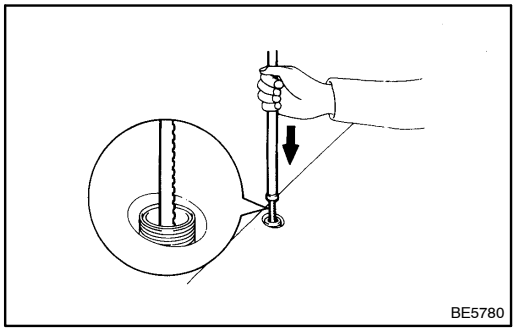
To prevent body damage when the antenna rod is released, hold the rod while it comes out.

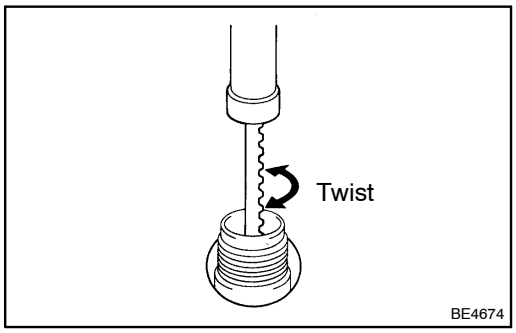
2. INSTALL ANTENNA ROD

(a) Insert the cable of the rod until it reaches the bottom.

HINT:

When inserting the cable, the teeth on the cable must face toward the front of the vehicle.





(b) Wind the cable to retract the rod by turning the ignition switch to ”LOCK” position.

HINT:

- If the ignition switch is already in ”LOCK” position, perform step 1 (c) first, then turn the ignition switch to ”ACC” position.
- In case the cable is not wound, twist it as shown in the illustration.
- Even if the rod has not retracted fully, install the antenna nut and inspect the antenna rod operation. It will finally retract fully.

(c) Inspect the antenna rod operation by pushing the radio wave band select buttons.

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CLOCK

TROUBLESHOOTING

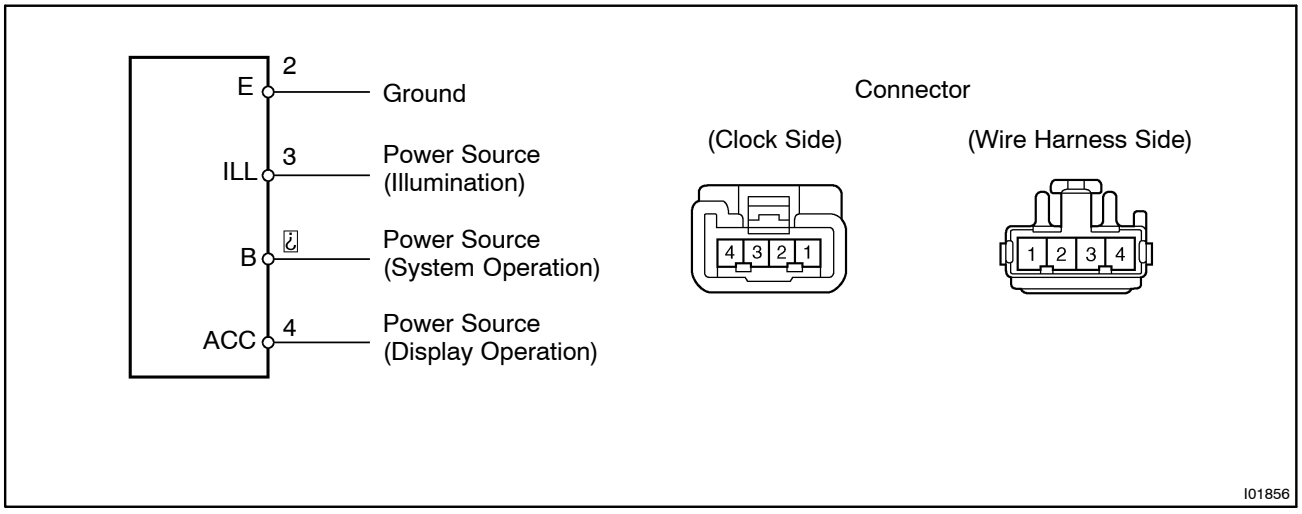
BE03N–09

HINT:

Troubleshoot the clock according to the table below.

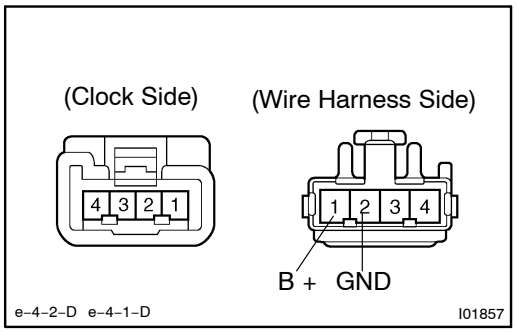
Problem	No.
Clock will not operate	1
Clock loses or gains time	2

± 1.5 seconds / day



1. PROBLEM NO.1

1	**CLOCK WILL NOT OPERATE**



(a) Check that the battery positive voltage is 10 – 16 V.

If voltage is not as specified, replace the battery.

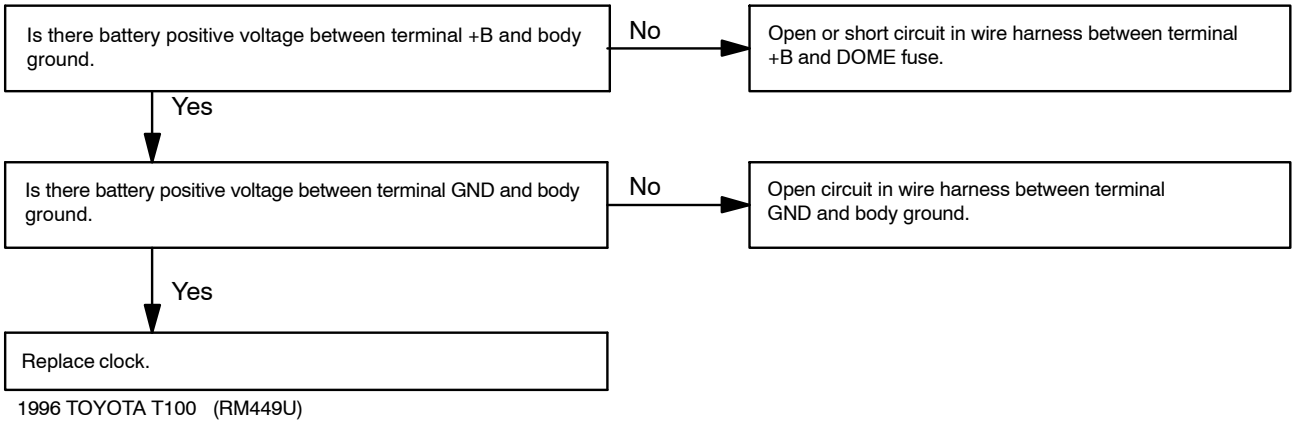
(b) Check that the DOME fuse is not blown.

If the fuse is blown, replace the fuse and check for short.

(c) Troubleshoot the clock as follows.

HINT:

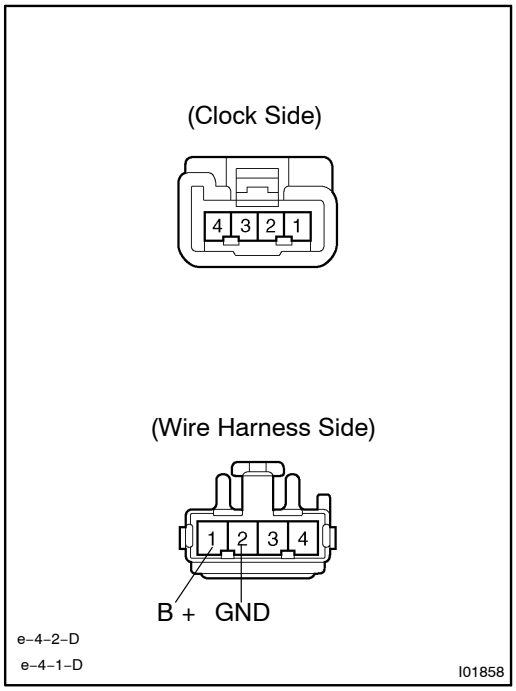
Inspect the connector on the wire harness side.



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2. PROBLEM NO.2

2	CLOCK LOSES OR GAINS TIME



(a) Check that the battery positive voltage is 10 – 16 V.

If voltage is not as specified, replace the battery.

(b) Inspect the error of the clock.

Allowable error (per day): ± 1.5 seconds

If the error exceeds the allowable error, replace the clock.

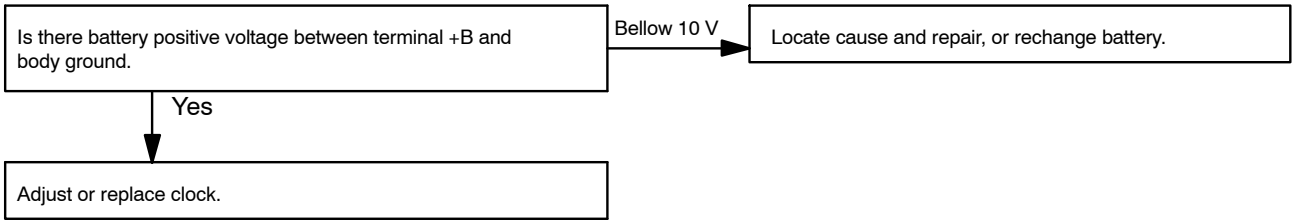
(c) Check that the clock adjusting button is sticking in position and has failed to return.

If the error exceeds the allowable error, replace the clock.

(d) Troubleshoot the clock as follows.

HINT:

Inspect the connector on the wire harness side.



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BO – BODY

CLIP	BO-1
SRS AIRBAG	BO-3
FRONT BUMPER	BO-4
HOOD	BO-5
FRONT DOOR	BO-6
FRONT WIPER AND WASHER	BO-11
WHEEL ARCH MOULDING	BO-16
WINDSHIELD	BO-19
QUARTER WINDOW GLASS	BO-25
BACK WINDOW GLASS	BO-29
INSTRUMENT PANEL	BO-34
TAIL GATE	BO-41
FRONT SEAT (BENCH TYPE)	BO-44
FRONT SEAT (SPLIT BENCH TYPE)	BO-45
REAR SEAT	BO-46
SEAT BELT	BO-47

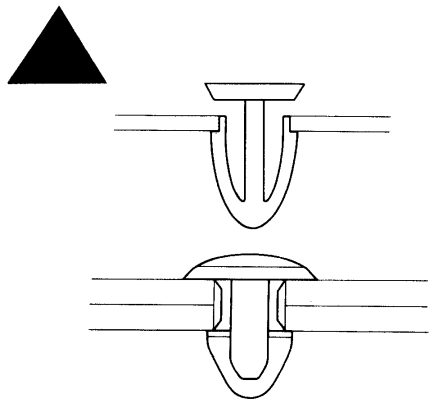
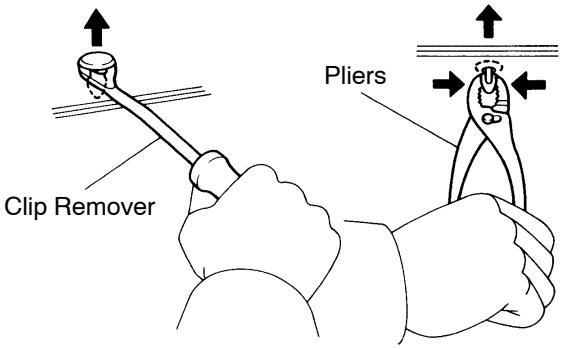
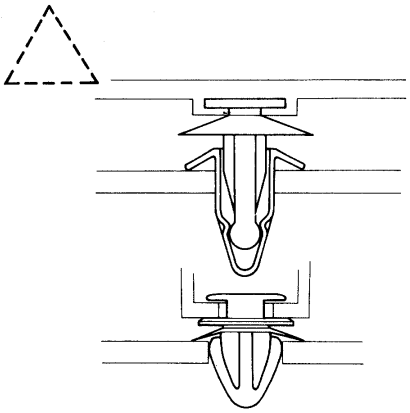
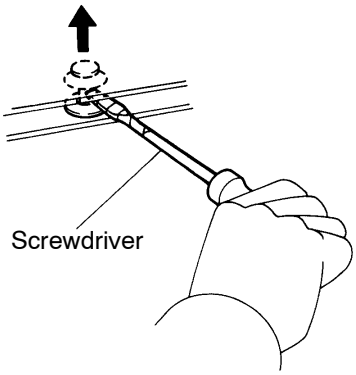
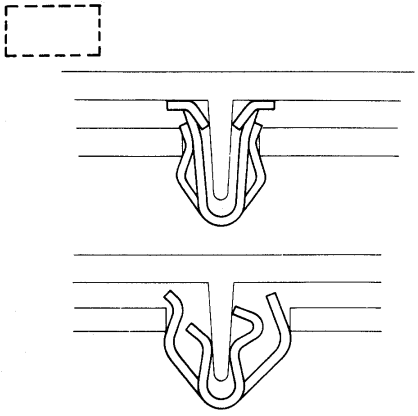
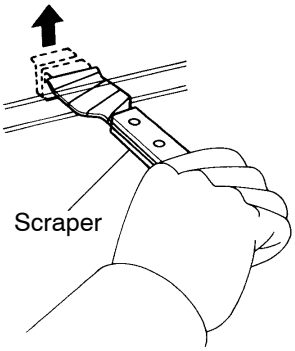
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CLIP

BO0DT–02

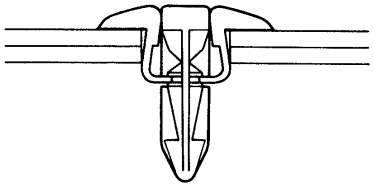
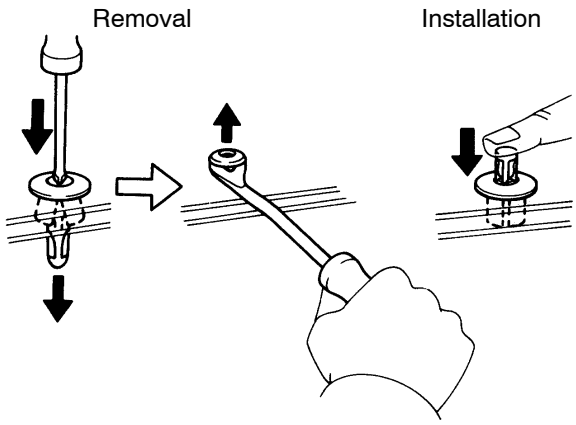
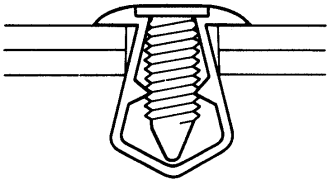
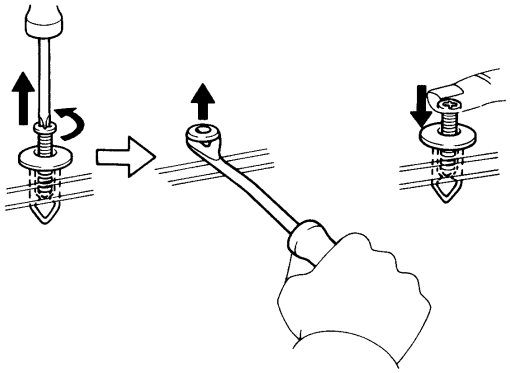
REPLACEMENT

The removal and installation methods of typical clips used in body parts are shown in the table below.
HINT:
If the clip is damaged during the operation, always replace it with a new clip.

Shape (Example)	Removal/Installation
	
	
	

V00005

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Shape (Example)	Removal/Installation
	
	

V00012

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SRS AIRBAG

BO0DU–02

PRECAUTION

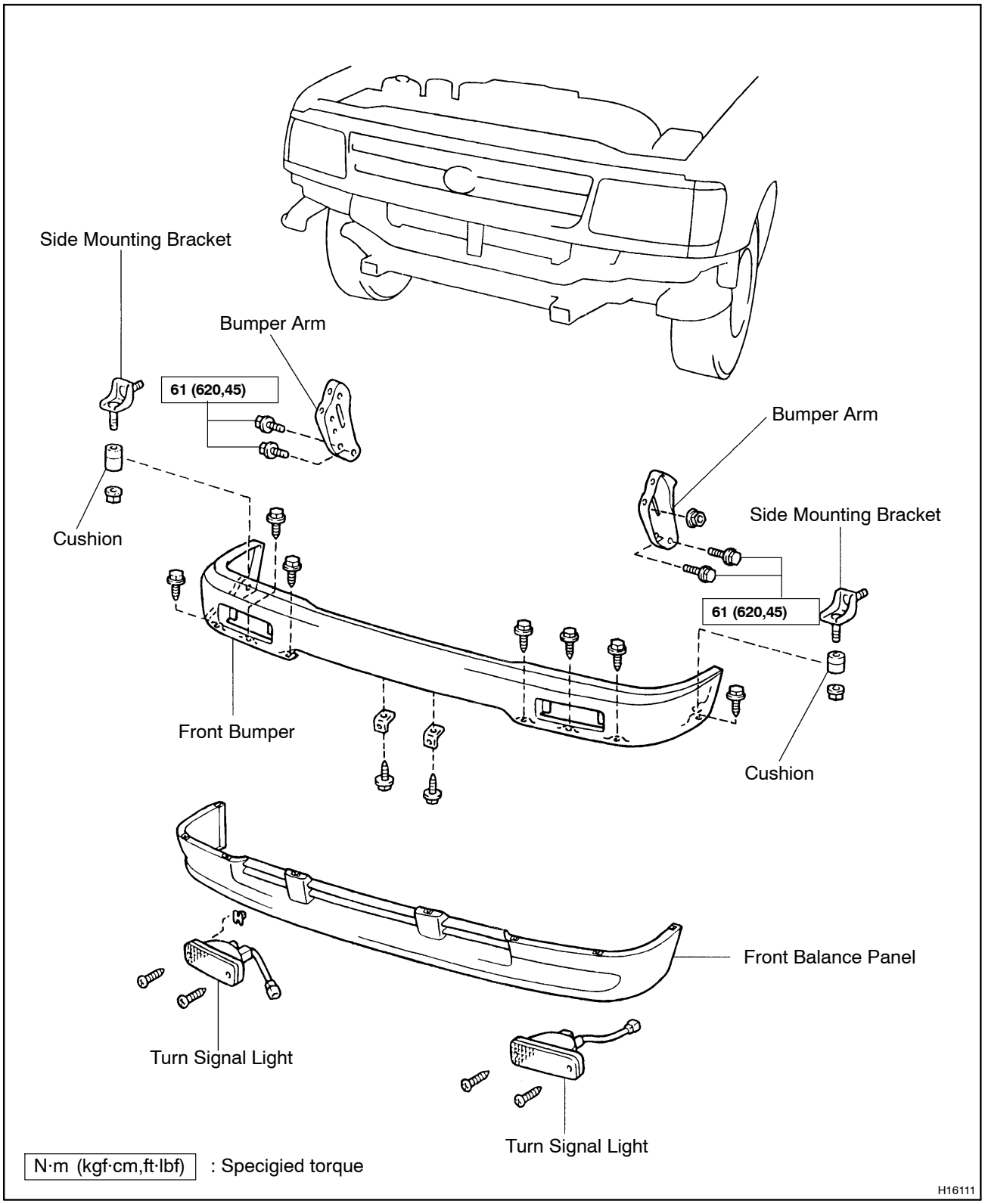
The TOYOTA T100 is equipped with an SRS (Supplemental Restraint System) such as the driver airbag. Failure to carry out service operation in the correct sequence could cause the SRS to unexpectedly deploy during servicing, possibly leading to a serious accident. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the precautionary notices in the RS section.

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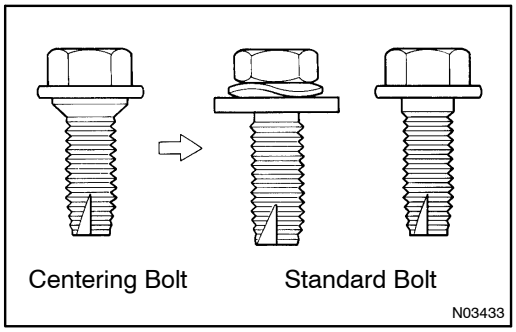
FRONT BUMPER

COMPONENTS

BO0DV–02



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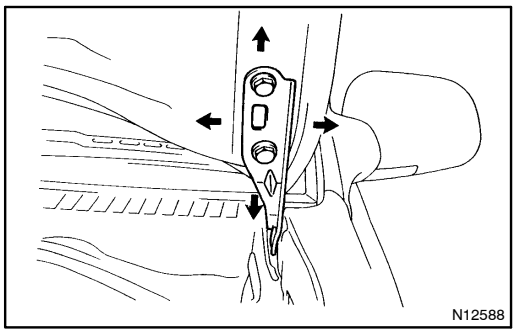


HOOD

ADJUSTMENT

BO0DW–02

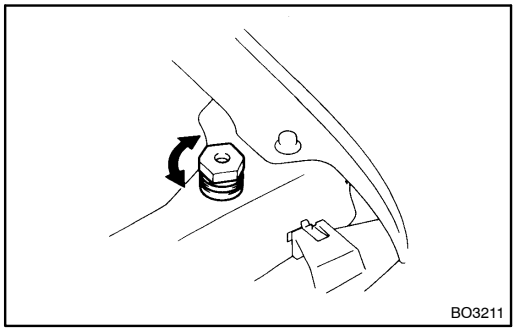
HINT:
Since the centering bolt is used as the hood hinge and lock set bolt, the hood and lock cannot be adjusted with it on. Substitute the standard bolt for the centering bolt.



1. ADJUST HOOD IN FORWARD/REARWARD AND LEFT/RIGHT DIRECTIONS

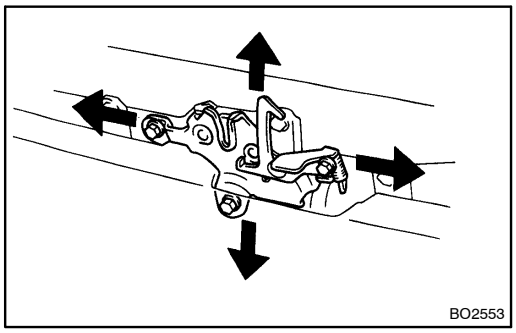
Adjust the hood by loosening the hood side hinge bolts.

Torque: 14 N·m (145 kgf·cm, 10 ft·lbf)



2. ADJUST FRONT EDGE OF HOOD IN VERTICAL DIRECTIONS

Adjust the hood by turning the cushions.



3. ADJUST HOOD LOCK

Adjust the lock by loosening bolts.

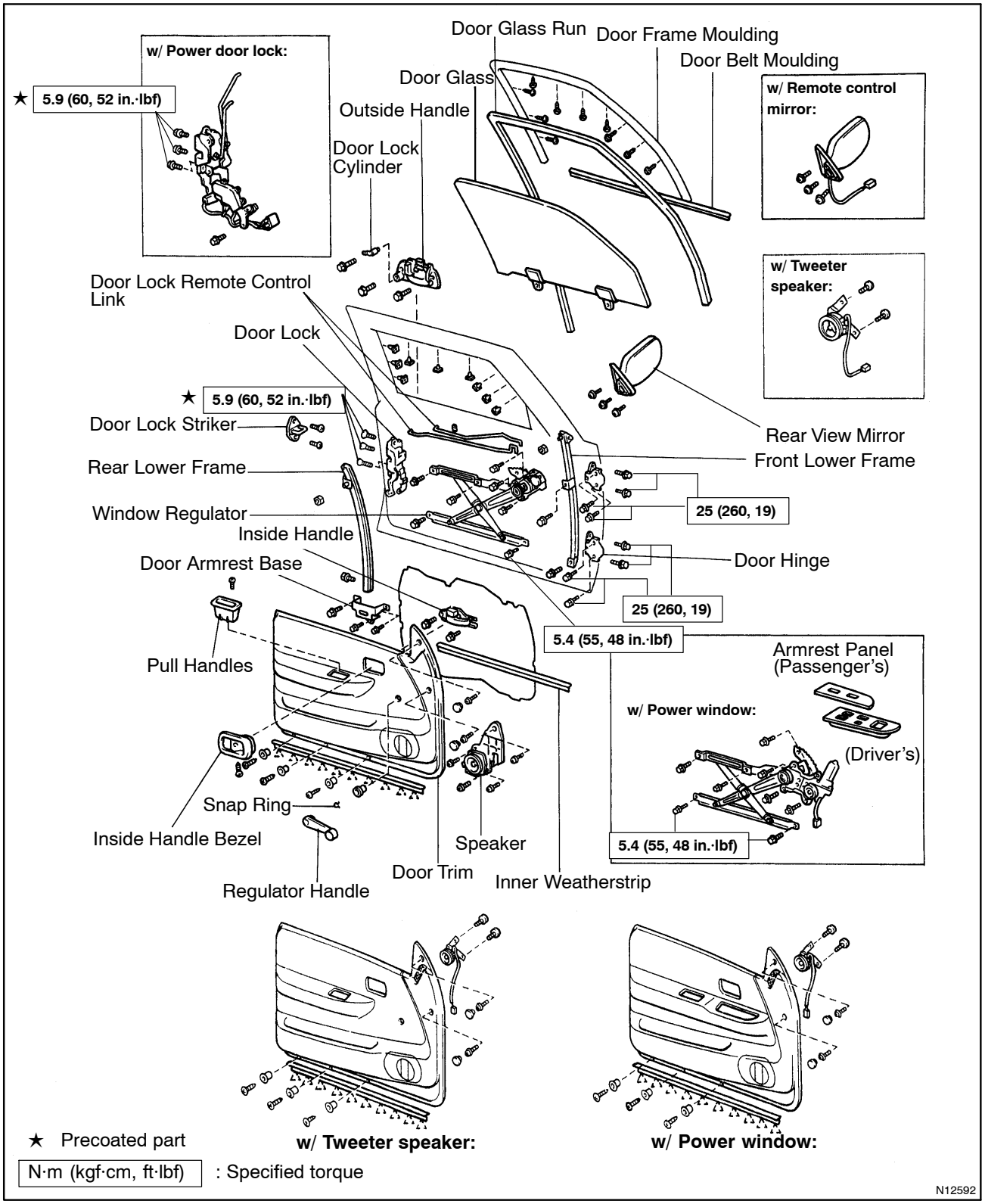
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

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FRONT DOOR

COMPONENTS

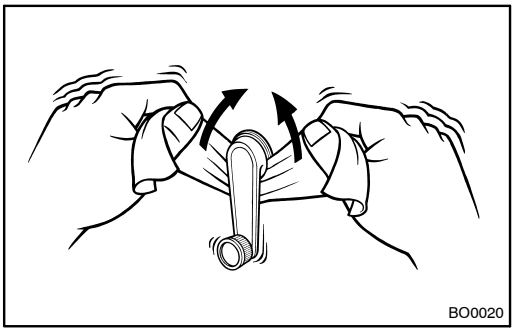
BO0DX–02



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BO0DY–02

DISASSEMBLY

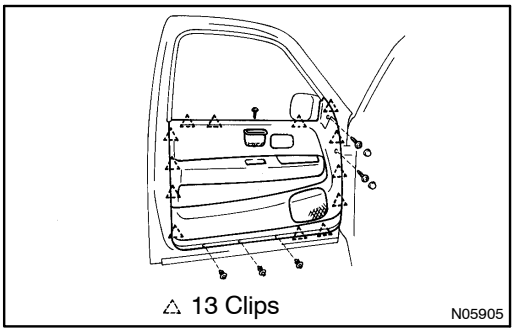


1. w/o Power window:
REMOVE REGULATOR HANDLE

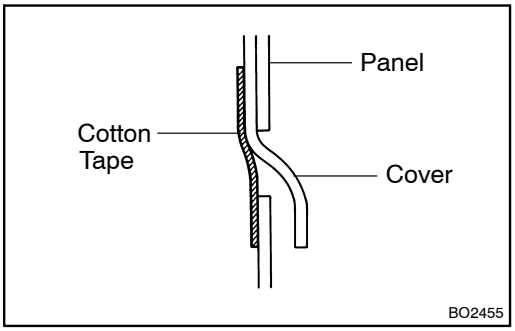
Pull off the snap ring with a shop rag and remove the regulator handle and plate.

2. REMOVE INSIDE HANDLE BEZEL

Remove the screw and pull the inside handle bezel.



3. REMOVE POWER WINDOW SWITCH
4. REMOVE PULL HANDLE
5. REMOVE DOOR TRIM
6. REMOVE INSIDE HANDLE
7. w/ Tweeter speaker:
REMOVE SPEAKER AND TWEETER SPEAKER
8. REMOVE DOOR ARMREST BASE



9. REMOVE SERVICE HOLE COVER

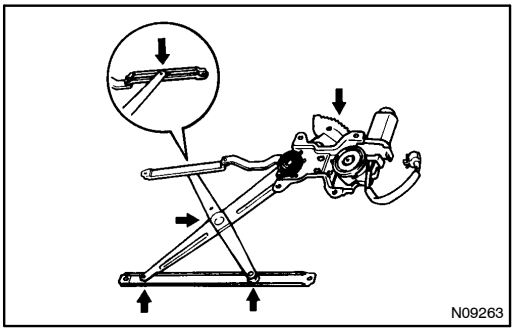
HINT:
At the time of reassembly, please refer to the follwing item.
Bring out the links through the service hole cover.

10. REMOVE REAR VIEW MIRROR
11. REMOVE DOOR BELT MOULDING
12. REMOVE DOOR FRAME MOULDING
13. REMOVE DOOR GLASS RUN
14. REMOVE INNER WEATHERSTRIP
15. REMOVE DOOR GLASS
16. REMOVE WINDOW REGULATOR

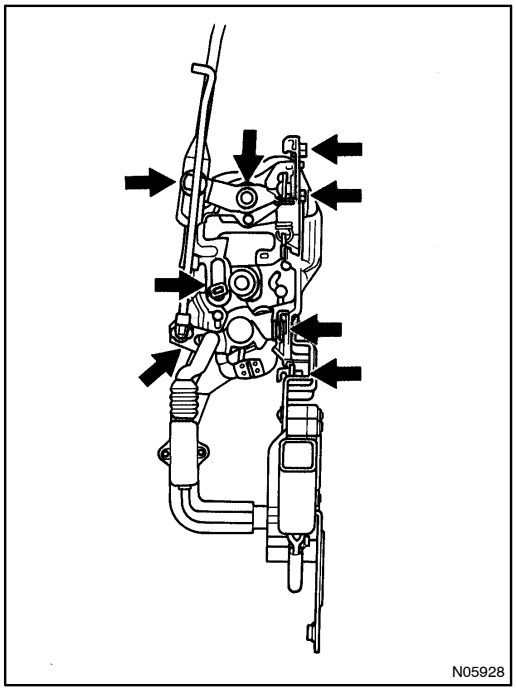
(a) Remove the 5 bolts and regulator.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

(b) Disconnect the connector.

HINT:
At the time of reassembly, please refer to the follwing item.
Apply MP grease to the window regulator rollers.



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17. REMOVE DOOR LOCK

(a) Disconnect the 2 links to the door lock.

(b) Disconnect the 2 links to the outside handle and the door lock cylinder.

(c) w/ Power door lock:
Disconnect the connector.

(d) Remove the 3 screws.
Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)

HINT:

At the time of reassembly, please refer to the follwing items.

- Apply adhesive to the 3 screws.
Part No. 08833–00070, THREE BOND 1324 or equivalent.
- Apply MP grease to the sliding and rotating parts of the door lock.

18. REMOVE FRONT LOWER FRAME

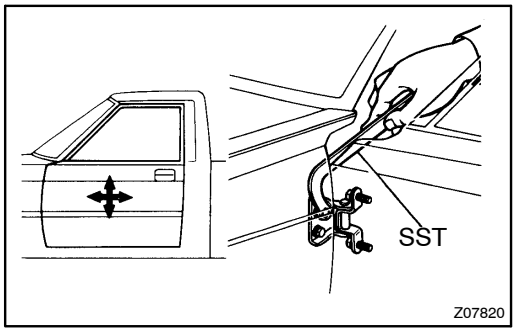
19. REMOVE OUTSIDE HANDLE

20. REMOVE REAR LOWER FRAME

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BO0DZ–03

ADJUSTMENT

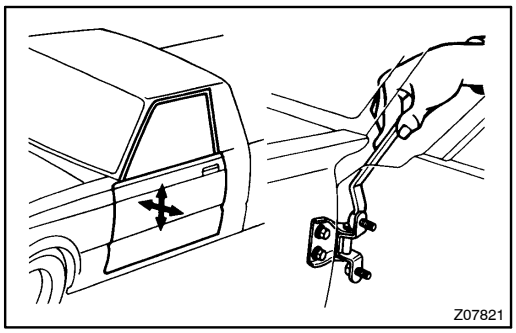


1. ADJUST DOOR IN FORWARD/REARWARD AND VERTICAL DIRECTIONS

Using SST, adjust the door by loosening the body side hinge bolts.

SST 09812–00010

Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)



2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

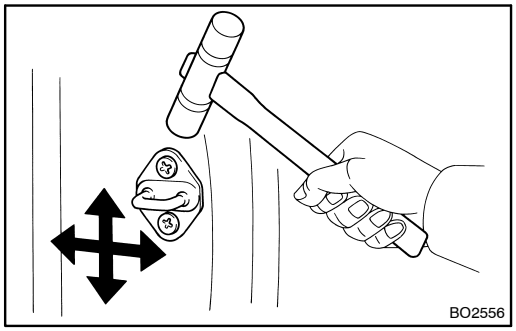
Loosen the door side hinge bolts to adjust.

HINT:

Substitute the standard bolt for the centering bolt.

(See page BO–5)

Torque: 25 N·m (260 kgf·cm, 19 ft·lbf)



3. ADJUST DOOR LOCK STRIKER

(a) Check that the door fit and door lock linkages are adjusted correctly.

(b) Loosen the striker mounting screws to adjust the striker.

(c) Using a plastic hammer, tap the striker to adjust it.

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BO0E0–01

REASSEMBLY

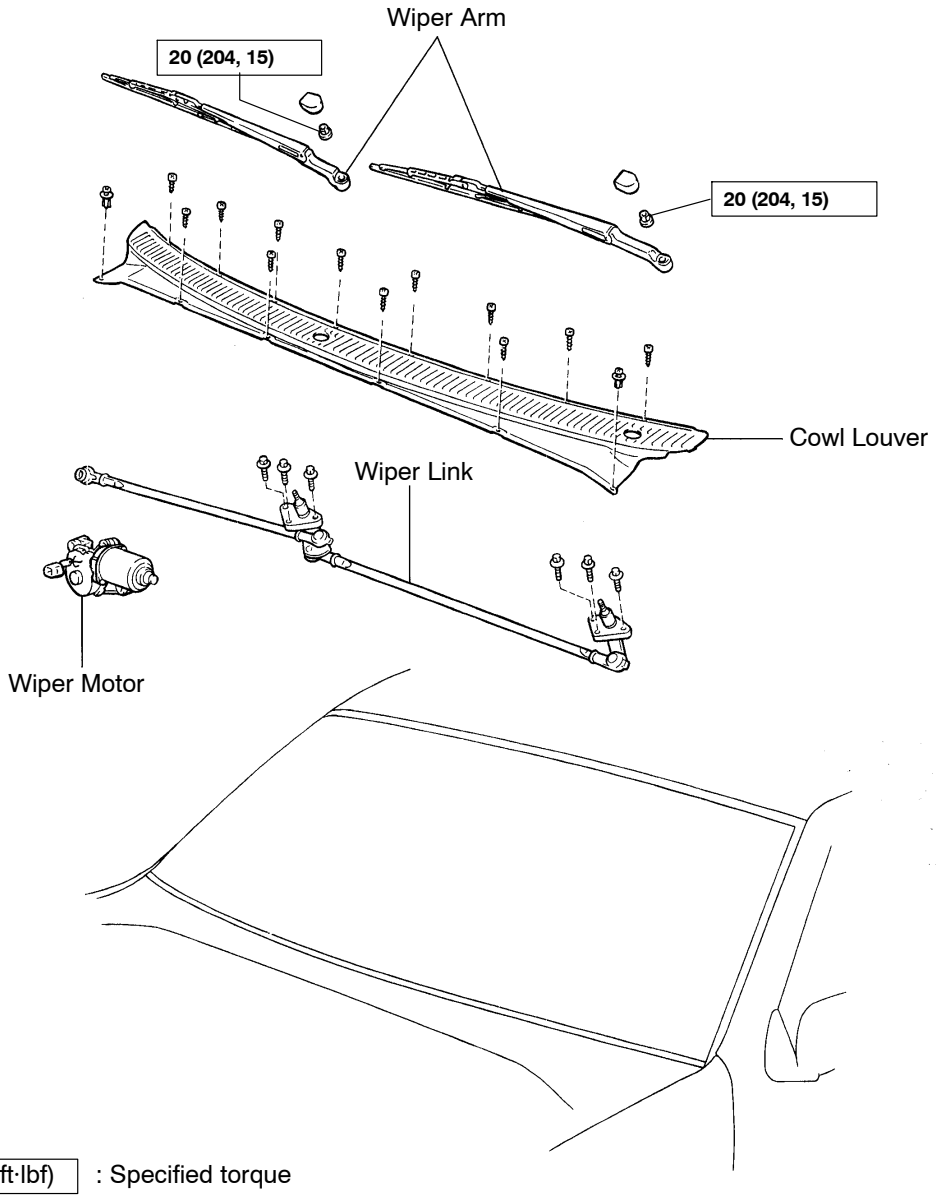
Reassembly is in the reverse order of disassembly (See page BO–7).

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FRONT WIPER AND WASHER

COMPONENTS

BO0E1–02

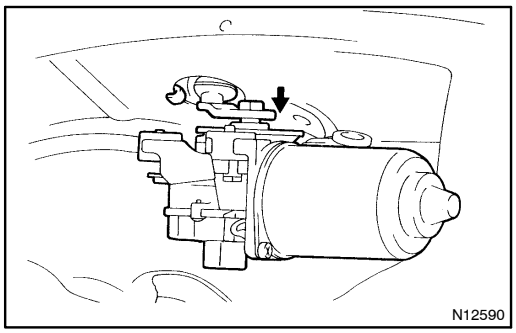


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BO0E2–02

REMOVAL

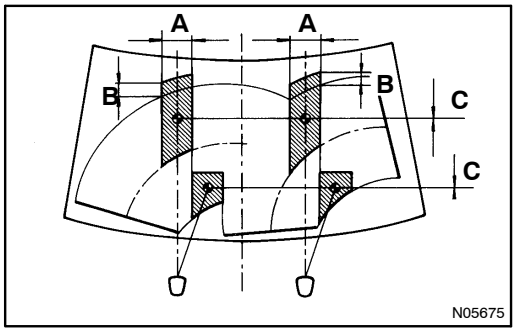
1. REMOVE WIPER ARMS
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)
2. REMOVE COWL LOUVER



3. REMOVE WIPER MOTOR
(a) Disconnect the connector, then unfasten 4 bolts.
(b) Connect the claw of the wiper link to the panel.
(c) Disconnect the motor from the wiper link and remove it.
4. REMOVE WIPER LINK
5. REMOVE WINDOW WASHER NOZZLE

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BO0E3–02



INSPECTION

INSPECT WASHER NOZZLE

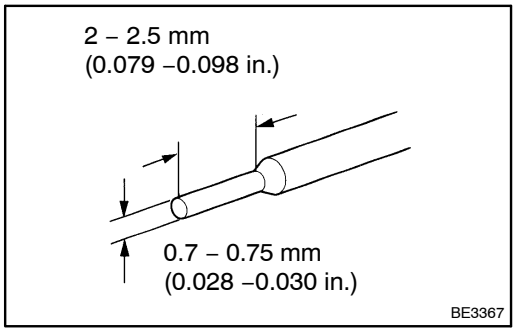
(a) While operating the washer, check whether the upper point where the washer fluid hits the windshield and the surge area are within the range indicated by the hatched line.

A: Approx. 150 mm (5.91 in.)
B: Approx. 50 mm (1.97 in.)
C: Approx. 0 – 50 mm (0 – 1.97 in.)

(b) Check if the lower point where the washer fluid hits the windshield is within the range of the wiping pattern the area of the glass which is wiped by the wiper blades.

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BO0E4–02



ADJUSTMENT

ADJUST WASHER NOZZLE

Using a tool like that shown in the figure, change the direction of the nozzle hole to adjust the point where washer fluid strikes the windshield.

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BO0E5–01

INSTALLATION

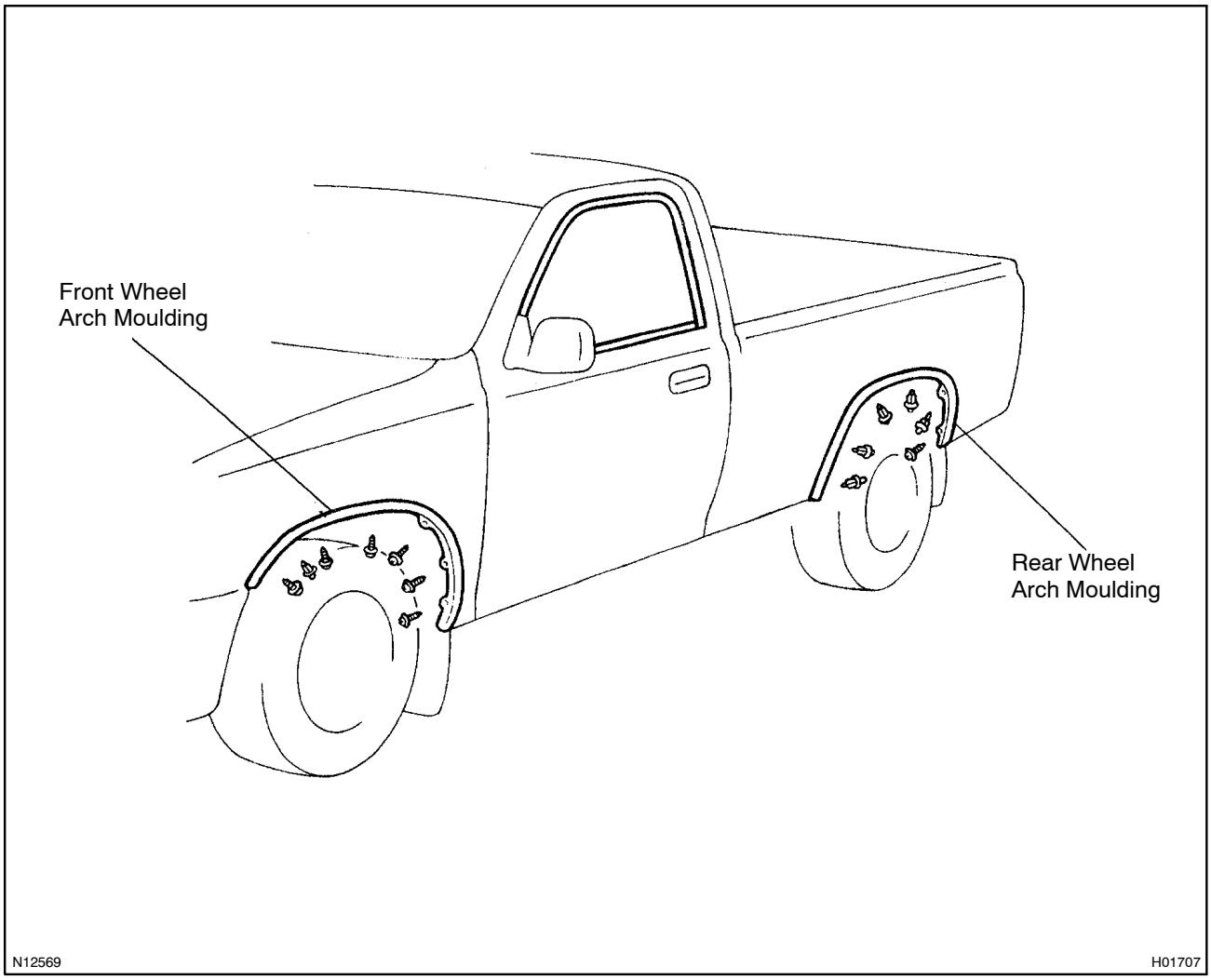
Installation is in the reverse order of removal (See page BO–12).

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WHEEL ARCH MOULDING

COMPONENTS

BO0E6–02



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BO0E7–01

REMOVAL

1. REMOVE FRONT WHEEL ARCH MOULDING

HINT:

Tape a screwdriver tip before use.

(a) Remove the 6 screws and a clip.

(b) Using the screwdriver, pry up the wheel arch moulding, and remove it.

2. REMOVE REAR WHEEL ARCH MOULDING

HINT:

Tape a screwdriver tip before use.

(a) Remove the screw and 5 clips.

(b) Using the screwdriver, pry up the wheel arch moulding, and remove it.

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BO0E8–01

INSTALLATION

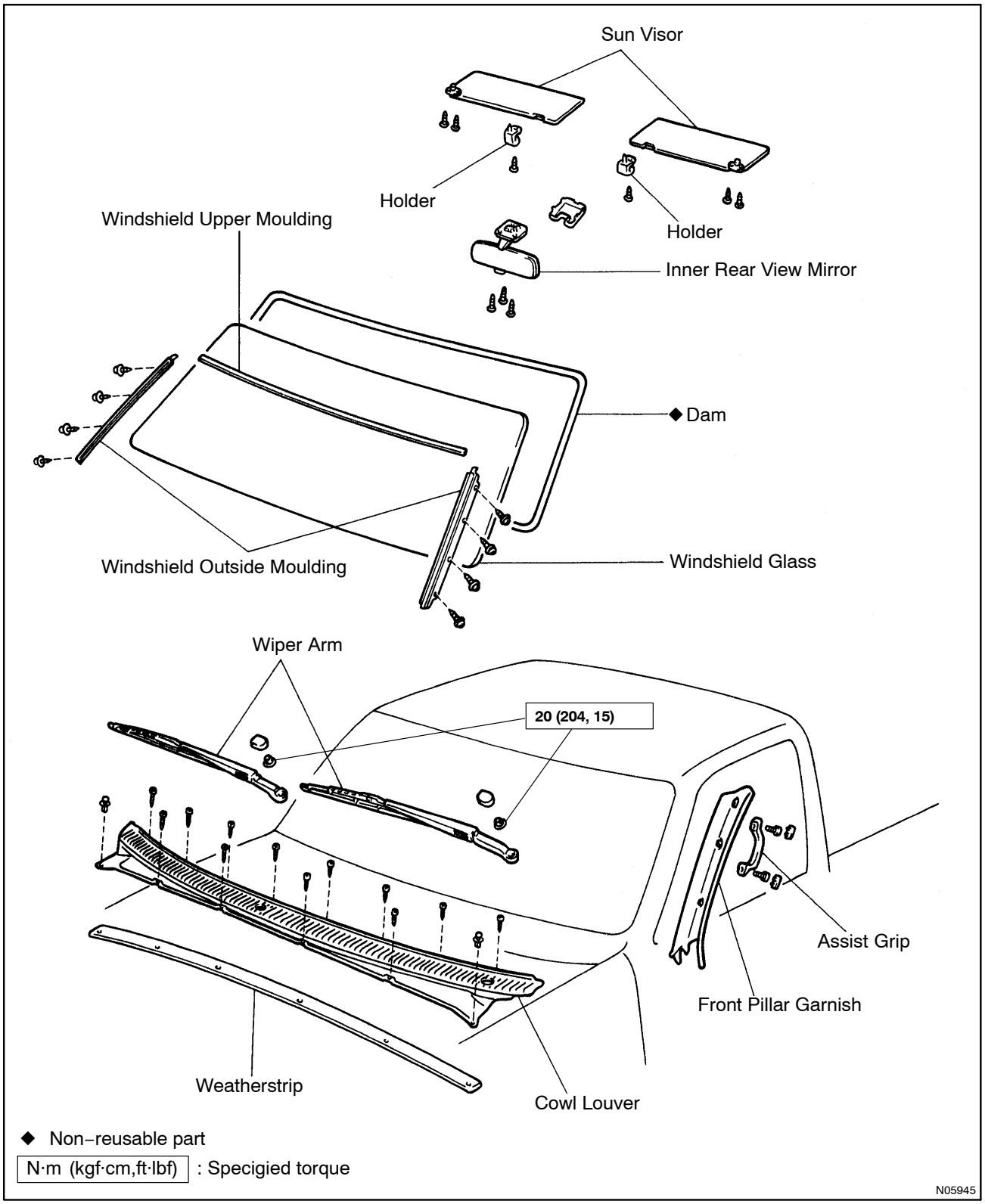
Installation is in the reverse order of removal (See page BO–17).

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WINDSHIELD

COMPONENTS

BO0E9–02

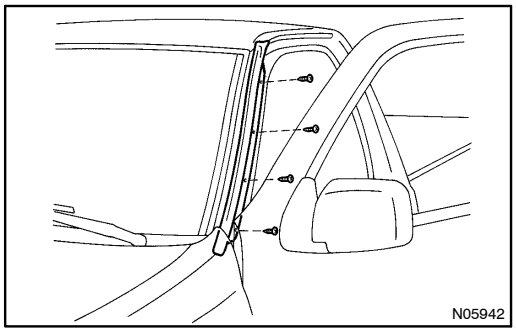


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BO0EA–02

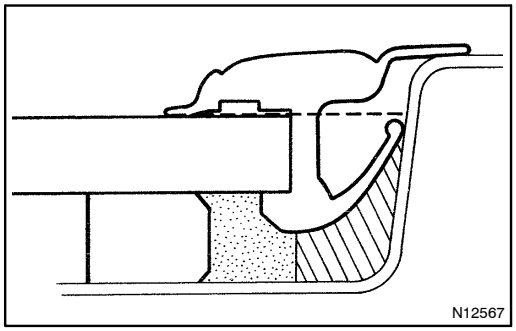
REMOVAL

1. **REMOVE INNER REAR VIEW MIRROR**
2. **REMOVE SUN VISORS AND HOLDERS**
3. **REMOVE ASSIST GRIPS**
4. **REMOVE FRONT PILLAR GARNISHES**
5. **REMOVE WIPER ARMS**
6. **REMOVE COWL LOUVER**
7. **REMOVE WEATHERSTRIP**



8. REMOVE WINDSHIELD OUTSIDE MOULDING

Remove the 4 screws and the moulding.

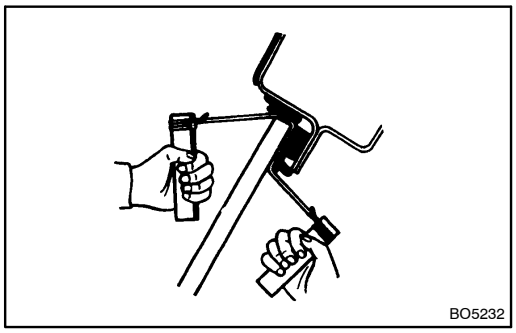


9. REMOVE WINDSHIELD OUTSIDE MOULDING

Using a knife, cut off the moulding, as shown.

NOTICE:

Do not damage the body with the knife.



10. REMOVE WINDSHIELD GLASS

(a) Push piano wire through between the body and glass from the interior.

(b) Tie both wire ends to a wooden block or similar object.

HINT:

Apply adhesive tape to the outer surface to keep the surface from being scratched.

NOTICE:

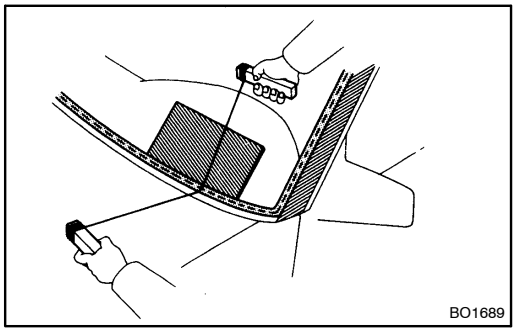
When separating the glass, take care not to damage the paint and interior and exterior ornaments. To prevent scratching the safety pad when removing the windshield, place a plastic sheet between the piano wire and safety pad.

(c) Cut the adhesive by pulling the piano wire around it.

(d) Remove the glass.

NOTICE:

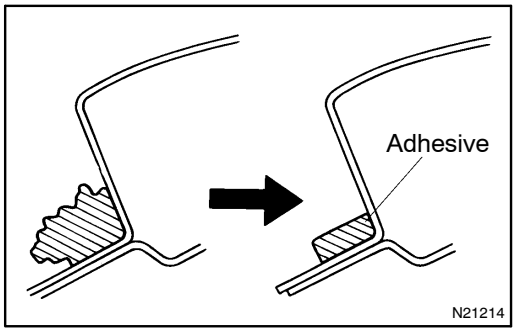
Leave as much of the adhesive on the body as possible when cutting off the glass.



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BO3E4–02

INSTALLATION



1. CLEAN AND SHAPE CONTACT SURFACE OF BODY

(a) Using a knife, cut away any rough areas on the body.

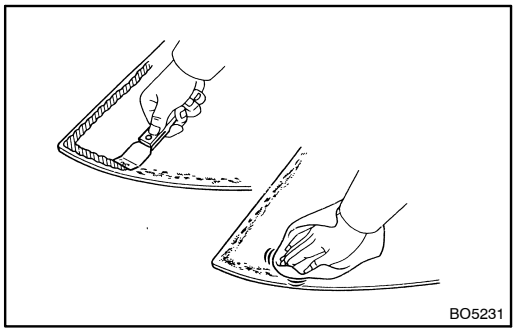
HINT:

Leave as much of the adhesive on the body as possible.

(b) Clean the cutting surface of the adhesive with a piece of shop rag saturated in cleaner.

HINT:

Even if all the adhesive has been removed, clean the body.



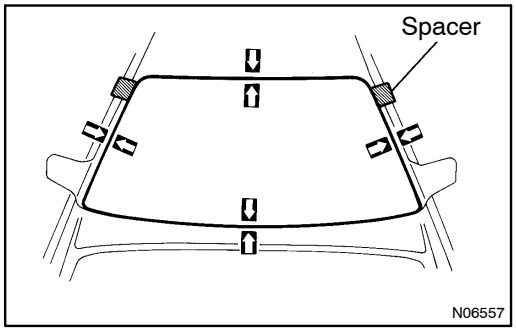
2. CLEAN REMOVED GLASS

(a) Using a scraper, remove the adhesive sticking to the glass.

(b) Clean the glass with cleaner.

NOTICE:

Do not touch the glass after cleaning it.



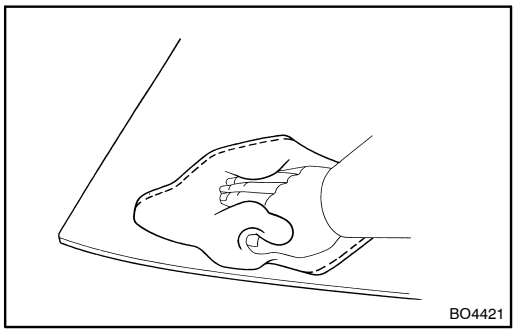
3. POSITION GLASS

(a) Place the glass in correct position.

(b) Check that all contacting parts of the glass rim are perfectly even and do not make contact with the spacers.

(c) Place reference marks between the glass and body.

(d) Remove the glass.

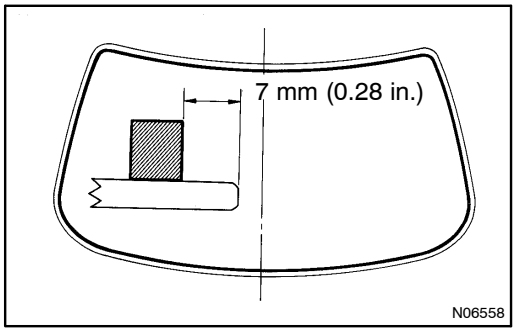


4. CLEAN CONTACT SURFACE OF GLASS

Using a cleaner, clean the contact surface black–colored area around the entire glass rim.

NOTICE:

Do not touch the glass face after cleaning it.



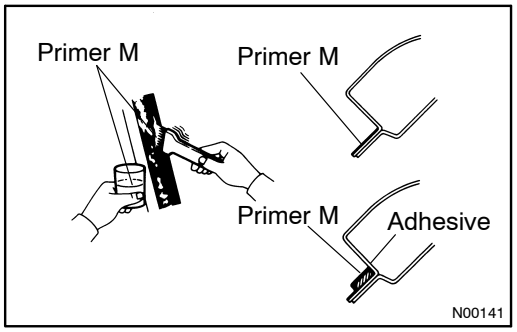
5. INSTALL DAM

Install the dam with double – stick tape as shown in the illustration.

NOTICE:

Do not touch the glass face after cleaning it.

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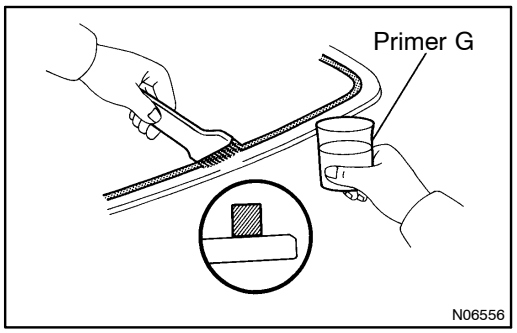


6. COAT CONTACT SURFACE OF BODY WITH PRIMER "M"

Using a brush, coat the contact surface on the body with Primer M.

NOTICE:

- **Let the primer coating dry for 3 minutes or more.**
- **Do not coat Primer M to the adhesive.**
- **Do not keep any of the opened Primer M for later use.**



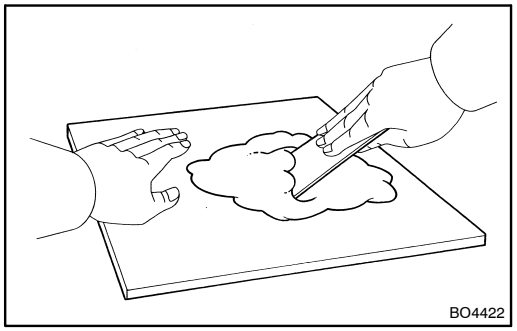
7. COAT CONTACT SURFACE OF GLASS WITH PRIMER "G"

(a) Using a brush or sponge, coat the edge of the glass and the contact surface with Primer G.

(b) Before the primer dries, wipe it off with a clean shop rag.

NOTICE:

- **Let the primer coating dry for 3 minutes or more.**
- **Do not keep any of the opened Primer G for later use.**



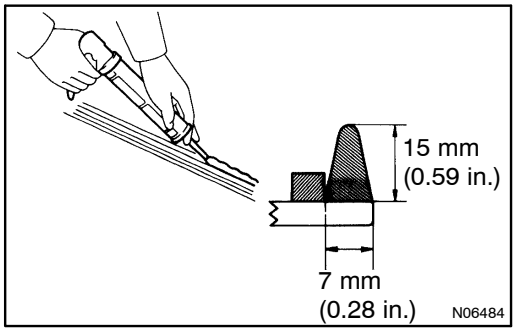
8. MIX ADHESIVE COATING

NOTICE:

- **Be sure that installation of the moulding is finished within usable time.**
- **The mixture should be made in 5 minutes or less.**

(a) Throughly clean the glass plate and putty spatula with solvent.

(b) Thoroughly mix 500 g (17.64 oz.) of the main agent and 75 g (2.65 oz.) of the hardening agent on a glass plate or like object with a putty spatula.



9. APPLY ADHESIVE

(a) Cut off the tip of the cartridge nozzle.

Part No. 08850–00801 or equivalent

HINT:

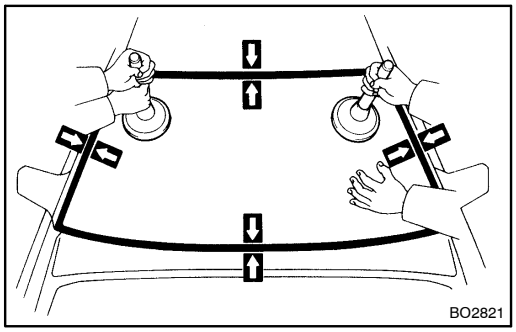
After cutting off the tip, use all adhesive within the time described in the chart below.

Temperature	Tackfree time
35˚C (95 ˚F)	15 minutes
20˚C (68 ˚F)	100 minutes
5˚C (41 ˚F)	8 hours

(b) Load the cartridge into the sealer gun.

(c) Coat the glass with adhesive, as shown.

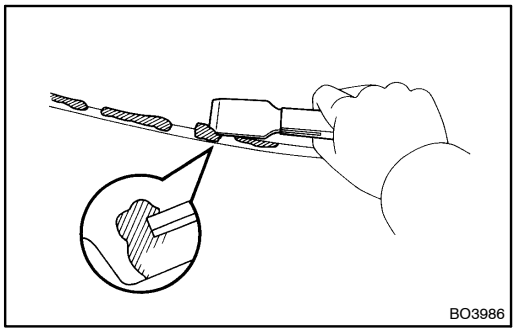
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BO2821

10. INSTALL GLASS

(a) Position the glass so that the reference marks are lined up, and press in gently along the rim.

(b) Using a spatula, apply adhesive on the glass rim.


BO3986

(c) Use a scraper to remove any excess or protruding adhesive.

(d) Fasten glass securely until the adhesive sets.

NOTICE:

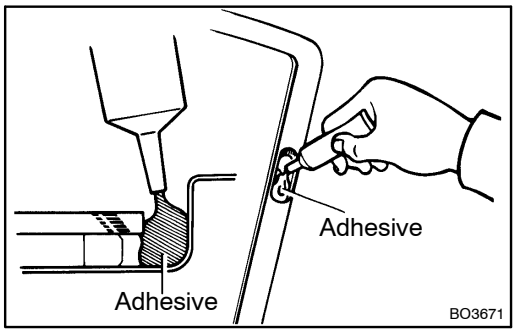
Take care not to drive the vehicle during the time described in the chart below.

Temperature	Minimum time prior to drive of the vehicle
35˚C (95 ˚F)	1.5 hours
20˚C (68 ˚F)	5 hours
5˚C (41 ˚F)	24 hours

11. INSPECT FOR LEAKS AND REPAIR

(a) Perform a leak test after the hardening time has elapsed.

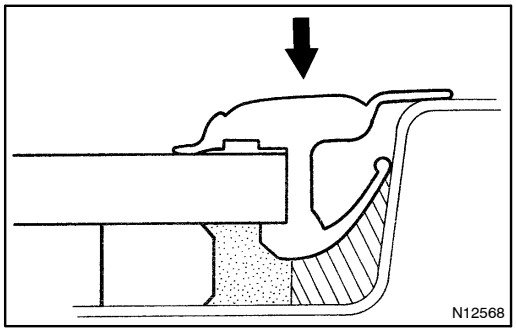
(b) Seal any leak with sealant.
Part No. 08833–00030 or equivalent



BO3671

12. APPLY ADHESIVE AT MOULDING INSTALLATION AREA

Coat the glass with adhesive at the mouldig installation area.
Part No. 08833–00030 or equivalent


N12568

13. INSTALL WINDSHIELD UPPER MOULDING

Place the moulding onto the body and tap it by hand.

14. INSTALL WINDSHIELD OUTSIDE MOULDING

15. INSTALL WEATHERSTRIP

16. INSTALL COWL LOUVER

17. INSTALL WIPER ARMS
Torque: 20 N·m (204 kgf·cm, 15 ft·lbf)

18. INSTALL FRONT PILLAR GARNISHES

19. INSTALL ASSIST GRIPS

20. INSTALL SUN VISORS AND HOLDERS

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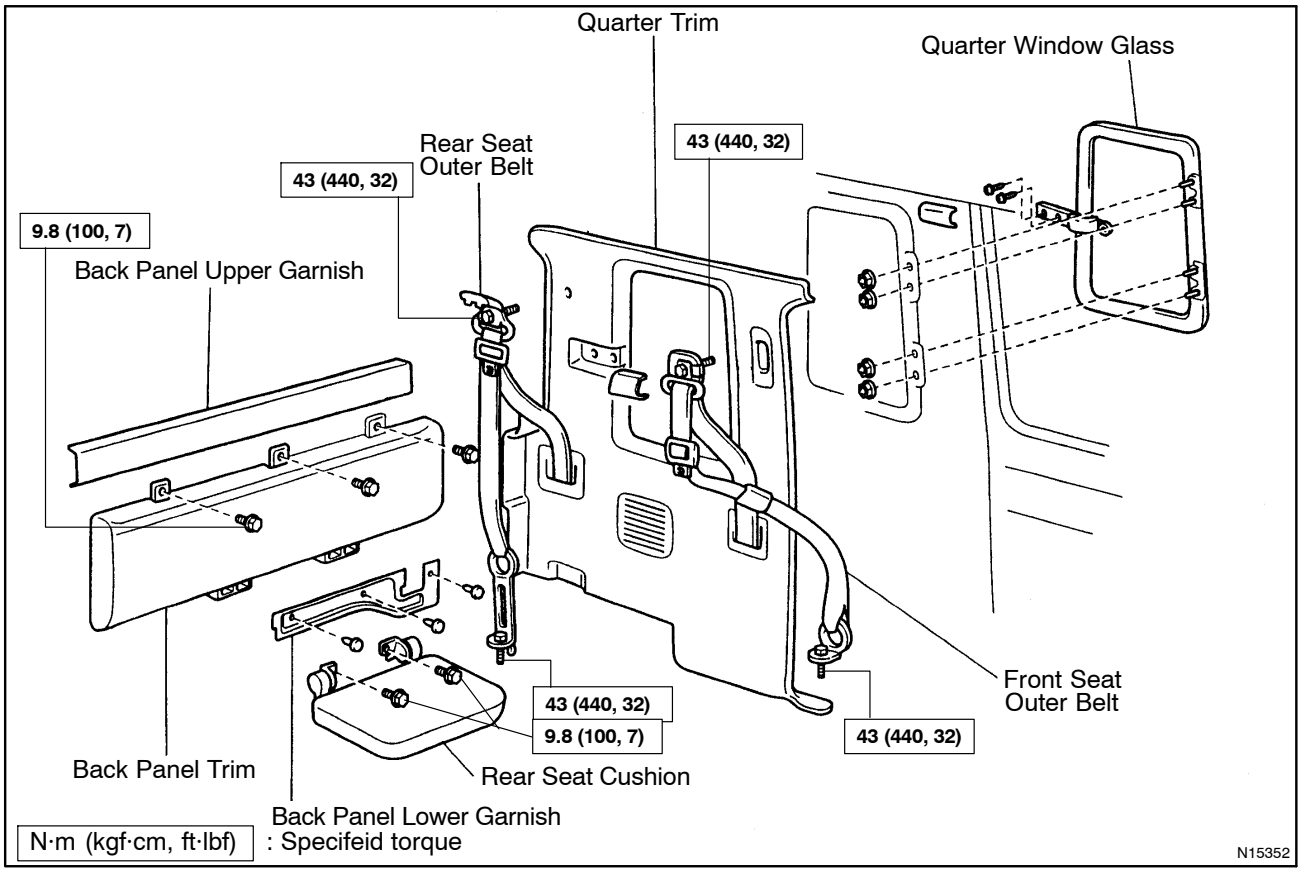
21. INSTALL INNER REAR VIEW MIRROR

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QUARTER WINDOW GLASS

COMPONENTS

BO0EC–02



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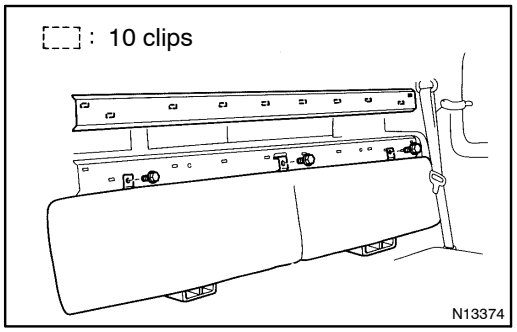
BO0ED–03

REMOVAL

1. REMOVE FRONT PILLAR GARNISH

2. REMOVE DOOR SCUFF PLATE

3. REMOVE ASSIST GRIP



4. REMOVE BACK PANEL UPPER GARNISH AND BACK PANEL TRIM

(a) Insert a screwdriver between the back panel upper garnish and body to remove the back panel upper garnish.

HINT:

Tape the screwdriver tip before use.

(b) Remove the 3 bolts and back panel trim.

Torque: 9.8 N·m (100 kgf·cm, 7 in.·lbf)

5. REMOVE REAR SEAT CUSHION

(a) Remove the 3 clips and back panel lower garnishes.

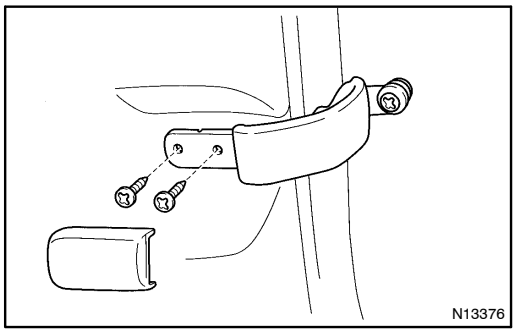
(b) Remove the 2 bolts and rear seat cushion.

Torque: 9.8 N·m (100 kgf·cm, 7 in.·lbf)

6. REMOVE SEAT BELT

Remove the 4 bolts, seat belt anchor and belt guide.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)



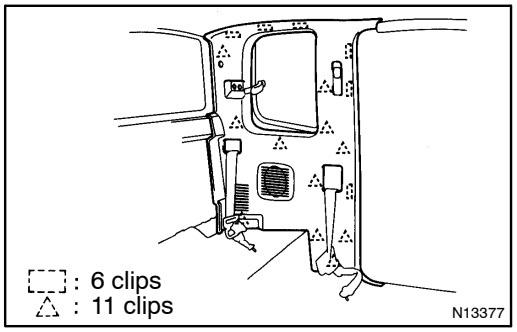
7. REMOVE LOCK HANDLE

HINT:

Tape a screwdriver tip before use.

(a) Using a screwdriver, remove the cover.

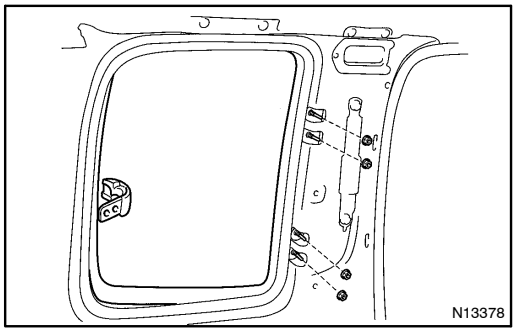
(b) Remove the 2 screws.



8. REMOVE QUARTER TRIM

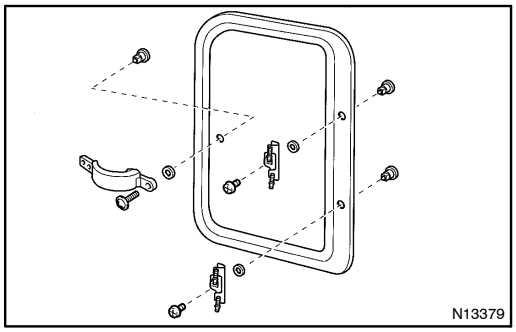
Remove the 17 clips and quarter trim.

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9. REMOVE QUARTER WINDOW GLASS

(a) Remove the 4 nuts and quarter window glass.



(b) Remove the screw and lock handle from the quarter window glass.

(c) Remove the 2 screws and hinges from the quarter window glass.

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BO0EE–01

INSTALLATION

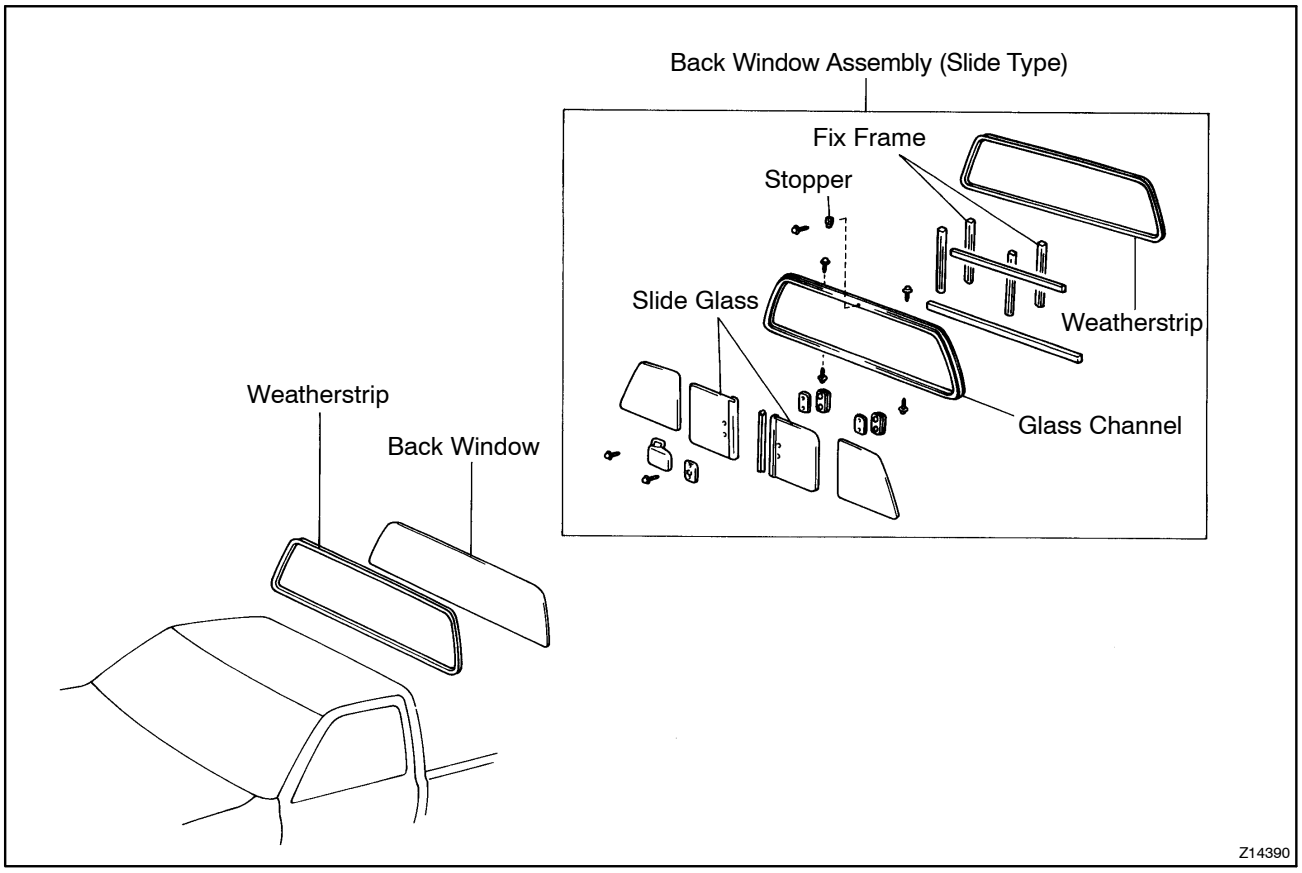
Installation is in the reverse order of removal (See page BO–26).

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BACK WINDOW GLASS

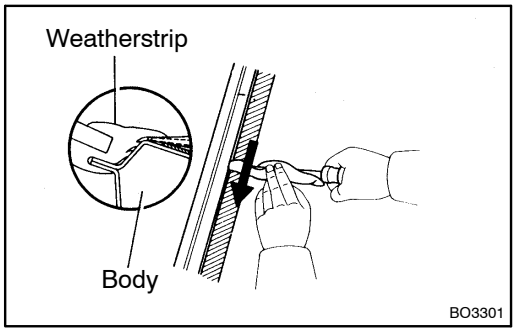
COMPONENTS

BO0EF–03



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BO0EG–03



REMOVAL

REMOVE BACK WINDOW GLASS WITH WINDOW FRAME

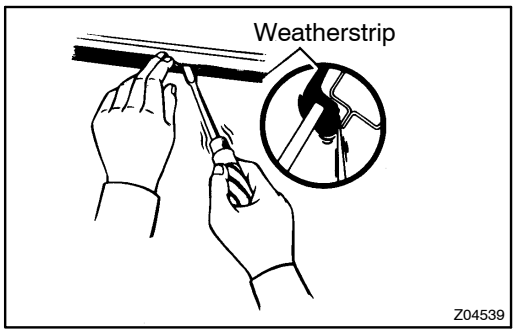
HINT:

Tape a screwdriver tip before use.

(a) Using a screwdriver, loosen the weatherstrip from the body.

NOTICE:

Be careful not to damage the body paint.



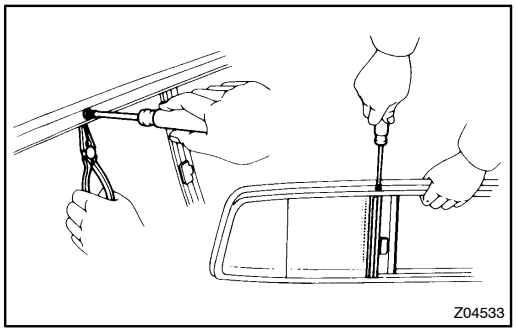
(b) Pry the lip of the weatherstrip outward from the interior part of the body flange.

(c) Pull the glass outwards, and remove it with the weatherstrip.

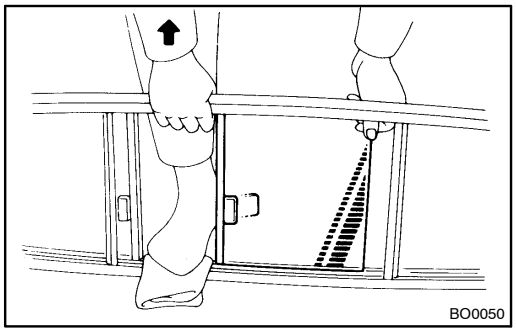
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BO0EH–02

DISASSEMBLY

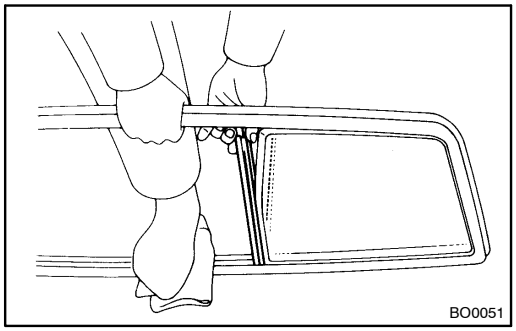


1. **REMOVE STOPPER**
2. **REMOVE FIX FRAMES**



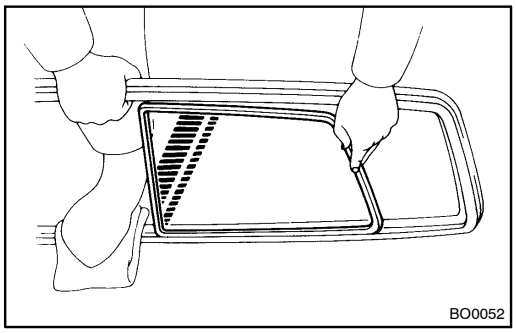
3. **REMOVE SLIDE GLASS**

Pull apart the channels and remove the 2 slide glass panes at the center area of the glass channel.



4. **REMOVE NON–SLIDE GLASS**

(a) Pull apart the channels and remove the 2 fix frames, as shown.



(b) Pull apart the channels and remove the 2 non–slide glass panes, as shown.

HINT:

At the time of reassembly, please refer to the following item.

Apply soapy water to the contact surface of the weatherstrip and glass channel flange.

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BO0EI–01

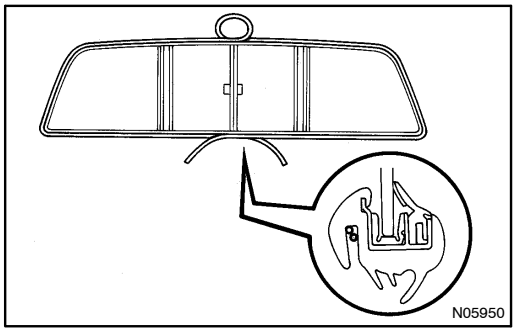
REASSEMBLY

Reassembly is in the reverse order of disassembly (See page BO–31).

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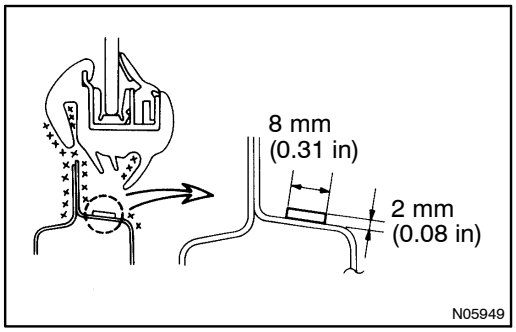
BO0EJ–02

INSTALLATION

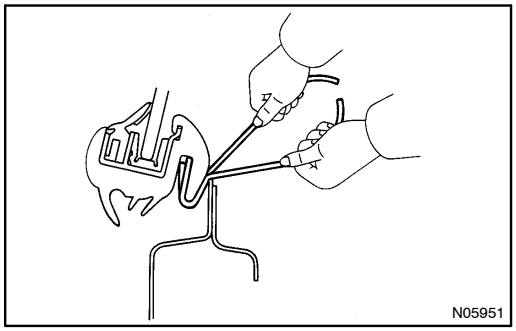


1. INSTALL BACK WINDOW GLASS WITH WINDOW FRAME

(a) Install the working cord to the frame, as shown.

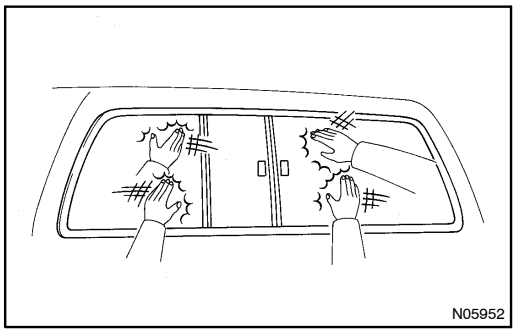


(b) Apply soapy water to the contact surface of the body and the weatherstrip lip.



(c) Hold the glass in position on the body.

(d) Install the glass by pulling the cord from the room side, while pushing on the outside of the weatherstrip with your open hand.



(e) To snug the glass in place, tap from the outside with your open hand.

2. INSPECT FOR LEAKS AND REPAIR

(a) Perform a leak test after the hardening time has elapsed.

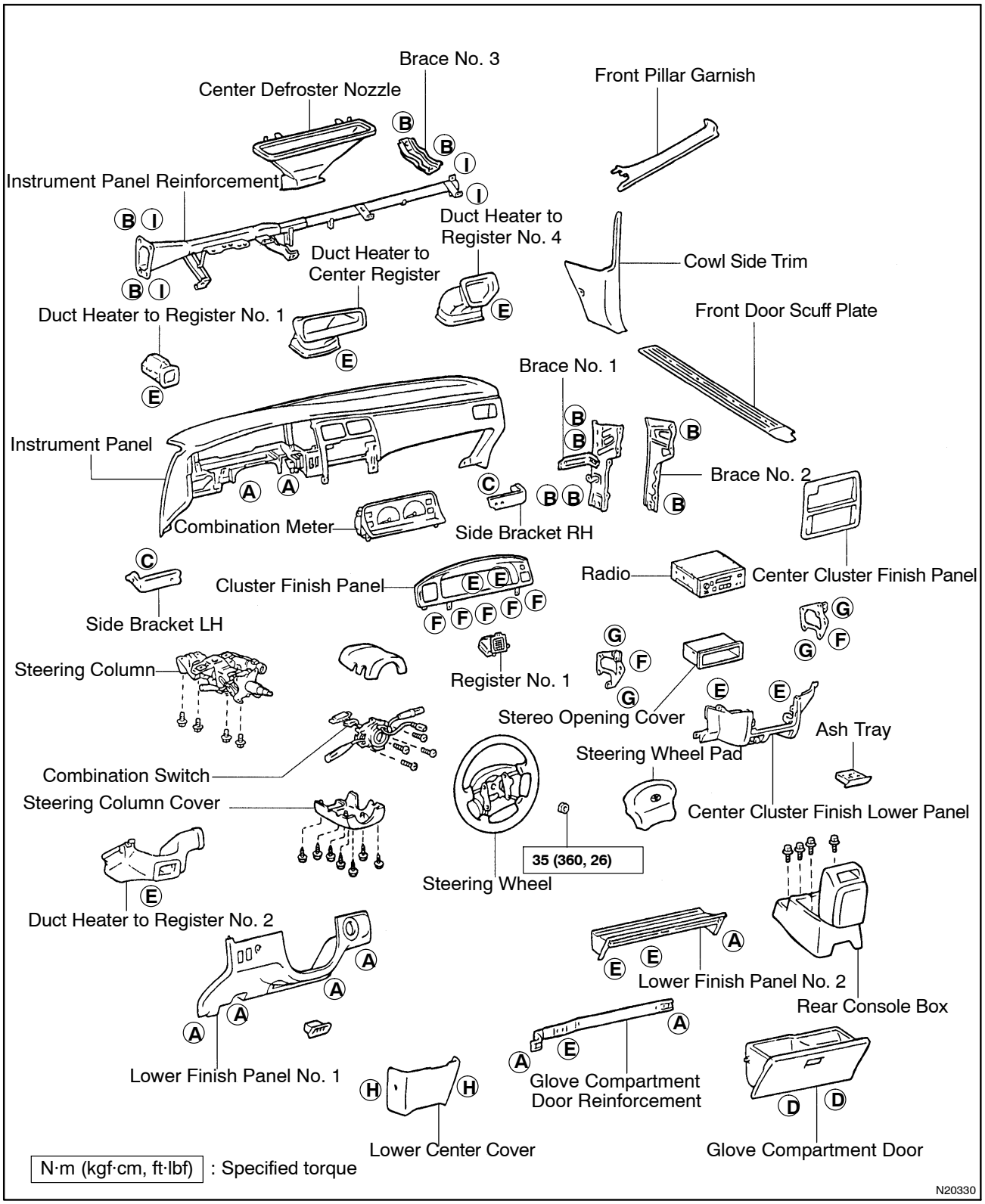
(b) Seal any leak with sealant.
Part No. 08833–00030 or equivalent

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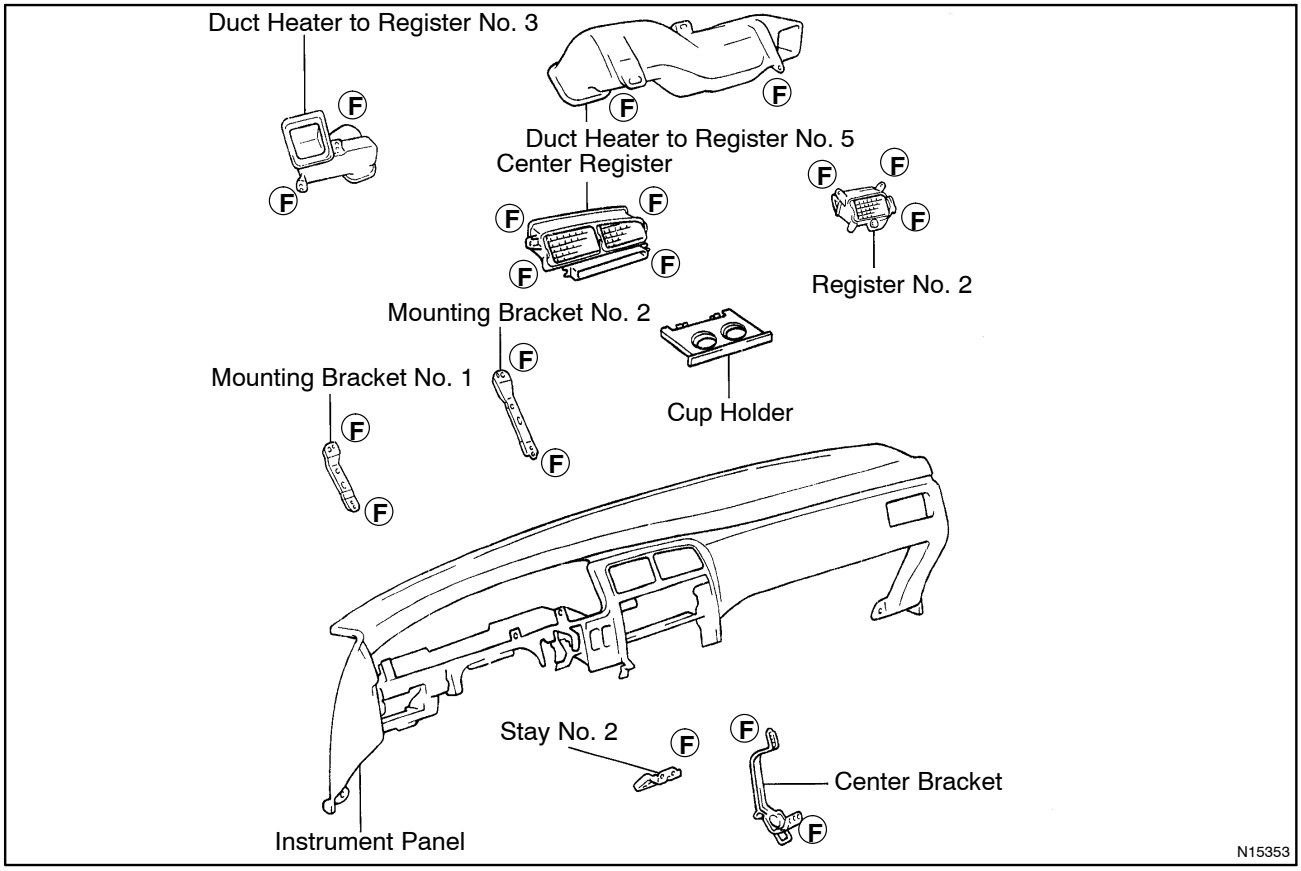
INSTRUMENT PANEL

COMPONENTS

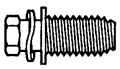
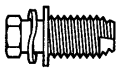
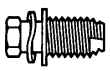
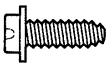
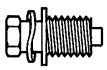
BO0EK–02



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HINT:
Screw shapes and sizes are inndecated in the able below.
The codes (A ~ I) correspond to those indecated on the previous pages.

Code	Shape	Size	Code	Shape	Size	Code	Shape	Size
A		ø = 6 (0.24) L = 22 (0.87)	B		ø = 8 (0.31) L = 20 (0.79)	C		ø = 6 (0.24) L = 18 (0.71)
D		ø = 5 (0.20) L = 14 (0.55)	E		ø = 5 (0.20) L = 16 (0.63)	F		ø = 5 (0.20) L = 14 (0.55)
G		ø = 5 (0.20) L = 18 (0.71)	H		—	I		—

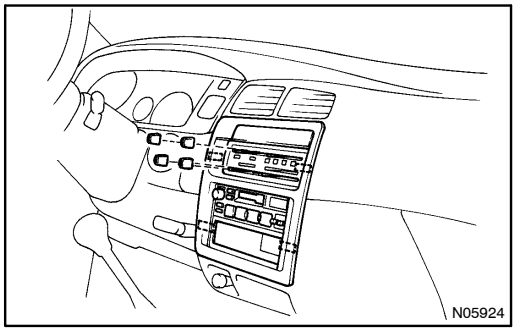
V06838

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BO0EL–03

REMOVAL

1. **REMOVE FRONT PILLAR GARNISH**
2. **REMOVE FRONT DOOR SCUFF PLATE**
3. **REMOVE COWL SIDE TRIM**
4. **REMOVE STEERING WHEEL**
   (See page SR–13)
5. **REMOVE STEERING COLUMN COVER**
6. **REMOVE HOOD LOCK RELEASE LEVER**
7. **REMOVE LOWER FINISH PANEL NO. 1**
8. **REMOVE COMBINATION SWITCH**
9. **REMOVE GLOVE COMPARTMENT DOOR**
10. **REMOVE LOWER FINISH PANEL NO. 2**
11. **REMOVE LOWER CENTER COVER**
12. **w/ Sports seat:**
    REMOVE REAR CONSOLE BOX

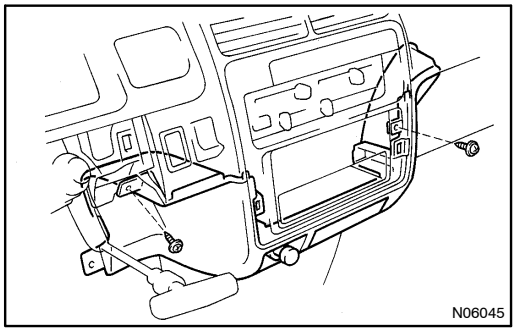


13. REMOVE CENTER CLUSTER FINISH PANEL

HINT:

Tape a screwdriver tip before use.

(a) Remove the heater control knobs.
(b) Using a screwdriver, remove the panel.
(c) Remove the radio.
(d) Remove the heater control.

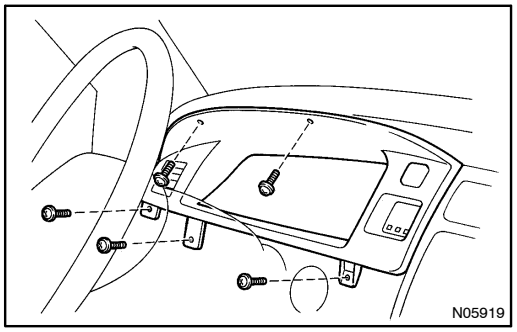


14. REMOVE CENTER CLUSTER FINISH LOWER PANEL

HINT:

Tape a screwdriver tip before use.

(a) Remove the 2 screws.
(b) Using a screwdriver, remove the panel, then disconnect the connector.
(c) Remove the stereo opening cover.

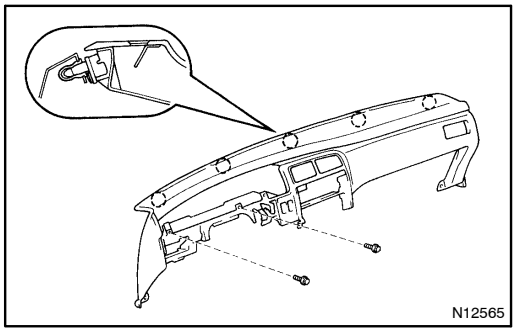


15. REMOVE CLUSTER FINISH PANEL

(a) Remove the 5 screws.
(b) Remove the combination meter.

16. **REMOVE REGISTER NO. 1**
17. **REMOVE DUCT HEATER TO REGISTER NO. 1**
18. **REMOVE DUCT HEATER TO REGISTER NO. 2**
19. **REMOVE GLOVE COMPARTMENT DOOR REINFORCEMENT**
20. **REMOVE BRACE NO. 1 AND NO. 2**

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21. REMOVE INSTRUMENT PANEL

(a) Disconnect the connectors.

(b) Remove the 2 bolts from instrument panel.

22. REMOVE INSTRUMENT PANEL REINFORCEMENT

(a) Remove the brace No. 3.

(b) Remove the 4 nuts, 2 bolts and the reinforcement.

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BO0EM–02

DISASSEMBLY

1. REMOVE DUCT HEATER TO REGISTER NO. 3
2. REMOVE DUCT HEATER TO REGISTER NO. 5
3. REMOVE REGISTER NO.2
4. REMOVE CENTER BRACKET
5. REMOVE MOUNTING BRACKET NO. 1 AND NO. 2
6. REMOVE STAY NO. 2
7. REMOVE CENTER REGISTER
8. REMOVE CUP HOLDER
9. REMOVE DUCT HEATER TO CENTER REGISTER
10. REMOVE DUCT HEATER TO REGISTER NO. 4
11. REMOVE CENTER DEFROSTER NOZZLE

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BO0EN–01

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page BO–38).

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BO0EO–01

INSTALLATION

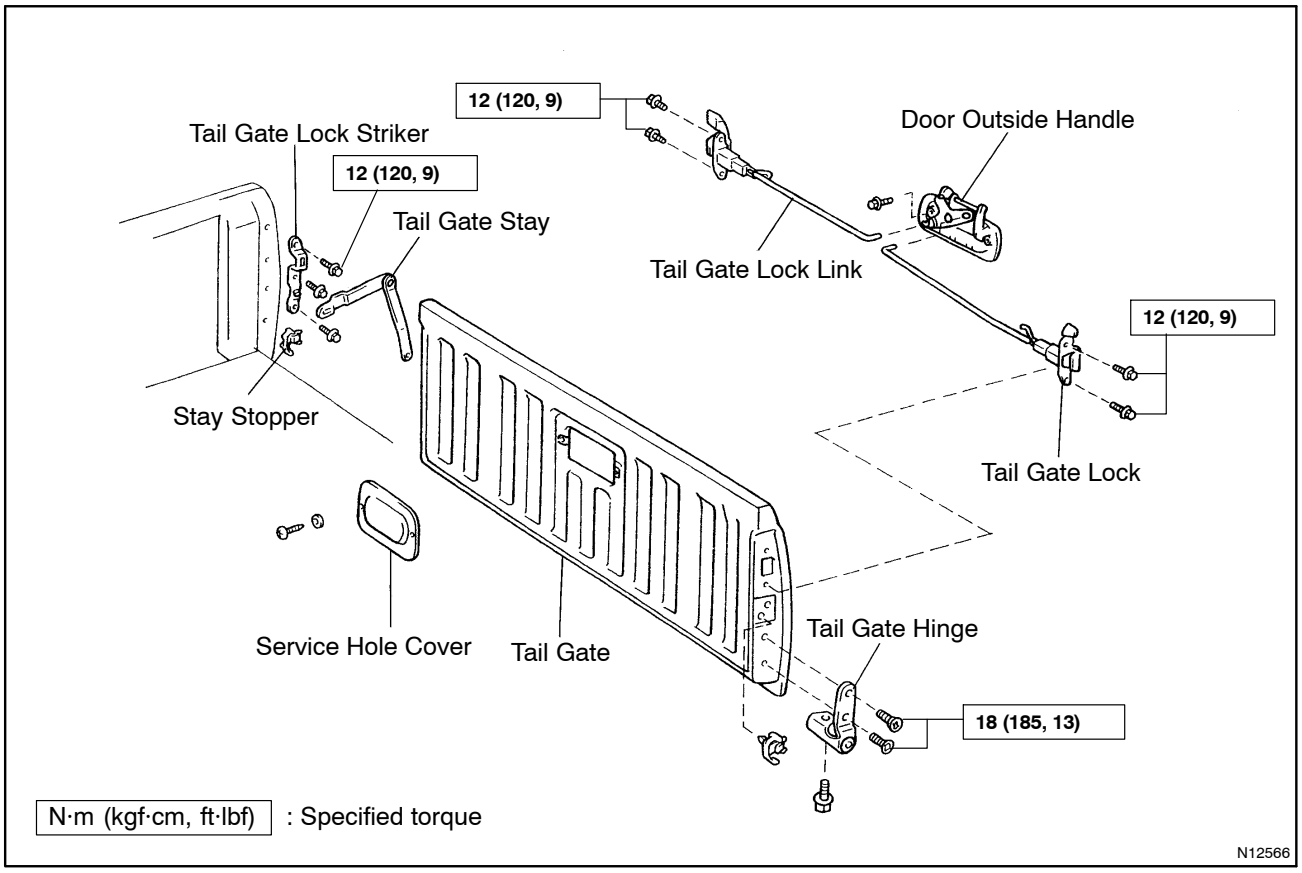
Installation is in the reverse order of removal (See page BO–36).

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TAIL GATE

COMPONENTS

BO0EP–02



Author : Date : 1925

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BO0EQ–02

REMOVAL

1. REMOVE SERVICE HOLE COVER
2. REMOVE TAIL GATE LOCK
3. REMOVE TAIL GATE LOCK LINK
   Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)
4. REMOVE DOOR OUTSIDE HANDLE
5. REMOVE TAIL GATE STAY
6. REMOVE TAIL GATE LOCK STRIKER
   Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)
7. REMOVE TAIL GATE
8. REMOVE TAIL GATE HINGE
   Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

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BO0ER–01

INSTALLATION

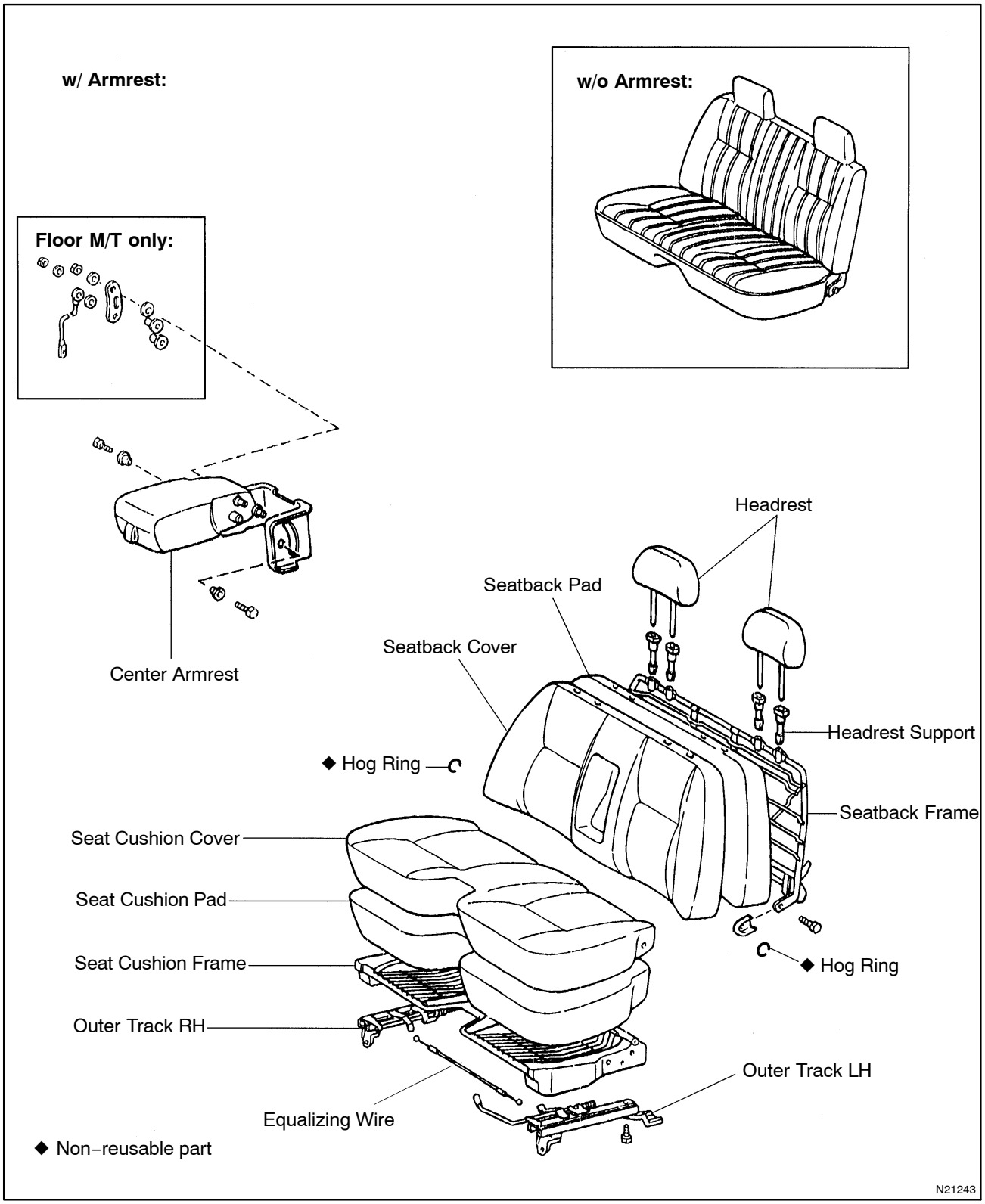
Installation is in the reverse order of removal (See page BO–42).

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FRONT SEAT (Bench Type)

COMPONENTS

BO0FE–02

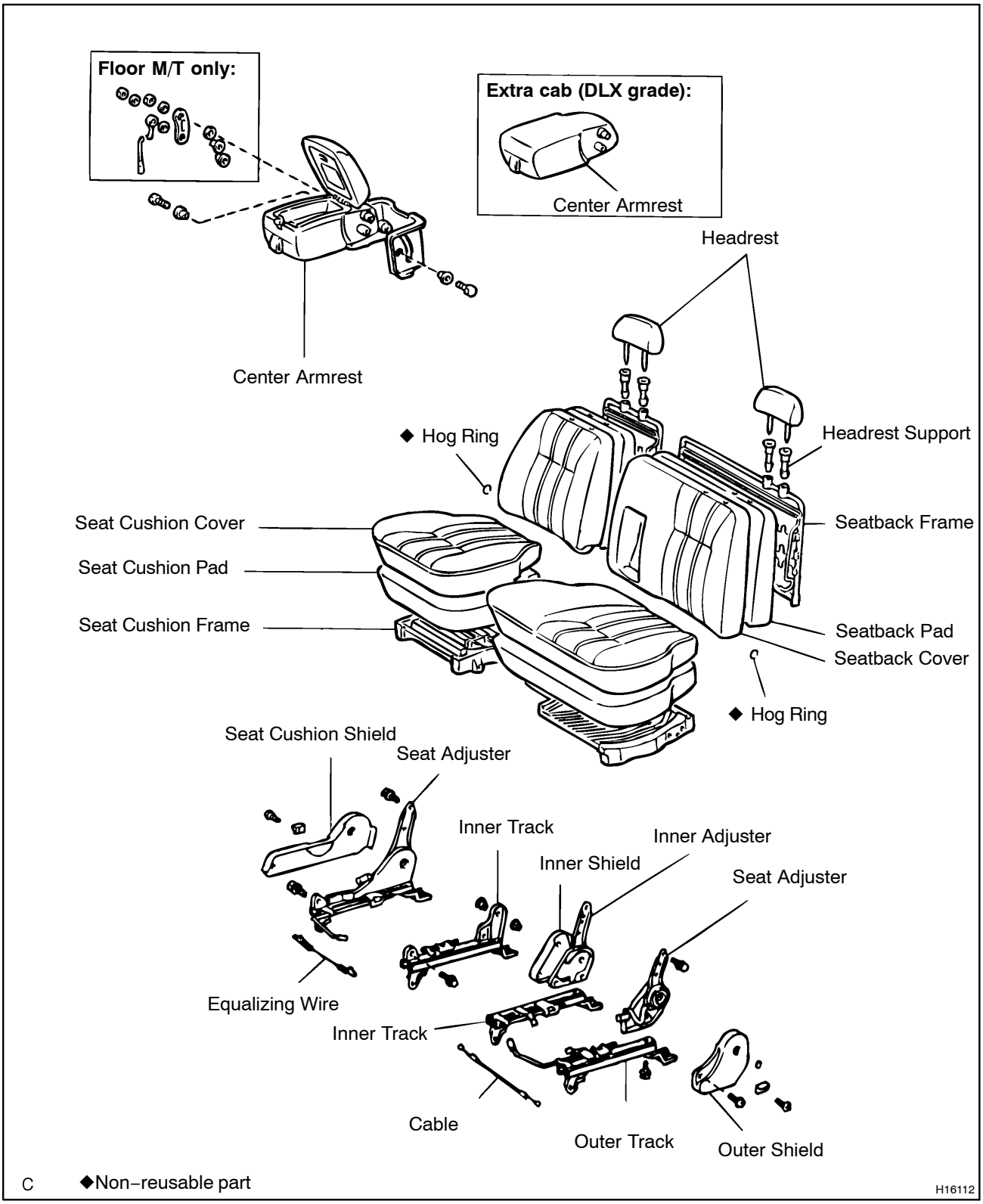


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FRONT SEAT (Split Bench Type)

COMPONENTS

BO0F1–03

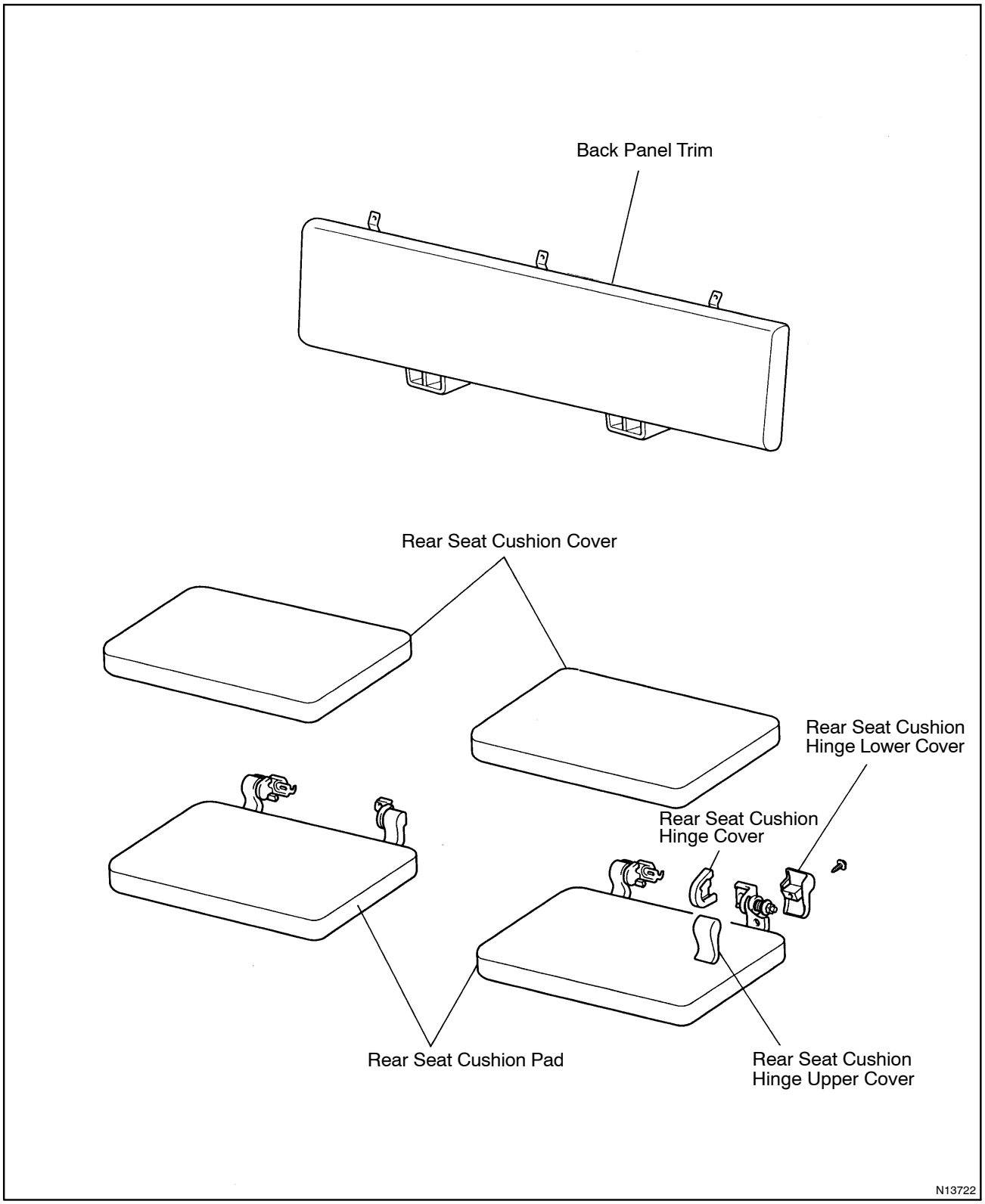


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REAR SEAT

COMPONENTS

BO0F7–02



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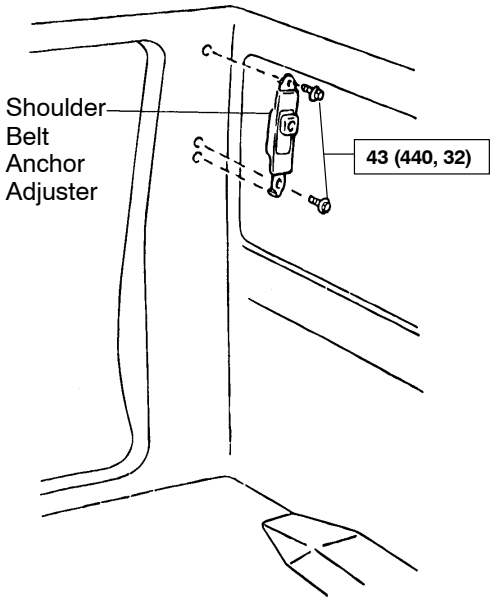
SEAT BELT

COMPONENTS

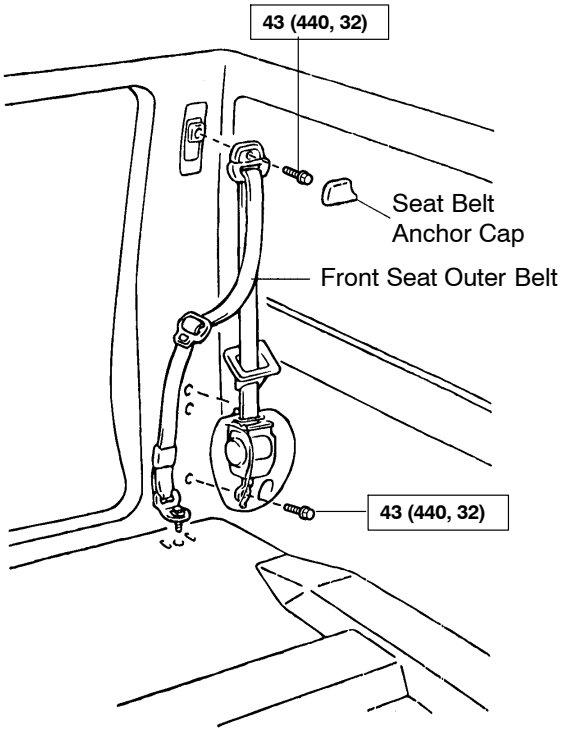
BO0FC–02

Regular cab:

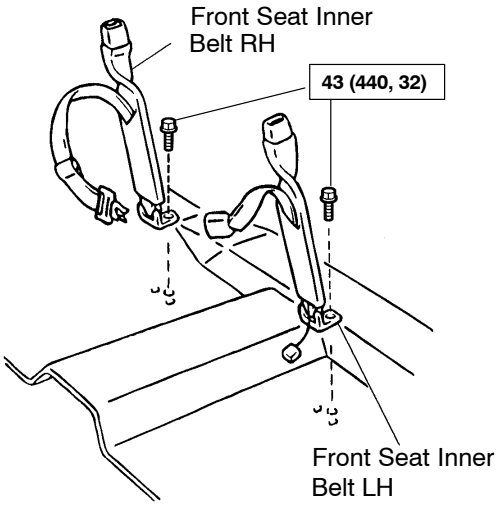
Adjustable anchor:



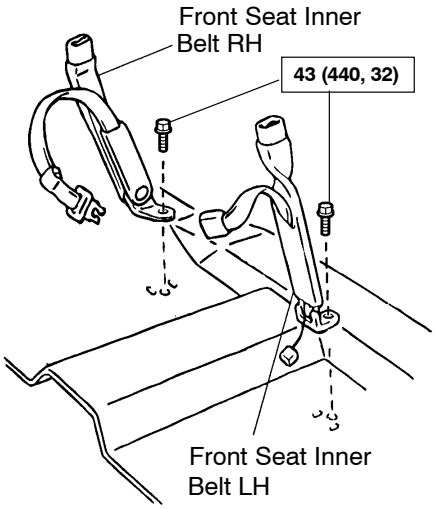
Outer belt:



Inner belt bench seat:



Inner belt split seat:

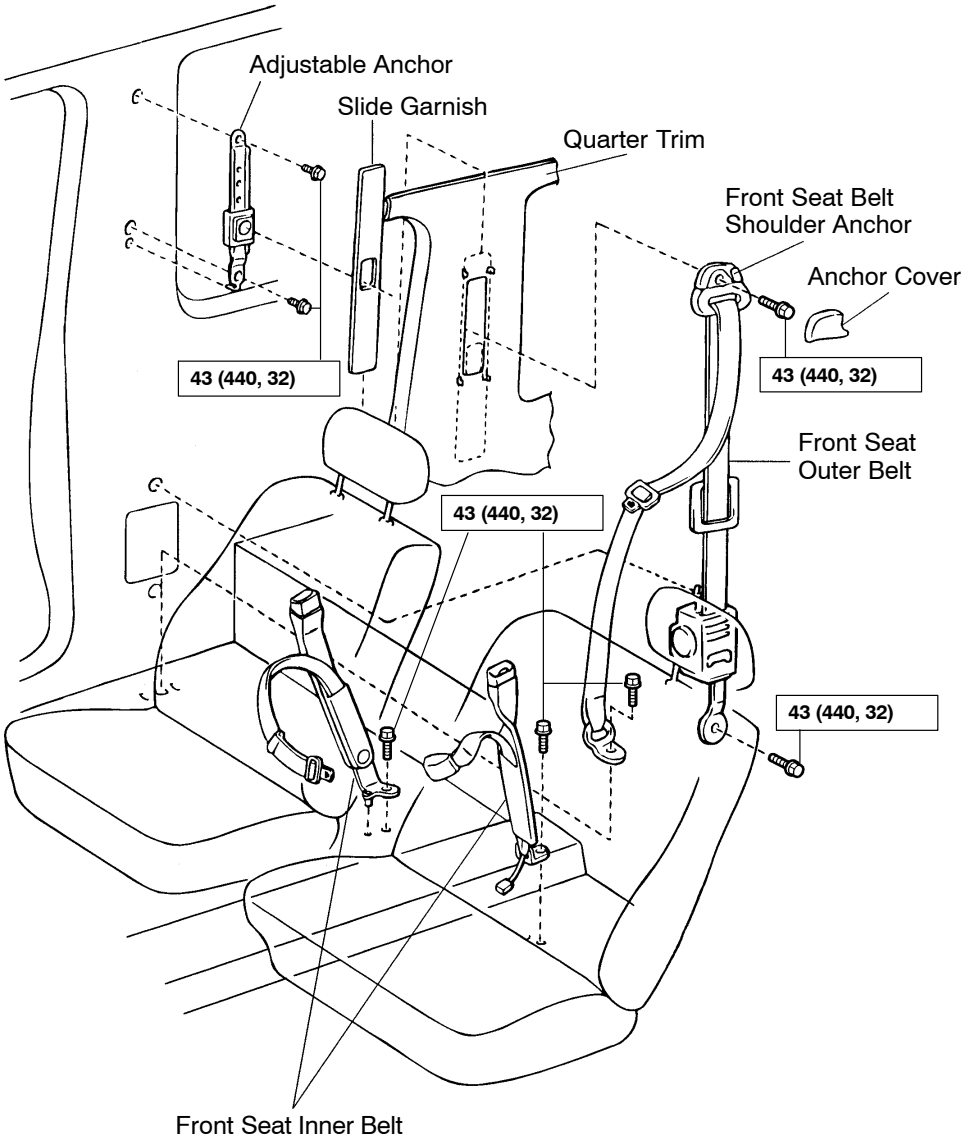


N·m (kgf·cm, ft·lbf) : Specified torque

N21244

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Extra cab
(Front seat belt)

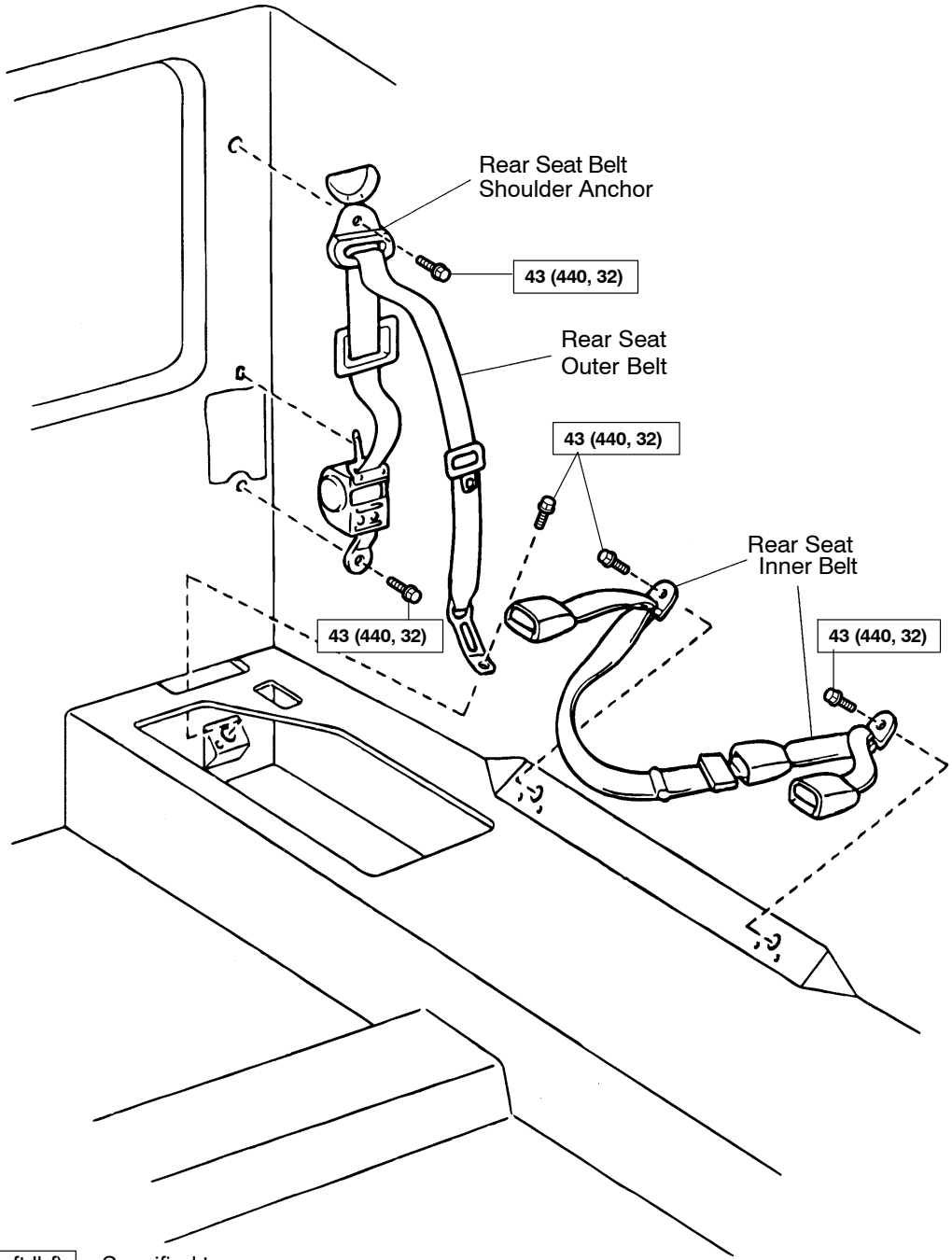


N·m (kgf·cm, ft·lbf) : Specified torque

H16113

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Extra cab
(Rear seat belt)



N·m (kgf·cm, ft·lbf) : Specified torque

N21245

Author : Date : 1933

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BO0FD–02

INSPECTION

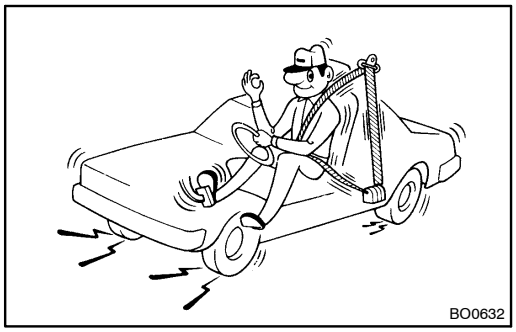
CAUTION:

Replace the seat belt assembly (outer belt, inner belt, bolts or nuts and sill–bar) if it has been used in a severe impact. The entire assembly should be replaced even if damage is not obvious.

1. All seat belts:
RUNNING TEST (IN SAFE AREA)

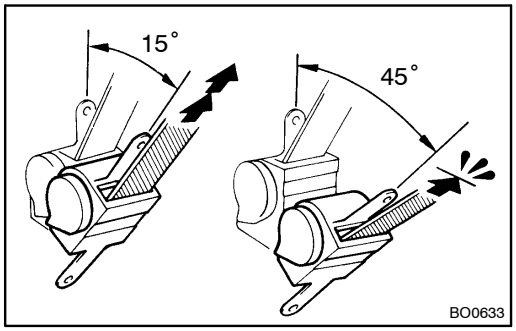
(a) Fasten the seat belts.
(b) Drive the car at 10 mph (16 km/h) and make a very hard stop.
(c) Check that the seat belt is locked and cannot be extended at this time.

HINT:
Conduct this test in a safe area. If the belt does not lock, remove the belt mechanism assembly and conduct the following static check. Also, whenever installing a new belt assembly, verify the proper operation before installation.


BO0632

2. All seat belts:
STATIC TEST

(a) Make sure that the belt locks when pulled out quickly.
(b) Remove the locking retractor assembly.
(c) Tilt the retractor slowly.
(d) Make sure that the belt can be pulled out at a tilt of 15 degrees or less, and cannot be pulled out at over 45 degrees of tilt.



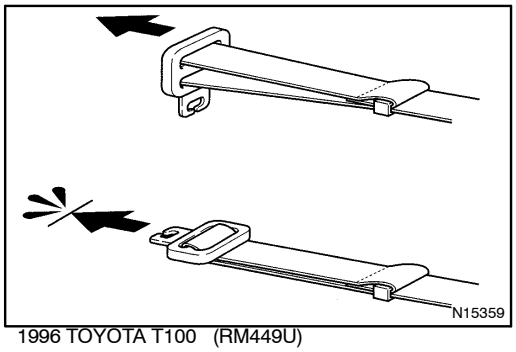
BO0633

If a problem is found, replace the assembly.

3. Except driver's seat belt:
STATIC TEST

(a) Pull out the whole belt, release it slightly and then pull it out again.
(b) Make sure that the belt cannot be extended further.

If a problem is found, replace the assembly.


N15359

4. Manual type seat belt:
TEST

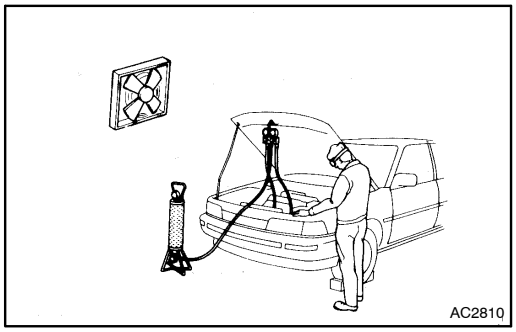
(a) Adjust the belt to the proper length.
(b) Apply a firm load to the belt.
(c) Make sure that the belt does not extend.

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AC – AIR CONDITIONING

AIR CONDITIONING SYSTEM	AC-1
DRIVE BELT	AC-14
MANIFOLD GAUGE SET	AC-17
REFRIGERANT LINE	AC-19
COOLING UNIT	AC-22
HEATER UNIT	AC-27
BLOWER UNIT	AC-33
COMPRESSOR AND MAGNETIC CLUTCH	AC-38
RECEIVER	AC-46
CONDENSER	AC-49
EVAPORATOR	AC-53
HEATER RADIATOR	AC-56
EXPANSION VALVE	AC-59
WATER VALVE	AC-62
BLOWER MOTOR	AC-65
BLOWER RESISTOR	AC-68
THERMISTOR	AC-71
PRESSURE SWITCH	AC-75
HEATER MAIN RELAY	AC-78
AIR CONDITIONING AMPLIFIER	AC-79
AIR CONDITIONING SWITCH	AC-82
HEATER CONTROL ASSEMBLY	AC-85

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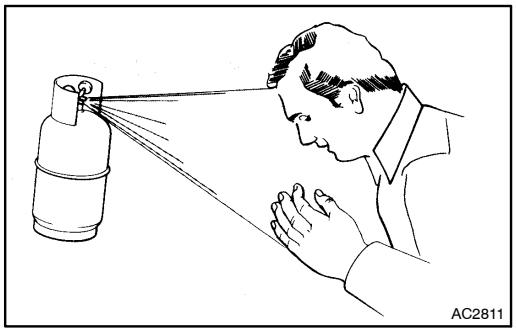
AIR CONDITIONING SYSTEM

AC0EV-02

PRECAUTION

1. DO NOT HANDLE REFRIGERANT IN AN ENCLOSED AREA OR WEAR EYE PROTECTION

2. ALWAYS WEAR EYE PROTECTION



3. BE CAREFUL NOT TO GET LIQUID REFRIGERANT IN YOUR EYES OR ON YOUR SKIN

If liquid refrigerant gets in your eyes or on your skin.

(a) Wash the area with lots of cool water.

CAUTION:

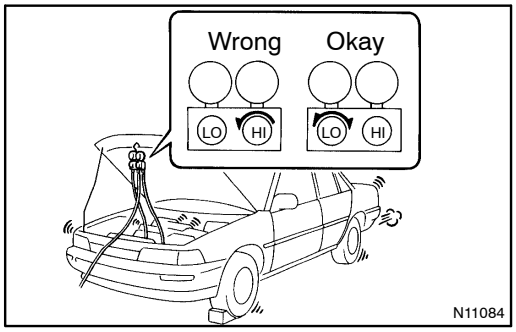
Do not rub your eyes or skin.

(b) Apply clean petroleum jelly to the skin.

(c) Go immediately to a physician or hospital for professional treatment.

4. NEVER HEAT CONTAINER OR EXPOSE IT TO NAKED FLAME

5. BE CAREFUL NOT TO DROP CONTAINER AND NOT TO APPLY PHYSICAL SHOCKS TO IT



6. DO NOT OPERATE COMPRESSOR WITHOUT ENOUGH REFRIGERANT IN REFRIGERATION SYSTEM

If there is not enough refrigerant in the refrigerant system oil lubrication will be insufficient and compressor burnout may occur, so that care to avoid this, necessary care should be taken.

7. DO NOT OPEN PRESSURE MANIFOLD VALVE WHILE COMPRESSOR IS OPERATE

If the high pressure valve is opened, refrigerant flows in the reverse direction and could cause the charging cylinder to rupture, so open and close the only low pressure valve.

8. BE CAREFUL NOT TO OVERCHARGE SYSTEM WITH REFRIGERANT

If refrigerant is overcharged, it causes problems such as insufficient cooling, poor fuel economy, engine overheating etc.

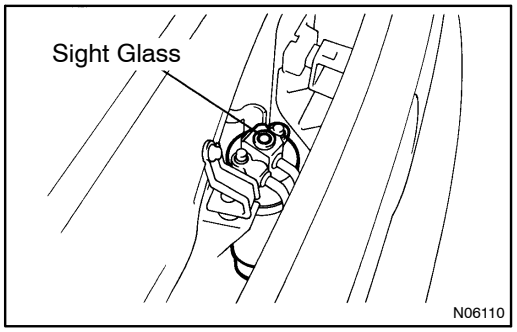
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9. SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

The TOYOTA T100 is equipped with an SRS (Supplemental Restraint System) such as the driver airbag and passenger airbag. Failure to carry out service operations the correct sequence could cause the SRS to unexpectedly deployed during servicing, possible the SRS may fail to operate when required. Before servicing (including removal or installation of parts, inspection or replacement), be sure to read the following item carefully, then follow the correct procedure described in the repair manual.

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AC0EX–02



ON–VEHICLE INSPECTION

1. INSPECT REFRIGERANT VOLUME

Observe the sight glass on the liquid tube.

Test conditions:

- Running engine at 1,500 rpm
- Blower speed control switch on ”HI” position
- A/C switch ON
- Temperature control dial on ”COOL” position
- Fully open the doors

Item	Symptom	Amount of refrigerant	Remedy
1	Bubbles present in sight glass	Insufficient*	(1) Check for gas leakage with gas leak detector and repair if necessary (2) Add refrigerant until bubbles disappear
2	No bubbles present in sight glass	None, sufficient or too much	Refer item 3 and 4
3	No temperature difference between compressor inlet and outlet	Empty or nearly empty	(1) Check for gas leakage with gas leak detector and repair if necessary (2) Add refrigerant until bubbles disappear
4	Temperature between compressor inlet and outlet is noticeably different	Correct or too much	Refer to items 5 and 6
5	Immediately after air conditioning is turned off, refrigerant in sight glass stays clear	Too much	(1) Discharge refrigerant (2) Evacuate air and charge proper amount of purified refrigerant
6	When air conditioning is turned off, refrigerant foams and then stays clear	Correct	–

*: Bubbles in the sight glass with ambient temperatures higher than usual can be considered normal if cooling is sufficient.

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2. INSPECT REFRIGERANT PRESSURE WITH MANIFOLD GAUGE SET

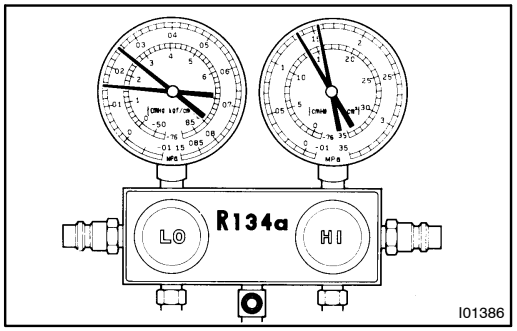
This is a method in which the trouble is located by using a manifold gauge set. Read the manifold gauge pressure when these conditions are established.

Test conditions:

- Temperature at the air inlet with the switch set at RECURC is 30 – 35 °C (86 – 95 °F)
- Engine running at 1500 rpm
- Blower speed control switch on "HI" position
- Temperature control dial on "COOL" position

HINT:

It should be noted that the gauge indications may vary slightly due to ambient temperature conditions.



(1) Normally functioning refrigeration system.

Gauge reading:

Low pressure side:

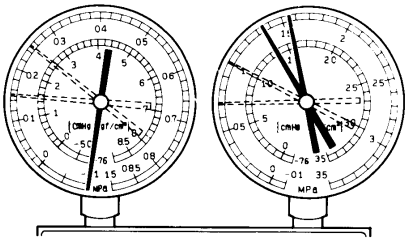
0.15 – 0.25 MPa (1.5 – 2.5 kgf/cm^2)

High pressure side:

1.37 – 1.57 MPa (14 – 16 kgf/cm^2)

(2) Moisture present in refrigeration system.

Condition: Periodically cools and then fails to cool

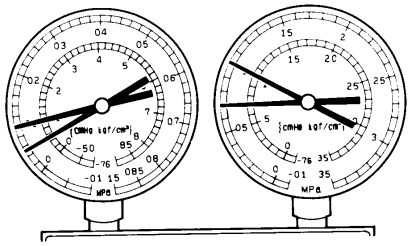


Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
During operation, pressure on low pressure side sometimes become a vacuum and sometime normal	Moisture entered in refrigeration system freezes at expansion valve orifice and temporarily stops cycle, but normal state is restored after a time when the ice melts	• Drier in oversaturated state • Moisture in refrigeration system freezes at expansion valve orifice and blocks circulation of refrigerant	(1) Replace receiver (2) Remove moisture in cycle through repeatedly evacuating air (3) Charge proper amount of new refrigerant

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(3) Insufficient cooling

Condition: Insufficient cooling

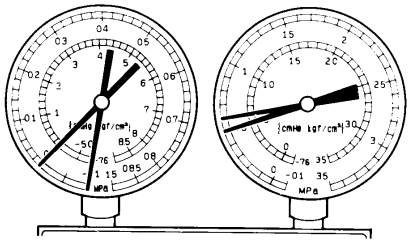


I01388

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure low on both low and high pressure sides • Bubbles seen in sight glass continuously • Insufficient cooling performance	Gas leakage at some place in refrigeration system	• Insufficient refrigerant in system • Refrigerant leaking	(1) Check for gas leakage with gas leak detector and repair if necessary (2) Charge Proper amount of refrigerant (3) If indicated pressure value is near 0 when connected to gauge, create the vacuum after inspecting and repairing the location of the leak

(4) Poor circulation of refrigerant

Condition: Insufficient cooling



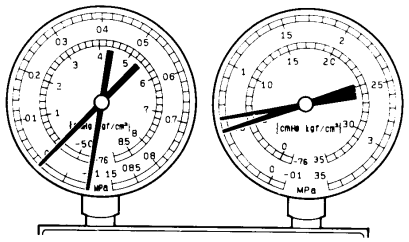
I01389

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure low in both low and high pressure sides • Frost on tube from receiver to unit	Refrigerant flow obstructed by dirt in receiver	Receiver clogged	Replace receiver

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(5) Refrigerant does not circulate

Condition: Does not cool (Cools from time to time in some cases)

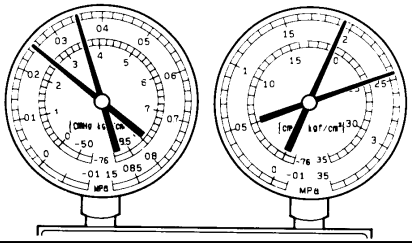


I01449

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Vacuum indicated on low pressure side, very low pressure indicated on high pressure side • Frost or dew seen on piping before and after receiver/ drier or expansion valve	• Refrigerant flow obstructed by moisture or dirt in refrigeration system • Refrigerant flow obstructed by gas leakage from expansion valve	Refrigerant does not circulate	(1) Check expansion valve (2) Clean out dirt in expansion valve by blowing with air (3) Replace receiver (4) Evacuate air and charge new refrigerant to proper amount (5) For gas leakage from expansion valve, replace expansion valve

(6) Refrigerant overcharged or insufficient cooling of condenser

Condition: Insufficient cooling



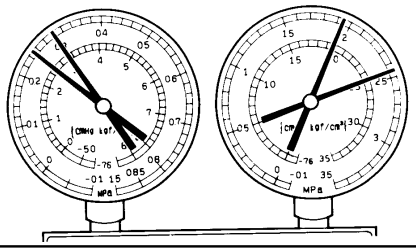
I01390

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure too high on both low and high pressure sides • No air bubbles seen through the sight glass even when the engine rpm is lowered	• Unable to develop sufficient performance due to excessive refrigerant in system • Insufficient cooling of condenser	• Excessive refrigerant in cycle → refrigerant overcharged • Condenser cooling insufficient → condenser fins clogged of cooling fn faulty	(1) Clean condenser (2) Check cooling fan with fluid coupling operation (3) If (1) and (2) are in normal state, check amount of refrigerant Charge proper amount of refrigerant

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(7) Air present in refrigeration system

Condition: Insufficient cooling



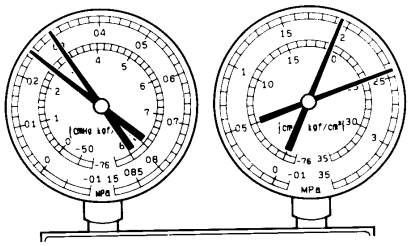
NOTE : These gauge indications are shown when the refrigeration system has been opened and the refrigerant charged without vacuum purging.

I01392

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure too high on both low and high pressure sides • The low pressure piping hot to the touch • Bubbles seen in sight glass	Air entered in refrigeration system	• AIr present in refrigeration system • Insufficient vacuum purging	(1) Check compressor oil to see if it is dirty or insufficient (2) Evacuate air and charge new refrigerant

(8) Expansion valve improperly Mounted/ Heat sensing tube defective (Open too wide)

Condition: Insufficient cooling



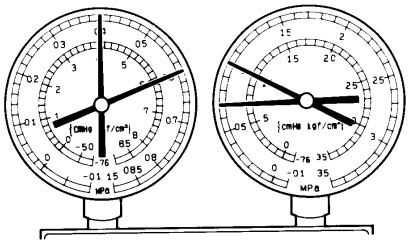
I01450

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure too high on both low and high pressure sides • Frost or large amount of dew on piping on low pressure side	Trouble in expansion valve or heat sensing tube not installed correctly	• Excessive refrigerant in low pressure piping • Expansion valve opened too wide	(1) Check heat sensing tube installed condition (2) Check expansion valve Replace if defective

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(9) Defective compression compressor

Condition : Does not cool



I01393

Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure too high on low and high pressure sides • Pressure too low on high pressure side	Internal leak in compressor	• Compression defective • Valve leaking or broken sliding parts	Repair or replace compressor

3. INSPECT IDLE–UP SPEED

(a) Warm up engine.

(b) Inspect idle–up speed when the these conditions are established.

- Warm up engine
- Blower speed control switch at "HI" position
- A/C switch ON
- Temperature control dial at "COOL" position

Magnetic clutch condition	Idle–up speed
3RZ–FE Engine	–
Magnetic clutch not engaged	700 ± 50 rpm
Magnetic clutch engaged	900 ± 50 rpm
5VZ–FE Engine	–
Magnetic clutch not engaged	700 ± 50 rpm
Magnetic clutch engaged	850 ± 50 rpm

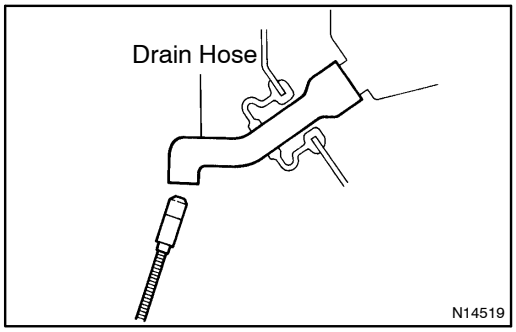
If idle speed is not as specified, check idle control system.

4. INSPECT FOR LEAKAGE OF REFRIGERANT

(a) Perform in these conditions:

- Stop engine.
- Secure good ventilation (If the gas leak detector may not react to volatile gases which are not refrigerant, such as evaporated gasoline and exhaust gas.)
- Repeat the test 2 or 3 times.
- Make sure that there is some refrigerant remaining in the refrigeration system.
  When compressor is OFF: approx. 392 – 588 kPa (4 – 6 kgf/ cm^2, 57 – 85 psi)

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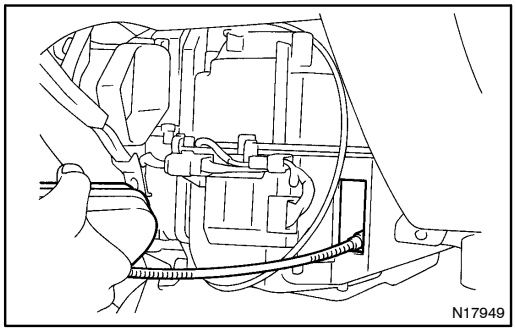


(b) Bring the gas leak detector close to the drain hose before performing the test.

HINT:

- After the blower motor has stopped, leave the cooling unit for more than 15 minutes.
- Expose the gas leak detector sensor under the drain hose.
- When bring the gas leak detector close to the drain hose, make sure that the gas leak detector does not react to the volatile gases.

If such reaction is unavoidable, the vehicle must be lifted up.



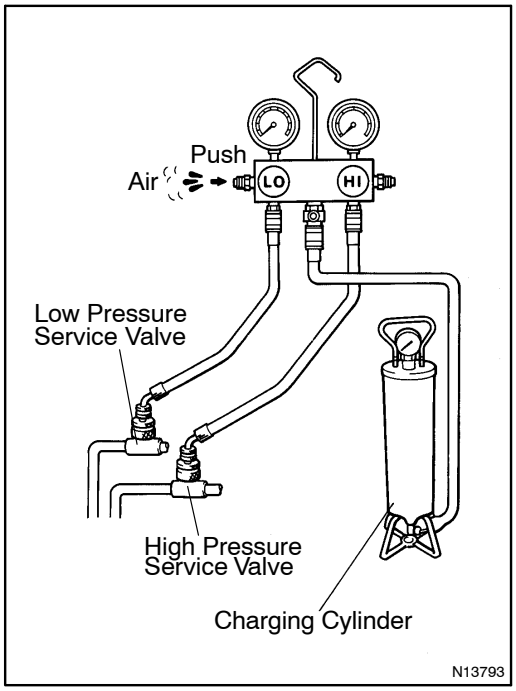
(c) If gas leak is not detected on the drain hose, remove the blower resistor from the cooling unit. Then insert the gas leak detector sensor into the unit and perform the test.

(d) Disconnect the connector and leave the pressure switch for approx. 20 minutes. Then bring the gas leak detector close to the pressure switch and perform the test.

(e) Bring the gas leak detector close to the refrigerant lines and perform the test.

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AC0EZ–01



CHARGING

1. INSTALL CHARGING CYLINDER

HINT:

When handling the charging cylinder, always follow the directions given in the instruction manual.

(a) Charge the proper amount of refrigerant into the charging cylinder.

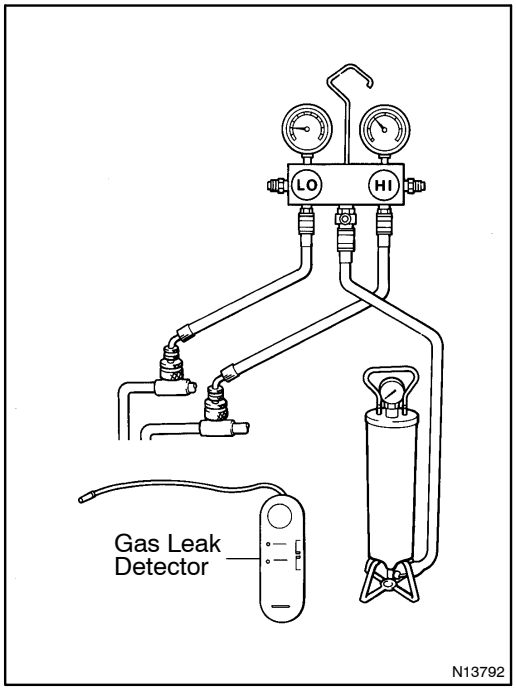
(b) Connect the center hose to the charging cylinder.

CAUTION:

Do not open both high and low hand valves of manifold gauge set.

(c) Open the valve of charging cylinder.

(d) Press the valve core on the side of manifold gauge and expel the air inside of the center hose.



2. INSPECT REFRIGERATION SYSTEM FOR LEAKS

(a) Open the high pressure hand valve and charge refrigerant.

(b) When the low pressure gauge indicates 98 kPa (1 kgf/cm^2, 14 psi) close the high pressure hand valve.

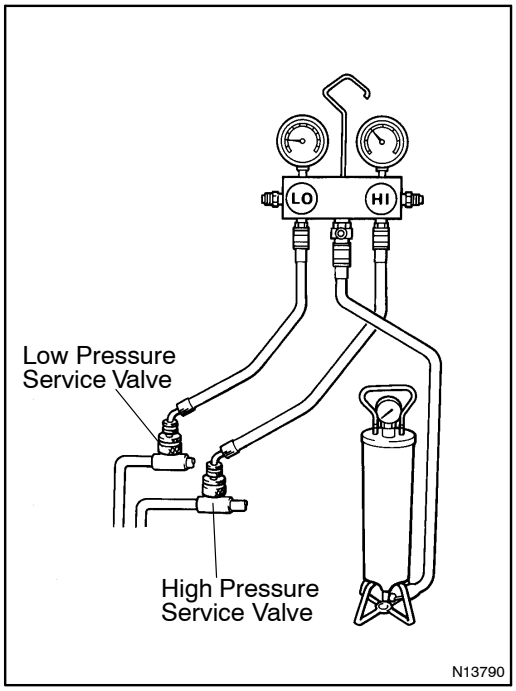
(c) Using a gas leak detector, check the system for leakage.

If leak is found, repair the faulty component or connection.

CAUTION:

Use the refrigerant recovery/ recycling machine to recover the refrigerant whenever replacing parts.

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3. CHARGE REFRIGERANT INTO REFRIGERANT SYSTEM

If there is no leak after refrigerant leak check, charge the proper amount of refrigerant into refrigeration system.

CAUTION:

- **Never run the engine when charging the system through the high pressure side.**
- **Do not open the low pressure hand valve when the system is being charged with liquid refrigerant.**

(a) Open the high pressure hand valve fully.

(b) Charge specified amount of refrigerant, then close the high pressure hand valve.

HINT:

A fully charged system is indicated by the sight glass being free of any bubbles.

4. SET OFF MANIFOLD GAUGE SET

(a) Close both hand valves of manifold gauge set.

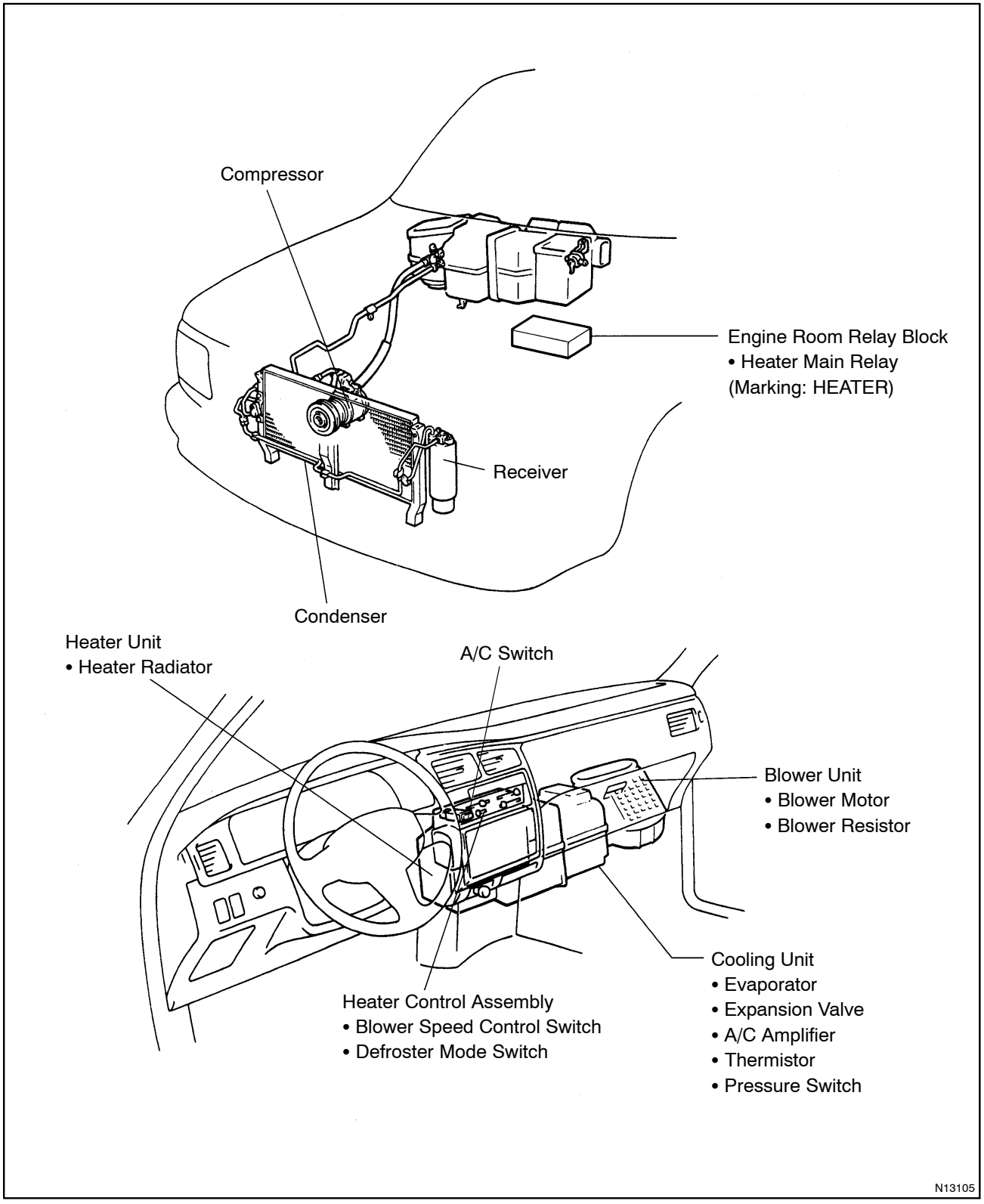
(b) Disconnect the quick disconnect adapters from the service valves.

5. INSTALL CAPS TO SERVICE VALVES ON REFRIGERANT LINES

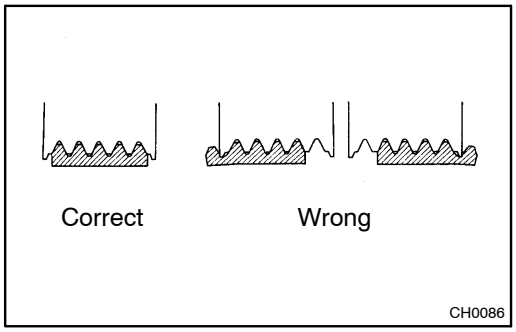
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AC0F0–01

LOCATION



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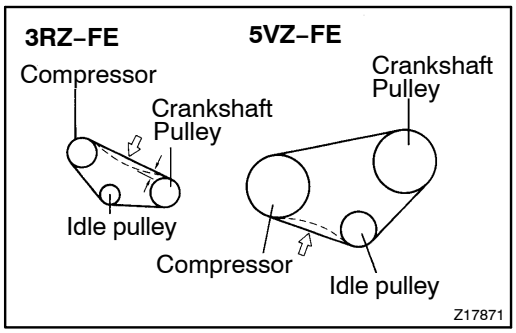
DRIVE BELT

AC0F1–01

ON–VEHICLE INSPECTION

1. INSPECT DRIVE BELT'S INSTALLATION CONDITION

Check that the drive belt fits properly in the ribbed grooves.



2. INSPECT DRIVE BELT TENSION

Using a belt tension gauge, check the drive belt tension.

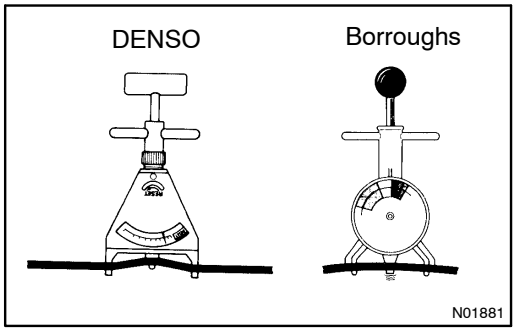
Drive belt tension:

New belt 160 ± 25 lbf

Used belt 100 ± 20 lbf

HINT:

- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly in the ribbed grooves.

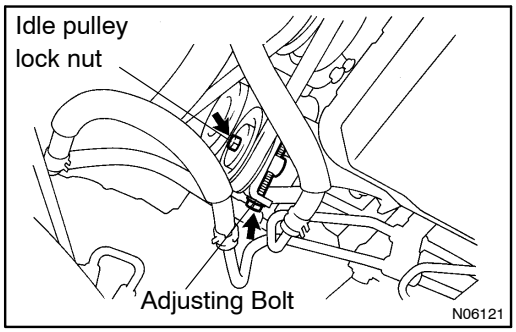


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AC0F2–01

REMOVAL

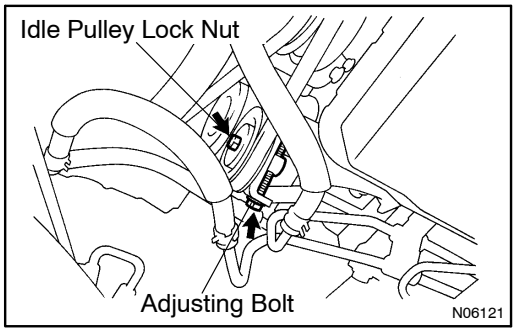
1. **REMOVE PS PUMP DRIVE BELT**
   3RZ–FE: (See page SR–36)
   5VZ–FE: (See page SR–46)
2. **REMOVE ENGINE UNDER COVER**



3. **LOOSEN IDLE PULLEY LOCK NUT**
4. **REMOVE COMPRESSOR DRIVE BELT**

Loosen drive belt tension by adjusting bolt and remove the drive belt.

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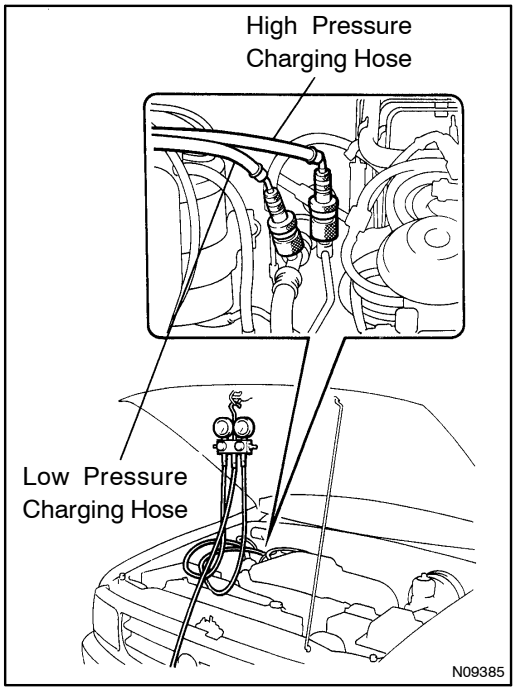


AC0F3–01

INSTALLATION

1. **TIGHTEN IDLE PULLEY LOCK NUT TEMPORALLY**
   Torque: 2.5 N·m (25 kgf·cm, 22 in.·lbf)
2. **INSTALL DRIVE BELT**
3. **USING ADJUSTING BOLT, ADJUST DRIVE BELT TENSION**
   Drive belt tension:
   New belt: 160 ± 25 lbf
   Used belt: 100 ± 25 lbf
4. **TIGHTEN IDLE PULLEY LOCK NUT**
   Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
5. **INSTALL PS PUMP DRIVE BELT**
6. **INSTALL ENGINE UNDER COVER**

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MANIFOLD GAUGE SET

AC0F4–01

SET ON

1. CONNECT CHARGE HOSE TO MANIFOLD GAUGE SET

Tighten the nuts by hand.

CAUTION:

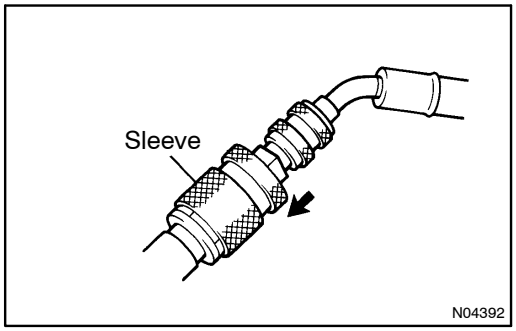
Do not connect the wrong hoses.

2. CONNECT QUICK DISCONNECT ADAPTERS TO CHARGING HOSES

Tighten the nuts by hand.

3. CLOSE BOTH HAND VALVES OF MANIFOLD GAUGE SET

4. REMOVE CAPS FROM SERVICE VALVES ON REFRIGERANT LINE



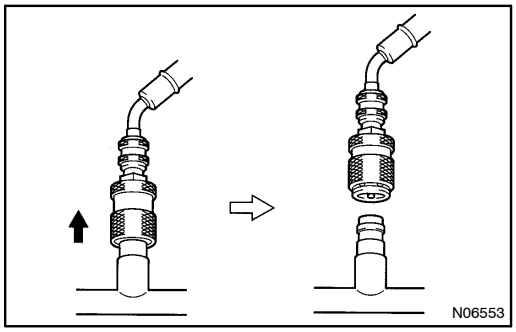
5. CONNECT QUICK DISCONNECT ADAPTERS TO SERVICE VALVES

HINT:

Push the quick disconnect adapter onto the service valve, then slide, then slide the sleeve of the quick disconnect adapter downward to lock it.

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AC0F5–01



SET OFF

1. **CLOSE BOTH HAND VALVE OF MANIFOLD GAUGE SET**
2. **DISCONNECT QUICK DISCONNECT ADAPTERS FROM SERVICE VALVES ON REFRIGERANT LINE**

HINT:

Slide the sleeve of the quick disconnect adapter upward to unlock the adapter and remove it from the service valve.

3. **INSTALL CAPS TO SERVICE VALVES ON REFRIGERANT LINE**

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REFRIGERANT LINE

AC0F6–01

ON–VEHICLE INSPECTION

1. INSPECTION HOSE AND TUBE CONNECTIONS FOR LOOSENESS

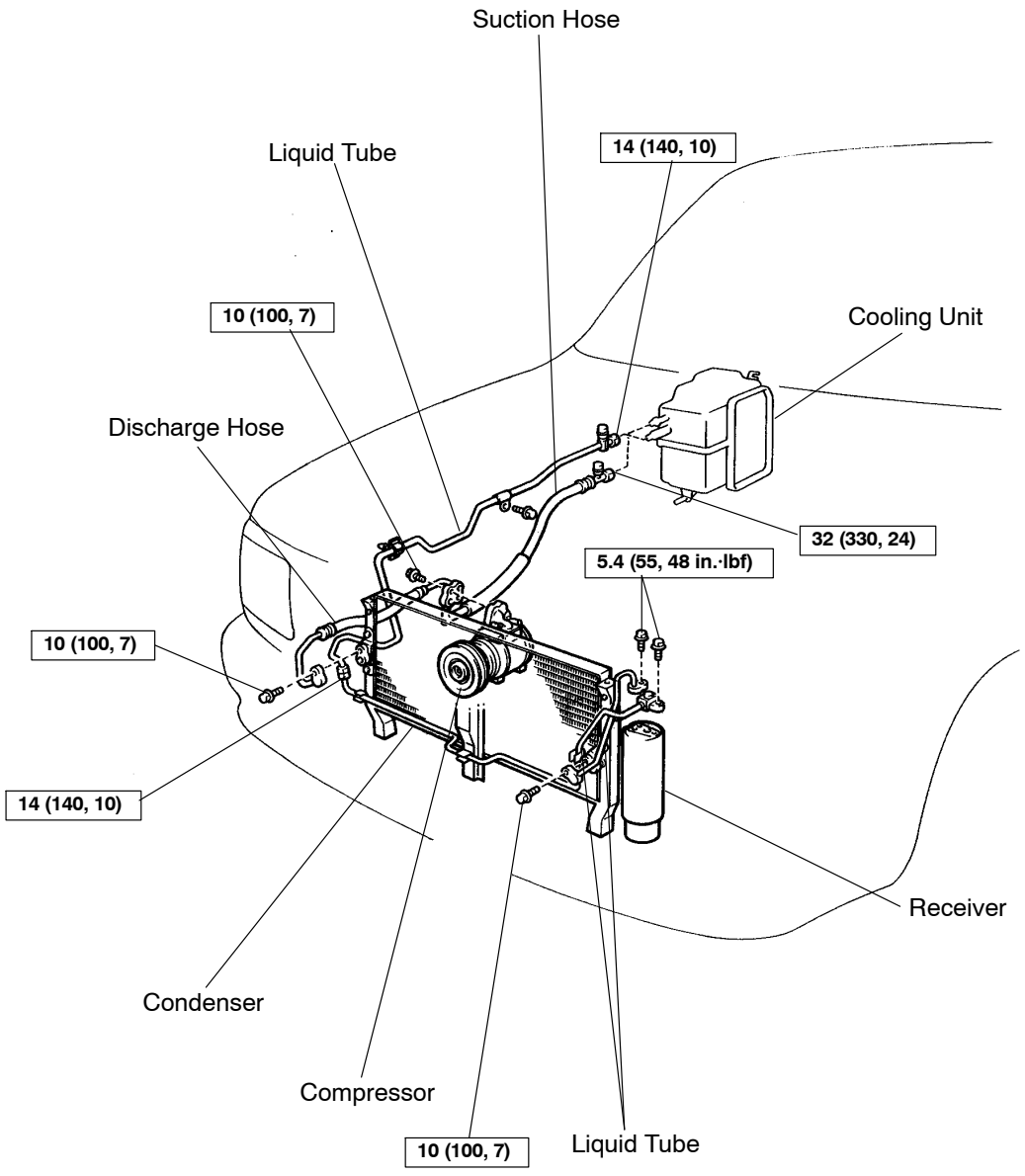
2. INSPECT HOSES AND TUBES FOR LEAKAGE

Using a gas leak detector, check for leakage of refrigerant.

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AC0F7–02

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non–reusable part

N12919

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AC0F8–01

REPLACEMENT

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

2. REPLACE FAULTY TUBE OR HOSE

NOTICE:

Cap the open fittings immediately to keep moisture or dirt out of the system.

3. TIGHTEN JOINT OF BOLT OR NUT TO SPECIFIED TOQUE

NOTICE:

Connections should not be torqued tighter than the specified torque.

Part tightened	N·m	kgf·cm	ft·lbf
Receiver x Liquid tube	6.0	60	52 in.·lbf
Condenser x Discharge hose	10	100	7
Condenser x Liquid tube	14	140	10
Compressor x Discharge hose	10	100	7
Compressor x Suction hose	10	100	7
Cooling unit x Liquid tube	14	140	10
Cooling unit x Suction tube	32	330	24
Expansion valve x Evaporator	22	225	16
Expansion valve x Liquid tube	14	140	10
Suction line (Piping joint)	32	330	24
Liquid line (Piping joint)	14	140	10

4. EVACUATE AIR IN REFRIGERATION SYSTEM AND CHARGE SYSTEM WITH REFRIGERANT

Specified amount: 650 ± 50g (22.92 ± 1.76 oz.)

5. INSPECT FOR LEAKAGE OF REFRIGERANT

Using a gas leak detector, check for leakage of refrigerant.

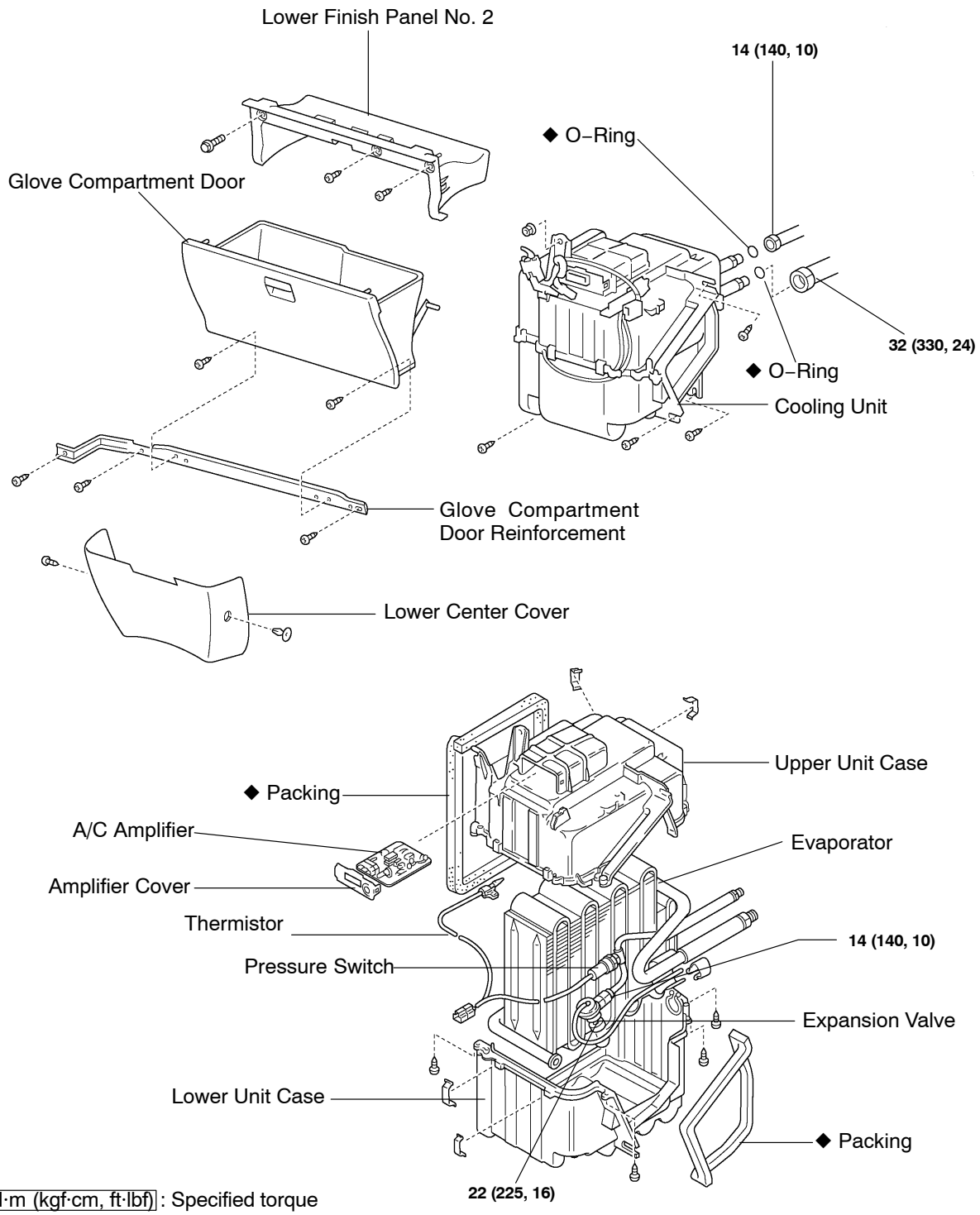
6. INSPECT AIR CONDITIONING OPERATION

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COOLING UNIT

COMPONENTS

AC0F9–02



Author : Date : 1956

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AC0FA–01

REMOVAL

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

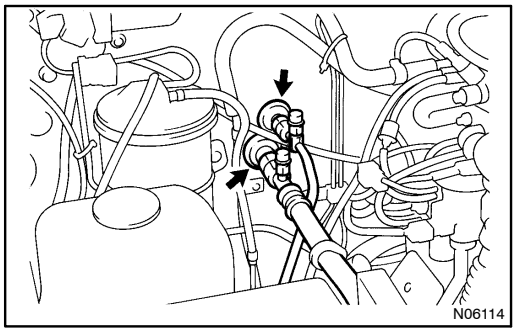
HINT:

At the time of installation, please refer to the following item.

Evacuate air from refrigeration system.

Charge system with refrigerant and inspect for leakage of refrigerant

Specified amount: 650 ± 50 g (22.92 ± 1.76 oz.)



2. DISCONNECT LIQUID TUBE AND SUCTION HOSE

Loosen the 2 nuts and disconnect the both tube and hose.

Torque:

Liquid tube: 14 N·m (140 kgf·cm, 10 ft·lbf)

Suction hose: 32 N·m (330 kgf·cm, 24 ft·lbf)

CAUTION:

Cap the open fittings immediately to keep moisture or dirt out of the system.

HINT:

At the time of installation, please refer to the following item.

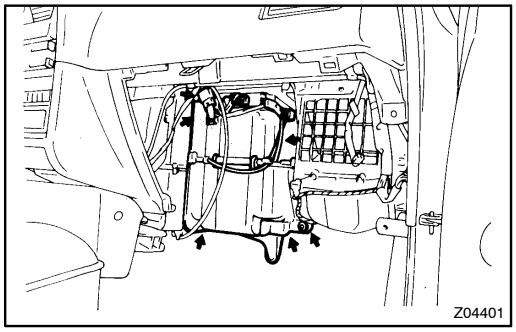
Lubricate 2 new O–rings with compressor oil and install the tube and hose.

3. REMOVE 2 GROMMETS

4. REMOVE DRAIN PIPE GROMMET

5. REMOVE GLOVE COMPARTMENT PARTS

(See page BO–36)



6. REMOVE COOLING UNIT

(a) Disconnect the connectors.

(b) Remove the 5 screws, nut and cooling unit.

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AC0FB–02

DISASSEMBLY

1. REMOVE A/C AMPLIFIER

2. SEPARATE COOLING UNIT CASES

(a) Using a knife, cut off each packing.

(b) Remove the 4 clip and 4 screws then separate the cooling unit cases.

3. REMOVE EVAPORATOR FROM COOLING UNIT CASE

HINT:

At the time of reassembly, please refer to the following item,.

If evaporator is replaced, add compressor oil to evaporator.

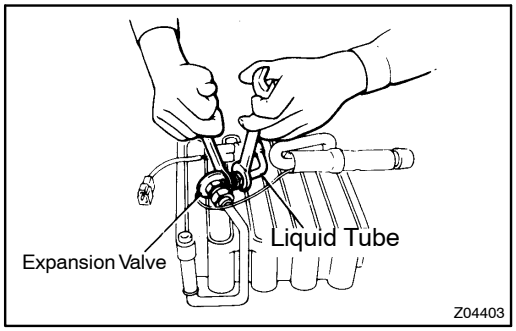
Add 40 cc (1.4 fl.oz.)

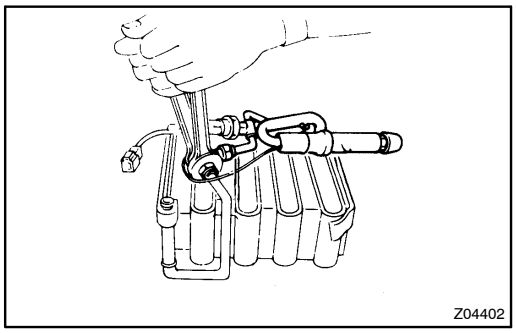
Compressor oil: ND–OIL 8 or equivalent

4. REMOVE THERMISTOR FROM EVAPORATOR

(a) Disconnect the connector from pressure switch.

(b) Pull out the thermistor from evaporator.





5. REMOVE EXPANSION VALVE

(a) Pry out the packing.

(b) Remove the clamp and disconnect heat sensing tube.

(c) Loosen the 2 nuts and remove the expansion valve.

Torque:

Expansion valve x Liquid tube:

14 N·m (140 kgf·cm, 10 ft·lbf)

Expansion valve x Evaporator:

22 N·m (225 kgf·cm, 16 ft·lbf)

NOTICE:

Cap the open fittings immediately to keep moisture or dirt out of the system.

HINT:

At the time of reassembly, please refer to the following item.

Lubricate 2 new O–rings with compressor oil and install the valve.

6. REMOVE PRESSURE SWITCH

(a) Disconnect the connector.

(b) Remove the pressure switch from liquid tube.

Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

HINT:

- Lock the switch mounted on the tube with on open end wrench, being careful not to deform the tube and remove the switch.
- At the time of installation, please refer to the following item.

  Lubricate a new O–ring with compressor oil and install the valve.

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AC0FC–01

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page AC–24).

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AC0FD–01

INSTALLATION

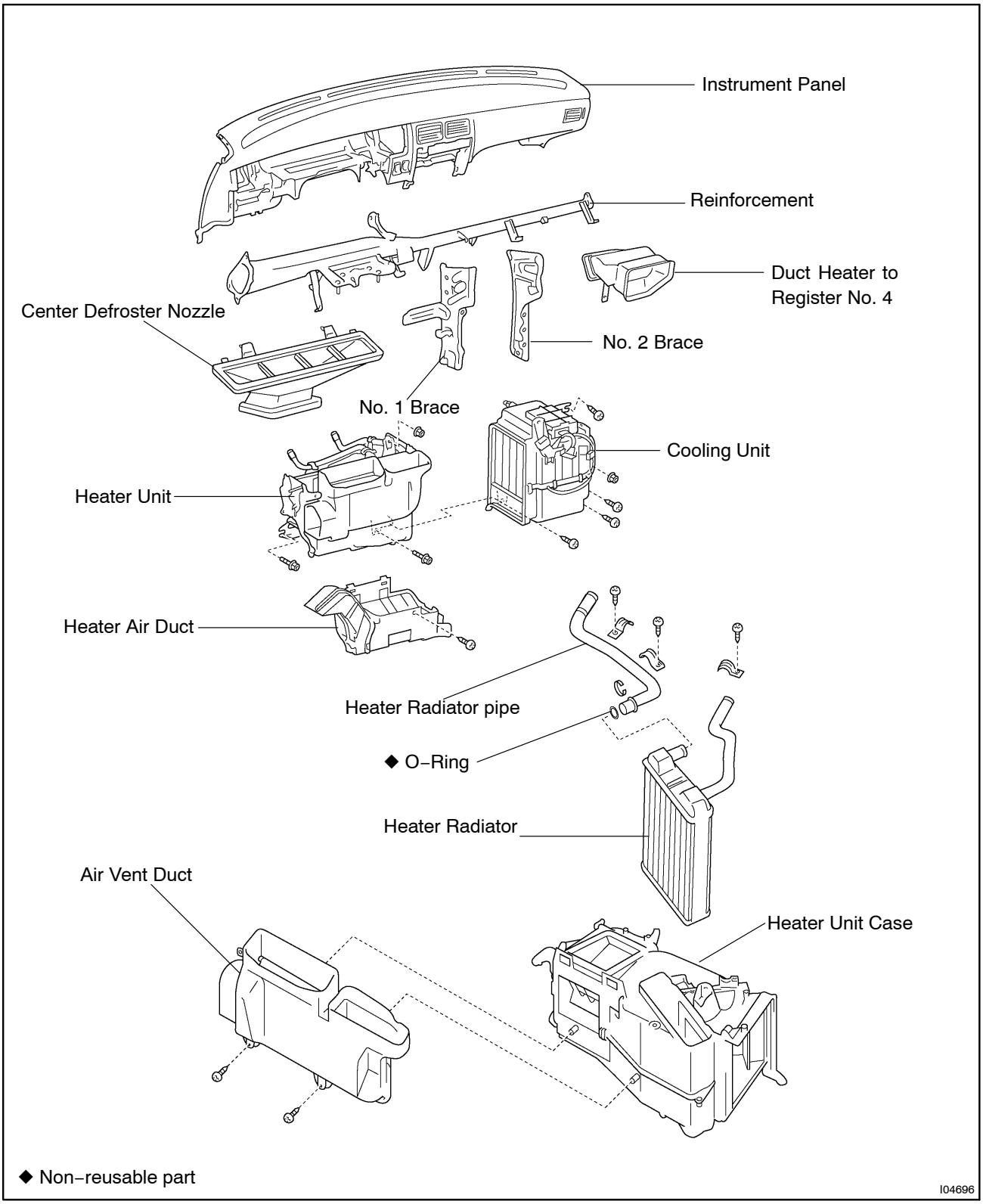
Installation is in the reverse order of removal (See page AC–23).

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HEATER UNIT

COMPONENTS

AC0FE–01



Author : Date : 1961

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AC0FF–02

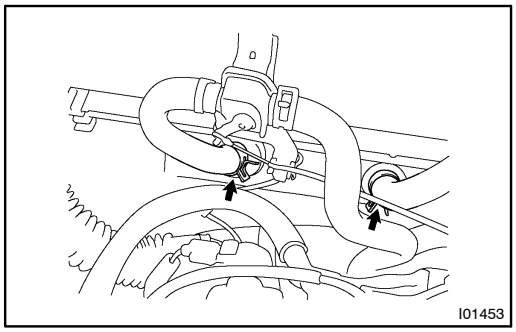
REMOVAL

1. REMOVE COOLING UNIT (See page AC–23)

2. DRAIN ENGINE COOLANT FROM RADIATOR

HINT:

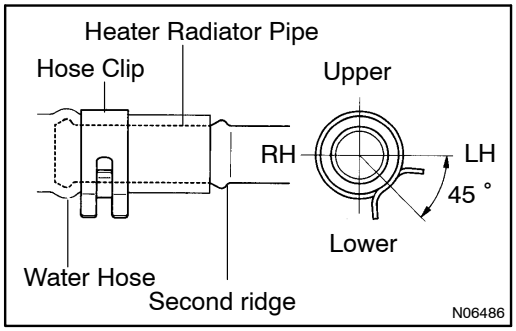
It is not necessary to drain out all coolant.



3. DISCONNECT WATER HOSES FROM HEATER RADIATOR PIPES

(a) Grip the claws of hose clip and slide the hose clip along the hose.

(b) Disconnect the water hose.



HINT:

At the time of installation, please refer to the following item.

- Push the water hose onto the heater radiator pipe as far as the second ridge on the pipe.
- Install the hose clip in the position, as shown in the illustration.

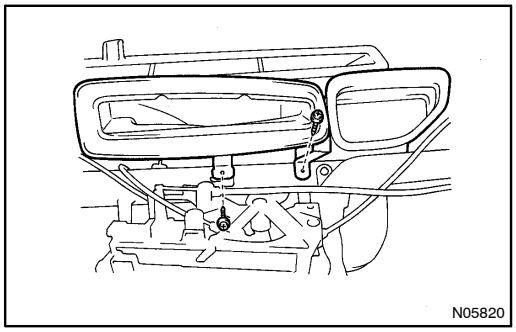
4. REMOVE INSTRUMENT PANEL AND REINFORCEMENT (See page BO–36)

5. DISCONNECT HEATER CONTROL CABLES FROM HEATER UNIT

HINT:

At the time of installation, please refer to the following item.

After connection, adjust the control cables.



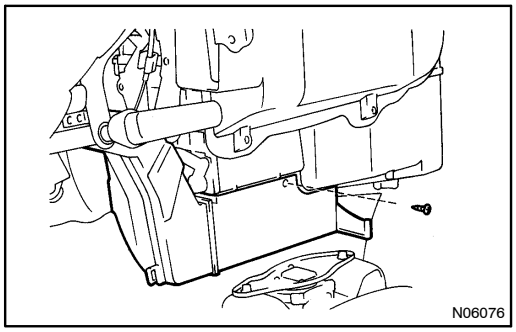
6. REMOVE HEATER TO REGISTER No. 4 DUCT

Remove the screw and the duct.

7. REMOVE HEATER TO REGISTER CENTER DUCT

Remove the screw and duct.

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8. REMOVE HEATER AIR DUCT

Remove the screw and duct.

9. REMOVE HEATER UNIT

Remove the 2 bolts, nut and heater unit.

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AC0FG–01

DISASSEMBLY

1. REMOVE HEATER RADIATOR

(a) Remove the 3 screws and 3 plates.
(b) Pull out the heater radiator.
(c) Remove the 2 clips and heater radiator pipes.
(d) Remove the 2 O–rings from heater radiator pipes.

HINT:
At the time of reassembly, please refer to the following item.
Do not reuse the 2 O–rings.

2. REMOVE AIR VENT DUCT

Remove the 2 screws and duct.

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AC0FH–01

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page AC–30).

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AC0FI–01

INSTALLATION

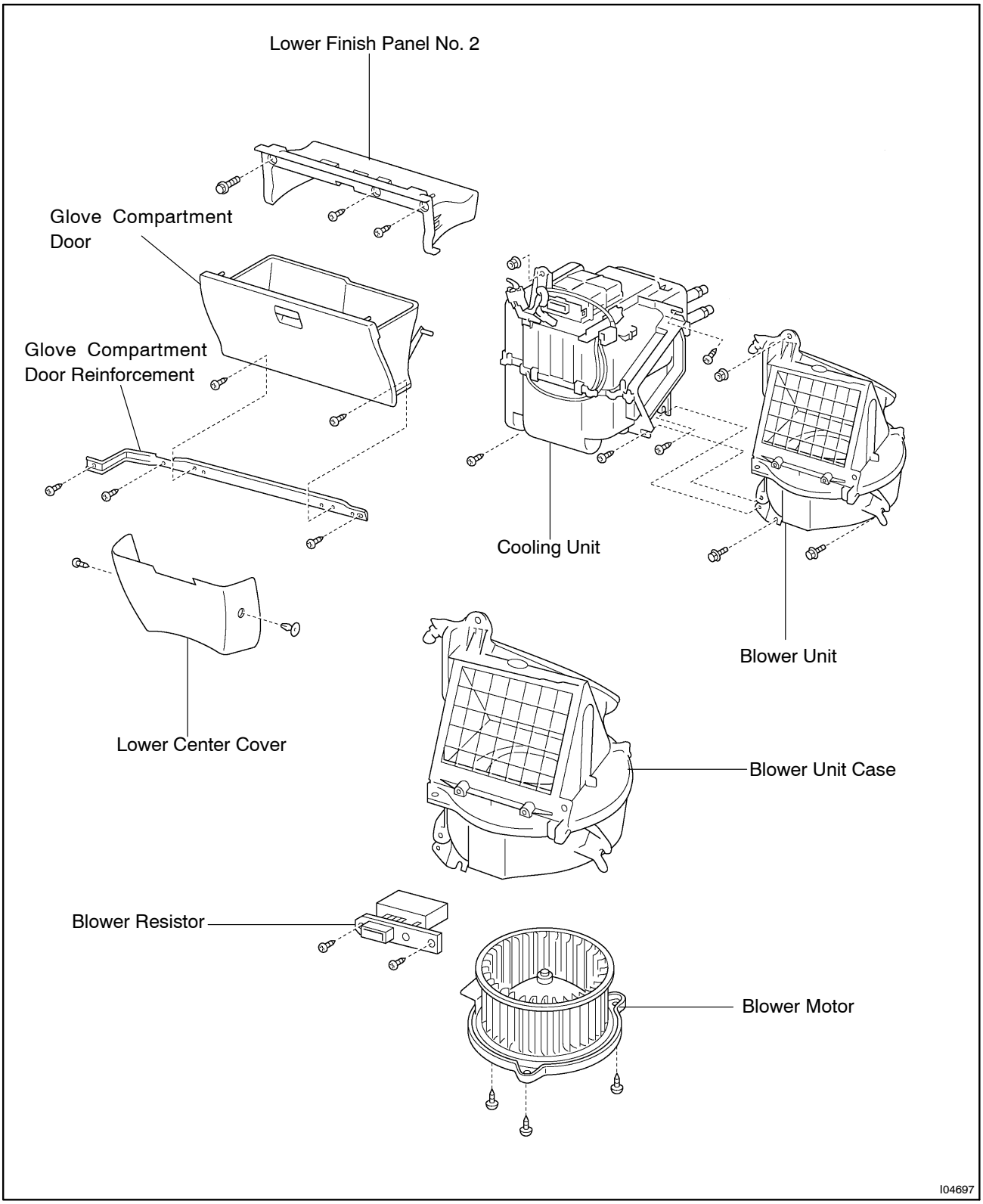
Installation is in the reverse order of removal (See page AC–28).

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BLOWER UNIT

COMPONENTS

AC0FJ–01



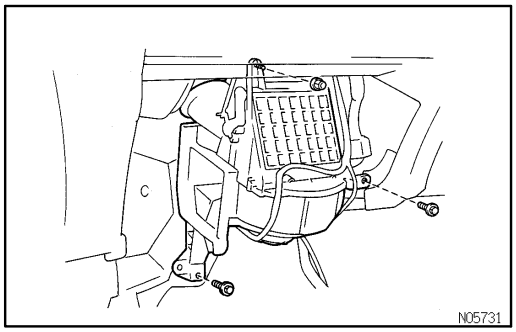
Author : Date : 1967

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AC3IX–01

REMOVAL

1. **REMOVE GLOVE COMPARTMENT DOOR**
2. **REMOVE GLOVE COMPARTMENT REINFORCEMENT**
3. **REMOVE INSTRUMENT PANEL LOWER FINISH PANEL**
4. **REMOVE COOLING UNIT**



5. **REMOVE BLOWER UNIT**

(a) Disconnect the connectors.

(b) Disconnect the air inlet control cable.

HINT:

At the time of installation, please refer to the following item. After connection, adjust the control cable.

(c) Remove the nut, 2 bolts and blower unit.

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AC0FL–01

DISASSEMBLY

1. REMOVE BLOWER MOTOR

Remove the 3 screws and blower motor.

2. REMOVE BLOWER RESISTOR

Remove the 2 screws and blower resistor.

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AC0FM–01

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page AC–35).

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AC0FN–01

INSTALLATION

Installation is in the reverse order of removal (See page AC–34).

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COMPRESSOR AND MAGNETIC CLUTCH

AC07W–02

ON–VEHICLE INSPECTION

1. SET ON MANIFOLD GAUGE SET
(See page AC–17)

2. START ENGINE

3. INSPECT COMPRESSOR FOR METALLIC SOUND

Check if there is an abnormal metallic sound from the compressor when the A/C switch is on.

If abnormal metallic sound is heard, replace the compressor assembly.

4. INSPECT REFRIGERANT PRESSURE

See "ON–VEHICLE INSPECTION" of AIR CONDITIONING SYSTEM on page AC–3.

5. STOP ENGINE

6. INSPECT VISUALLY FOR LEAKAGE OF REFRIGERANT FROM SAFETY SEAL

Using a gas leak detector, check for leakage of refrigerant.

If there is any leakage, replace the compressor assembly.

7. SET OFF MANIFOLD GAUGE SET
(See page AC–18)

8. MAKE THESE VISUAL CHECK:

(a) Leakage of grease from the clutch bearing.

(b) Signs of oil on the pressure plate

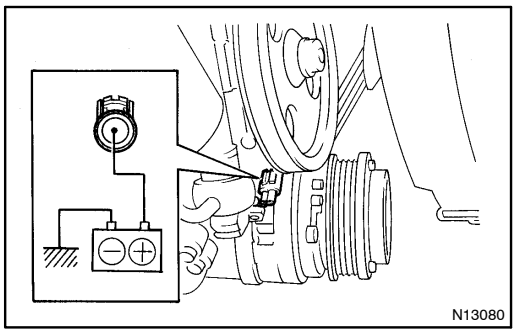
If necessary, repair or replace.

9. INSPECT MAGNETIC CLUTCH BEARING FOR NOISE

(a) Start engine.

(b) Check for abnormal noise from near the compressor when the A/C switch is OFF.

If abnormal noise is being emitted, replace the magnetic clutch.



10. INSPECT MAGNETIC CLUTCH OPERATION

(a) Disconnect the connector.

(b) Connect the positive (+) lead from the battery to terminal on the magnetic clutch connector and the negative (–) lead to the body ground.

(c) Check that the magnetic clutch is energized.

If operation is not as specified, replace the magnetic clutch.

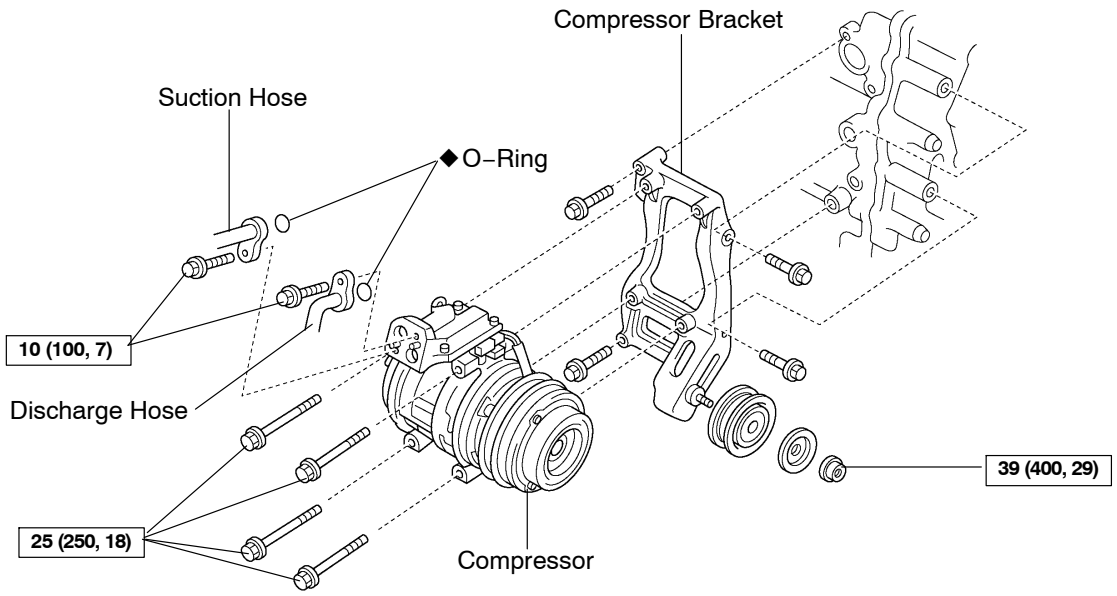
Author : Date : 1972

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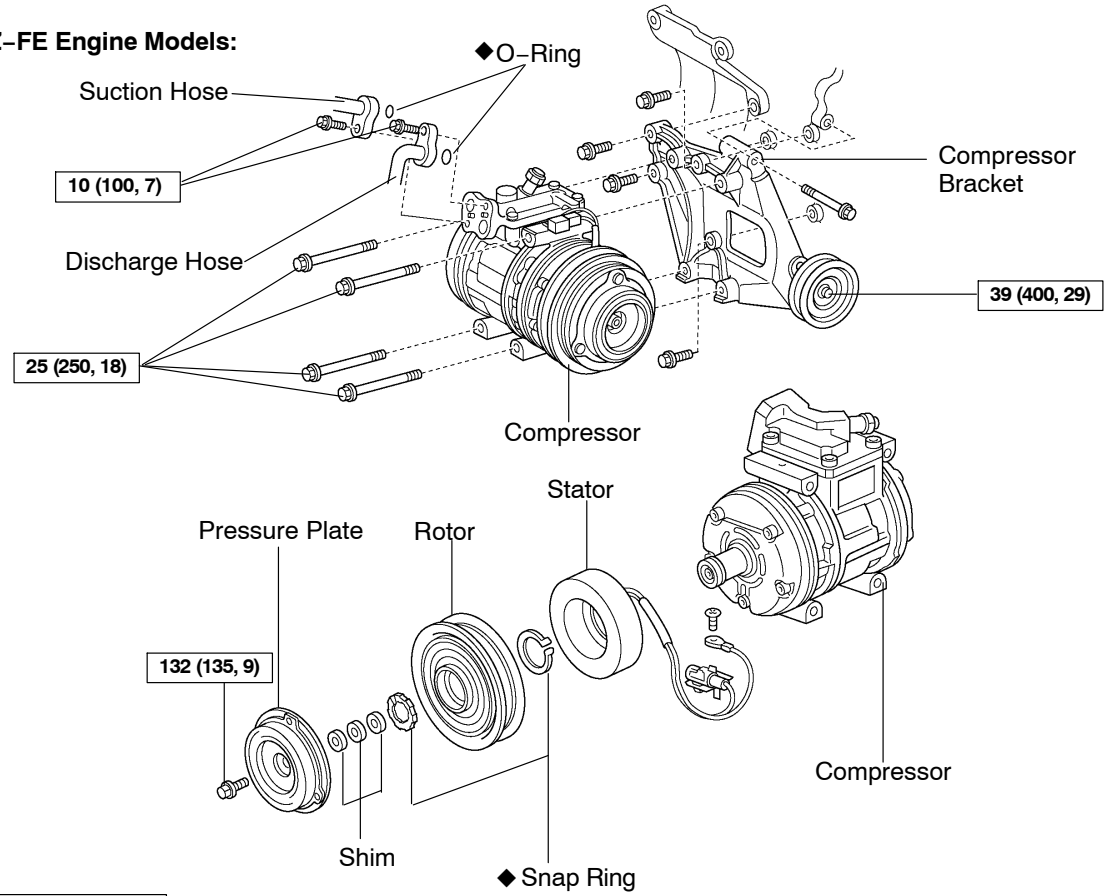
AC07X–03

COMPONENTS

3RZ–FE Engine Models:



5VZ–FE Engine Models:



N·m (kgf·cm,ft·lbf) : Specified torque

◆ Non–reusable part

I01455

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AC07Y–02

REMOVAL

1. RUN ENGINE AT IDLE SPEED WITH A/C ON FOR APPROX. 10 MINUTES WITH A/C ON

2. STOP ENGINE

3. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

4. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

5. REMOVE ENGINE UNDER COVER

6. DISCONNECT DISCHARGE AND SUCTION HOSES

Remove the 2 bolts and disconnect the both hoses.

NOTICE:

Cap the open fitting immediately to keep moisture or dirt out of the system.

7. REMOVE DRIVE BELT (See page AC–15)

8. 5VZ–FE Engine Models:
REMOVE PS PUMP SET BOLT AND NUT

9. REMOVE COMPRESSOR

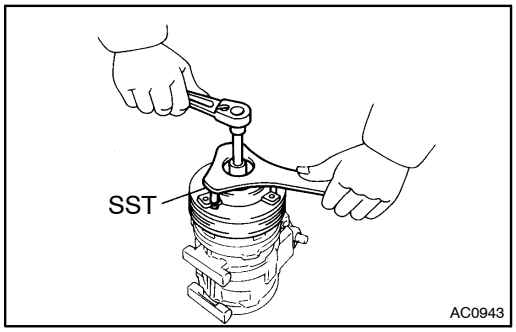
(a) Disconnect the connector.

(b) Remove the 4 bolts and compressor.

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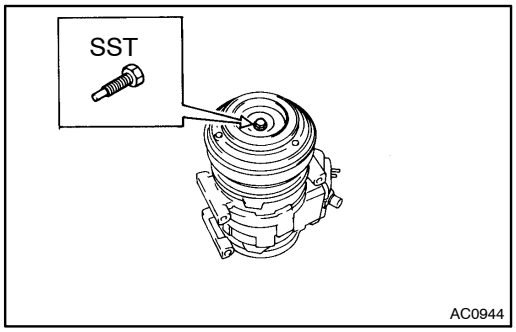
AC07Z–02

DISASSEMBLY

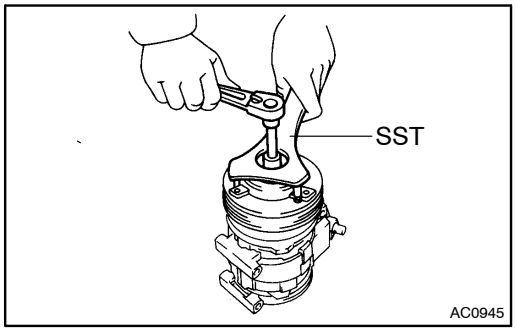


1. REMOVE PRESSURE PLATE

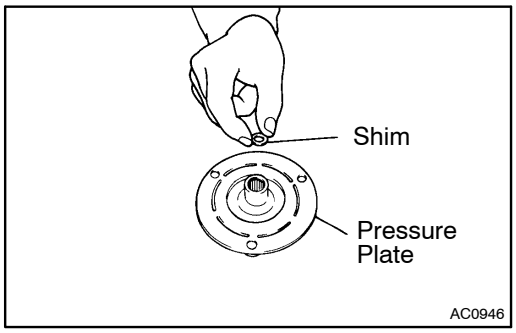
(a) Using SST and a socket wrench, remove the shaft bolt.
SST 07112–76060
Torque: 13.2 N·m (135 kgf·cm, 9 ft·lbf)



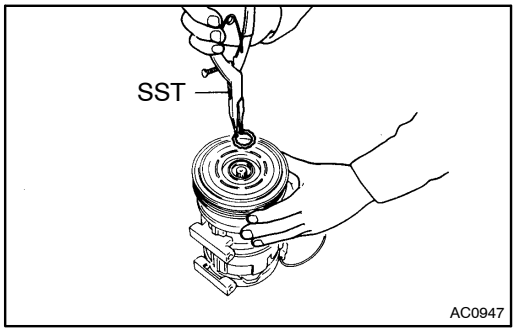
(b) Install SST on the pressure plate.
SST 07112–66040



(c) Using SST and socket wrench, remove the pressure plate.
SST 07112–66040, 07112–76060



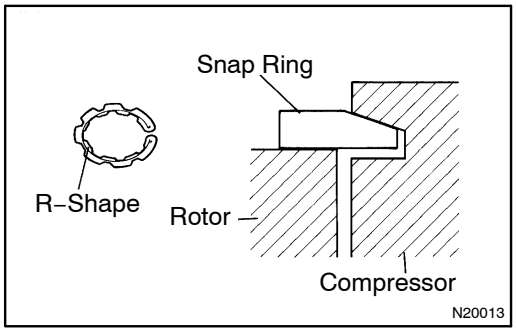
(d) Remove the shims from the pressure plate.



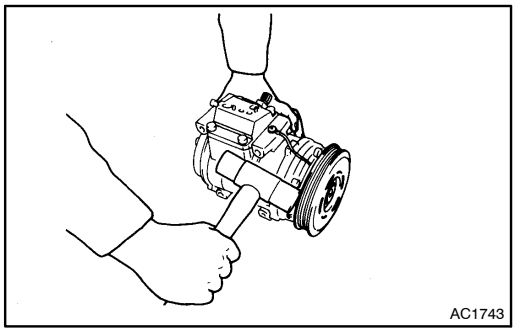
2. REMOVE ROTOR

(a) Using SST, remove the snap ring.
SST 07114–84020

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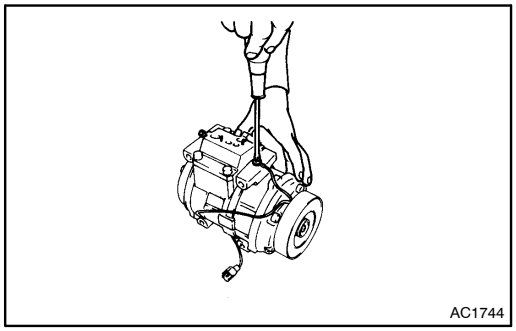


NOTICE:
At the time of reassembly, please refer to the following item.
The snap ring should be installed so that beveled side faces up.



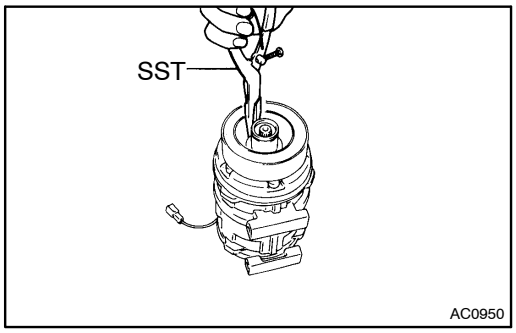
(b) Using a plastic hammer, tap the rotor off the shaft.

NOTICE:
Be careful not to damage the pulley when tapping on the rotor.

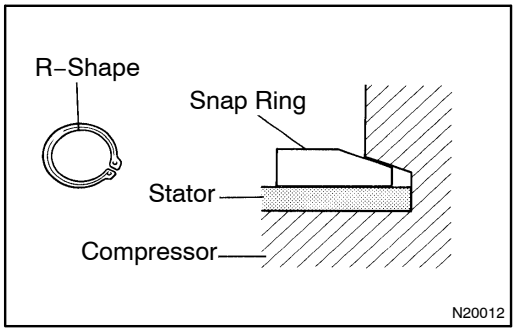


3. REMOVE STATOR

(a) Disconnect the stator lead wire from the compressor housing.

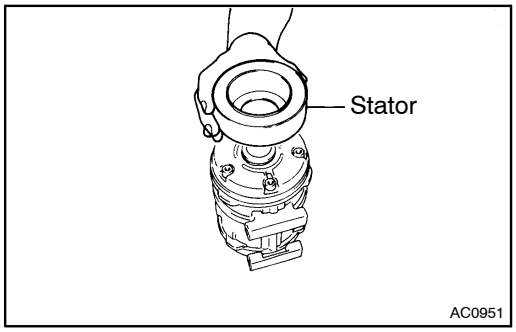


(b) Using SST, remove the snap ring.
SST 07114–84020



NOTICE:
At the time of reassembly, please refer to the following item.
The snap ring should be installed so that its beveled side faces up.

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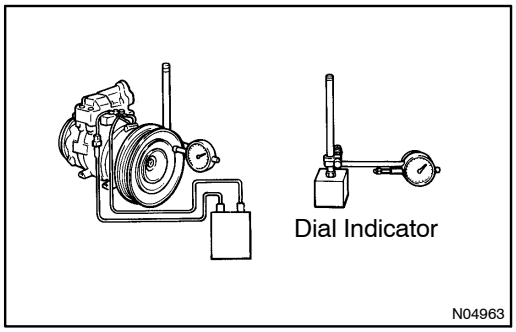
(c) Remove the stator.

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AC080–02

REASSEMBLY

Reassembly is in the reverse order of disassembly (See page AC–41).



AFTER REASSEMBLY, CHECK THE MAGNETIC CLUTCH CLEARANCE

(a) Set the dial indicator to the pressure plate of the magnetic clutch.

(b) Connect the magnetic clutch lead wire to the positive (+) terminal of the battery.

(c) Check the clearance between the pressure plate and rotor when connecting the negative (–) terminal to the battery.

Standard clearance:
0.5 ± 0.15 mm (0.020 ± 0.0059 in.)

If the clearance is not within the standard clearance, adjust the clearance using shims to obtain the standard clearance.

Shim thickness:
0.1 mm (0.004 in.)
0.3 mm (0.012 in.)
0.5 mm (0.020 in.)

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AC081–02

INSTALLATION

1. INSTALL COMPRESSOR

(a) Install the compressor with 4 bolts.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(b) Connect the connector.

2. CONNECT DISCHARGE AND SUCTION HOSES

Connect the both hoses with the 2 bolts.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

NOTICE:

Hose should be connected immediately after the caps have been removed.

HINT:

Lubricate 2 new O–rings with compressor oil and install the hoses.

3. INSTALL AND CHECK DRIVE BELT
(See page AC–16, AC–14)

4. INSTALL ENGINE UNDER COVER

5. 5VZ– FE Engine Models:
INSTALL PS PUMP SET BOLT AND NUT
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

6. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

7. EVACUATE AIR FROM REFRIGERATION SYSTEM

8. CHARGE SYSTEM WITH REFRIGERANT
Specified amount: 650 ± 50 g (22.92 ± 1.76 oz.)

9. INSPECT FOR LEAKAGE OF REFRIGERANT

Using a gas leak detector, check for leakage of refrigerant.
If there is leakage, check the tightening torque at the joints.

10. INSPECT A/C OPERATION

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RECEIVER

AC0FO–01

ON–VEHICLE INSPECTION

INSPECT FITTINGS FOR LEAKAGE

Using a gas leak detector, check for leakage.
If there is leakage, check the tightening toque at the joints.

Author : Date : 1980

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AC0FP–02

REMOVAL

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

HINT:

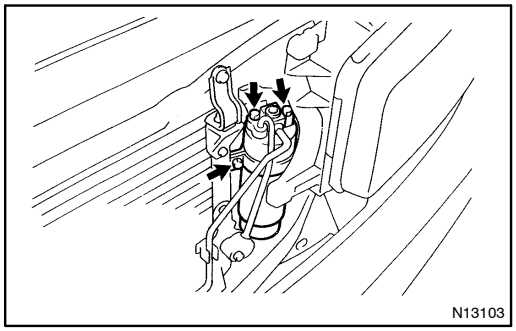
At the time of installation, please refer to the following item.

Evacuate air from refrigeration system.

Charge system with refrigerant and inspect for leakage of refrigerant.

Specified amount: 650 ± 50 g (22.92 ± 1.76 oz.)

2. REMOVE RADIATOR GRILLE


N13103

3. DISCONNECT LIQUID TUBE BETWEEN RECEIVER AND COOLING UNIT

Remove the bolt and disconnect the liquid tube.

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

NOTICE:

Cap the open fittings immediately to keep moisture or dirt out of the system.

HINT:

At the time of installation, please refer to the following item.

Lubricate 2 new O–rings with compressor oil and install the tube.

4. REMOVE RECEIVER FROM RECEIVER HOLDER

Remove the holder bolt and pull the receiver upward from the holder

HINT:

At the time of installation, please refer to the following item.

If receiver is replaced, add compressor oil to receiver.

Add 20 cc (0.71 fl.oz.)

Compressor oil: ND–OIL 8 or equivalent

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AC0FQ–01

INSTALLATION

Installation is in the reverse order of removal (See page AC–47).

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CONDENSER

AC0FR–01

ON–VEHICLE INSPECTION

1. INSPECT CONDENSER FINS FOR BLOCKAGE OR DAMAGE

If the fins are clogged, wash them with water and dry with compressed air.

NOTICE:

Be careful not to damage the fins.

If the fins are bent, straighten them with a screwdriver or pliers.

2. INSPECT CONDENSER AND FITTINGS FOR LEAKAGE

Using a gas leak detector, check for leakage of refrigerant.

If there is leakage, check the tightening torque at the joints.

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AC0FS–02

REMOVAL

1. DISCHARGE REFRIGERANT FROM REFRIGERATION SYSTEM

HINT:

At the time of installation, please refer to the following item.

Evacuate air from refrigeration system.

Charge system with refrigerant and inspect for leakage of refrigerant.

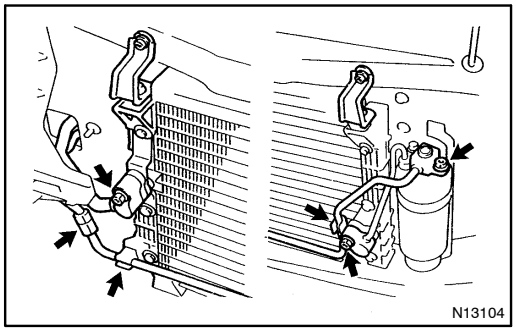
Specified amount: 650 ± 50 g (22.92 ± 1.76 oz.)

2. REMOVE RADIATOR GRILE

3. REMOVE HORNS

4. REMOVE HOOD LOCK SET BOLTS

5. REMOVE CENTER BRACE



6. REMOVE 2 LIQUID TUBES

(a) Remove the 2 bolt and disconnect the liquid tubes from receiver.

Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

NOTICE:

Cap the open fittings immediately to keep moisture or dirt out of the system.

HINT:

At the time of installation, please refer to the following item.

Lubricate 2 new O–rings with compressor oil and install the tubes.

(b) Loosen the nut and disconnect the 2 clamps, then remove the liquid tube.

Torque: 14 N·m (140 kgf·cm, 10 ft·lbf)

NOTICE:

Cap the open fittings immediately to keep moisture or dirt out of the system.

HINT:

At the time of installation, please refer to the following item.

Lubricate a new O–ring with compressor oil and install the tubes.

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7. DISCONNECT DISCHARGE HOSE FROM CONDENSER

Remove the bolt and disconnect the liquid tubes from receiver.

Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

NOTICE:

Cap the open fittings immediately to keep moisture or dirt out of the system.

HINT:

At the time of installation, please refer to the following item.

Lubricate a new O–ring with compressor oil and install the tubes.

8. REMOVE CONDENSER

Remove the 2 set bolts and pull out the condenser

HINT:

At the time of installation, please refer to the following item.

If condenser is replaced, add compressor oil to the condenser.

Add 40 cc (1.4 fl.oz.)

Compressor oil: ND–OIL 8 or equivalent

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AC0FT–01

INSTALLATION

Installation is in the reverse order of removal (See page AC–50).

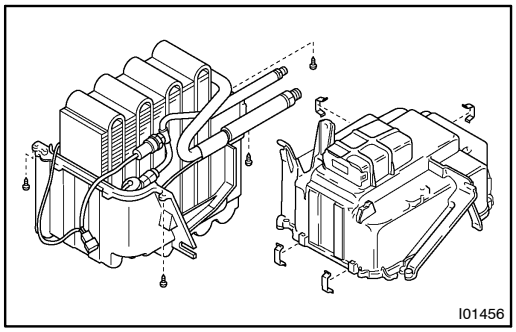
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EVAPORATOR

AC0FU–01

REMOVAL

1. **REMOVE COOLING UNIT**
   (See page AC–23)



2. **REMOVE EVAPORATOR**

(a) Using a knife, cut off each packing.

(b) Remove the 4 screws and 4 clips, then separate the upper and lower case.

(c) Remove the evaporator.

HINT:

At the time of installation, please refer to the following item.

If evaporator is replaced, add compressor oil to evaporator.

Add 40 cc (1.4 fl.oz.)

Compressor oil: ND–OIL 8 or equivalent

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AC0FV–01

INSPECTION

1. CHECK EVAPORATOR FINS FOR BLOCKAGE

If the fins are clogged, clean them with compressed air.

2. CHECK FITTING FOR CRACKS FOR SCRATCHES

If necessary, repair or replace.

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AC0FW–01

INSTALLATION

Installation is in the reverse order of removal (See page AC–53).

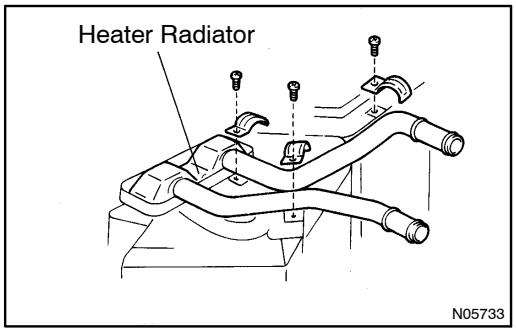
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HEATER RADIATOR

AC0FX–02

REMOVAL

1. **REMOVE HEATER UNIT (See page AC–28)**



2. **REMOVE HEATER RADIATOR**

(a) Remove the 3 screws, 3 plates and clamp.

(b) Pull out the heater radiator.

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AC0FY–01

INSPECTION

INSPECT FINS FOR BLOCKAGE

If the fins are clogged, clean them with compressed air.

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AC0FZ–01

INSTALLATION

Installation is in the reverse order of removal (See page AC–56).

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EXPANSION VALVE

AC0G0–02

ON–VEHICLE INSPECTION

1. CHECK QUANTITY OF GAS DURING REFRIGERATION CYCLE

2. SET ON MANIFOLD GAUGE SET (See page AC–17)

3. RUN ENGINE

(a) Run the engine at 1,500 rpm for at least 5 minutes.

(b) Then check that the high pressure reading is 1.37 – 1.57 MPa (14 – 16 kgf/cm^2, 199 – 228 psi).

4. CHECK EXPANSION VALVE

If the expansion valve is faulty, the low pressure reading will drop to 0 kPa (0 kgf/cm^2, 0 psi).

HINT:

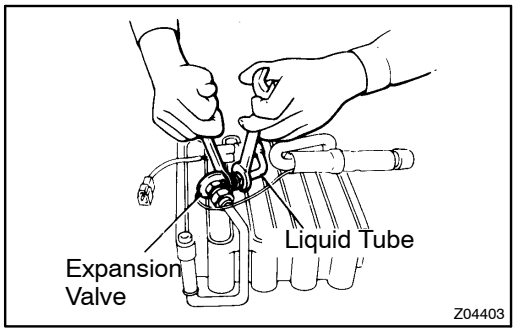
When the low pressure drops to 0 kPa (0 kgf/cm^2, 0 psi), check the receiver's IN and OUT sides for no temperature difference.

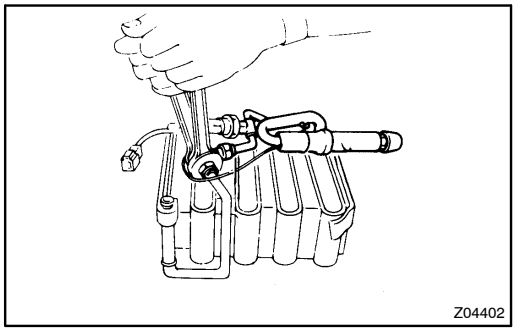
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AC0G1–02

REMOVAL

1. REMOVE EVAPORATOR (See page AC–53)





2. REMOVE EXPANSION VALVE

(a) Remove the packing and clamp, then disconnect the heat sensing tube from suction tube of evaporator.

(b) Loosen the 2 nuts and remove the expansion valve from evaporator and liquid tube.

Torque:
Expansion valve x Evaporator:
22 N·m (225 kgf·cm, 16 ft·lbf)
Expansion valve x Liquid tube
13 N·m (135 kgf·cm, 9 ft·lbf)

NOTICE:

Cap the open fittings immediately to keep moisture or dirt out of the system.

HINT:

At the time of installation, please refer to the following item.

Lubricate 2 new O–rings with compressor oil and install the valve.

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AC0G2–01

INSTALLATION

Installation is in the reverse order of removal (See page AC–60).

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WATER VALVE

AC08H–02

ON–VEHICLE INSPECTION

1. WARM UP ENGINE

2. DISCONNECT WATER VALVE CONTROL CABLE

3. INSPECT WATER VALVE OPERATION

(a) Check that warm air blown out the vent when the water valve lever is moved to ”WARM” position.

(b) Check that cool air blown out when the water valve is moved to the ”COOL” position.

If operation is not as specified, replace the water valve.

4. CONNECT WATER VALVE CONTROL CABLE

After connection, adjust the control cable.

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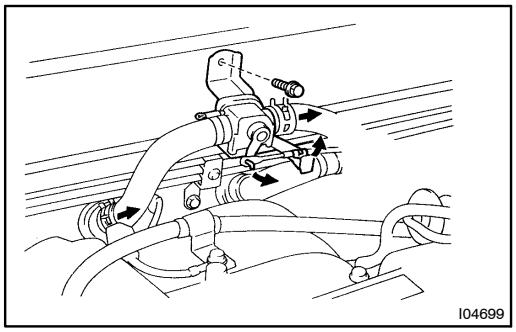
AC0G3–01

REMOVAL

1. DRAIN ENGINE COOLANT FROM RADIATOR

HINT:

It is not necessary to drain out all coolant.



2. DISCONNECT WATER VALVE CONTROL CABLE FROM WATER VALVE

HINT:

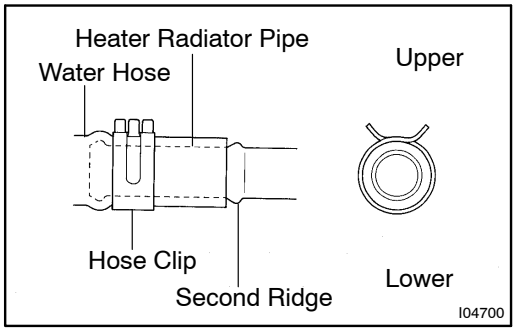
At the time of installation, please refer to the following item.

After installation, adjust the control cable (See page AC–91).

3. DISCONNECT WATER HOSES

(a) Using pliers grip the claws of hose clip and slide the clip along the hose.

(b) Disconnect the water hose.



HINT:

At the time of installation, please refer to the following item.

- Push the water hose onto the heater radiator pipe as far as second ridge on the pipe.
- Push the water hose onto the pipe of water valve pipe as far as water valve.

4. REMOVE WATER VALVE

Remove the bolt and water valve.

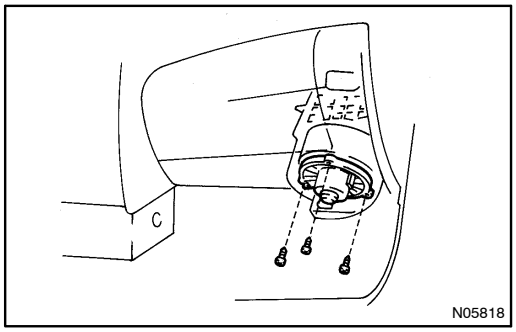
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AC0G4–01

INSTALLATION

Installation is in the reverse order of removal (See page AC–63).

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BLOWER MOTOR

AC0G5–01

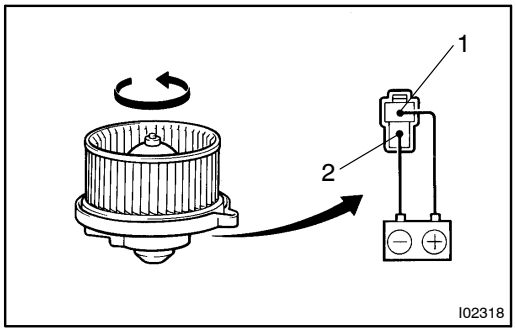
REMOVAL

REMOVE BLOWER MOTOR

(a) Disconnect the connector.
(b) Remove the 3 screws and blower motor.

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AC0G6–01



INSPECTION

INSPECT BLOWER MOTOR OPERATION

Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, then check that the motor operations smoothly.

If operation is not as specified, replace the blower motor.

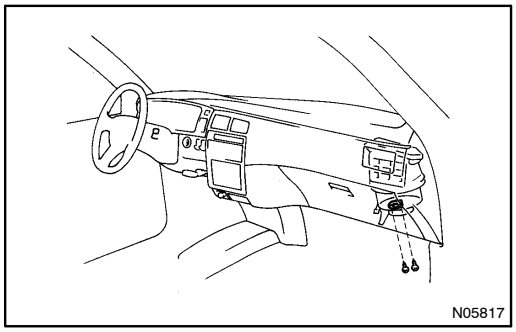
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AC0G7–01

INSTALLATION

Installation is in the reverse order of removal (See page AC–65).

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BLOWER RESISTOR

AC0G8–01

REMOVAL

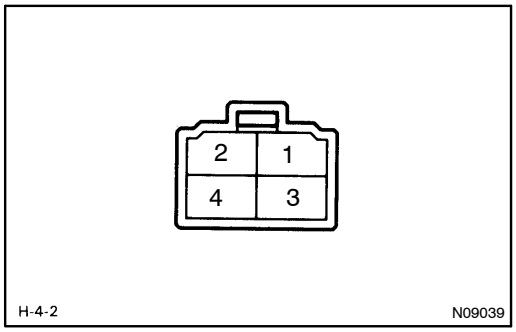
REMOVE BLOWER RESISTOR

(a) Disconnect the connector.

(b) Remove the 2 screws and blower resistor.

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AC0G9–01



INSPECTION

INSPECT BLOWER RESISTOR RESISTANCE

Tester connection	Condition	Specified condition
1 – 2 – 3 – 4	Constant	Continuity

If continuity is not as specified, replace the blower resistor.

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AC0GA–01

INSTALLATION

Installation is in the reverse order of removal (See page AC–68).

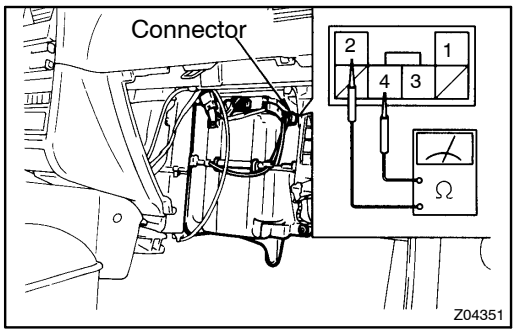
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THERMISTOR

AC0GB–01

ON–VEHICLE INSPECTION

1. REMOVE GLOVE COMPARTMENT DOOR
(See page BO–36)



2. INSPECT THERMISTOR RESISTANCE

(a) Disconnect the connector

(b) Measure resistance between terminals 2 and 4.
Standard resistance: 1,500 Ω at 25 ˚C (77˚F)

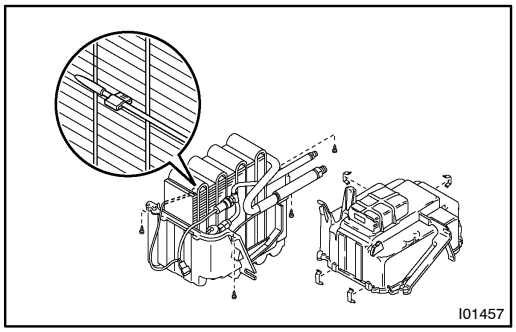
If resistance is not as specified, proceed next inspection.

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AC0GC–01

REMOVAL

1. REMOVE EVAPORATOR
(See page AC–53)



2. REMOVE THERMISTOR

(a) Disconnect the connector.

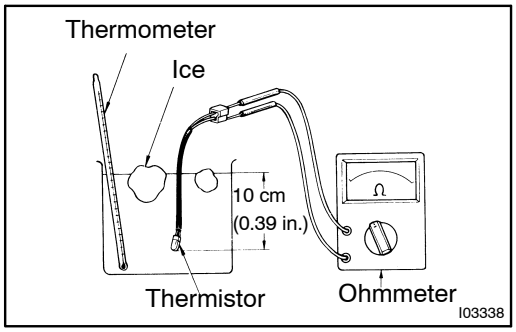
(b) Pull out the thermistor from evaporator.

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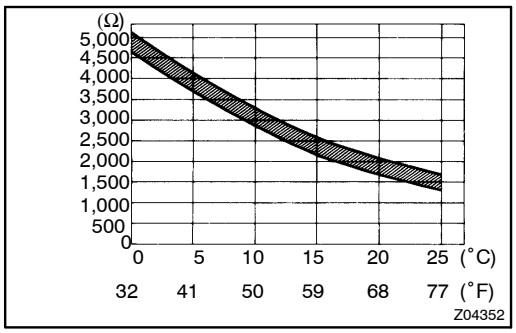
AC0GD–01

INSPECTION

INSPECT THERMISTOR RESISTANCE



(a) Place the thermistor in cold water, and while changing the temperature of the water, measure resistance at the connector and at the same time, measure temperature of the water with a thermometer.



(b) Compare the 2 readings on the chart.

If resistance value is not as specified, replace the thermistor.

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AC0GE–01

INSTALLATION

Installation is in the reverse order of removal (See page AC–72).

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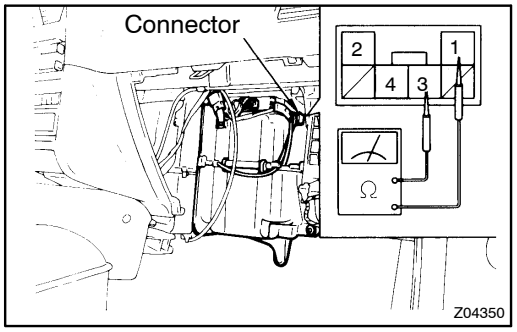
PRESSURE SWITCH

AC0GF–01

ON–VEHICLE INSPECTION

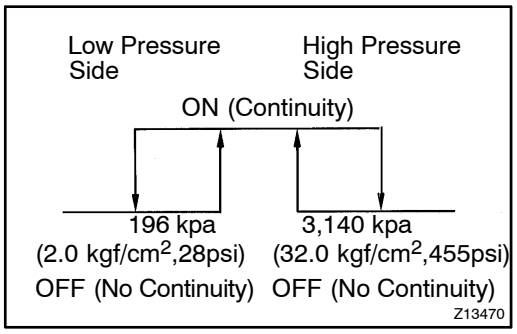
1. **SET ON MANIFOLD GAUGE SET**
   (See page AC–17)
2. **REMOVE GLOVE COMPARTMENT DOOR**
   (See page BO–36)
3. **DISCONNECT CONNECTOR FROM COOLING UNIT**
4. **SET VEHICLE IN THESE CONDITIONS:**

(a) Running engine at 2,000 rpm
(b) Blower speed control switch at HI
(c) Temperature control lever MAX. COOL
(d) A/C switch ON



5. **INSPECT PRESSURE SWITCH OPERATION**

(a) Connect the positive (+) lead from the ohmmeter to terminal 1 and negative (–) lead to terminal 3.



(b) Check continuity between terminals when refrigerant pressure is changed, as shown in the illustration.

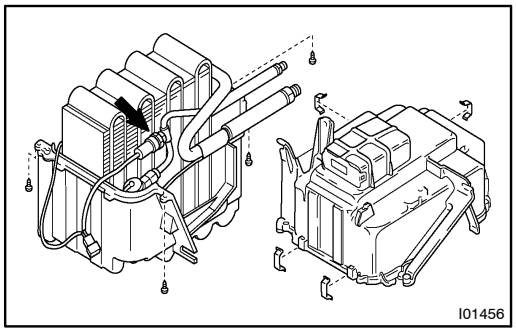
If operation is not as specified, replace the pressure switch.

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AC0GG–02

REMOVAL

1. REMOVE EVAPORATOR (See page AC–53)



2. REMOVE PRESSURE SWITCH FROM LIQUID TUBE

Disconnect the connector and remove the pressure switch.

Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

HINT:

- Lock the switch mounted on the tube with an open end wrench, being careful not to deform the tube and remove the switch.
- At the time of installation, please refer to the following item.
  Lubricate a new O–ring with the compressor oil and install the switch.

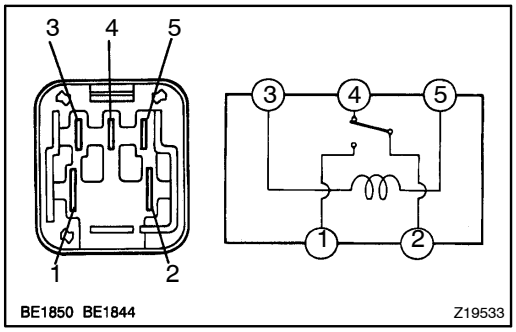
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AC0GH–01

INSTALLATION

Installation is in the reverse order of removal (See page AC–76).

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HEATER MAIN RELAY

INSPECTION

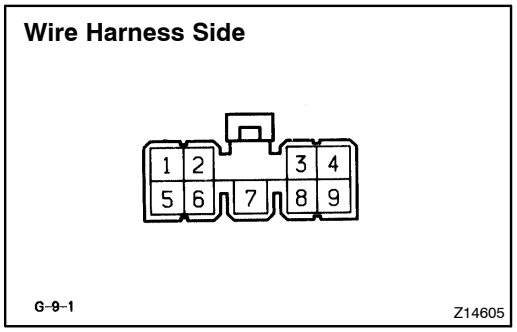
AC0GI–01

INSPECT HEATER MAIN RELAY (Making: HTR) CONTINUITY

Condition	Tester connection	Specified condition
Constant	2 – 4 3 – 5	Continuity
Apply B+ between terminals 3 and 5	1 – 2	Continuity

If continuity is not as specified, replace the relay.

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AIR CONDITIONING AMPLIFIER

AC0GJ-02

ON–VEHICLE INSPECTION

INSPECT AMPLIFIER CIRCUIT

(a) Remove the glove compartment door (See page BO–36).

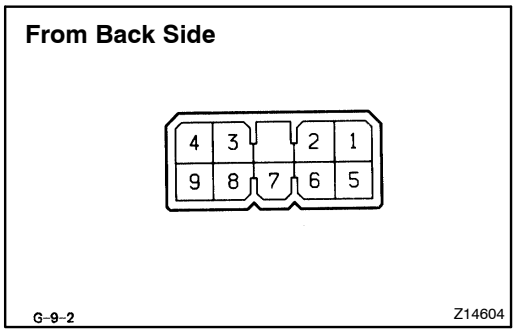
(b) Disconnect the amplifier connector and inspect the connector on wire harness side, as shown in the chart below.

Test conditions:

- Temperature control lever MAX. COOL
- A/C switch ON
- Turn ignition switch to ON
- Blower speed switch at HI

Tester connection	Condition	Specified condition
8 – Ground	Constant	Continuity
2 – 6	Constant	Continuity
2 – 10	Evaporator temperature at 25 °C (77 °F)	Approx. 1.5 kΩ at 25 °C (77 °F)
4 – Ground	A/C switch ON	Battery positive voltage
4 – Ground	A/C switch OFF	No voltage
1 – ECM terminal ACT	Constant	Continuity
9 – ECM terminal AC1	Constant	Continuity
7 – Ground	A/C switch ON	Continuity
7 – Ground	A/C switch OFF	No continuity

If the circuit is not as specified, inspect the circuits connected to other parts.



(c) Connect the connector to amplifier and inspect wire harness side connector from the back side, as shown in the chart below.

Test conditions

- Running engine at idle speed
- Blower speed switch at ”HI” position
- A/C switch ON
- Temperature control lever at ”COOL” position
- Set on manifold gauge set

Tester connection	Condition	Specified condition
3 – Ground	Refrigerant pressure 196 – 1,340 kPa	Battery positive voltage
3 – Ground	Refrigerant pressure less than 196 or more than 3,140 kPa	No voltage

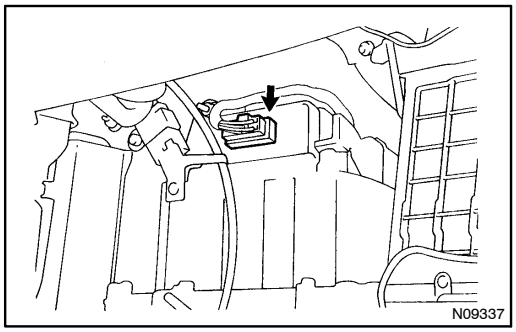
If circuit is as specified, try replacing the amplifier with a new one. If the circuit is not as specified, inspect the circuits connected to other parts.

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AC0GK–01

REMOVAL

1. REMOVE GLOVE COMPARTMENT DOOR
(See page BO–36)



2. REMOVE A/C AMPLIFIER

(a) Disconnect the connector.

(b) Remove the amplifier from the cooling unit.

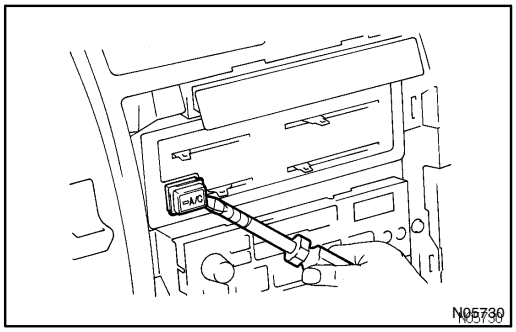
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AC0GL–01

INSTALLATION

Installation is in the reverse order of removal (See page AC–80).

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AIR CONDITIONING SWITCH

AC0GM–02

REMOVAL

REMOVE A/C SWITCH

Using a screwdriver, pry loose the clips and remove the A/C switch.

HINT:

Tape the screwdriver tip before use.

Author : Date : 2016

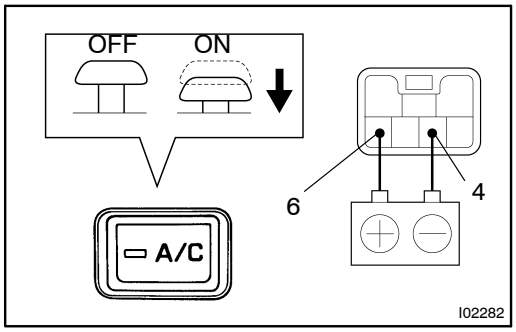
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AC0GN–02

INSPECTION

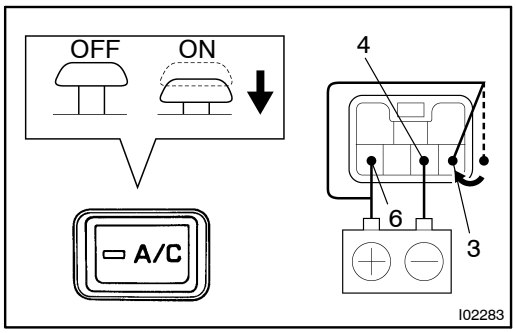
1. INSPECT A/C INDICATOR OPERATION

(a) Connect the positive (+) lead from the battery to terminal 6 and negative (–) lead to terminal 4 and check that the indicator lights up, when A/C switch ON.



(b) Connect the positive (+) lead from the battery to terminal 3 and check that the indicator dims

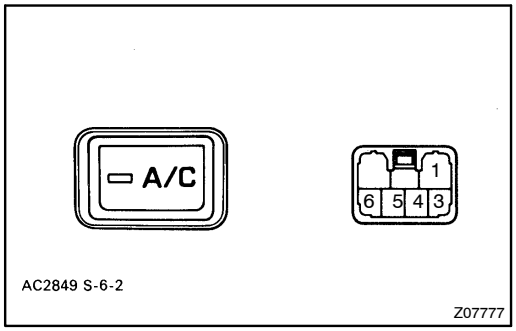
If operations are not as specified, replace the A/C switch.



2. INSPECT A/C SWITCH CONTINUITY

Condition/ Circuit	Tester connection	Specified condition
OFF	–	No continuity
ON	4 – 5 4 – 6	Continuity
Illumination circuit	3 – 1	Continuity

If continuity is not as specified, replace the A/C switch



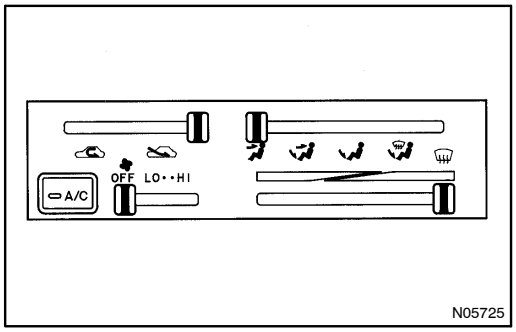
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AC0GO–01

INSTALLATION

Installation is in the reverse order of removal (See page AC–82).

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HEATER CONTROL ASSEMBLY

AC0GP–01

ON–VEHICLE INSPECTION

INSPECT HEATER CONTROL LEVER OPERATION

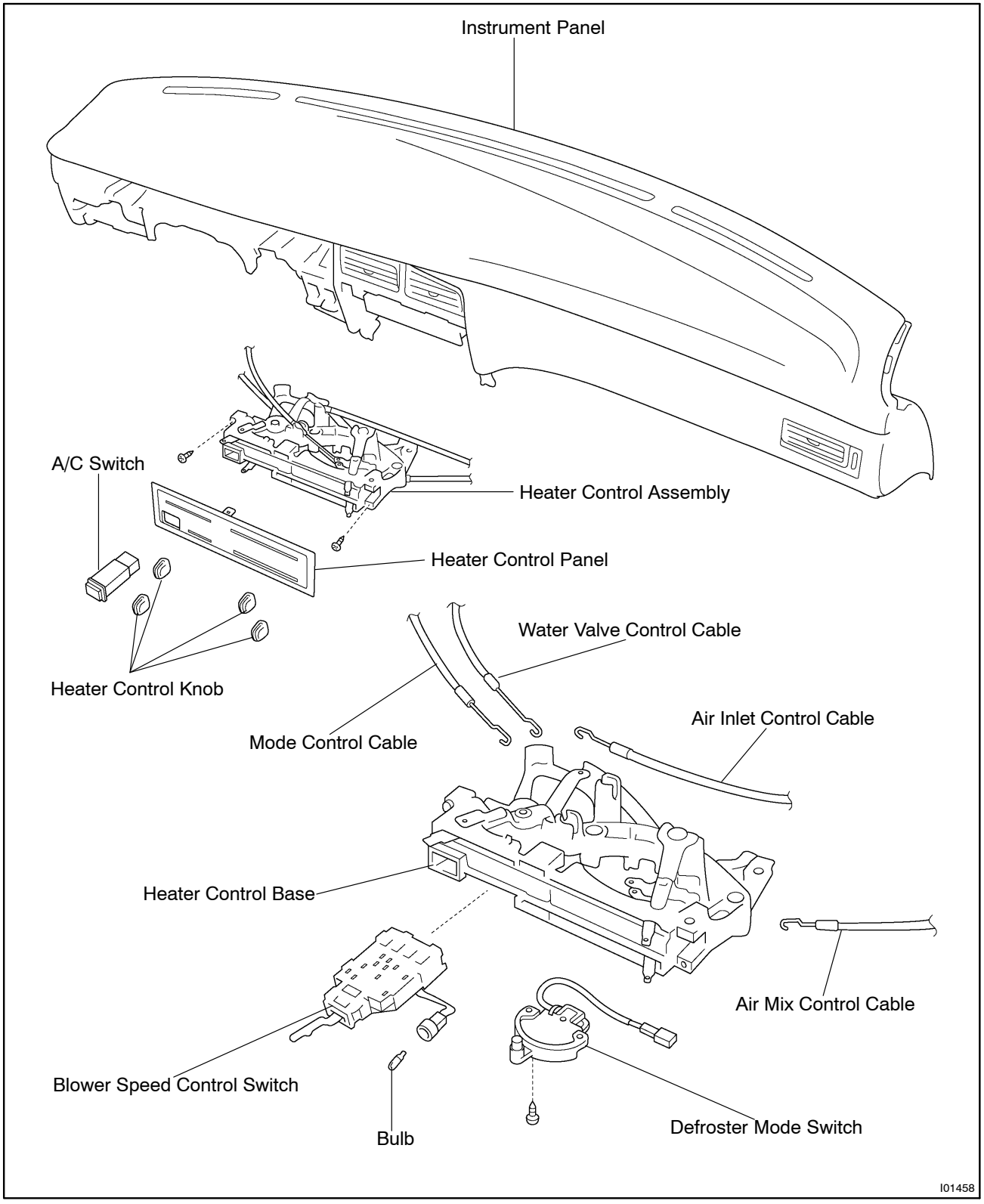
Move the control lever and dials left and right check for stiffness and binding the full range of the lever and dials.

If there is stiffness and binding, adjust the heater control cable.

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AC0GQ–01

COMPONENTS



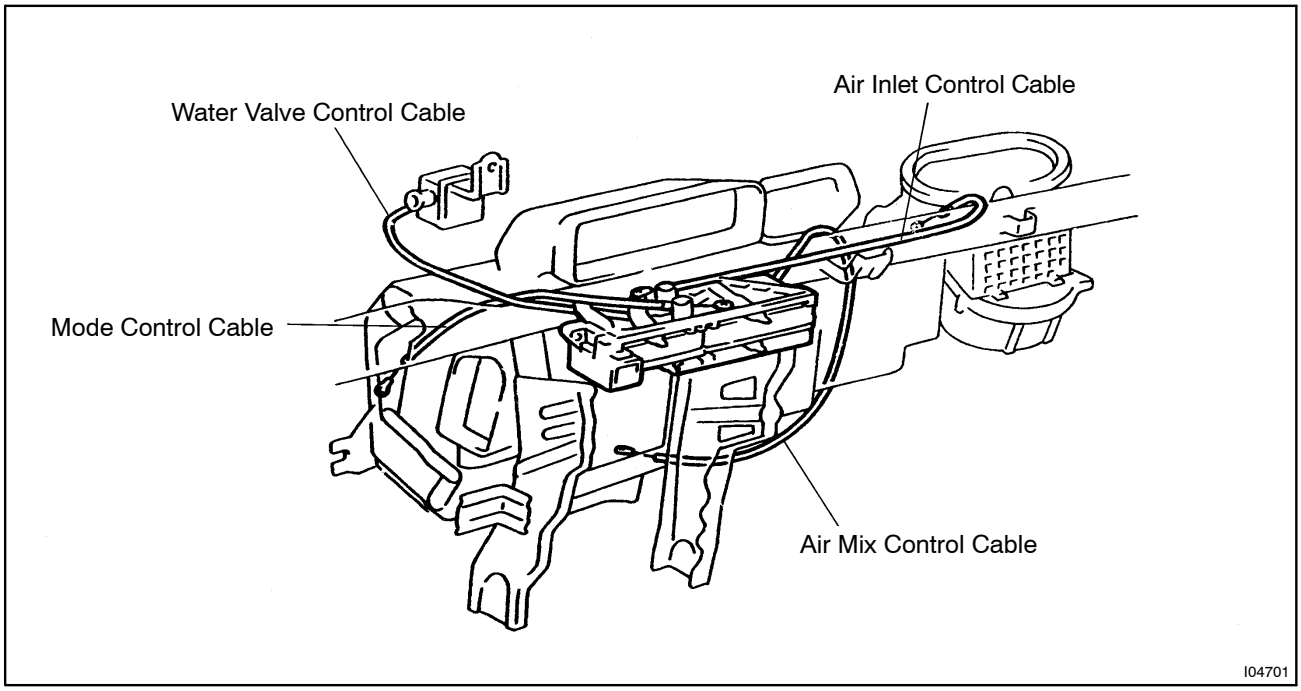
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AC0GR–02

REMOVAL

1. REMOVE INSTRUMENT PANEL
(See page BO–36)

2. DISCONNECT HEATER CONTROL CABLES



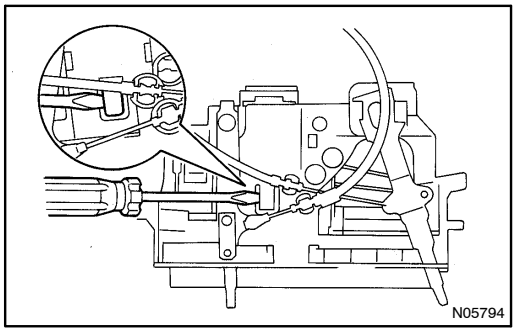
3. REMOVE HEATER CONTROL ASSEMBLY

Remove the 2 screws and pull out the heater control assembly, then disconnect the connector.

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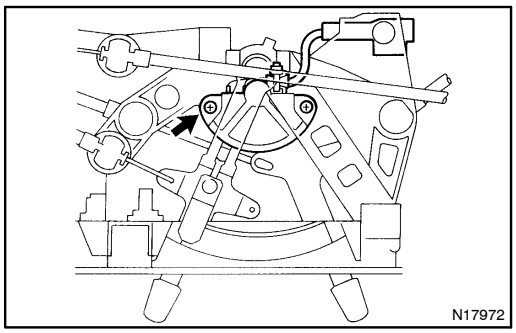
AC0GS–01

DISASSEMBLY



1. REMOVE BLOWER SPEED CONTROL SWITCH

(a) Pull out the bulb.
(b) Disconnect the bulb holder.
(c) Using a screwdriver, pry loose the clip and push out the blower speed control switch to rear of the heater control assembly.

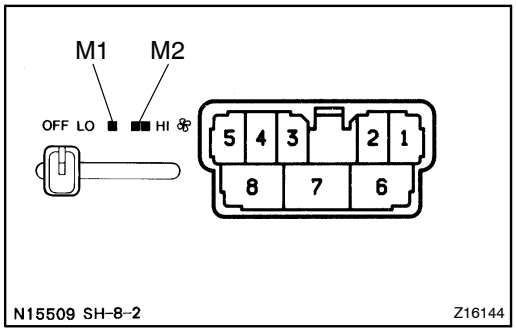


2. REMOVE DEFROSTER MODE SWITCH

(a) Disconnect the connector clamp.
(b) Remove the screw and switch.

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AC3IY–01



INSPECTION

INSPECT BLOWER SPEED CONTROL SWITCH CONTINUITY

Position/ Circuit	Tester connection	Specified condition
OFF	–	No continuity
LO	5 – 6	Continuity
M1	1 – 5 – 6	Continuity
M2	2 – 5 – 6	Continuity
HI	5 – 6 – 8	Continuity
Illumination circuit	3 – 4	Continuity

Switch continuity:
If continuity is not as specified, replace the switch.
Illumination circuit:
If continuity is not as specified, test the bulb.

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AC0GU–01

REASSEMBLY

Reassembly is in the reverse order of disassmebly (See page AC–88)

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AC0GV–02

INSTALLATION

Installation is in the reverse order of removal (See page AC–87).

1. AFTER INSTALLATION, INSPECT HEATER CONTROL LEVER OPERATION

Move the control lever and dials left and right check for stiffness and binding the full range of the lever.

If there is stiffness and binding, proceed next step.

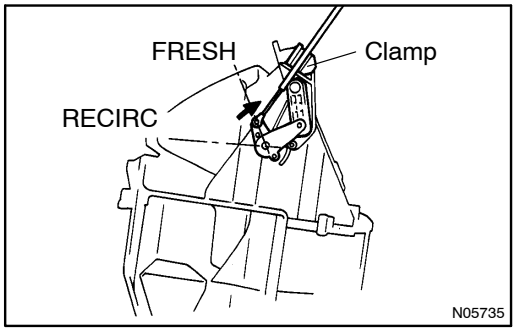
2. ADJUST HEATER CONTROL CABLES

(a) Set heater control assembly in these conditions:

(1) Air inlet control lever in ”FRESH” position

(2) Mode control lever in ”FACE” position

(3) Temperature control lever in ”Max. WARM” position

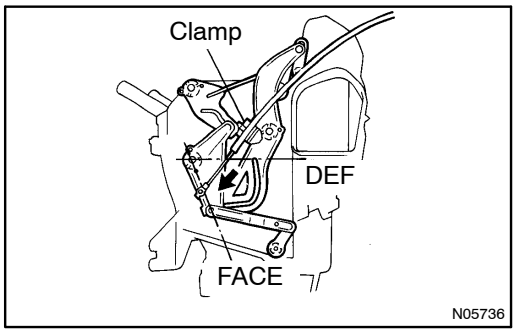


(b) Adjust the air inlet control cable.

Set the air inlet damper control damper on ”FRESH” position, install the control cable and lock the clamp.

HINT:

Lock the clamp during lightly pushing the outer cable in the direction shown by arrow.

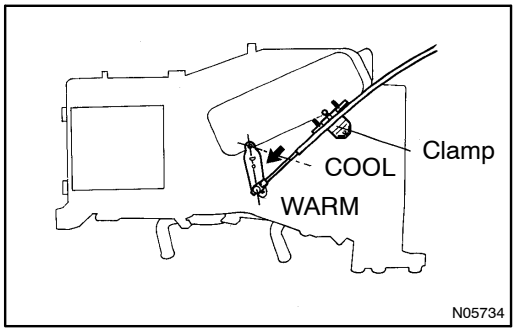


(c) Adjust mode control cable.

Set the air inlet damper control damper on ”FACE” position, install the control cable and lock the clamp.

HINT:

Lock the clamp during lightly pulling the outer cable in the direction shown by arrow.



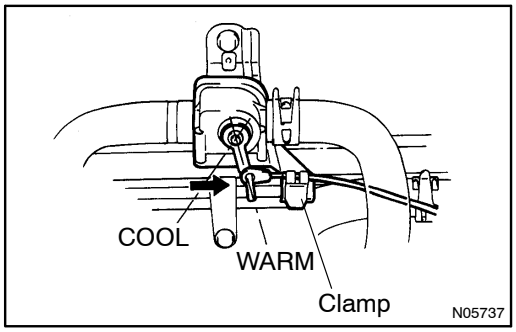
(d) Adjust air mix control cable.

Set the air inlet damper control damper on ”WARM” position, install the control cable and lock the clamp.

HINT:

Lock the clamp during lightly pulling the outer cable in the direction shown by arrow.

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(e) Adjust water valve control cable.
Set the air inlet damper control damper on ”WARM” position, install the control cable and lock the clamp.

HINT:
Lock the clamp during lightly pulling the outer cable in the direction shown by arrow.

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