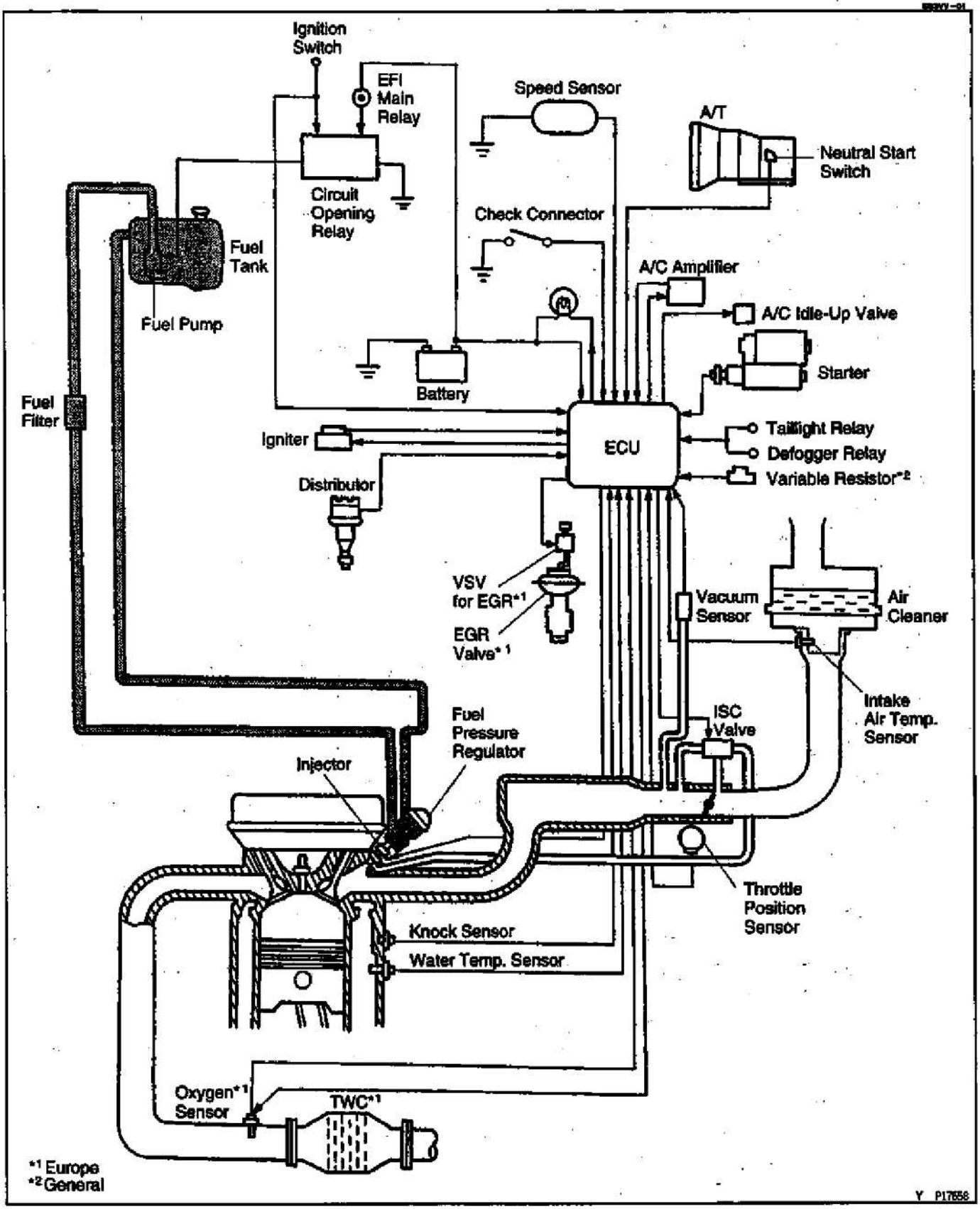
EFI SYSTEM

DESCRIPTION



The EFI system is composed of three basic sub—systems: Fuel, Air Induction and Electronic Control Systems.

FUEL SYSTEM

Fuel is supplied under constant pressure to the EFI injectors by an electric fuel pump. The injectors inject a metered quantity of fuel into the intake manifold in accordance with signals from the ECU (Engine Control Unit).

EG

AIR INDUCTION SYSTEM

The air induction system provides sufficient air for engine operation.

ELECTRONIC CONTROL SYSTEM

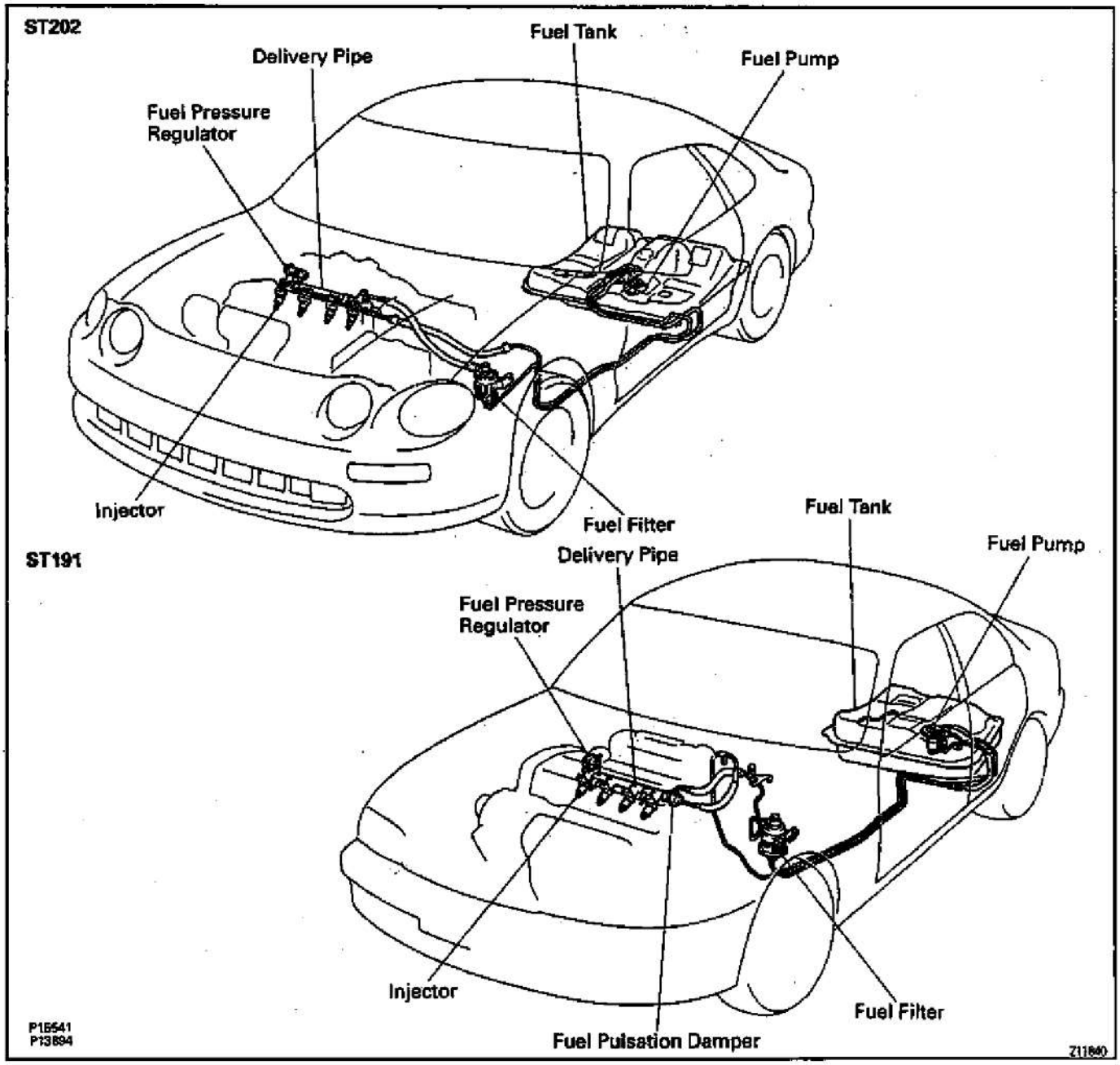
The 3S—FE engine is equipped with a TOYOTA Computer Controlled System (TCCS) which centrally controls the EFI, ESA, ISC, Diagnosis systems etc. by means of an ECU—formerly EFI computer employing a microcomputer.

The ECU controls the following functions:

1. Electronic Fuel Injection (EFI)
   The ECU receives signals from various sensors indicating changing engine operating conditions such as:
   - Intake manifold pressure
   - Intake air temperature
   - Engine coolant temperature
   - Engine speed
   - Throttle valve opening angle
   - Exhaust oxygen content etc.

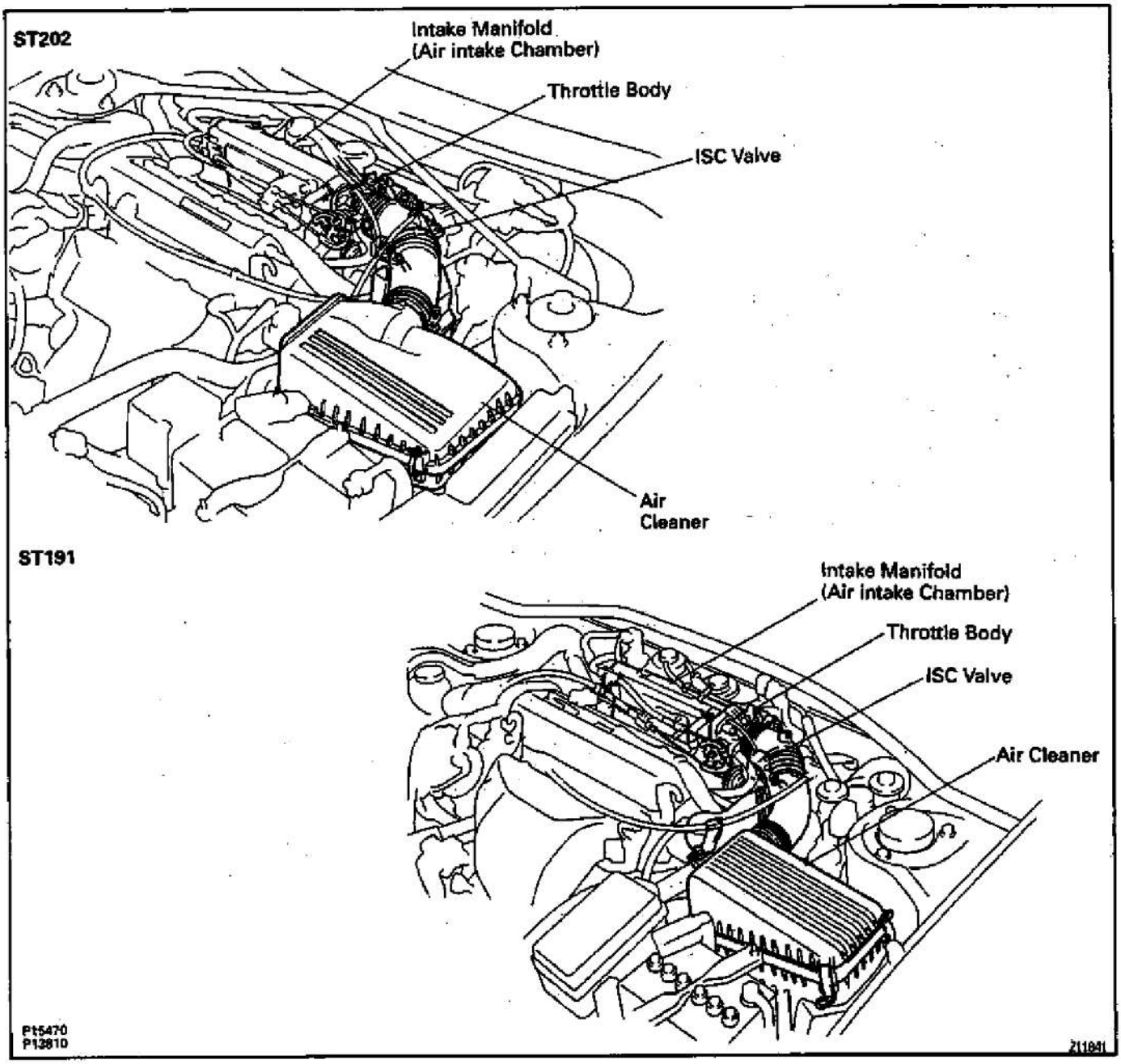
   The signals are utilized by the ECU to determine the injection duration necessary for an optimum air—fuel ratio.
2. Electronic Spark Advance (ESA)
   The ECU is programmed with data for optimum ignition timing under all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, coolant temperature, etc.), the microcomputer (ECU) triggers the spark at precisely the right instant.
3. Idle Speed Control (ISC)
   The ECU is programmed with target idling speed values to respond to different engine conditions (coolant temperature, air conditioning ON/OFF, etc.). Sensors transmit signals to the ECU which control the flow of air through the throttle valve bypass and adjust idle speed to the target value.
4. Diagnosis
   The ECU detects any malfunctions and abnormalities in the sensor network and lights a check engine warning light in the combination meter. At the same time, trouble is identified and a diagnostic code is recorded by the ECU. The diagnostic corde can be read by the number of blinks of the check engine warning light when terminals TE1 and E1 of the check connector are connected.The diagnistic code are referred to in a later page. (See page EG—171)
5. Self—Correction Function
   If any sensor malfunctions, an average value recorded in the back—up circuit is substituted to make driving possible. If danger is predicted, the engine is stopped and the check engine warning light will light up.
6. Fail—Safe Function
   In the event of the sensor malfunctioning, a back—up circuit will take over to provide minimal driveability, and the check engine warning light will illuminate.

OPERATION
FUEL SYSTEM



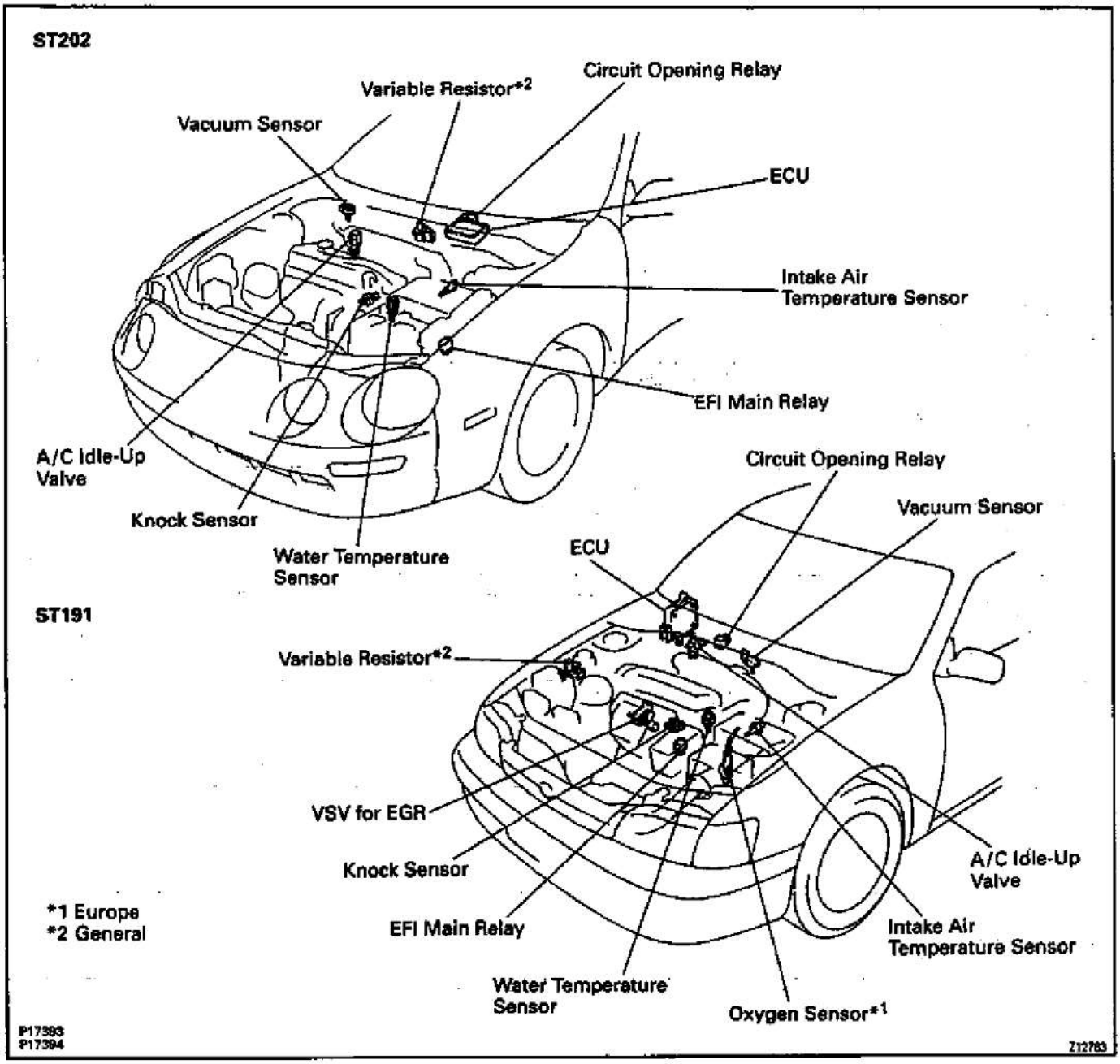
Fuel pumped up by the fuel pump, flows through the fuel filter and is distributed to each injector at a set pressure maintained by the fuel pressure regulator.
The fuel pressure regulator adjusts the pressure of the fuel from the fuel line (high pressure side) to a pressure 284 kPa (2.9 kgf/cm², 41 psi) higher than the pressure inside the intake manifold, and excess fuel is returned to the fuel tank through the return pipe.
Fuel is injected into the intake manifold according to signals from the ECU.

AIR INDUCTION SYSTEM



Air is filtered through the air cleaner and the amount flowing to the air intake chamber is determined according to the throttle valve opening in the throttle body and the engine speed.
Intake air controlled by the throttle valve opening is distributed from the air intake chamber to the manifold of each cylinder and is drawn into the combustion chamber.
At low temperatures the ISC valve opens and air flows through the ISC valve and the throttle body, into the air intake chamber. During engine warming up, even if the throttle valve is completely closed, air flows to the air intake chamber, thereby increasing the idle speed (first idle operation). The air intake chamber prevents pulsation of the intake air. It also prevents intake air interference in each cylinder.

ELECTRONIC CONTROL SYSTEM

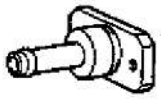
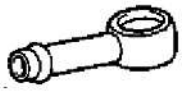
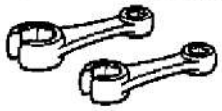


The control system consists of sensors which detect various engine conditions, and an ECU which determines the injection volume (timing) based on the signals from the sensors.

The various sensors detect the intake air pressure, engine speed, oxygen density in the exhaust gas, engine coolant temperature, intake air temperature and atmospheric pressure etc. and convert the information into an electrical signal which is sent to the ECU. Based on these signals, the ECU calculates the optimum ignition timing for the current conditions and operates the injectors. The ECU not only controls the fuel injection timing, but also the self—diagnostic function which records the occurrence of a malfunction, ignition timing control, idle speed control and EGR control.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

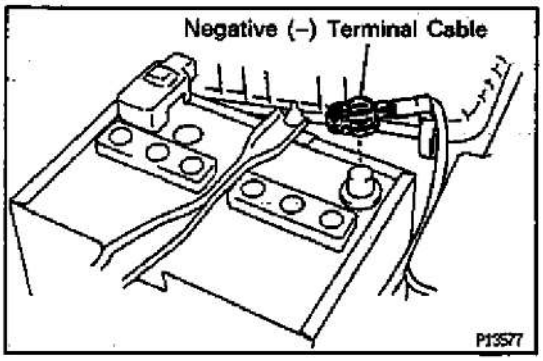
	09268–41045 Injection Measuring Tool Set	
	(09268–41080) No.6 Union	
	(09268–41090) No.7 Union	
	(90405–09015) No.1 Union	
	09268–45012 EFI Fuel Pressure Gauge	
	09631–22020 Power Steering Hose Nut 14 x 17 mm Wrench Set	Fuel line flare nut
	09816–30010 Oil Pressure Switch Socket	Knock sensor
	09842–30070 Wiring "F" EFI Inspection	
	09843–18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

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

EQUIPMEMT

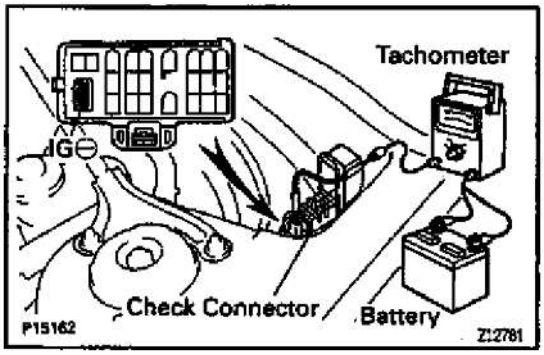
Carburetor cleaner	Throttle body
Graduated cylinder	Injector
Soft brush	Throttle body
Sound scope	Injector
Tachometer	
Torque wrench	
Vacuum gauge	



EG

PRECAUTION

1. **Before working on the fuel system, disconnect the negative (–) terminal cable from the battery.**
   HINT: Any diagnostic code retained by the computer will be erased when the negative (–) terminal cable is disconnected.
   Therefore, if necessary, read the diagnosis before disconnecting the negative (–) terminal cable from the battery.
2. **Do not smoke or work near an open flame when working on the fuel system.**
3. **Keep gasoline away from rubber or leather parts.**

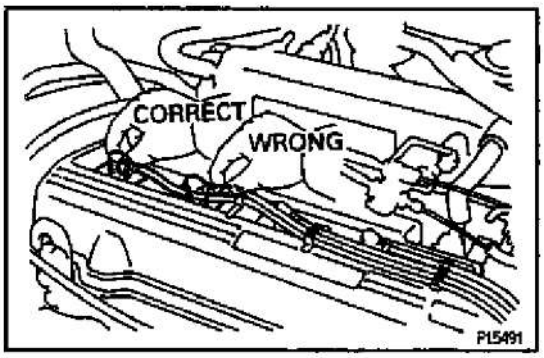


MAINTENANCE PRECAUTIONS

1. **CHECK CORRECT ENGINE TUNE–UP**
   (See page EG–13)
2. **PRECAUTION WHEN CONNECTING GAUGE**

(a) Use battery as the power source for the timing light, tachometer, etc.

(b) Connect the tester probe of a tachometer to the terminal IG⊖ of the check connector.



3. **IN EVENT OF ENGINE MISFIRE, FOLLOWING PRECAUTIONS SHOULD BE TAKEN**

(a) Check proper connection of battery terminals, etc.

(b) Handle high–tension cords carefully.

(c) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely.

(d) When cleaning the engine compartment, be especially careful to protect the electrical system from water.

4. **PRECAUTIONS WHEN HANDLING OXYGEN SENSOR**

(a) Do not allow the oxygen sensor to drop or hit against an object.

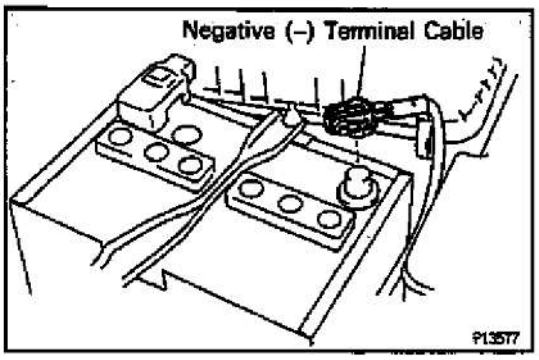
(b) Do not allow the sensor to come into contact with water.

IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.)

If the vehicle is equipped with a mobile communication system, refer to the preaution in the IN section.

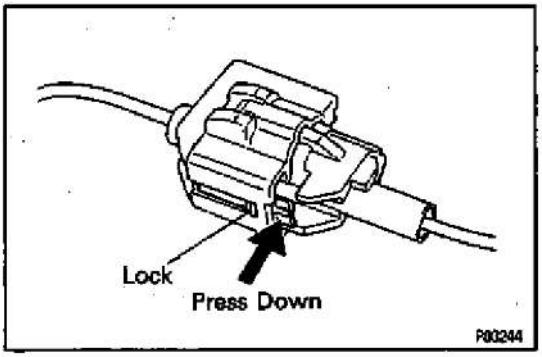
AIR INDUCTION SYSTEM

1. Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.
2. 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.

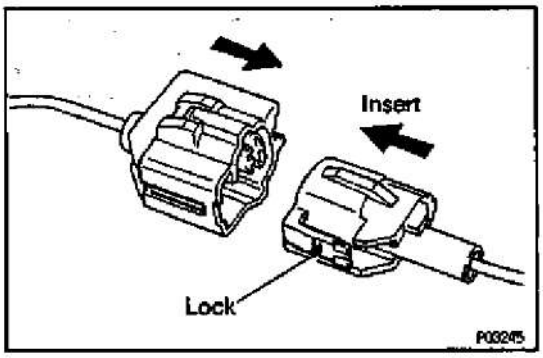


ELECTRONIC CONTROL SYSTEM

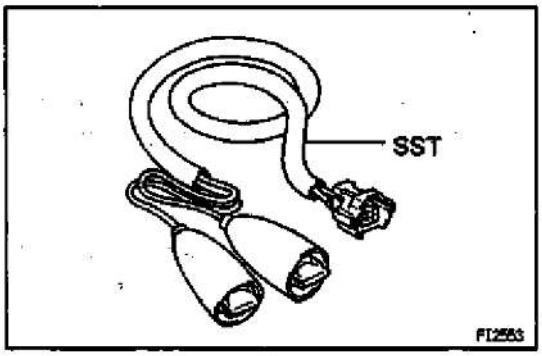
1. Before removing EFI wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch OFF or disconnecting the negative (–) terminal cable from the battery.
   HINT: Always check the diagnostic code before disconnecting the negative (–) terminal cable from the battery.
2. When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (–) cables.
3. Do not permit parts to receive a severe impact during removal or installation. Handle all EFI parts carefully, especially the ECU.
4. Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can cause further troubles.
5. Do not open the ECU cover.
6. When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the EFI parts and wiring connectors.
7. Parts should be replaced as an assembly.



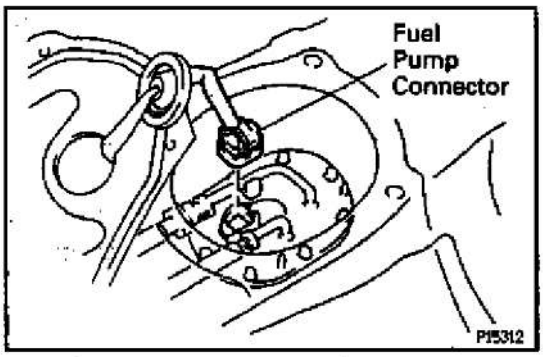
8. Care is required when pulling out and inserting wiring connectors.
(a) Release the lock and pull out the connector, pulling on the connectors.



(b) Fully insert the connector and check that it is locked.

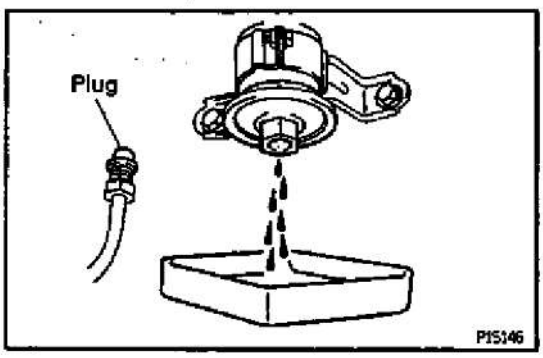


9. Use SST for inspection or test of the injector or its wiring connector.
SST 09842—30070

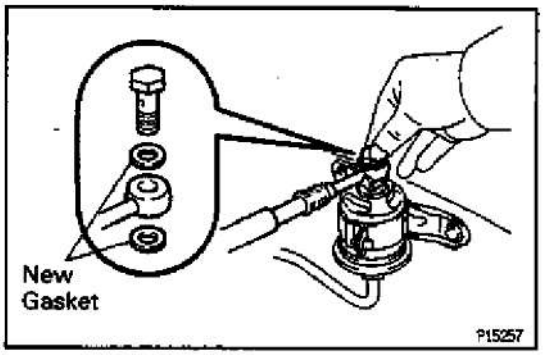


FUEL SYSTEM

1. When disconnecting the high pressure fuel line, a large amount of gasoline will spill out, so observe the following procedures:
(a) Disconnect the fuel pump connector.
(b) Start the engine. After the engine has stopped on its own, turn the ignition switch OFF.



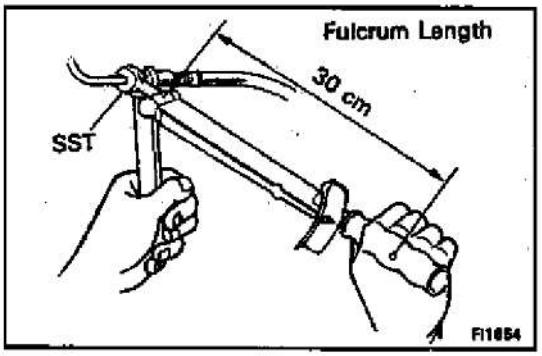
(c) Put a container under the connection.
(d) Slowly loosen the connection.
(e) Disconnect the connection.
(f) Plug the connection with a rubber plug.
(g) Reconnect the fuel pump connector.



2. When connecting the flare nut or union bolt on the high pressure pipe union, observe the following procedures:

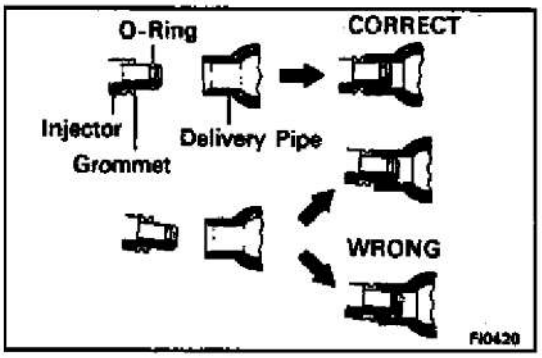
Union Bolt Type:

(a) Always use a new gasket.
(b) Tighten the union bolt by hand.
(c) Tighten the union bolt to the specified torque.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



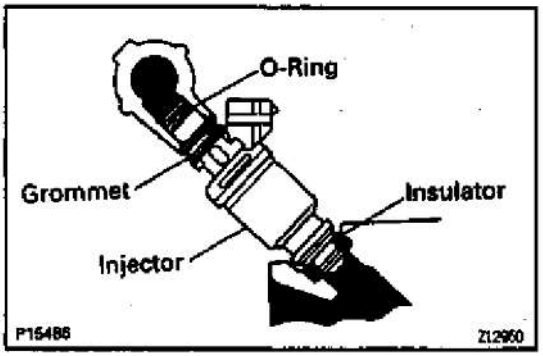
Flare Nut Type:

(a) Apply a light coat of engine oil to the flare nut, and tighten the flare nut by hand.
(b) Using SST, tighten the flare nut to specified torque.
SST 09631 – 22020
Torque:
Fuel pump side: 24 N·m (240 kgf·cm, 18 ft·lbf)
Others: 30 N·m (310 kgf·cm, 22 ft·lbf)
HINT: Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).

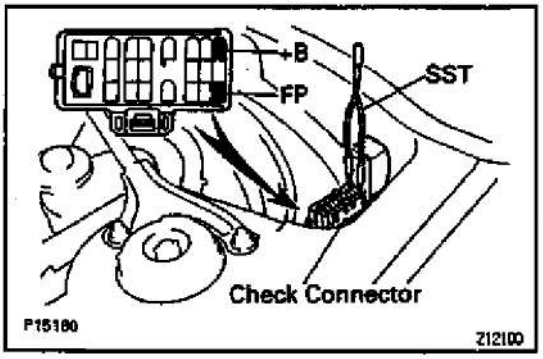


3. Observe the following precautions when removing and installing the injectors.

(a) Never reuse the O – ring.
(b) When placing a new O – ring on the injector, take care not to damage it in any way.
(c) Coat a new O – ring with spindle oil or gasoline before installing – never use engine, gear or brake oils.

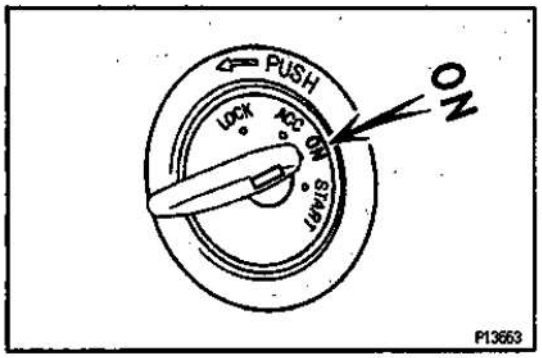


4. Install the injector to the delivery pipe and intake manifold as shown in the illustration.

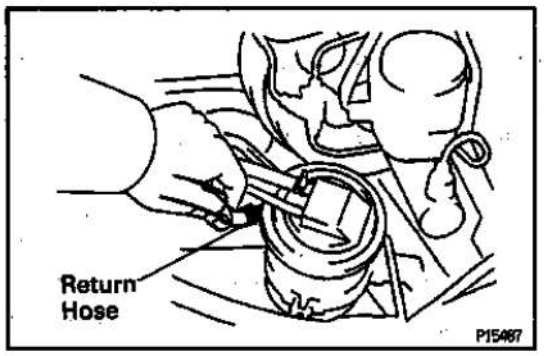


5. Check that there are no fuel leaks after performing maintenance anywhere on the fuel system.

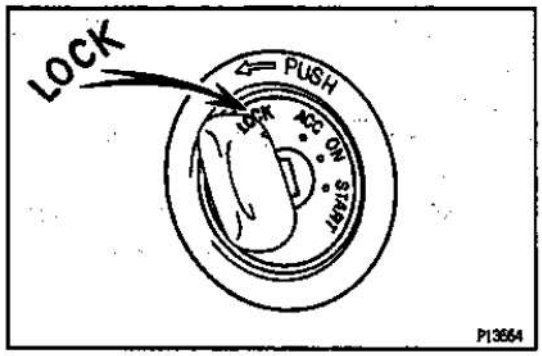
(a) Using SST, connect terminals +B and FP of the check connector.
SST 09843 – 18020



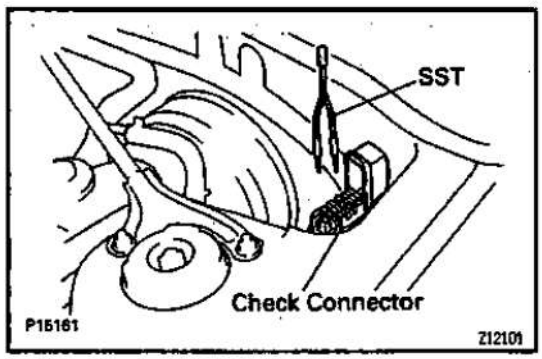
(b) Turn the ignition switch ON.
NOTICE: Do not start the engine.



(c) Pinch the fuel return hose.
The pressure in the high pressure line will rise to approx. 392 kPa (4 kgf/cm², 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.



(d) Turn the ignition switch to LOCK.



(e) Remove the SST from the check connector.
SST 09843–18020

DIAGNOSIS SYSTEM

DESCRIPTION

The ECU contains a built–in self–diagnosis system by which troubles with the engine signal network are detected and the check engine warning light on the combination meter lights up.
By analyzing various signals as shown in the later table (See page EG–171) the ECU detects system malfunctions relating to the sensors or actuators.
The self–diagnosis system has 2 modes, a normal mode and a test mode.
If a malfunction is detected when in the normal mode, the ECU lights up the check engine warning light to inform the driver of the occurrence of a malfunction. (For some codes the light does not come on.) The light goes OFF automatically when the malfunction has been repaired. But the diagnostic code(s) remains stored in the ECU memory (except for code No.16). The ECU stores the code(s) until it is cleared by removing the EFI fuse with the ignition switch OFF.
The diagnostic code can be read by the number of blinks of the check engine warning light when TE1 and E1 terminals on the check connector are connected. When 2 or more codes are indicated, the lowest number (code) will appear first.
If a malfunction is detected when in the test mode, the ECU lights up the check engine warning light to inform the technician of the occurrence of a malfunction (except for code Nos.42, 43 and 51). In this case, TE2 and E1 terminals on the check connector should be connected as shown later. (See page EG–168).
In the test mode, even if the malfunction is corrected, the malfunction code is stored in the ECU memory even when the ignition switch is OFF (except code Nos. 42, 43 and 51). This also applies in the normal mode. The diagnostic mode (normal or test) and the output of the check engine warning light can be selected by connecting the TE1, TE2 and E1 terminals on the check connector, as shown later. (See page EG–166)
A test mode function has been added to the functions of the self–diagnosis system of the normal mode for the purpose of detecting malfunctions such as poor contact, which are difficult to detect in the normal mode. This function fills up the self–diagnosis system. The test mode can be implemented by the technician following the appropriate procedures of check terminal connection and operation described later. (See page EG–168)



"CHECK" Engine Warning Light

P07777

CHECK ENGINE WARNING LIGHT CHECK

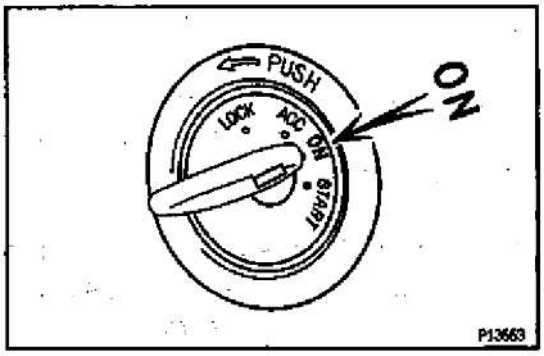
1. The check engine warning light will come on when the ignition switch is turned ON and the engine is not running.
2. When the engine is started, the check engine warning light should go off.
   If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

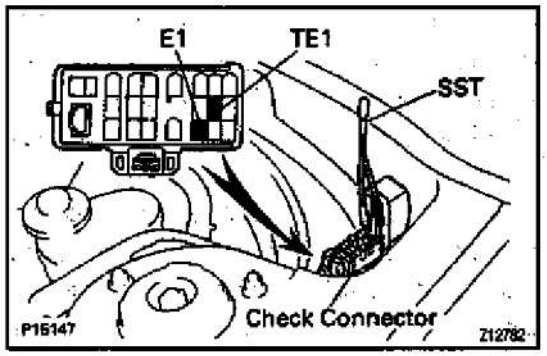
EG

DIAGNOSTIC CODES OUTPUT
(Normal mode)

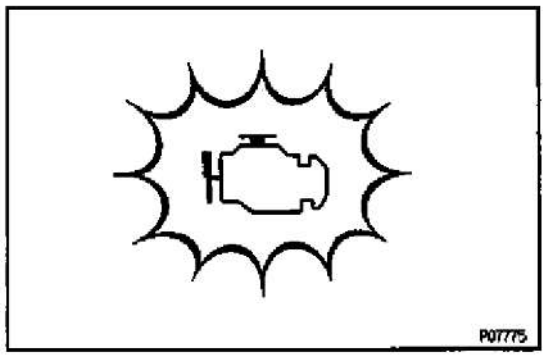
To obtain an output of diagnostic codes, proceed as follows:

1. Initial conditions
(a) Battery voltage 11 V or more
(b) Throttle valve fully closed (throttle position sensor IDL points closed)
(c) Transmission in neutral range
(d) Accessories switched OFF
(e) Engine at normal operating temperature
2. Turn the ignition switch ON.
NOTICE: Do not start the engine.

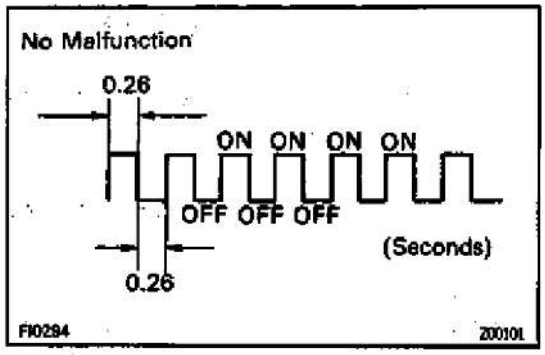




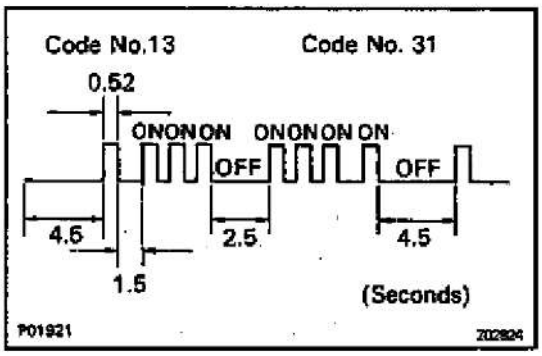
3. Using SST, connect terminals TE1 and E1 of the check connector.
SST 09843—18020



4. Read the diagnostic code as indicated by the number of flashes of the check engine warning light.



Diagnostic Codes (See page EG—171)
(a) Normal System Operation (no malfunction)
- The light will alternately blink ON and OFF at 0.26 second intervals.

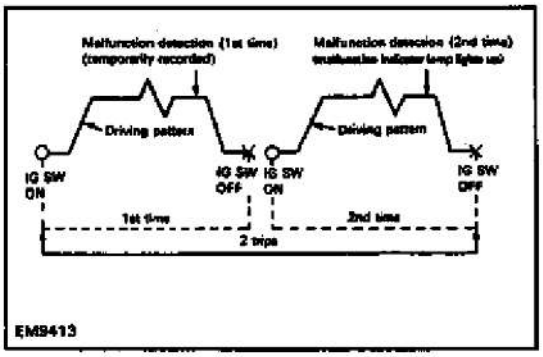


(b) Malfunction Code Indication

- In the event of a malfunction, the light will blink every 0.52 seconds. The first number of blinks will equal the first digit of a 2 digit diagnostic code and, after a 1.5 second pause, the 2nd number of blinks will equal the 2nd. If there are 2 or more codes, there will be a 2.5 second pause between each code.
- After all the codes have been output, there will be a 4.5 second pause and they will all be repeated as long the terminals TE1 and E1 of the check connector are connected.

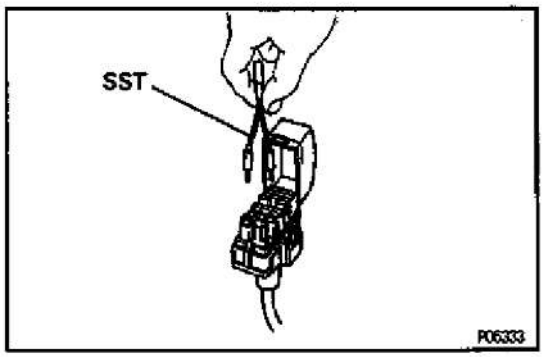
HINT: In the event of a number of codes, indication will begin from the smaller value and continue to the larger.

EG



(c) 2 Trip Detection Logic

Diagnostic codes 21 and 25 use "2 trip detection logic". With this logic, when a malfunction is first detected, the malfunction is temporarily stored in the ECU memory. If the same case is detected again during the second drive test, this second detection causes the check engine warning light to light up. The 2 trip repeats the same mode a 2nd time. (However, the ignition switch must be turned OFF between the 1st time and 2nd time.) In the Test Mode, the check engine warning light lights up the 1st time a malfunction is detected.



5. After the diagnosis check, remove the SST from the check connector.
   SST 09843–18020

EG

(Test mode)

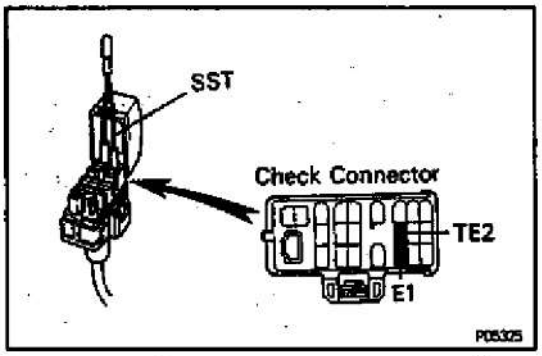
HINT:

- Compared to the normal mode, the test mode has high sensing ability to detect malfunctions.
- It can also detect malfunctions in the starter signal circuit, air conditioner signal and neutral start switch signal.
- Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the test mode.

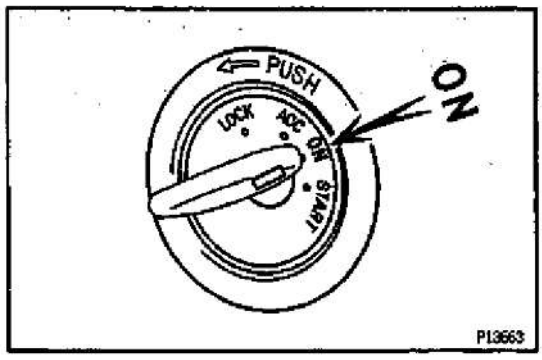
To obtain an output of diagnostic codes, proceed as follows:

1. Initial conditions

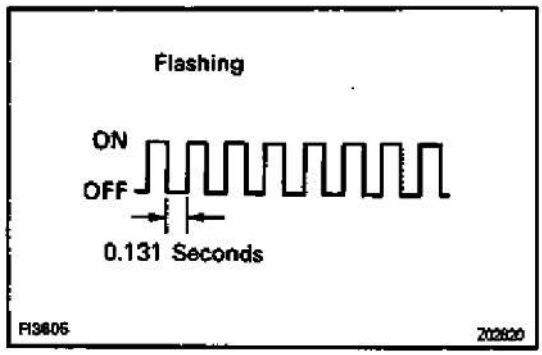
(a) Battery voltage 11 V or more
(b) Transmission in neutral range
(c) Accessories switched OFF
(d) Engine at normal operating temperature



2. First, using SST, connect terminals TE2 and E1 of the check connector.
   SST 09843–18020

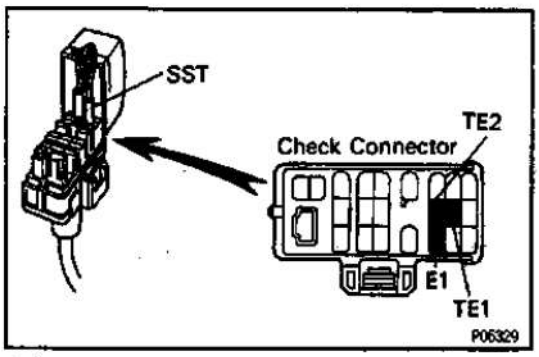


3. Turn the ignition switch ON to begin the diagnosis in the test mode.

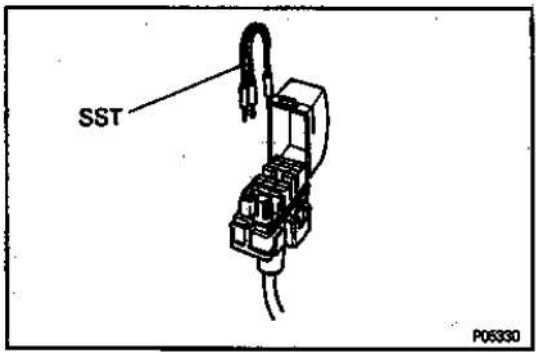


HINT: To confirm that the test mode is operating, check that the check engine warning light flashes when the ignition switch is turned ON.

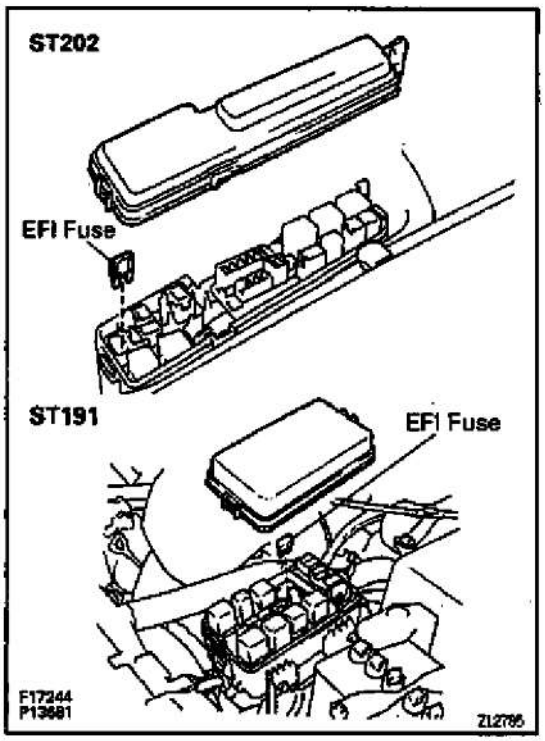
4. Start the engine and drive the vehicle at a speed of 10 km/h (6 mph) or higher.
5. Simulate the conditions of the malfunction described by the customer.



6. Using SST, connect terminals TE1 and E1 of the check connector.
   SST 09843–18020
7. Read the diagnostic code as indicated by the number of flashes of the check engine warning light. (See page EG–171)



8. After the diagnosis check, remove the SST from the check connector.
   SST 09843–18020
   HINT:
   - The test mode will not start if terminals TE2 and E1 are connected after the ignition switch is turned on.
   - The starter signal and vehicle speed signal will be diagnosed by the ECU as malfunctions, and code Nos. 42, and 43 will be output, if the operation in step 4 is not performed.
   - When the automatic transmission shift lever is in the "D", "2", "L" or "R" shift position, or when the air conditioner is ON or when the accelerator pedal is depressed, code No. 51 (Switch Condition Signal) is output, but this is not abnormal.



EG

DIAGNOSTIC CODE CANCELLATION

1. After repair of the trouble area, the diagnostic code retained in memory by the ECU must be cancelled out by removing the EFI fuse 15A for 10 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF.
   HINT:
   - Cancellation can also be done by removing the negative (−) terminal cable from the battery, but in this case, other memory systems (clock, etc.) will also be cancelled out.
   - If the diagnostic code is not cancelled out, it will be retained by the ECU and appear along with a new code in the event of future trouble.
   - If it is necessary to work on engine components requiring removal of the battery terminal, a check must first be made to see if a diagnostic code has been recorded.
2. After cancellation, perform road test of the vehicle to check that a normal code is now read on the check engine warning light.
   If the same diagnostic code appears, it indicates that the trouble area has not been repaired thoroughly.

DIAGNOSIS INDICATION

1. When 2 or more codes are indicated, the lowest numbered code will appear first.
2. All detected diagnostic codes, except code Nos. 16, 43, 51 and 42 under the test mode will be retained in memory by the ECU from the time of detection until cancelled out.
3. Once malfunction is cleared, the check engine warning light on the combination meter will go off but the diagnostic code(s) remains stored in ECU memory (except for code Nos. 16, 43, 51 and 42 under the test mode).

DIAGNOSTIC CODES

HINT:

- If a malfunction is detected during the diagnostic code check, refer to the circuit indicated in the table, and turn to the corresponding page.
- Your readings may vary from the parameters listed in the table, depending on the instruments used.

Code No.	Number of blinks of Check Engine Warning Light	System	Check Engine*1 Warning Light: Normal Mode	Check Engine*1 Warning Light: Test Mode	Diagnosis	Trouble Area	Memory*2	See page
–	FI1461	Normal	–	–	Output when no other code is recorded.	–	–	–
12	FI1606	RPM Signal	ON	N.A.	NE signal is not input to ECU for 2 secs. or more after STA turns ON. G signal is not input to ECU for 3 sec. or more.	• Open or short in NE, G circuit • Distributor • Open or short in STA circuit • ECU	O	IG-5
13	FI1607	RPM Signal	ON	ON	NE signal is not input to ECU for 300 msec. or more when engine speed is 1,500 rpm or more.	• Open or short in NE circuit • Distributor • ECU	O	IG-5
14	FI1608	Ignition Signal	ON	N.A.	IGF signal from igniter is not input to ECU for 4 – 6 consecutive ignitions.	• Open or short in IGF or IGT circuit from igniter to ECU • Igniter • ECU	O	IG-5
*4 16	FI3600	ECT Control Signal	ON	N.A.	Normal signal is not output from ECU CPU.	• ECU	X	–
*5 21	FI1609	Oxygen Sensor Circuit	OFF	N.A.	(1) Open or short in heater circuit of oxygen sensor for 500 msec. or more. (HT) (2) At normal driving speed (below 100 km/h (60 mph) and engine speed is above 1,500 rpm), amplitude of oxygen sensor signal (OX1) is reduced to between 0.35 – 0.70 V continuously for 60 sec. or more. *3 (2 trip detection logic) (only for (2))	• Open or short in heater circuit of oxygen sensor • Oxygen sensor heater • ECU • Open or short in oxygen sensor circuit • Oxygen sensor • ECU	O	EG-194 EG-284
22	FI1610	Water Temp. Sensor Signal	ON	ON	Open or short in water temp. sensor circuit for 500 msec. or more. (THW)	• Open or short in water temp. sensor circuit • Water temp. sensor • ECU	O	EG-189
24	FI1611	Intake Air Temp. Sensor Signal	OFF	ON	Open or short in intake air temp. sensor circuit for 500 msec. or more. (THA)	• Open or short in intake air temp. circuit • Intake air temp. sensor • ECU	O	EG-188
*5 25	FI2562	Air-Fuel Ratio Lean Malfunction	OFF	ON	Oxygen sensor output is less than 0.45 V for at least 90 secs. for others when oxygen sensor is warmed up (racing at 2,000 rpm) *3 (2 trip detection logic)	• Engine ground bolt loose • Open in E1 circuit • Open in injector circuit • Fuel line pressure (injector blockage, etc.) • Open or short in oxygen sensor circuit • Oxygen sensor • Ignition system	O	EG-194 EG-284
31	FI1612	Vacuum Sensor Signal	ON	ON	Open or short detected continuously for 500 msec. or more in vacuum sensor sensor circuit. (PIM)	• Open or short in vacuum sensor circuit • Vacuum sensor • ECU	O	EG-186

DIAGNOSTIC CODES (Cont'd)

Code No.	Number of blinks of Check Engine Warning Light	System	Check Engine*1 Warning Light		Diagnosis	Trouble Area	Memory*2	See page
			Normal Mode	Test Mode				
41	 FI1614	Throttle Position Sensor Signal	OFF	ON	Open or short detected continuously for 500 msec. or more in throttle position sensor (VTA) circuit.	• Open or short in throttle Position sensor circuit • Throttle position sensor • ECU	○	EG-184
42	 FI1615	Vehicle Speed Sensor Signal	OFF	OFF	SPD signal is not input to ECU for at least 8 seconds during high load driving with engine speed 3,000 rpm or more.	• Open or short in vehicle speed senor circuit • Vehicle speed sensor • ECU	○	–
43	 FI1616	Starter Signal	N.A.	OFF	Starter signal (STA) is not input to ECU.	• Open or short in starter signal circuit • Open or short in IG SW or main relay circuit • ECU	X	EG-190
52	 FI1618	Knock Sensor Signal	ON	N.A.	With engine speed between 2,000 rpm and 6,000 rpm, signal from knock sensor is not input to ECU for 6 revolutions. (KNK)	• Open or short in knock sensor circuit • Knock sensor (looseness, etc.) • ECU	○	–
51	FI1617	Switch Condition Signal	N.A.	OFF	Displayed when A/C is ON, IDL contact OFF or shift position in "R", "D", "2", or "1" ranges with the check terminals E1 and TE1 connected.	• A/C switch system • Throttle position sensor IDL circuit • Neutral start switch circuit • Accelerator pedal, cable • ECU	X	EG-194

REMARKS:

*1 "ON" displayed in the diagnosis mode column indicates that the check engine warning light is lit up when a malfunction is detected. "OFF" indicates that the check engine warning light does not light up during malfunction diagnosis, even if a malfunction is detected. "N.A." indicates that the item is not included in malfunction diagnosis.

*2 "○" in the memory column indicates that a diagnostic code is recorded in the ECU memory when a malfunction occurs. "X" indicates that a diagnostic code is not recorded in the ECU memory even if a malfunction occurs. Accordingly, output of diagnostic results in normal or test mode is performed with the ignition switch ON.

*3 "2" trip detection logic" (See page EG-167)

*4 A/T

*5 w/ Oxygen Sensor

DIAGNOSTIC CODE DETECTION DRIVING PATTERN

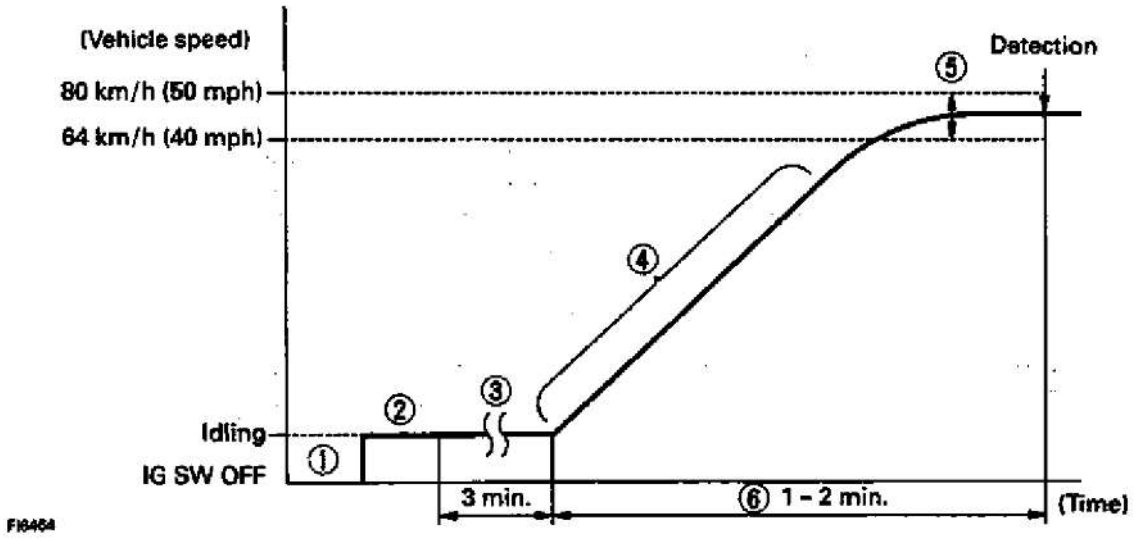
Purpose of the driving pattern.

(a) To simulate diagnostic code detecting condition after diagnostic code is recorded.

(b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic code is not longer detected.

Code No.	21	Oxygen Sensor Circuit

Malfunction: Deterioration of Oxygen Sensor



It is vital that test routine is adhered to detect the malfunction:

① Disconnect the EFI fuse (15A) for 10 sec. or more, with IG switch OFF.
Initiate test mode (Connect terminals TE2 and E1 of check connector with IG switch OFF).

② Start the engine and warm up with all ACC switched OFF.

③ Idle the engine for 3 minutes.

④ With A/C switched ON, A/T in D range (M/T in 5th gear), accelerate gradually within the range 1,300 – 1,700 rpm centered around 1,500 rpm.

HINT:
- Ensure engine speed does NOT fall below 1,200 rpm.
- Gradually depress the accelerator pedal at a suitable rate to comply with the test requirements on the above graph.
- Never allow engine speed to drop at any time during the test.

⑤ Maintain the vehicle speed at 64 – 80 km/h (40 – 50 mph).

⑥ Keep the vehicle running for 1 – 2 min. after starting acceleration.

HINT: If a malfunction exists, the check engine warning light will light up after approx. 60 sec. from the start of acceleration.

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

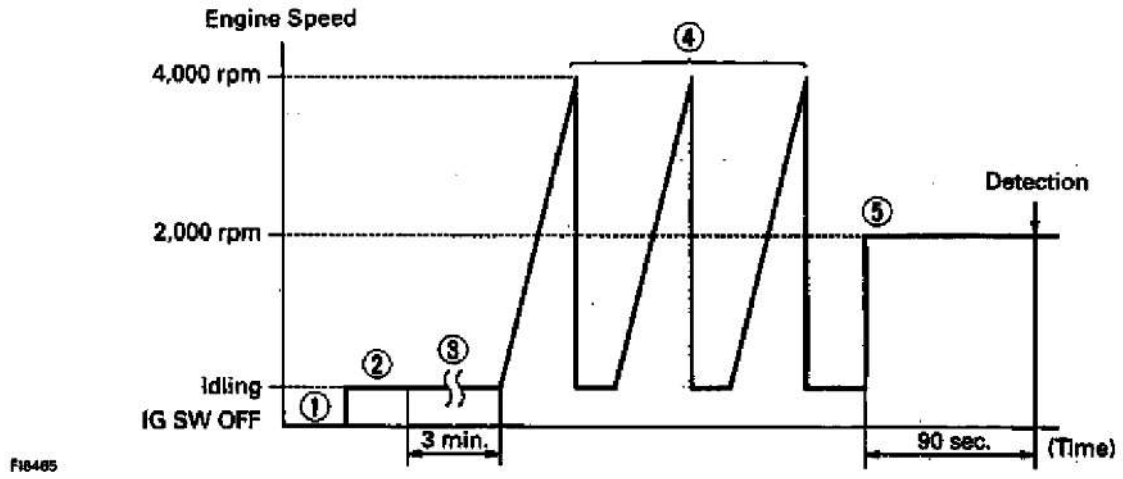
Purpose of the driving pattern.

(a) To simulate diagnostic code detecting condition after diagnostic code is recorded.

(b) To check that the malfunction is corrected when the repair is completed, confirming that diagnostic code is no longer detected.

EG

Code No.	25	Air-Fuel Radio Lean Malfunction



HINT: Before this test, check the feedback voltage for oxygen sensor.

① Disconnect the EFI fuse (15A) for 10 sec. or more, with IG switch OFF.
Initiate test mode (Connect terminals TE2 and E1 of check connector with IG switch OFF).

② Start the engine and warm up.

③ Idle the engine for 3 minutes.

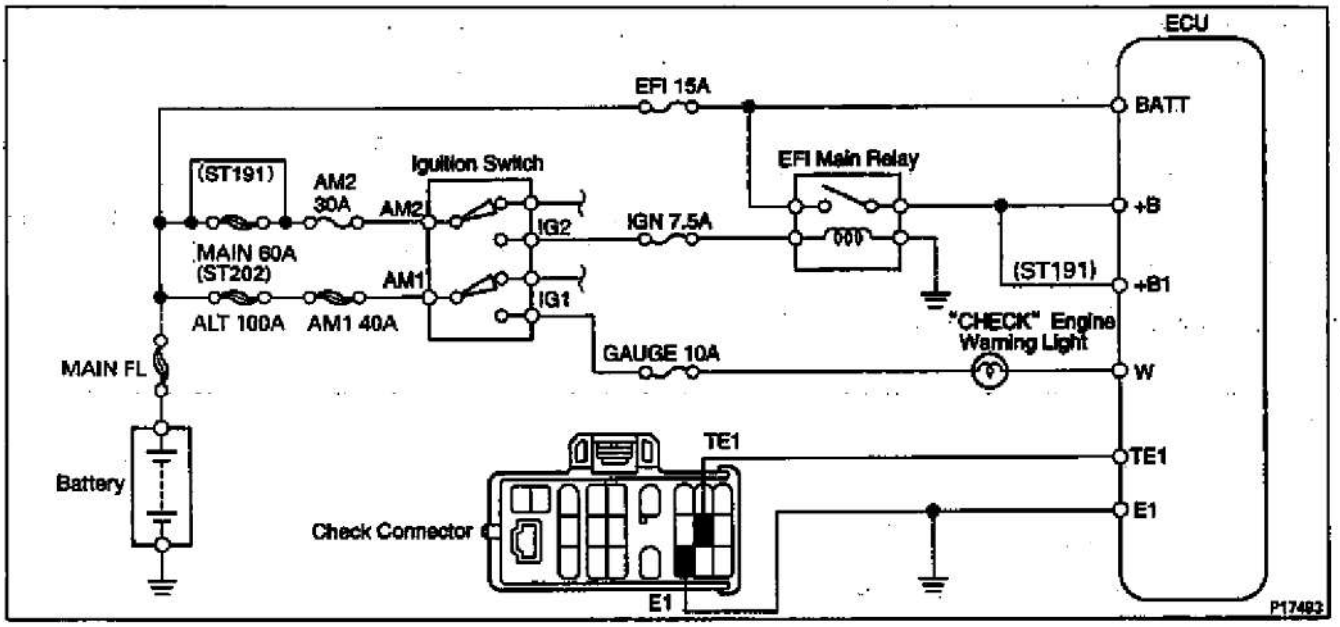
④ Quickly race the engine to 4,000 rpm 3 times using the accelerator pedal.

⑤ Race the engine at 2,000 rpm for 90 secs.

HINT: If a malfunction exists, the check engine warning light will light up during step ④.

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

DIAGNOSIS CIRCUIT INSPECTION



1. Does "CHECK" engine warning light come on when ignition switch is ON?
   - YES → System Normal.
   - NO → Does "CHECK" engine warning light come on when ECU terminal W is grounded to the body?
     - YES → Check wiring between ECU terminal E1 and body ground.
       - OK → Try another ECU.
       - BAD → Repair or replace.
     - NO → Check bulb, fuse, and wiring between ECU and ignition switch.
       - BAD → Repair or replace.

2. Does "CHECK" engine warning light go off when the engine is started?
   - YES → System Normal.
   - NO → Check wiring between ECU and "CHECK" engine warning light.
     - BAD → Repair.
     - OK → Is there diagnostic code output when check connector terminals TE1 and E1 are connected?
       - NO → Check wiring between ECU terminal TE1 and check connector terminal TE1, and ECU terminal E1 and check connector terminal E1.
         - OK → Try another ECU.
       - YES → Does "CHECK" engine warning light go off after repair according to malfunction code?
         - NO → Further repair required.
         - YES → System OK → Cancel out diagnostic code.

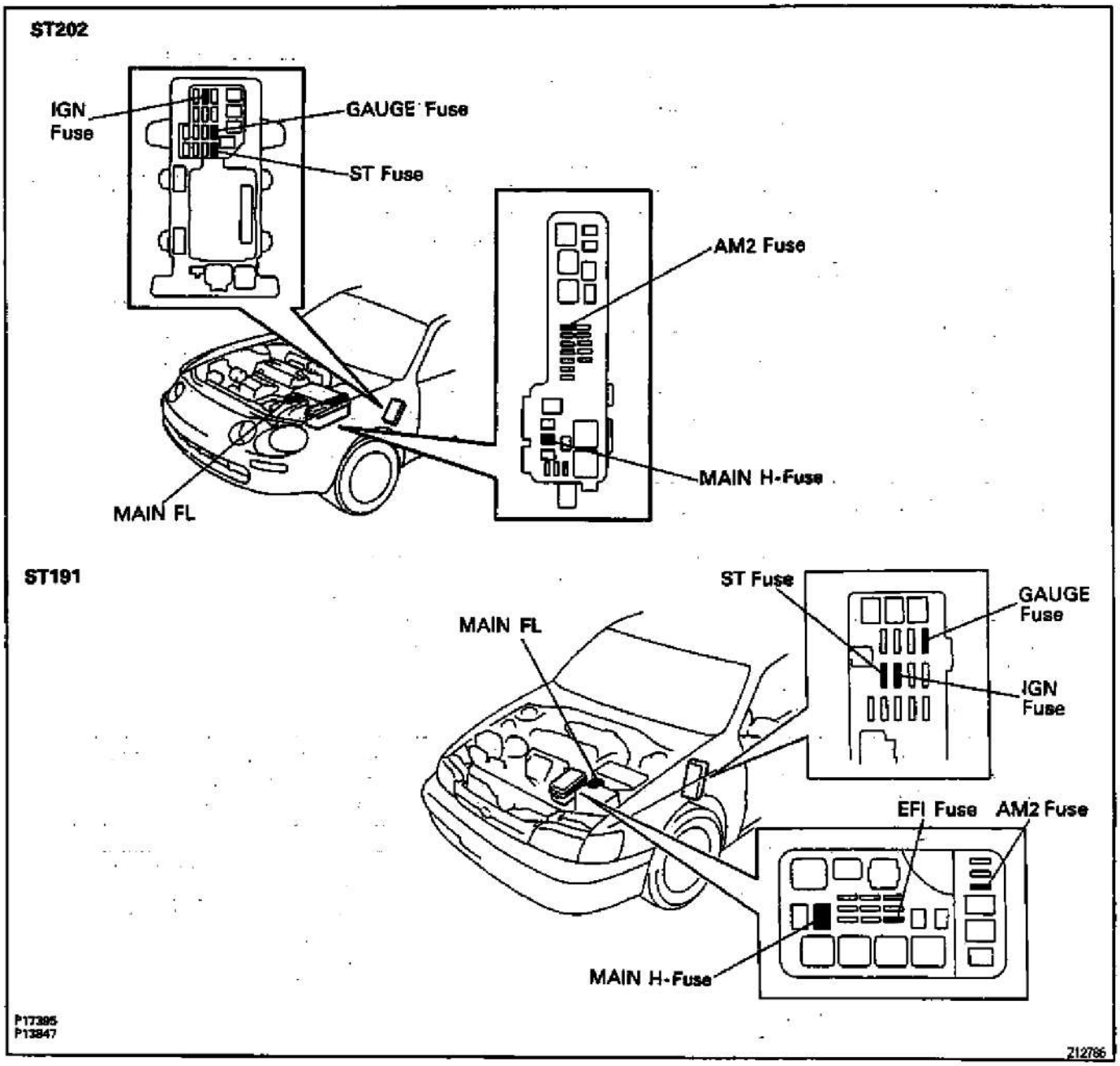
V05370

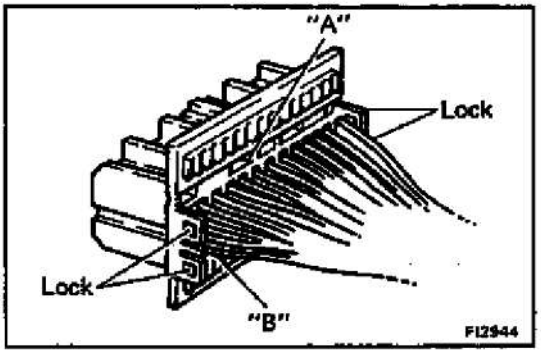
TROUBLESHOOTING w/ VOLT, OHMMETER

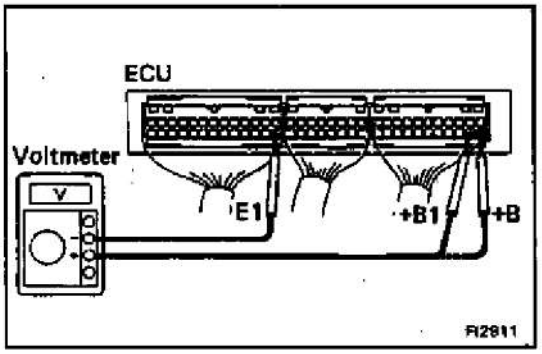
HINT:

- The following troubleshooting procedures are designed for inspection of each separate system, and therefore the actual procedure may vary somewhat. However, troubleshooting should be performed while referring to the inspection methods described in this manual.
- Before beginning inspection, it is best to first make a simple check of the fuses, fusible link and the condition of the connectors.
- The following troubleshooting procedures are based on the supposition that the trouble lies in either a short or open circuit within the computer.
- If engine trouble occurs even though proper operating voltage is detected in the computer connector, then it can be assumed that the ECU is faulty and should be replaced.

FUSES AND FUSIBLE LINK LOCATION







EFI SYSTEM CHECK PROCEDURE

PREPARATION

(a) Disconnect the connectors from the ECU.

(b) Remove the locks as shown in the illustration so that the tester probe(s) can easily come in.
NOTICE: Pay attention to sections "A" and "B" in the illustration which can be easily broken.

(c) Reconnect the connectors to the ECU.
HINT:
- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in the "ON" position.

Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal of the wiring connectors.
NOTICE: The ECU shown in the illustrations for measuring the voltage at each terminal of the wiring connectors, on pages EG–182 to EG–194, is the ECU used for the ST191 (A/T) and ST202. For the ECU of the ST191 (M/T), refer to EG–179 or EG–181.

EG

ECU Terminals
(ST202)

EG

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	POWER GROUND	S1	ECT SOLENOID	AC1	A/C AMPLIFIER
E02	POWER GROUND	S2	ECT SOLENOID	ACT	A/C AMPLIFIER
#10	INJECTOR	SL	ECT SOLENOID	SPD	SPEED SENSOR
	–	E1	ENGINE GROUND	OD1	CRUISE CONTROL ECU
#20	INJECTOR	VF	CHECK CONNECTOR	ATS	A/C AMPLIFIER
	–	E21	SENSOR GROUND	L	NEUTRAL START SWITCH
ISCO	ISC VALVE	TT	CHECK CONNECTOR	OD2	O/D SWITCH
	–	TE1	CHECK CONNECTOR	2	NEUTRAL STRAT SWITCH
ISCC	ISC VALVE		–		–
	–	TE2	CHECK CONNECTOR	SEL	GROUND
	–	VAF	VARIABLE RESISTOR	W	WARNING LIGHT
	–	KNK	KNOCK SENSOR	R/P	FUEL CONTROL CONNECTOR
VISC	A/C IDLE-UP VSV	THW	WATER TEMP. SENSOR	B/K	STOP LIGHT SWITCH
IGT	IGNITER	IDL	THROTTLE POSITION SENSOR		–
	–	THA	INTAKE AIR TEMP. SENSOR		–
	–	VTA	THROTTLE POSITION SENSOR	FC	CIRCUIT OPENING RELAY
NE–	DISTRIBUTOR	PIM	VACUUM SENSOR	ELS	TAILLIGHT RELAY, DEFOGGER RELAY
G+	DISTRIBUTOR		–		–
NE+	DISTRIBUTOR	VC	VACUUM SENSOR, THROTTLE POSITION SENSOR	BATT	BATTERY
G–	DISTRIBUTOR	E2	SENSOR GROUND	+B	EFI MAIN RELAY
IGF	IGNITER	STA	STARTER SWITCH		
	–	NSW	NEUTRAL START SWITCH		

ECU Terminals

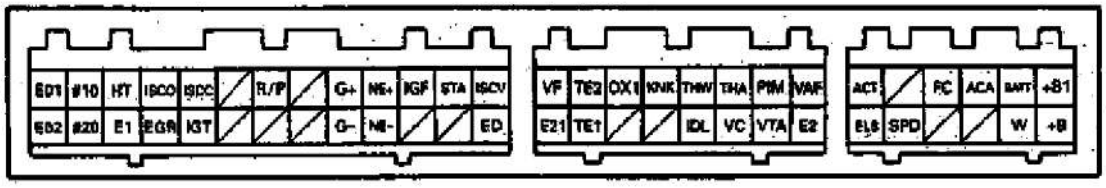


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ECU Terminals (Cont'd)
(ST191 M/T)

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	POWER GROUND	NE+	DISTRIBUTOR	THA	INTAKE AIR TEMP. SENSOR
E02	POWER GROUND	NE–	DISTRIBUTOR	VC	VACUUM SENSOR, THROTTLE POSITION SENSOR
#10	INJECTOR	IGF	IGNITER	PIM	VACUUM SENSOR
#20	INJECTOR		–	VTA	THROTTLE POSITION SENSOR
HT*1	OXYGEN SENSOR HEATER	STA	STARTER RELAY	VAF*2	VARIABLE RESISTOR
E1	ENGINE GROUND		–	E2	SENSOR GROUND
ISCO	ISC VALVE	ISCV	A/C IDLE-UP VSV	ACT	A/C AMPLIFIER
EGR*1	EGR VSV	ED*1	ED MONITOR	ELS	TAILLIGHT RELAY, DEFOGGER SWITCH
ISCC	ISC VALVE	VF	CHECK CONNECTOR		–
IGT	IGNITER	E21	SENSOR GROUND	SPD	SPEED SENSOR
	–	TE2	CHECK CONNECTOR	FC	CIRCUIT OPENING RELAY
	–	TE1	CHECK CONNECTOR		–
R/P*2	FUEL CONTROL CONNECTOR	OX1	OXYGEN SENSOR	AC1	A/C AMPLIFIER
	–		–		–
	–	KNK	KNOCK SENSOR	BATT	BATTERY
	–		–	W	WARNING LIGHT
G+	DISTRIBUTOR	THW	WATER TEMP. SENSOR	+B1	EFI MAIN RELAY
G–	DISTRIBUTOR	IDL	THROTTLE POSITION SENSOR	+B	EFI MAIN RELAY

ECU Terminals



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*1 Europe
*2 General

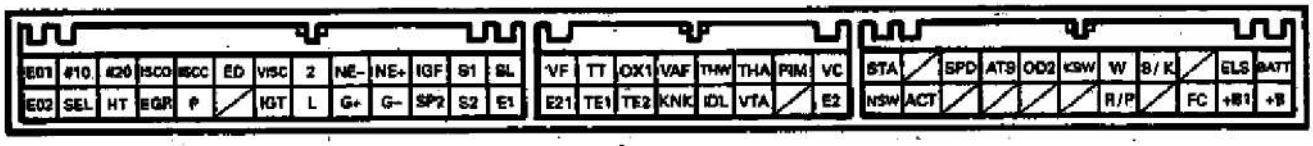
V05371

ECU Terminals (Cont'd)
(ST191 A/T)

EG

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	POWER GROUND	S1	ECT SOLENOID		-
E02	POWER GROUND	S2	ECT SOLENOID	ACT	A/C AMPLIFIER
#10	INJECTOR	SL	ECT SOLENOID	SPD	SPEED SENSOR
SEL*2	GROUND	E1	ENGINE GROUND		-
#20	INJECTOR	VF	CHECK CONNECTOR	ATS	A/C AMPLIFIER
HT*2	OXYGEN SENSOR HEATER	E21	SENSOR GROUND		-
ISCO	ISC VALVE	TT	CHECK CONNECTOR	OD2	O/D SWITCH
EGR*2	EGR VSV	TE1	CHECK CONNECTOR		-
ISCC	ISC VALVE	OX1*2	OXYGEN SENSOR	KSW*2	KICK-DOWN SWITCH
P	PATTERN SELECT SWITCH	TE2	CHECK CONNECTOR		-
ED*2	ED MONITOR	VAF*1	VARIABLE RESISTOR	W	WARNING LIGHT
	-	KNK	KNOCK SENSOR	R/P*1	FUEL CONTROL CONNECTOR
VISC	A/C IDLE-UP VSV	THW	WATER TEMP. SENSOR	B/K	STOP LIGHT SWITCH
IGT	IGNITER	IDL	THROTTLE POSITION SENSOR		-
2	NEUTRAL START SWITCH	THA	INTAKE AIR TEMP. SENSOR		-
L	NEUTRAL START SWITCH	VTA	THROTTLE POSITION SENSOR	FC	CIRCUIT OPENING RELAY
NE-	DISTRIBUTOR	PIM	VACUUM SENSOR	ELS	TAILLIGHT RELAY, DEFOGGER RELAY
G+	DISTRIBUTOR		-	+B1	EFI MAIN RELAY
NE+	DISTRIBUTOR	VC	VACUUM SENSOR, THROTTLE POSITION SENSOR	BATT	BATTERY
G-	DISTRIBUTOR	E2	SENSOR GROUND	+B	EFI MAIN RELAY
IGF	IGNITER	STA	STARTER SWITCH		
SP2	SPEED SENSOR	NSW	NEUTRAL START SWITCH		

ECU Terminals



FI2796

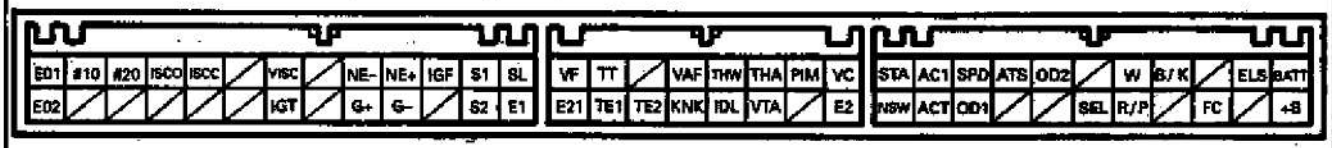
*1 General
*2 Europe

ECU Wiring Connectors Voltage

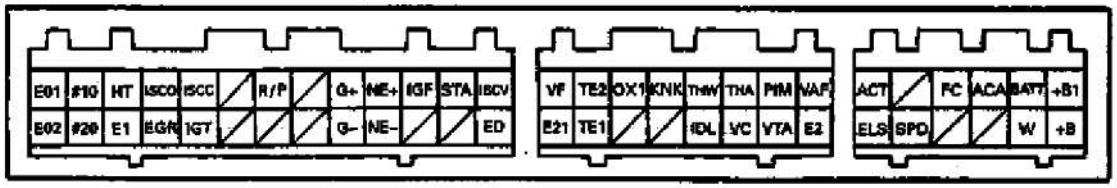
No.	Terminals	Condition		STD voltage (V)	See page
1	+B, +B1 – E1	IG SW ON		9 – 14	EG-182
2	BATT – E1	–		9 – 14	EG-183
3	IDL – E2	IG SW ON	Throttle valve open	9 – 14	EG-184
	VC – E2		–	4.5 – 5.5	
	VTA – E2		Throttle valve fully closed	0.3 – 0.8	
			Throttle valve fully open	3.2 – 4.9	
4	PIM – E2	IG SW ON		3.3 – 3.9	EG-186
	VC – E2			4.5 – 5.5	
5	#10, #20 – E01, E02	IG SW ON		9 – 14	EG-187
6	THA – E2	IG SW ON	Intake air temp. 20 °C (68°F)	0.5 – 3.4	EG-188
7	THW – E2		Coolant temp. 80°C (176°F)	0.2 – 1.0	EG-189
8	STA – E1	Cranking		6 or more	EG-190
9	IGT – E1	Cranking or idling		Pulse generation	EG-191
10	ISCC, ISCO – E1	IG SW ON	ECU connectors disconnected	9 – 14	EG-192
11	W – E1	No trouble (Check engine warning light off) and engine running		9 – 14	EG-193

ECU Terminals

ST202



ST191 (M/T)



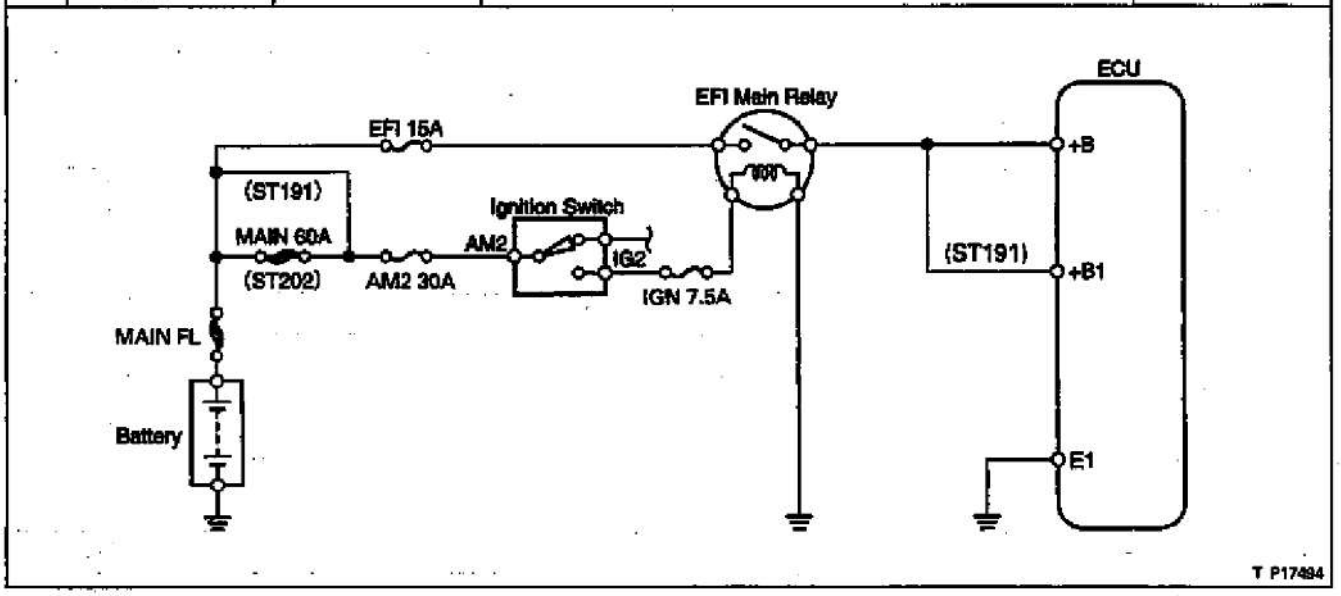
ST191 (A/T)

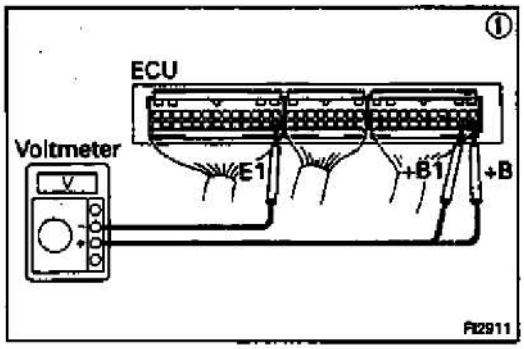


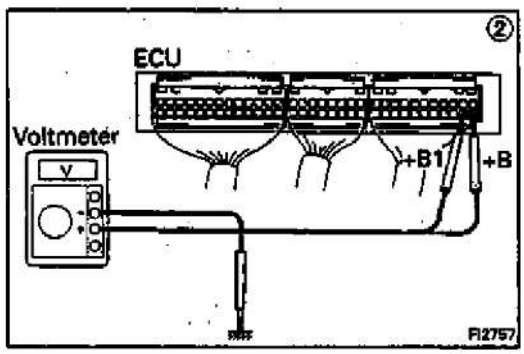
FI2796
P01821
FI2798

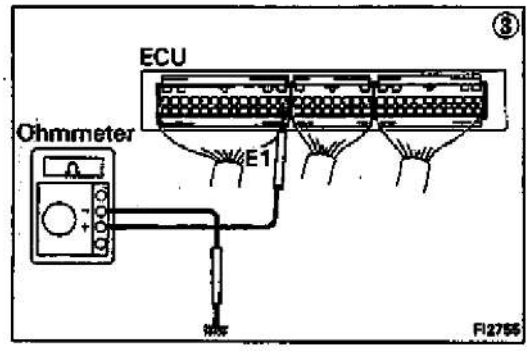
V05373

No.	Terminals	Trouble	Condition	STD Voltage
1	+B +B1 – E1	No voltage	IG SW ON	9 – 14 V









① There is no voltage between ECU terminals +B or +B1 and E1. **(IG SW ON)**

↓

② Check that there is voltage between ECU terminal +B or +B1 and body ground. **(IG SW ON)**

NO → OK

↓

③ Check wiring between ECU terminal E1 and body ground.

OK → Try another ECU.

BAD → Repair or replace.

↓

Check fuses, fusible links and ignition switch. → BAD → Repair or replace.

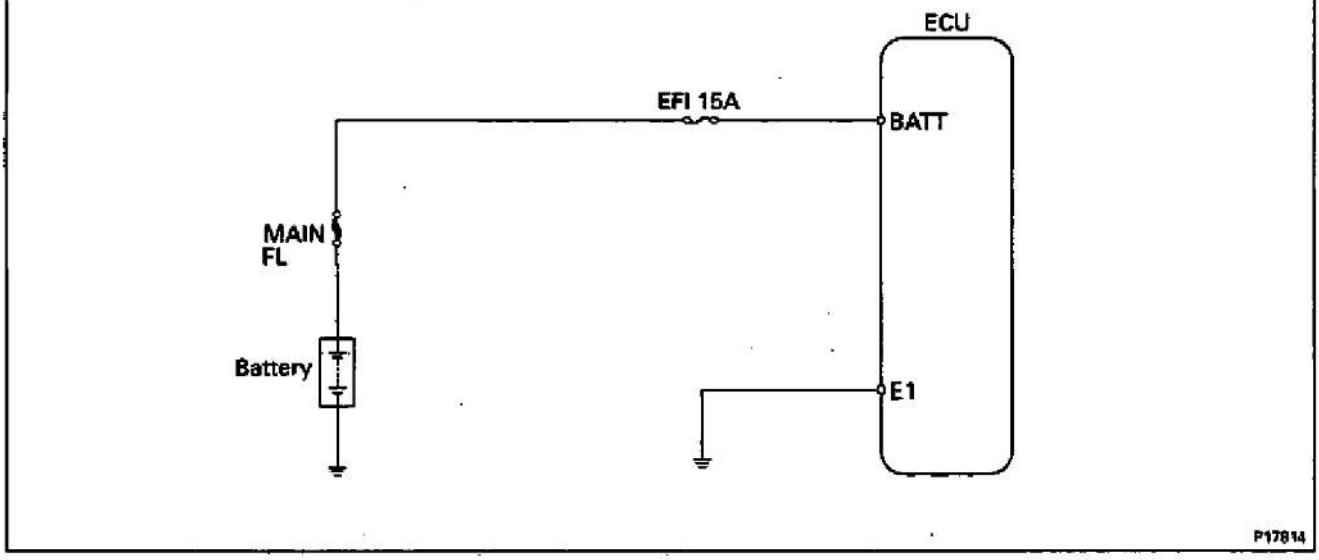
↓ OK

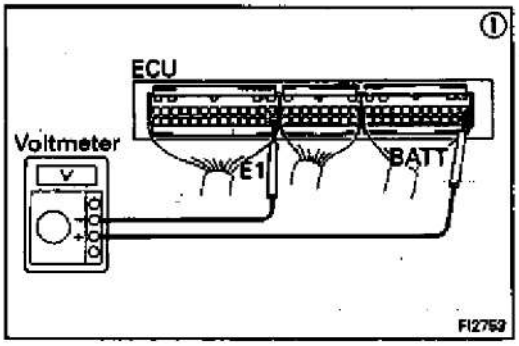
Check EFI main relay. (See page EG-261 or 262) → BAD → Replace.

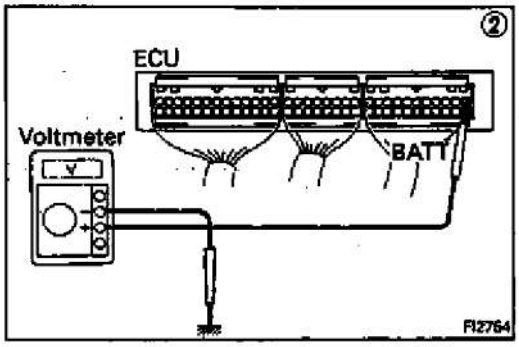
↓ OK

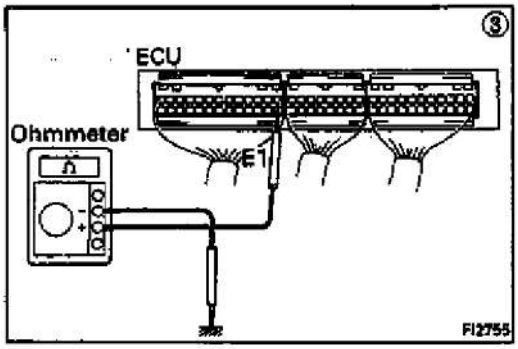
Check wiring between EFI main relay and battery. → BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD Voltage
2	BATT – E1	No voltage	–	9 – 14 V









① There is no voltage between ECU terminals BATT and E1.

② Check that there is voltage between ECU terminal BATT and body ground.

NO → OK

③ Check wiring between ECU terminal E1 and body ground.

OK → Try another ECU.

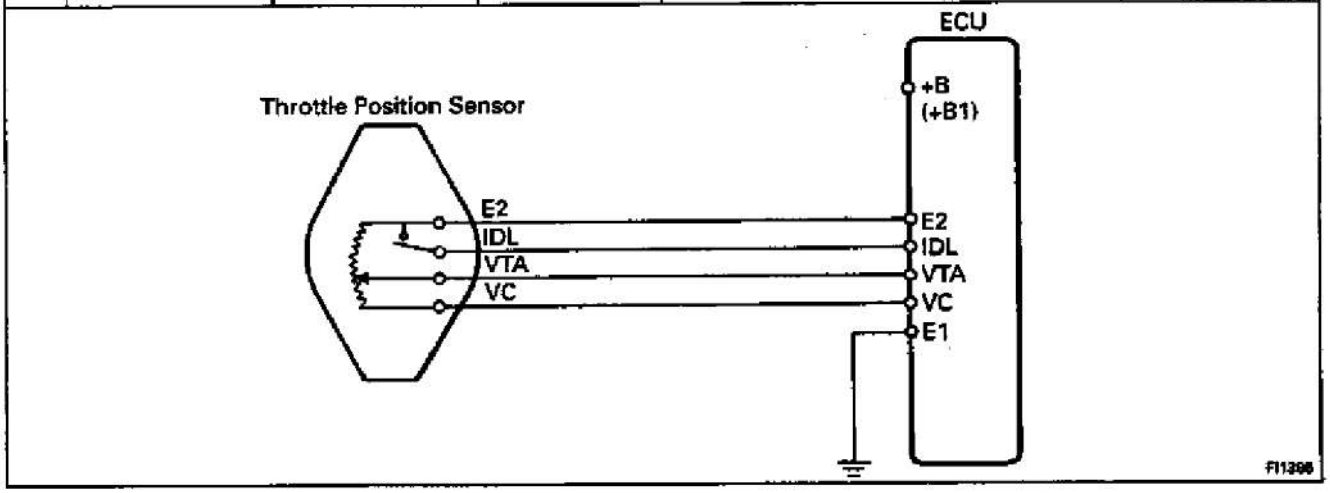
BAD → Repair or replace.

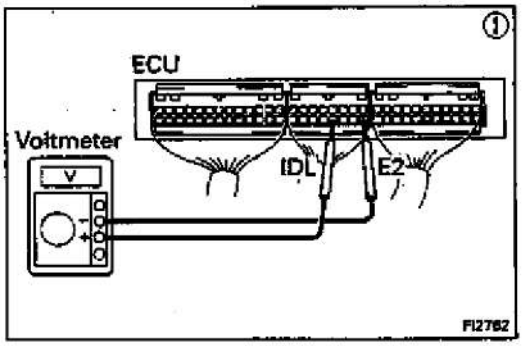
Check fuse and fusible link. BAD → Replace.

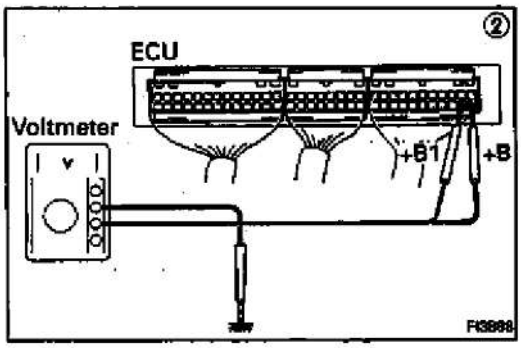
OK

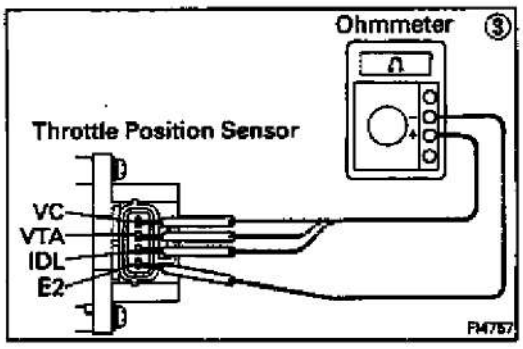
Check wiring between ECU terminal and battery. BAD → Repair or replace.

No.	Terminals	Trouble	Condition		STD Voltage
3	IDL – E2	No voltage	Ignition switch ON	Throttle valve open	9 – 14 V
	VC – E2			–	4.5 – 5.5 V
	VTA – E2			Throttle valve fully closed	0.3 – 0.8 V
				Throttle valve fully open	3.2 – 4.9 V









• **IDL – E2**

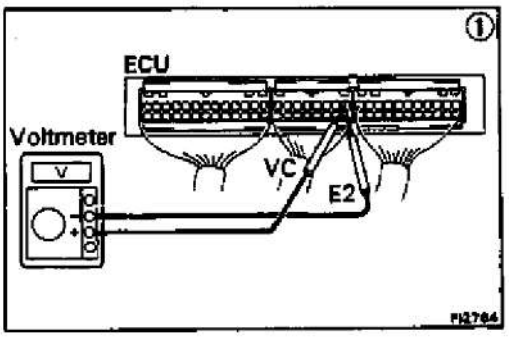
① There is no voltage between ECU terminals IDL and E2. **(IG SW ON) (Throttle valve open)**

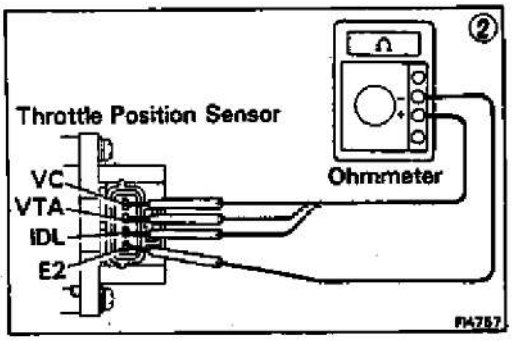
② Check that there is voltage between ECU terminal +B or +B1 and body ground. **(IG SW ON)**

NO → Check wiring between ECU terminal E1 and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.

OK → Refer to +B – E1 trouble section (No.1). (See page EG-182)
- BAD → Repair or replace.

③ Check throttle position sensor. (See page EG-248)
- BAD → Repair or replace throttle position sensor.
- OK → Check wiring between ECU and throttle position sensor.
  - BAD → Repair or replace.
  - OK → Try another ECU.





• **VC – E2**

① No voltage between ECU terminals VC and E2. (IG SW ON)

Check that there is voltage between ECU terminal +B or +B1 and body ground. (IG SW ON)

OK → ② Check throttle position sensor. (See page EG-248)

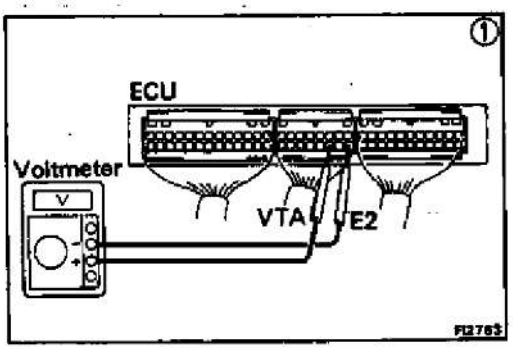
NO → Refer to +B – E1 trouble section (No.1). (See page EG-182)

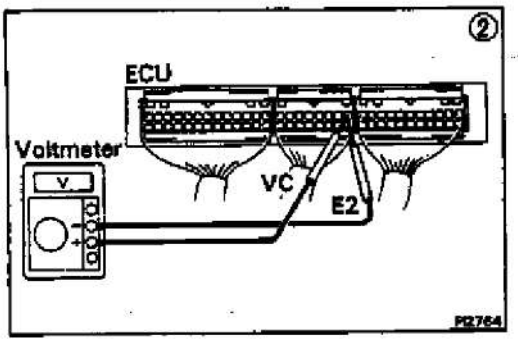
② BAD → Repair or replace.

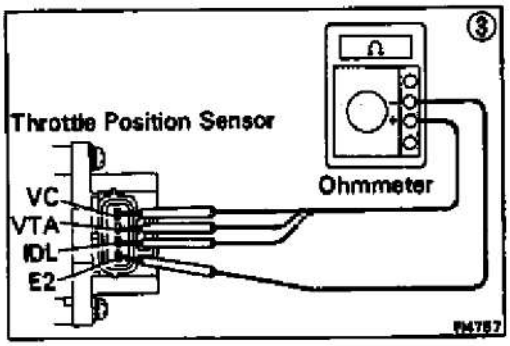
② OK → Check wiring between ECU and throttle position sensor.

Check wiring OK → Try another ECU.

Check wiring BAD → Repair or replace.







• **VTA – E2**

① No specified voltage at ECU terminals VTA and E2. (IG SW ON)

② Check that there is voltage between ECU terminals VC and E2. (IG SW ON)

NO → Refer to VC – E2 trouble section.

OK → ③ Check throttle position sensor. (See page EG-248)

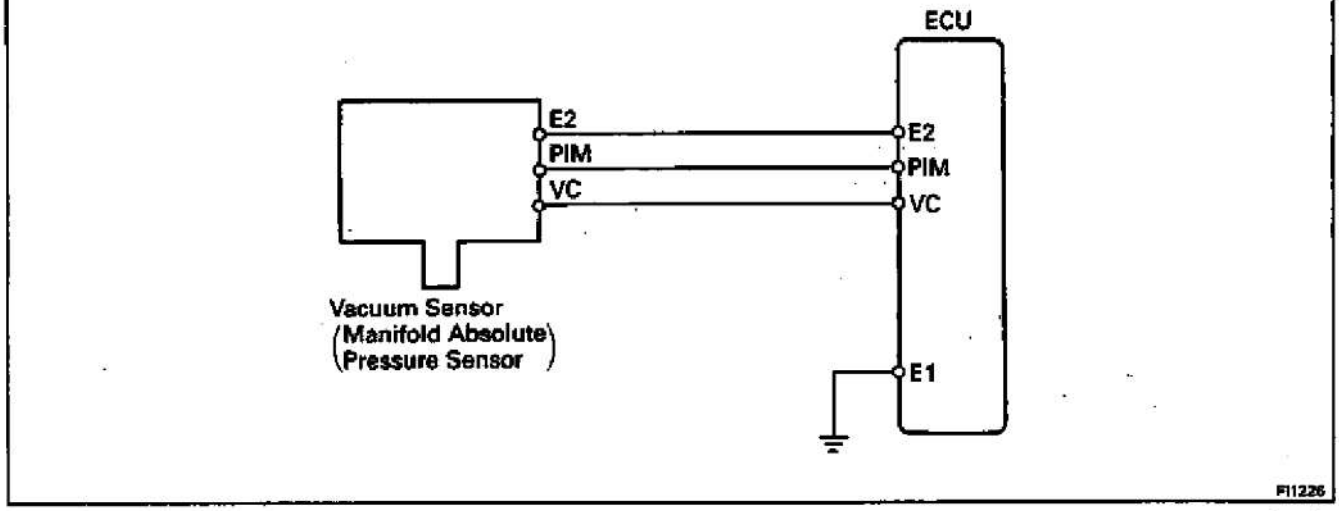
③ BAD → Repair or replace.

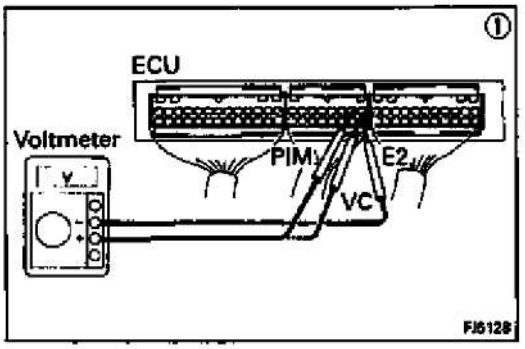
③ OK → Check wiring between ECU and throttle position sensor.

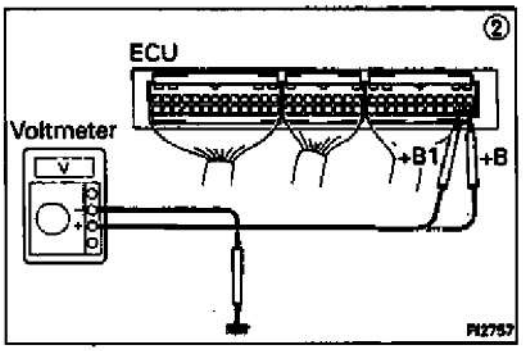
Check wiring BAD → Repair or replace.

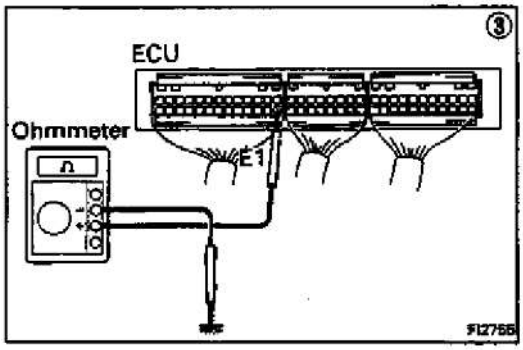
Check wiring OK → Try another ECU.

No.	Terminals	Trouble	Condition	STD voltage
4	PIM – E2	No voltage	IG SW ON	3.3 – 4.9 V
	VC – E2			4.5 – 5.5 V









① There is no voltage between ECU terminals PIM or VC and E2. (IG SW ON)

↓

② Check that there is voltage between ECU terminal +B or +B1 and body ground. (IG SW ON)

OK ↓

NO → Refer to +B – E1 trouble section (No.1). (See page EG-182)

↓

③ Check wiring between ECU terminal E1 and body ground.

OK ↓

BAD → Repair or replace.

↓

Check vacuum sensor. (See page EG-275)

BAD → Replace vacuum sensor.

OK → Check wiring between ECU and vacuum sensor.

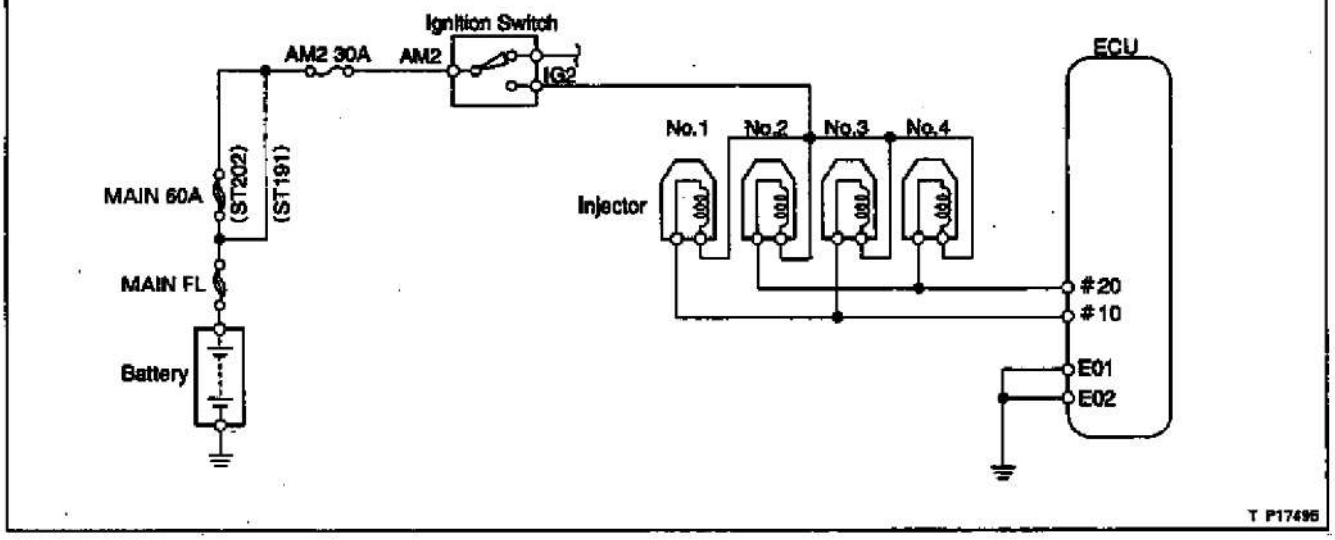
OK ↓

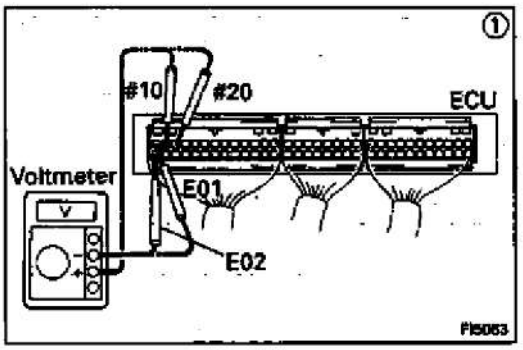
BAD → Repair or replace.

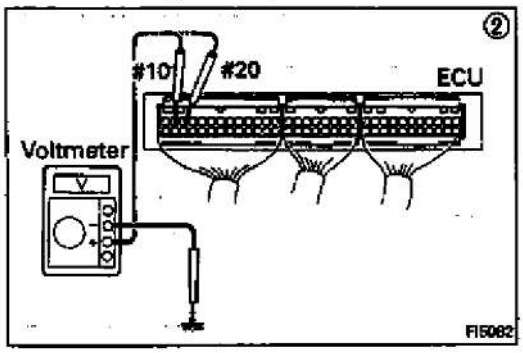
↓

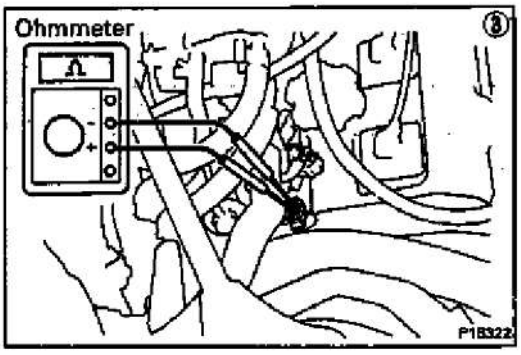
Try another ECU.

No.	Terminals	Trouble	Condition	STD voltage
5	#10 – E01 #20 – E02	No voltage	IG SW ON	9 – 14 V









① There is no voltage between ECU terminals #10 and/or #20 and E01 and/or E02. **(IG SW ON)**

② Check that there is voltage between ECU terminal #10 and/or #20 and body ground.

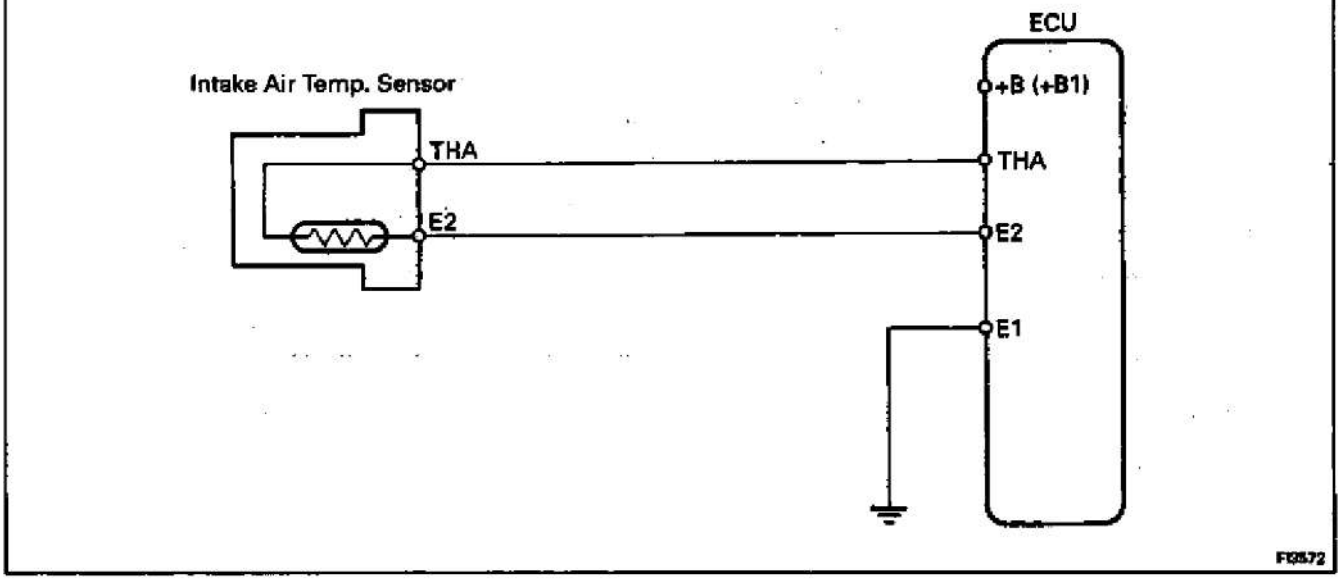
NO → Check wiring between ECU terminal E01 and/or E02 and body ground.
- OK → Try another ECU.
- BAD → Repair or replace.

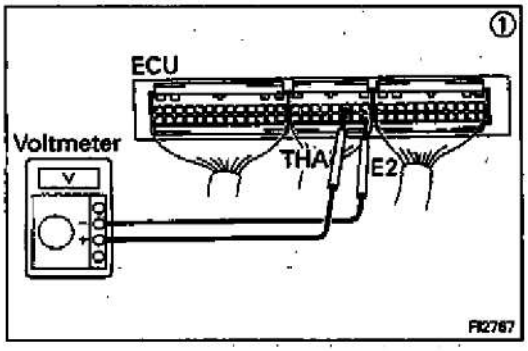
OK → Check fuse, fusible links and ignition switch.
- BAD → Repair or replace.

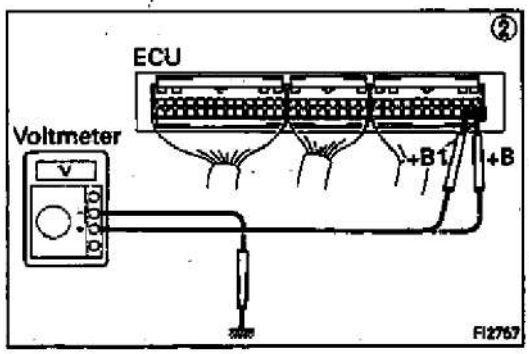
OK → ③ Check resistance of each injector.
STD resistance: Approx 13.8 Ω
- BAD → Replace injector.

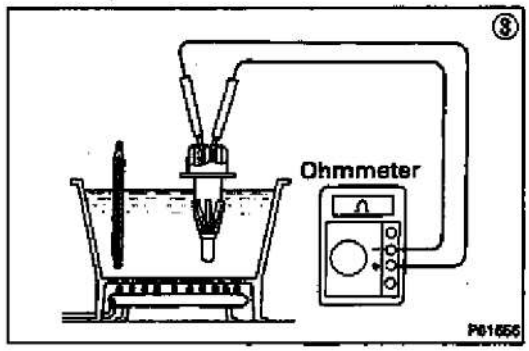
OK → Check wiring between ECU terminal #10 and/or #20 and battery.
- BAD → Repair or replace.

No.	Terminals	Trouble	Condition		STD voltage
6	THA – E2	No voltage	IG SW ON	Intake air temperature 20°C (68°F)	0.5 – 3.4 V









① There is no voltage between ECU terminals THA and E2. **(IG SW ON)**

② Check that there is voltage between ECU terminal +B or +B1 and body ground. **(IG SW ON)**

OK

NO

Refer to +B – E1 trouble section No.1. (See page EG-182)

Check wiring between ECU terminal E1 and body ground.

OK

BAD

③ Check intake air temp. sensor. (See page EG-273)

Repair or replace.

BAD

OK

Repair intake air temp. sensor.

Check wiring between ECU and intake air temp. sensor.

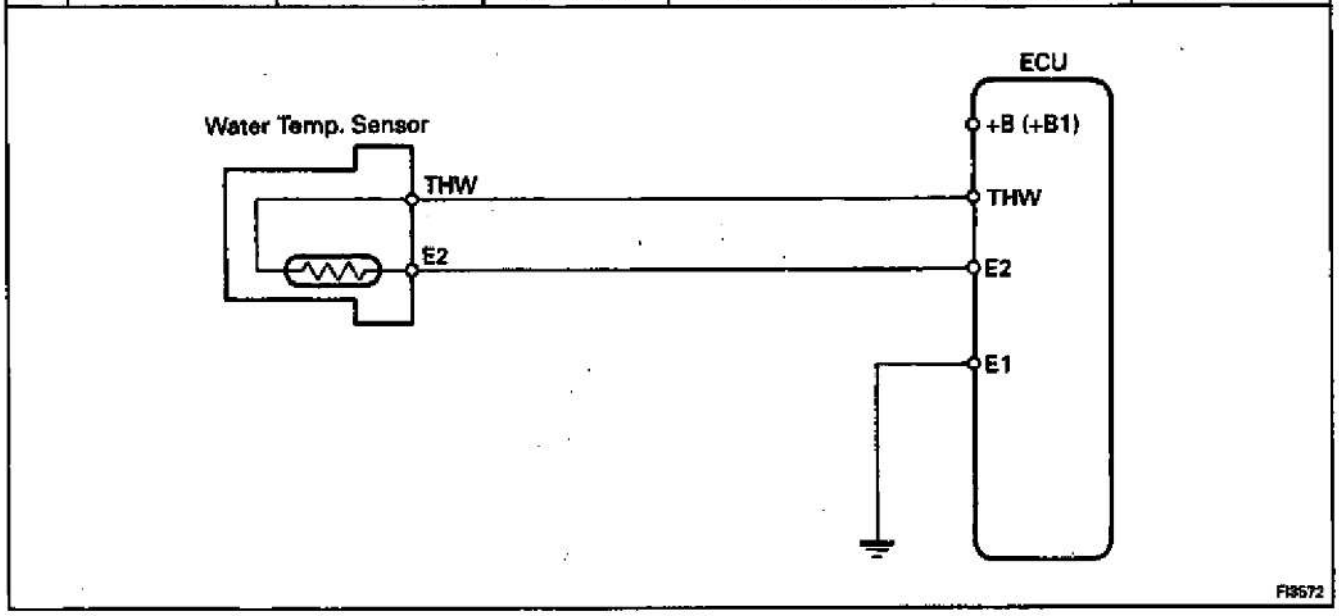
OK

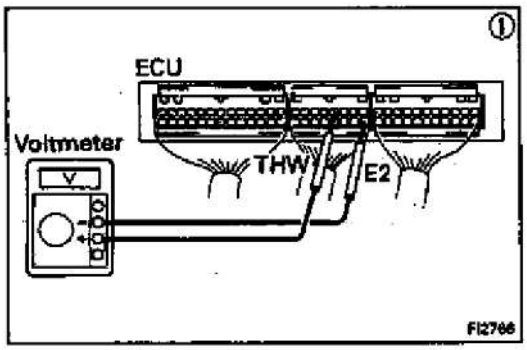
BAD

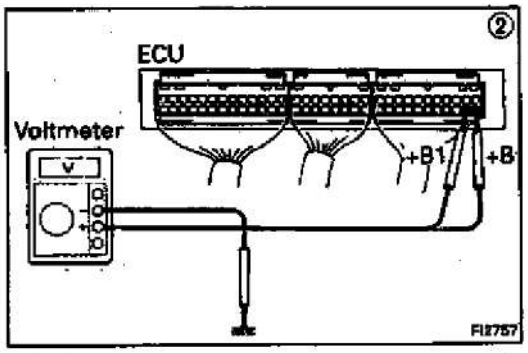
Try another ECU.

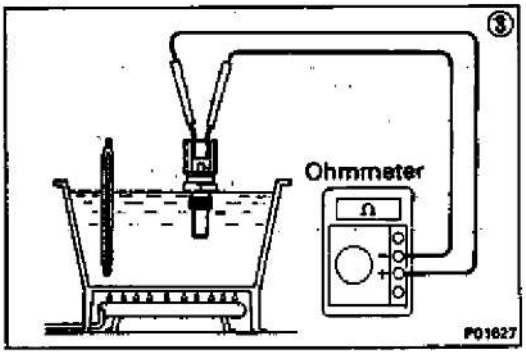
Repair or replace.

No.	Terminals	Trouble	Condition		STD voltage
7	THW – E2	No voltage	IG SW ON	Coolant temperature 80°C (176°F)	0.2 – 1.0 V









① There is no voltage between ECU terminals THW and E2. (IG SW ON)

② Check that there is voltage between ECU terminal +B or +B1 and body ground. (IG SW ON)

OK → Check wiring between ECU terminal E1 and body ground.

NO → Refer to +B – E1 trouble section (No.1). (See page EG-182)

Check wiring between ECU terminal E1 and body ground.

OK → ③ Check water temp. sensor. (See page EG-271)

BAD → Repair or replace.

③ Check water temp. sensor. (See page EG-271)

BAD → Replace water temp. sensor.

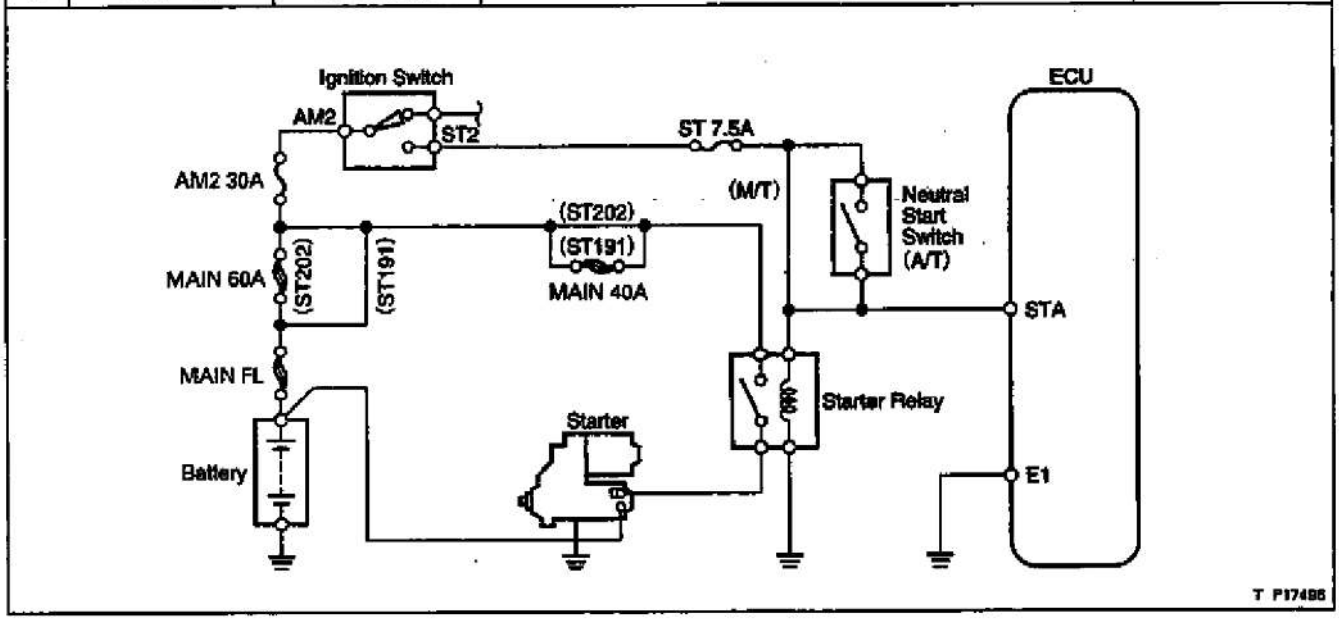
OK → Check wiring between ECU and water temp. sensor.

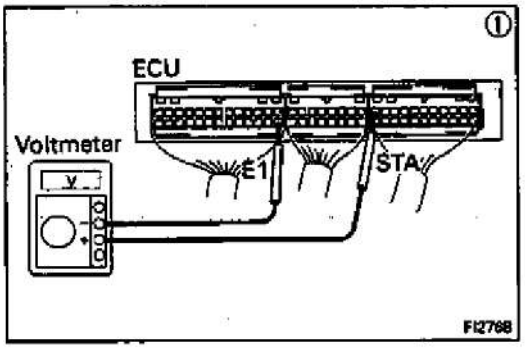
OK → Try another ECU.

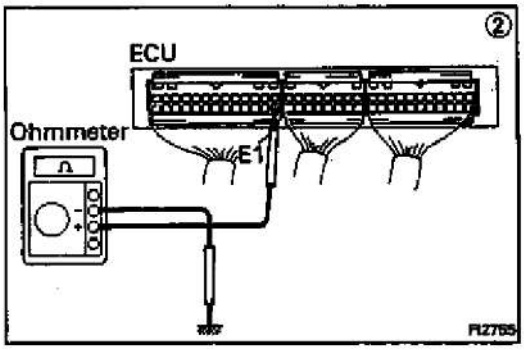
BAD → Repair or replace.

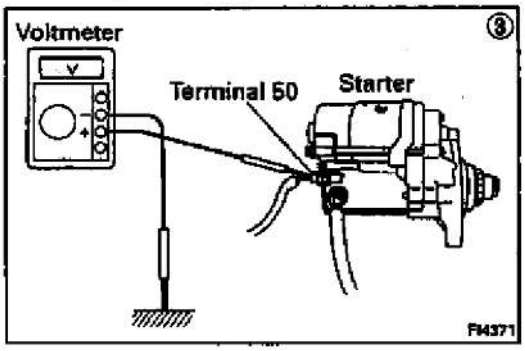
EG

No.	Terminals	Trouble	Condition	STD voltage
8	STA – E1	No voltage	Cranking	6 V or more









① There is no voltage between ECU terminals STA and E1. (IG SW START)

Check starter operation. → OK → Check wiring between ECU terminal STA and ignition switch terminal ST2.

BAD

OK → BAD → Repair or replace.

② Check wiring between ECU terminal E1 and body ground.

OK → Try another ECU.

BAD → Repair or replace.

Check fuse, fusible links, battery, wiring, starter relay and ignition switch. → BAD → Repair or replace.

OK

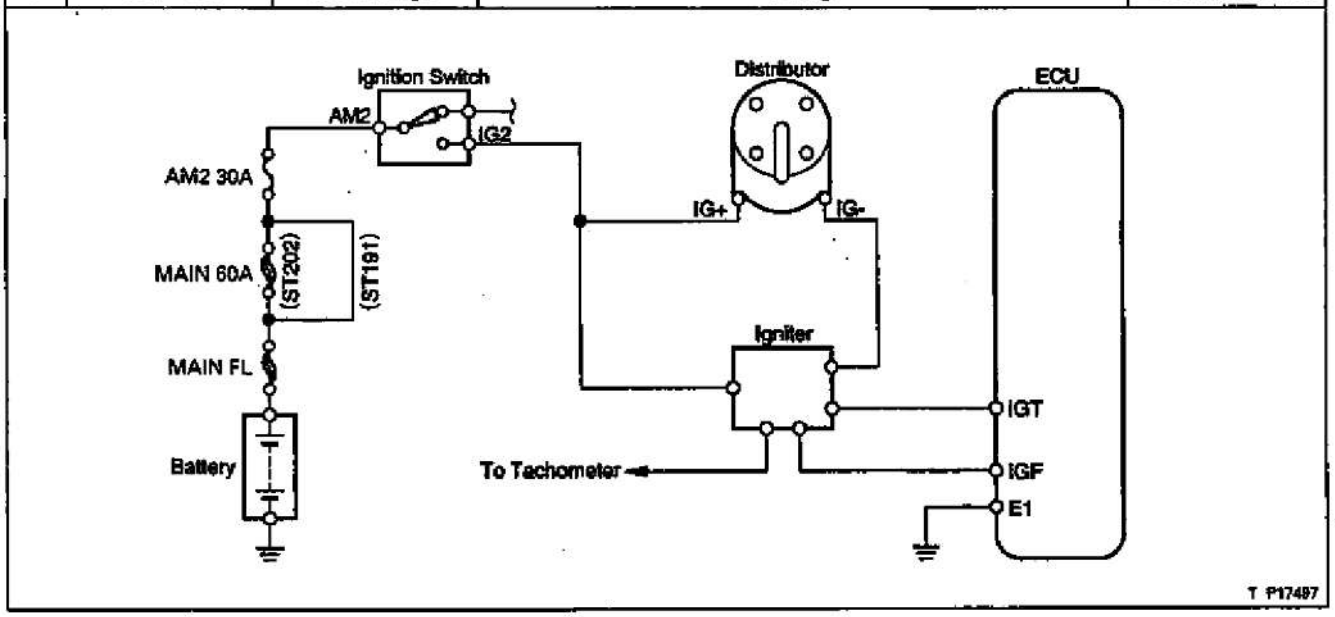
③ Check that there is voltage at terminal 50 of starter. (IG SW START) STD voltage: 6 V or more

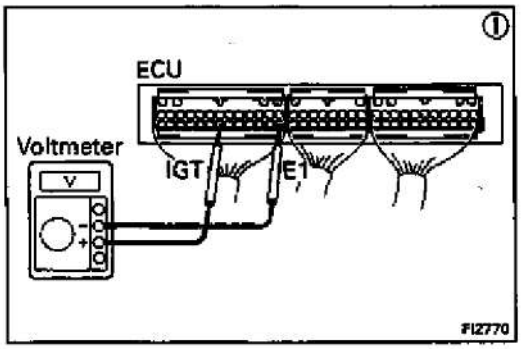
OK → Check starter.

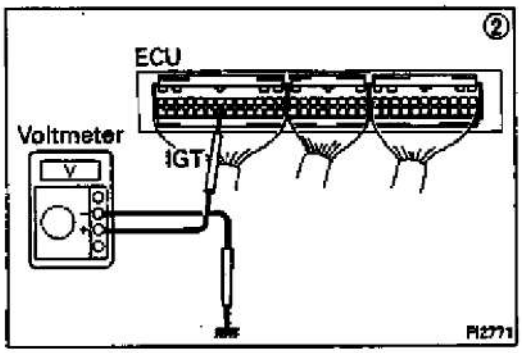
NO → Check wiring between 1). ST2 and starter relay, and 2). battery and starter terminal 50.

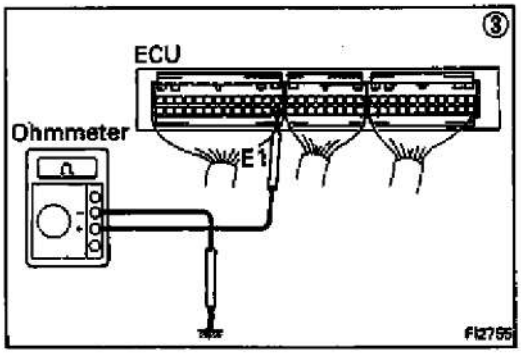
V05381

No.	Terminals	Trouble	Condition	STD voltage
9	IGT – E1	No voltage	Idling	Pulse generation









① There is no voltage between ECU terminals IGT and E1. (Idling)

↓

② Check that there is voltage between ECU terminal IGT and body ground. (Idling)

NO → OK

② NO → ③ Check wiring between ECU terminal E1 and body ground. → BAD → Repair or replace.

③ OK → Try another ECU.

② OK → Check fusible links and ignition switch. → BAD → Repair or replace.

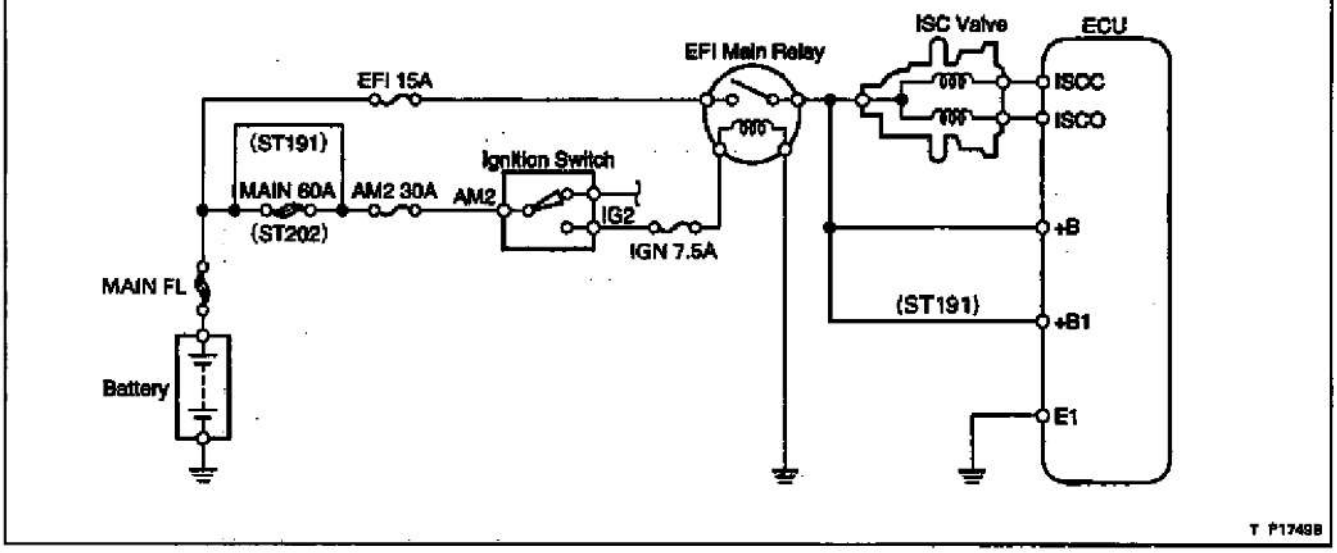
OK → Check distributor. (See page IG-10) → BAD → Repair or replace.

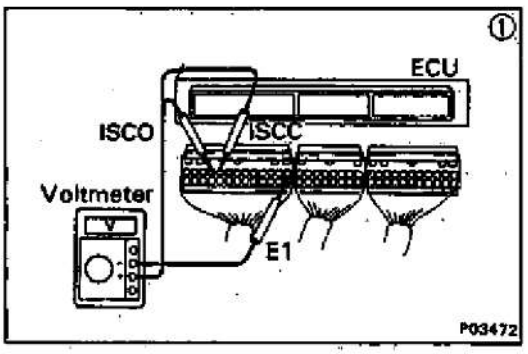
OK → Check wiring between ECU and battery. → BAD → Repair or replace.

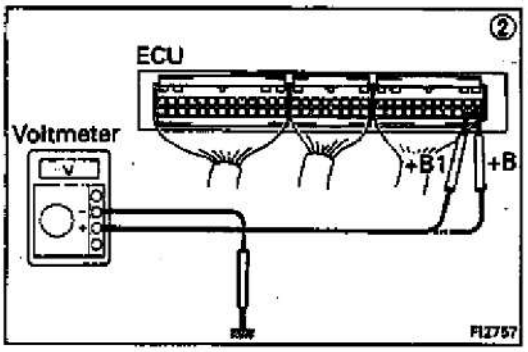
OK → Check igniter. (See page IG-11) → BAD → Repair or replace.

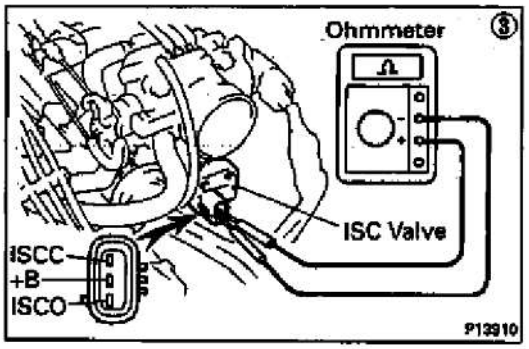
V05382

No.	Terminals	Trouble	Condition		STD voltage
10	ISCC, ISCO – E1	No voltage	IG SW ON	ECU connectors disconnected	9 – 14 V









① There is no voltage between ECU terminals ISCC or ISCO and E1. **(IG SW ON)**

↓

② Check that there is voltage between ECU terminal +B or +B1 and body ground. **(IG SW ON)**

OK ↓

NO → Refer to +B – E1 trouble section (No.1). (See page EG-182)

↓

③ Check resistance between ISC valve terminals +B and ISCC or ISCO.
STD resistance:
Aprox. 19.3 – 22.3 Ω

BAD → Replace ISC valve.

OK ↓

Check wiring between ECU and ISC valve.

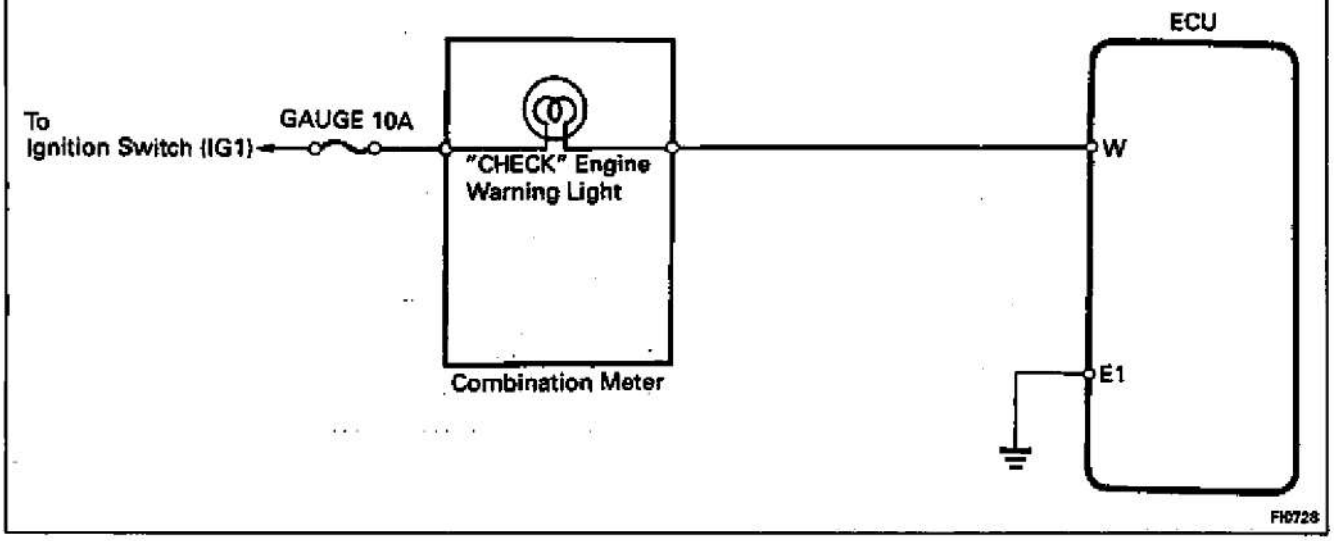
BAD → Repair or replace.

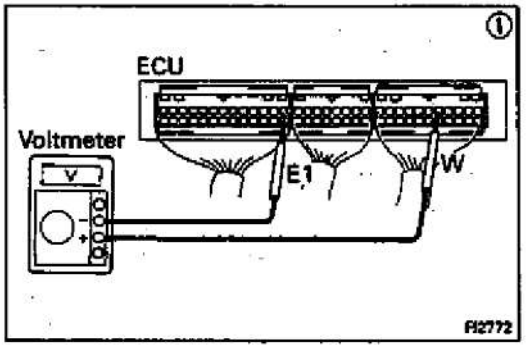
OK ↓

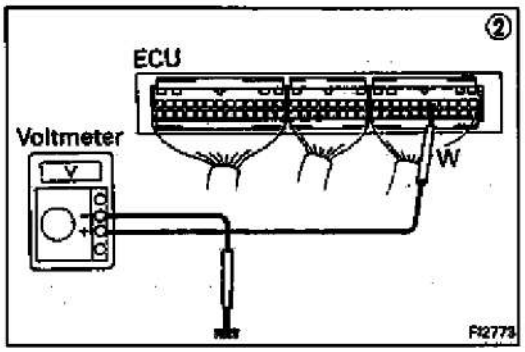
Try another ECU.

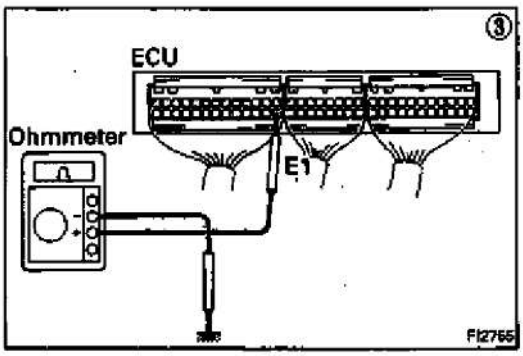
V05383

No.	Terminals	Trouble	Condition	STD voltage
11	W – E1	No voltage	No trouble ("CHECK" engine warning light off) and engine running.	9 – 14 V









① There is no voltage between ECU terminals W and E1. (Idling)

↓

② Check that there is voltage between ECU terminal W and body ground.

NO → Check GAUGE fuse (10 A) and "CHECK" engine warning light.

OK → ③ Check wiring between ECU terminal E1 and body ground.

- OK → Try another ECU.
- BAD → Repair or replace.

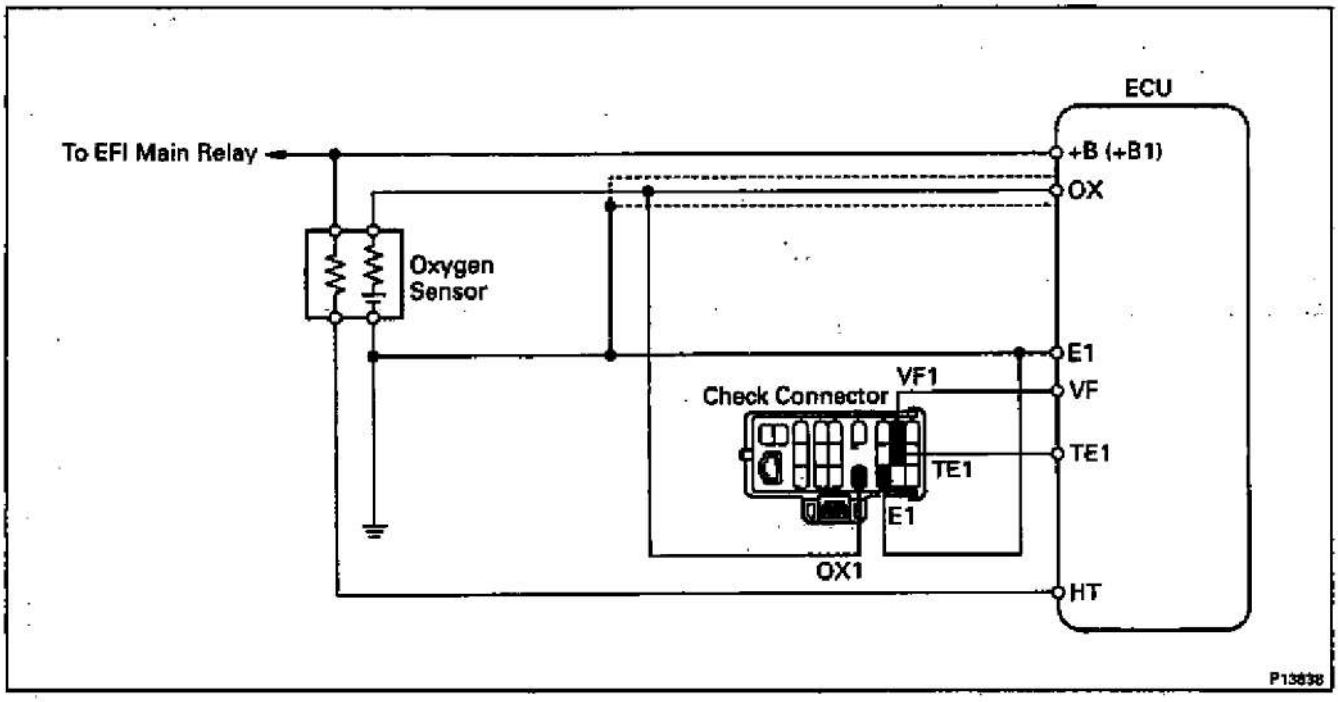
Check GAUGE fuse (10 A) and "CHECK" engine warning light.

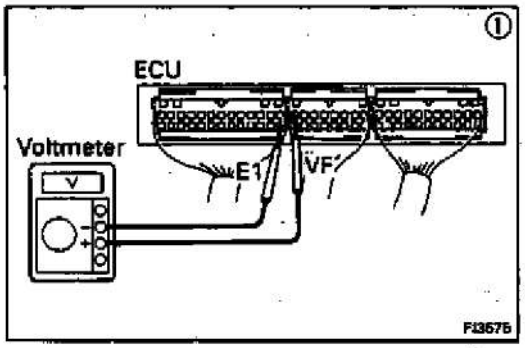
- OK → Check wiring between ECU terminal W and fuse.
- BAD → Repair or replace.

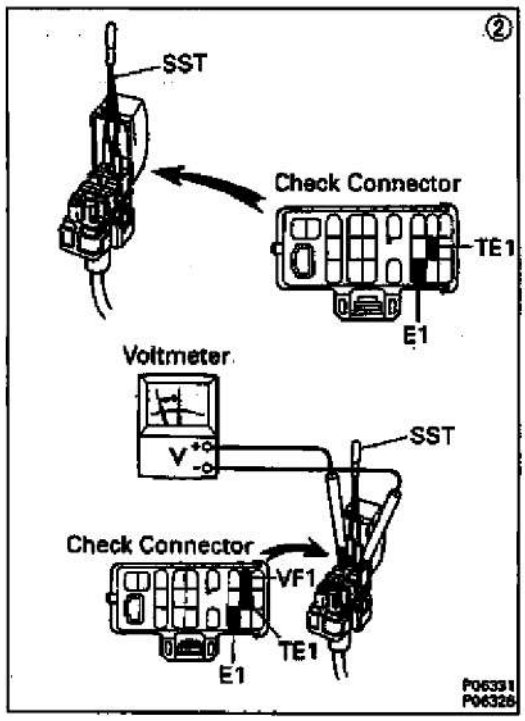
Fuse blows again → Check wiring between ECU terminal W and fuse.

- BAD → Repair or replace.

EG







① There is no voltage between ECU terminals VF and E1.

Check that there is voltage between ECU terminal VF and body ground.

NO → OK: Check wiring between ECU terminal E1 and body ground.

OK → Try another ECU. BAD → Repair or replace.

BAD → Repair or replace.

Is air leaking into air induction system? BAD → Repair or replace.

OK

Check spark plugs. (See page IG-8) BAD → Repair or replace.

OK

Check distributor and ignition system. (See page IG-7) BAD → Repair or replace.

OK

Check fuel pressure. (See page EG-195) BAD → Repair or replace.

OK

Check injectors. (See page EG-220 or 234) BAD → Repair or replace.

OK

Check vacuum sensor. (See page EG-275) BAD → Repair or replace.

OK

② Check operation of oxygen sensor. (See page EG-284) OK → System normal.

BAD

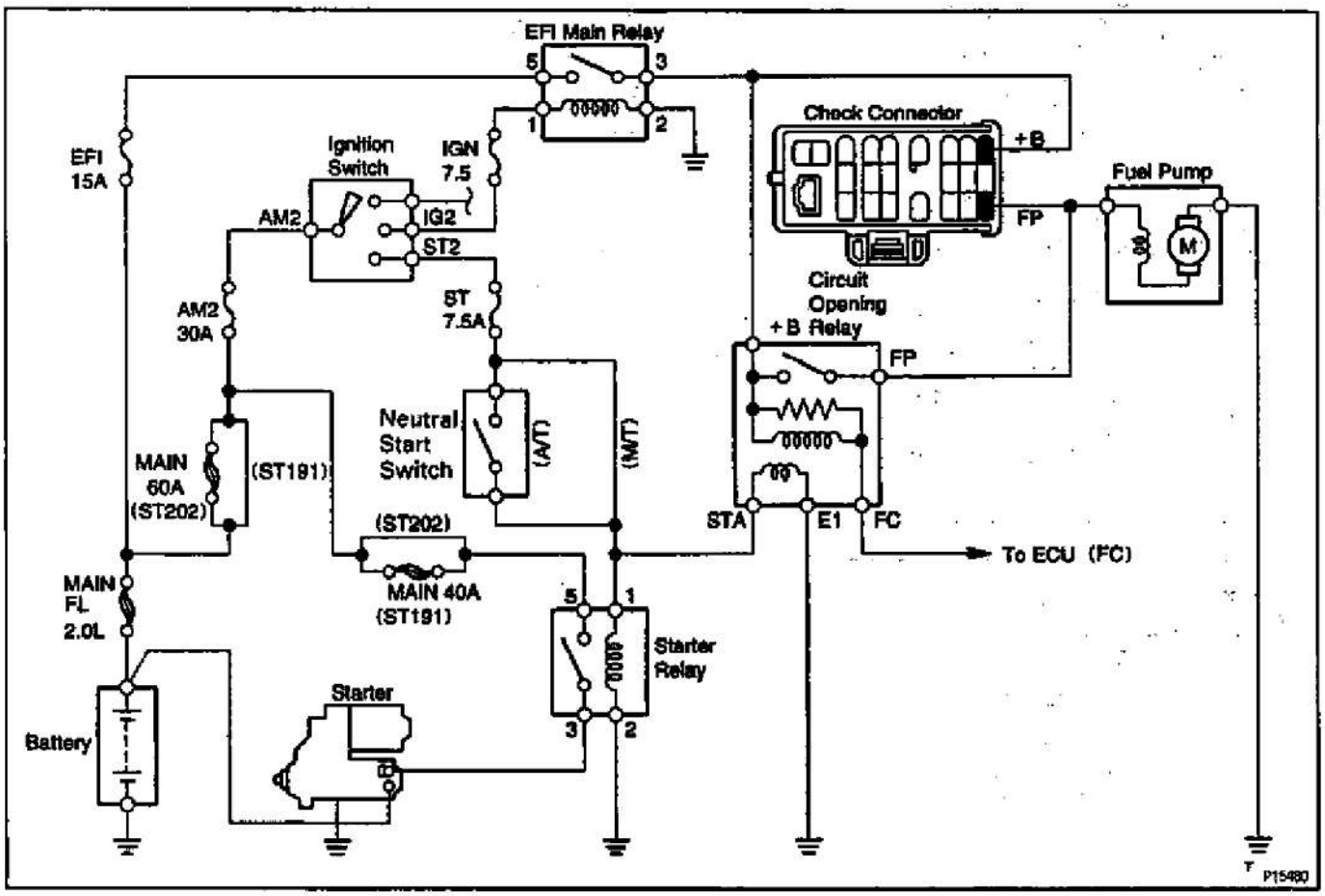
Check wiring between oxygen sensor and ECU. BAD → Repair wiring.

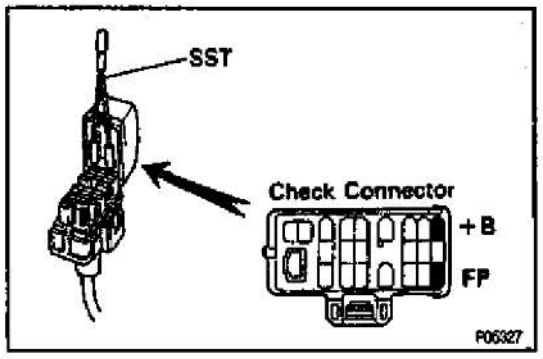
OK

Replace oxygen sensor.

V05385

FUEL PUMP
SYSTEM CIRCUIT

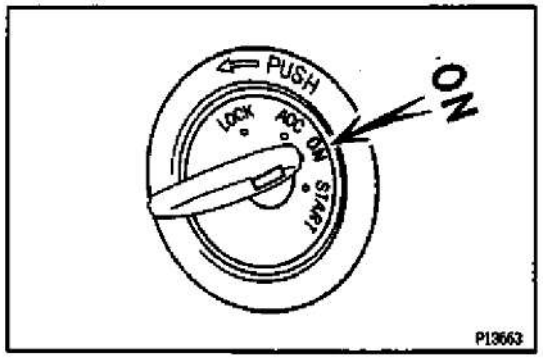




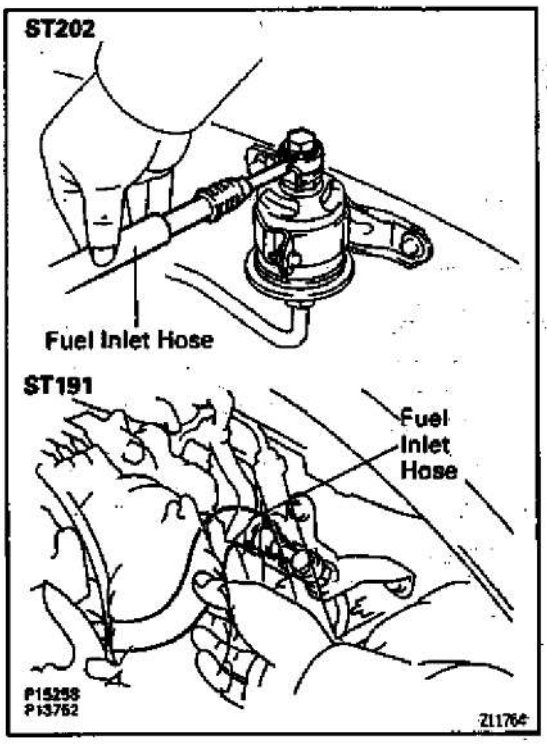
ON–VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

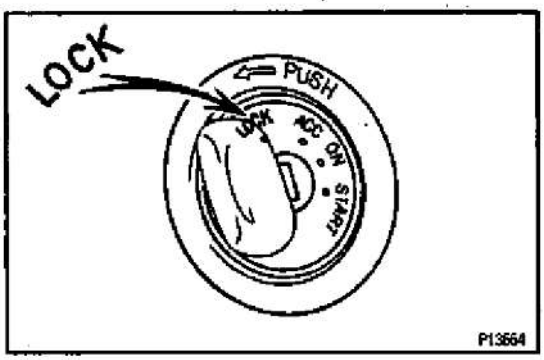
(a) Using SST, connect terminals +B and FP of the check connector.
SST 09843–18020



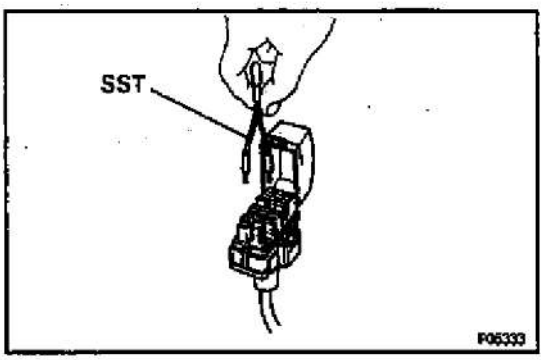
(b) Turn the ignition switch ON.
NOTICE: Do not start the engine.



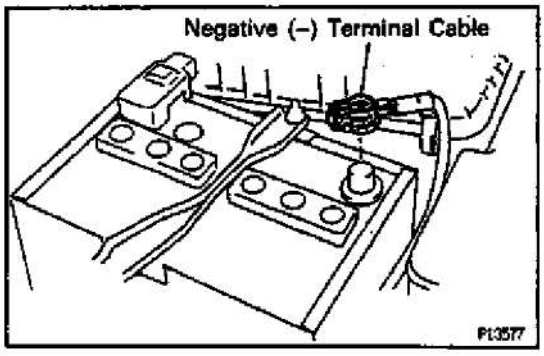
(c) Check that there is pressure in the fuel inlet hose from the fuel filter.
HINT: If there is fuel pressure, you will hear the sound of fuel flowing.
If there is no pressure, check the following parts:
- Fusible link
- H–fuse
- Fuses
- EFI main relay
- Neutral start switch
- ECU
- Fuel pump
- Wiring connections



(d) Turn the ignition switch to LOCK.



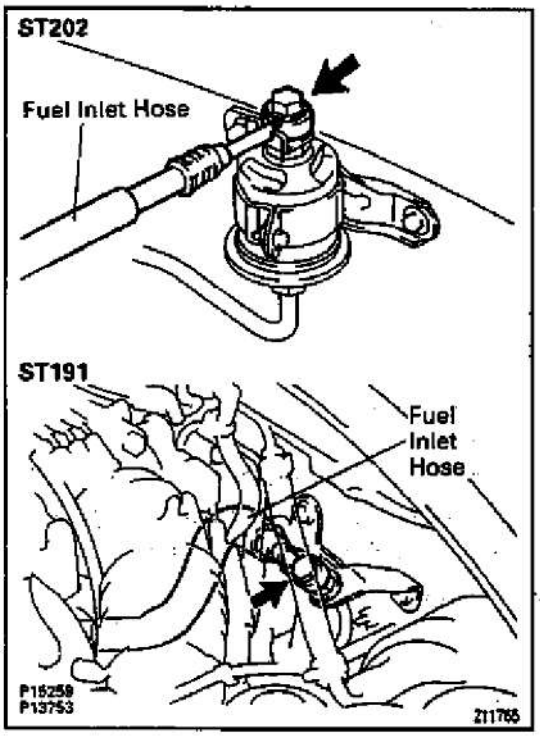
(e) Remove the SST from the check connecter.
SST 09843–18020



2. CHECK FUEL PRESSURE

(a) Check that the battery voltage is above 12 V.

(b) Disconnect the negative (–) terminal cable from the battery.



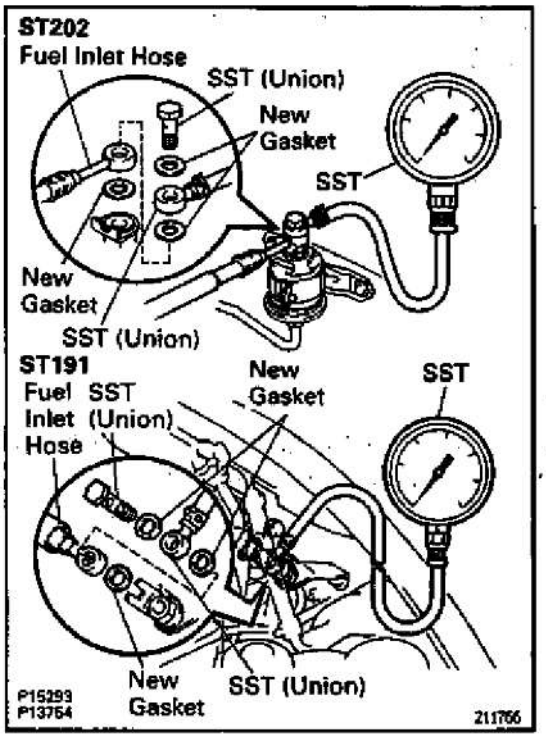
(c) ST202:
Remove the union bolt and 2 gaskets, and disconnect the fuel inlet hose from the fuel filter outlet.

(d) ST191:
Remove the union bolt and 2 gaskets, and disconnect the fuel inlet hose from the fuel inlet pipe.

CAUTION:

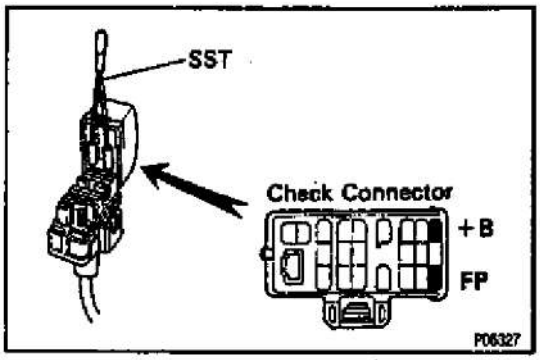
- **Put a suitable container or shop rag under the fuel filter or fuel inlet pipe.**
- **Slowly loosen the union bolt.**
- **When removing the union bolt, fix the fuel filter in place using a spanner.**

EG



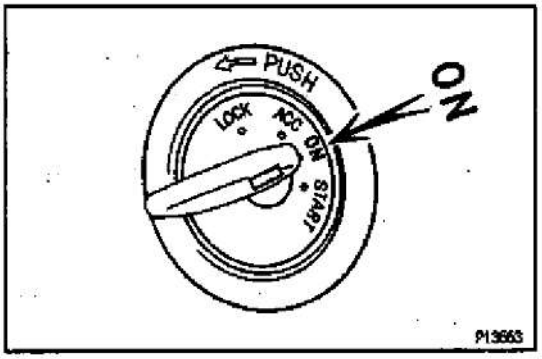
(e) ST202:
Install the fuel inlet hose and SST (pressure gauge) to the fuel filter with 3 new gaskets and SST (union bolt).
ST191:
Install the fuel inlet hose and SST (pressure gauge) to the fuel inlet pipe with 3 new gaskets and SST (union bolt).
SST 09268–45012
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

(f) Wipe off any splattered gasoline.

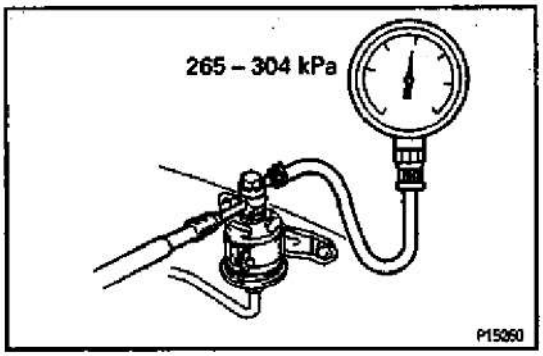


(g) Using SST, connect terminals +B and FP of the check connector.
SST 09843–18020

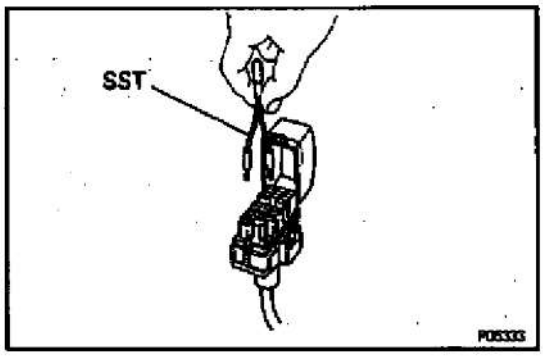
(h) Reconnect the negative (–) terminal cable to the battery.



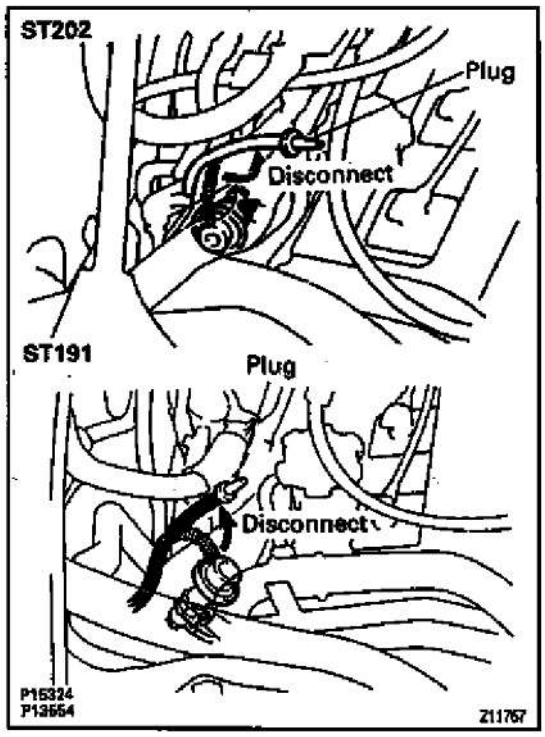
(i) Turn the ignition switch ON.



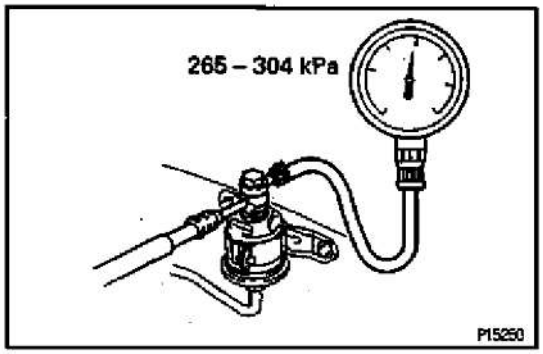
(j) Measure the fuel pressure.
Fuel pressure:
265 – 304 kPa (2.7 – 3.1 kgf/cm², 38 – 44 psi)
If pressure is high, replace the fuel pressure regulator.
If pressure is low, check the following parts:
- Fuel hoses and connections
- Fuel pump
- Fuel filter
- Fuel pressure regulator



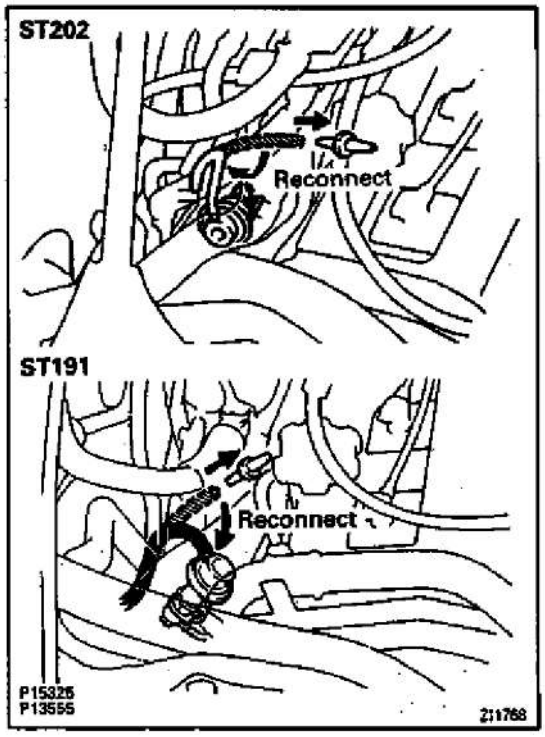
(k) Remove the SST from the check connector.
SST 09483–18020



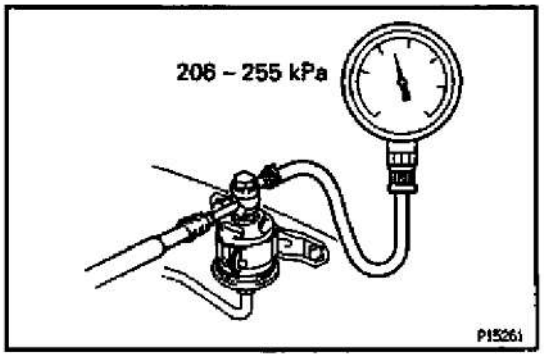
(l) Start the engine.
(m) Disconnect the vacuum sensing hose from the fuel pressure regulator, and plug the hose end.



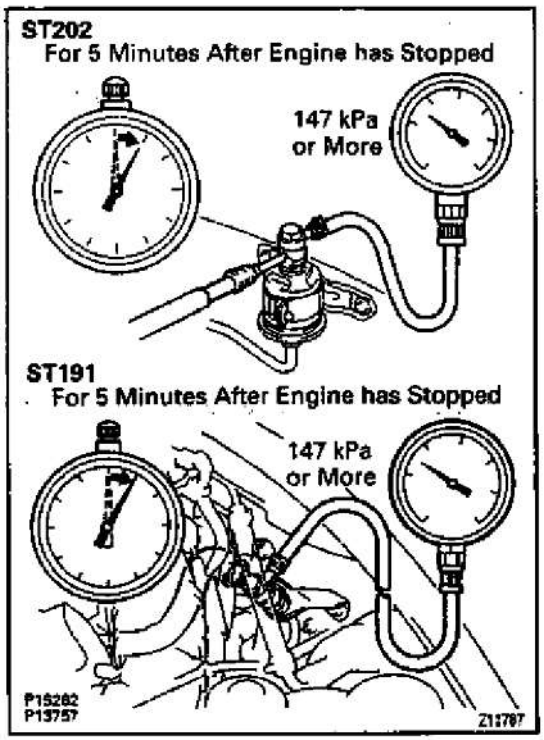
(n) Measure the fuel pressure at idle.
Fuel pressure:
265 – 304 kPa (2.7 – 3.1 kgf/cm², 38 – 44 psi)



(o) Reconnect the vacuum sensing hose to the fuel pressure regulator.



(p) Measure the fuel pressure at idle.
Fuel pressure:
206 – 255 kPa (2.1 – 2.6 kgf/cm², 31 – 37 psi)
If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.



(q) Stop the engine.

(r) Check that the fuel pressure remains as specified for 5 minutes after the engine has stopped.

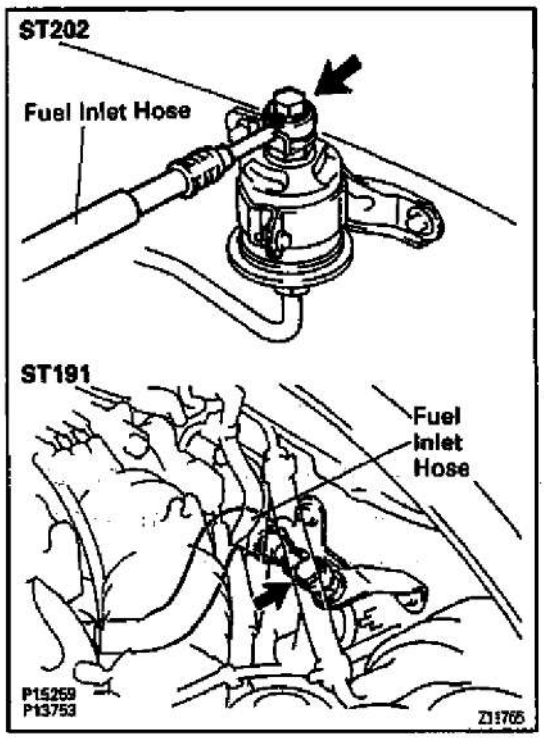
Fuel pressure:

147 kPa (1.5 kgf/cm², 21 psi) or more

If pressure is not as specified, check the fuel pump, pressure regulator and/or injector.

(s) 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



(t) ST202:

Reconnect the fuel inlet hose to the fuel filter with 2 new gaskets and the union bolt.

ST191:

Reconnect the fuel inlet hose to the fuel inlet pipe with with 2 new gaskets and the union bolt.

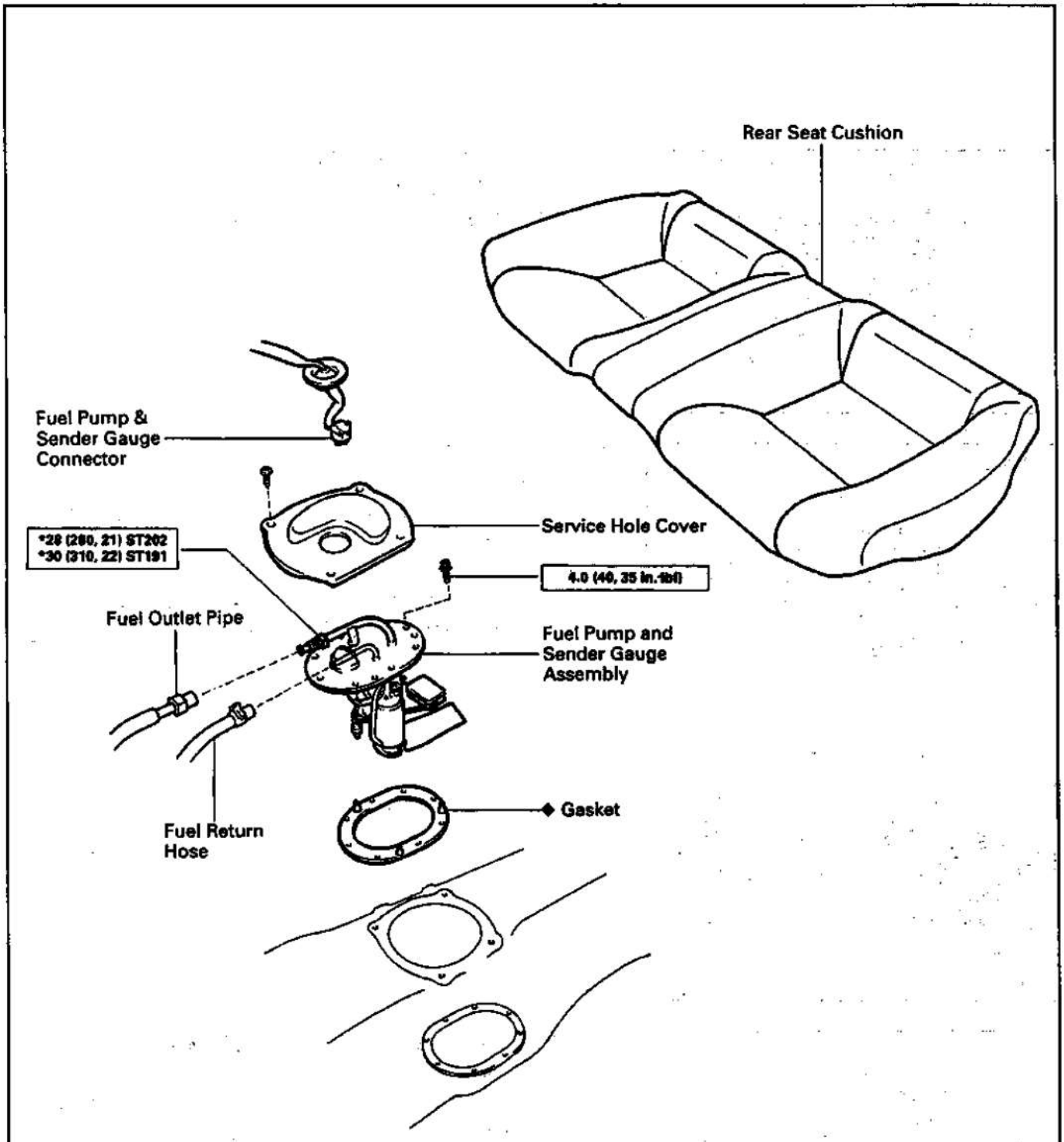
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

CAUTION: When installing the union bolt, fix the fuel filter in place using a spanner.

(u) Reconnect the negative (–) terminal cable to the battery.

(v) Check for fuel leaks. (See page EG–163)

COMPONENTS FOR REMOVAL AND INSTALLATION



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
* For use with SST

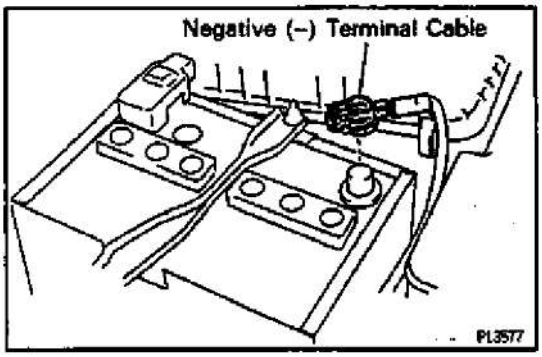
ZI1724

FUEL PUMP REMOVAL

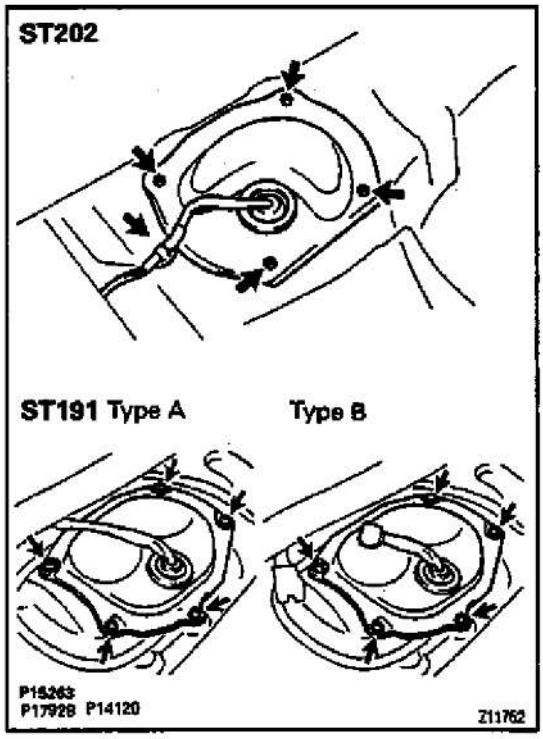
(See Components for Removal and Installation)

CAUTION: Do not smoke or work near an open flame when working on the fuel pump.

EG



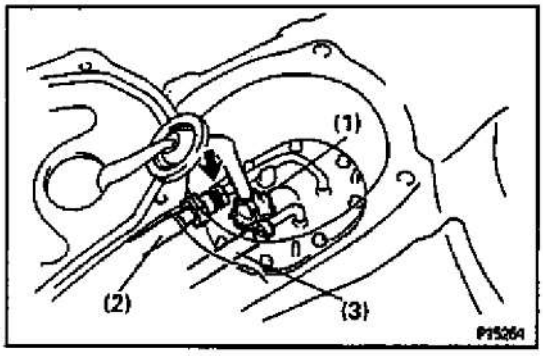
1. **DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY**
2. **REMOVE REAR SEAT CUSHION**



3. **REMOVE SERVICE HOLE COVER**

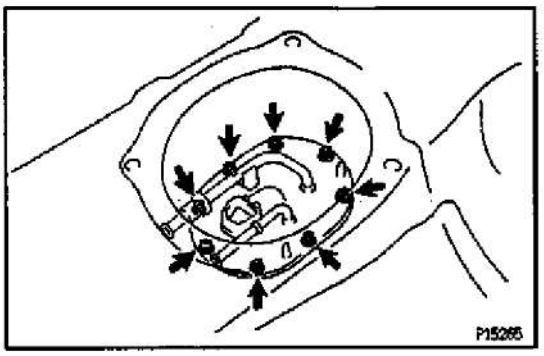
(a) ST202:
Remove the 4 screws, service hole cover and clamp.

(b) ST191:
Type A: Remove the 5 screws and service hole cover.
Type B: Disconnect the sub–wire harness. Remove the 5 screws and service hole cover.

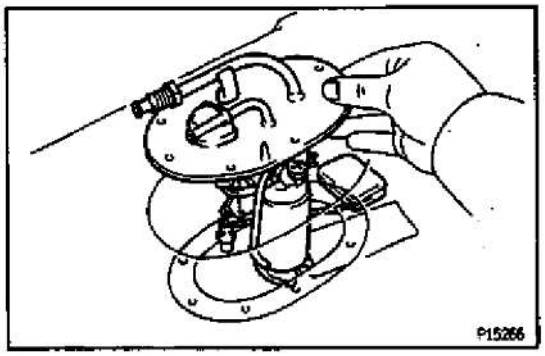


4. **REMOVE FUEL PUMP AND SENDER GAUGE ASSEMBLY**

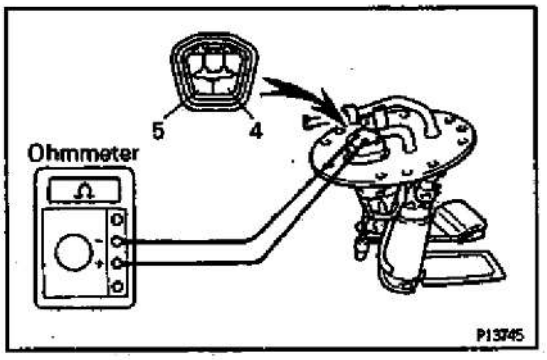
(a) Disconnect the following connector, pipe and hose:
(1) Fuel pump & sender gauge connector
(2) Fuel outlet pipe
(3) Fuel return hose



(b) Remove the 8 bolts.



(c) Remove the fuel pump, sender gauge assembly and gasket.



FUEL PUMP INSPECTION

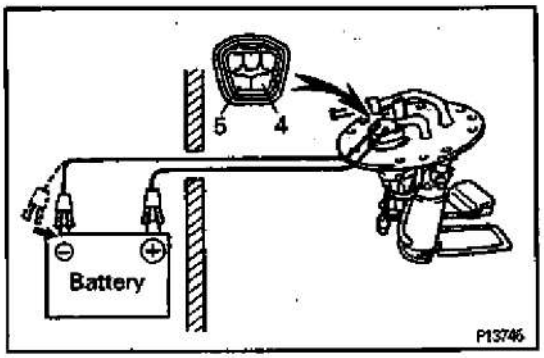
1. INSPECT FUEL PUMP RESISTANCE

Using an ohmmeter, measure the resistance between terminals 4 and 5.

Resistance:

0.2 – 3.0 Ω at 20°C (68°F)

If the resistance is not as specified, replace the fuel pump, lead wire or connector.



2. INSPECT FUEL PUMP OPERATION

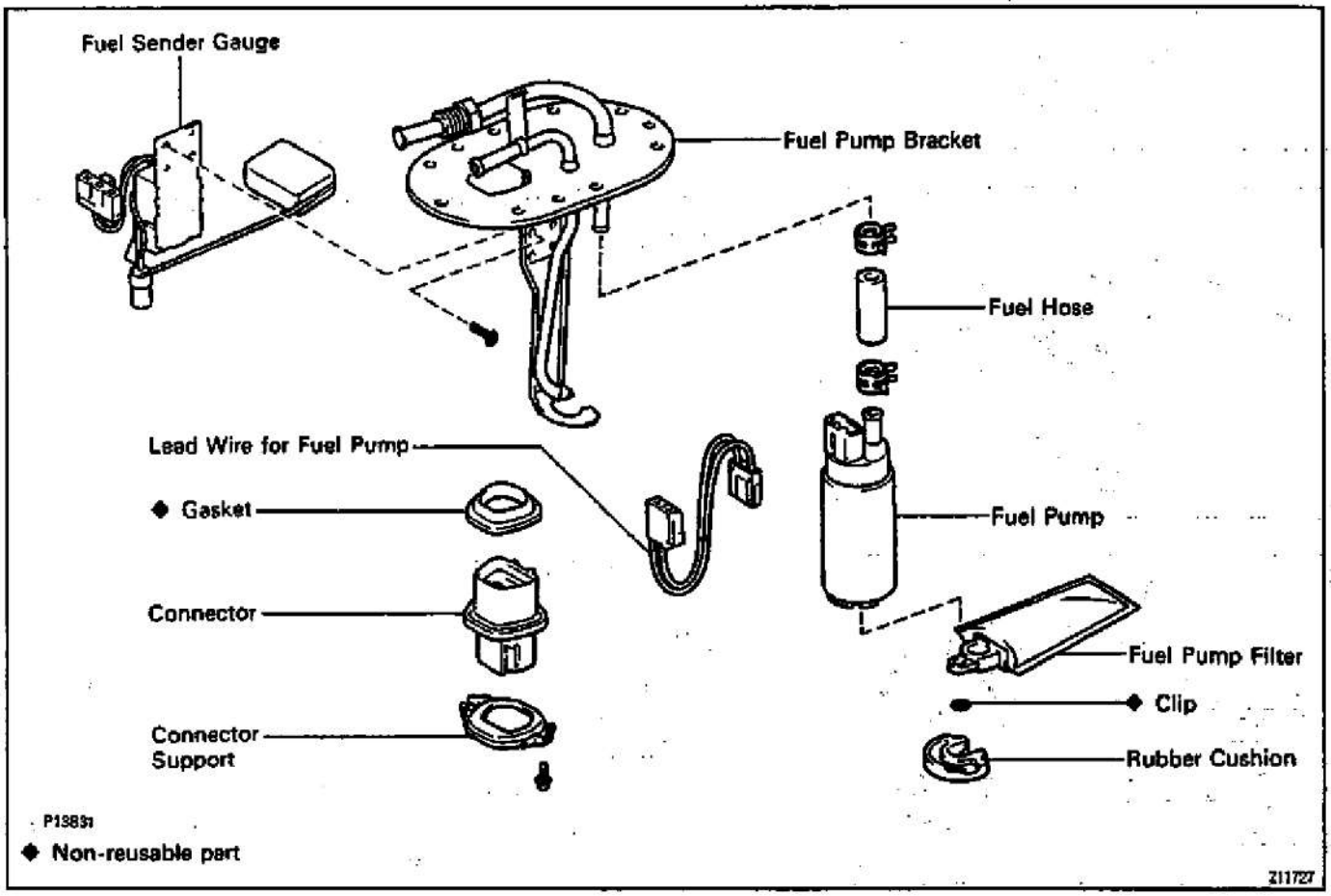
Connect a tester lead from terminal 4 of the connector to the positive (+) terminal of the battery; connect another tester lead from terminal 5 of the connector to the negative (–) terminal of the battery.

NOTICE:

- **These tests must be performed quickly (within 10 seconds) to prevent the coil from burning out.**
- **Keep the fuel pump as far away from the battery as possible.**
- **Always connect or disconnect at the battery.**

If operation is not as specified, replace the fuel pump, lead wire or connector.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

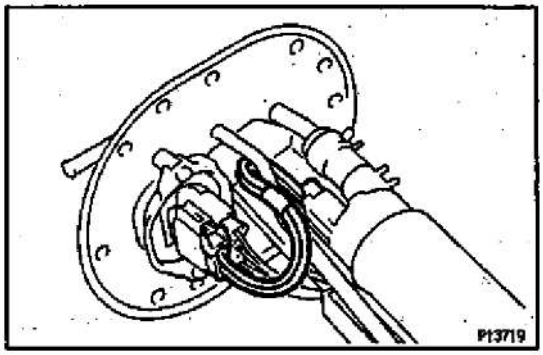


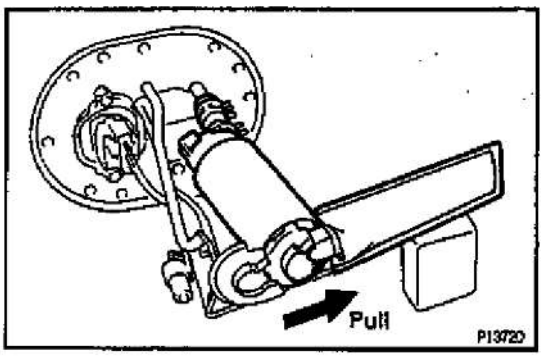
FUEL PUMP DISASSEMBLY

(See Components for Disassembly and Assembly)

1. REMOVE FUEL PUMP FROM PUMP BRACKET

(a) Disconnect the lead wire from the connector.

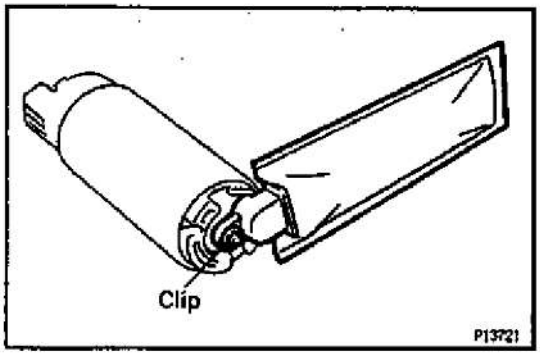




(b) Pull out the lower side of the fuel pump from the pump bracket.

(c) Remove the rubber cushion from the fuel pump.

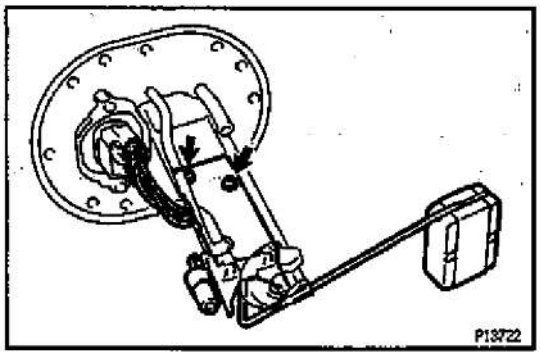
(d) Disconnect the fuel hose from inlet port of the fuel pump, and remove the fuel pump.



2. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

(a) Remove the clip.

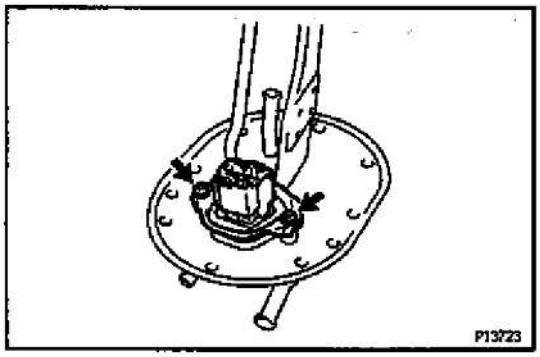
(b) Pull out the fuel pump filter.



3. REMOVE FUEL SENDER GAUGE FROM FUEL PUMP BRACKET

(a) Disconnect the fuel sender gauge connector from the connector.

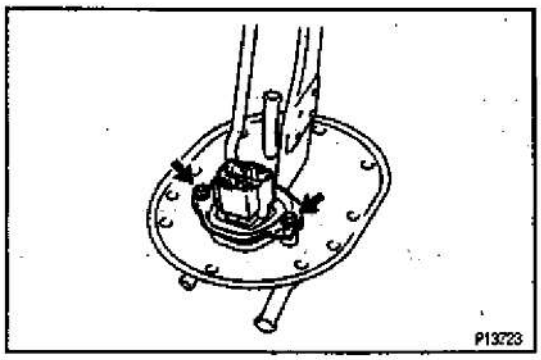
(b) Remove the 2 screws and sender gauge.



4. REMOVE CONNECTOR

Remove the 2 screws, connector support, connector and gasket.

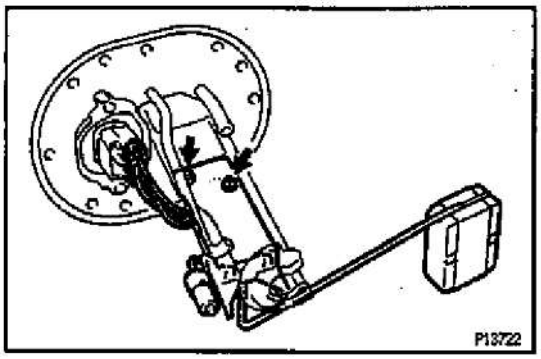
FUEL PUMP ASSEMBLY



(See Components for Disassembly and Assembly)

1. INSTALL CONNECTOR

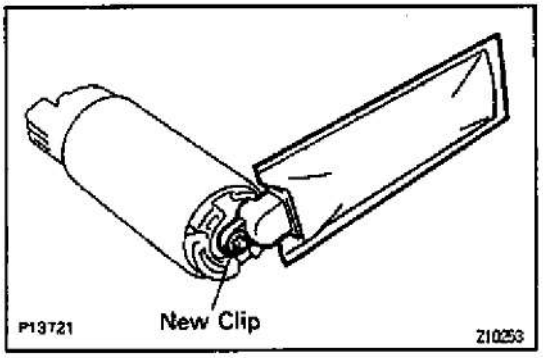
Install a new gasket, the connector and connector support with the 2 screws.



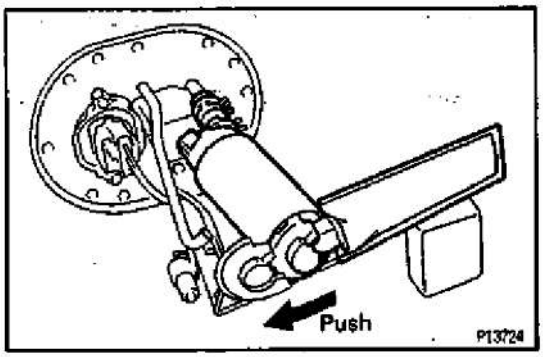
2. INSTALL FUEL SENDER GAUGE TO FUEL PUMP BRACKET

(a) Install the sender gauge with the 2 screws.

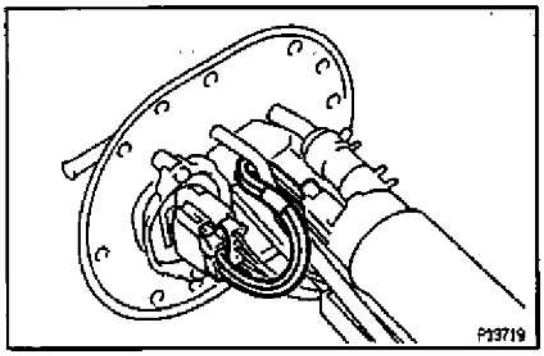
(b) Connect the fuel sender gauge connector to the connector.



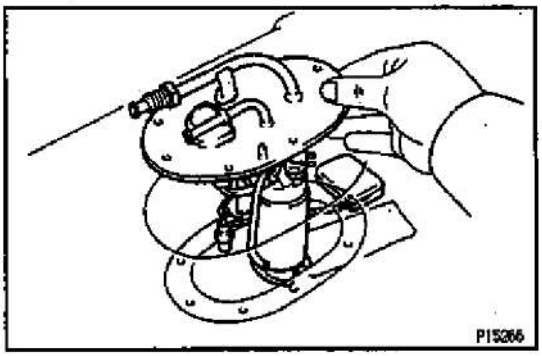
3. INSTALL FUEL PUMP FILTER TO FUEL PUMP
Install the fuel pump filter with a new clip.



4. INSTALL FUEL PUMP TO FUEL PUMP BRACKET
(a) Connect the fuel hose to the outlet port of the fuel pump.
(b) Install the rubber cushion to the fuel pump.
(c) Install the fuel pump by pushing the lower side of the fuel pump.



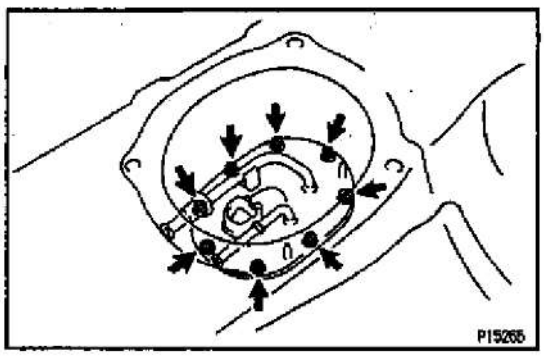
(d) Connect the lead wire to the connector.



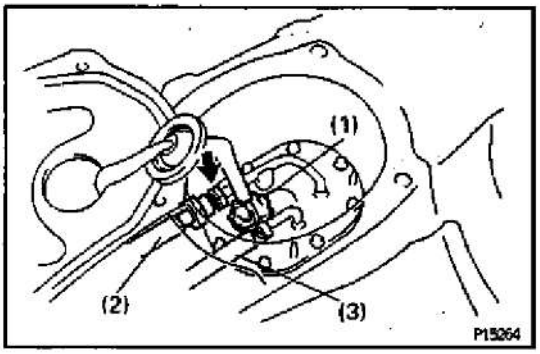
FUEL PUMP INSTALLATION

(See Components for Removal and Installation)

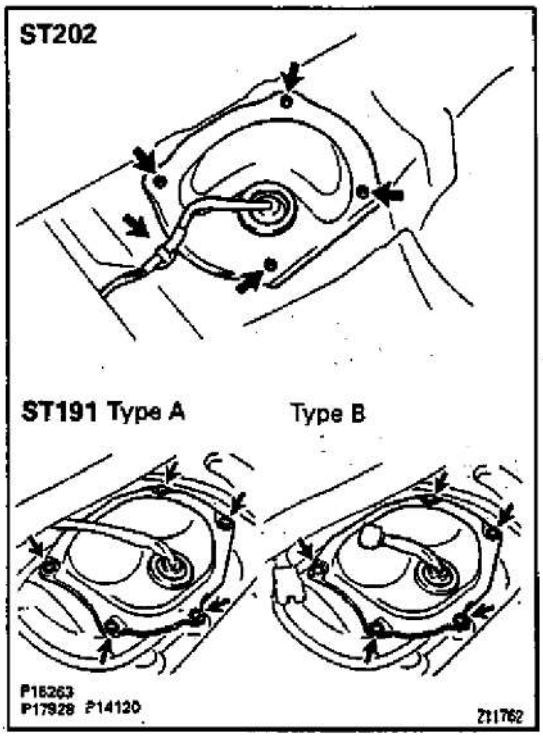
1. INSTALL FUEL PUMP AND SENDER GAUGE ASSEMBLY
(a) Install a new gasket to the fuel pump bracket.
(b) Insert the fuel pump and sender gauge assembly into the fuel tank.



(c) Install the fuel pump bracket with the 8 bolts.
Torque: 4.0 N·m (40 kgf·cm, 35 in.·lbf)



(d) Connect the following connector, pipe and hose:
(1) Fuel pump & sender gauge connector
(2) Fuel outlet pipe
HINT: Use SST. (See page EG–163)
SST 09631–22020
Torque:
ST202: 28 N·m (280 kgf·cm, 21 ft·lbf)
ST191: 30 N·m (310 kgf·cm, 22 ft·lbf)
(3) Fuel return hose



2. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

3. CHECK FOR FUEL LEAKS
(See page EG–163)

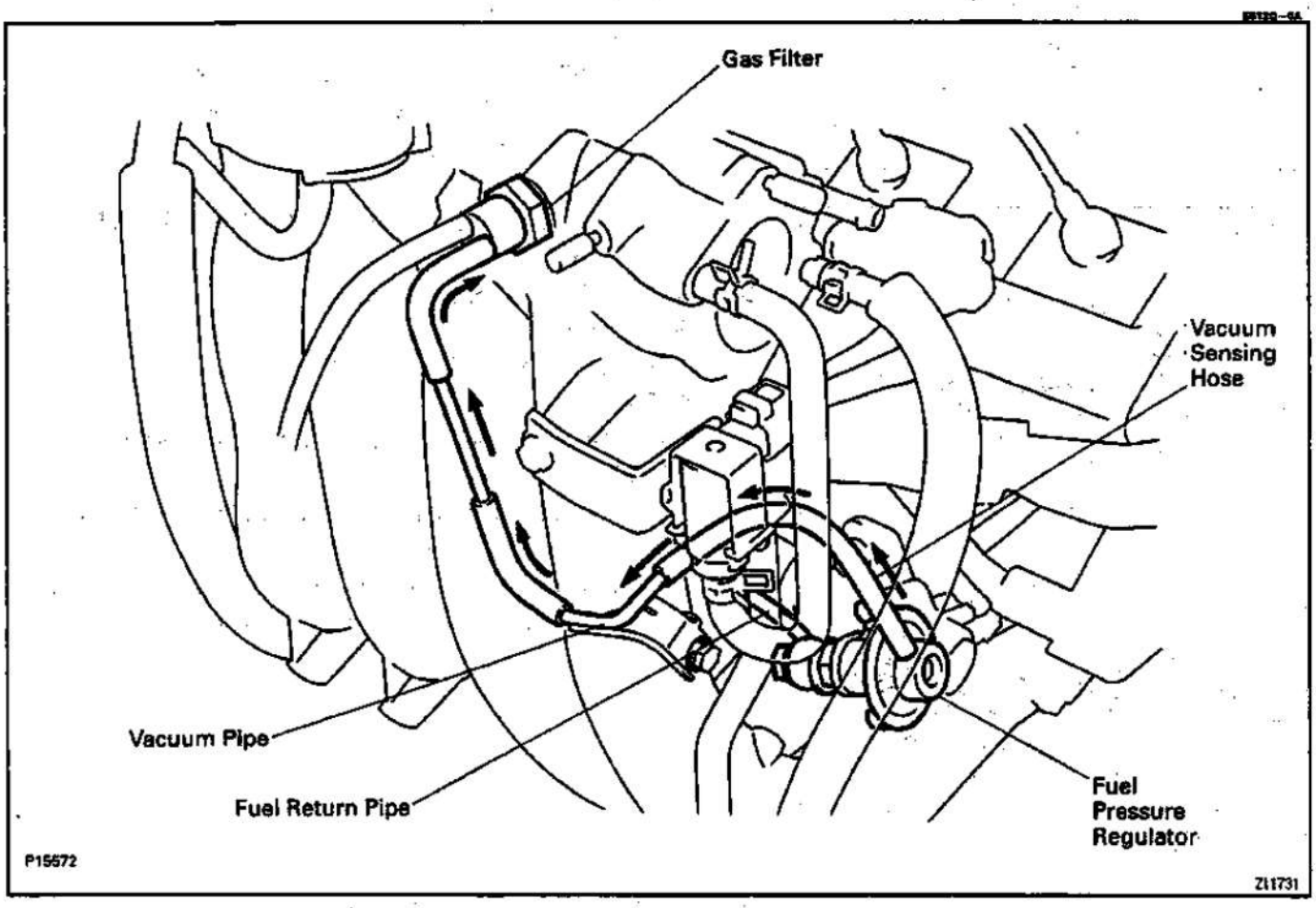
INSTALL SERVICE HOLE COVER
ST202:
Install the service hole cover with the 4 screws.
ST191:
Type A: Install the service hole cover with the 5 screws.
Type B: Connect the sub–wire haness, Install the service hole cover with the 5 screws.

4. INSTALL REAR SEAT CUSHION

EG

FUEL PRESSURE REGULATOR (ST202)

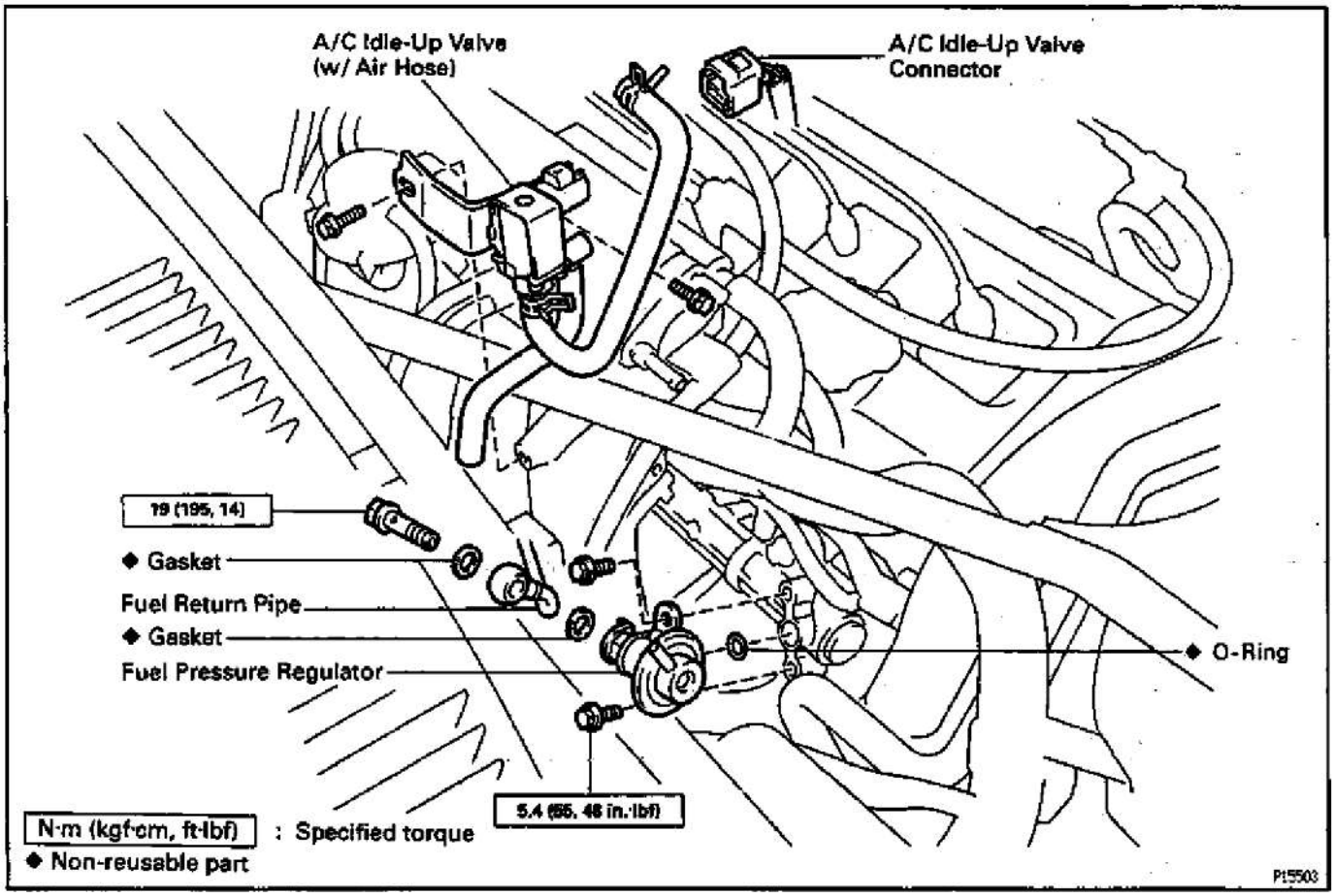
EG

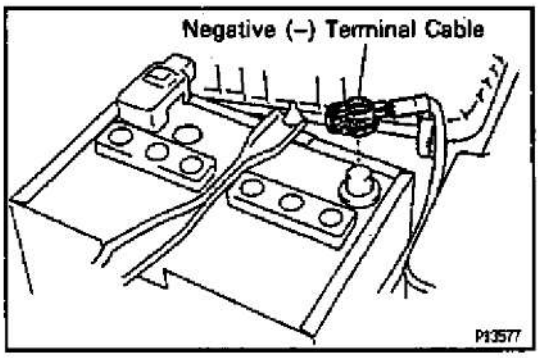


ON–VEHICLE INSPECTION

INSPECT FUEL PRESSURE
(See page EG–196)

COMPONENTS FOR REMOVAL AND INSTALLATION

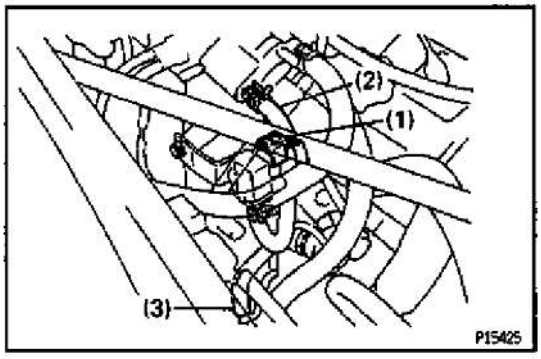




FUEL PRESSURE REGULATOR REMOVAL

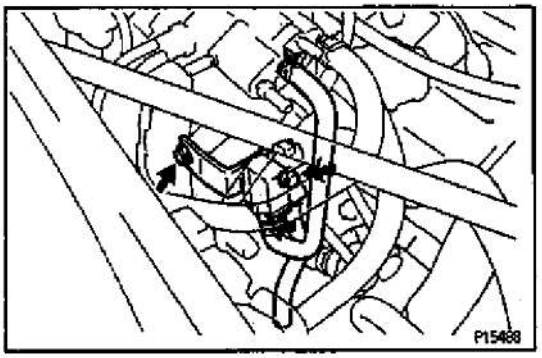
(See Components for Removal and Installation)

1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY



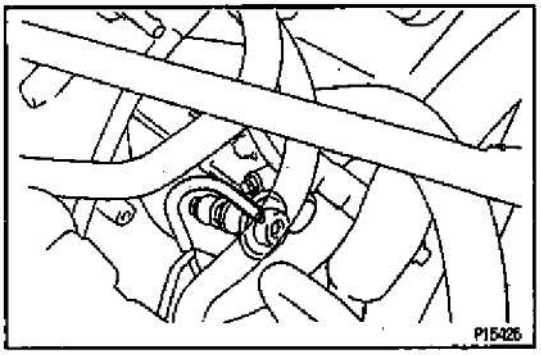
2. REMOVE A/C IDLE–UP VALVE

(a) Disconnect the following connector and hoses:
- (1) A/C Idle–up valve connector
- (2) Air hose from intake manifold
- (3) Air hose from air tube

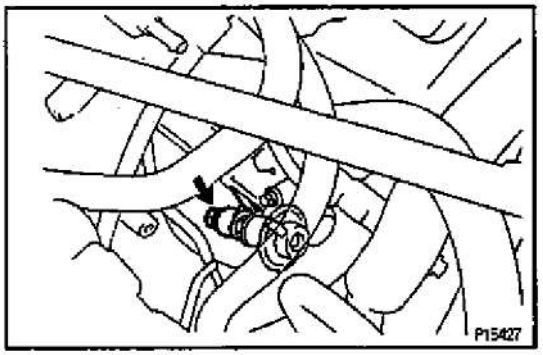


(b) Remove the 2 bolts and idle—up valve.

EG



3. DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR

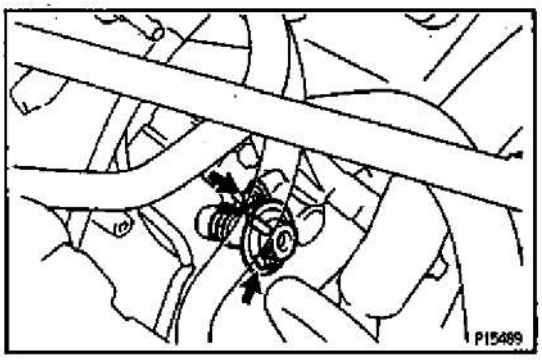


4. DISCONNECT FUEL RETURN PIPE FROM FUEL PRESSURE REGULATOR

Remove the union bolt and 2 gaskets, and disconnect the return pipe from the pressure regulator.

CAUTION:

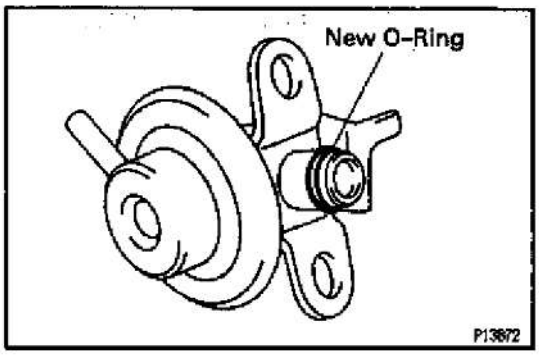
- **Put a suitable container or shop rag under the pressure regulator.**
- **Slowly loosen the union bolt.**



5. REMOVE FUEL PRESSURE REGULATOR

(a) Remove the 2 bolts, and pull out the pressure regulator.

(b) Remove the O—ring from the pressure regulator.



FUEL PRESSURE REGULATOR INSTALLATION

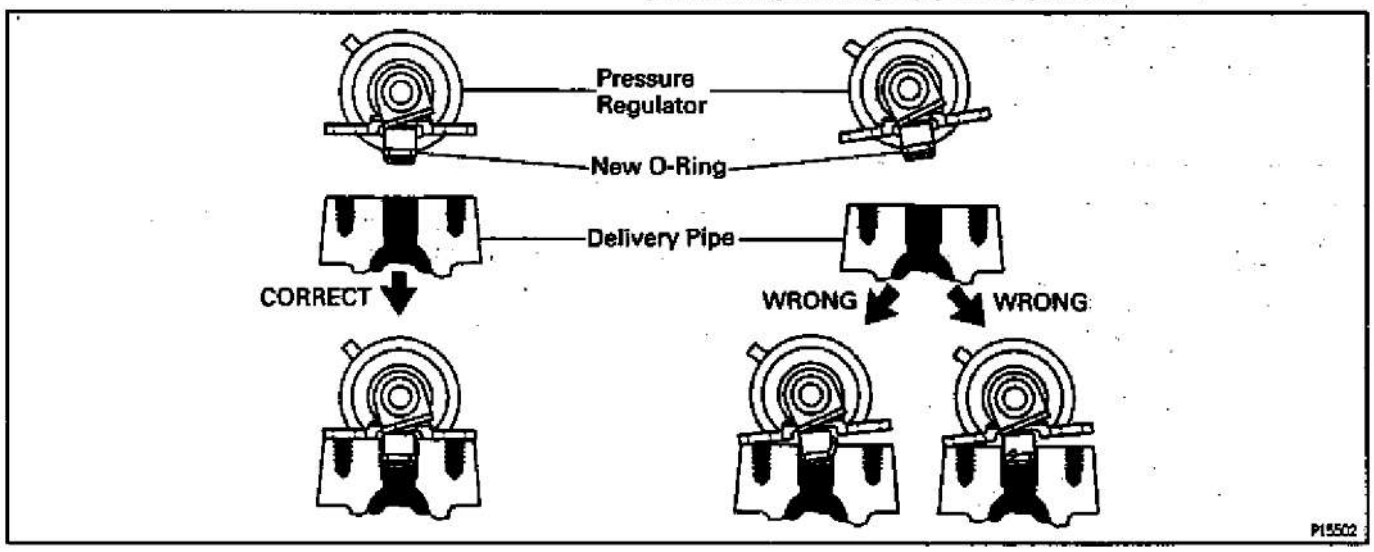
(See Components for Removal and Installation)

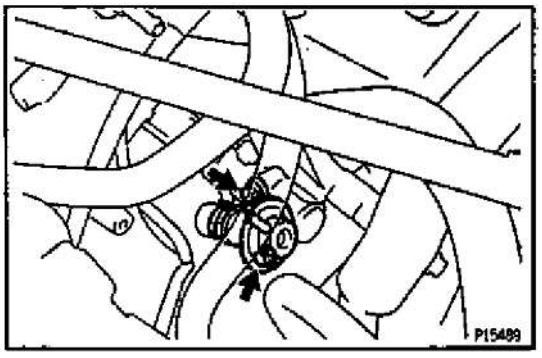
1. INSTALL FUEL PRESSURE REGULATOR

(a) Apply a light coat of gasoline to a new O–ring, and install it to the pressure regulator.

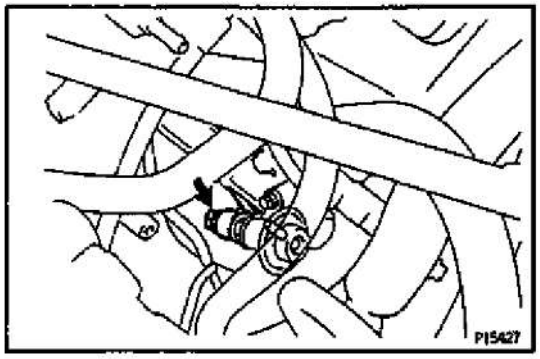
(b) Attach the pressure regulator to the delivery pipe.

(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 perform again steps (b) and (c) above.



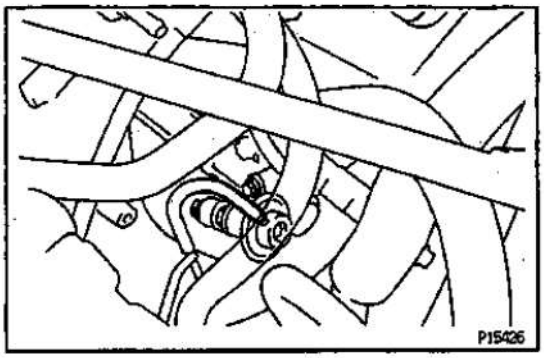


(d) Install the pressure regulator with the 2 bolts.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

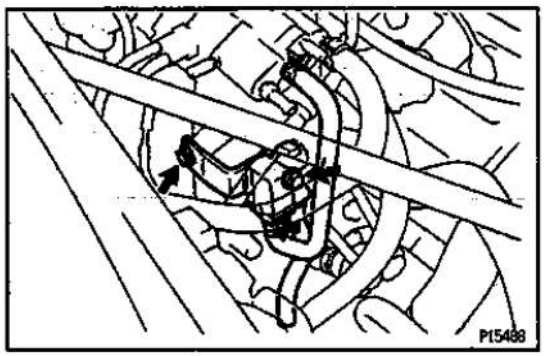


2. CONNECT FUEL RETURN PIPE TO FUEL PRESSURE REGULATOR

Install the return pipe with 2 new gaskets and the union bolt.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

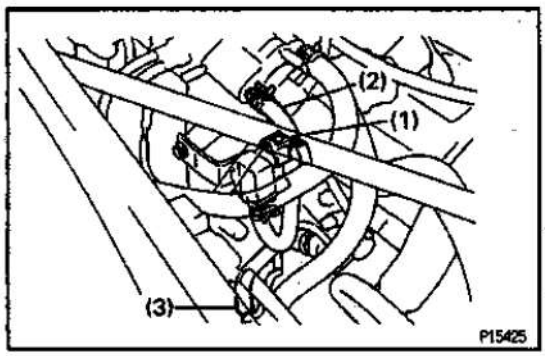


3. CONNECT VACUUM SENSING HOSE TO FUEL PRESSURE REGULATOR



4. INSTALL A/C IDLE–UP VALVE

(a) Install the A/C idle–up valve with the 2 bolts.



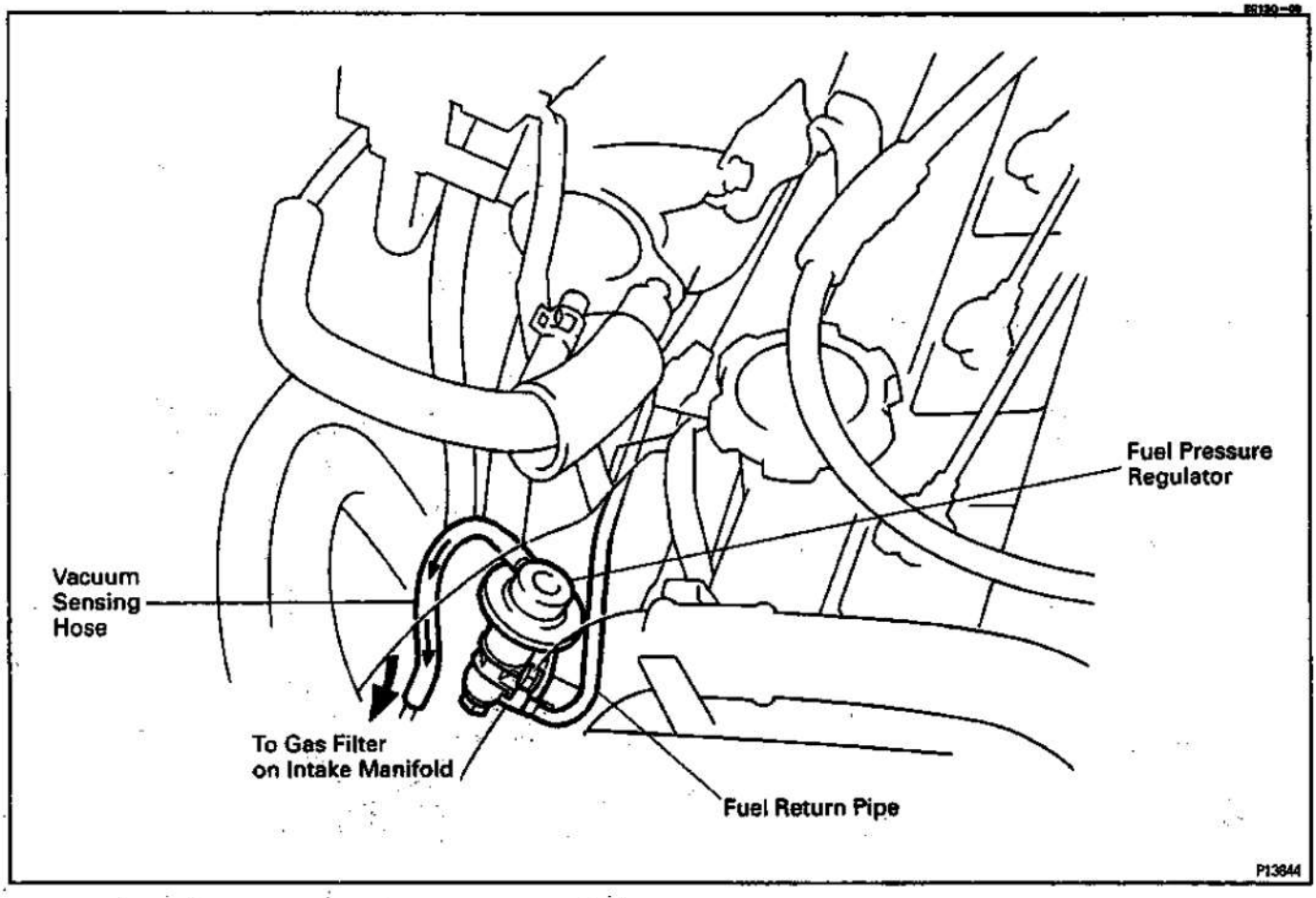
(b) Connect the following connector and hoses:
(1) A/C idle–up valve connector
(2) Air hose to intake manifold
(3) Air hose to air tube

5. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

6. CHECK FOR FUEL LEAKS

(See page EG–163)

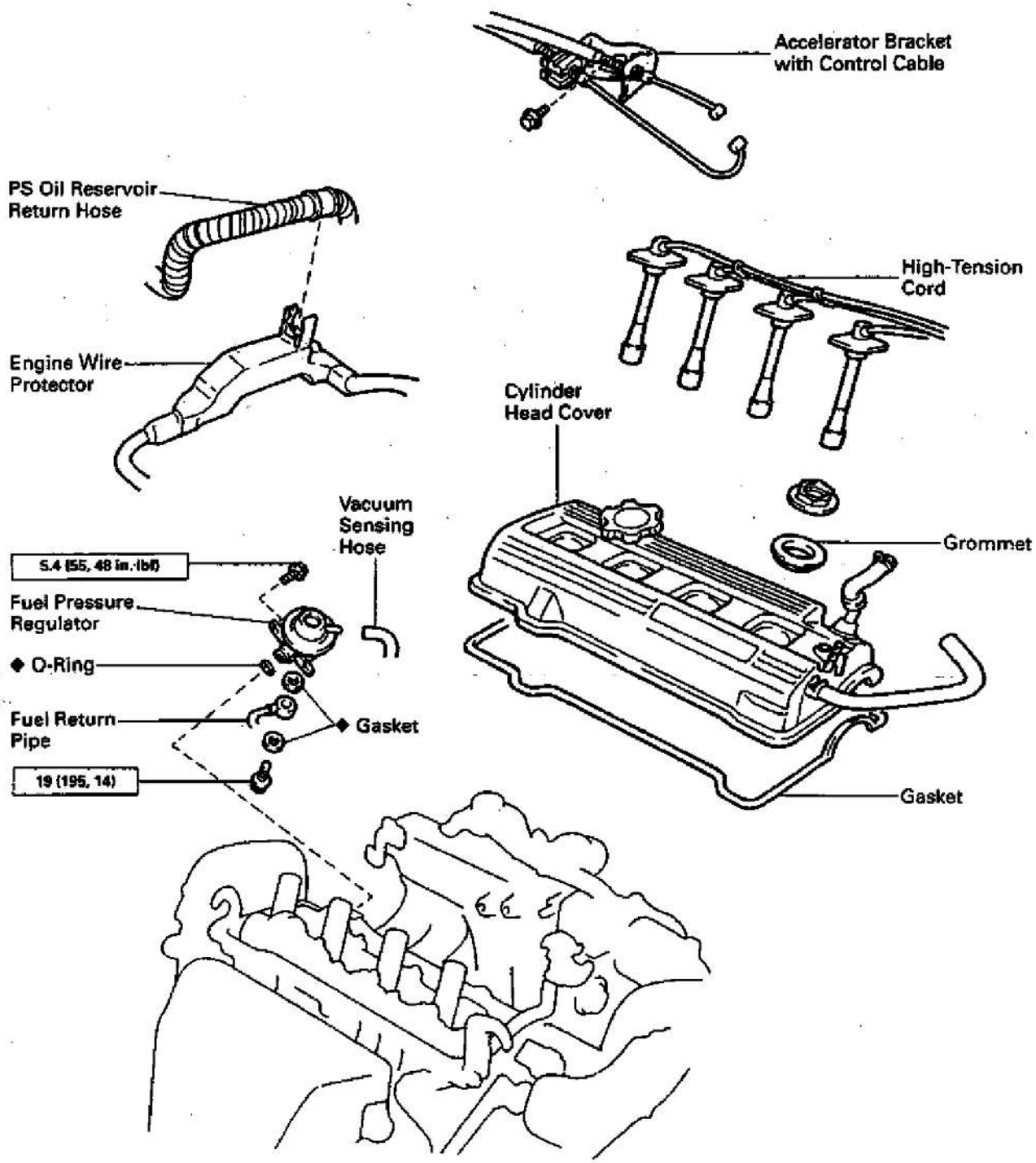
FUEL PRESSURE REGULATOR (ST191)



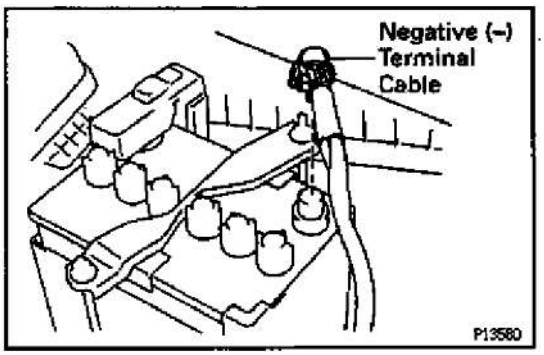
ON–VEHICLE INSPECTION

INSPECT FUEL PRESSURE
(See page EG–196)

COMPONENTS FOR REMOVAL AND INSTALLATION



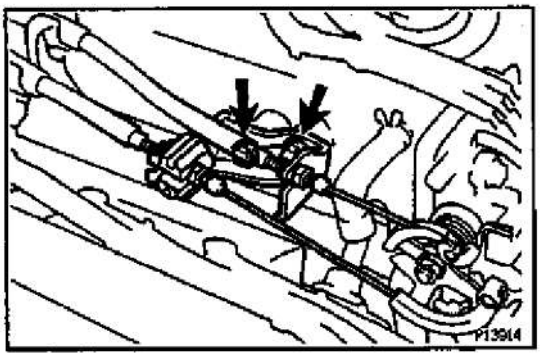
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part



FUEL PRESSURE REGULATOR REMOVAL

(See Components for Removal and Installation)

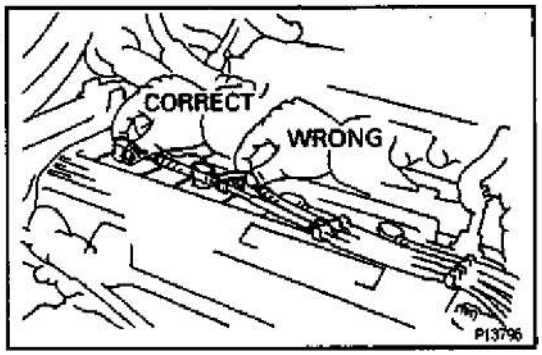
1. **DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY**



2. **REMOVE ACCELERATOR CABLE BRACKET**

(a) Disconnect the control cables from the throttle linkage.

(b) Remove the 2 bolts and accelerator bracket.

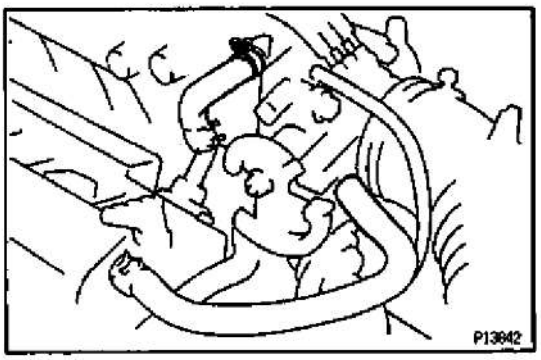


3. **REMOVE CYLINDER HEAD COVER**

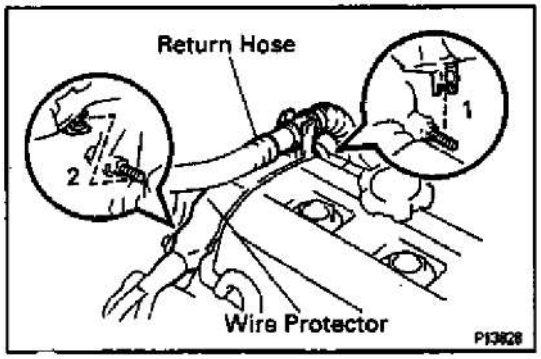
(a) Disconnect the high – tension cords at the rubber boot.

NOTICE: Pulling on or bending the cords may damage the conductor inside.

Do not pull on the high–tension cords.

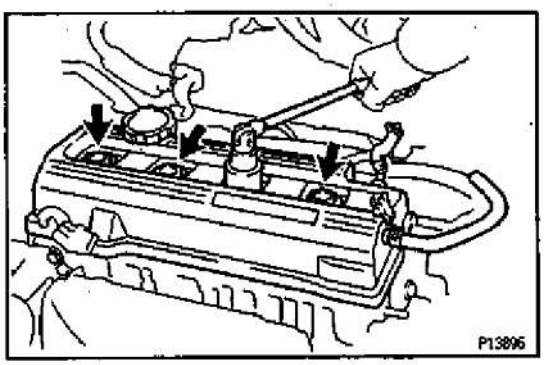


(b) Disconnect the 2 PCV hoses from the intake manifold and throttle body.

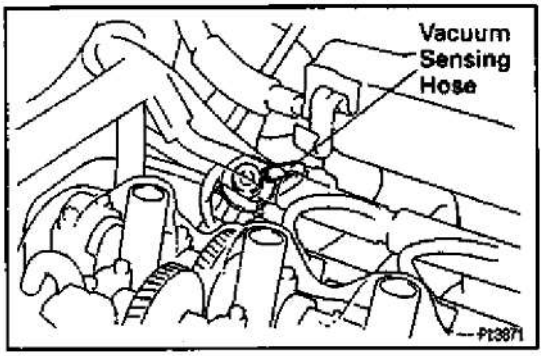


(c) Disconnect the PS oil reservoir return hose from the engine wire protecter.

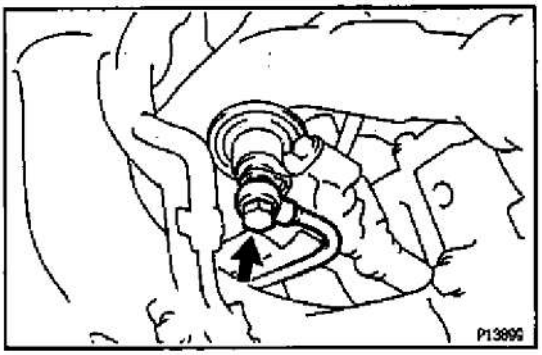
(d) Disconnect the 2 clamps of the engine wire protector from the mounting bolts of the No.2 timing belt cover in the sequence shown.



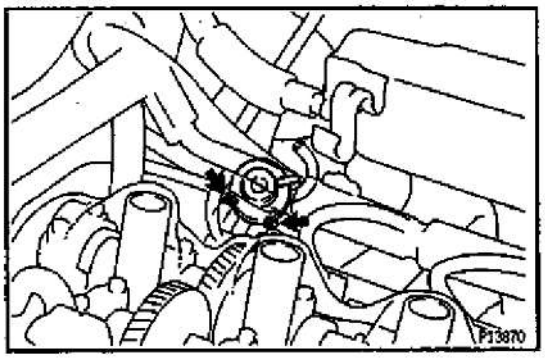
(e) Remove the 4 nuts, grommets, cylinder head cover and gasket.
NOTICE: Cover the cylinder head with a clean cloth to prevent dirt, etc. getting into the cylinder head.



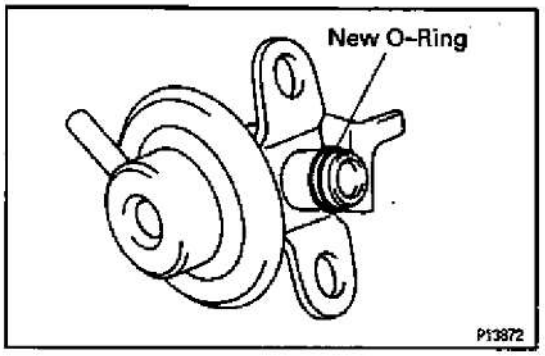
4. DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR



5. DISCONNECT FUEL RETURN PIPE FROM FUEL PRESSURE REGULATOR
Remove the union bolt and 2 gaskets, and disconnect the return pipe from the pressure regulator.
CAUTION:
- **Put a suitable container or shop rag under the pressure regulator.**
- **Slowly loosen the union bolt.**



6. REMOVE FUEL PRESSURE REGULATOR
(a) Remove the 2 bolts, and pull out the pressure regulator.
(b) Remove the O−ring from the pressure regulator.



FUEL PRESSURE REGULATOR INSTALLATION

(See Components for Removal and Installation)

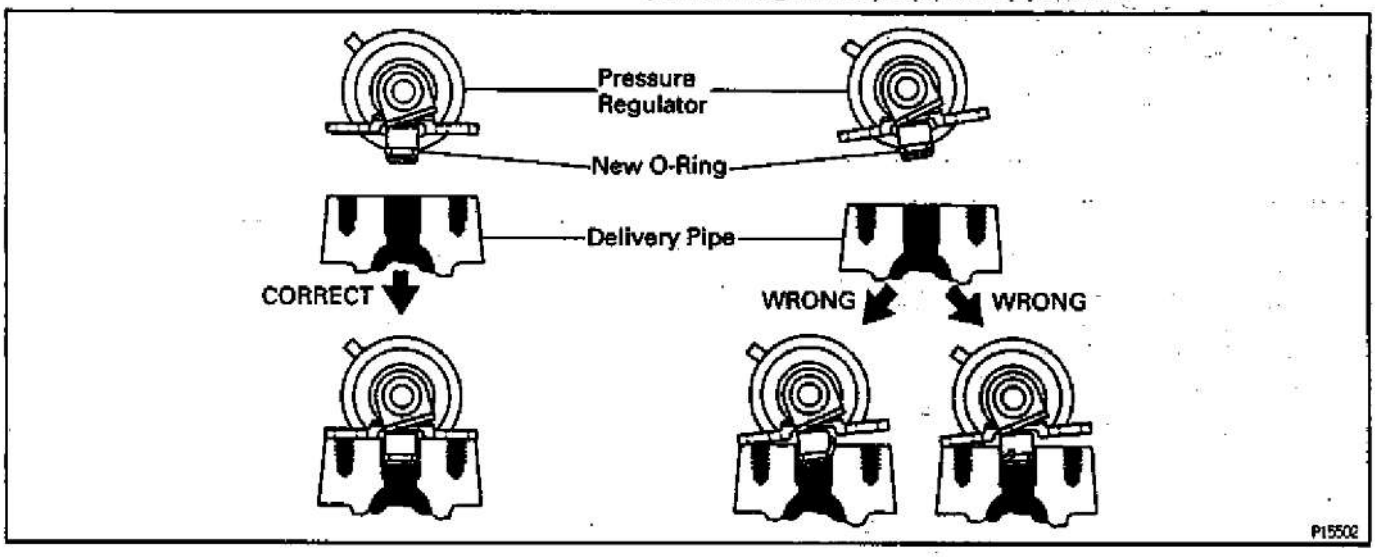
1. INSTALL FUEL PRESSURE REGULATOR

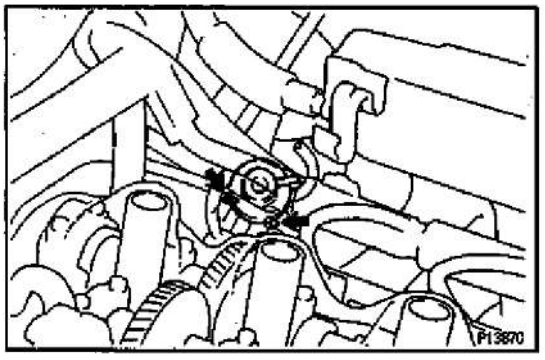
(a) Apply a light coat of gasoline to a new O–ring, and install it to the pressure regulator.

EG

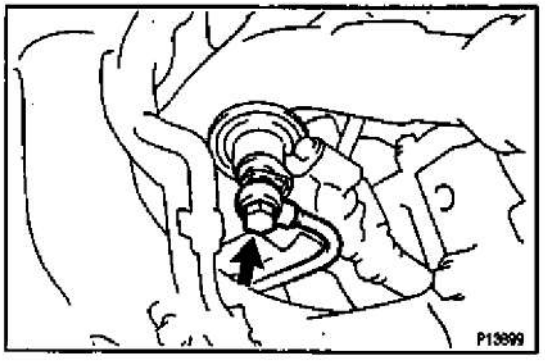
(b) Attach the pressure regulator to the delivery pipe.

(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 perform again steps (b) and (c) above.



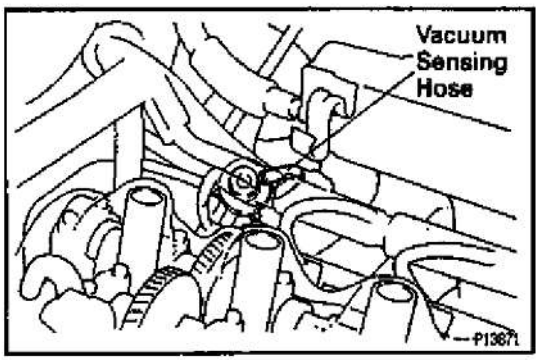


(d) Install the pressure regulator with the 2 bolts.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

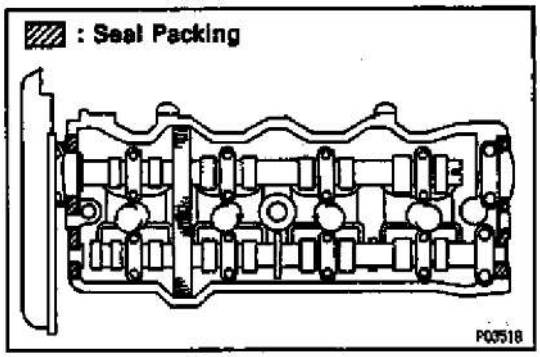


2. CONNECT FUEL RETURN PIPE TO FUEL PRESSURE REGULATOR

Install the return pipe with 2 new gaskets and the union bolt.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)



3. CONNECT VACUUM SENSING HOSE TO FUEL PRESSURE REGULATOR



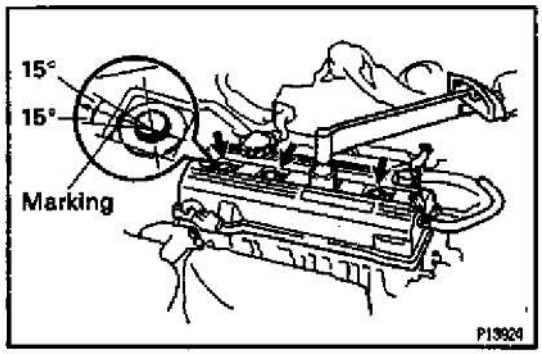
4. INSTALL CYLINDER HEAD COVER

(a) Remove any old packing (FIPG) material.

(b) Apply seal packing to the cylinder head as shown in the illustration.

Seal packing:

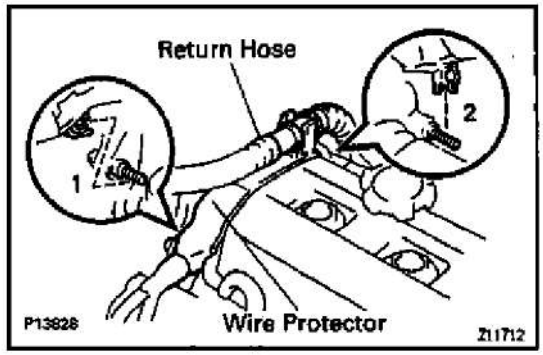
Part No. 08826—00080 or equivalent



(c) Install the gasket to the cylinder head cover.

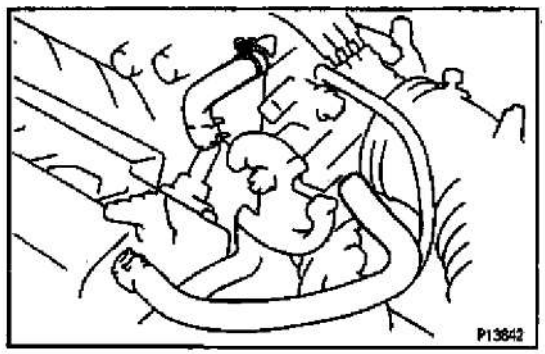
(d) Install the cylinder head cover with the 4 grommets and nuts.

Torque: 23 N·m (230 kgf·cm, 17 ft·lbf)



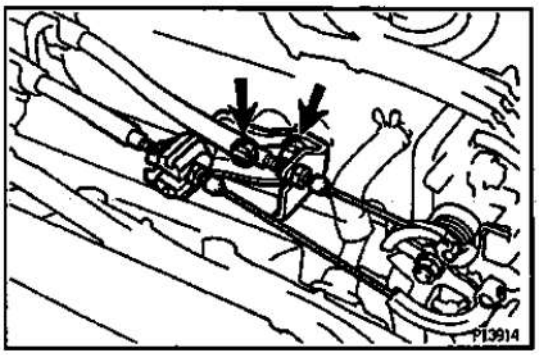
(e) Install the 2 clamps of the engine wire protecter to the mounting bolts of the No.2 timing belt cover in the sequence shown.

(f) Install the PS oil reservoir return hose to the engine wire protector.



(g) Connect the 2 PCV hoses to the intake manifold and throttle body.

(h) Connect the 4 high—tension cords to the spark plugs.



5. INSTALL ACCELERATOR CABLE BRACKET

(a) Install the accelerator cable bracket with the 2 bolts.

(b) Connect the control cables to the throttle linkage.

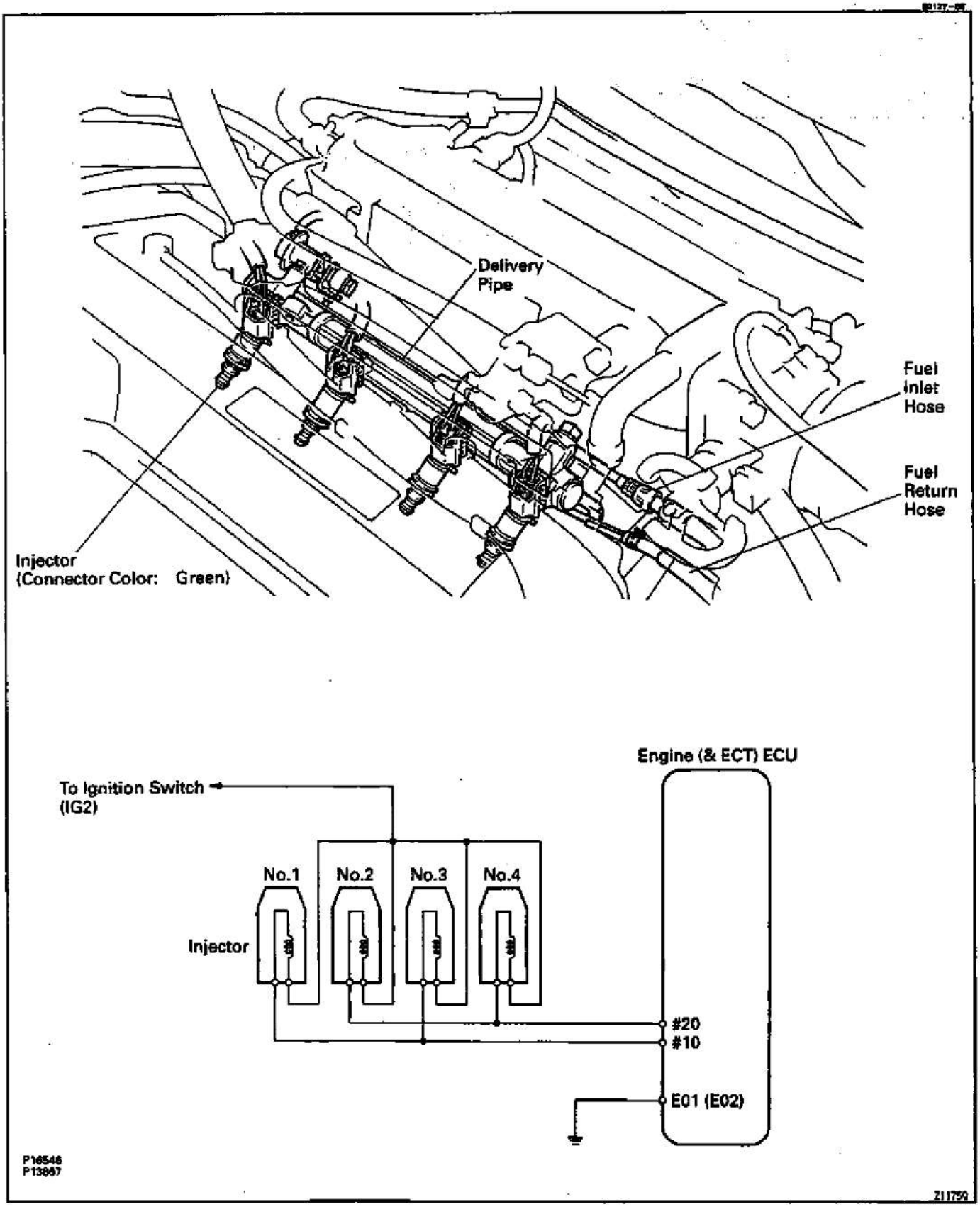
6. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

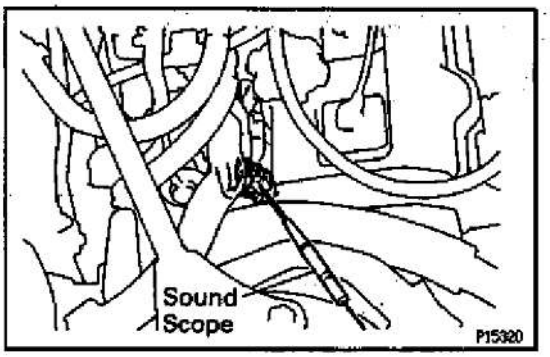
7. CHECK FOR FUEL LEAKS

(See page EG–163)

INJECTOR
(ST202)

EG





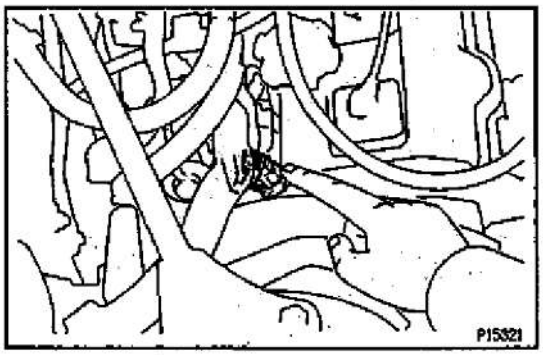
ON–VEHICLE INSPECTION

1. INSPECT INJECTOR OPERATION

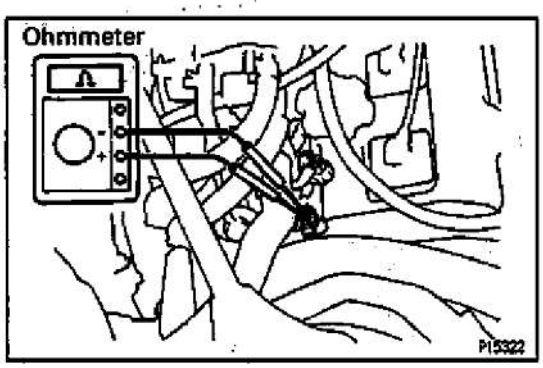
Check operation sound from each injector.

(a) With the engine running or cranking, use a sound scope to check that there is a normal operating noise in proportion to engine speed.

EG



(b) 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 ECU.



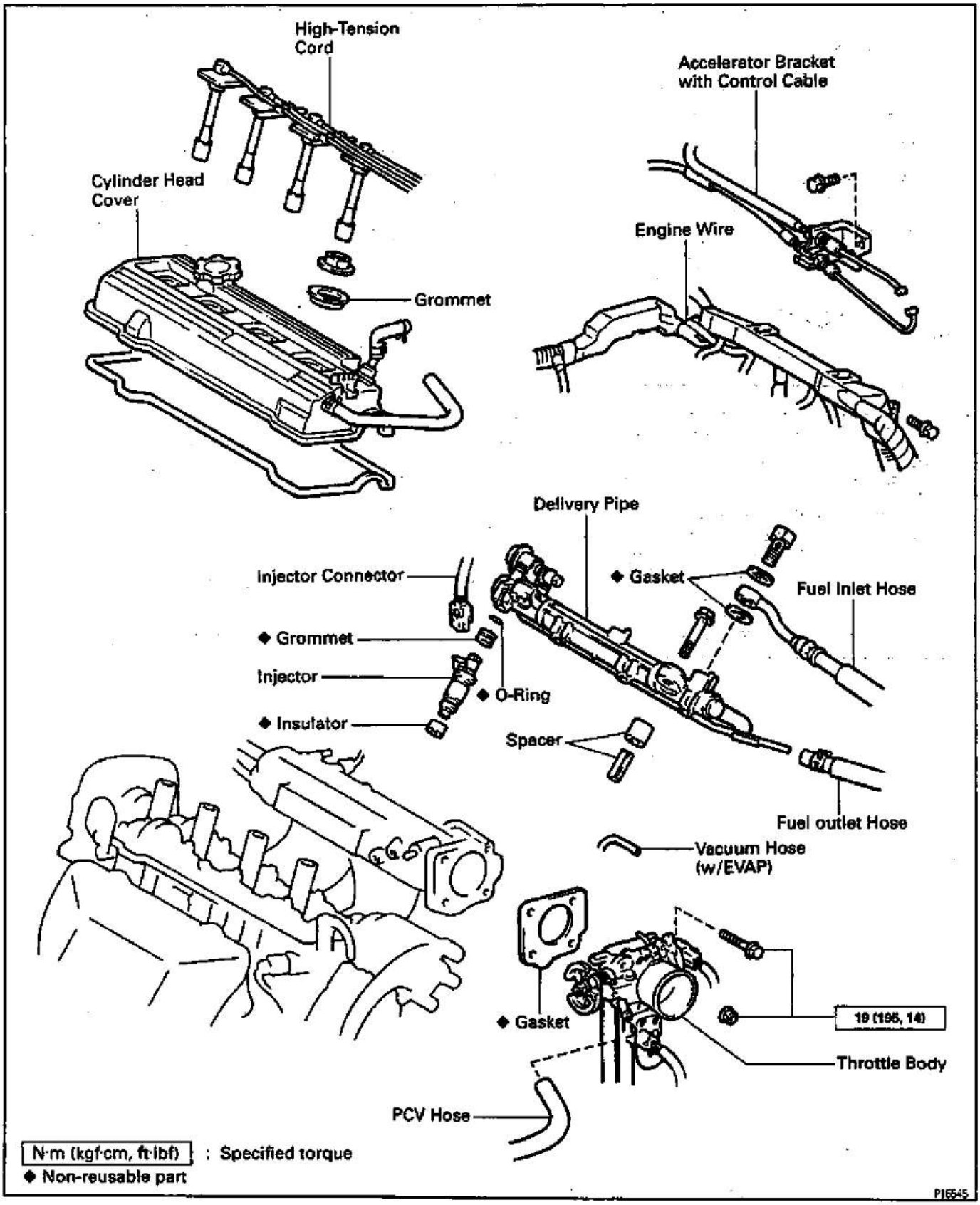
2. INSPECT INJECTOR RESISTANCE

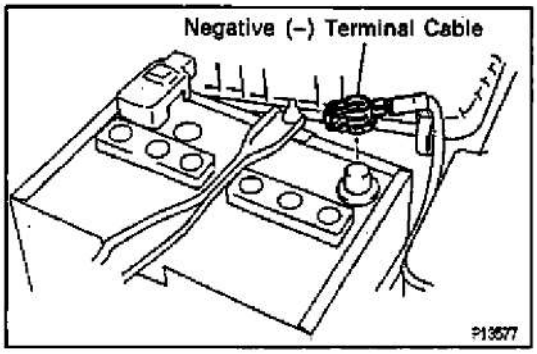
(a) Disconnect the injector connector.

(b) Using an ohmmeter, measure the resistance between the terminals.
Resistance:
13.4 – 14.2 Ω at 20°C (68°F)
If the resistance is not as specified, replace the injector.

(c) Reconnect the injector connector.

COMPONENTS FOR REMOVAL AND INSTALLATION



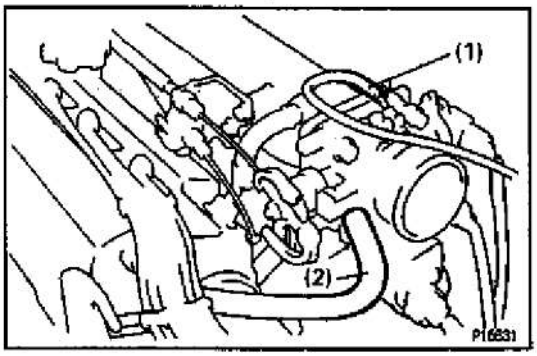


INJECTORS REMOVAL

(See Components for Removal and Installation)

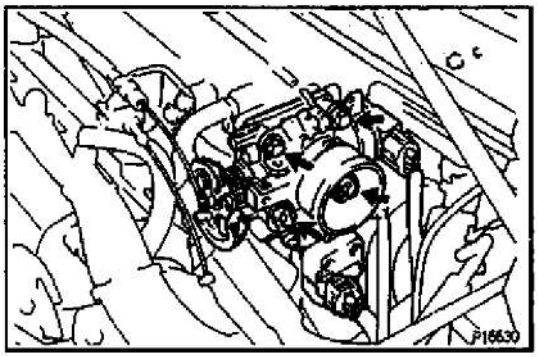
1. DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY

2. DISCONNECT INTAKE AIR TEMPERATURE SENSOR FROM AIR CLEANER CAP
3. REMOVE AIR CLEANER CAP
4. DISCONNECT ACCELEARTOR CABLE FROM THOTTLE BODY
5. A/T:
   DISCONNECT A/T THOTTLE CABLE FROM THOTTLE BODY



6. DISCONNECT THROTTLE BODY FROM INTAKE MANIFOLD

(a) Disconnect the following hoses:
   (1) w/ EVAP:
   Vacuum hose
   (2) PCV hose

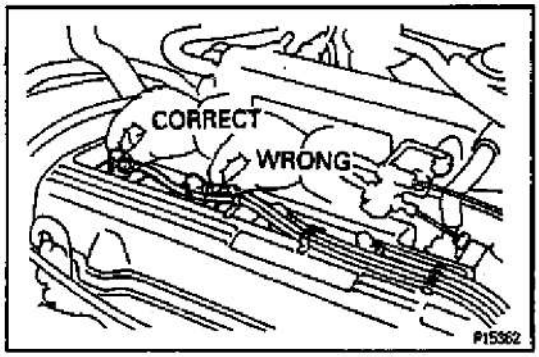


(b) Type A:
Remove the 4 bolts.

(c) Type B:
Remove the 2 bolts and 2 nuts.

(d) Disconnect the throttle body from the intake manifold.

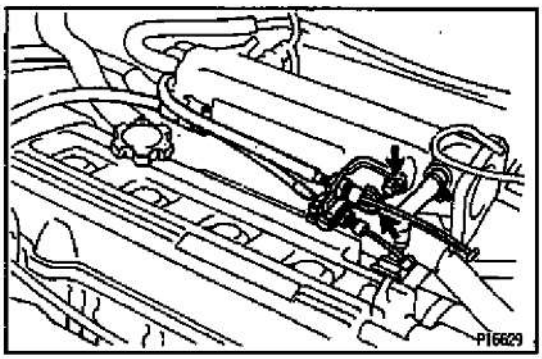
(e) Remove the gasket.



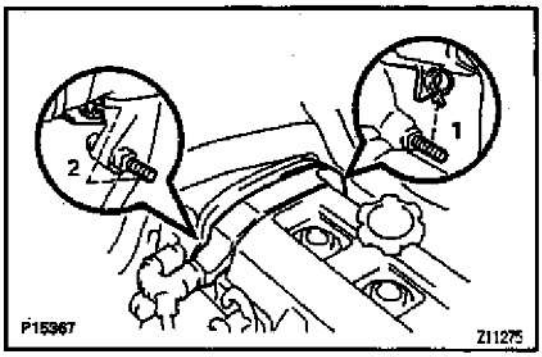
7. REMOVE CYLINDER HEAD COVER

(a) Disconnect the 4 high–tension cords from the clamp on the cylinder head cover.

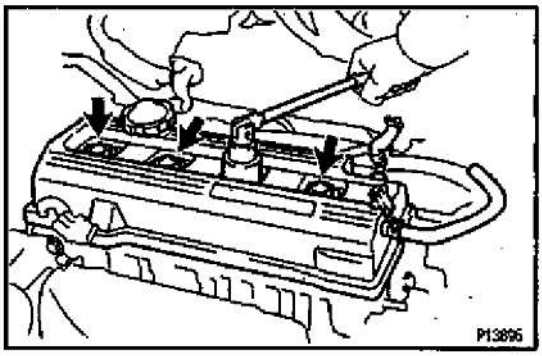
(b) Disconnect the high – tension cords at the rubber boot. Do not pull on the high–tension cords.
NOTICE: Pulling on or bending the cords may damage the conductor inside.



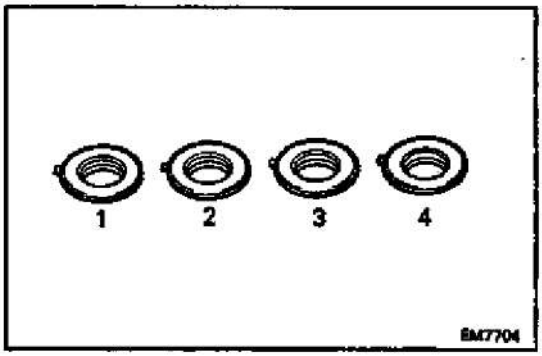
(c) Remove the 2 bolts, and disconnect the accelerator cable bracket from the intake manifold.
(d) Disconnect the PCV hose from the intake manifold.



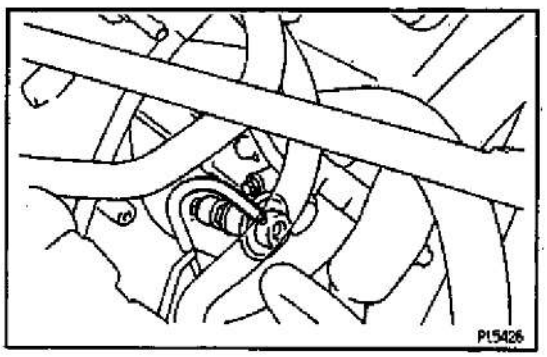
(e) Disconnect the engine wire protector from the 2 mounting bolts of the No.2 timing belt cover in the sequence shown.



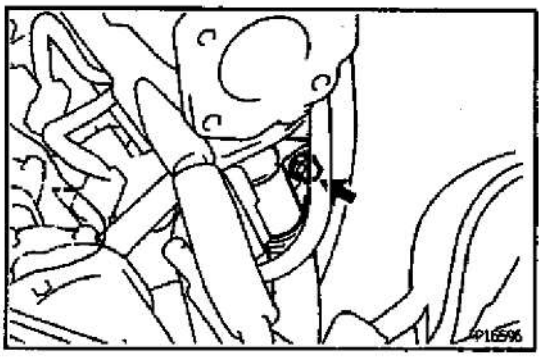
(f) Remove the 4 nuts, grommets, cylinder head cover and gasket.
NOTICE: Cover the cylinder head with a clean cloth to prevent dirt, etc. getting into the cylinder head.



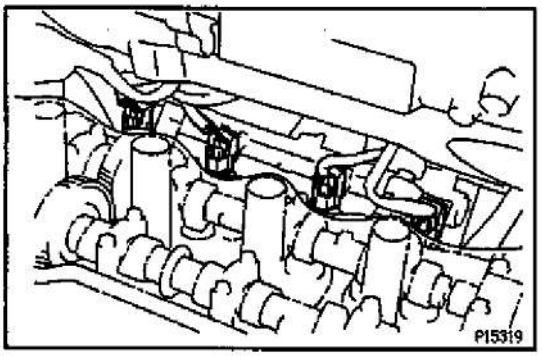
HINT: Arrange the grommets in the correct order, so that they can be reinstalled into their original positions. This minimizes any possibility of oil leakage due to reuse of the grommets in different positions.



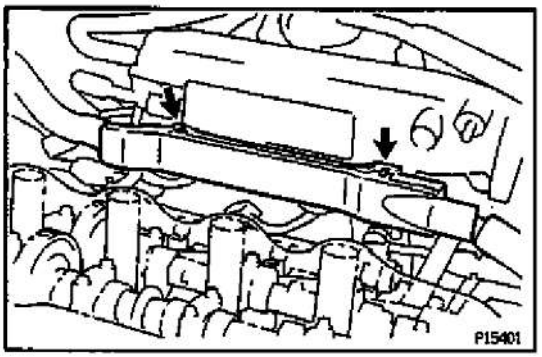
8. REMOVE DELIVERY PIPE AND INJECTORS
(a) Disconnect the vacuum sensing hose from the fuel pressure regulator.



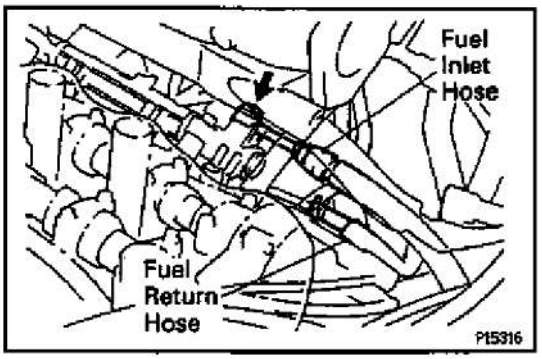
(b) Remove the bolt, and disconnect the engine wire protector from the LH side of the intake manifold.



(c) Disconnect the 4 injector connectors.

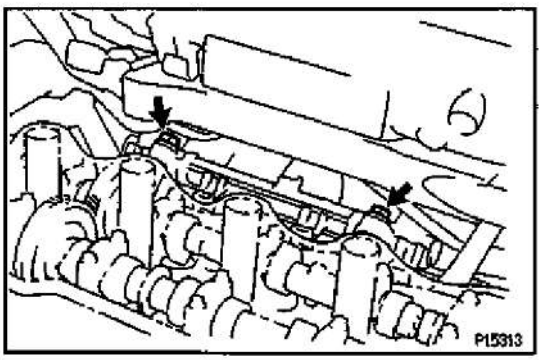


(d) Disconnect the engine wire protector from the 2 brackets on the front side of the intake manifold.

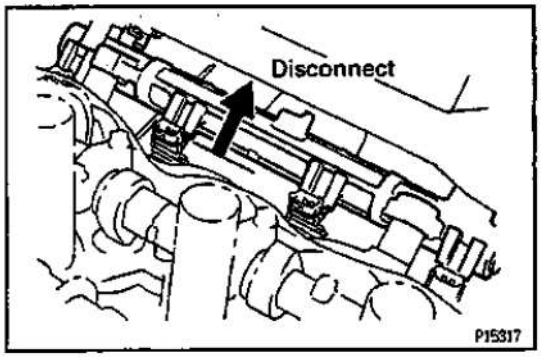


(e) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet hose from the delivery pipe.

(f) Disconnect the fuel return hose from the return pipe.



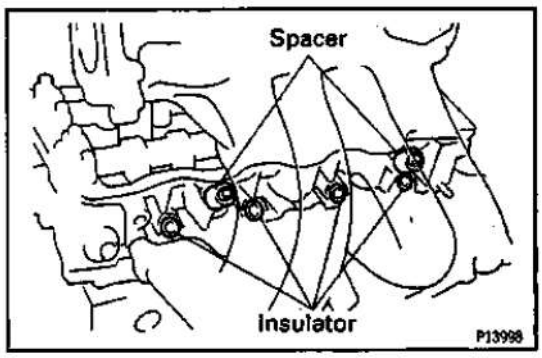
(g) Remove the 2 bolts holding the delivery pipe to the cylinder head.



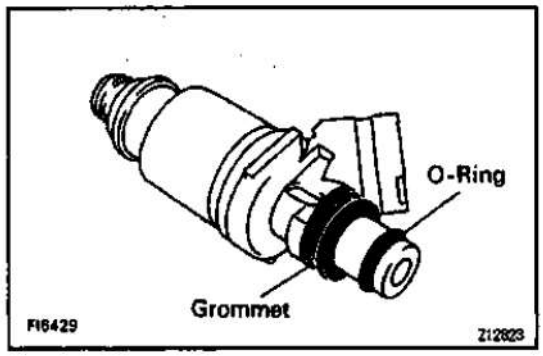
(h) Remove the delivery pipe from the 4 injectors, and remove the delivery pipe.

(i) Pull out the 4 injectors.

NOTICE: Be careful not to drop the injectors.



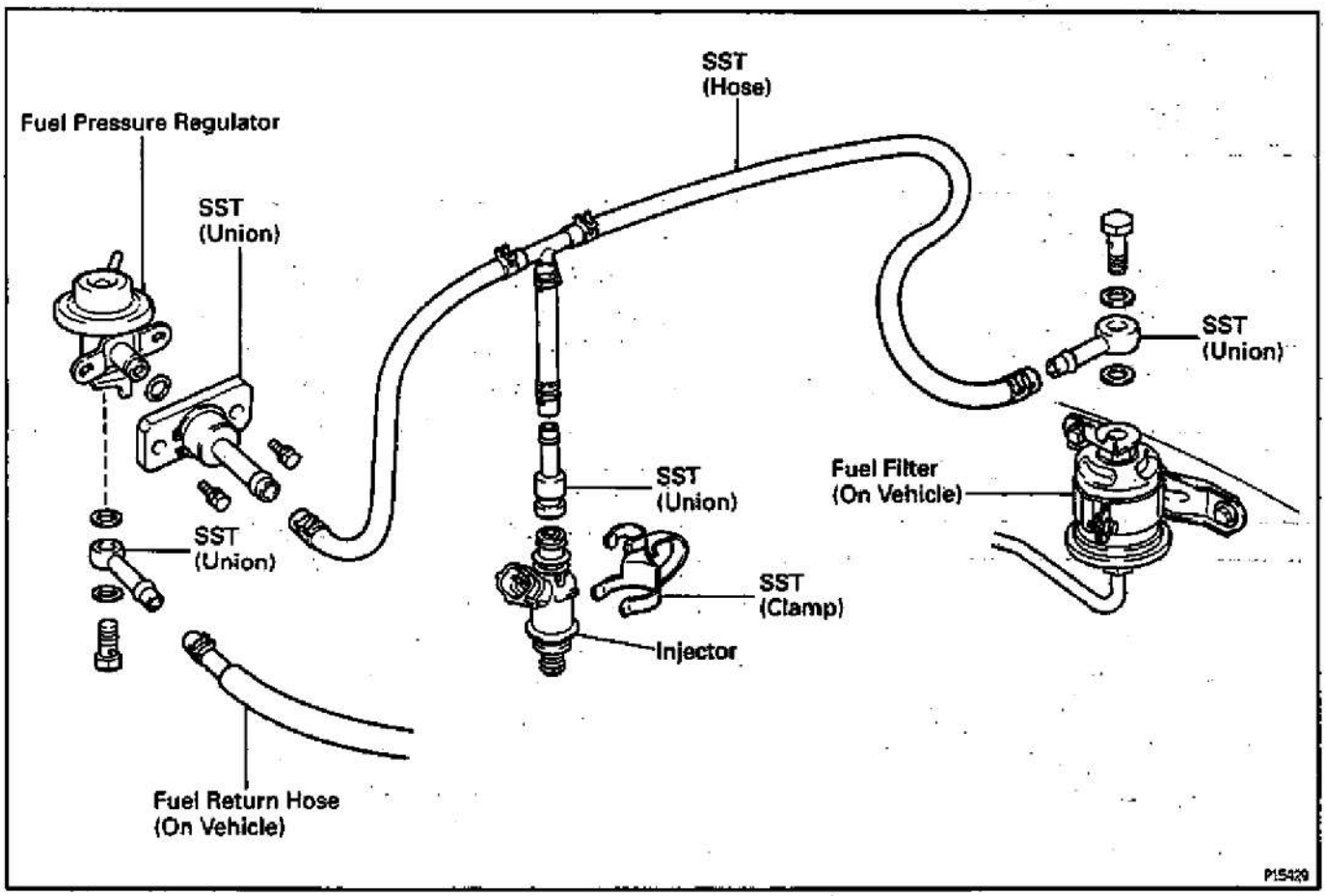
(j) Remove the 4 insulators and 2 spacers from the intake manifold.

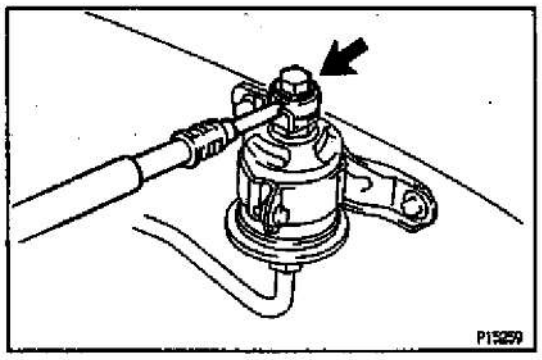


(k) Remove the O—ring and grommet from each injector.

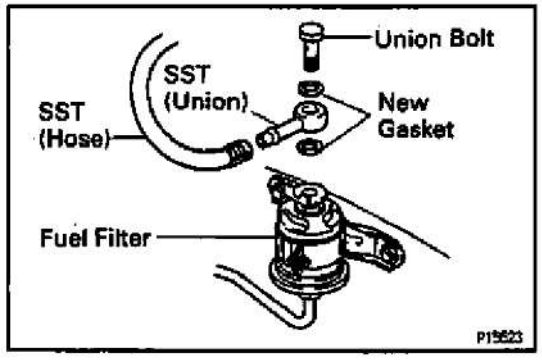
INJECTORS INSPECTION

1. **INSPECT INJECTOR INJECTION**
CAUTION: Keep injector clear of sparks during the test.

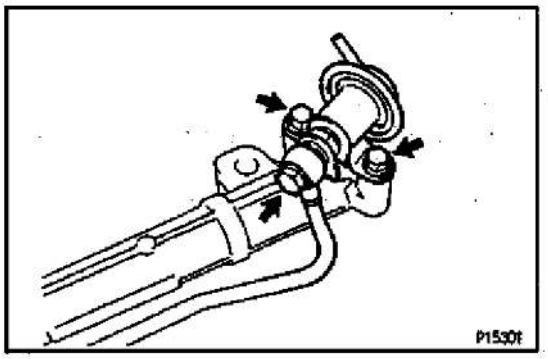




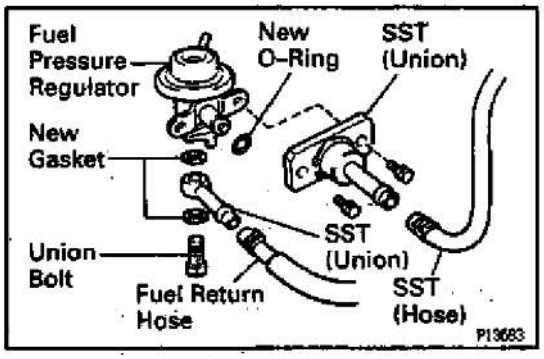
(a) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet hose from the fuel filter outlet.
CAUTION: When removing or installing the union bolt, fix the fuel filter in place using a spanner.



(b) Connect SST (union and hose) to the fuel filter outlet with 2 new gaskets and union bolts.
SST 09268–41045 (90405–09015)
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



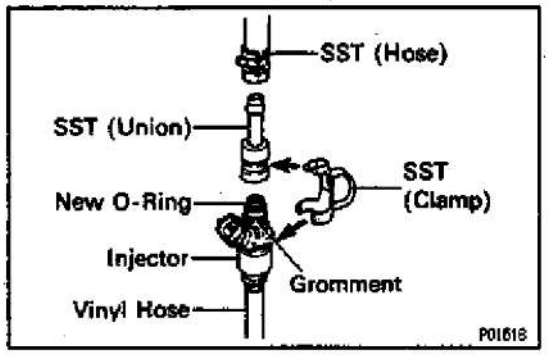
(c) Remove the pressure regulator from the delivery pipe. (See step 5 on page EG–210)



(d) Install a new O–ring to the fuel pressure regulator inlet.

(e) Connect SST (hose) to the fuel inlet of the pressure regulator with SST (union) and the 2 bolts.
SST 09268–41045 (09268–41090)
Torque: 5.4 N·m (55 kgf·cm, 48 ft·lbf)

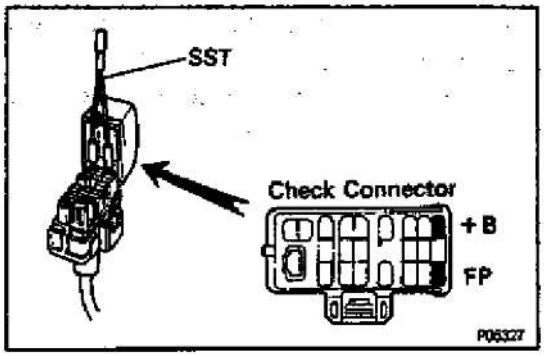
(f) Connect the fuel return hose to the fuel pressure regulator outlet with SST (union), 2 new gaskets and union bolt.
SST 09268–41045 (09268–41080)
Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)



(g) Install the grommet and a new O–ring to the injector.

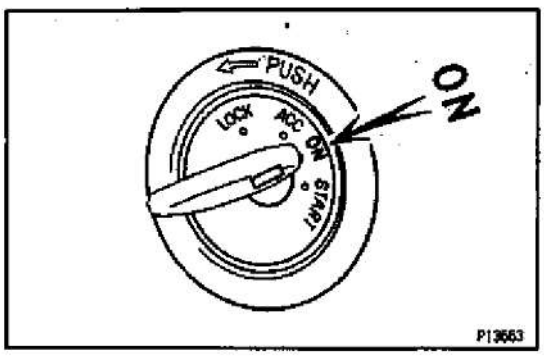
(h) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp).
SST 09268–41045

(i) Put the injector into a graduated cylinder.
CAUTION: Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.

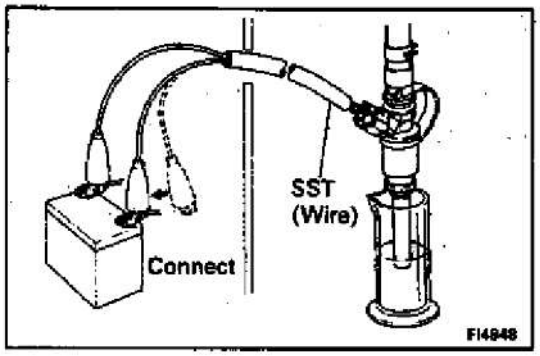


(j) Using SST, connect terminals +B and FP of the check connector.
SST 09843–18020

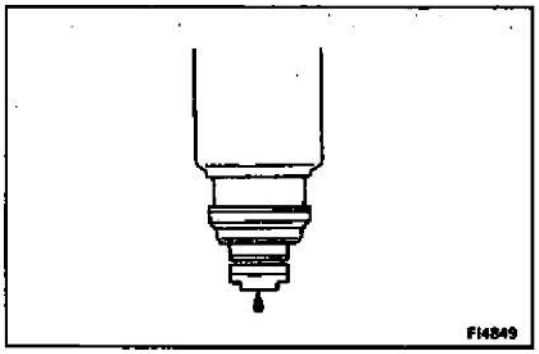
(k) Reconnect the negative (–) terminal cable to the battery.



(l) Turn the ignition switch ON.
NOTICE: Do not start the engine.

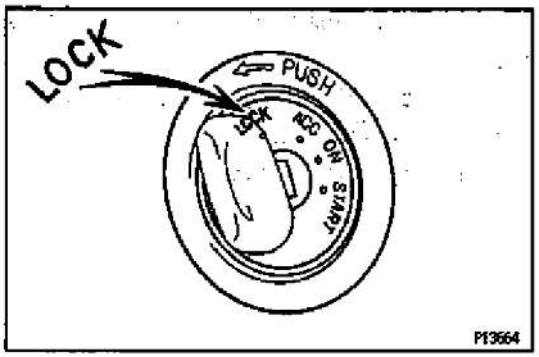


(m) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector 2 or 3 times.
SST 09842–30070
Volume:
49 – 59 cm³ (3.0 – 3.6 cu in.) per 15 sec.
Difference between each injector:
5 cm³ (0.3 cu in.) or less
If the injection volume is not as specified, replace the injector.

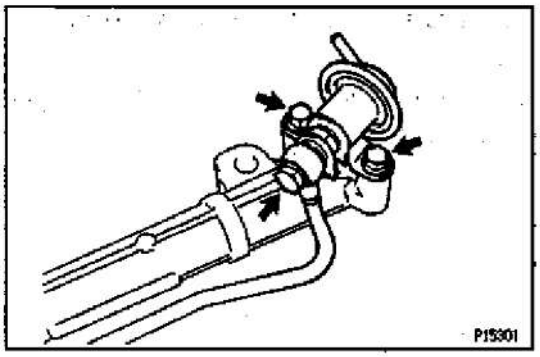


2. INSPECT LEAKAGE

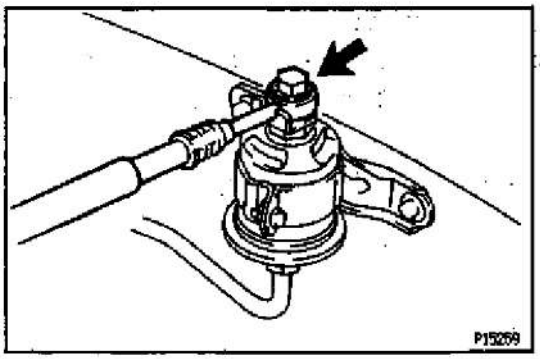
(a) In the condition above, disconnect the tester probes of SST (wire) from the battery and check the fuel leakage from the injector.
SST 09842–30070
Fuel drop:
One drop or less per minute



(b) Turn the ignition switch to LOCK.
(c) Disconnect the negative (–) terminal cable from the battery.
(d) Remove the SST.
SST 09268–41045, 09842–30070, 09843–18020



(e) Reinstall the pressure regulator to the delivery pipe. (See step 1 on page EG–211)

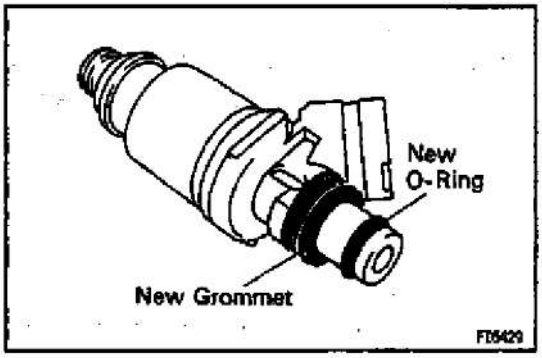


(f) Reconnect the fuel inlet hose to the fuel filter outlet with 2 new gaskets and the union bolt.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)
CAUTION: When removing or installing the union bolt, fix the fuel filter in place using a spanner.

EG

EG

INJECTORS INSTALLATION

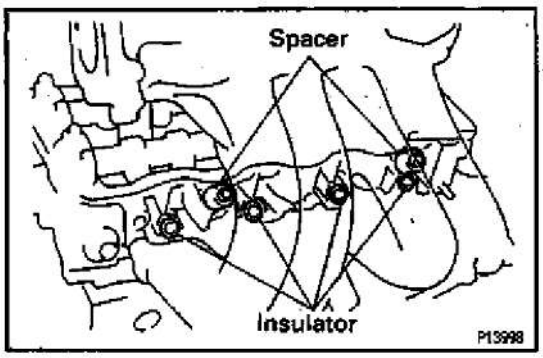


(See Components for Removal and Installation)

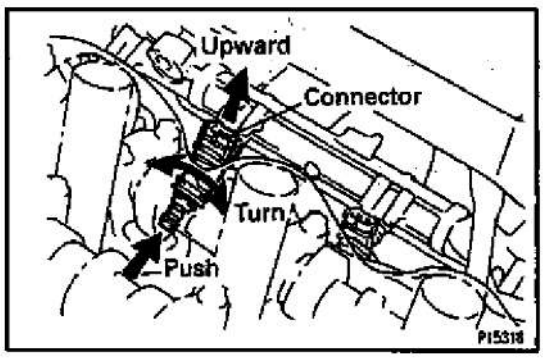
1. **INSTALL INJECTORS AND DELIVERY PIPE**

(a) Install a new grommet to each injector.

(b) Apply a light coat of gasoline onto a new O—ring, and install it to each injector.



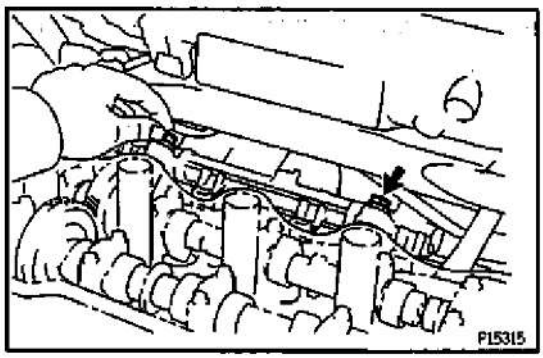
(c) Install the following parts to the intake manifold:
   (1) 2 spacers
   (2) 4 new insulators



(d) Place the delivery pipe between the intake manifold and cylinder head.

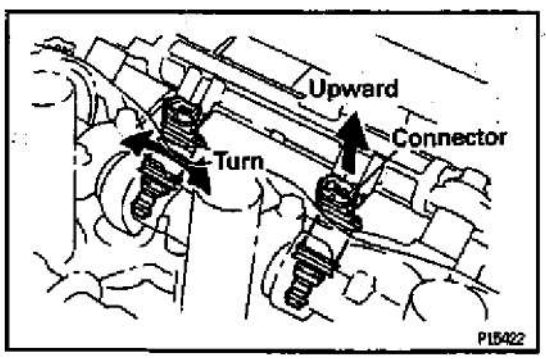
(e) While turning the injector left and right, install it to the delivery pipe. Install the 4 injectors.

(f) Position the injector connector upward.



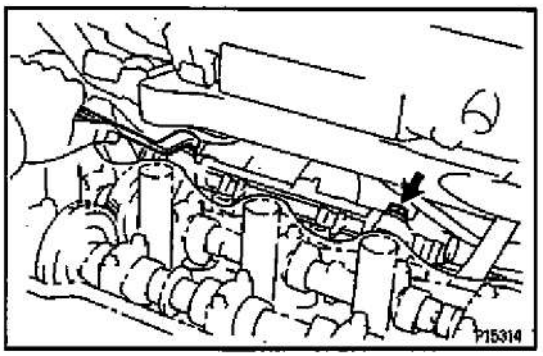
(g) Attach the 4 injectors and delivery pipe assembly to the cylinder head.

(h) Temporarily install the 2 bolts holding the delivery pipe to the cylinder head.

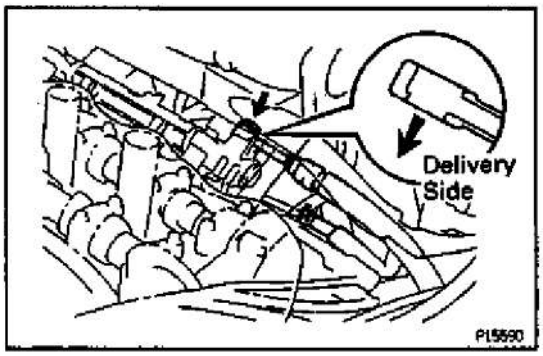


(i) Check that the injectors rotate smoothly.
HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of O—rings. Replace the O—rings.

(j) Position the injector connector upward.

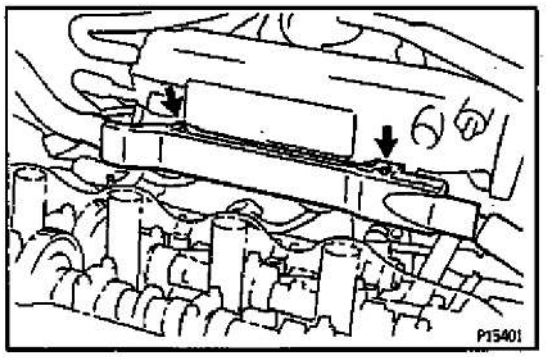


(k) Tighten the 2 bolts holding the delivery pipe to the cylinder head.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

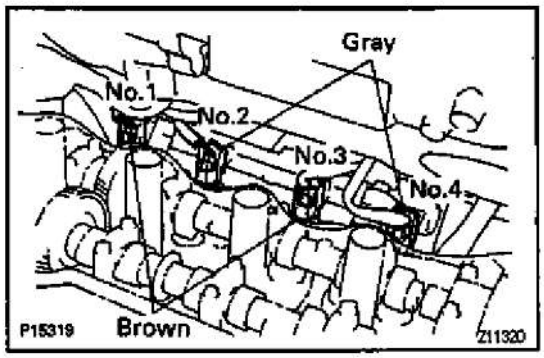


(l) Connect the fuel inlet hose to the delivery pipe with 2 new gaskets and the union bolt.
Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)
NOTICE: Be careful of the fuel inlet hose installation direction.

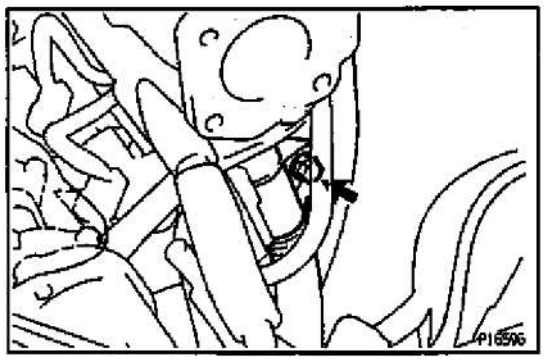
(m) Connect the fuel return hose to the return pipe.



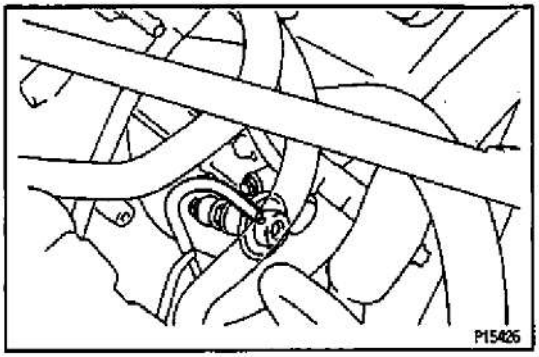
(n) Install the the engine wire protector to the 2 brackets on the front side of the intake manifold.



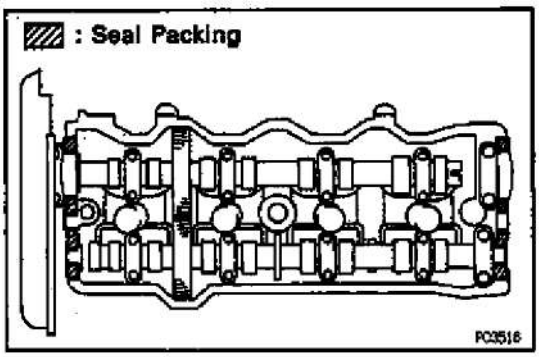
(o) Connect the 4 injector connectors.
HINT: The No.1 and No.3 injector connectors are brown, and the No.2 and No.4 injector connectors are gray.



(p) Install the engine wire protector to LH side of the intake manifold with the bolt.



(q) Connect the vacuum sensing hose to the fuel pressure regulator.



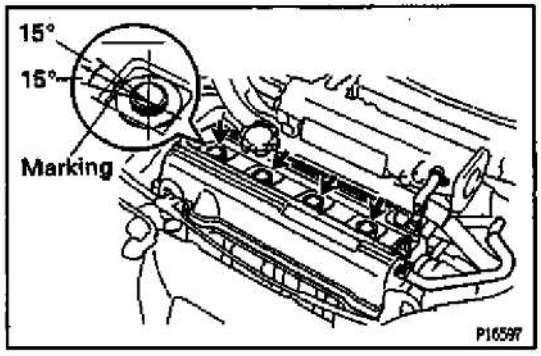
2. INSTALL CYLINDER HEAD COVER

(a) Remove any old packing (FIPG) material.

(b) Apply seal packing to the cylinder head as shown in the illustration.

Seal packing:

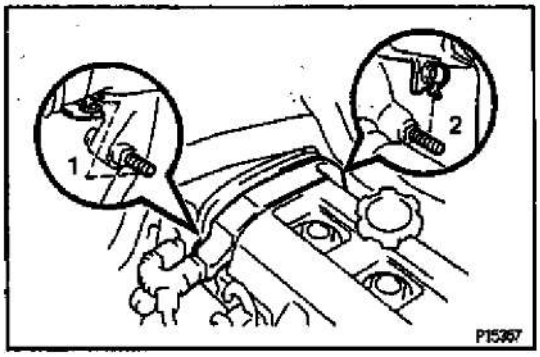
Part No. 08826–00080 or equivalent



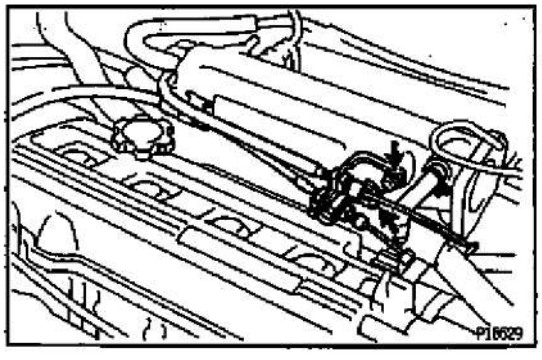
(c) Install the gasket to the cylinder head cover.

(d) Install the cylinder head cover with the 4 grommets and nuts.

Torque: 23 N·m (230 kgf·cm, 17 ft·lbf)



(e) Install the engine wire protector to the 2 mounting bolts of the No.2 timing belt cover in the sequence shown.

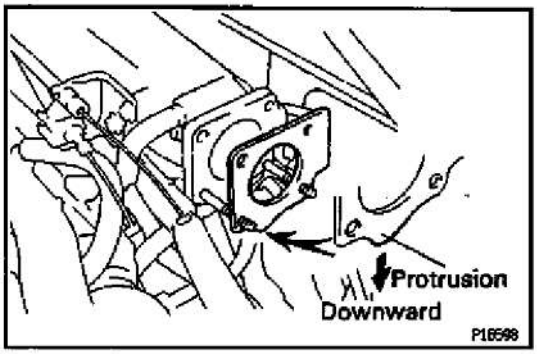


(f) Connect the PCV hose to the intake manifold.

(g) Install the cable bracket with the 2 bolts.

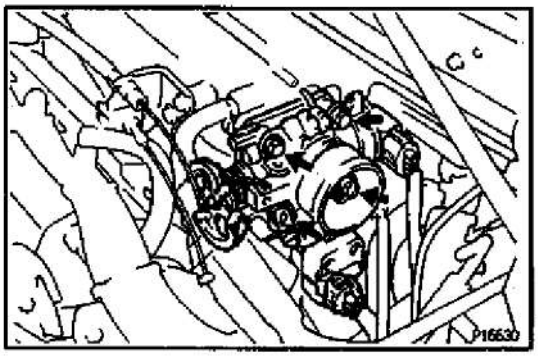
(h) Connect the 4 high–tension cords to the spark plugs.

(i) Install the 4 high–tension cords to the clamp on the cylinder head cover.



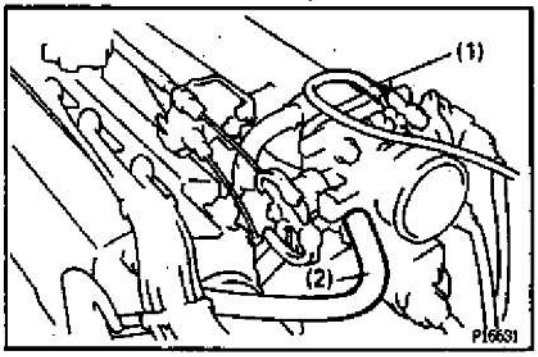
3. INSTALL THROTTLE BODY

(a) Attach a new gasket to the intake manifold, facing the protrusion downward.



(b) Type A:
Install the throttle body with the 4 bolts.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)
HINT: Different bolt lengths are used for the upper and lower sides.
Bolt length:
Upper side: 40 mm (1.59 in.)
Lower side: 55 mm (2.17 in.)

(c) Type B:
Install the throttle body with the 2 bolts and 2 nuts.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)



(d) Connect the following hoses:
(1) w/ EVAP:
Vacuum hose
(2) PCV hose

4. A/T:
CONNECT A/T THROTTLE CABLE TO THROTTLE BODY

5. CONNECT ACCELERTOR CABLE TO THROTTLE BODY

6. INSTALL AIR CLEANER CAP

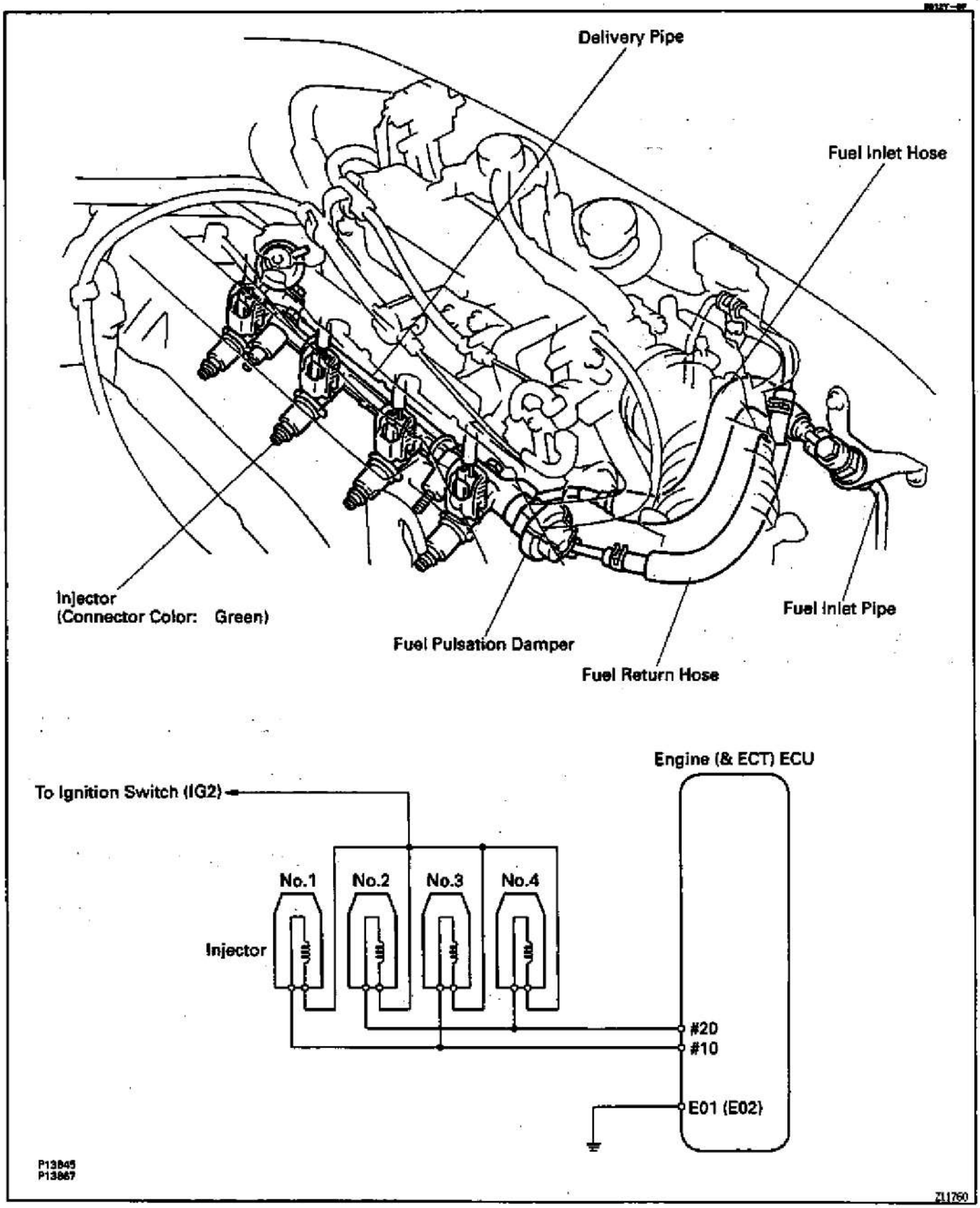
7. CONNECT INTAKE AIR TEMPERATURE SENSOR TO AIR CLEANER CAP

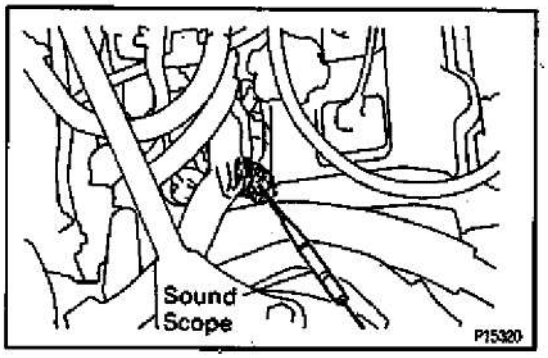
8. CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY

9. CHECK FOR FUEL LEAKS
(See page EG–163)

INJECTOR
(ST191)

EG





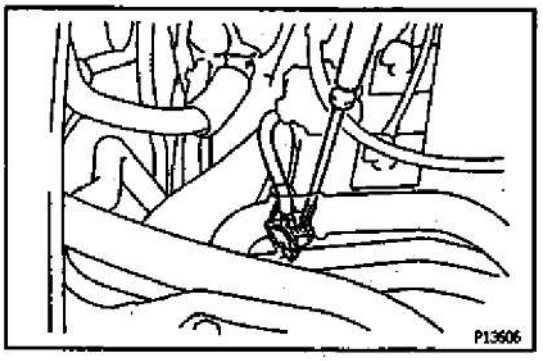
ON–VEHICLE INSPECTION

1. INSPECT INJECTOR OPERATION

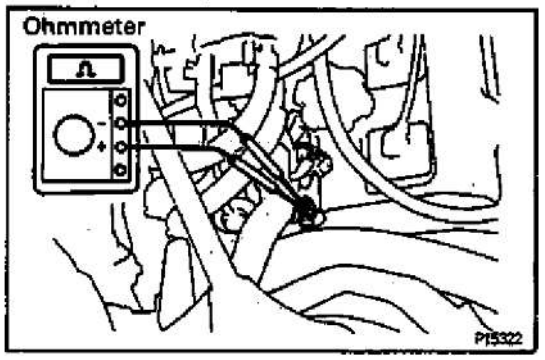
Check operation sound from each injector.

(a) With the engine running or cranking, use a sound scope to check that there is a normal operating noise in proportion to engine speed.

EG



(b) If you have no sound scope, you can check the injector transmission operation with a screwdriver.
If no sound or unusual sound is heard, check the wiring connector, injector or injection signal from the ECU.



2. INSPECT INJECTOR RESISTANCE

(a) Disconnect the injector connector.

(b) Using an ohmmeter, measure the resistance between the terminals.

Resistance:

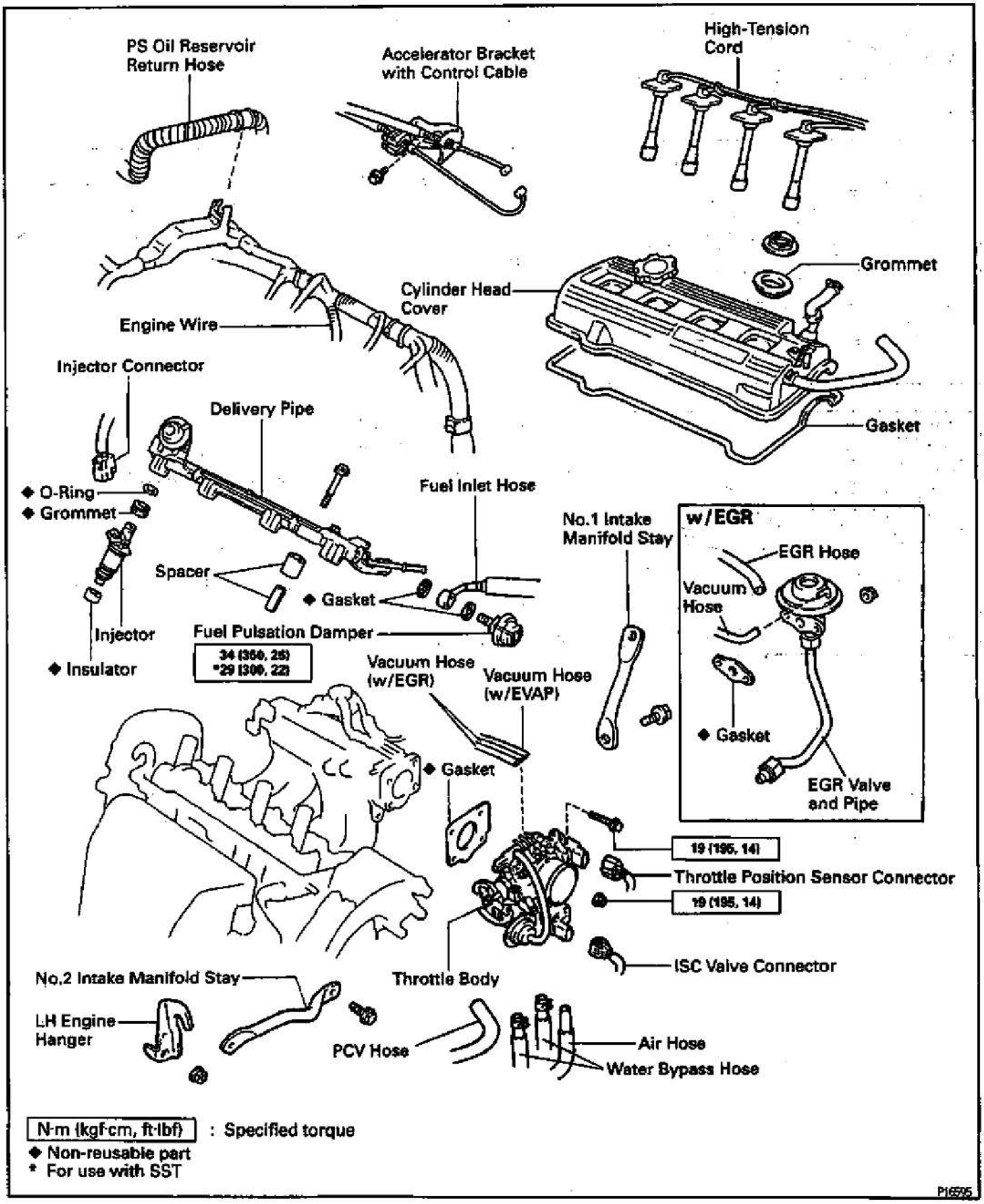
13.4 – 14.2 Ω at 20°C (68°F)

If the resistance is not as specified, replace the injector.

(c) Reconnect the injector connector.

EG

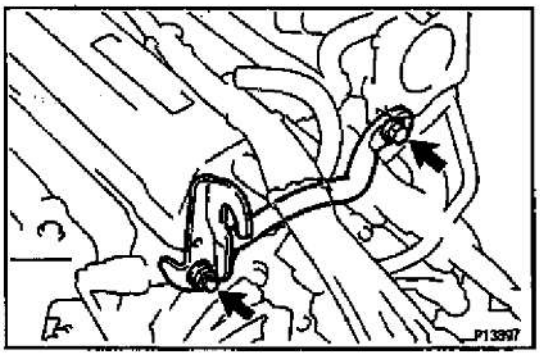
COMPONENTS FOR REMOVAL AND INSTALLATION



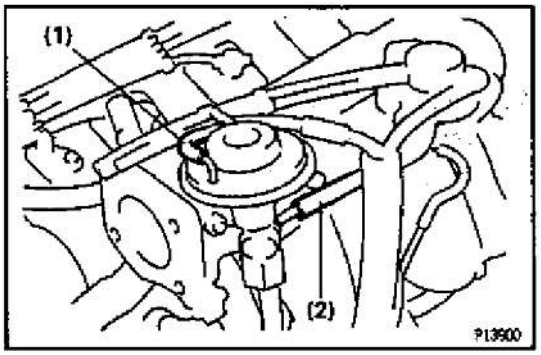
INJECTORS REMOVAL

(See Components for Removal and Installation)

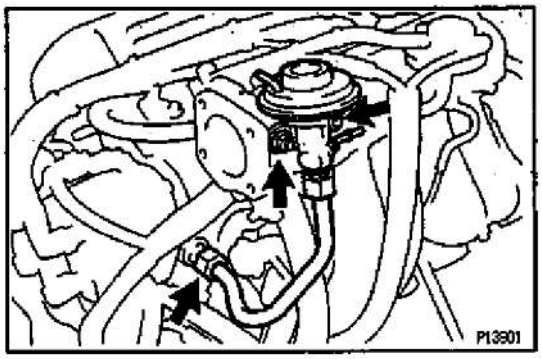
1. REMOVAL THROTTLE BODY
   (See page EG–251)



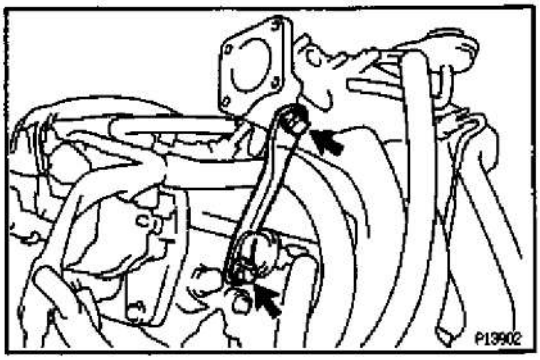
2. REMOVE LH ENGINE HANGER AND No.2 INTAKE MANIFOLD STAY
   Remove the bolt, nut, engine hanger and manifold stay.



3. w/ EGR:
   REMOVE EGR VALVE AND PIPE
(a) Disconnect the following hoses from the EGR valve:
   (1) Vacuum hose (from port E of VSV)
   (2) EGR hose (from vacuum modulator)

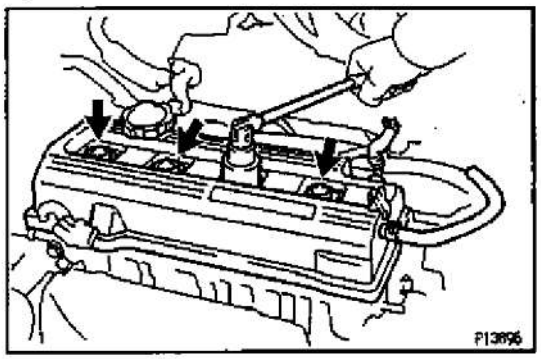


(b) Loosen the cylinder head side of the EGR pipe union nut.
(c) Remove the 2 nuts, the EGR valve, pipe assembly and gasket.

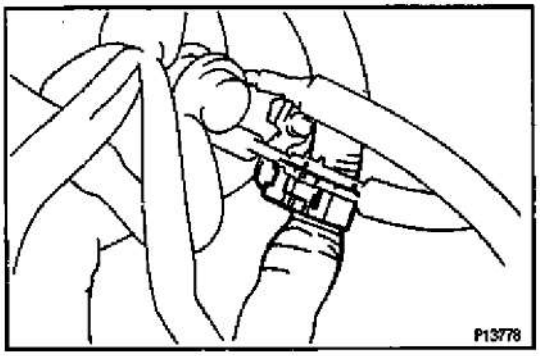


4. REMOVE NO.1 INTAKE MANIFOLD STAY
   Remove the 2 bolts and manifold stay.

EG

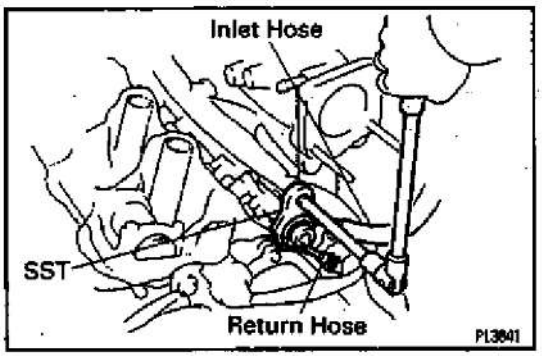


5. REMOVE CYLINDER HEAD COVER
(See steps 1 and 2 on page EG–19)

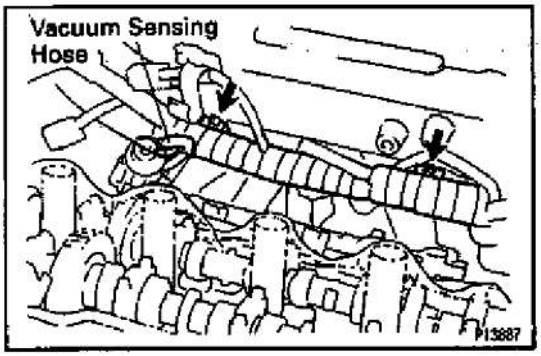


6. DISCONNECT FUEL INLET HOSE AND FUEL RETURN HOSE

(a) Disconnect the clamp of the engine wire from the wire bracket.

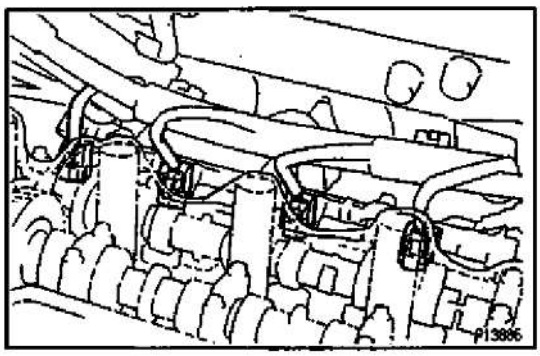


(d) Using SST, loosen the fuel pulsation damper.
SST 09612–24014 (09617–24011)
(c) Remove the fuel pulsation damper and 2 gaskets, and disconnect the fuel inlet hose from the delivery pipe.
(d) Disconnect fuel return hose from return pipe.

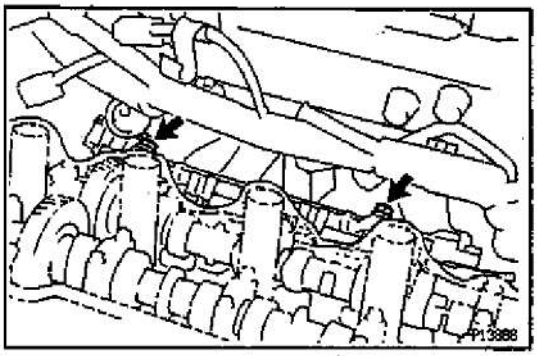


7. REMOVE DELIVERY PIPE AND INJECTORS

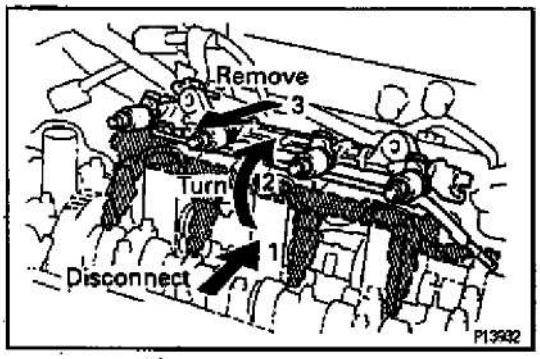
(a) Disconnect the 2 clamps of the engine wire from the wire brackets on the intake manifold.
(b) Disconnect the vacuum sensing hose from the fuel pressure regulator.



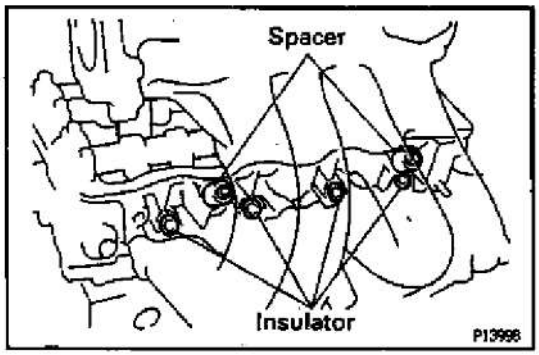
(c) Disconnect the 4 injector connectors.



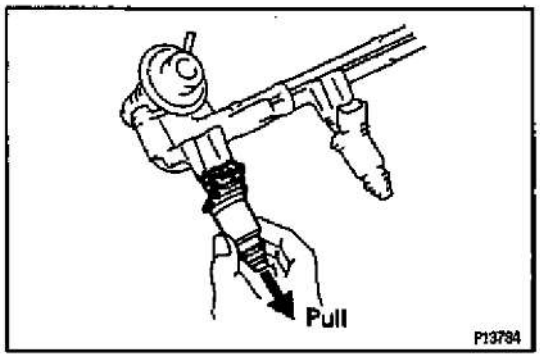
(d) Remove the 2 bolts holding the delivery pipe to the cylinder head.



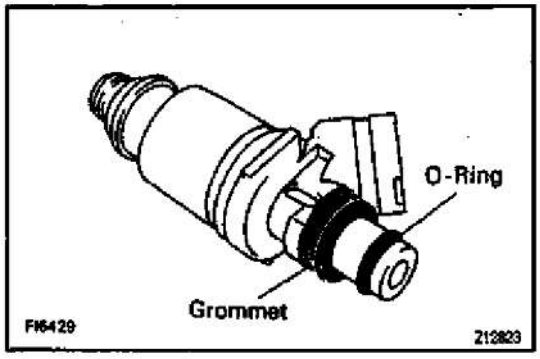
(e) Remove the delivery pipe together with the 4 injectors by following the instructions as shown in the illustrations.
NOTICE: Be careful not to drop the injectors when removing the delivery pipe.



(f) Remove the 4 insulators and 2 spacers from the cylinder head.



(g) Pull out the 4 injectors from the delivery pipe.

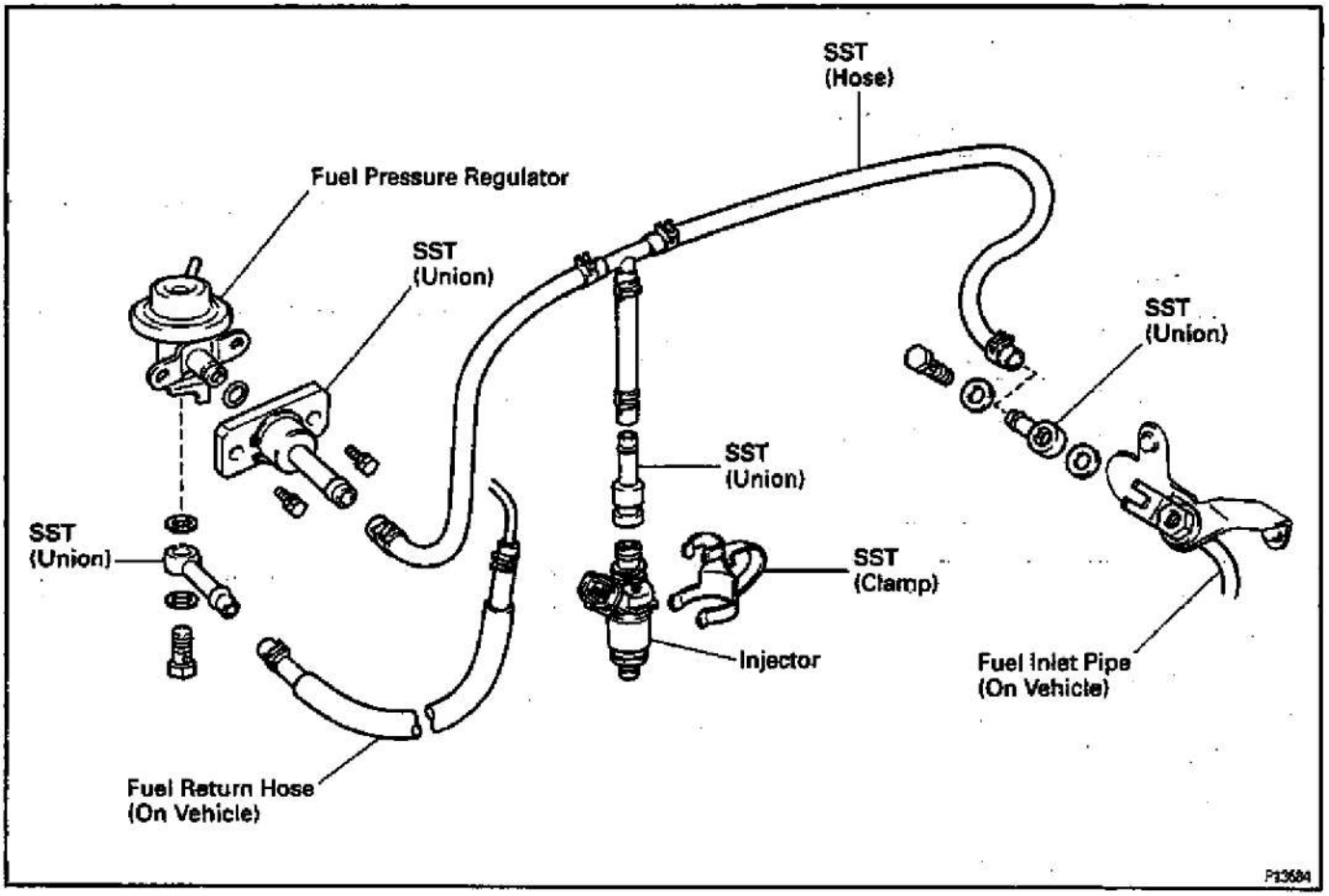


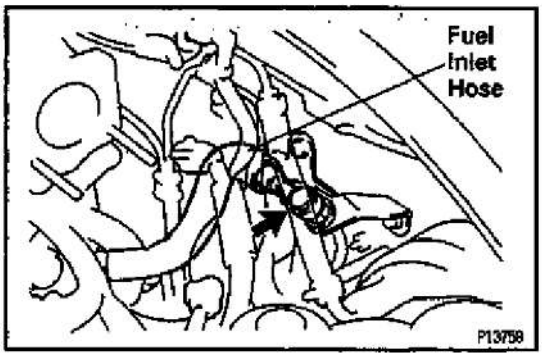
(h) Remove the O–ring and grommet from each injector.

INJECTORS INSPECTION

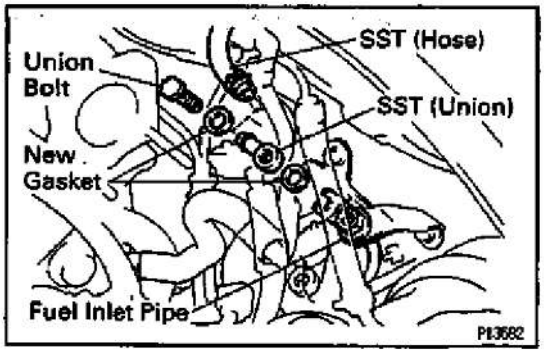
1. INSPECT INJECTOR INJECTION

CAUTION: Keep injector clear of sparks during the test.

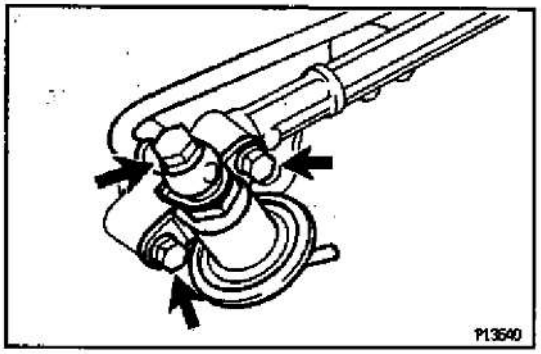




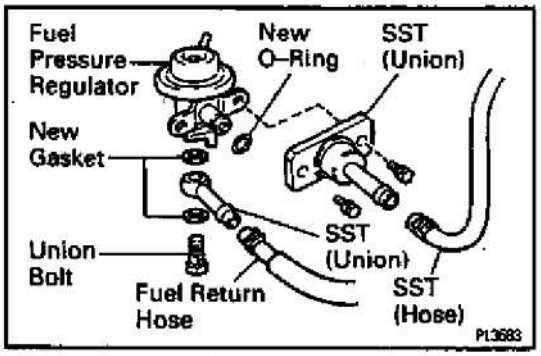
(a) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet hose from the fuel inlet pipe.



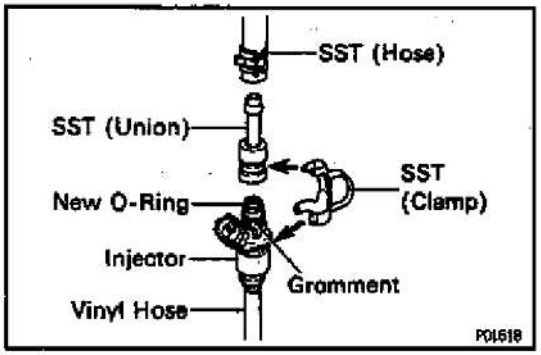
(b) Connect SST (union and hose) to the fuel inlet pipe with 2 new gaskets and union bolts.
SST 09268–41045 (90405–09015)
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



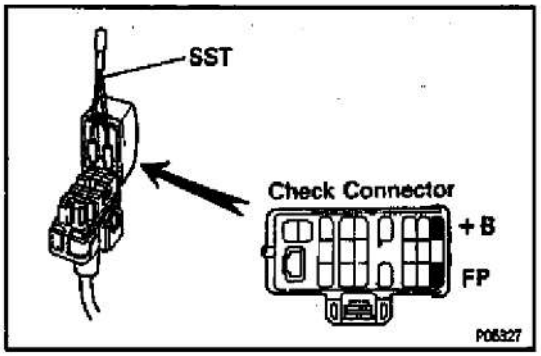
(c) Remove the fuel pressure regulator from the delivery pipe.
(See step 4 on page EG–216)



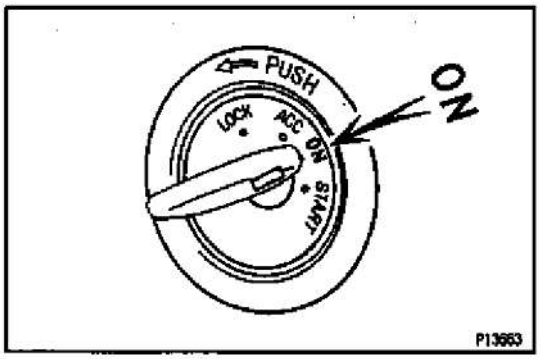
(d) Install a new O–ring to the fuel pressure regulator inlet.
(e) Connect SST (hose) to the fuel pressure regulator inlet with SST (union) and the 2 bolts.
SST 09268–41045 (09268–41090)
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)
(f) Connect the fuel return hose to the pressure regulator outlet with SST (union), 2 new gaskets and union bolt.
SST 09268–41045 (09268–41080)
Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)



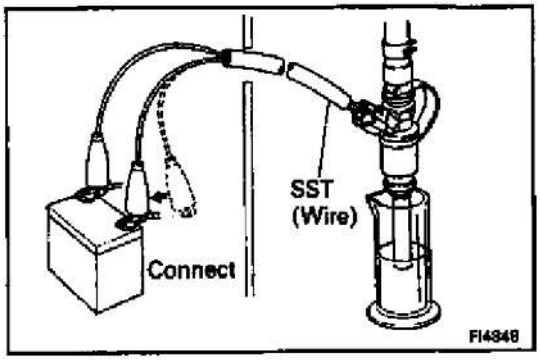
(g) Install the grommet and a new O–ring to the injector.
(h) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp).
SST 09268–41045
(i) Put the injector into the graduated cylinder.
CAUTION: Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.



(j) Using SST, connect terminals +B and FP of the check connector.
SST 09843–18020
(k) Reconnect the negative (–) terminal cable to the battery.



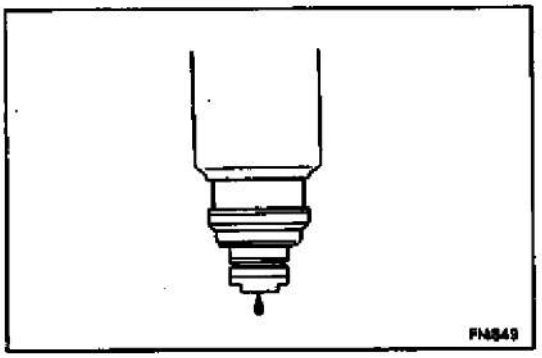
(l) Turn the ignition switch ON.
NOTICE: Do not start the engine.

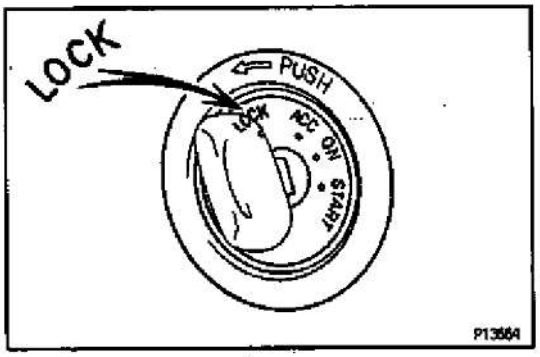


(m) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector 2 or 3 times.
SST 09842–30070
Volume:
49 – 59 cm³ (3.0 – 3.6 cu in.) per 15 sec.
Difference between each injector:
5 cm³ (0.3 cu in.) or less
If the injection volume is not as specified, replace the injector.

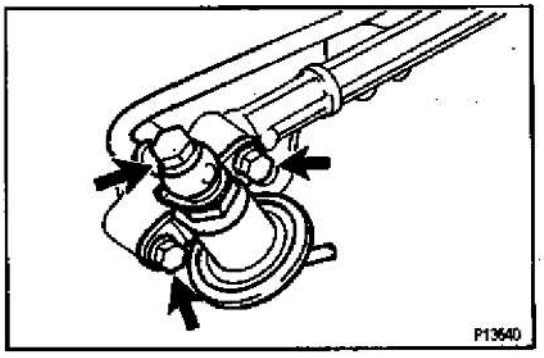
2. INSPECT LEAKAGE

(a) In the condition above, disconnect the tester probes of SST (wire) from the battery and check the fuel leakage from the injector.
SST 09842–30070
Fuel drop:
One drop or less per minute

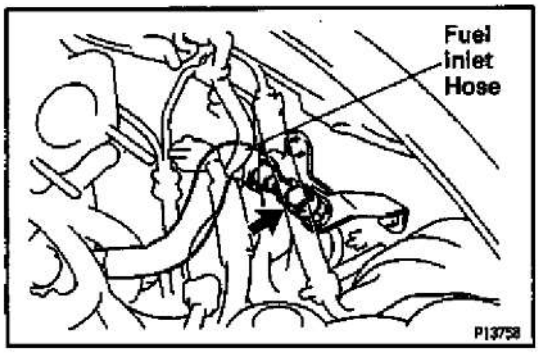




(b) Turn the ignition switch to LOCK.
(c) Disconnect the negative (–) terminal cable from the battery.
(d) Remove the SST.
SST 09268–41045, 09842–30070, 09843–18020

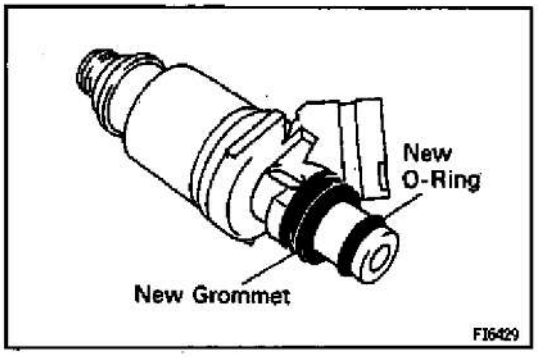


(e) Reinstall the fuel pressure regulator to the delivery pipe.
(See step 1 on page EG–217)



(f) Reconnect the fuel inlet hose to the fuel inlet pipe with 2 new gaskets and the union bolt.
Torque: 29 N·m (300 kgf-cm, 22 ft-lbf)

INJECTORS INSTALLATION

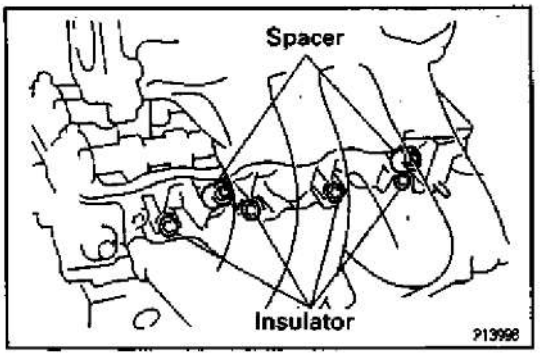


(See Components for Removal and Installation)

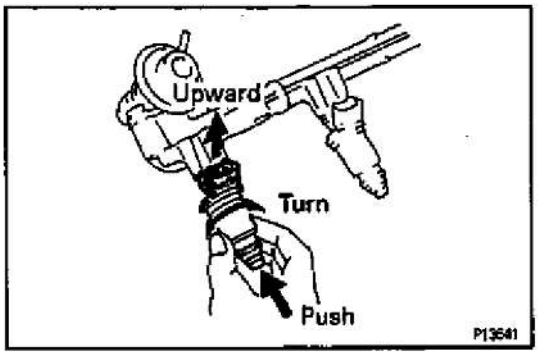
1. INSTALL INJECTORS AND DELIVERY PIPE

(a) Install a new grommet to the injector.

(b) Apply a light coat of gasoline onto a new O—ring, and install it to each injector.

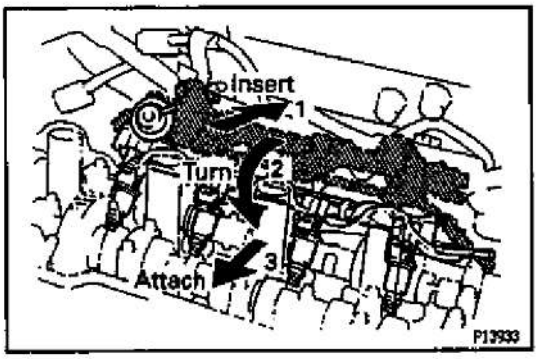


(c) Place 4 new insulators and the 2 spacers in position on the cylinder head.

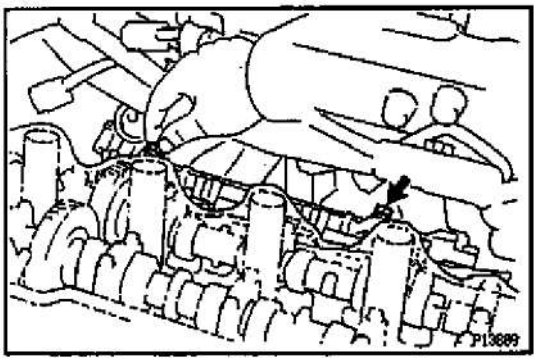


(d) While turning the injector left and right, install it to the delivery pipe. Install the 4 injectors.

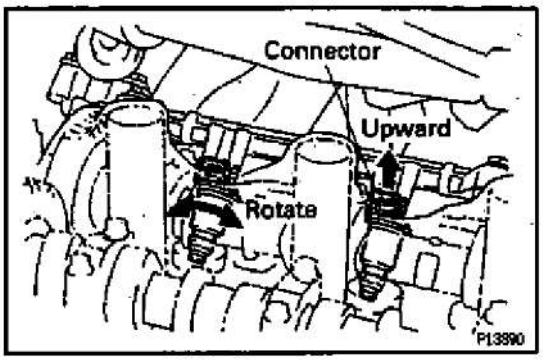
(e) Position the injector connector upward.



(f) Install the 4 injectors and delivery pipe assembly to the cylinder head by following the instructions as shown in the illustration.

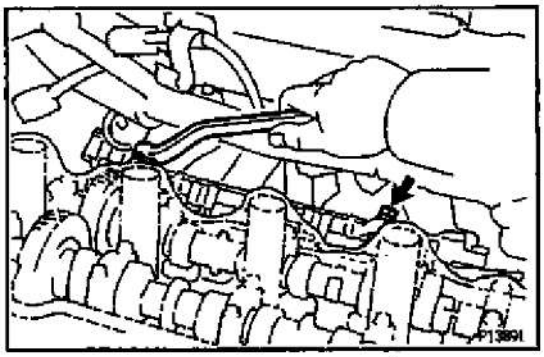


(g) Temporarily install the 2 bolts holding the delivery pipe to the cylinder head.

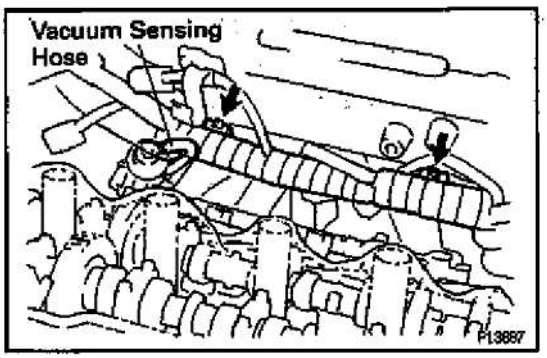


(h) Check that the injectors rotate smoothly.
HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of O–rings. Replace the O–rings.

(i) Position the injector connector upward.

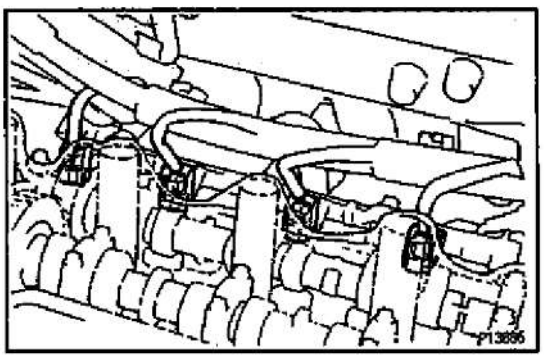


(j) Tighten the 2 bolts holding the delivery pipe to the cylinder head.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

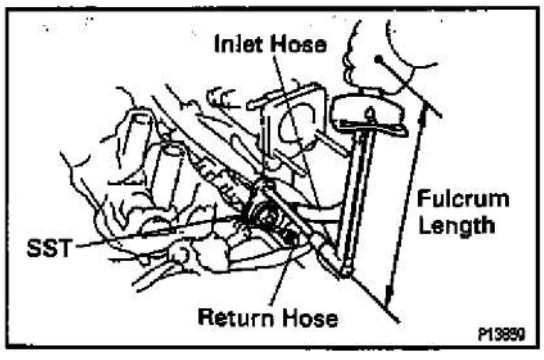


(k) Connect the vacuum sensing hose to the fuel pressure regulator.

(l) Install the 2 clamps of the engine wire to the wire brackets on the intake manifold.



(m) Connect the 4 injector connectors.

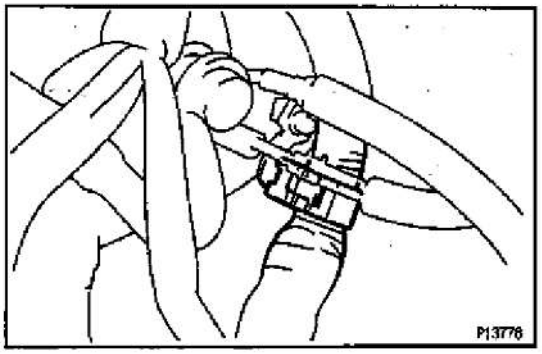


2. CONNECT FUEL RETURN HOSE TO RETURN PIPE

3. CONNECT FUEL INLET HOSE TO DELIVERY PIPE

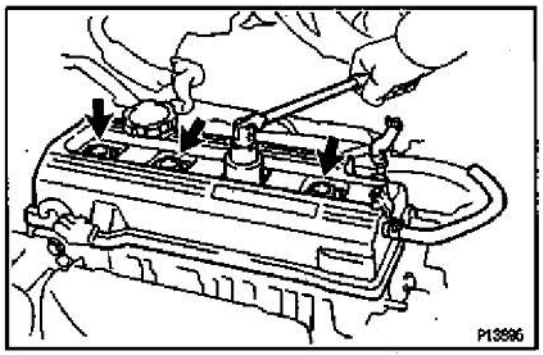
(a) Temporarily connect the fuel inlet hose with 2 new gaskets and fuel pulsation damper.

(b) Using SST, tighten the fuel pulsation damper.
SST 09612–24014 (09617–24011)
Torque:
34 N·m (350 kgf·cm, 25 ft·lbf)
29 N·m (300 kgf·cm, 22 ft·lbf) for use with SST

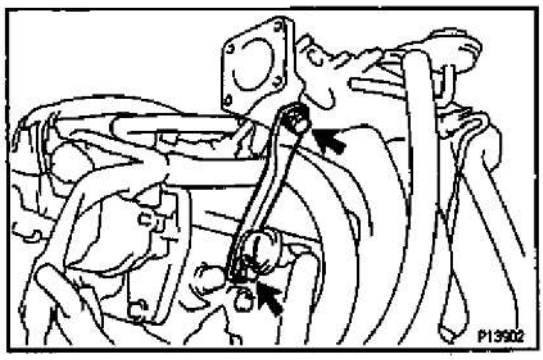


HINT:Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).

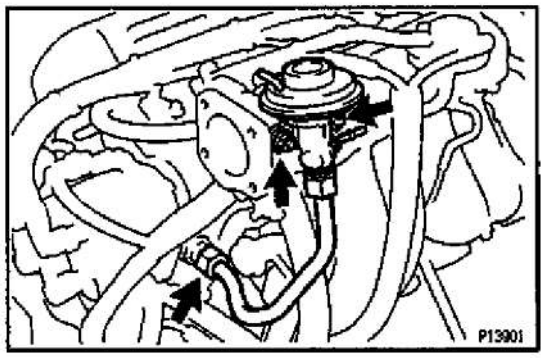
(c) Install the clamp of the engine wire to the wire clamp.



4. INSTALL CYLINDER HEAD COVER
(See step 6 on page EG–24)

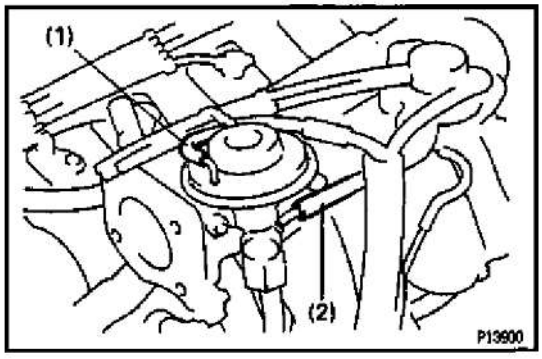


5. INSTALL NO.1 INTAKE MANIFOLD STAY
Install the manifold stay with the 2 bolts.
Torque: 42 N·m (425 kgf·cm, 31 ft·lbf)

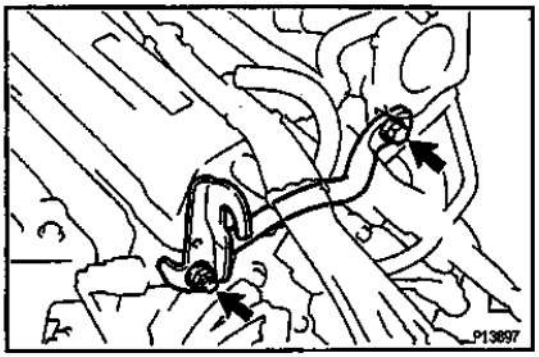


6. w/ EGR:
INSTALL EGR VALVE AND PIPE

(a) Install a new gasket, the EGR valve and pipe assembly with the union nut and 2 nuts.
Torque:
Nut: 13 N·m (130 kgf·cm, 9 ft·lbf)
Union nut: 59 N·m (600 kgf·cm, 43 ft·lbf)



(b) Connect the following hoses to the EGR valve:
(1) Vacuum hose (from port E of VSV)
(2) EGR hose (from vacuum modulator)

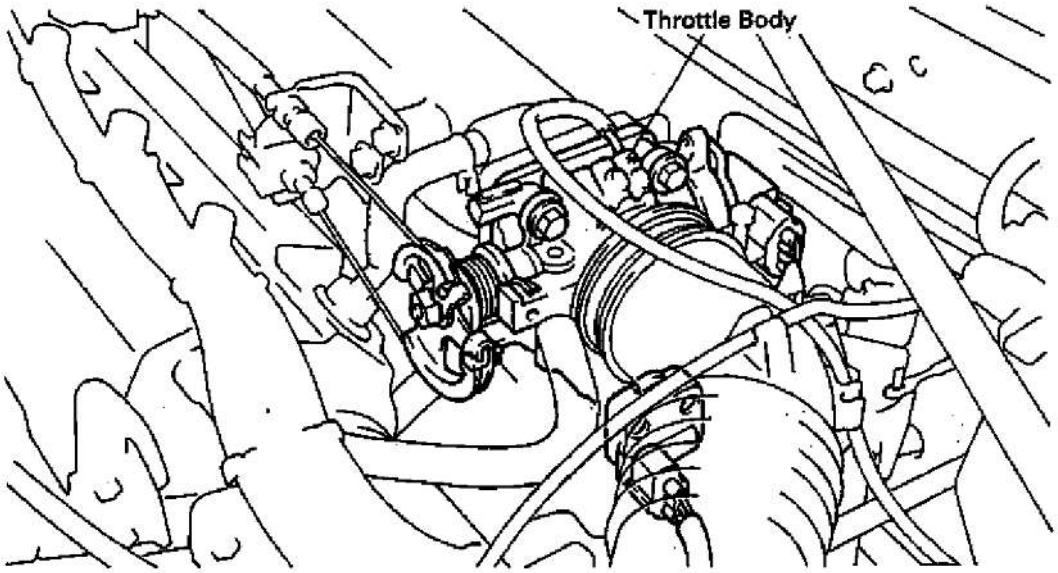


7. **INSTALL NO.2 INTAKE MANIFOLD STAY AND LH ENGINE HANGER**
Install the No.2 intake manifold stay and LH engine hanger with the bolt and nut.
Torque: 42 N·m (425 kgf·cm, 31 ft·lbf)

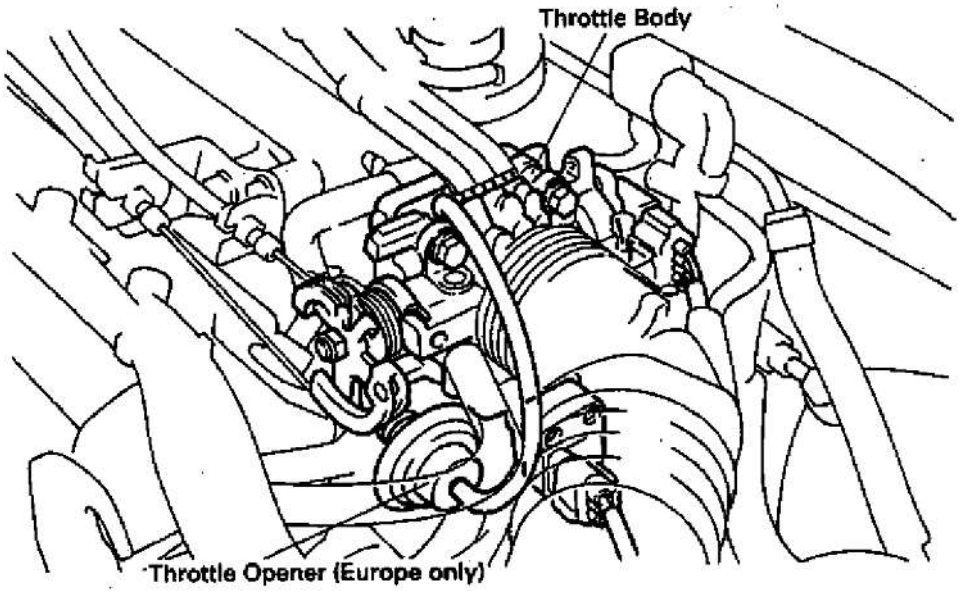
8. **INSTALL THROTTLE BODY**
(See page EG–255)

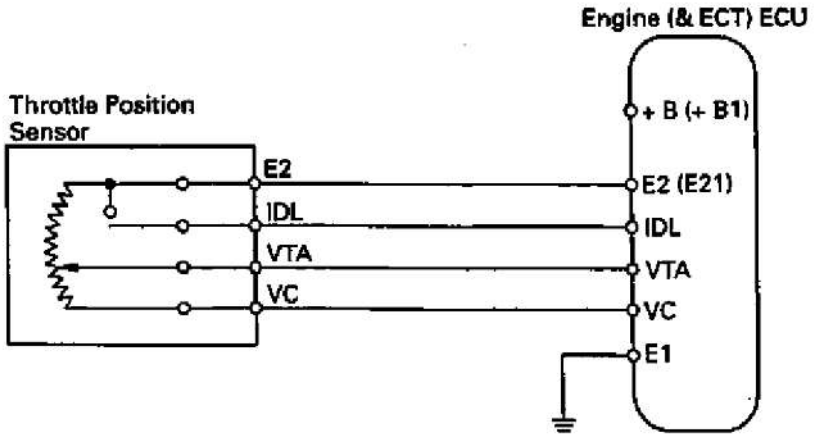
THROTTLE BODY

ST202



ST191

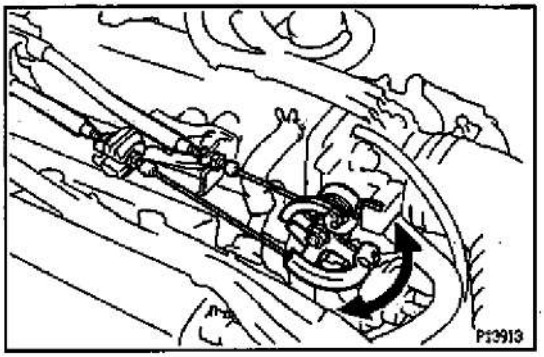




P17024
P13882
P17113

Z11820

EG

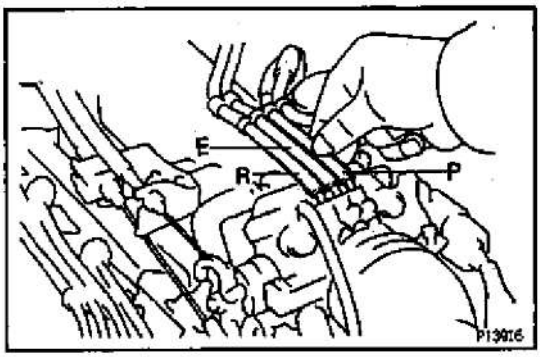


ON—VEHICLE INPSECTION

Throttle Body

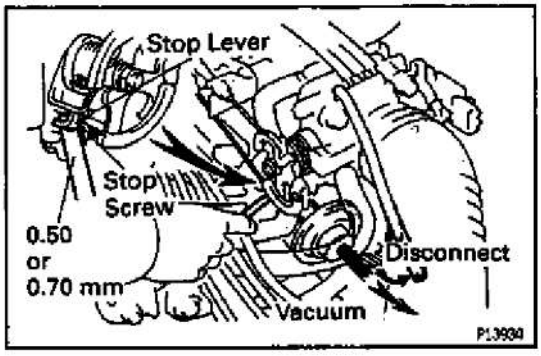
INSPECT THROTTLE BODY

(a) Check that the throttle linkage moves smoothly.



(b) Check the vacuum at each port.
- Start the engine.
- Check the vacuum with the vacuum hoses pick your finger.

Port name	At idle	Other than idle
P	No vacuum	Vacuum
E	No vacuum	Vacuum
R	No vacuum	No vacuum



Throttle Position Sensor

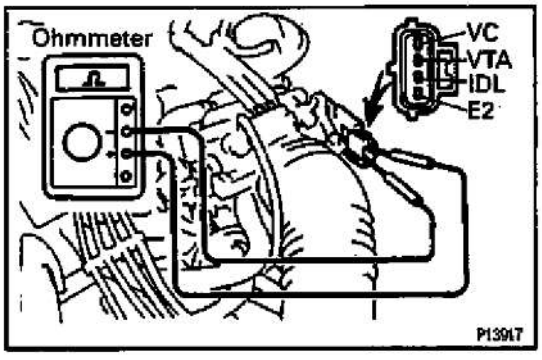
INSPECT THROTTLE POSITION SENSOR

(a) Disconnect the sensor connector.

(b) w/ Throttle Opener:
- Disconnect the vacuum hose from the throttle opener.
- Apply vacuum to the throttle opener.

(c) Insert a feeler gauge between the throttle stop screw and stop lever.

(d) 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
0.70 mm (0.028 in.)	IDL — E2	Infinity
Throttle valve fully open	VTA — E2	2.0 — 10.2 kΩ
—	VC — E2	2.5 — 5.9 kΩ

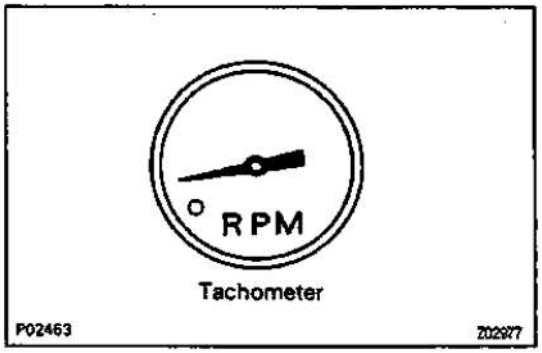
(e) w/ Throttle Opener:
Reconnect the vacuum hose to the throttle opener.

(f) Reconnect the sensor connector.

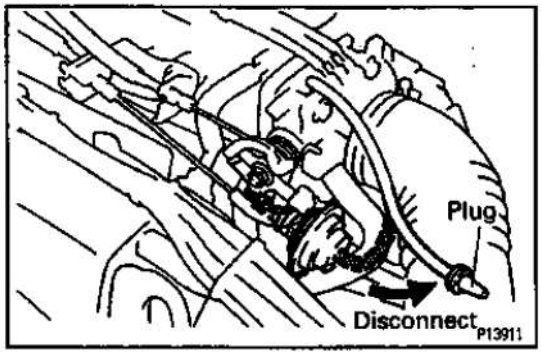
Throttle Opener

1. **WARM UP ENGINE**
   Allow the engine to warm up to normal operating temperature.
2. **CONNECT TACHOMETER**
   (See step 2 on page EG–25)

EG

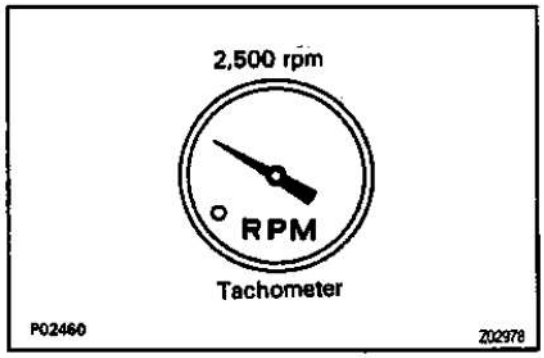


3. **CHECK IDLE SPEED (See page EG–27)**
   Idle speed:
   700 ± 50 rpm

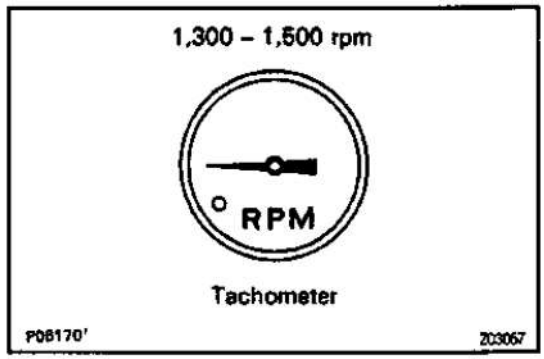


4. **CHECK AND ADJUST THROTTLE OPENER SETTING SPEED**

(a) Disconnect the vacuum hose from the throttle opener, and plug the hose end.

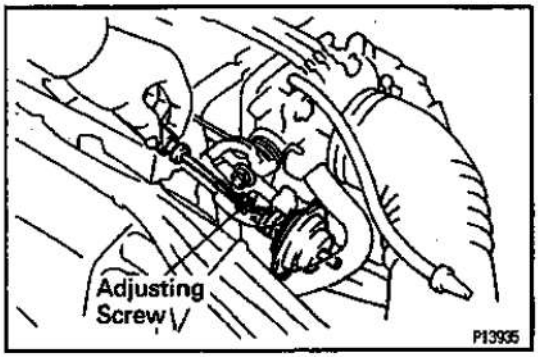


(b) Maintain the engine speed at 2,500 rpm.

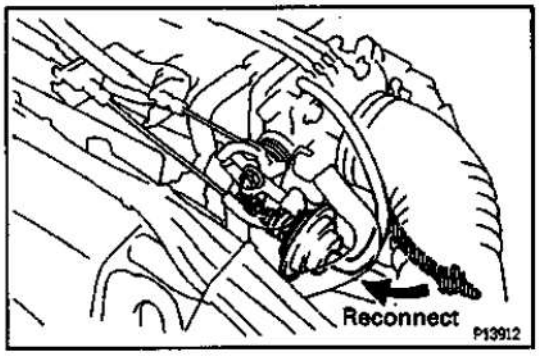


(c) Release the throttle valve.

(d) Check that the throttle opener is set.
Throttle opener setting speed:
1,300 – 1,500 rpm (w/ Cooling fan OFF)
If setting is not as specified, adjust the throttle valve.



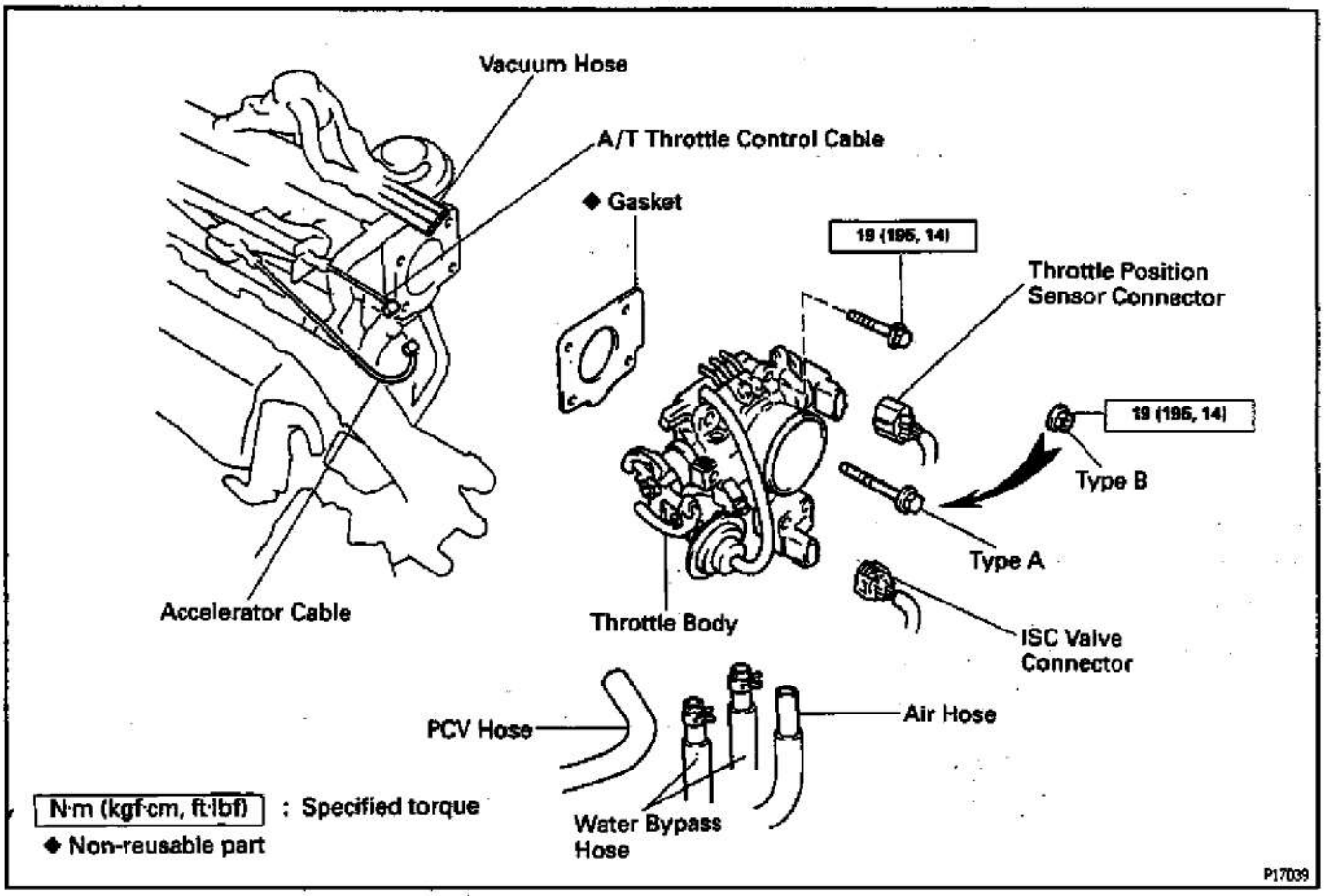
(e) Adjust the throttle opener setting speed by turning the throttle opener adjusting screw.
Throttle opener setting speed:
1,400 rpm (w/ Cooling fan OFF)

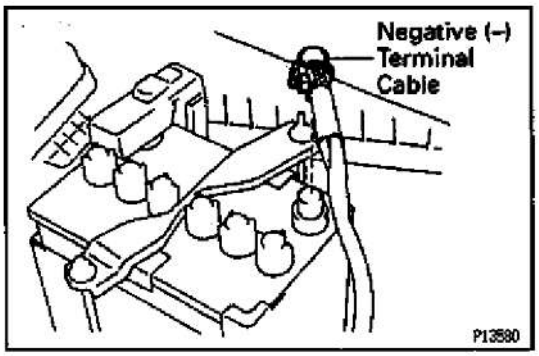


(f) Reconnect the vacuum hose to the throttle opener.

5. DISCONNECT TACHOMETER

COMPONENTS FOR REMOVAL AND INSTALLATION

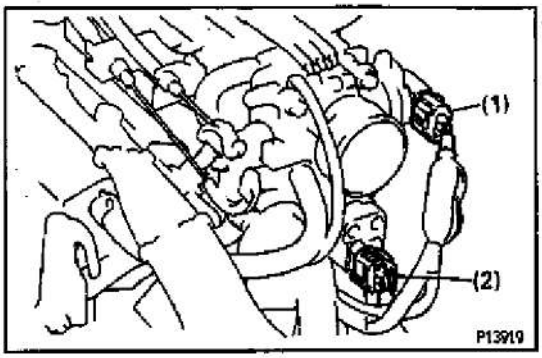




THROTTLE BODY REMOVAL

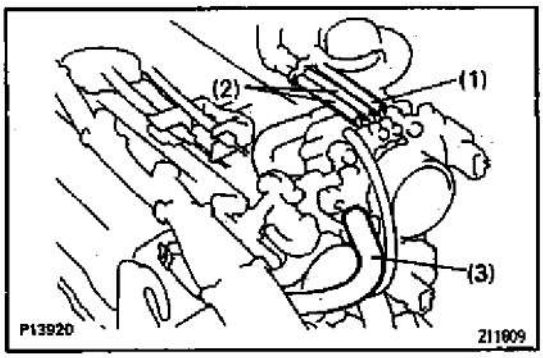
(See Components for Removal and Installation)

1. **DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY**
2. **DRAIN ENGINE COOLANT**
3. **DISCONNECT INTAKE AIR TEMPERATURE SENSOR FROM AIR CLEANER CAP**
4. **REMOVE AIR CLEANER CAP**
5. **DISCONNECT ACCELERTOR CABLE FROM THOTTLE BODY**
6. **A/T:**
   DISCONNECT A/T THOTTLE CABLE FROM THOTTLE BODY

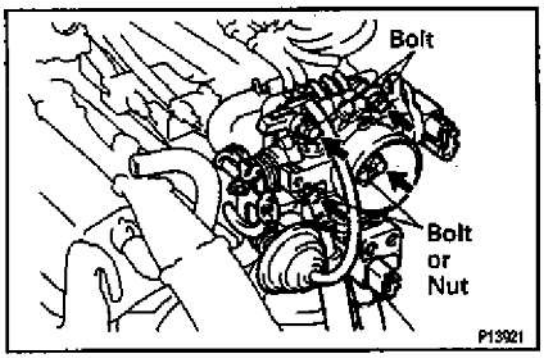


7. DISCONNECT THROTTLE BODY FROM INTAKE MANIFOLD

(a) Disconnect the following connectors:
- (1) Throttle position sensor connector
- (2) ISC valve connector



(b) Disconnect the following hoses:
- (1) w/ EVAP:
  Vacuum hose
- (2) w/ EGR:
  Vacuum hoses
- (3) PCV hose

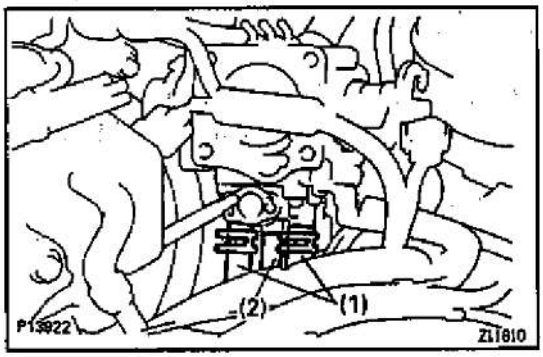


(c) Type A:
Remove the 4 bolts.

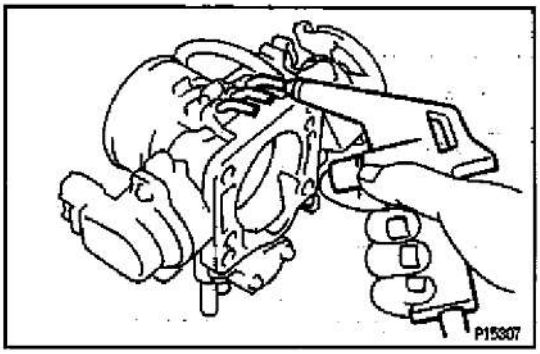
(d) Type B:
Remove the 2 bolts and 2 nuts.

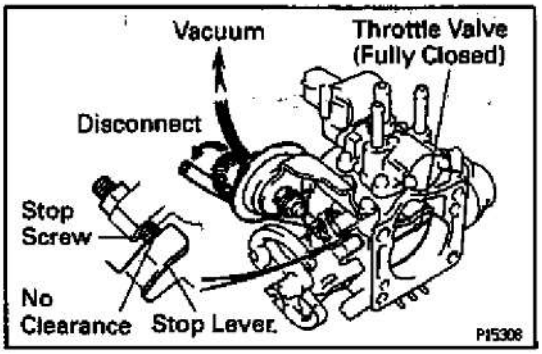
(e) Disconnect the throttle body from the intake manifold.

(f) Remove the gasket.



(g) Disconnect the following hoses from the throttle body, and remove the throttle body:
- (1) Water bypass hoses
- (2) Air hose





THROTTLE BODY INSPECTION

Throttle Body

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 throttle opener.

2. INSPECT THROTTLE VALVE

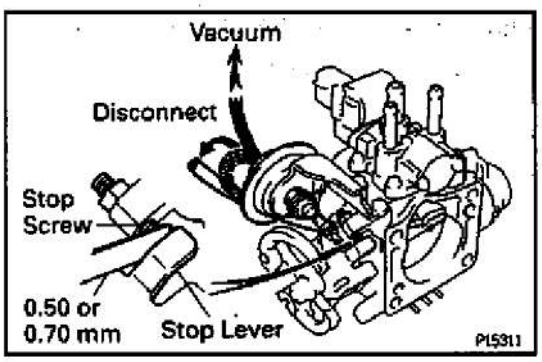
(a) w/ Throttle Opener:

- Disconnect the throttle opener vacuum hose from the throttle body.
- 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.

(c) w/ Throttle Opener:

Reconnect the throttle opener vacuum hose to the throttle body.



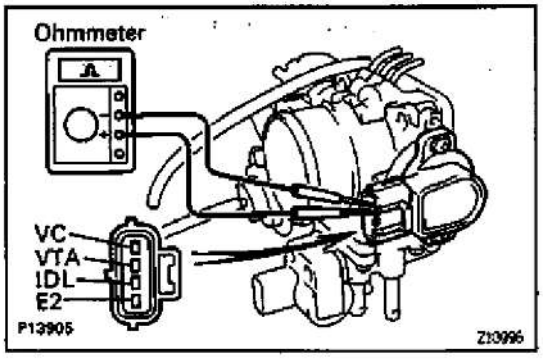
Throttle Position Sensor

1. INSPECT THROTTLE POSITION SENSOR

(a) w/ Throttle Opener:

Apply vacuum to the throttle opener.

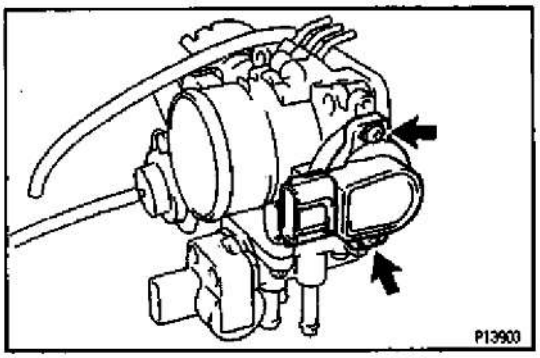
(b) Insert a 0.50 mm (0.020 in.) or 0.70 mm (0.028 in.) feeler gauge between the throttle stop screw and stop lever.



(c) Using an ohmmeter, measure the resistance between each terminal.

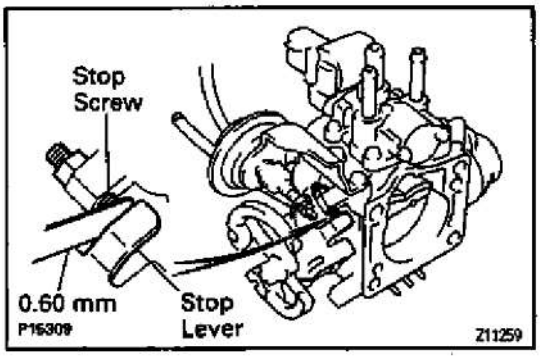
EG

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
0.70 mm (0.028 in.)	IDL – E2	Infinity
Throttle valve fully open	VTA – E2	2.0 – 10.2 kΩ
–	VC – E2	2.5 – 5.9 kΩ

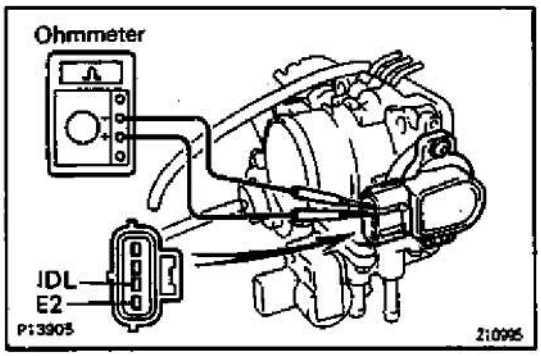


2. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

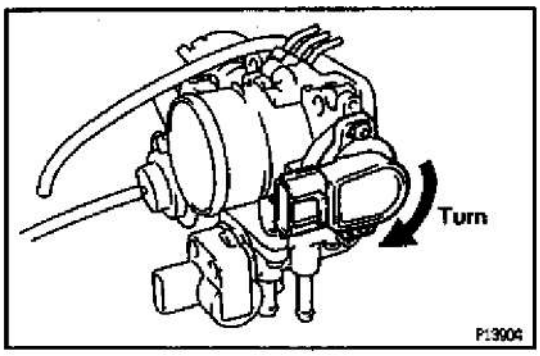
(a) Loosen the 2 set screws of the sensor.



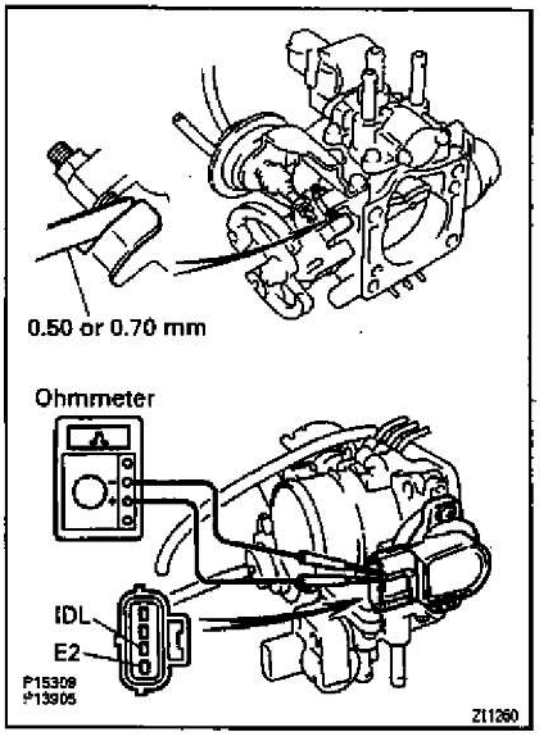
(b) Insert a 0.60 mm (0.024 in.) feeler gauge between the throttle stop screw and stop lever.



(c) Connect the tester probe of an ohmmeter to the terminals IDL and E2 of the sensor.



(d) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the 2 set screws.

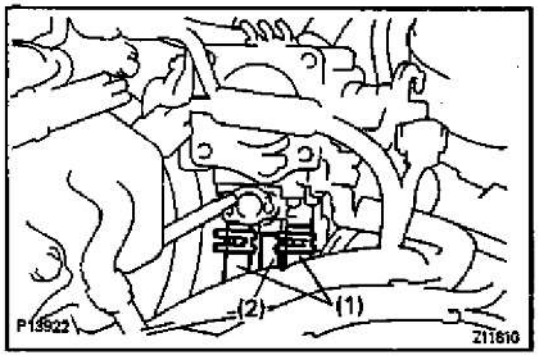


(e) Recheck the continuity between terminals IDL and E2.

Clearance between lever and stop screw	Continuity (IDL – E2)
0.50 mm (0.020 in.)	Continuity
0.70 mm (0.028 in.)	No continuity

(f) w/ Throttle Opener:
Reconnect the throttle opener vacuum hose to the throttle body.

EG

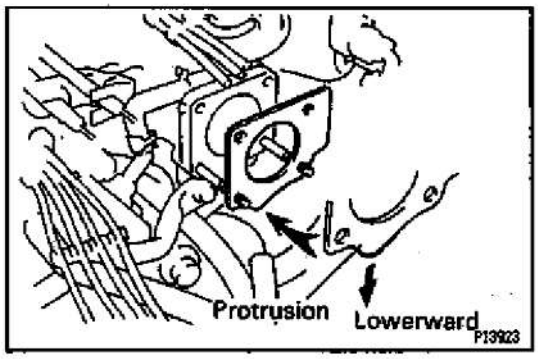


THROTTLE BODY INSTALLATION

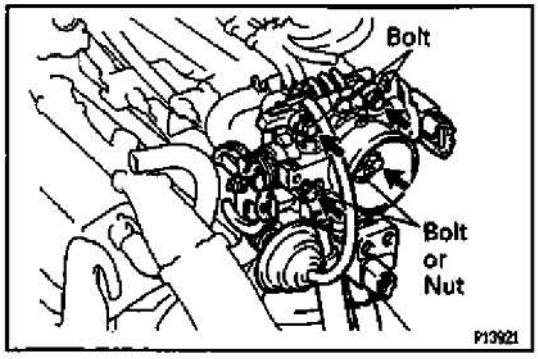
(See Components for Removal and Installation)

1. INSTALL THROTTLE BODY

(a) Connect the following hoses to the throttle body:
(1) Water bypass hoses
(2) Air hose



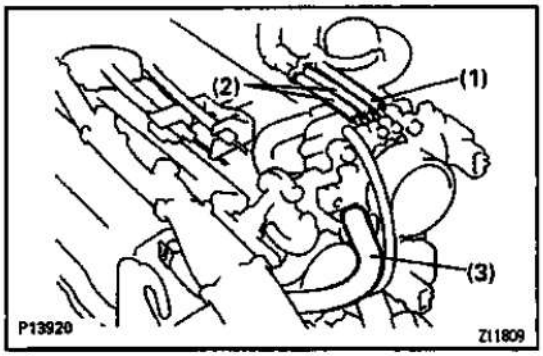
(b) Place a new gasket on the intake manifold, facing the protrusion lowerward.



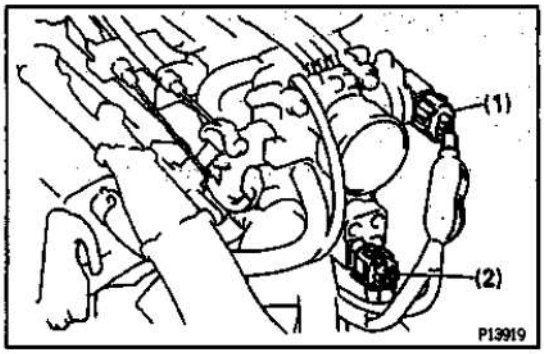
(c) Type A:
Install the throttle body with the 4 bolts.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)
HINT: Different bolt lengths are used for the upper and lower sides.

Bolt length:
Upper side: 40 mm (1.59 in.)
Lower side: 55 mm (2.17 in.)

(d) Type B:
Install the throttle body with the 2 bolts and 2 nuts.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)



(e) Connect the following hoses:
(1) w/ EVAP:
Vacumm hose
(2) w/ EGR:
Vacumm hoses
(3) PCV hose

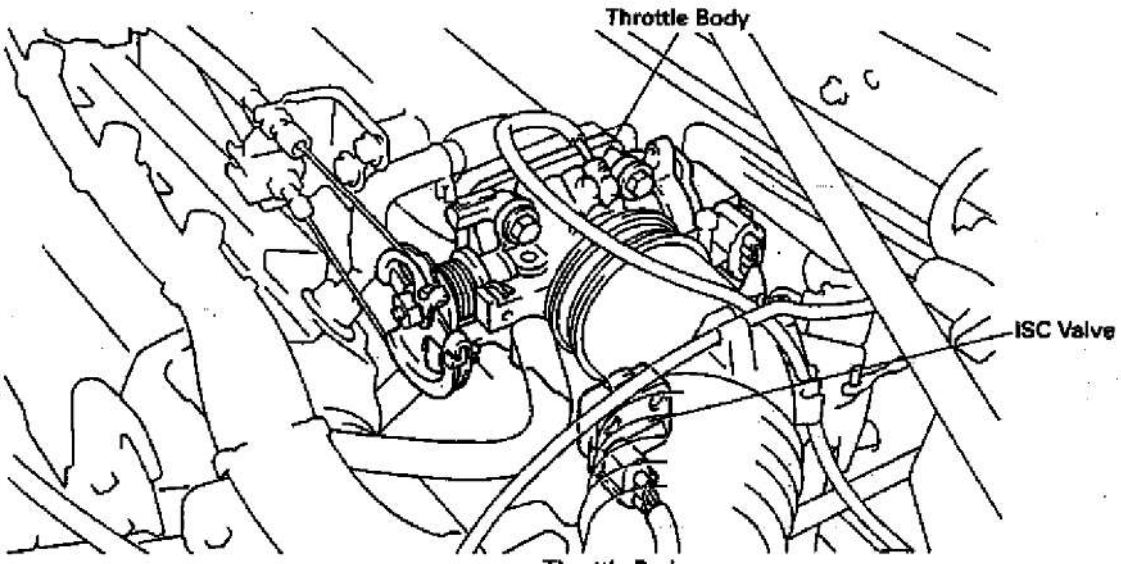


(f) Connect the following connectors:
(1) Throttle position sensor connector
(2) ISC valve connector

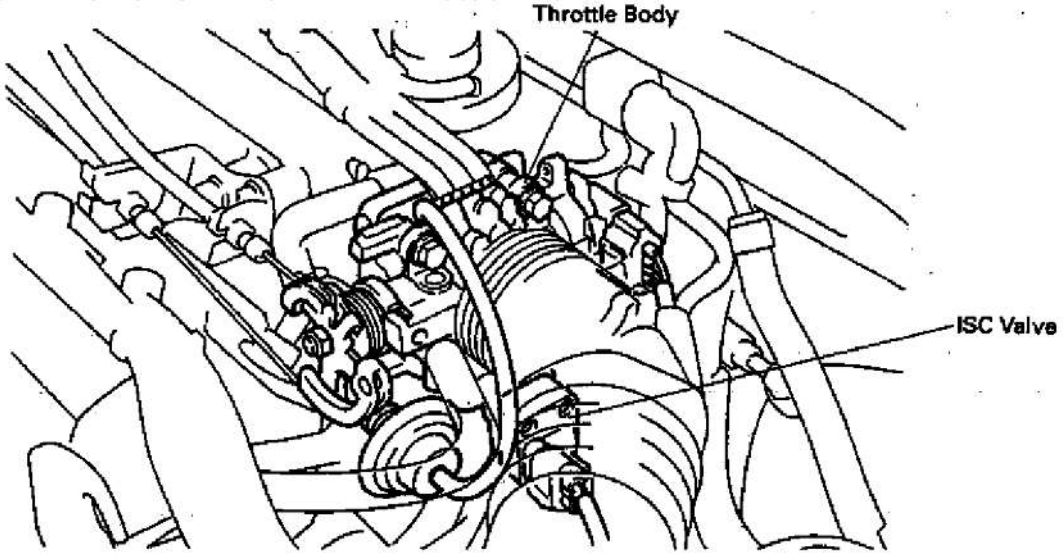
2. **A/T:**
CONNECT A/T THROTTLE CABLE FROM THROTTLE BODY
3. **CONNECT ACCELERTOR CABLE FROM THROTTLE BODY**
4. **INSTALL AIR CLEANER CAP**
5. **CONNECT INTAKE AIR TEMPERATURE SENSOR TO AIR CLEANER CAP**
6. **FILL WITH ENGINE COOLANT**
7. **CONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY**

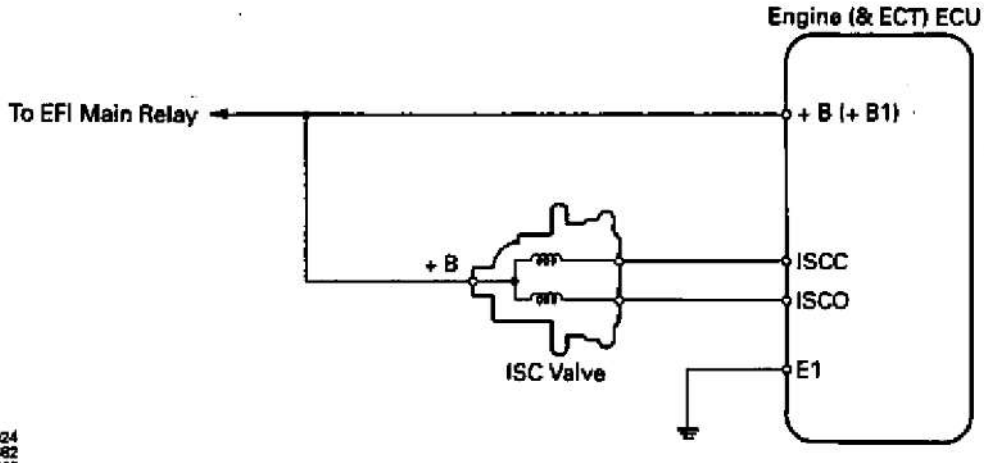
ISC VALVE

ST202



ST191





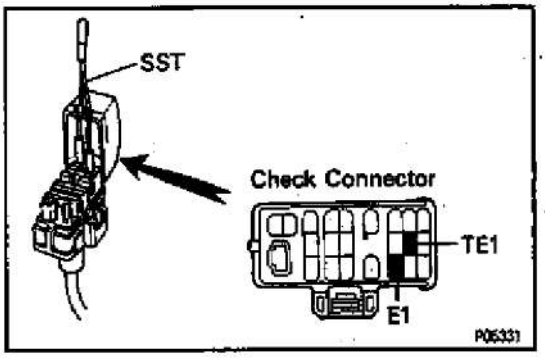
P17024
P13982
P14449

Z11837

ON–VEHICLE INSPECTION

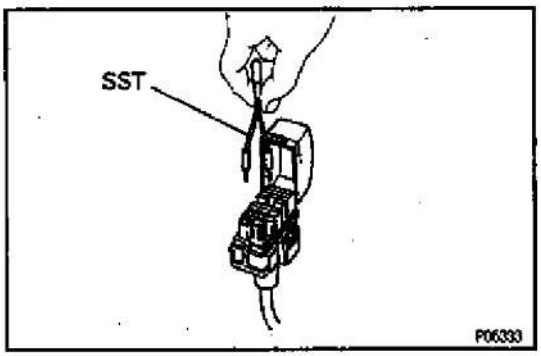
1. INSPECT ISC VALVE OPERATION

(a) Initial conditions:
- Engine at normal operating temperature
- Idle speed set correctly
- Transmission in neutral position

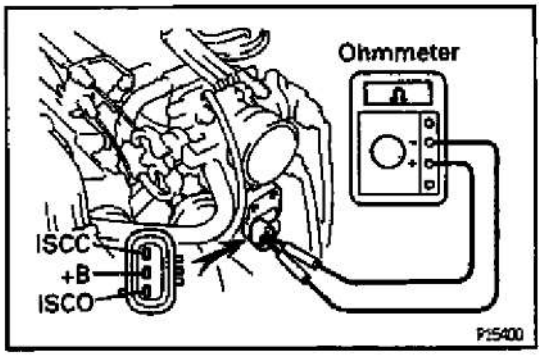


(b) Using SST, connect terminals TE1 and E1 of the check connector.
SST 09843–18020

(c) After engine rpm is kept at 900 – 1,300 rpm for 5 seconds, check that it returns to idle speed.
If the rpm operation is not as specified, check the ISC valve, wiring and ECU.



(d) Remove the SST form the check connector.
SST 09843–18020



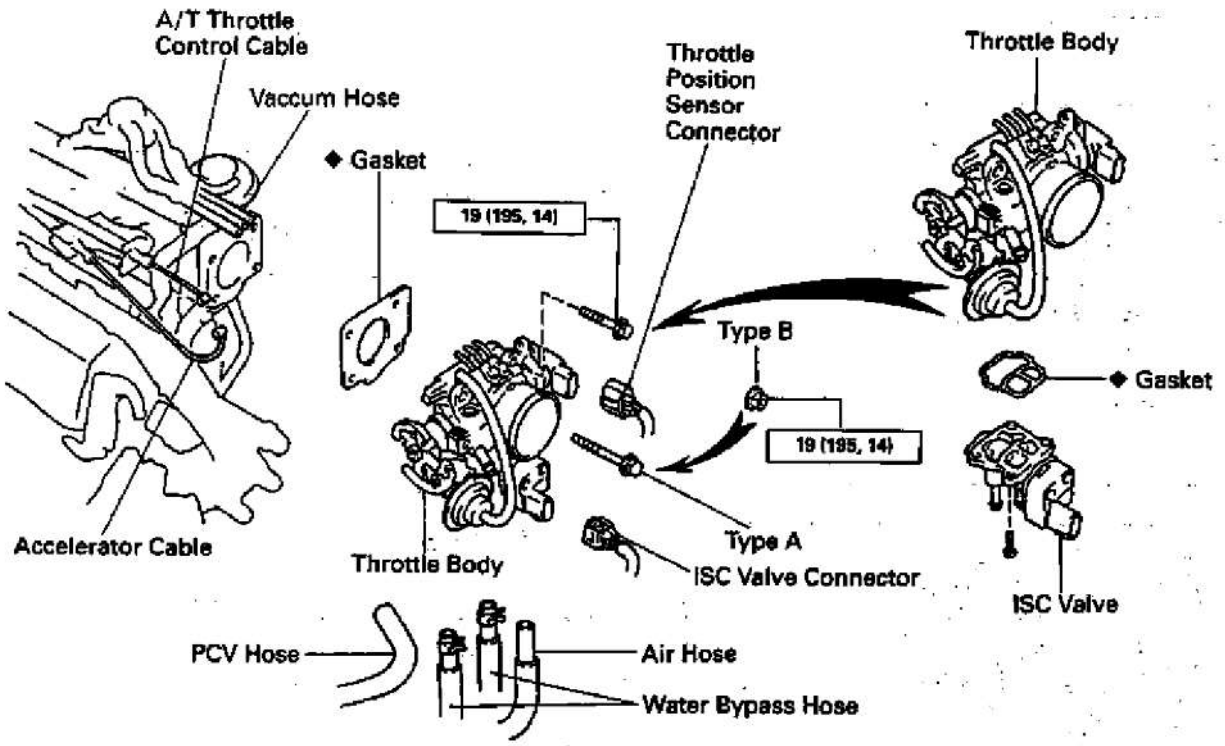
2. INSPECT ISC VALVE RESISTANCE

(a) Disconnect the ISC valve connector.

(b) Using an ohmmeter, measure the resistance between terminal +B and other terminals (ISCC, ISCO).
Resistance:
19.3 – 22.3 Ω at 20°C (68°F)
If resistance is not as specified, replace the ISC valve.

(c) Reconnect the ISC valve connector.

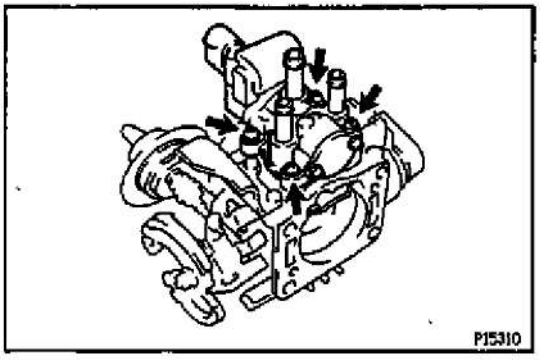
COMPONENTS FOR REMOVAL AND INSTALLATION



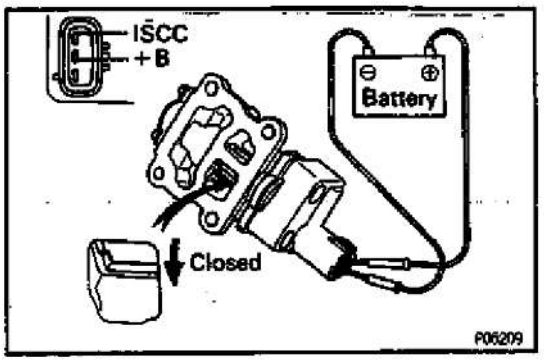
ISC VALVE REMOVAL

(See Components for Removal and Installation)

1. **REMOVE THROTTLE BODY**
   (See page EG–251)



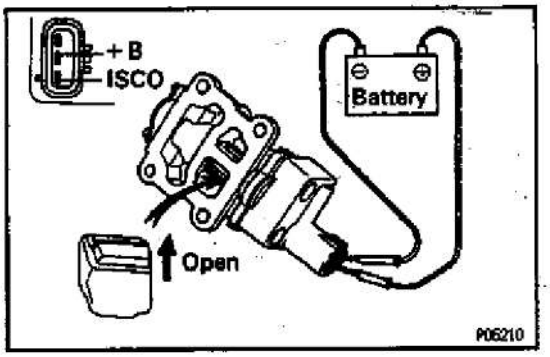
2. **REMOVE ISC VALVE**
   Remove the 4 screws, ISC valve and gasket.



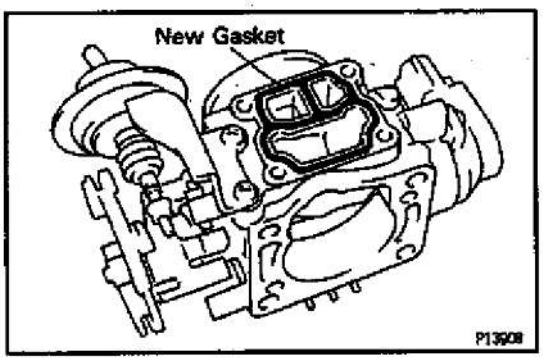
ISC VALVE INSPECTION

INSPECT ISC VALVE OPERATION

(a) Connect the positive (+) lead from the battery to terminal +B and negative (–) lead to terminal ISCC, and check that the valve is closed.



(b) Connect the positive (+) lead from the battery to terminal +B and negative (–) lead to terminal ISCO, and check that the valve is open.
If operation is not as specified, replace the ISC valve.

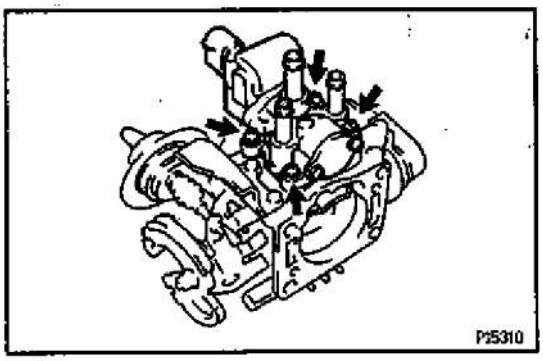


ISC VALVE INSTALLATION

(See Components for Removal and Installation)

1. INSTALL ISC VALVE

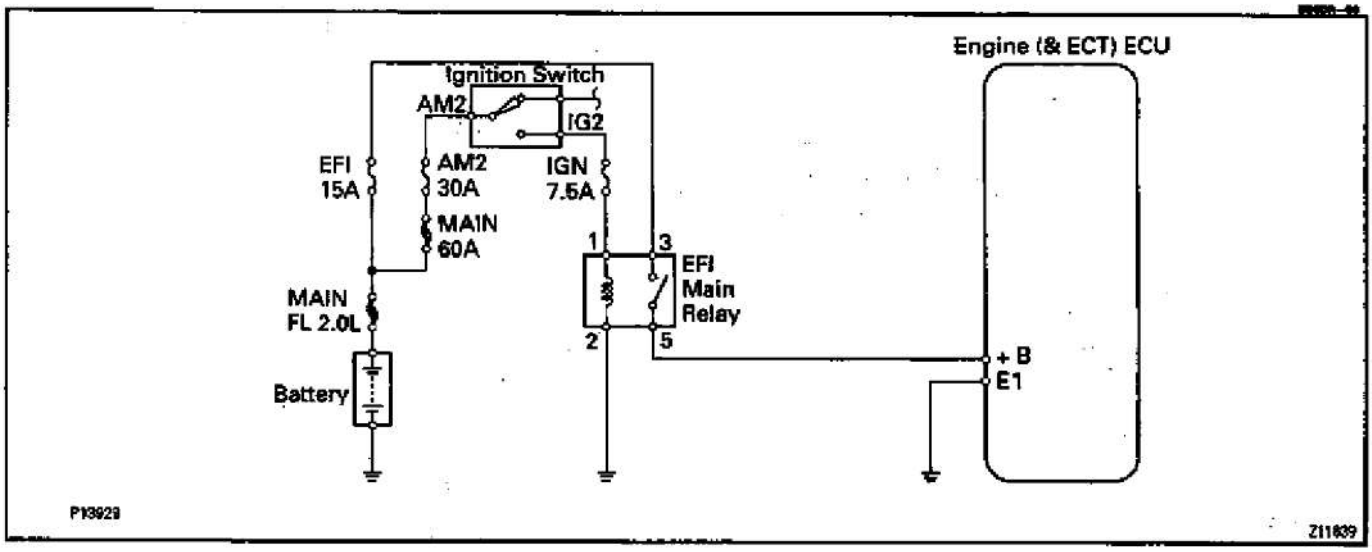
(a) Place a new gasket on the throttle body.

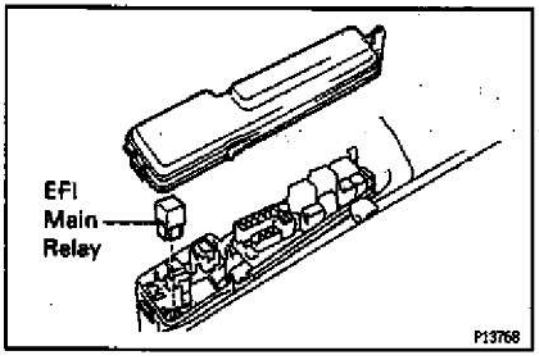


(b) Install the ISC valve with the 4 screws.

2. INSTALL THROTTLE BODY
(See page EG–255)

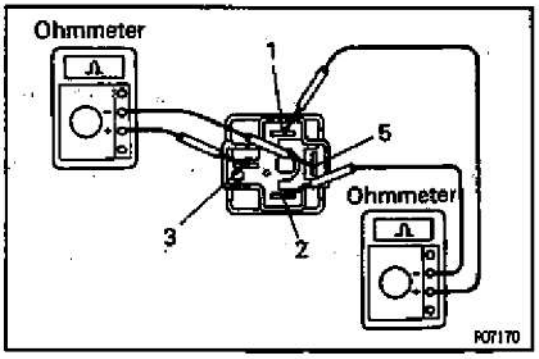
EFI MAIN RELAY (ST202)





EFI MAIN RELAY INSPECTION

1. **REMOVE EFI MAIN RELAY**
   LOCATION: In the engine compartment relay box.



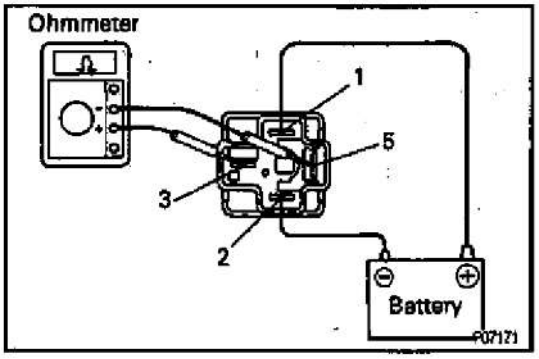
2. **INSPECT EFI MAIN RELAY**

A. Inspect relay continuity

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

(b) Check that there is no continuity between terminals 3 and 5.

If continuity is not as specified, replace the relay.



B. Inspect relay operation

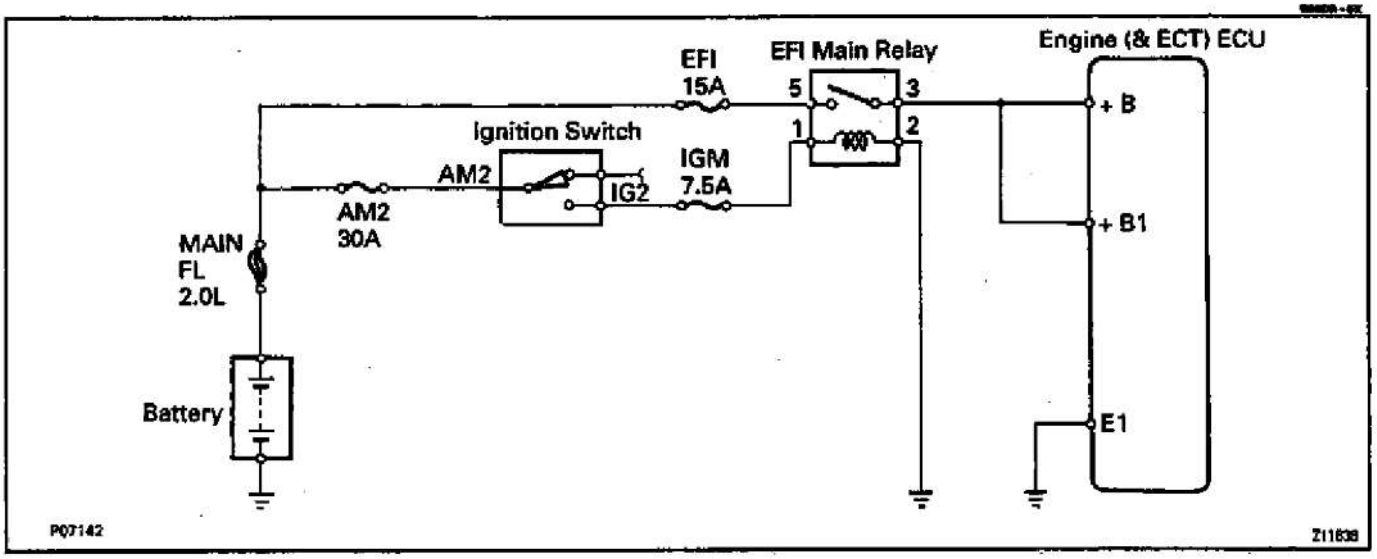
(a) Apply battery voltage across terminals 1 and 2.

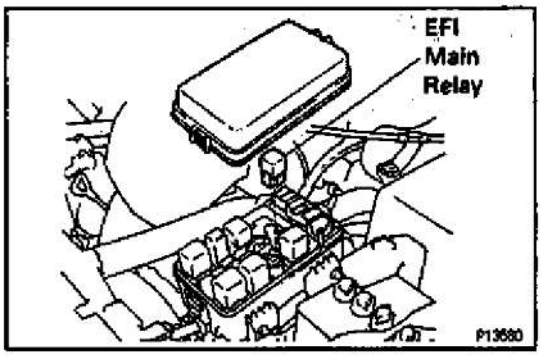
(b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

If operation is not as specified, replace the relay.

3. **REINSTALL EFI MAIN RELAY**

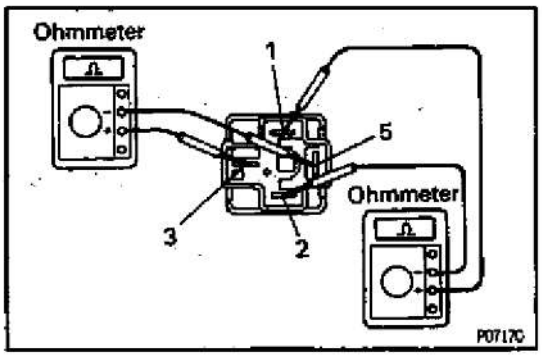
EFI MAIN RELAY (ST191)





EFI MAIN RELAY INSPECTION

1. **REMOVE EFI MAIN RELAY**
   LOCATION: In the engine compartment relay box.



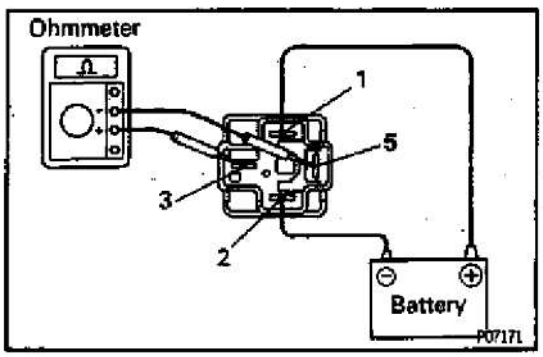
2. **INSPECT EFI MAIN RELAY**

A. Inspect relay continuity

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

(b) Check that there is no continuity between terminals 3 and 5.

If continuity is not as specified, replace the relay.



B. Inspect relay operation

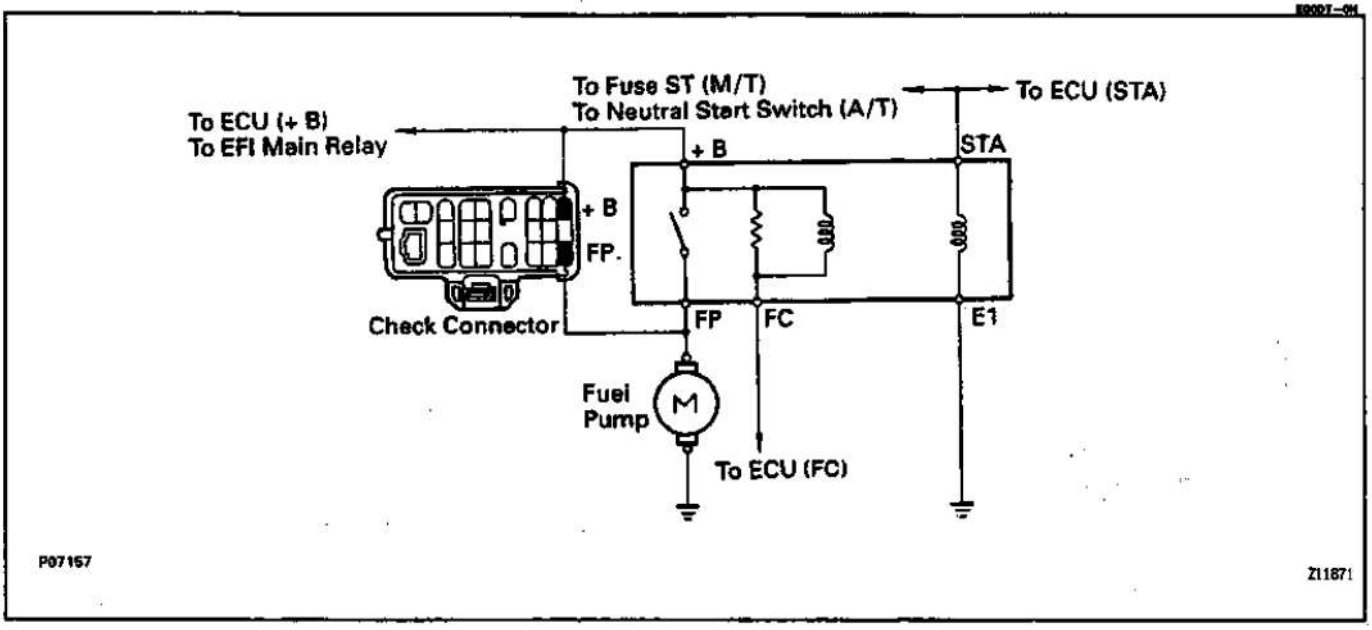
(a) Apply battery voltage across terminals 1 and 2.

(b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

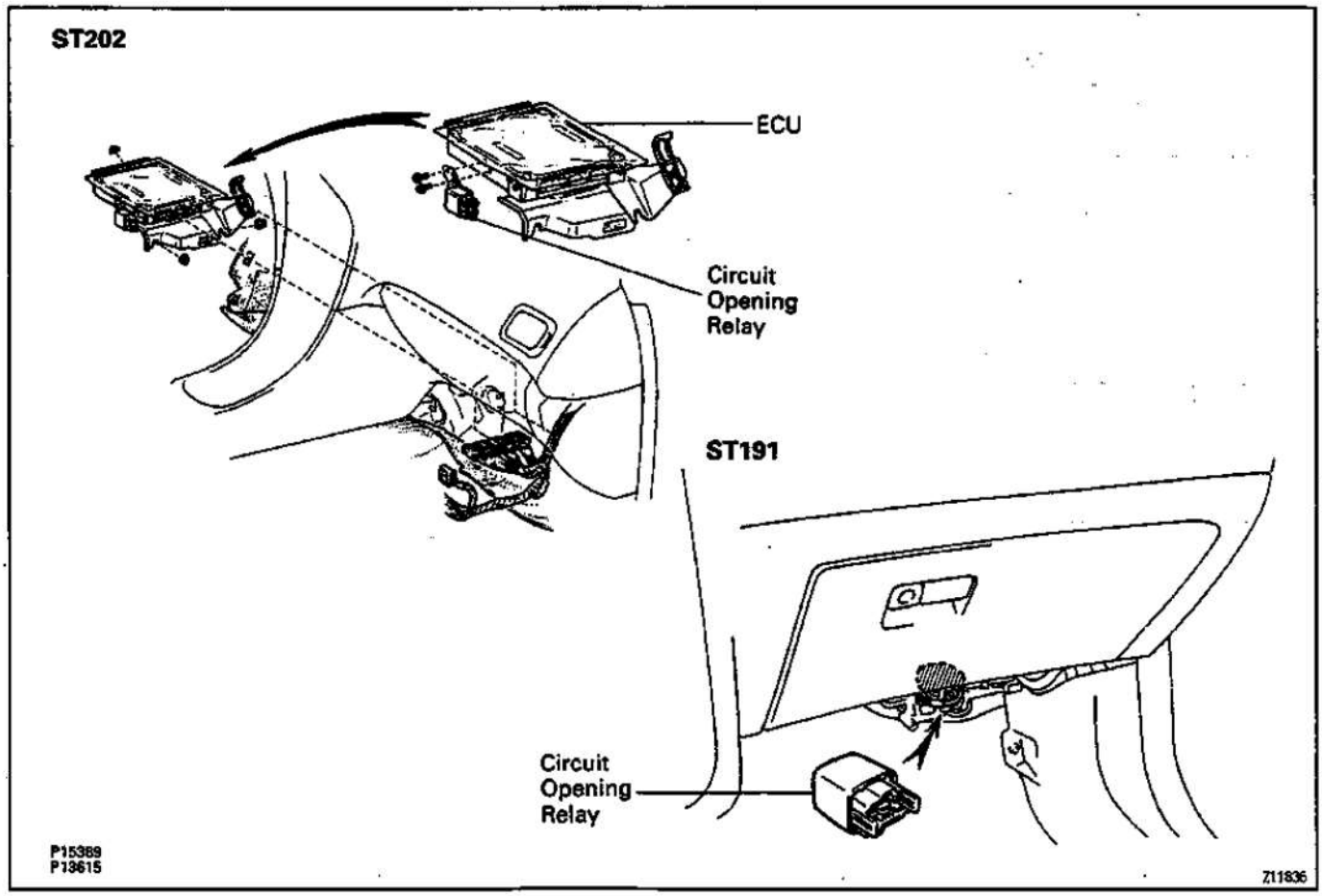
If operation is not as specified, replace the relay.

3. **REINSTALL EFI MAIN RELAY**

CIRCUIT OPENING RELAY



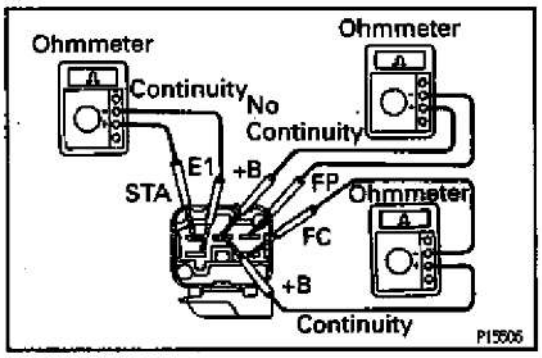
COMPONENTS FOR REMOVAL AND INSTALLATION



CIRCUIT OPENING RELAY INSPECTION

(See Components for Removal and Installation)

1. REMOVE CIRCUIT OPENING RELAY



2. INSPECT CIRCUIT OPENING RELAY

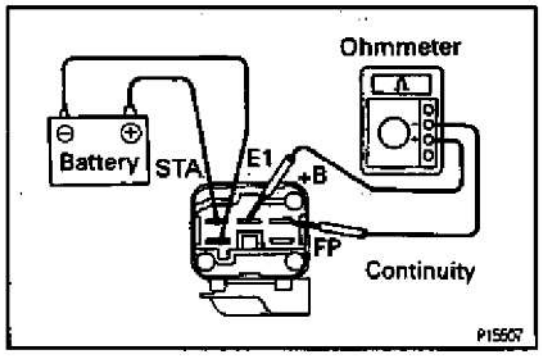
A. Inspect relay continuity

(a) Using and ohmmeter, check that there is continuity between terminals STA and E1.

(b) Check that there is continuity between terminals +B and FC.

(c) Check that there is no continuity between terminals +B and FP.

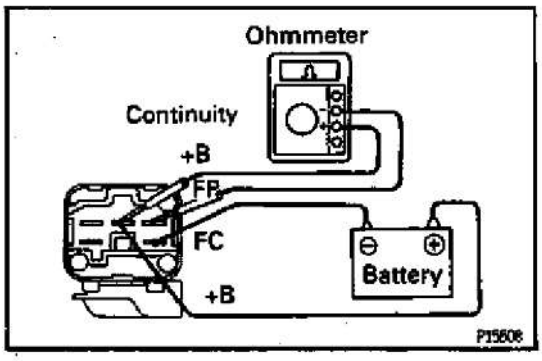
If continuity is not as specified, replace the relay.



B. Inspect 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.



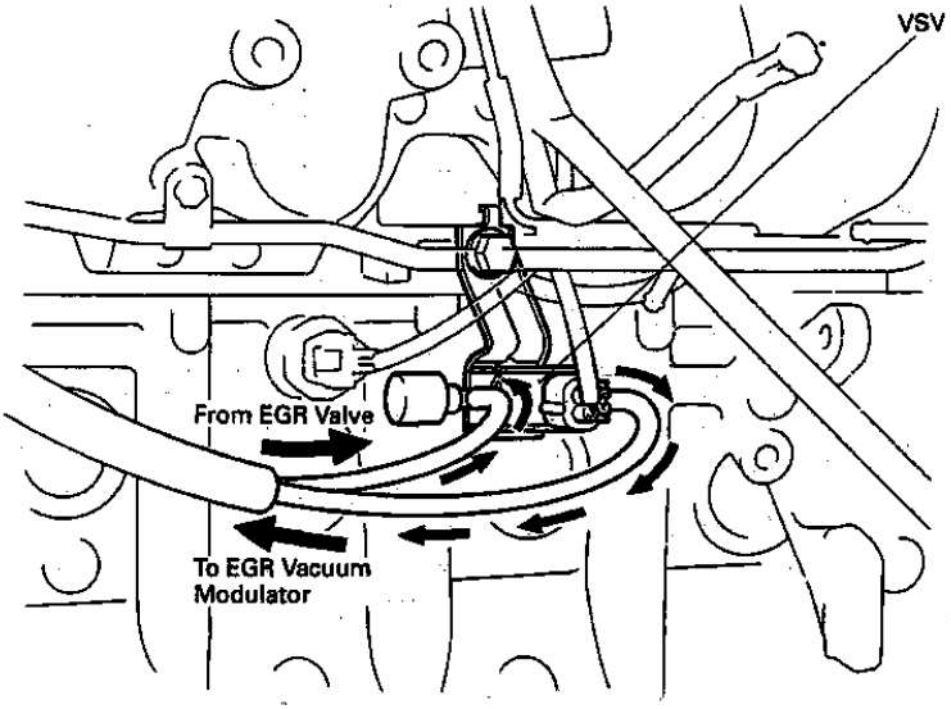
(c) Apply battery voltage across terminals +B and FC.

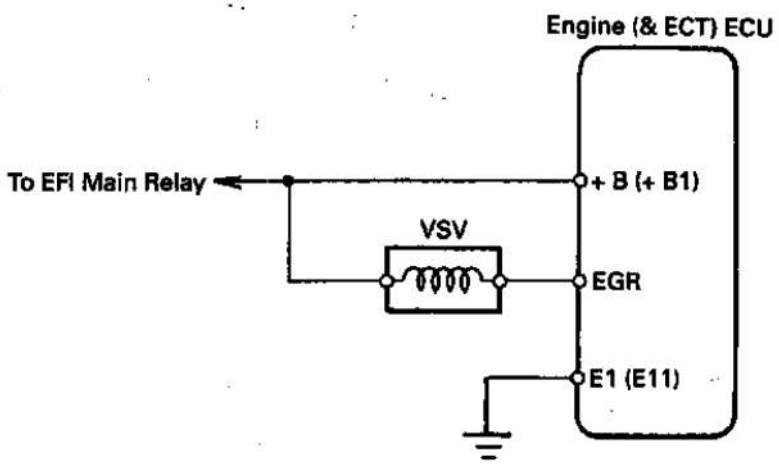
(d) Check that there is continuity between terminals +B and FP.

If operation is not as specified, replace the relay.

3. REINSTALL CIRCUIT OPENING RELAY

VSV FOR EGR

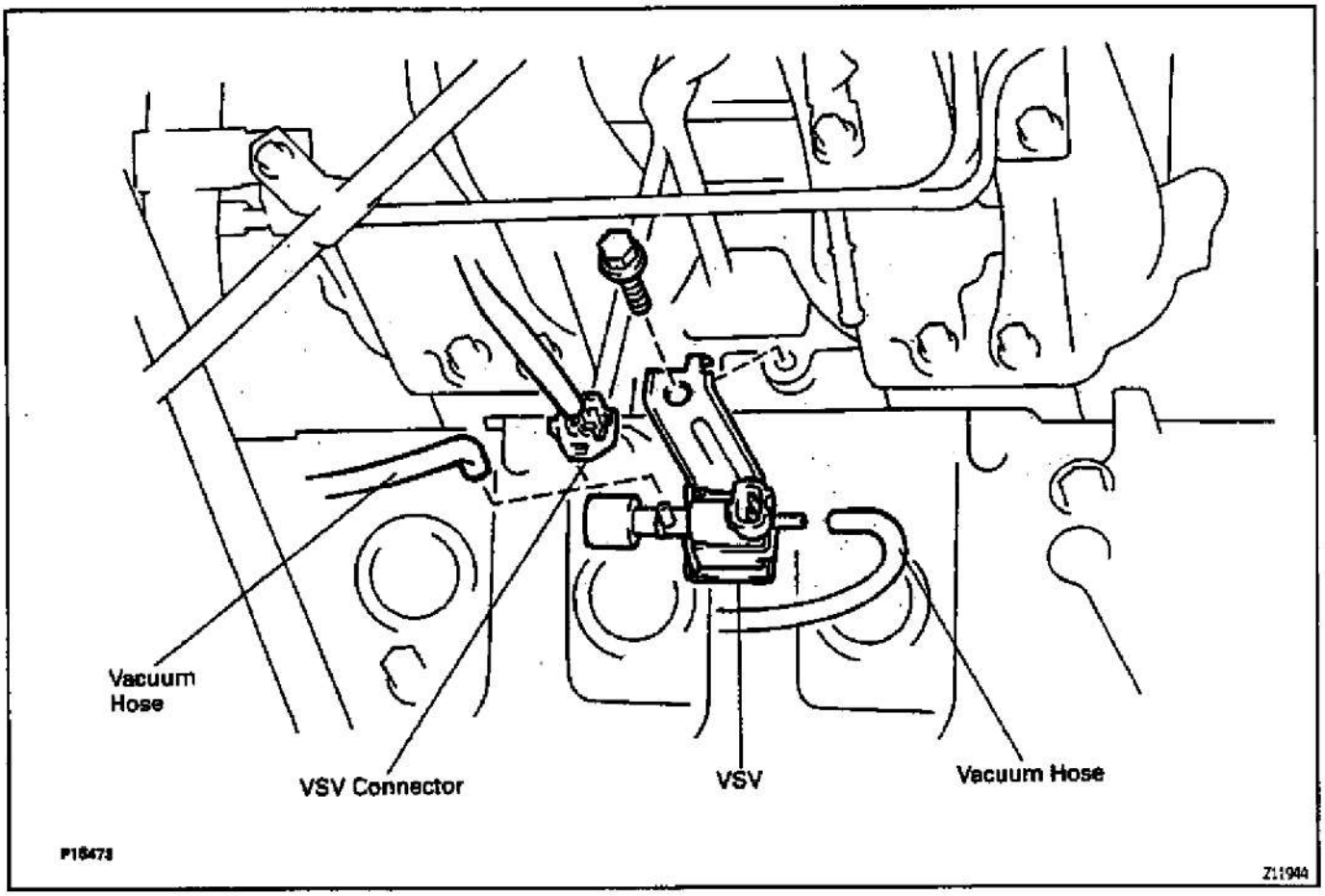




P13883
P01447

Z11843

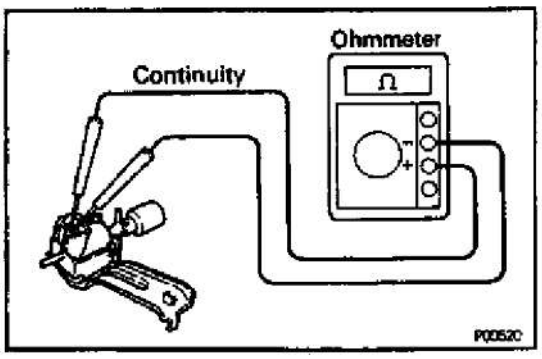
COMPONENTS FOR REMOVAL AND INSTALLATION



VSV INSPECTION

(See Components for Removal and Installation)

1. REMOVE VSV



2. INSPECT VSV

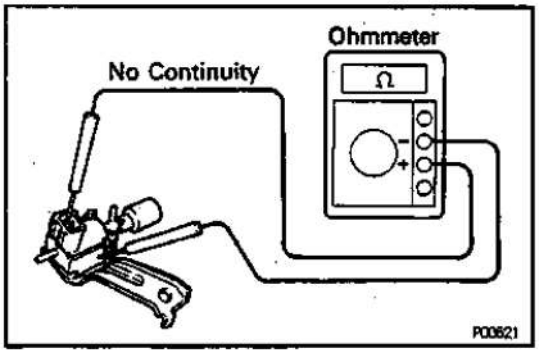
A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance:

33 – 39 Ω at 20°C (68°F)

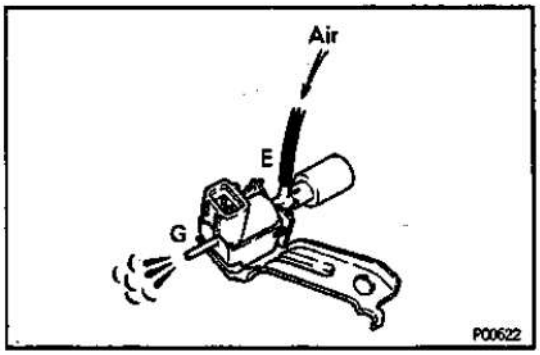
If there is no continuity, replace the VSV.



B. Inspect VSV for ground

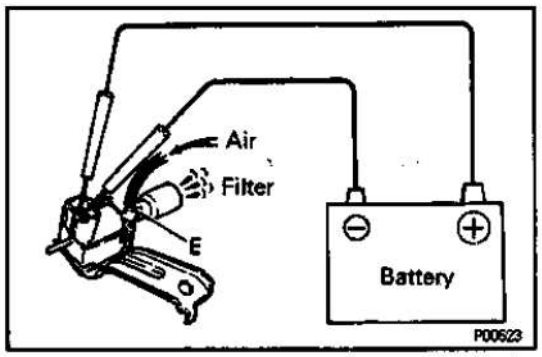
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



C. Inspect VSV operation

(a) Check that air does not flow from ports E to G.



(b) Apply battery voltage across the terminals.

(c) Check that air flows from port E to the filter.

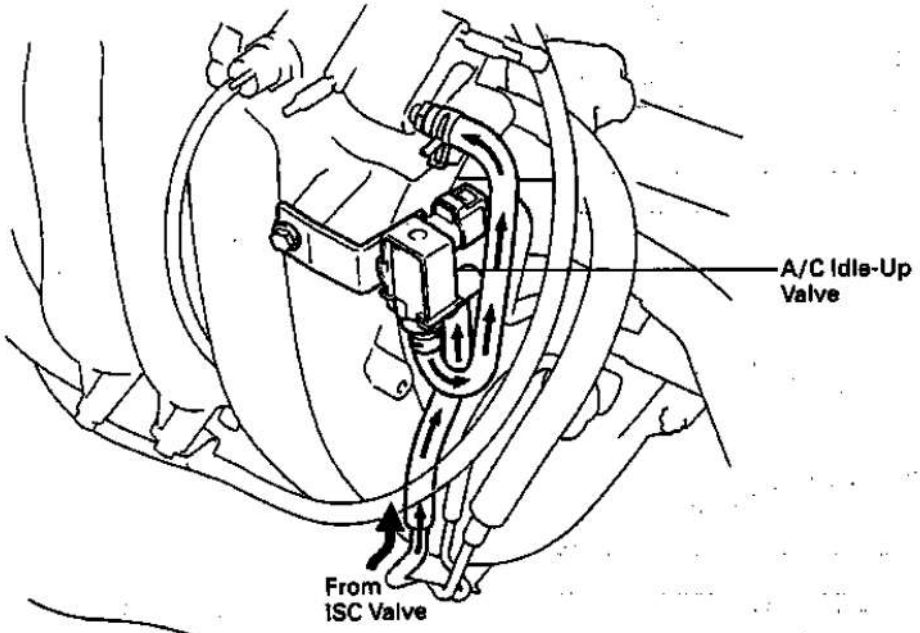
If operation is not as specified, replace the VSV.

3. REINSTALL VSV

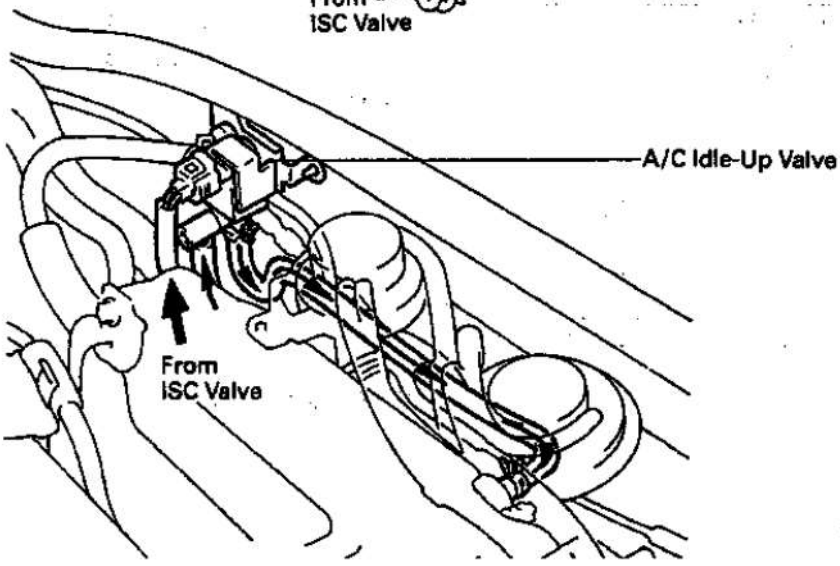
A/C IDLE–UP VALVE

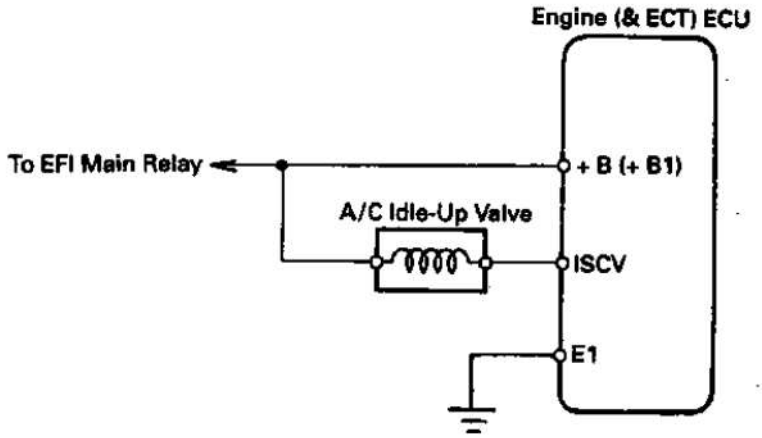
EG

ST202



ST191



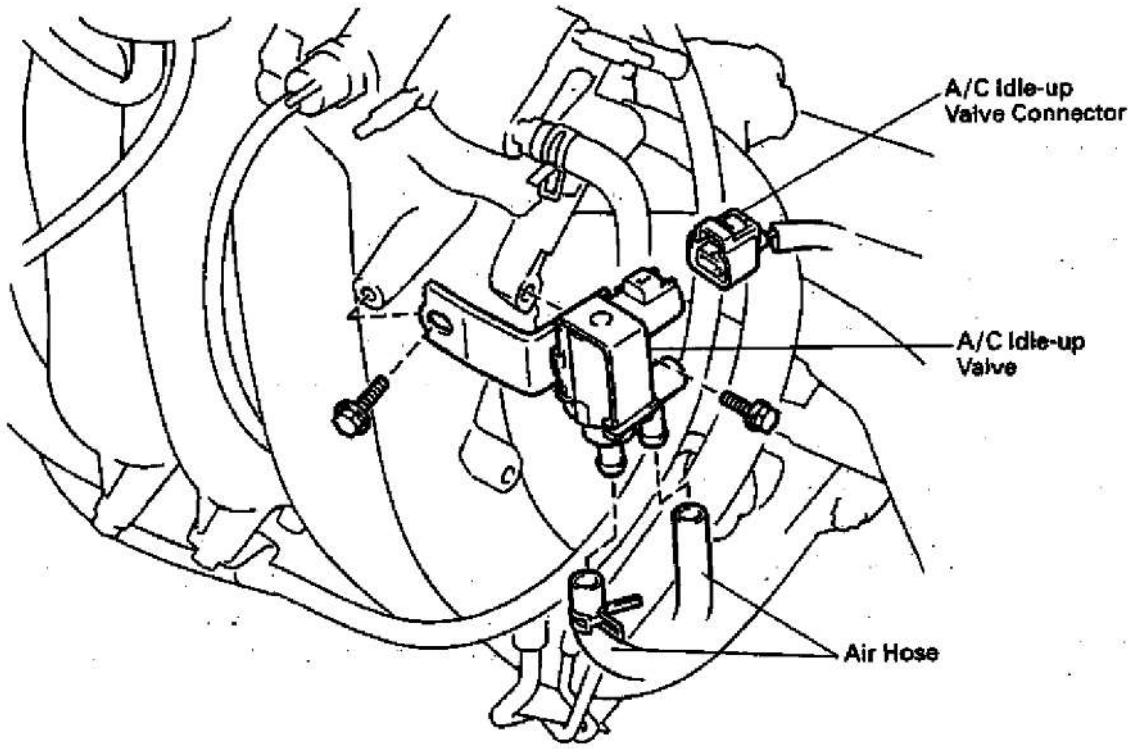


P17134
P17137
P01447

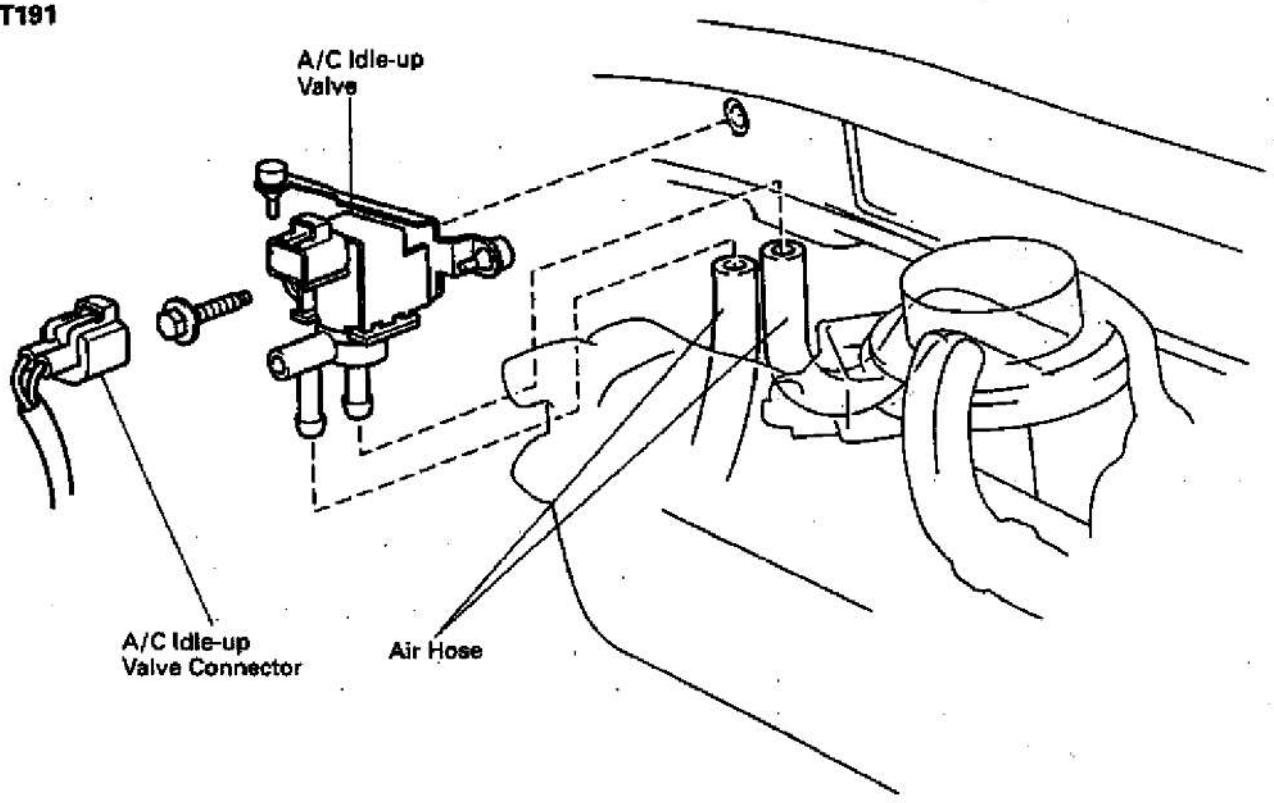
Z11846

COMPONENTS FOR REMOVAL AND INSTALLATION

ST202



ST191



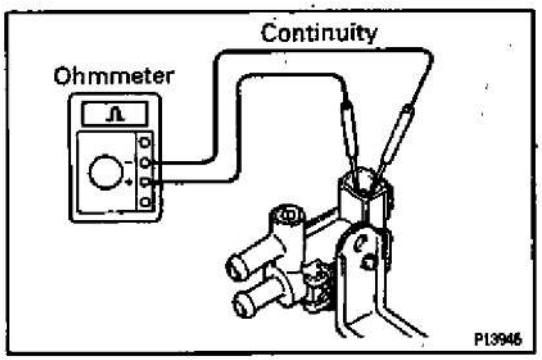
P13851
P17499

212005

A/C IDLE–UP VALVE INSPECTION

(See Components for Removal and Installation)

1. REMOVE A/C IDLE–UP VALVE



2. INSPECT A/C IDLE–UP VALVE

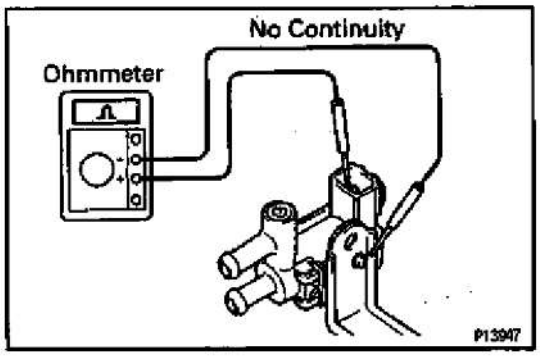
A. Inspect A/C idle–up valve for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance:

30 – 34 Ω at 20°C (68°F)

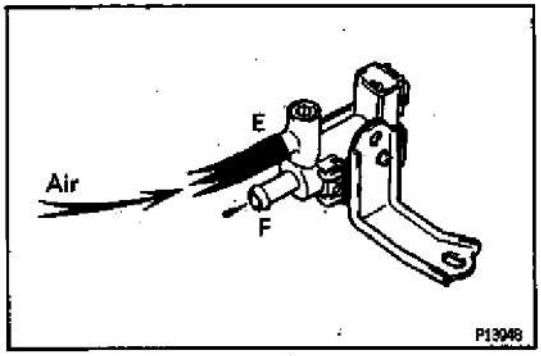
If there is no continuity, replace the A/C idle–up valve.



B. Inspect A/C idle–up valve for ground

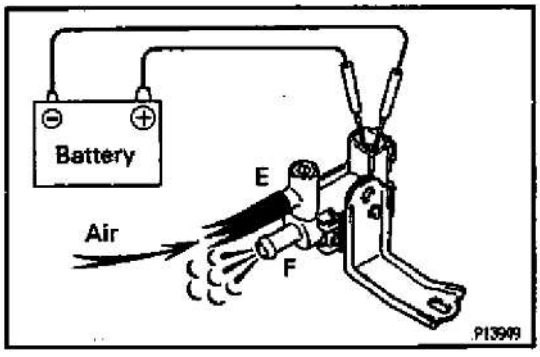
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the A/C idle–up valve.



C. Inspect A/C idle–up valve operation

(a) Check that air does not flow from port E to port F.



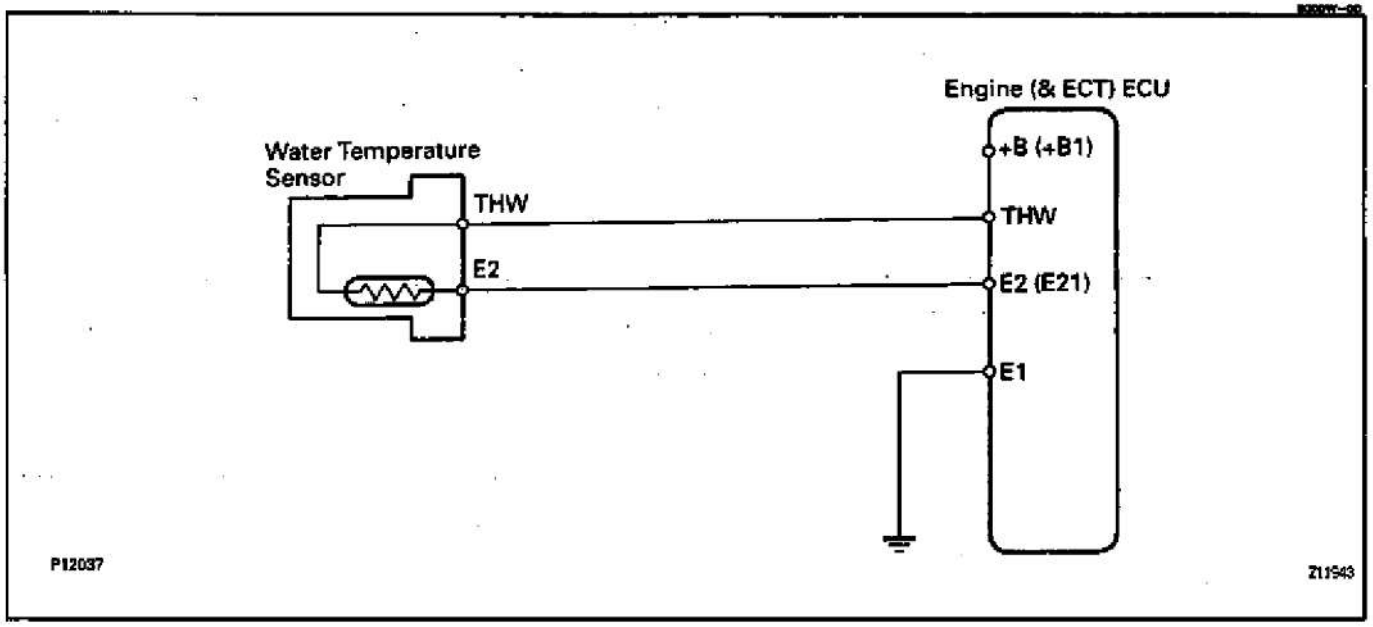
(b) Apply battery voltage across the terminals.

(c) Check that air flows from port E to port F.

If operation is not as specified, replace the A/C idle–up valve.

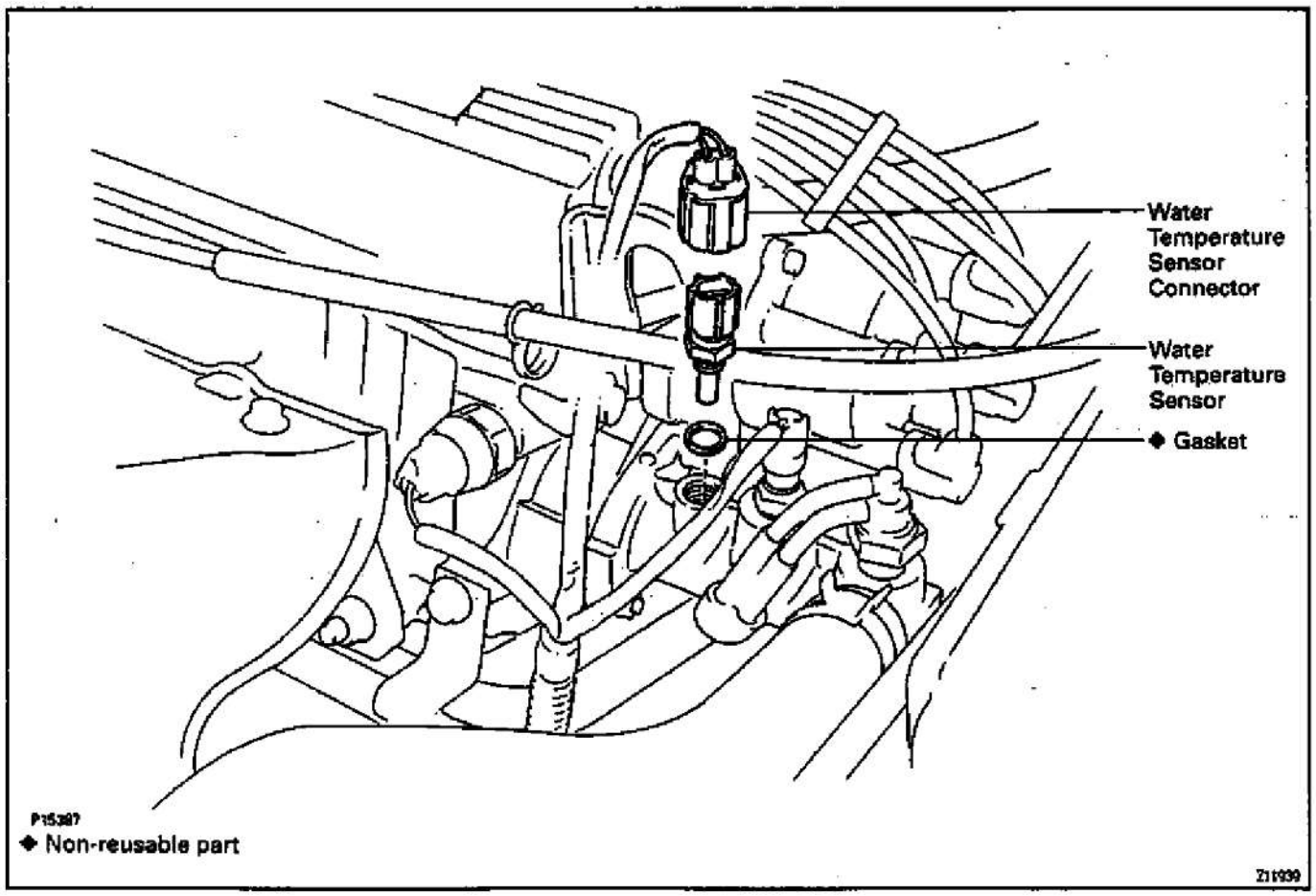
3. REINSTALL A/C IDLE–UP VALVE

WATER TEMPERATURE SENSOR



EG

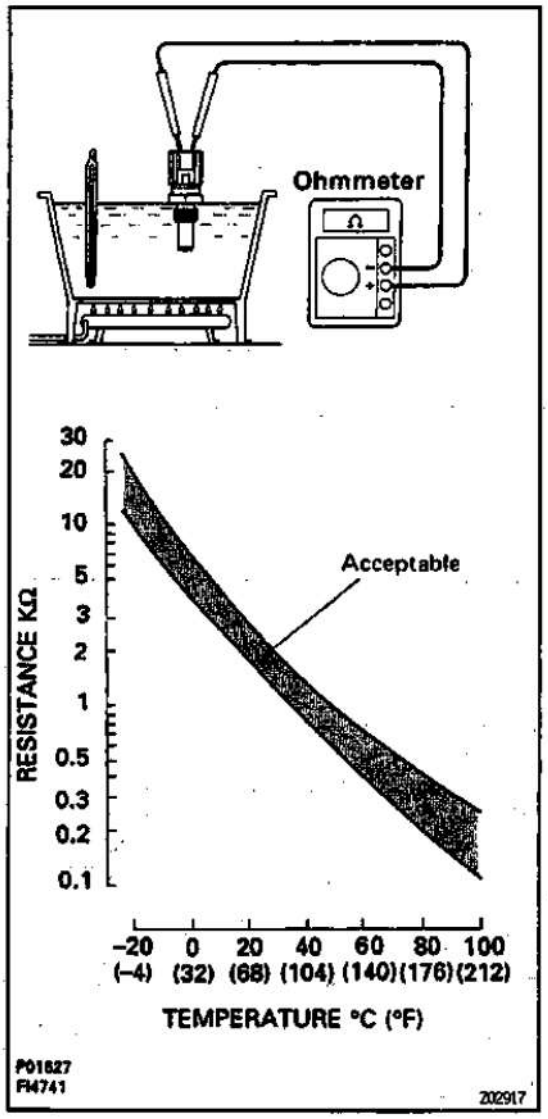
COMPONENTS FOR REMOVAL AND INSTALLATION



WATER TEMPERATURE SENSOR INSPECTION

(See Components for Removal and Installation)

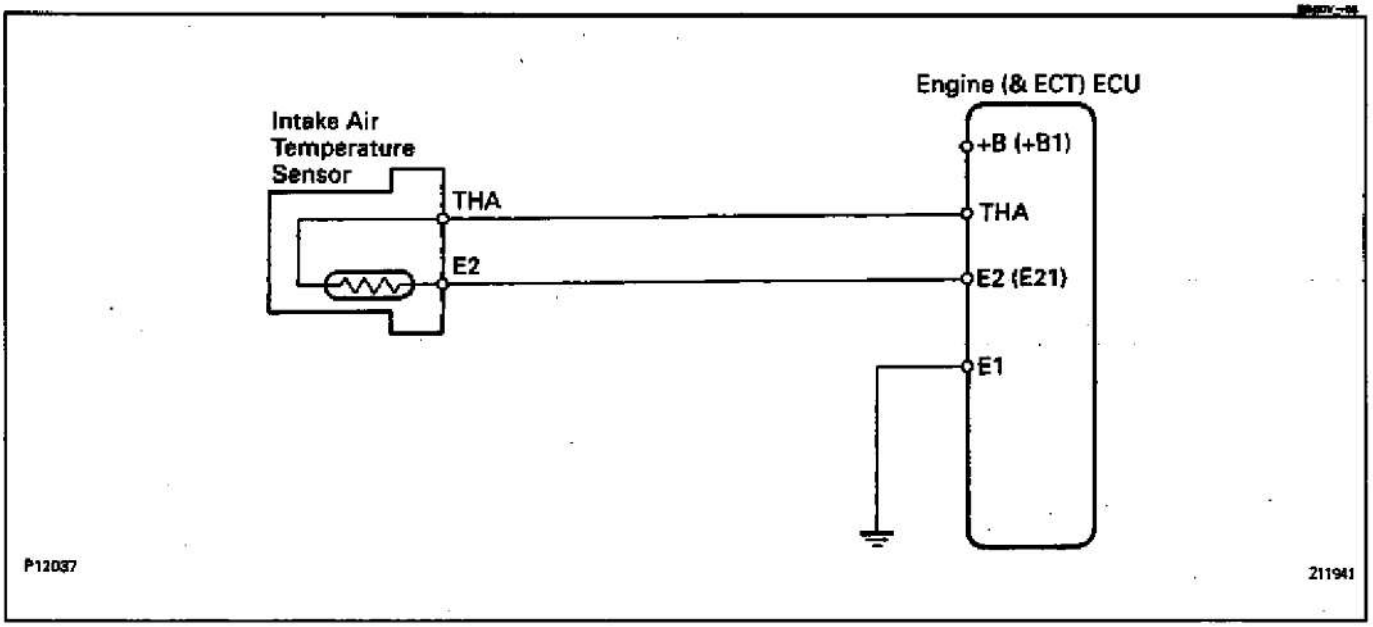
1. DRAIN ENGINE COOLANT
2. REMOVE WATER TEMPERATURE SENSOR



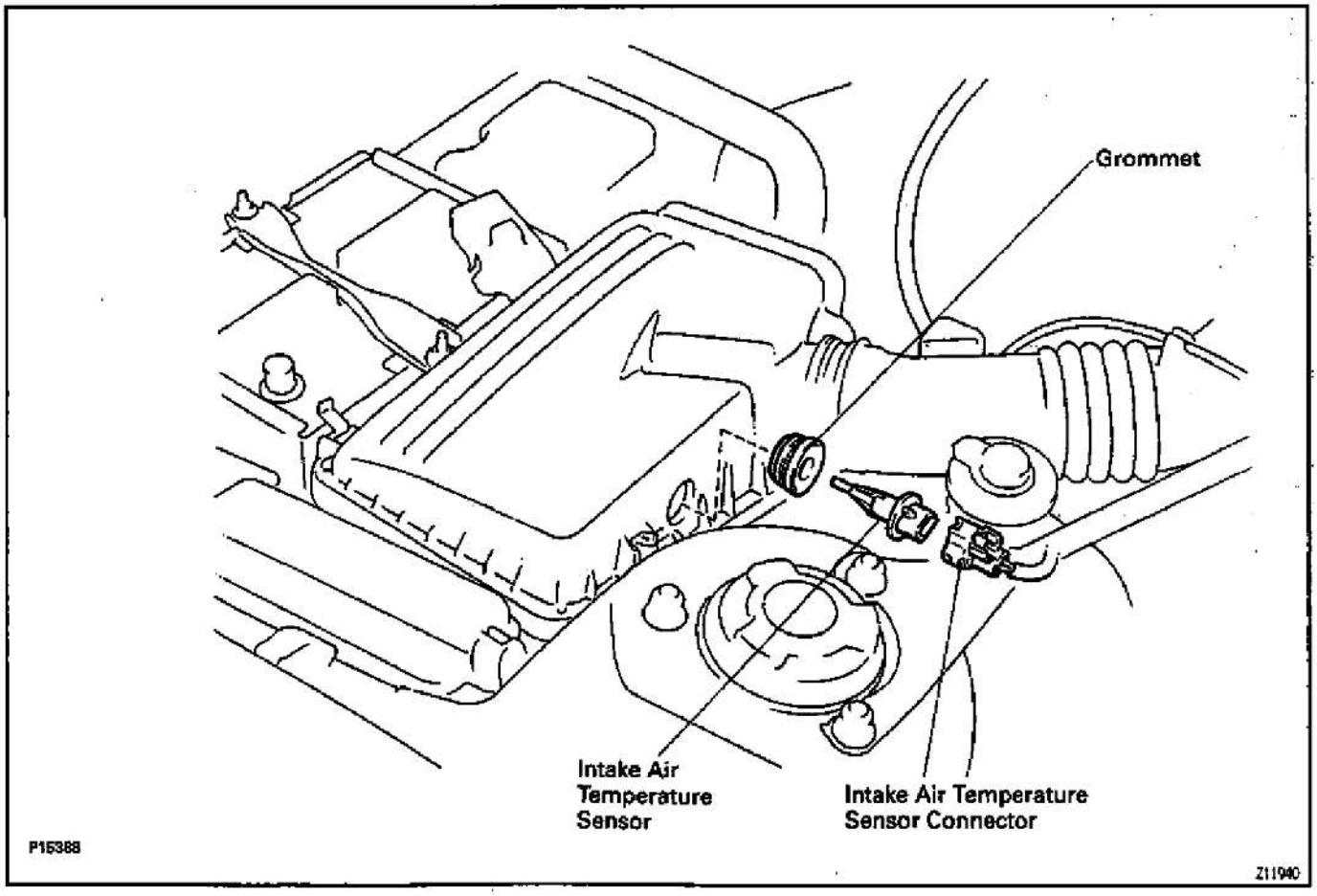
3. INSPECT WATER TEMPERATURE SENSOR
   Using an ohmmeter, measure the resistance between the terminals.
   Resistance:
   Refer to the graph
   If the resistance is not as specified, replace the water temperature sensor.

4. REINSTALL WATER TEMPERATURE SENSOR
5. REFILL WITH ENGINE COOLANT

INTAKE AIR TEMPERATURE SENSOR



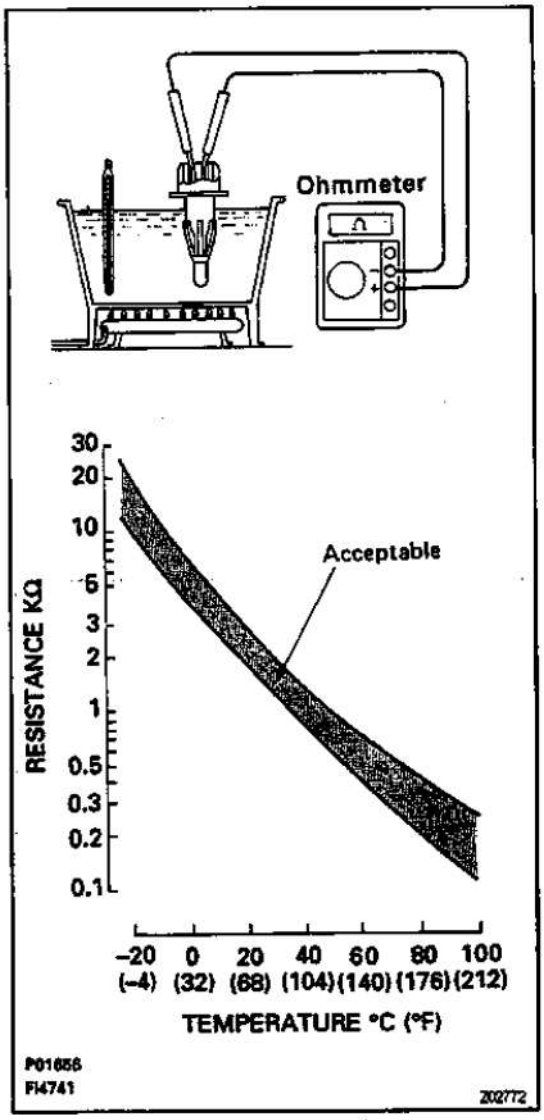
COMPONENTS FOR REMOVAL AND INSTALLATION



INTAKE TEMPERATURE SENSOR INSPECTION

(See Components for Removal and Installation)

1. REMOVE INTAKE TEMPERATURE SENSOR



2. INSPECT INTAKE TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

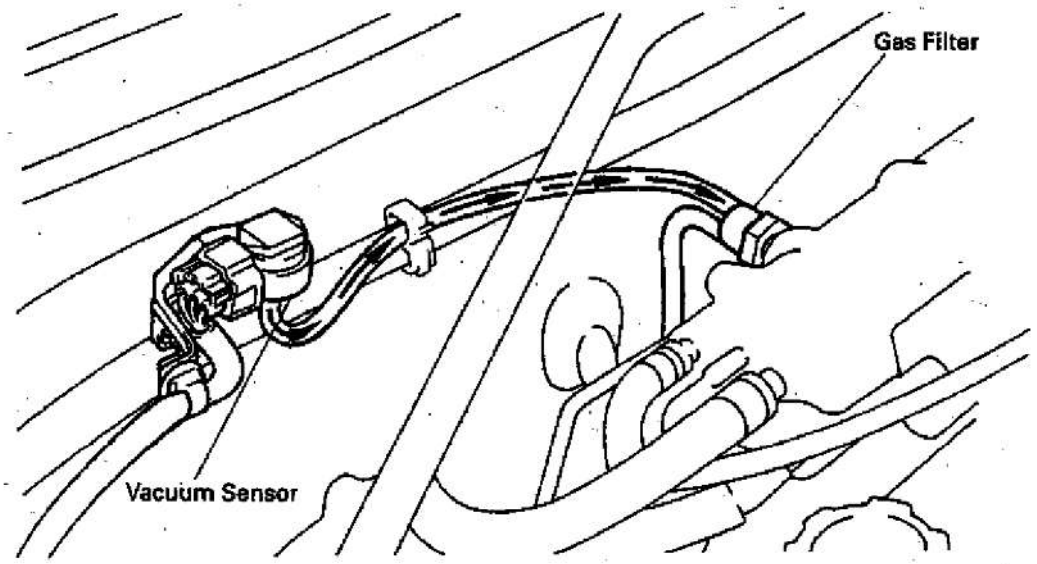
Refer to the graph

If the resistance is not as specified, replace the sensor.

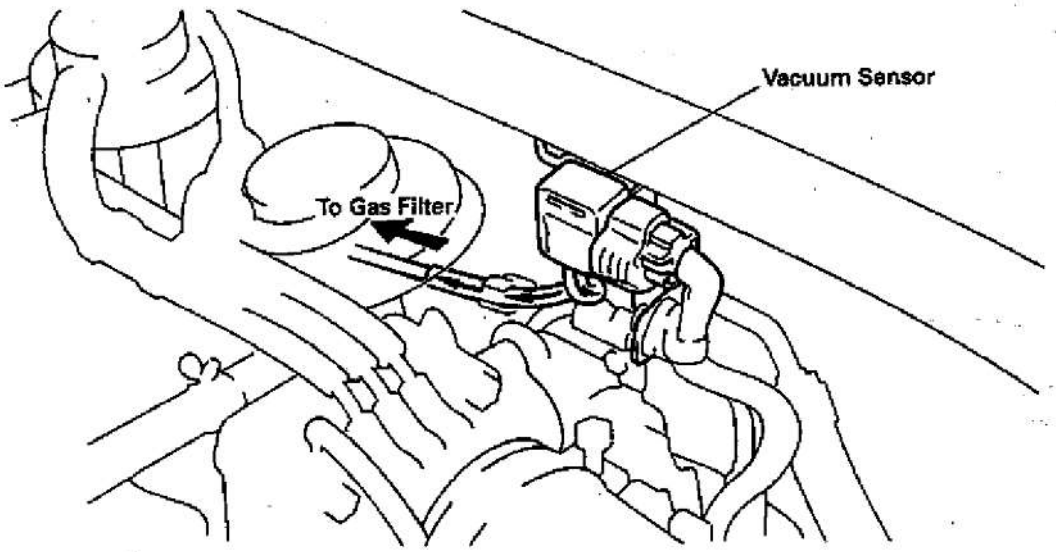
3. REINSTALL INTAKE TEMPERATURE SENSOR

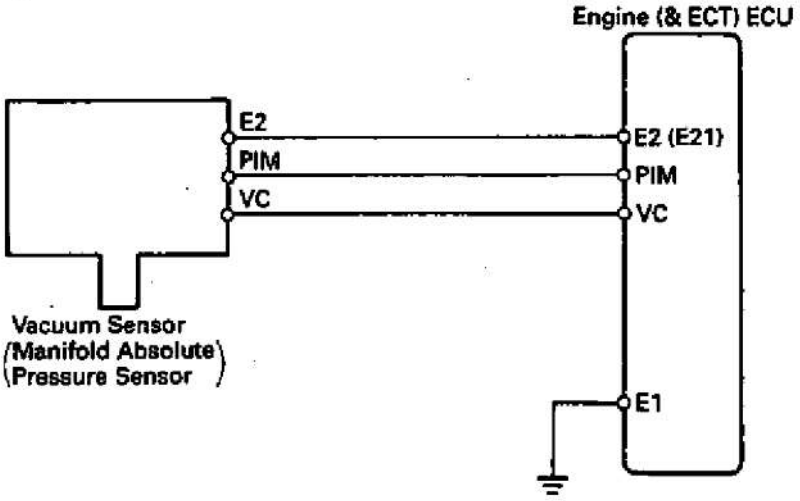
VACUUM SENSOR

ST202



ST191



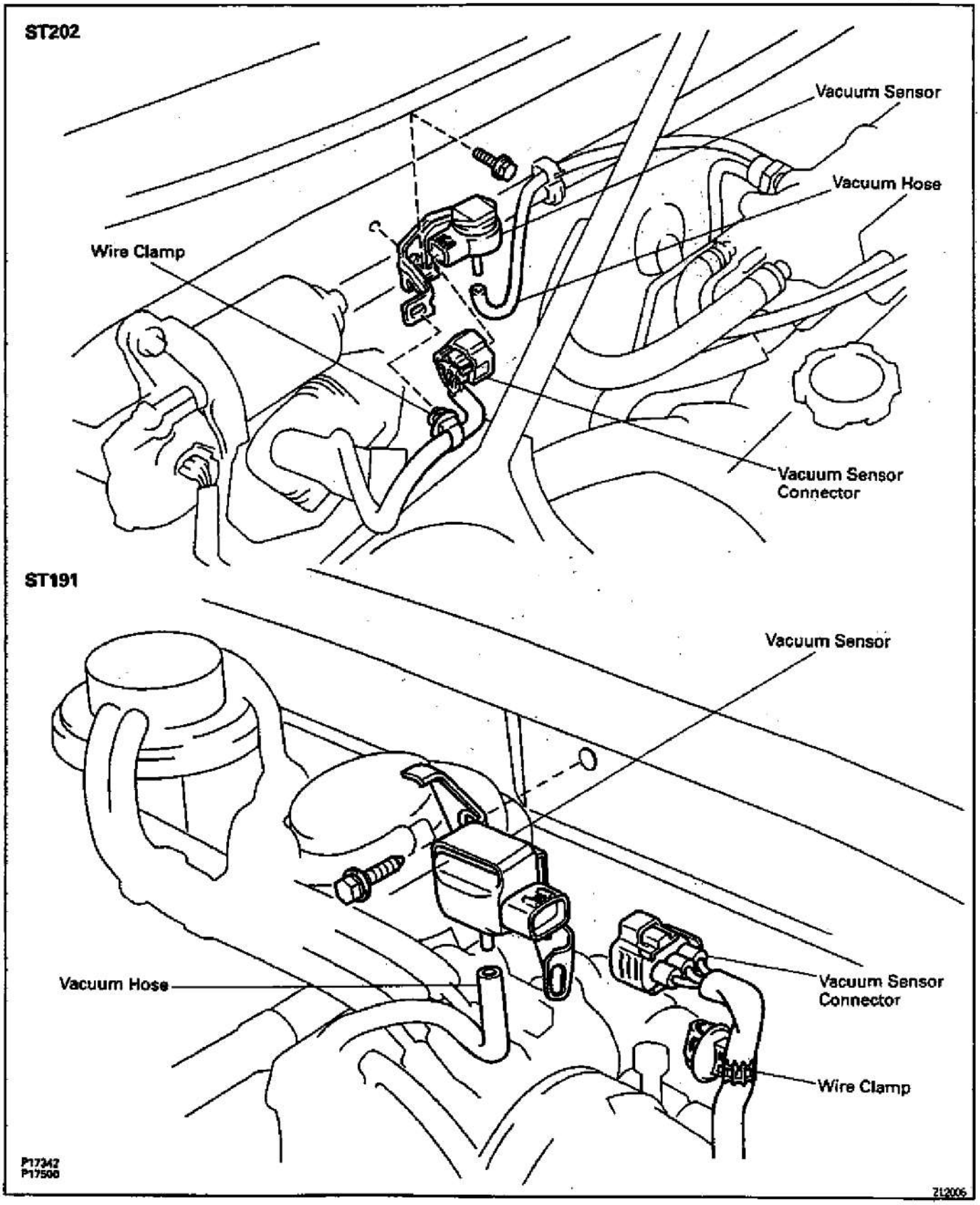


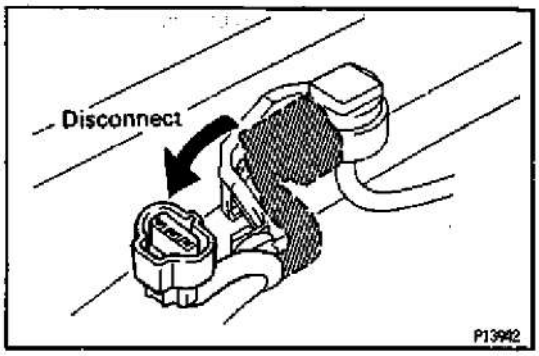
P17135
P13866
P1226

Z11847

COMPONENTS FOR REMOVAL AND INSTALLATION

EG



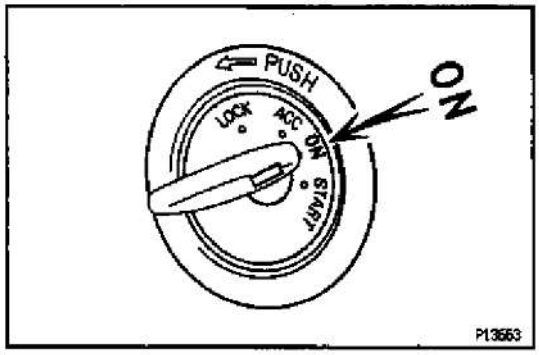


VACUUM SENSOR INSPECTION

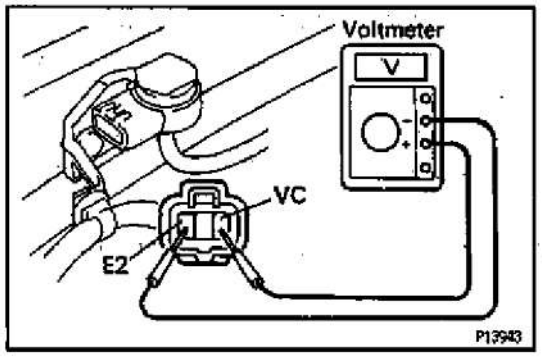
(See Components Removal and Installation)

1. INSPECT POWER SOURCE VOLTAGE OF VACUUM SENSOR

(a) Disconnect the vacuum sensor connector.



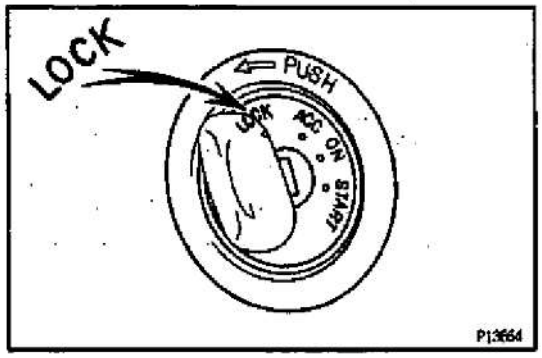
(b) Turn the ignition switch ON.



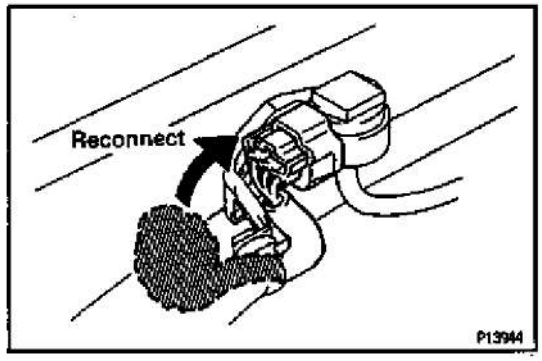
(c) Using a voltmeter, measure the voltage between connector terminals VC and E2 of the wiring harness side.

Voltage:

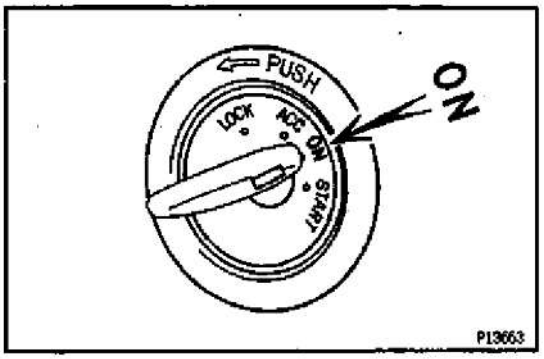
4.5 – 5.5 V



(d) Turn the ignition switch to LOCK.

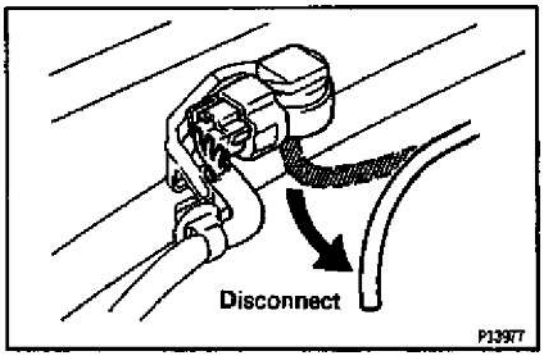


(e) Reconnect the vacuum sensor connector.

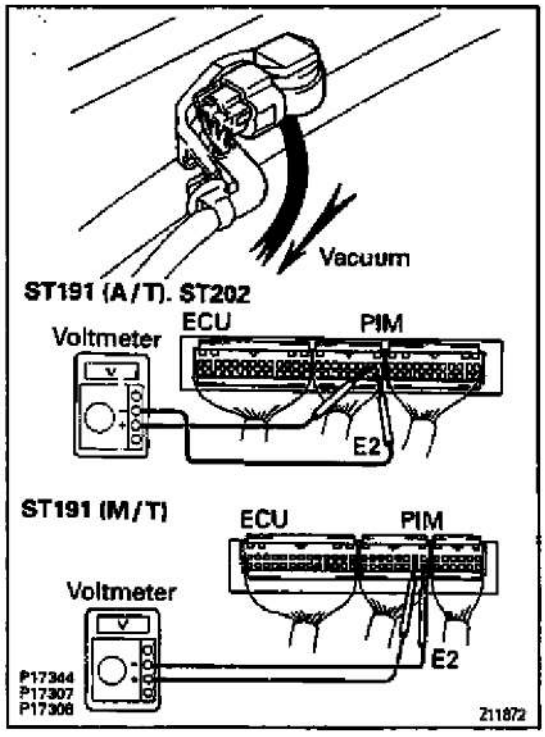


2. INSPECT POWER OUTPUT OF VACUUM SENSOR

(a) Turn the ignition switch ON.



(b) Disconnect the vacuum hose from the vacuum sensor.



(c) Connect a voltmeter to terminals PIM and E2 of the ECU, and measure the output voltage under ambient atmospheric pressure.

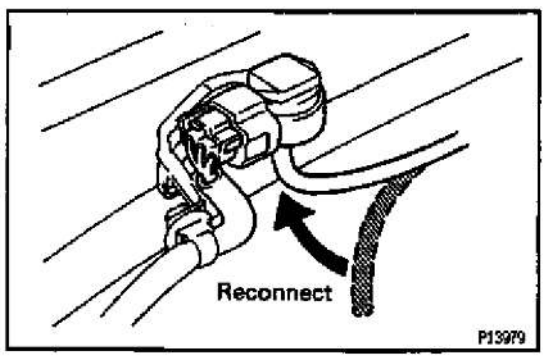
(d) Apply vacuum to the vacuum sensor in 13.3 kPa (100 mmHg, 3.94 in.Hg) segments to 66.7 kPa (500 mmHg, 19.69 in.Hg).

(e) Measure the voltage drop from step (c) above for each segment.

Voltage drop

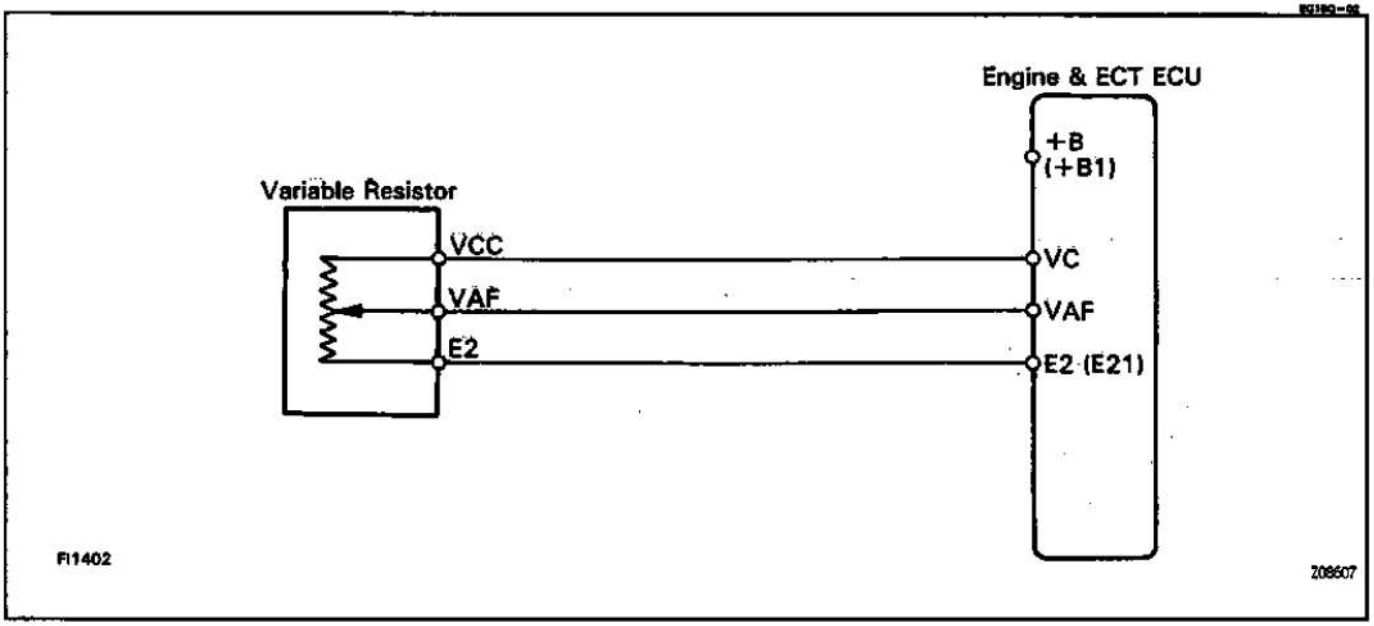
Applied Vacuum kPa (mmHg, in.Hg)	13.3 (100, 3.94)	26.7 (200, 7.87)	40.0 (300, 11.81)	53.5 (400, 15.75)	66.7 (500, 19.69)
Voltage drop V	0.3 – 0.5	0.7 – 0.9	1.1 – 1.3	1.5 – 1.7	1.9 – 2.1

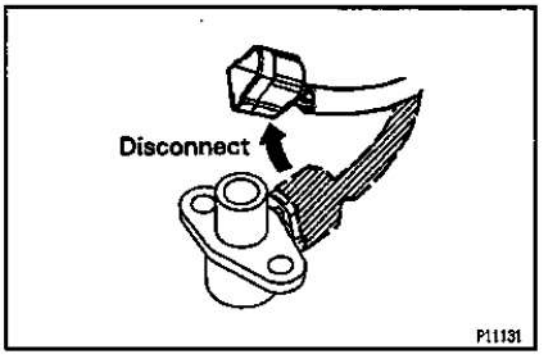
V00494



(f) Reconnect the vacuum hose to the vacuum sensor.

VARIABLE RESISTOR

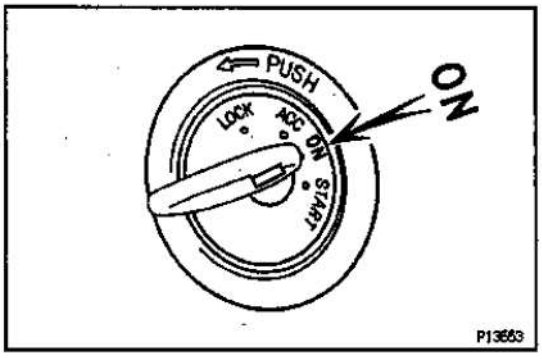




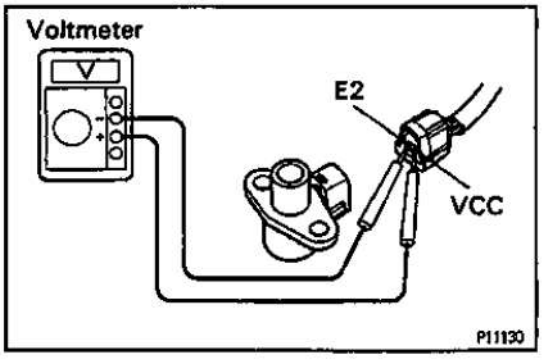
VARIABLE RESISTOR INSPECTION

1. INSPECT POWER SOURCE VOLTAGE OF VARIABLE RESISTOR

(a) Disconnect the variable resistor connector.



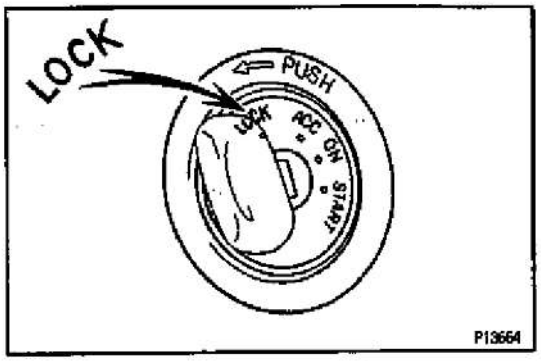
(b) Turn the ignition switch ON.



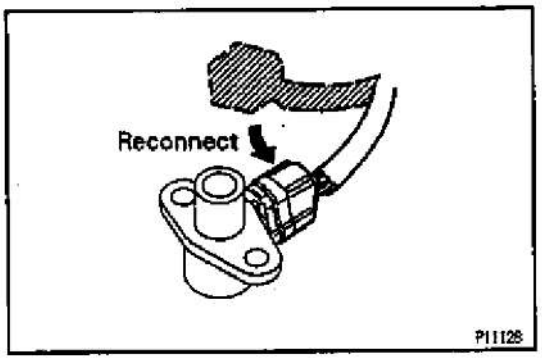
(c) Using a voltmeter, measure the voltage between connector terminals VCC and E2 of the wiring harness side.

Voltage:

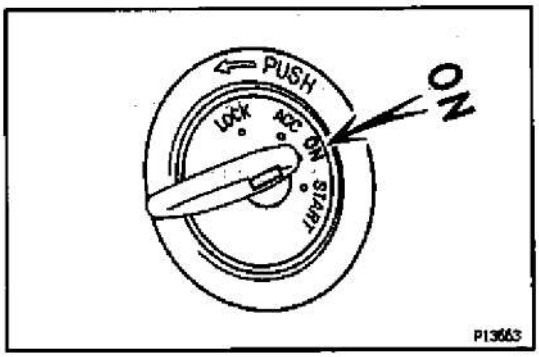
4.5 – 5.5 V



(d) Turn the ignition switch to LOCK.

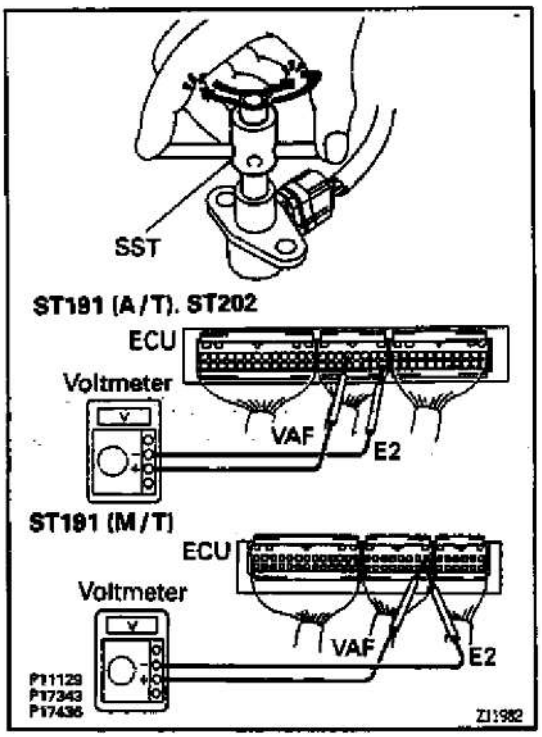


(e) Reconnect the variable resistor connector.



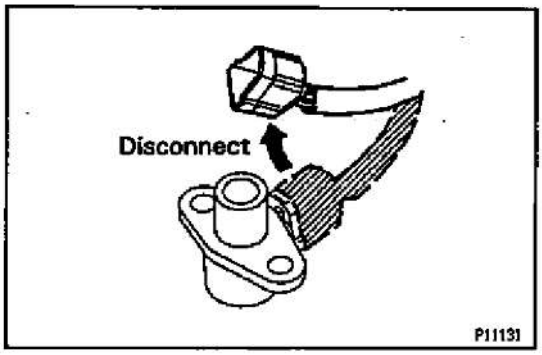
2. INSPECT POWER OUTPUT OF VARIABLE RESISTOR

(a) Turn the ignition switch ON.



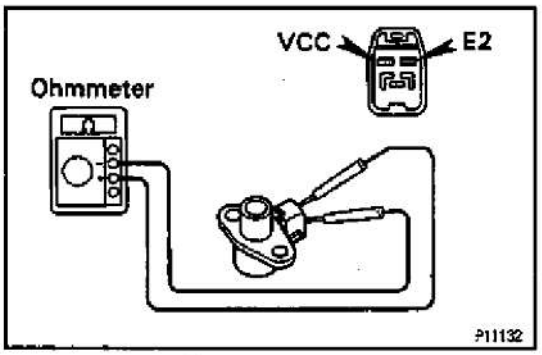
(b) Connect a voltmeter to terminals VAF and E2 of the ECU, and measure the voltage while slowly turning the idle mixture adjusting screw first fully counter–clockwise, and then fully clockwise using SST.
SST 09243–00020

(c) Check that voltage changes smoothly from 0 V to approx. 5 V.
HINT: There is no sudden jump up to 5 V or down to 0 V.

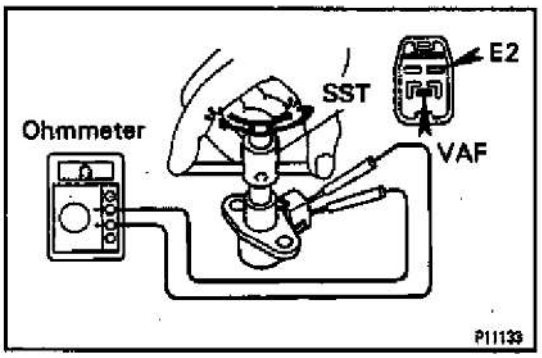


3. INSPECT RESISTANCE OF VARIABLE RESISTOR

(a) Disconnect the variable resistor connector.

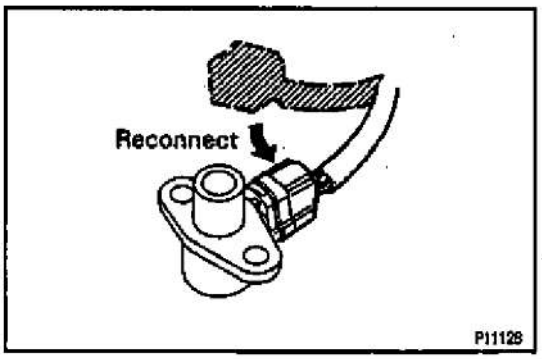


(b) Using an ohmmeter, measure the resistance between terminals VCC and E2 of the variable resistor.
Resistance:
4 – 6 kΩ



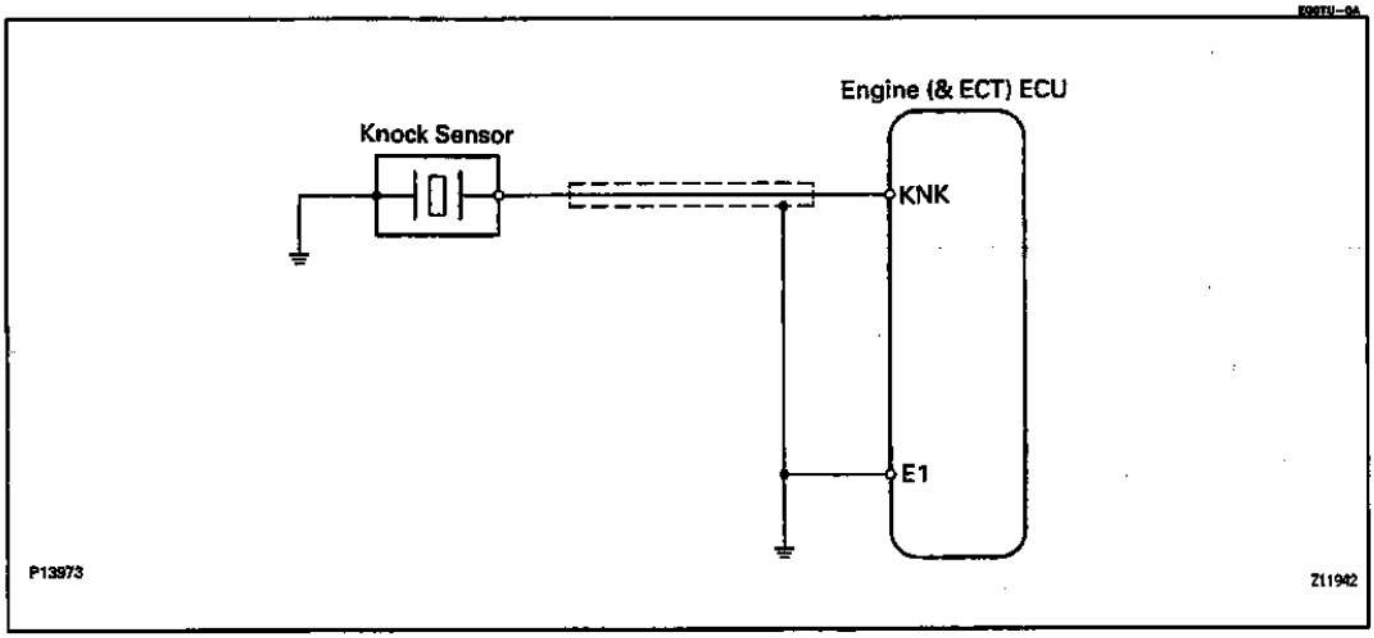
(c) Using SST, turn the idle mixture adjusting screw fully counterclockwise.
SST 09243–00020

(d) Connect the ohmmeter to terminals VAF and E2 of the variable resistor, and turn the idle mixture adjusting screw fully clockwise and check that the resistance value changes from approx. 5 kΩ to 0 kΩ accordingly.

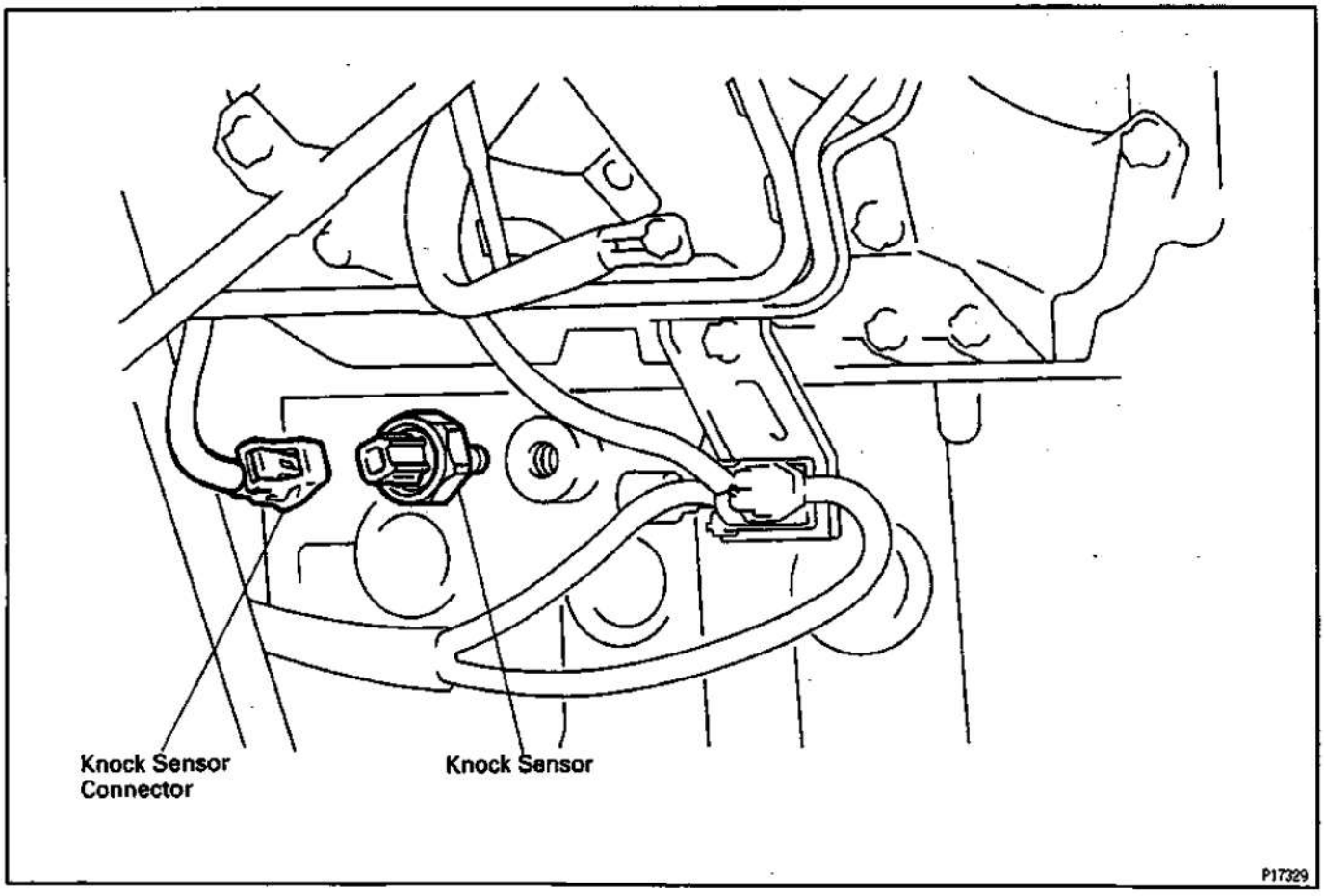


(e) Reconnect the variable resistor connector.

KNOCK SENSOR



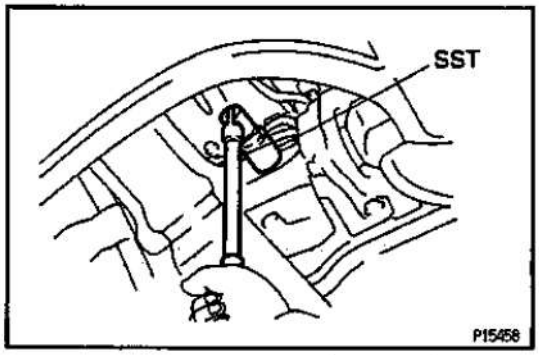
COMPONENTS FOR REMOVAL AND INSTALLATION



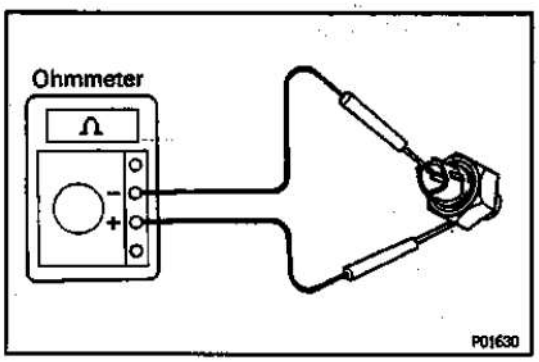
KNOCK SENSORS INSPECTION

(See Components for Removal and Installation)

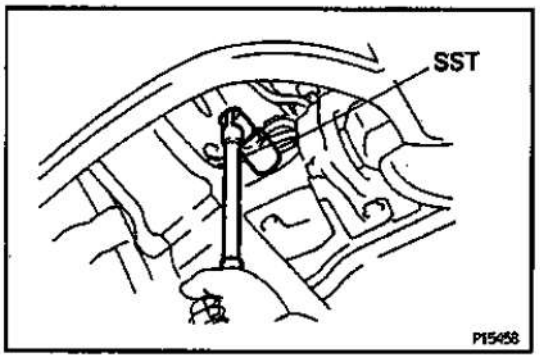
1. **DISCONNECT NEGATIVE (–) TERMINAL CABLE FROM BATTERY**



2. **REMOVE KNOCK SENSORS**
   (a) Disconnect the knock sensor connector.
   (b) Using SST, remove the knock sensor.
   SST 09816–30010

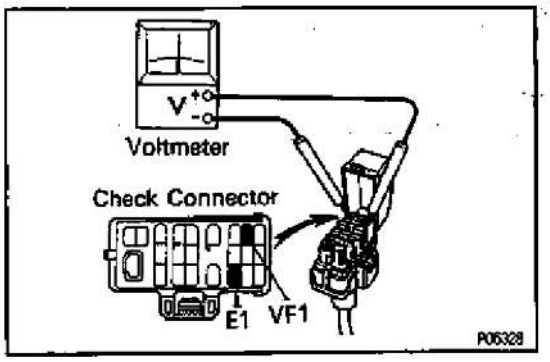


3. **INSPECT KNOCK SENSORS**
   Using an ohmmeter, check that there is no continuity between the terminal and body.
   If there is continuity, replace the sensor.



4. **REINSTALL KNOCK SENSORS**
   (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.

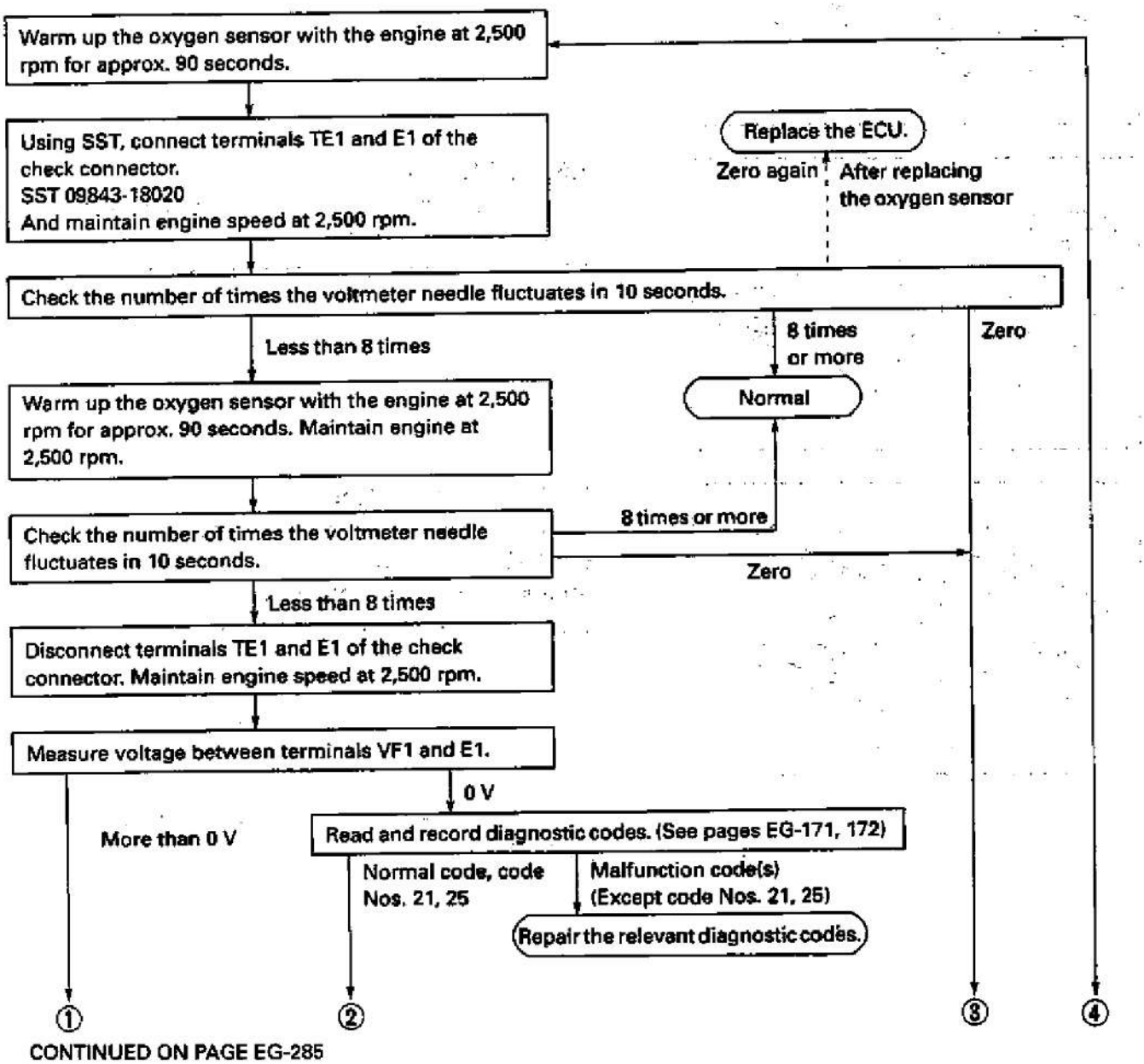
5. **RECONNECT NEGATIVE (–) TERMINAL CABLE TO BATTERY**



OXYGEN SENSOR

OXYGEN SENSOR INSPECTION

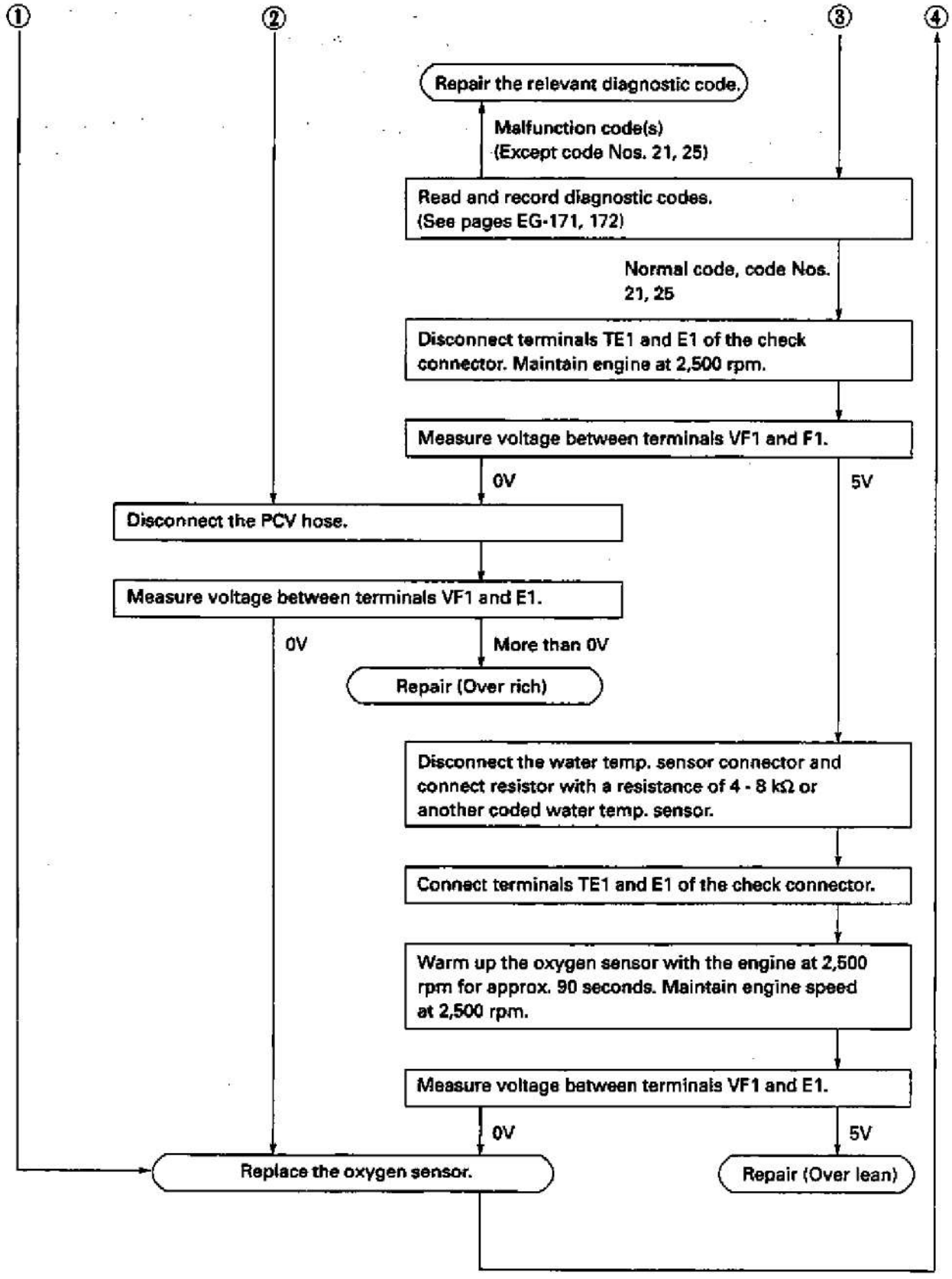
1. **WARM UP ENGINE**
   Allow the engine to reach normal operating temperature.
2. **INSPECT FEEDBACK VOLTAGE**
   Connect the positive (+) probe of a voltmeter to terminal VF1 of the check connector, and negative (−) probe to terminal E1. Perform the test as follows:

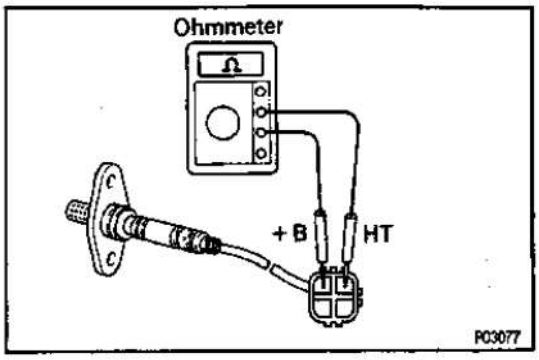


CONTINUED ON PAGE EG-285

V05366

CONTINUED FROM PAGE EG-284





3. INSPECT HEATER RESISTANCE OF OXYGEN SENSOR

Using an ohmmeter, measure the resistance between the terminal +B and HT.

Resistance (Cold):

5.1 – 6.3 Ω at 20°C(68°F)

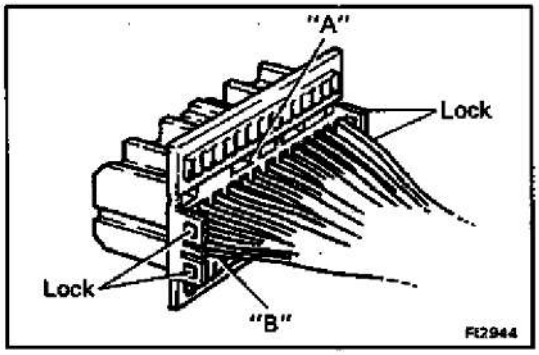
If the resistance is not as specified, replace the sensor.

ECU

ECU INSPECTION

HINT: The EFI circuit can be checked by measuring the resistance and voltage at the wiring connectors of the ECU.

EG

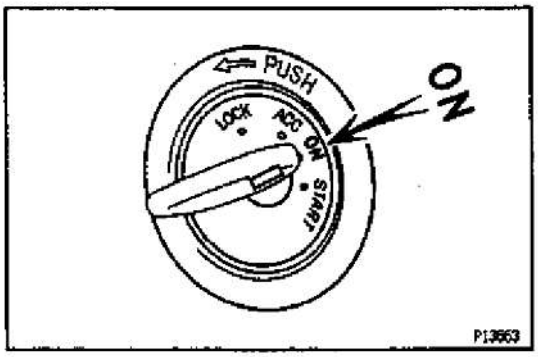


1. PREPARATION

(a) Disconnect the 3 connectors from the ECU.

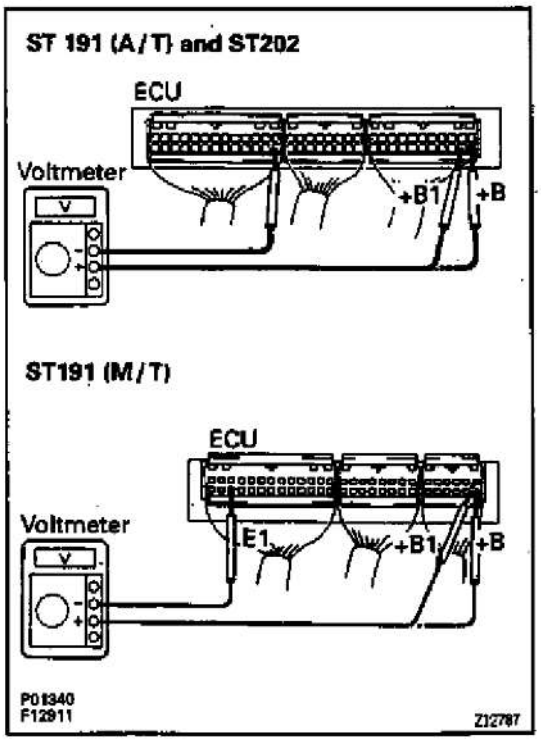
(b) Remove the locks as shown in the illustration so that the tester probe(s) can easily come in.
NOTICE: Pay attention to sections A and B in the illustration which can easily broken.

(c) Reconnect the 3 connectors to the ECU.



2. INSPECT VOLTAGE OF ECU

(a) Turn the ignition switch ON.



(b) Measure the voltage between each terminal of the wiring connectors.
HINT:

- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is ON.

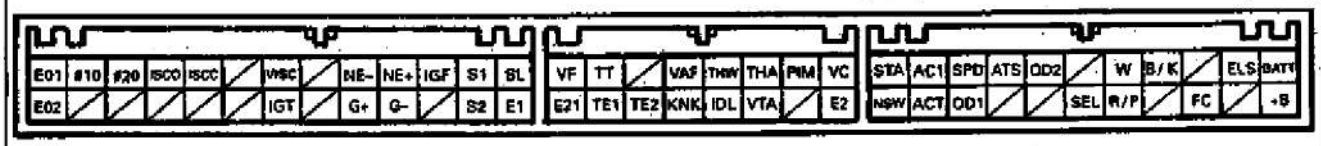
ECU Wiring Connectors Voltage

EG

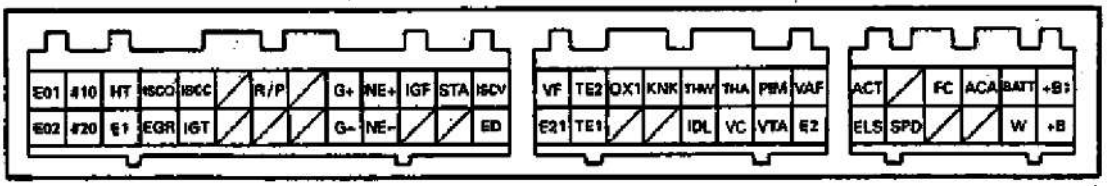
Terminals	Condition		STD voltage (V)
+B, +B1 – E1	IG SW ON		9 – 14
BATT – E1	–		9 – 14
IDL – E2	IG SW ON	Throttle valve open	9 – 14
VTA – E2		Throttle valve fully closed	0.3 – 0.8
		Throttle valve fully open	3.2 – 4.9
PIM – E2	IG SW ON		3.3 – 3.9
VC – E2			4.5 – 5.5
#10, #20 – E01, E02			9 – 14
THA – E2	IG SW ON	Intake air temp. 20°C (68°F)	0.5 – 3.4
THW – E2		Engine coolant temp. 80°C (176°F)	0.2 – 1.0
STA – E1	Cranking		6 or more
IGT – E1	Idling		Pulse generation
ISCC, ISCO – E1	IG SW ON	ECU connectors disconnected	9 – 14
W – E1	No trouble (check engine warning light off) and engine running		9 – 14
TE1, TE2 – E1	IG SW ON	Check connector TE1 – E1 not connected	9 – 14
		Check connector TE1 – E1 connected	0 – 3
NSW – E1 (A/T only)		Neutral start switch P or N position	0 – 2
		Except neutral start switch P or N position	9 – 14

ECU Terminals

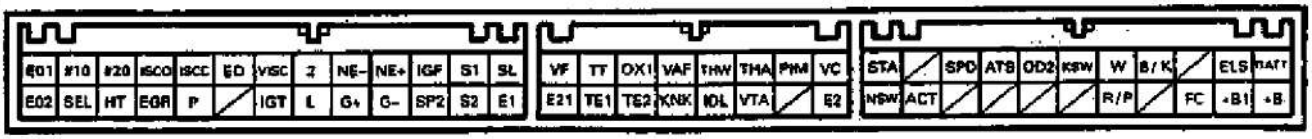
ST202



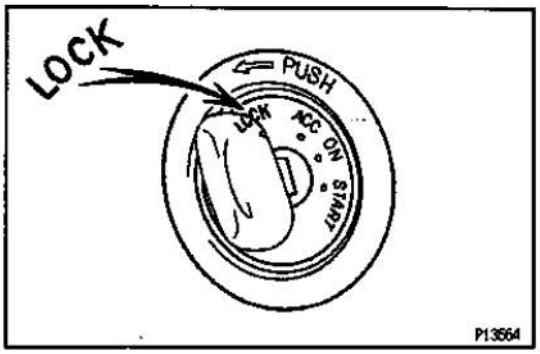
ST191 (M/T)



ST191 (A/T)



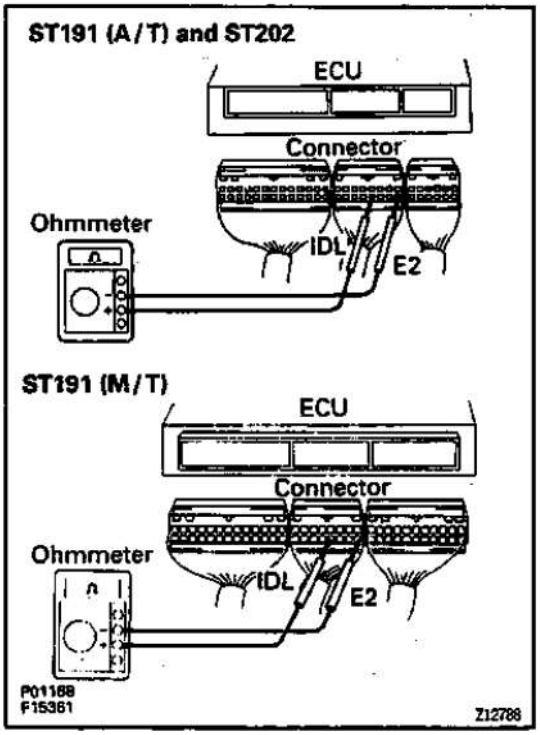
FI2798
P01821
FI2796



3. INSPECT RESISTANCE OF ECU

(a) Turn the ignition switch OFF.

(b) Disconnect the 3 connectors from the ECU.



(c) Measure the resistance between each terminal of the wiring connectors.

NOTICE:

- **Do not touch the ECU terminals.**
- **The tester probe should be inserted in the wiring connector from the wiring side.**

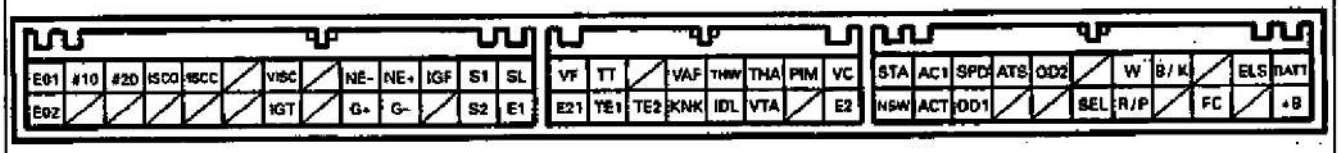
ECU Wiring Connectors Resistance

EG

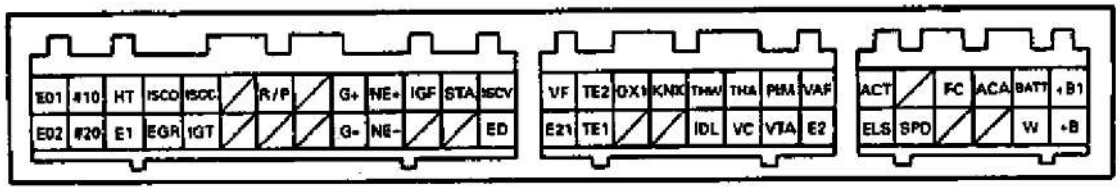
Terminals	Condition	STD Resistance (Ω)
IDL – E2	Throttle valve fully open	Infinity
	Throttle valve fully closed (Throttle opener must be cancelled first)	2,300 or less
VTA – E2	Throttle valve fully open	2,000 – 10,200
	Throttle valve fully closed Throttle opener must be cancelled first)	200 – 5,700
VC – E2	–	2,500 – 5,900
THA – E2	Intake air temp. 20°C (68°F)	2,000 – 3,000
THW – E2	Coolant temp. 80°C (176°F)	200 – 400
G+ – G–	Cold (-10°C (14°F) to 50°C (122°F))	185 – 275
	Hot (50°C (122°F) to 100°C (212°F))	240 – 325
NE+ – NE–	Cold (-10°C (14°F) to 50°C (122°F))	370 – 550
	Hot (50°C (122°F) to 100°C (212°F))	475 – 650
ISCC – +B ISCO – +B1	–	19.3 – 22.3
EGR* – +B +B1	–	33 – 39

ECU Terminals

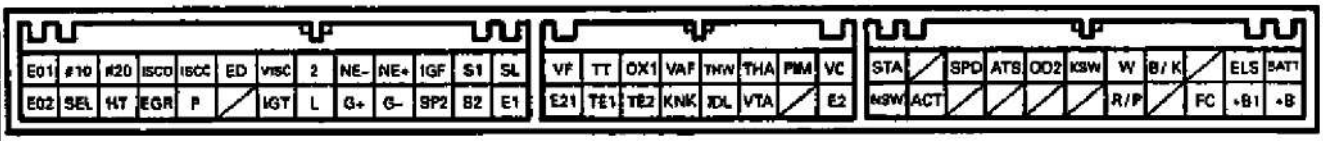
ST202



ST191 (M/T)



ST191 (A/T)



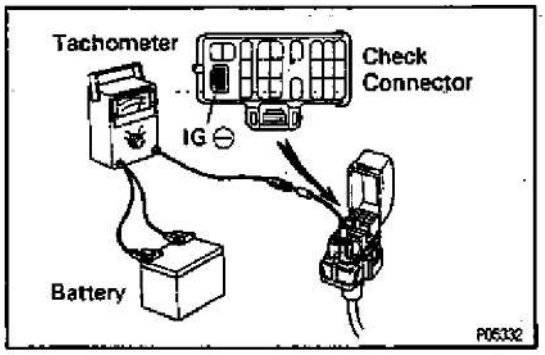
FI2796
P01821
FI2796

* Europe

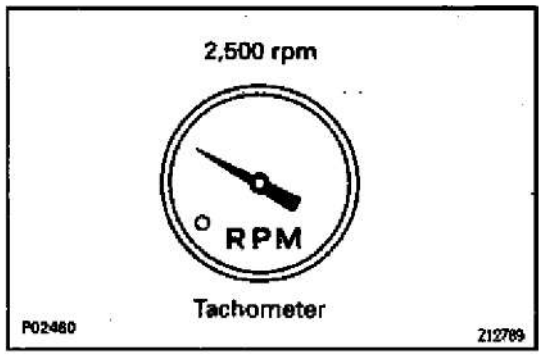
FUEL CUT RPM

FUEL CUT PRM INSPECTION

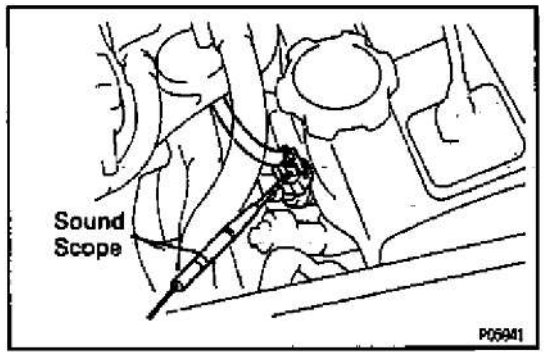
1. **WARM UP ENGINE**
   Allow the engine to warm up to normal operating temperature.



2. **CONNECT TACHOMETER TO ENGINE**
   Connect the test probe of a tachometer to terminal IG ⊖ of the check connector.
   NOTICE:
   - **Never allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
   - **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.**



3. **INSPECT FUEL CUT RPM**
   (a) Increase the engine speed to at least 2,500 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:
   1,500 rpm

4. **DISCONNECT TACHOMETER**

SERVICE SPECIFICATIONS

SERVICE DATA

Fuel pressure regulator	Fuel pressure	at no vacuum	265 — 304 kPa (2.7 — 3.1 kgf/cm², 38 — 44 psi)
Fuel pump	Resistance	at 20°C (68°F)	0.2 — 3.0 Ω
Injector	Resistance		13.4 — 14.2 Ω
	Injection volume		49 — 59 cm³ (3.0 — 3.6 cu in.) per 15 sec.
	Difference between each cylinder		5 cm³ (0.3 cu in.) or less
	Fuel leakage		One drop or less per minute
Throttle body	Throttle body fully closed angle		6°
	Throttle opener setting speed		1,300 — 1,500 rpm (w/ Cooling fan OFF)
Throttle position sensor	Clearance between stop screw and lever		
	0 mm (0 in.)	VTA — E2	0.2 — 5.7 kΩ
	0.50 mm (0.020 in.)	IDL — E2	2.3 kΩ or less
	0.70 mm (0.028 in.)	IDL — E2	Infinity
	Throttle valve fully open	VTA — E2	2.0 — 10.2 kΩ
	—	VC — E2	2.5 — 5.9 kΩ
ISC valve	Resistance (+B — ISCC or ISCO)	at 20°C (68°F)	19.3 — 22.3 Ω
VSV for EGR	Resistance		33 — 39 Ω
A/C idle-up valve	Resistance		30 — 34 Ω
Water Temp. sensor	Resistance	at −20°C (−4°F)	10 — 20 kΩ
		at 0°C (32°F)	4 — 7 kΩ
		at 20°C (68°F)	2 — 3 kΩ
		at 40°C (104°F)	0.9 — 1.3 kΩ
		at 60°C (140°F)	0.4 — 0.7 kΩ
		at 80°C (176°F)	0.2 — 0.4 kΩ
Intake Air Temp. sensor	Resistance	at −20°C (−4°F)	10 — 20 kΩ
		at 0°C (32°F)	4 — 7 kΩ
		at 20°C (68°F)	2 — 3 kΩ
		at 40°C (104°F)	0.9 — 1.3 kΩ
		at 60°C (140°F)	0.4 — 0.7 kΩ
		at 80°C (176°F)	0.2 — 0.4 kΩ
Oxygen sensor	Heater coil resistance		5.1 — 6.3 Ω
Fuel cut rpm	Fuel return rpm		1,500 rpm

SERVICE DATA (Cont'd)

ECU	Voltage		
	+B – E1	IG SW ON	9 – 14 V
	+B1 – E1	IG SW ON	9 – 14 V
	BATT – E1		9 – 14 V
	IDL – E2	IG SW ON (Throttle valve open)	9 – 14 V
	VTA – E2	IG SW ON (Throttle valve fully closed)	0.3 – 0.8 V
		IG SW ON (Throttle valve fully open)	3.2 – 4.9 V
	PIM – E2	IG SW ON	3.3 – 3.9 V
	VC – E2	IG SW ON	4.5 – 5.5 V
	#10 or #20 – E01	IG SW ON	9 – 14 V
	#10 or #20 – E02	IG SW ON	9 – 14 V
	THA – E2	IG SW ON (Intake air temp. 20°C (68°F))	0.5 – 3.4 V
	THW – E2	IG SW ON (Coolant temp. 80°C (176°F))	0.2 – 1.0 V
	STA – E1	Cranking	6 V or more
	IGT – E1	Idling	Pulse generation
	ISCC – E1	IG SW ON(ECU connectors disconnected)	9 – 14 V
	ISCO – E1	IG SW ON(ECU connectors disconnected)	9 – 14 V
	W – E1	No trouble (Check engine warning light off) and engine running	9 – 14 V
	TE1 – E1	IG SW ON (Check connector terminals TE1 – E1 not connected)	9 – 14 V
		IG SW ON (Check connector terminals TE1 – E1 connected)	0 – 3 V
	Resistance		
	IDL – E2	at throttle valve open	Infinity
		at throttle valve fully closed	2,300 Ω or less
	VTA – E2	at throttle valve fully open	2,000 – 10,200 Ω
		at throttle valve fully closed	200 – 5,700 Ω
	VC – E2		2,500 – 5,900 Ω
	THA – E2	at intake air temp. 20°C (68°F)	2,000 – 3,000 Ω
	THW – E2	at coolant temp. 80°C (176°F)	200 – 400 Ω
	G+ – G–	at cold (–10°C (14°F) to 50°C (122°F))	185 – 275 Ω
		at hot (50°C (122°F) to 100°C (212°F))	240 – 325 Ω
	NE+ – NE–	at cold (–10°C (14°F) to 50°C (122°F))	370 – 550 Ω
		at hot (50°C (122°F) to 100°C (212°F))	475 – 650 Ω
	+B or +B1 – ISCC or ISCO		19.3 – 22.3 Ω

EG

TORQUE SPECIFICATIONS

Part tightened		N·m	kgf-cm	ft-lbf
Fuel line				
Union bolt type		29	300	22
Flare nut type	Fuel pump side ST202 for SST	28	280	21
	ST191 for SST	30	310	22
	Others	30	310	22
Fuel pump x Fuel tank		4.0	40	35 in.-lbf
Fuel pressure regulator x Delivery pipe		5.4	55	48 in.-lbf
Fuel return pipe x Fuel pressure regulator		19	195	14
Delivery pipe x Cylinder head		13	130	9
Cylinder head x Grommet		23	230	17
Fuel inlet pipe x Delivery pipe		34	350	25
Pulsation damper x Delivery pipe	ST191	34	350	25
	ST191 for SST	29	300	22
Throttle body x Intake manifold		19	195	14
No.1 Intake manifold stay x Intake manifold	ST191	42	425	31
No.2 Intake manifold stay x Cylinder head	ST191	42	425	31
EGR valve x Intake manifold	ST191 for Nut	13	130	9
	ST191 for Union nut	59	600	43
Knock sensor x Cylinder block		44	450	33
Oxygen sensor x Exhaust manifold		20	200	14