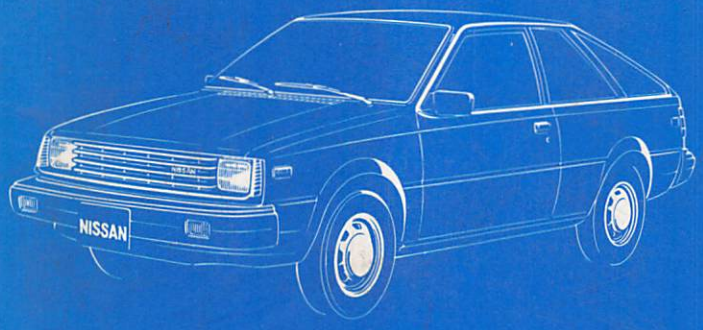


DATSUN

1983 DATSUN NISSAN SENTRA

SERVICE MANUAL

THE NAME OF QUALITY
NISSAN
NISSAN MOTOR CO. LTD.

NISSAN SENTRA

Model B11 Series

FOREWORD

This service manual has been prepared primarily for the purpose of assisting service personnel in providing effective service and maintenance of the 1983 NISSAN SENTRA.

This manual includes procedures for maintenance, adjustments, removal and installation, disassembly and assembly of components, and trouble-shooting.

All information, illustrations and specifications contained in this manual are based on the latest product information available at the time of publication. If your DATSUN model differs from the specifications contained in this manual, consult your NISSAN/ DATSUN dealer for information.

The right is reserved to make changes in specifications and methods at any time without notice.

NISSAN MOTOR CO., LTD.

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ELECTRICAL SYSTEM ..... EL



HOW TO USE THIS MANUAL

- This Service Manual is designed as a guide for servicing cars.
- This manual deals with the engine, chassis, body and the electrical system.
- A **QUICK REFERENCE INDEX** is provided on the first page. Refer to this index along with the index of the particular section you wish to consult.
- The first page of each section lists the contents and gives the page numbers for the respective topics.
- **SERVICE DATA AND SPECIFICATIONS** are contained in each section.
- **TROUBLE DIAGNOSES AND CORRECTIONS** are also included in each section. This feature of the manual lists the likely causes of trouble and recommends the appropriate corrective actions to be taken.
- A list of **SPECIAL SERVICE TOOLS** is included in each section. The special service tools are designed to assist you in performing repair safely, accurately and quickly. For information concerning how to obtain special service tools, write to the following address:

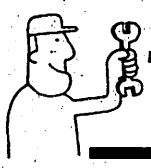
  Kent-Moore Corporation
  29784 Little Mack
  Roseville, Michigan 48066

  Kent-Moore of Canada, Ltd.
  5466 Timberlea Blvd., Unit 2
  Mississauga, Ontario
  Canada L4W 2T7

- The measurements given in this manual are primarily expressed with the SI unit (International System of Unit), and alternately expressed in the metric system and in the yard/pound system.
- The back cover of the manual provides maintenance data for quick reference.
- In the text, the following abbreviations are used:

S.D.S.:	Service Data and Specifications	L.H., R.H.:	Left Hand, Right Hand
Ⓣ:	Tightening Torque	M/T, A/T:	Manual Transaxle, Automatic Transaxle

- The captions **CAUTION and WARNING** warn you of steps that must be followed to prevent personal injury and/or damage to some part of the car.



IMPORTANT SAFETY NOTICE

The proper performance of service is essential for both the safety of the mechanic and the efficient functioning of the car.
The service methods in this Service Manual are described in such a manner that the service may be performed safely and accurately.
Special service tools have been designed to permit safe and proper performance of service. Be sure to use them.

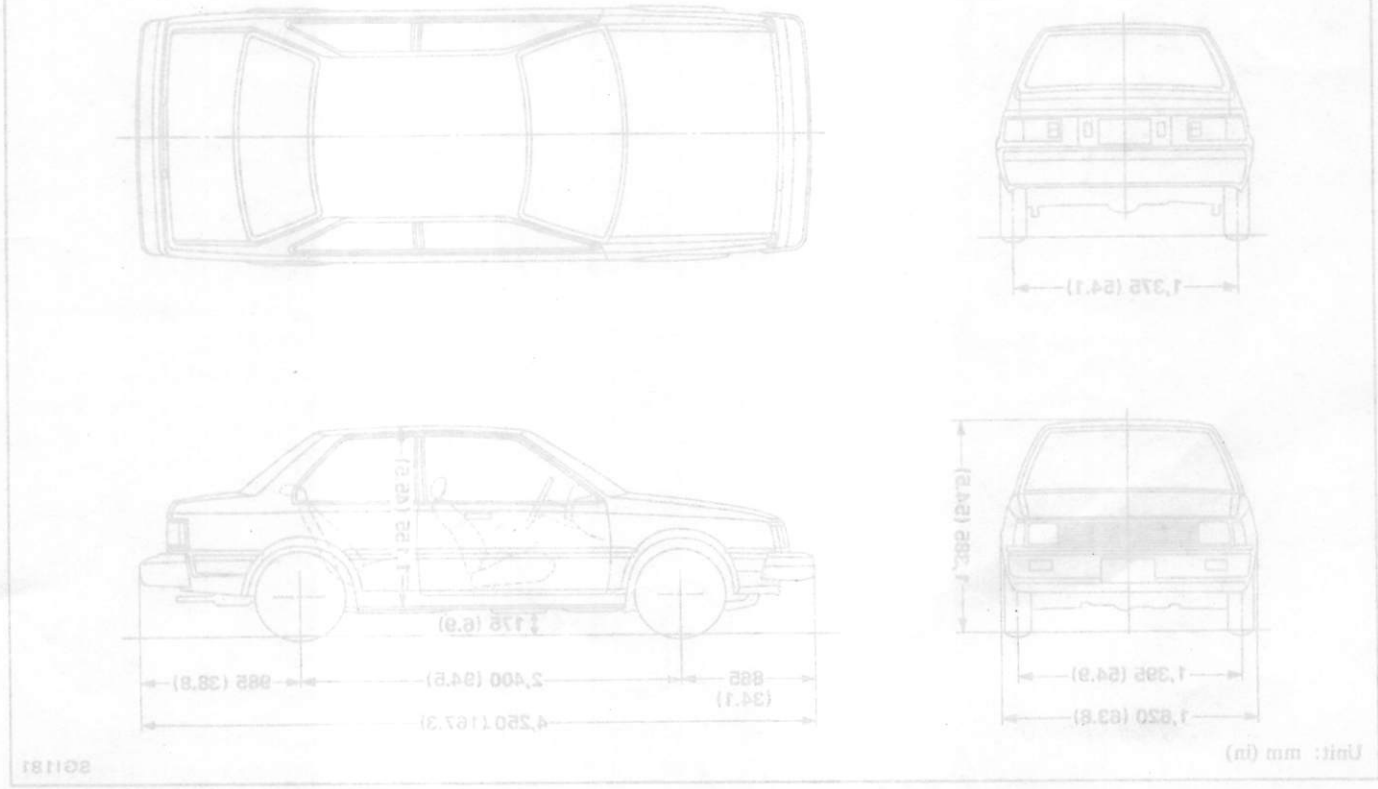
Service varies with the procedures used, the skills of the mechanic and the tools and parts available. Accordingly, anyone using service procedures, tools or parts which are not specifically recommended by NISSAN must first completely satisfy himself that neither his safety nor the car's safety will be jeopardized by the service method selected.

GENERAL INFORMATION

SECTION GI

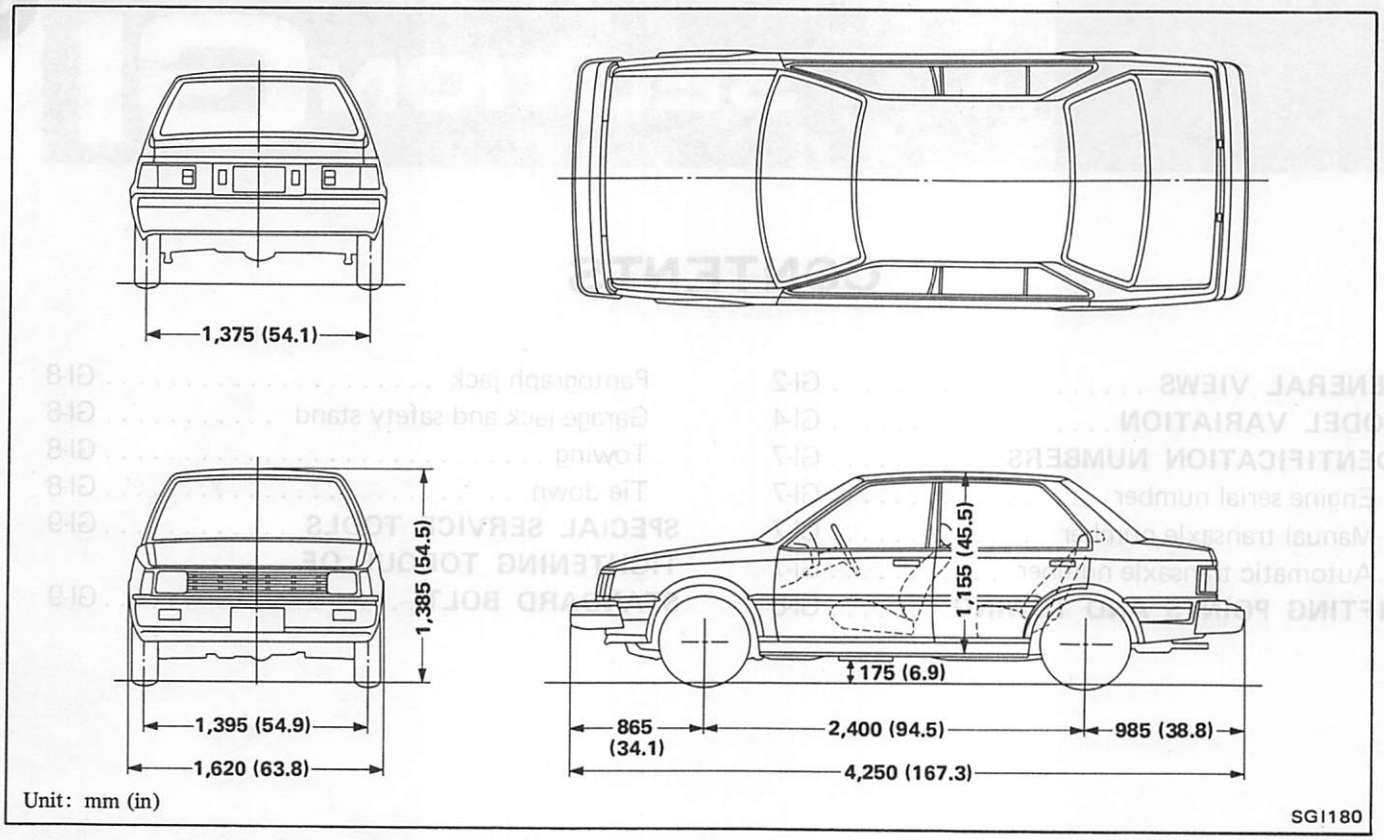
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GENERAL VIEWS

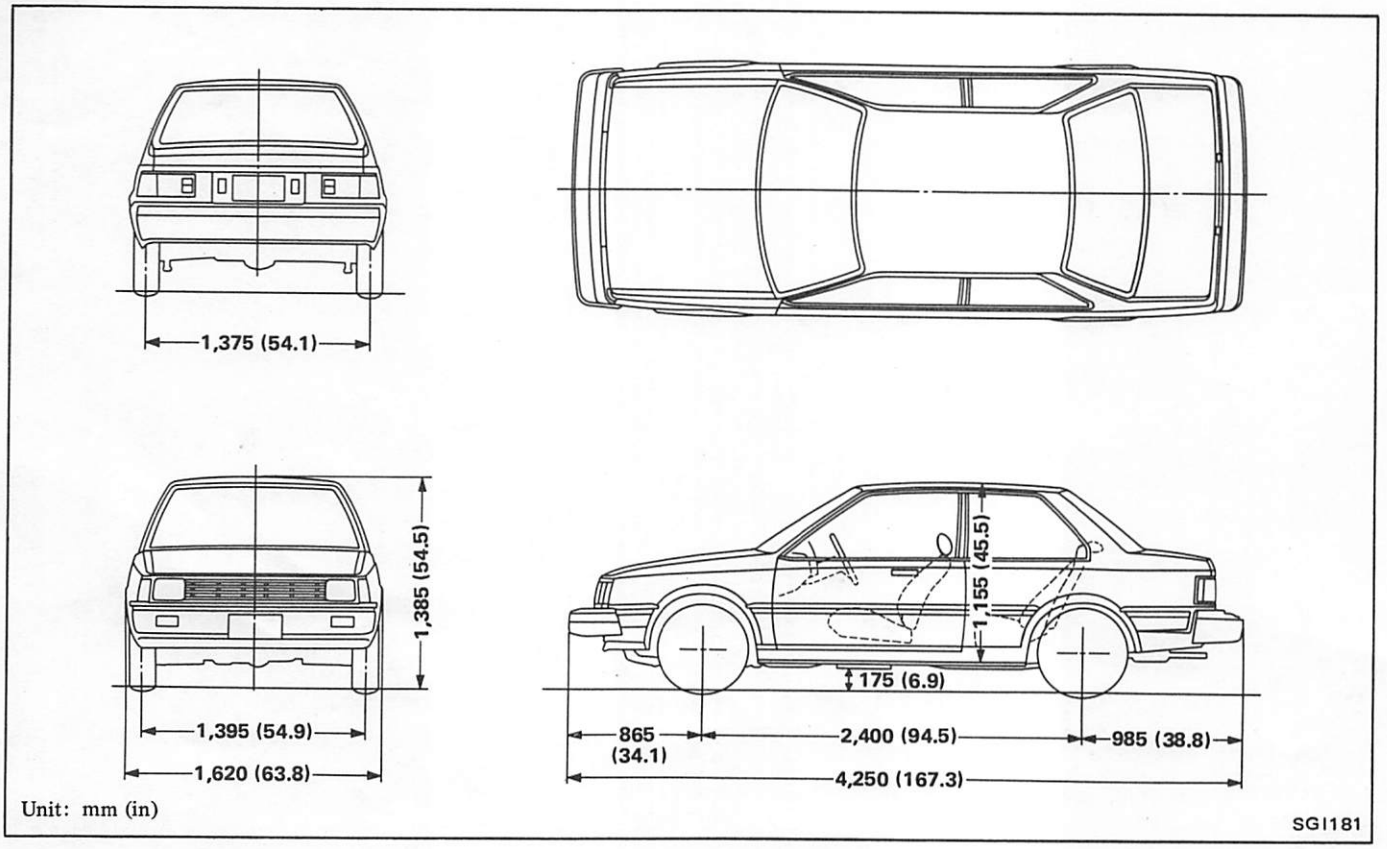
4-door Sedan



Unit: mm (in)

SGI180

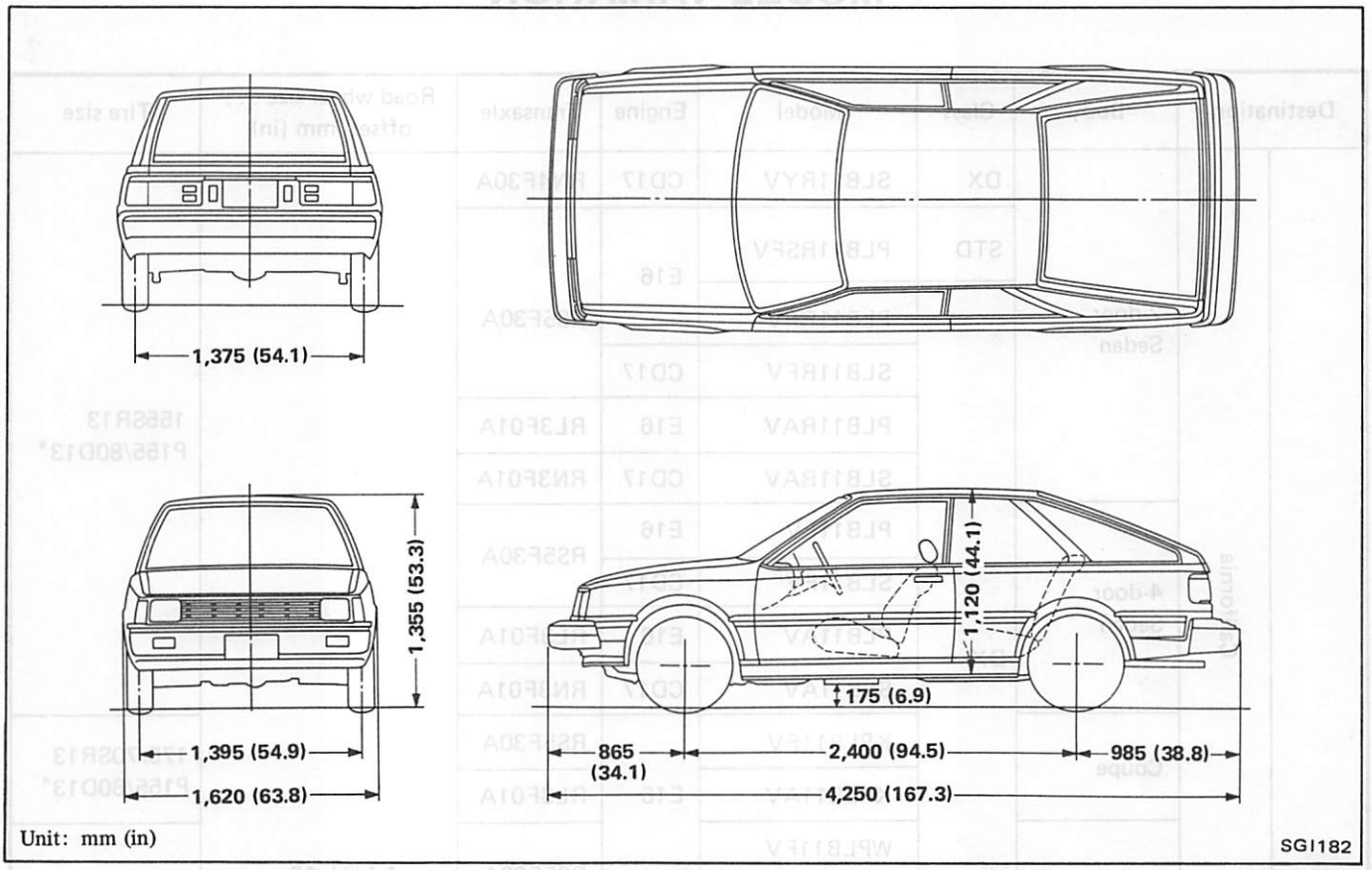
2-door Sedan



Unit: mm (in)

SGI181

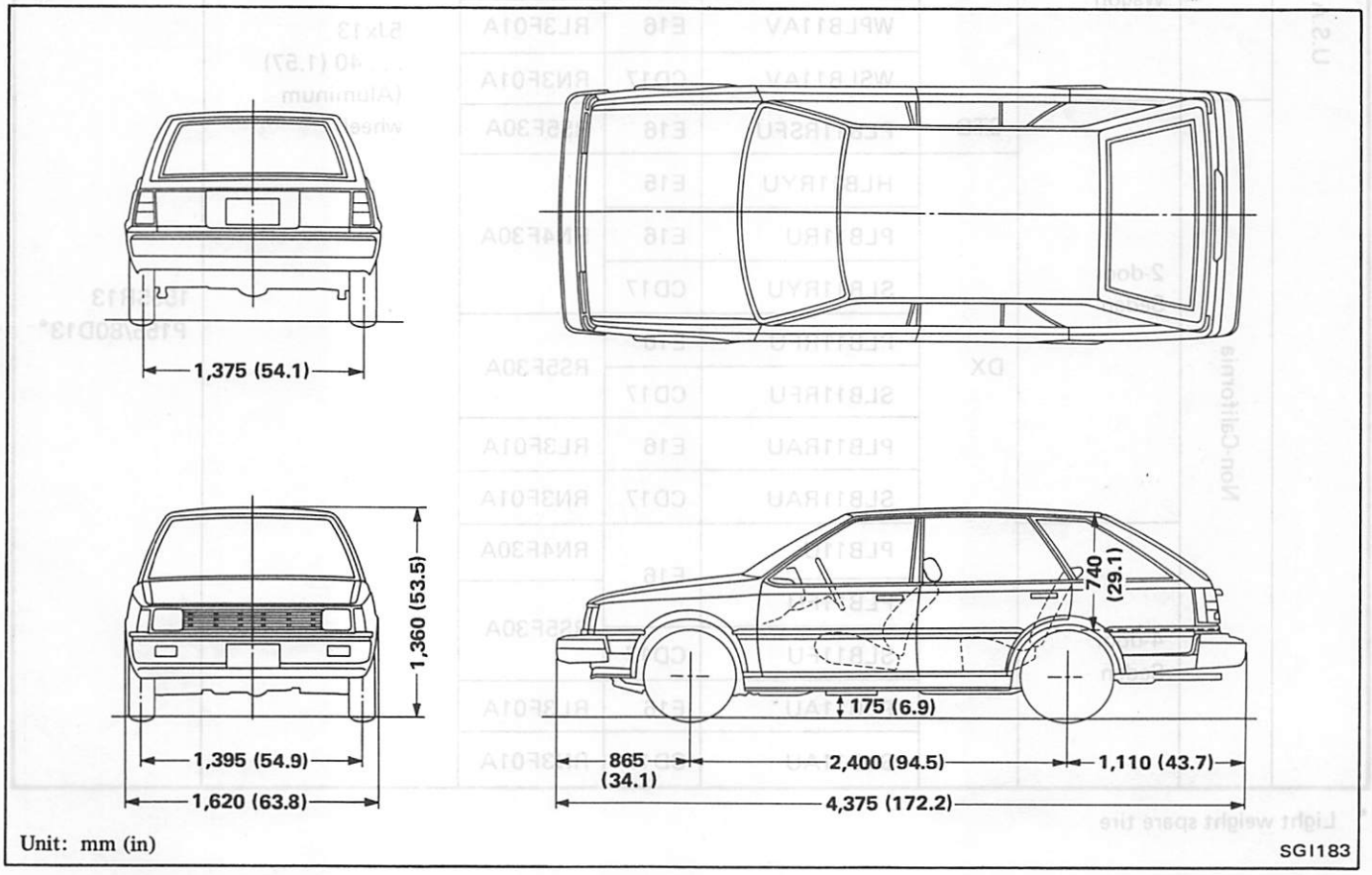
Coupe



Unit: mm (in)

SGI182

Wagon



Unit: mm (in)

SGI183

MODEL VARIATION

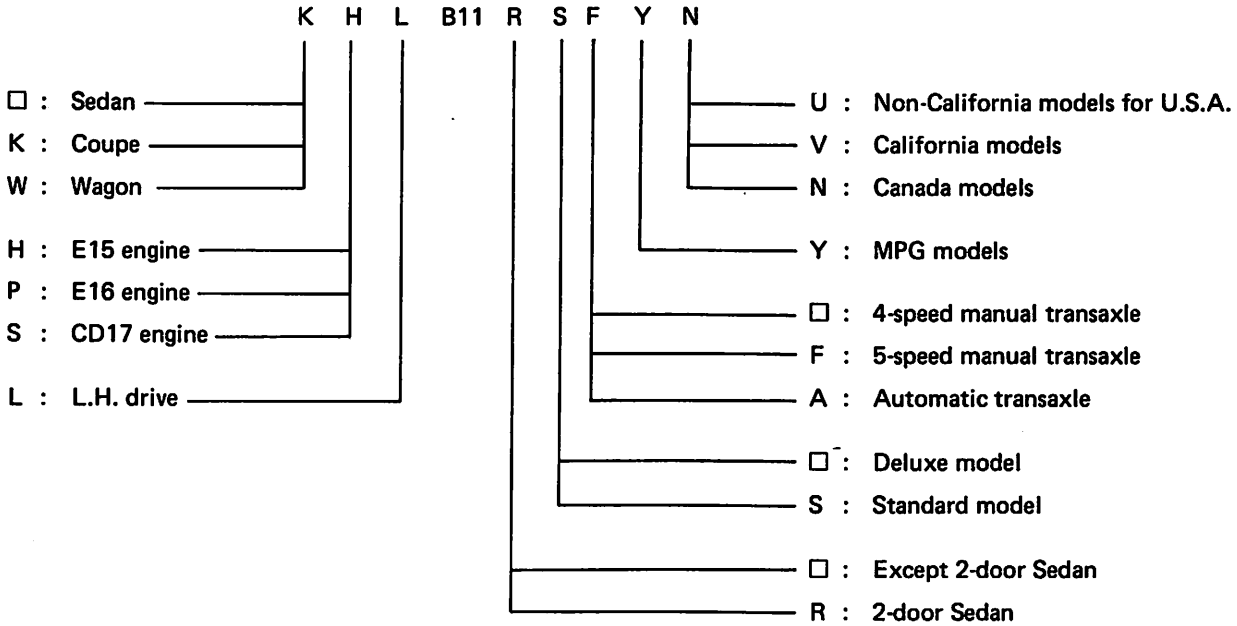
Destination		Body	Class	Model	Engine	Transaxle	Road wheel size . . . offset mm (in)	Tire size
U.S.A.	California	2-door Sedan	DX	SLB11RYV	CD17	RN4F30A	4-1/2Jx13 . . . 42 (1.65) 5Jx13 . . . 40 (1.57) (Aluminum wheel)	155SR13 P155/80D13*
			STD	PLB11RSFV	E16	RS5F30A		
			DX	PLB11RFV				
				SLB11RFV	CD17			
				PLB11RAV	E16	RL3F01A		
				SLB11RAV	CD17	RN3F01A		
		4-door Sedan		PLB11FV	E16	RS5F30A		
				SLB11FV	CD17			
				PLB11AV	E16	RL3F01A		
				SLB11AV	CD17	RN3F01A		
		Coupe		KPLB11FV	E16	RS5F30A		175/70SR13 P155/80D13*
				KPLB11AV		RL3F01A		
		Wagon		WPLB11FV		RS5F30A		155SR13 P155/80D13*
				WSLB11FV	CD17			
				WPLB11AV	E16	RL3F01A		
				WSLB11AV	CD17	RN3F01A		
	Non-California	2-door Sedan	STD	PLB11RSFU	E16	RS5F30A		
			DX	HLB11RYU	E15	RN4F30A		
				PLB11RU	E16			
				SLB11RYU	CD17			
				PLB11RFU	E16	RS5F30A		
				SLB11RFU	CD17			
				PLB11RAU	E16	RL3F01A		
				SLB11RAU	CD17	RN3F01A		
		4-door Sedan		PLB11U	E16	RN4F30A		
				PLB11FU		RS5F30A		
				SLB11FU	CD17			
				PLB11AU	E16	RL3F01A		
				SLB11AU	CD17	RN3F01A		

* Light weight spare tire

Destination		Body	Class	Model	Engine	Transaxle	Road wheel size . . . offset mm (in)	Tire size
U.S.A.	Non-California	Coupe	DX	KPLB11U	E16	RN4F30A	4-1/2Jx13 . . . 42 (1.65) 5Jx13 . . . 40 (1.57) (Aluminum wheel)	175/70SR13 P155/80D13*
				KPLB11FU		RS5F30A		
				KPLB11AU		RL3F01A		
		Wagon		WPLB11U		RN4F30A		155SR13 P155/80D13*
				WPLB11FU		RS5F30A		
				WSLB11FU	CD17			
				WPLB11AU	E16	RL3F01A		
				WSLB11AU	CD17	RN3F01A		
Canada		2-door Sedan	STD	PLB11RSFN	E16	RS5F30A		
				PLB11RSAN		RL3F01A		
			DX	HLB11RFYN	E15	RS5F30A		
				SLB11RFN	CD17			
				PLB11RAN	E16	RL3F01A		
				SLB11RAN	CD17	RN3F01A		
		4-door Sedan		PLB11FN	E16	RS5F30A		
				SLB11FN	CD17			
				PLB11AN	E16	RL3F01A		
				SLB11AN	CD17	RN3F01A		
		Coupe		KPLB11FN	E16	RS5F30A		175/70SR13 P155/80D13*
				KPLB11AN		RL3F01A		
		Wagon		WPLB11FN		RS5F30A		155SR13 P155/80D13*
				WSLB11FN	CD17			
				WPLB11AN	E16	RL3F01A		
				WSLB11AN	CD17	RN3F01A		

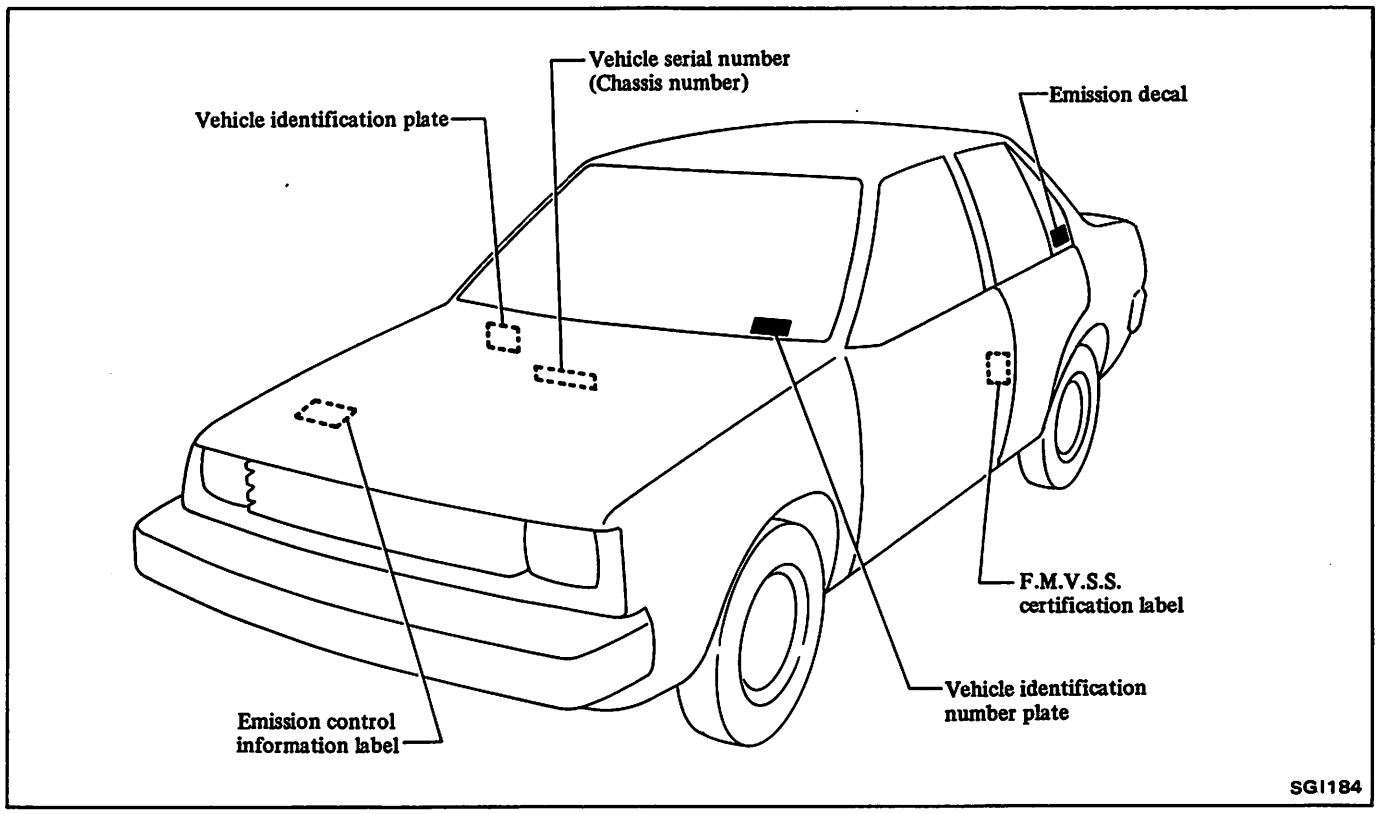
* Light weight spare tire

Prefix and suffix designations



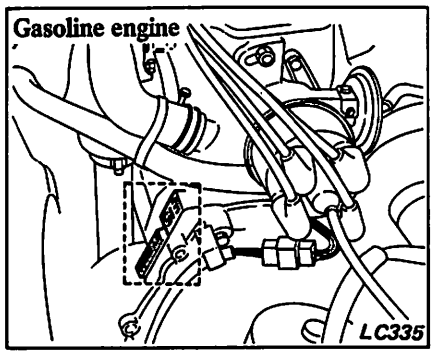
Note: □ means no indication.

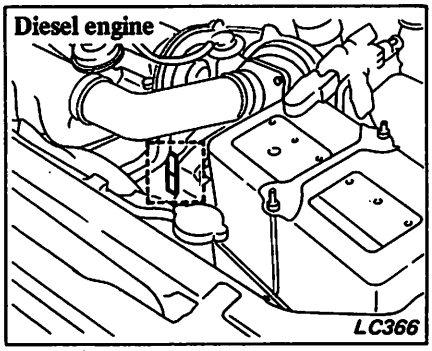
IDENTIFICATION NUMBERS



ENGINE SERIAL NUMBER

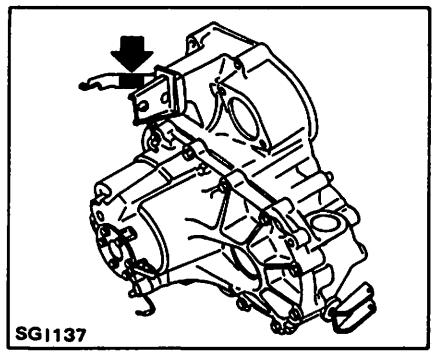
The engine serial number is stamped as shown in the illustrations.





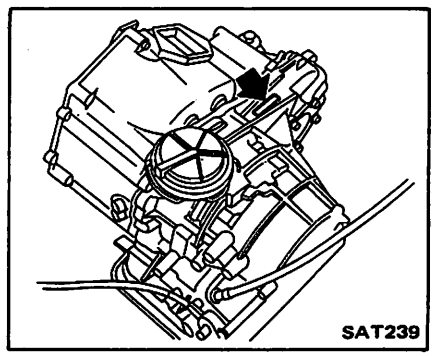
MANUAL TRANSAXLE NUMBER

The manual transaxle serial number label is attached on the clutch withdrawal lever.



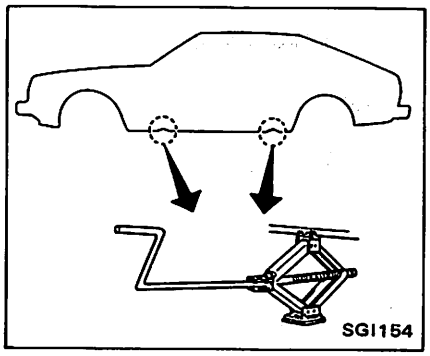
AUTOMATIC TRANSAXLE NUMBER

The automatic transaxle serial number label is attached on the upper face of the transmission case.



LIFTING POINTS AND TOWING

PANTOGRAPH JACK

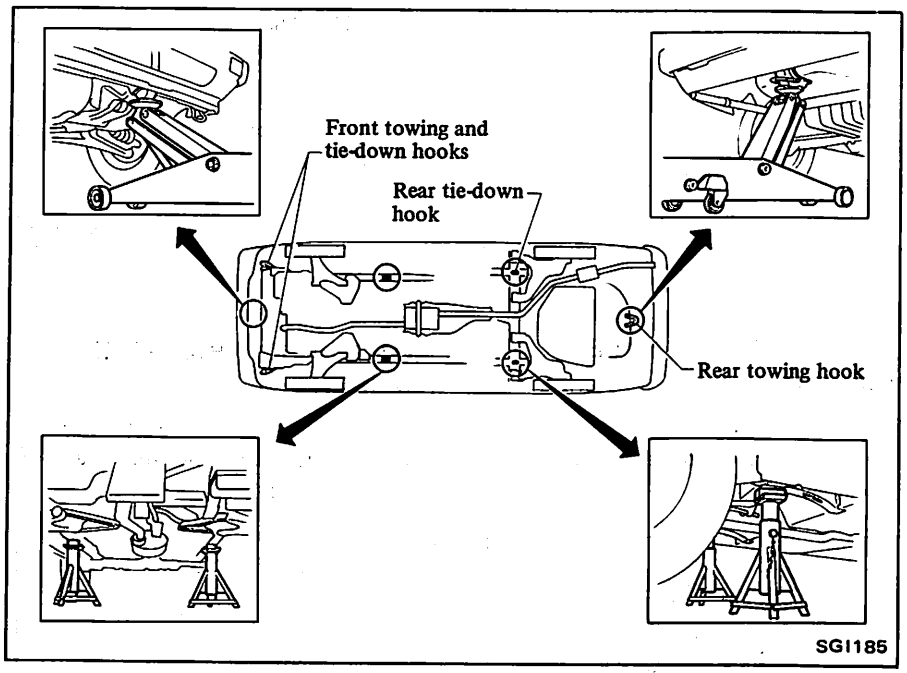


WARNING:

a. Never get under the vehicle while it is supported only by the jack. Always use safety stands to support frame when you have to get under the vehicle.
b. Place wheel chocks at both front and back of the wheel diagonally opposite the jack position.

Apply the pantograph jack furnished with the vehicle to the position indicated in the figure in a safe manner.

GARAGE JACK AND SAFETY STAND



WARNING:

a. When carrying out operations with the garage jack, be sure to support the vehicle with safety stands.
b. When jacking up the rear (front) of the vehicle, place the chocks at the front (rear) of the front (rear) wheels to hold them.

CAUTION:

Always place a wood block between safety stand and vehicle body when supporting body with safety stand.

Apply the garage jack and safety stand to the position indicated in the figure in a safe manner.

TOWING

CAUTION:

a. It is necessary to use proper towing equipment to avoid possible damage to the vehicle during a towing operation.
   Towing is in accordance with Towing Procedure Manual at dealer side.
b. All applicable State or Provincial (in Canada) laws and local laws regarding the towing operation must be obeyed.
c. Before towing, make sure that the transaxle, steering system and power train are in good order. If any unit is damaged, a dolley must be used.
d. Never tow an automatic transaxle model with rear wheels raised (with front wheels on ground) as this may cause serious damage to the vehicle. If it is necessary to tow it with rear wheels raised, always use a towing dolly under the front wheels.
e. If the transaxle is inoperative, tow the vehicle with the front wheels off the ground.
f. When the vehicle is towed with its front wheels on the ground, secure the steering wheel in a straight ahead position with the ignition key turned in "OFF" position.
g. Release the parking brake and set the gearshift lever in "Neutral" position before starting to tow the vehicle.
h. When towing an automatic transaxle model, try to restrict towing speed below 30 km/h (20 MPH) and towing distance less than 30 km (20 miles).
   With manual transaxle model, try to restrict towing speed below 80 km/h (50 MPH) and towing distance less than 80 km (50 miles).
i. Do not apply force to the towing hook in a lateral direction.
   Keep the tow rope or similar device straight ahead, in line with the vehicle.

TIE-DOWN

CAUTION:

Do not tow the vehicle with the rear tie-down hooks.

SPECIAL SERVICE TOOLS

Special Service Tools play very important role in the maintenance of cars. These are essential to the safe, accurate and speedy servicing.
The working times listed in the column under FLAT RATE TIME in FLAT RATE SCHEDULE are computed based on the use of Special Service Tools.
The identification code of maintenance tools is made up of 2 alphabetical letters and 8-digital figures.
The heading two letters roughly classify tools or equipment as:

ST00000000:	Special Service Tool
KV00000000:	Special Service Tool
EM00000000:	Engine Overhauling Machine
GG00000000:	General Gauge
LM00000000:	Garage Tool
HT00000000:	Hand Tool

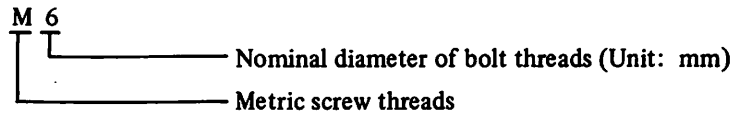
TIGHTENING TORQUE OF STANDARD BOLT

Grade	Bolt or nut size	Bolt or nut diameter* mm	Pitch mm	Tightening torque		
				N·m	kg-m	ft-lb
4T	M6	6.0	1.0	3 - 4	0.3 - 0.4	2.2 - 2.9
	M8	8.0	1.25	8 - 11	0.8 - 1.1	5.8 - 8.0
			1.0	8 - 11	0.8 - 1.1	5.8 - 8.0
	M10	10.0	1.5	16 - 22	1.6 - 2.2	12 - 16
			1.25	16 - 22	1.6 - 2.2	12 - 16
	M12	12.0	1.75	26 - 36	2.7 - 3.7	20 - 27
			1.25	30 - 40	3.1 - 4.1	22 - 30
	M14	14.0	1.5	46 - 62	4.7 - 6.3	34 - 46
7T	M6	6.0	1.0	6 - 7	0.6 - 0.7	4.3 - 5.1
	M8	8.0	1.25	14 - 18	1.4 - 1.8	10 - 13
			1.0	14 - 18	1.4 - 1.8	10 - 13
	M10	10.0	1.5	25 - 35	2.6 - 3.6	19 - 26
			1.25	26 - 36	2.7 - 3.7	20 - 27
	M12	12.0	1.75	45 - 61	4.6 - 6.2	33 - 45
			1.25	50 - 68	5.1 - 6.9	37 - 50
	M14	14.0	1.5	76 - 103	7.7 - 10.5	56 - 76
9T	M6	6.0	1.0	8 - 11	0.8 - 1.1	5.8 - 8.0
	M8	8.0	1.25	19 - 25	1.9 - 2.5	14 - 18
			1.0	20 - 27	2.0 - 2.8	14 - 20
	M10	10.0	1.5	36 - 50	3.7 - 5.1	27 - 37
			1.25	39 - 51	4.0 - 5.2	29 - 38
	M12	12.0	1.75	65 - 88	6.6 - 9.0	48 - 65
			1.25	72 - 97	7.3 - 9.9	53 - 72
	M14	14.0	1.5	109 - 147	11.1 - 15.0	80 - 108

1. Special parts are excluded.
2. This standard is applicable to bolts having the following marks embossed on the bolt head.

Grade	Mark
4T	4
7T	7
9T	9

*: Nominal diameter



SECTION MA

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PERIODIC MAINTENANCE

The following charts show the normal maintenance schedule. Under severe driving conditions, additional or more frequent maintenance will be required. Refer to "Maintenance under severe driving conditions".

The periodic maintenance schedule is repeated beyond the last mileage and period shown.

EMISSION CONTROL SYSTEM MAINTENANCE
— Gasoline engine (U.S.A. and Canada 2-door Sedan MPG models)

MAINTENANCE OPERATION		MAINTENANCE INTERVAL				Reference page
Periodic maintenance should be performed at number of miles, kilometers or months, whichever comes first.	Miles x 1,000	15	30	45	60	
	(Kilometers x 1,000)	(24)	(48)	(72)	(96)	
	Months	12	24	36	48	
Drive belts			I		I	MA-11
Air cleaner filter			R		R	MA-11
Air induction valve filter (Except MPG & California models)			R		R	MA-11
Choke mechanism (choke valve and linkage)			I		I	MA-12
Positive crankcase ventilation (P.C.V.) filter			See NOTE (1)*.			MA-12
Vapor lines			I*		I*	MA-12
Fuel lines (hoses, piping, connections, etc.)			I*		I*	MA-12
Fuel filter			See NOTE (1)*.			MA-13
Engine coolant			R		R	MA-13
Engine oil & oil filter		Replace every 7,500 miles (12,000 km) or 6 months.				MA-13
Spark plugs			R		R	MA-14
Ignition wires			I*		I*	MA-14
Intake & exhaust valve clearance	See NOTE (2).	A	A	A	A	MA-15
Idle rpm	See NOTE (3).	I*	I*	I*	I*	MA-16
Automatic temperature control air cleaner			I*		I*	MA-15
Exhaust gas sensor (MPG & California models only)			I		I	MA-19

NOTE: (1) If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filters might become clogged. In such an event, replace them immediately.

(2) The first 1,000 mile (1,600 km) adjustment is required.

(3) The first 1,000 mile (1,600 km) inspection is required.

(4) Maintenance items and intervals with "*" are recommended by NISSAN MOTOR CO., LTD. Other maintenance items and intervals are required.

Abbreviations: A = Adjust
R = Replace
I = Inspect. Coorect or replace if necessary.

EMISSION CONTROL SYSTEM MAINTENANCE
– Gasoline engine (Canada models except 2-door Sedan MPG)

MAINTENANCE OPERATION			MAINTENANCE INTERVAL				Reference page
Periodic maintenance should be performed at number of miles, kilometers or months, whichever comes first.		Miles x 1,000	15	30	45	60	
		(Kilometers x 1,000)	(24)	(48)	(72)	(96)	
		Months	12	24	36	48	
Drive belts				I		I	MA-11
Air cleaner filter				R		R	MA-11
Air induction valve filter				R		R	MA-11
Choke mechanism (choke valve and linkage)			I	I	I	I	MA-12
Positive crankcase ventilation (P.C.V.) filter				See NOTE (1)*.			MA-12
Vapor lines				I*		I*	MA-12
Fuel lines (hoses, piping, connections, etc.)				I*		I*	MA-12
Fuel filter				See NOTE (1)*.			MA-13
Engine coolant				R		R	MA-13
Engine oil & oil filter			Replace every 7,500 miles (12,000 km) or 6 months.				MA-13
Spark plugs			R	R	R	R	MA-14
Ignition wires				I*		I*	MA-14
Intake & exhaust valve clearance		See NOTE (3).	A	A	A	A	MA-15
Ignition timing			A	A	A	A	MA-17
Idle rpm & mixture ratio	Idle rpm	See NOTE (3).	A	A	A	A	MA-17
	Mixture ratio	See NOTE (4).	I	I	I	I	MA-17
Automatic temperature control air cleaner			I	I	I	I	MA-15
Fuel tank vacuum relief valve (If so equipped)				I		I	EF & EC-87

– Diesel engine (Non-California)

MAINTENANCE OPERATION			MAINTENANCE INTERVAL				Reference page
Periodic maintenance should be performed at number of miles, kilometers or months, whichever comes first.		Miles x 1,000	15	30	45	60	
		(Kilometers x 1,000)	(24)	(48)	(72)	(96)	
		Months	12	24	36	48	
Drive belts		See NOTE (4).	I	I	I	I	MA-32
Air cleaner filter				R		R	MA-32
Fuel lines (hoses, piping, connections, etc.)				I*		I*	MA-37
Rubber hoses (water, air, fuel, blow-by, oil, etc.)				I		I	MA-37
Fuel filter		See NOTE (1).		R		R	MA-33
Engine coolant				R		R	MA-32
Engine oil		See NOTE (2).	Replace every 7,500 miles (12,000 km) or 6 months.				MA-36
Engine oil filter	During the first 15,000 miles (24,000 km):		Replace every 7,500 miles (12,000 km) or 6 months.				MA-36
	After the first 15,000 miles (24,000 km):		Replace every 15,000 miles (24,000 km) or 12 months.				MA-36
Injection nozzle tips			I	I	I	I	MA-34
Intake & exhaust valve clearance		See NOTE (3).	A	A	A	A	MA-36
Idle rpm		See NOTE (4).		I		I	MA-36
Fuel injection timing				I		I	MA-33
Timing belts			Replace every 60,000 miles (100,000 km).				MA-34

NOTE: (1) If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filters might become clogged. In such an event, replace them immediately.
(2) Old engine oil should be drained completely, then new oil added. Never mix new oil with old oil.
(3) The first 1,000 mile (1,600 km) adjustment is required.
(4) The first 1,000 mile (1,600 km) inspection is required.
(5) Maintenance items and intervals with "*" are recommended by NISSAN MOTOR CO., LTD. Other maintenance items and intervals are required.

Abbreviations: A = Adjust
R = Replace
I = Inspect. Coorect or replace if necessary.

CHASSIS AND BODY MAINTENANCE

MAINTENANCE OPERATION Periodic maintenance should be performed at number of miles, kilometers or months, whichever comes first.	Miles x 1,000 (Kilometers x 1,000) Months	MAINTENANCE INTERVAL 15 (24) 12	 30 (48) 24	 45 (72) 36	 60 (96) 48	Reference page
Brake lines & hoses		I	I	I	I	MA-49
Brake pads, discs, drums & linings		I	I	I	I	MA-49
Brake fluid			R		R	MA-48
Manual and automatic transaxle gear oil		I	I	I	I	MA-44, 45
Power steering lines & hoses		I	I	I	I	MA-55
Steering gear & linkage, & suspension parts		I	I	I	I	MA-45, 47, 55
Steering linkage ball joints & front suspension ball joints					I	MA-46
Looks, hinges & hood latch		L	L	L	L	MA-56
Front wheel bearing grease			I		I	MA-46
Exhaust system		I	I	I	I	MA-44
Seat belts, buckles, retractors, anchors & adjuster		I	I	I	I	MA-56

Abbreviations: L = Lubricate
R = Replace
I = Inspect. Correct or replace if necessary

MAINTENANCE UNDER SEVERE DRIVING CONDITIONS

The maintenance intervals shown on the preceding pages are for normal operating conditions. If the vehicle is operated under severe driving conditions as shown below, more frequent maintenance must be performed on the following items as shown in the table.

Severe driving conditions

A – Repeated short distance driving
B – Extensive idling
C – Driving in dusty conditions
D – Driving in extremely low or high ambient temperatures
E – Towing a trailer
F – Driving in areas using road salt or other corrosive materials
G – Driving on rough and/or muddy roads
H – Driving in high humidity areas or in mountainous areas

Driving condition	Maintenance item	Maintenance operation	Maintenance interval
. . C	Air cleaner filter & air induction valve filter	R	More frequently
A B C . E . . .	Engine oil (Gasoline engine)	R	Every 3,000 miles (5,000 km) or 3 months
	(Diesel engine)	R	Every 3,750 miles (6,000 km) or 3 months
A B C . E . . .	Engine oil filter (Gasoline engine)	R	Every 3,000 miles (5,000 km) or 3 months
	(Diesel engine*1)	R	Every 3,750 miles (6,000 km) or 3 months
	(Diesel engine*2)	R	Every 7,500 miles (12,000 km) or 6 months
A . C . E F G .	Brake pads, discs, drums & lining	I	Every 7,500 miles (12,000 km) or 6 months
. . . . . H	Brake fluid	R	Every 15,000 miles (24,000 km) or 12 months
. . . . E . G .	Manual and automatic transaxle gear oil	R	Every 30,000 miles (48,000 km) or 24 months
. . . . . G .	Steering gear & linkage, & suspension parts	I	Every 7,500 miles (12,000 km) or 6 months
. . . D . F G .	Front drive shaft boots	I	Every 7,500 miles (12,000 km) or 6 months
. . C D . F G .	Steering linkage ball joints & front suspension ball joints	I	Every 7,500 miles (12,000 km) or 6 months
. . . . . F . .	Locks, hinges & hood latch	I	Every 7,500 miles (12,000 km) or 6 months
A . . . E F G .	Exhaust system	I	Every 7,500 miles (12,000 km) or 6 months

*1: During the first 15,000 miles (24,000 km)
*2: After the first 15,000 miles (24,000 km)
Maintenance operations: I = Inspect. Correct or replace if necessary R = Replace

GENERAL MAINTENANCE

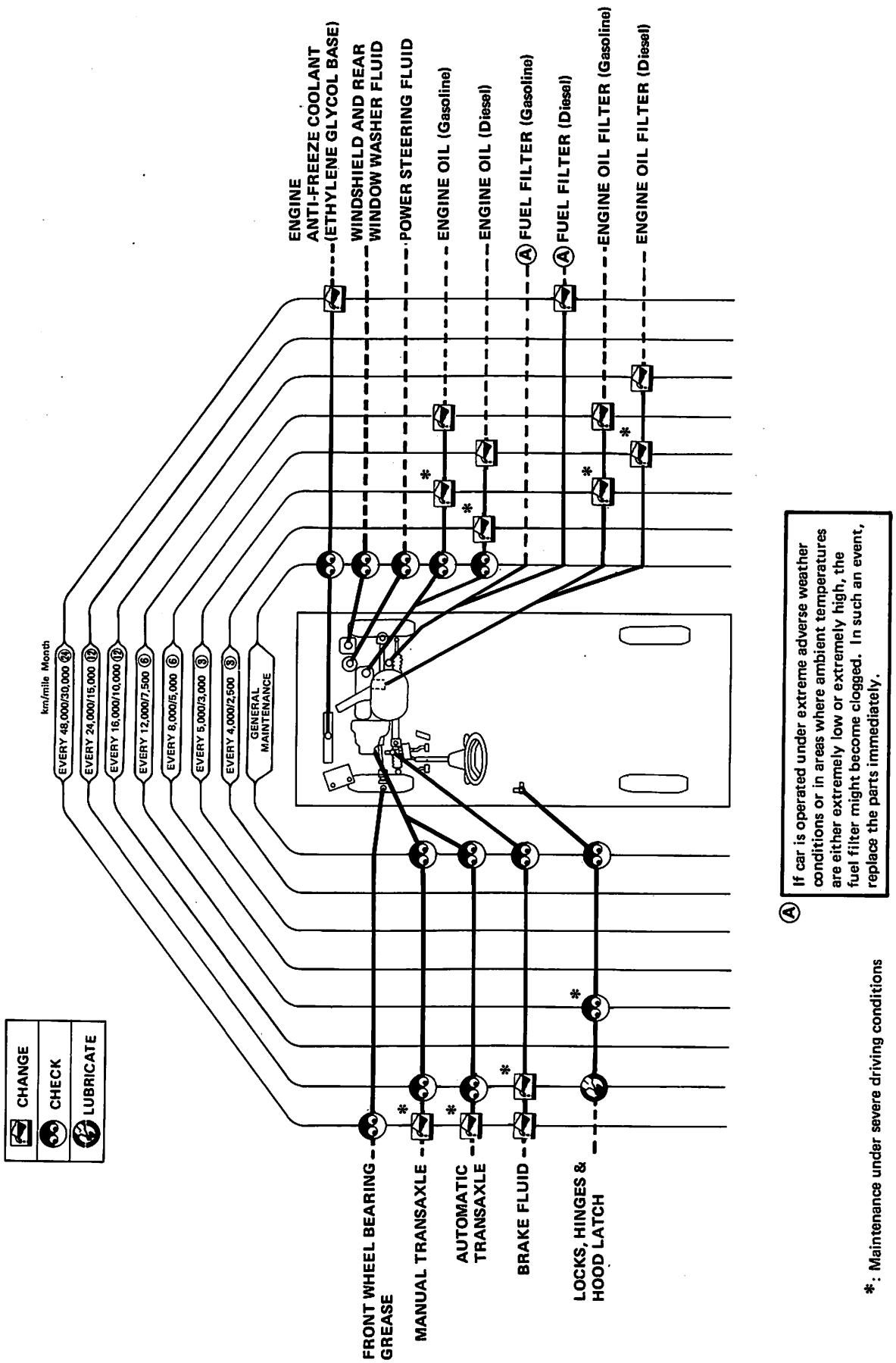
General maintenance includes those items which should be checked during the normal day-to-day operation of the vehicle. They are essential if the vehicle is to continue operating properly. The owners can perform the checks and inspections themselves or they can have their NISSAN/DATSUN dealers do them for a nominal charge.

Item	Reference item in MA section
OUTSIDE THE VEHICLE	
Tires Check the pressure with a gauge periodically when at a service station, including the spare, and adjust to the specified pressure if necessary. Check carefully for damage, cuts or excessive wear.	• CHECKING TIRE CONDITION
Wheel nuts When checking the tires, make sure no nuts are missing, and check for any loose nuts. Tighten if necessary.	• TIRE REPLACEMENT Wheel nut.
Tire rotation Tires should be rotated every 24,000 km (15,000 miles).	• TIRE ROTATION
Wheel alignment and balance If the vehicle should pull to either side while driving on a straight and level road, or if you detect uneven or abnormal tire wear, there may be a need for wheel alignment. If the steering wheel or seat vibrates at normal highway speeds, wheel balancing may be needed.	• CHECKING TIRE CONDITION Abnormal tire wear • CHECKING WHEEL ALIGNMENT • WHEEL INSPECTION
Windshield glass Check for abrasions or scratches.	–
Windshield wiper blades Check for cracks or wear if they do not wipe properly.	–
Fluid leaks Check under the vehicle for fuel, oil, water or other fluid leaks after the vehicle has been parked for a while. Water dripping from the air conditioner after use is normal. If you should notice any leaks or gasoline fumes are evident, check for the cause and correct it immediately.	• INSPECTING MANUAL TRANSAXLE OIL • INSPECTING AUTOMATIC TRANSAXLE FLUID • INSPECTING FRONT AXLE AND SUSPENSION PARTS • INSPECTING REAR AXLE AND SUSPENSION PARTS • INSPECTING BRAKE LINES & HOSES • CHECKING POWER STEERING LINE & HOSES
Doors and engine hood Check that all doors and the eingine hood operate smoothly as well as the trunk lid and back hatch. Also ensure, that all latches lock securely. Lubricate if necessary. Make sure that the secondary latch keeps the hood from opening when the primary latch is released.	• LUBRICATING LOCKS, HINGES AND HOOD LATCH
INSIDE THE VEHICLE	
The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, cleaning the vehicle, etc.	
Lights Make sure that the headlights, stop lights, tail lights, turn signal lights, and other lights are all operating properly and installed securely. Also check headlight aim.	–

Item	Reference item in MA section
Warning lights and buzzers/chimes Make sure that all warning lights and buzzers/chimes are operating properly.	–
Horn Make sure it operates properly.	–
Windshield wiper and washer Check that the wipers and washer operate properly and that the wipers do not streak.	–
Windshield defroster Check that the air comes out of the defroster outlets properly and in sufficient quantity when operating the heater or air conditioner.	–
Rear view mirror Make sure that it is secure.	–
Sun visors Make sure that they can be moved freely and are secure.	–
Steering wheel Check that it has the specified freeplay. Be sure to check for changes in the steering condition, such as excessive freeplay, hard steering or strange noises.	**Specification** **Free play: Less than 35 mm (1.38 in)**
Seats Check front seat position controls such as seat adjusters, seatback recliner, etc. to ensure they operate smoothly and that all latches lock securely in every position. Check that the head restraints move up and down smoothly and that the locks (if so equipped) hold securely in all latched positions. Check that the latches lock securely for folding-down rear seatbacks.	–
Seat belts Check that all parts of the seat belt system e.g. buckles, anchors and retractors operate property and smoothly. Check the belt webbing for cuts, fraying, wear or damage.	• **INSPECTING SEAT BELTS, BUCKLES, ANCHORS, RETRACTORS AND ADJUSTER**
Accelerator pedal Check the pedal for smooth operation and make sure the pedal does not catch or require uneven effort.	–
Clutch pedal Make sure the pedal operates smoothly and check that it has the proper free travel.	• **ADJUSTING CLUTCH PEDAL HEIGHT AND FREE PLAY**
Brakes Check that the brake does not pull the vehicle to one side when applied.	–
Brake pedal Check the pedal for smooth operation and make sure it has the proper distance under it when depressed fully. Check the brake booster function.	• **CHECKING BRAKE PEDAL DEPRESSED HEIGHT** • **CHECKING BRAKE BOOSTER FUNCTION**
Parking brake Check that the lever has the proper travel and confirm that your vehicle is held securery on a fairly steep hill with only the parking brake applied.	• **CHECKING PARKING BRAKE**
Automatic transaxle "Park" mechanism Check that the lock release button on the selector lever operates properly and smoothly. On a fairly steep hill check that your vehicle is held securely with the selector lever in the "P" position without applying any brakes.	–

Item	Reference Item in MA section
UNDER THE HOOD AND VEHICLE The maintenance items listed here should be checked periodically e.g. each time you check the engine oil or refuel.	
Windshield washer fluid Check that there is adequate fluid in the tank.	–
Engine coolant level Check the coolant level when the engine is cold.	–
Radiator and hoses Check the front of the radiator and clean off any dirt, insects, leaves, etc., that may have accumulated. Make sure the hoses have no cracks, deformation, rot or loose connections.	–
Brake fluid level Make sure that the brake fluid level is between the "MAX" and "MIN" lines on the reservoir.	• **INSPECTING BRAKE LINES & HOSES**
Engine drive belts Make sure that no belt if frayed, worn, cracked or oily.	• **CHECKING AND ADJUSTING DRIVE BELT**
Engine oil level Check the level on the dipstick after parking the vehicle on a level spot and turning off the engine.	–
Power steering fluid level Check the level on the dipstick when the fluid is cold and the engine is turned off.	• **CHECKING POWER STEERING FLUID LEVEL**
Automatic transaxle fluid level Check the level on the dipstick after putting the selector lever in "P" with the engine idling.	• **CHECKING AUTOMATIC TRANSAXLE FLUID LEVEL**
Exhaust system Make sure there are no loose supports, cracks or holes. If the sound of the exhaust seems unusual or there is a smell of exhaust fumes, immediately locate the trouble and correct it.	• **INSPECTING EXHAUST SYSTEM**
Underbody The underbody is frequently exposed to corrosive substances such as those used on icy roads or to control dust. It is very important to remove these substances, otherwise rust will form on the floor pan, frame, fuel lines and around the exhaust system. At the end of winter, the underbody should be thoroughly flushed with plain water, being careful to clean those areas where mud and dirt can easily accumulate.	–

LUBRICATION CHART



SMA440A

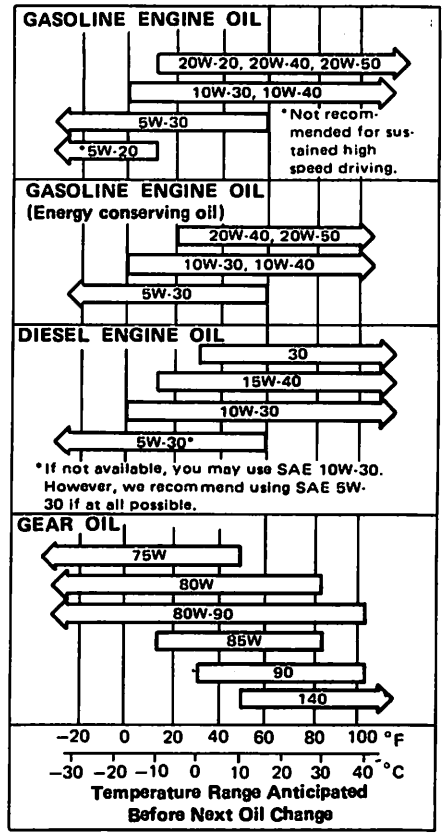
RECOMMENDED FUEL AND LUBRICANTS

FUEL

		Outside temperature	Fuel	Octane (Gasoline)/ Cetane (Diesel) number (minimum)	
				RON	(R+M)/2
Gasoline engine	U.S.A. and Canada 2-door Sedan MPG	–	Unleaded	91	87
	Canada models except 2-door Sedan MPG	–	Unleaded or leaded		
Diesel engine		above 20°F (–7°C)	*2-D Diesel fuel or equivalent blended diesel fuel	42	
		below 20°F (–7°C)	*1-D Diesel fuel or equivalent blended diesel fuel		

*: Check with the service station operator to be sure you get the properly blended fuel.

SAE VISCOSITY NUMBER



LUBRICANTS

Lubricant		Specifications	Remarks
Engine oil	Gasoline (except MPG model)	API SF (Energy Conserving Oils)	For further details, refer to "Engine oil and oil filter recommendation" in Owner's Manual.
	Gasoline (MPG model)	API SF (Energy Conserving Oils) or SE	
	Diesel	API SE/CC, SF/CC, SE/CD, SF/CD or CD	
Manual transaxle gear oil		API GL-4	For further details, refer to the recommended SAE viscosity chart.
Automatic transaxle and power steering gear fluid		Type DEXRON	–
Multi-purpose grease		NLGI No. 2	Lithium soap base
Brake fluid		DOT 3	US FMVSS No. 116
Anti-freeze		–	Ethylene glycol base

APPROXIMATE REFILL CAPACITIES

				Liter	US measure	Imp measure
Fuel tank				50	13-1/4 gal	11 gal
Engine coolant	With heater		M/T	4.7	5 qt	4-1/8 qt
			A/T	5.3	5-5/8 qt	4-5/8 qt
	Without heater		M/T	4.1	4-3/8 qt	3-5/8 qt
			A/T	4.7	5 qt	4-1/8 qt
	Reservoir tank			0.7	3/4 qt	5/8 qt
Engine oil	With oil filter			3.9	4-1/8 qt	3-3/8 qt
	Without oil filter			3.4	3-5/8 qt	3 qt
Transaxle	Manual	4-speed		2.3	4-7/8 pt	4 pt
		5-speed		2.7	5-3/4 pt	4-3/4 pt
	Automatic			6.0	6-3/8 qt	5-1/4 qt
Windshield washer tank				1.5	1-5/8 qt	1-3/8 qt
Power steering system				1.0	1-1/8 qt	7/8 qt
Air conditioning system	Compressor oil			0.15	5.1 fl oz	5.3 fl oz
	Refrigerant			0.8 - 1.0 kg	1.8 - 2.2 lb	1.8 - 2.2 lb

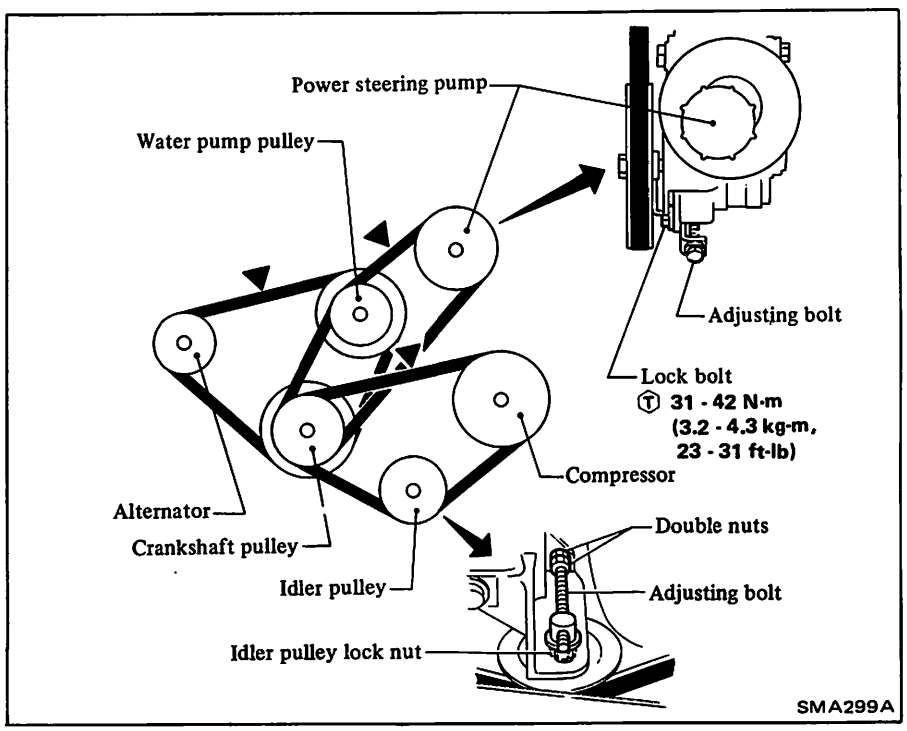
ENGINE MAINTENANCE (E15 & E16)

BEFORE ENGINE START

CHECKING DRIVE BELTS

1. Inspect for cracks and wear. Replace if necessary.
2. Check drive belt deflections by pushing midway between pulleys.
   Adjust if necessary.

Drive belt deflection mm (in)	Adjust deflection of used belt	Set deflection of new belt
Alternator	13 - 17 (0.51 - 0.67)	10 - 14 (0.39 - 0.55)
Air conditioner	9 - 11 (0.35 - 0.43)	7 - 9 (0.28 - 0.35)
Power steering	7 - 9 (0.28 - 0.35)	6.5 - 8.5 (0.256 - 0.335)
Applied pushing force N (kg, lb)	98 (10, 22)	



Alternator belt

1. Loosen the upper and lower alternator securing bolts until the alternator can be moved slightly.
2. Move the alternator with a prying bar until the belt deflection is within the specified range. Then tighten the bolts securely.

Air conditioner belt

1. Loosen the idler pulley lock nut and adjusting bolt double nuts for the belt being adjusted.
2. Adjust the adjusting bolt until the belt deflection is within the specified range.
3. Tighten the adjusting bolt double nuts and idler pulley lock nut securely.

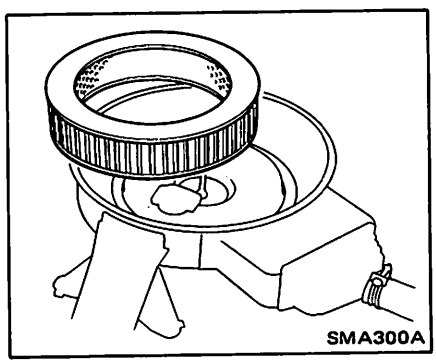
Power steering belt

1. Loosen the power steering oil pump adjusting lock bolt and its securing bolt for the belt being adjusted.
2. Adjust the adjusting bolt until the belt deflection is within the specified range.
3. Tighten the adjusting bolt lock bolt and oil pump securing bolt securely.

REPLACING AIR CLEANER FILTER

Air cleaner filter is a viscous paper type and does not require cleaning.

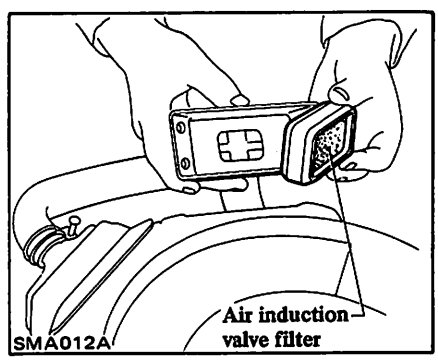
1. Remove air cleaner cover and remove air cleaner filter.



2. Install new air cleaner filter and install air cleaner cover.

REPLACING AIR INDUCTION VALVE FILTER

Stop engine and remove air induction valve case, and remove filter.



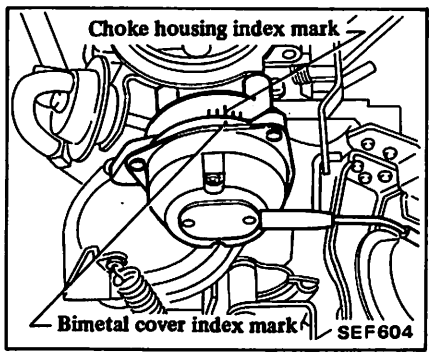
CHECKING CHOKE MECHANISM
(Lubrication and cleaning of choke plate and linkage)
(U.S.A.)

1. Check choke valve and linkage for free operation, and clean choke valve or lubricate choke linkage if necessary.
2. Before starting engine, fully open throttle valve and ensure that choke valve closes properly.

CHECKING CHOKE MECHANISM
(Choke plate and linkage)
(Canada)

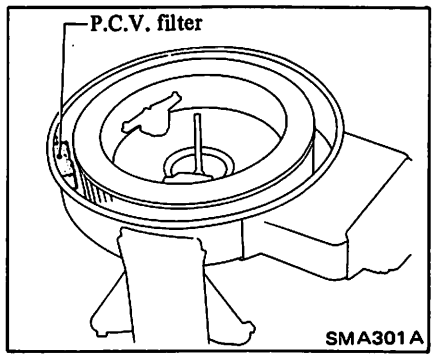
1. Check choke valve and mechanism for free operation, and clean or replace if necessary. Binding can result from petroleum gum formation on choke shaft or from damage.
2. Before starting engine, fully open throttle valve and ensure that choke valve closes properly.
3. Push choke valve with your finger, and check for binding.
4. Check to be sure that bi-metal cover index mark is set at the center of choke housing index mark as shown below.

Do not set bimetal cover index mark at any position except the center of choke housing index mark.



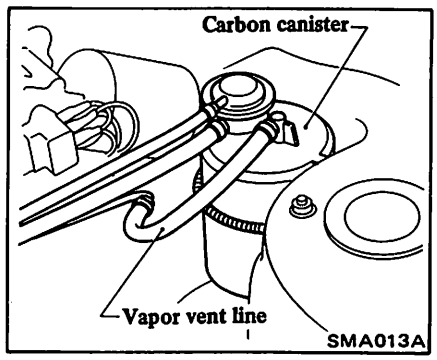
REPLACING P.C.V. FILTER

Remove air cleaner cover, and replace filter.



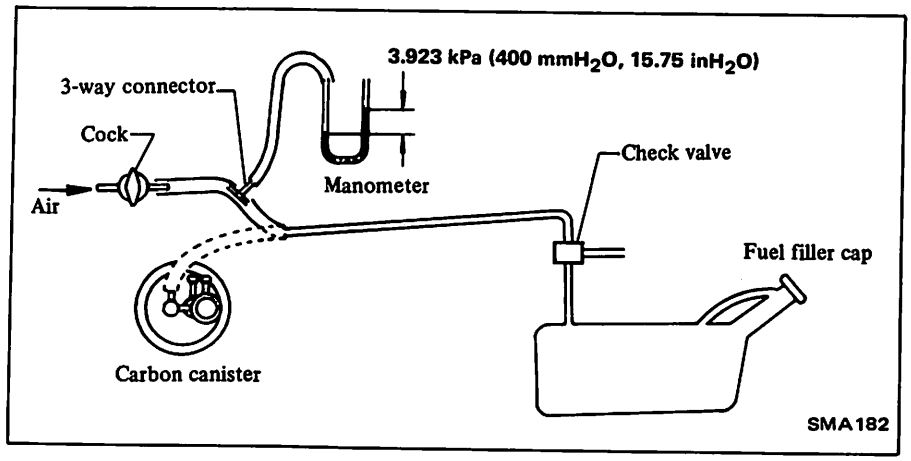
CHECKING VAPOR LINES

1. Check all hoses and fuel tank filler cap.
2. Disconnect vapor vent line connecting carbon canister to fuel tank.



3. Connect 3-way connector, manometer and cock (or equivalent 3-way charge cock) to end of vent line.
4. Slowly supply fresh air into vapor vent line through cock until pressure reaches 3.923 kPa (400 mmH_2O, 15.75 inH_2O).
5. Shut cock completely.
6. After 2-1/2 minutes, measure height of liquid in manometer.
7. Variation in height should remain 0.245 kPa (25 mmH_2O, 0.98 inH_2O).
8. When filler cap does not close completely, height should soon drop to zero.
9. If height does not soon drop to zero when filler cap is removed, the cause is a clogged hose.

If vent line is clogged, breathing in fuel tank is poor, thus causing insufficient delivery of fuel to engine or vapor lock. It must, therefore, be repaired or replaced.



CHECKING FUEL LINES
(Hoses, piping, connections, etc.)

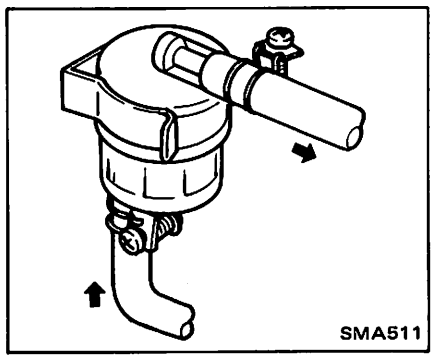
Check fuel lines for loose connections, cracks and deterioration. Retighten loose connections and replace any damaged or deformed parts.

REPLACING FUEL FILTER

Disconnect battery cable.

1. Disconnect fuel hoses from fuel filter and replace it.
2. Check filter for contamination and water deposit.

Plug open of fuel hose immediately after fuel hose has been removed from fuel filter.

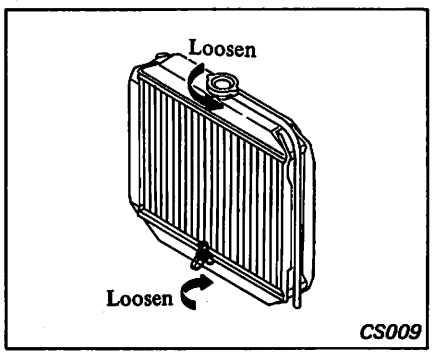


CHANGING ENGINE COOLANT

WARNING:
To avoid being scalded, never change the coolant when the engine is hot.

- **When replacing engine coolant, set heater "TEMP" control lever to fully "HOT" position.**

1. To flush system, open drain cock at bottom of radiator. Then thoroughly flush until clear water comes out.

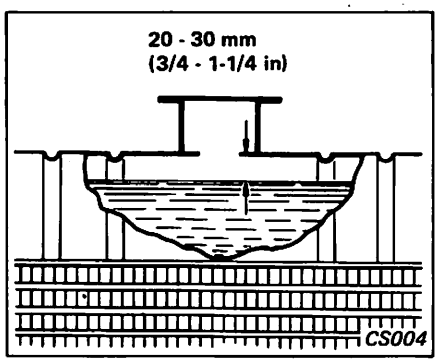


2. Close drain cock.
3. Fill radiator with coolant up to specified level. Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

Coolant capacity:

Liter (US qt, Imp qt)

	M/T	A/T
With heater	4.7 (5, 4-1/8)	5.3 (5-5/8, 4-5/8)
Without heater	4.1 (4-3/8, 3-5/8)	4.7 (5, 4-1/8)
Reservoir tank	0.7 (3/4, 5/8)	

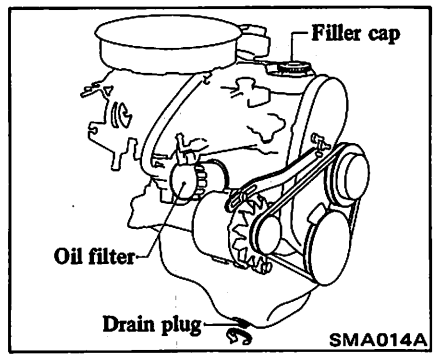


4. Install filler cap and fill reservoir tank with coolant up to "MAX" level.
5. Start engine and warm up engine until water temperature indicator points to the middle of gauge.
6. Stop engine and cool engine off completely.
7. Refill radiator with coolant up to filler opening if the coolant level is lever the specified level.
8. Also, refill reservoir tank with coolant up to "MAX" level.

CHANGING ENGINE OIL AND REPLACING OIL FILTER

1. Start engine and warm it up until water temperature indicator points to middle of gauge, then turn off engine.
2. Remove oil filler cap and oil pan drain plug, and allow oil to drain.

WARNING:
Use care as the engine oil is hot.

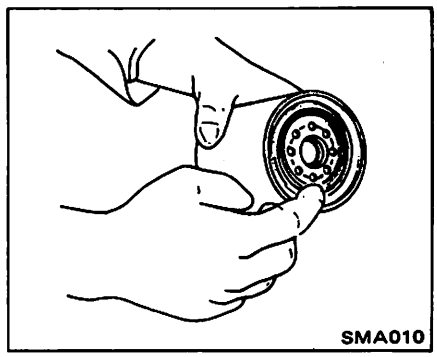


- **A milky oil indicates the presence of cooling water. Isolate the cause and take corrective measure.**
- **An oil with extremely low viscosity indicates dilution with gasoline.**

3. Using oil filter wrench, remove oil filter.
4. After draining engine oil, wipe oil pan drain hole with a clean rag.
5. Clean and install oil pan drain plug with washer.

Ⓣ : **Oil pan drain plug**
35 - 47 N·m
(3.6 - 4.8 kg-m, 26 - 35 ft-lb)

6. Wipe oil filter mounting surface with a clean rag.
7. Smear a little engine oil on rubber seal of new oil filter.

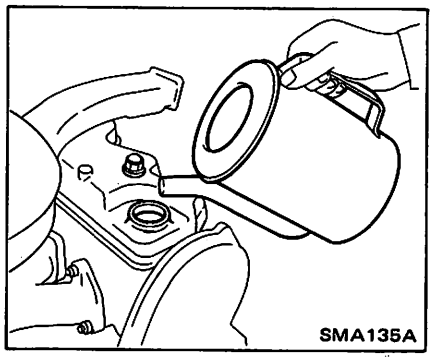


8. Install new oil filter by hand.

Do not use oil filter wrench to tighten the filter.

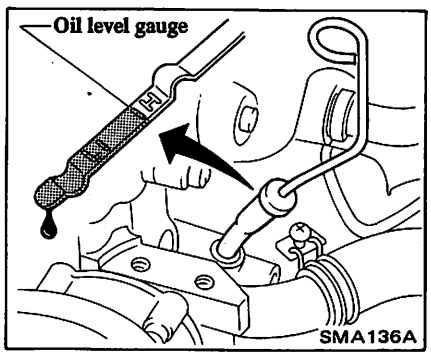
9. Refill engine with the appropriate new engine oil by referring to Recommended Lubricants.
Check oil level with dipstick.

Oil capacity:
With oil filter
3.9 liters
(4-1/8 US qt, 3-3/8 Imp qt)
Without oil filter
3.4 liters
(3-5/8 US qt, 3 Imp qt)



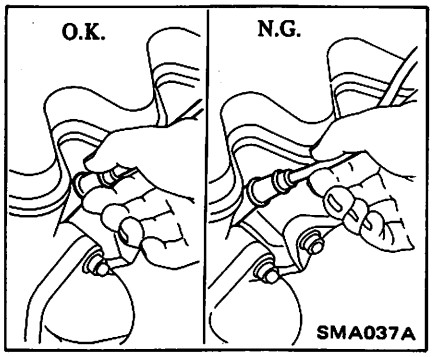
10. Install oil filler cap and start engine.
11. Check area around drain plug and oil filter for any sign of oil leakage.
If leakage is evident, retighten or replace.
12. Run engine until water temperature indicator points to middle of gauge. Then turn off engine and wait several minutes. Check oil level with oil level gauge. If necessary, add engine oil.

When checking oil level, park car on a level surface.

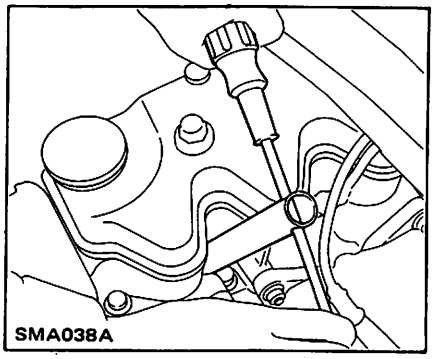


REPLACING SPARK PLUG

1. Remove air cleaner.
2. Disconnect spark plug wire at boot. **Do not pull on the wires.**



3. Remove spark plugs with spark plug wrench.



4. Install new spark plugs are reconnect high tension cables.

Spark plug type:

	U.S.A. and Canada M.P.G. models	*Canada models
Standard	BPR5ES-11	BPR5ES
Hot type	BPR4ES-11	BPR4ES
Cold type	BPR6ES-11	BPR6ES
Plug gap mm (in)	1.0 - 1.1 (0.039 - 0.043)	0.8 - 0.9 (0.031 - 0.035)

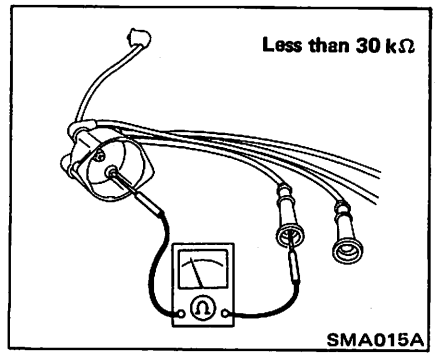
*: Not including Canada M.P.G. model

Ⓣ : Spark plug
20 - 29 N·m
(2.0 - 3.0 kg-m,
14 - 22 ft-lb)

CHECKING IGNITION WIRES

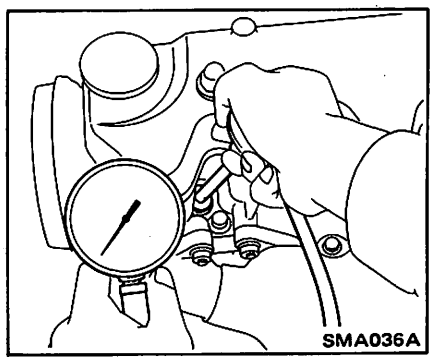
1. Visually check wiring for cracks, and damaged and burned terminals.
2. Using an ohmmeter, measure the resistance between cable terminal on the spark plug side and corresponding electrode inside cap.

- **Shake the wire while measuring resistance to ckeck for intermittent brakes.**



CHECKING ENGINE COMPRESSION PRESSURE

1. Warm up engine until water temperature indicator points to middle of gauge.
2. Remove air cleaner and all spark plugs.
3. Disconnect anti-dieseling solenoid valve connector.
4. Properly attach a compression tester to spark plug hole in cylinder being tested.



5. Depress accelerator pedal to fully open throttle and choke valve.
6. Crank engine and read gauge indication.
- Run engine at about 350 rpm.
- Engine compression measurement should be made as quickly as possible.

Compression pressure:
kPa (kg/cm^2, psi)/at rpm
Standard
1,245 (12.7, 181)/350
Minimum
981 (10.0, 142)/350

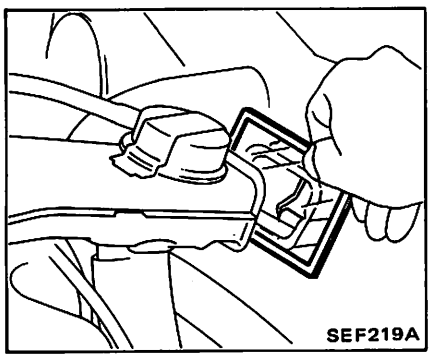
7. If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into cylinders through the spark plug holes and retest compression.

- **If adding oil helps the compression pressure,** chances are that piston rings are worn or damaged.
- **If pressure stays low,** valve may be sticking or seating improperly.
- **If cylinder compression in any two adjacent cylinders is low, and if adding oil does not help the compression,** there is leakage past the gasketed surface.
  Oil and water in combustion chambers can result from this problem.

CHECKING AUTOMATIC TEMPERATURE CONTROL (A.T.C.) AIR CLEANER

1. Check that vacuum hoses (Intake manifold to temperature sensor, idle compensator and vacuum motor) are securely connected in correct position.
2. Check each hose for cracks or distortion.
3. Check A.T.C. system for function by proceeding as follows:
   Confirm that engine is cold before starting test.

With engine turned off, check position of air control valve by hand or mirror.



Air control valve is in correct position if its cold air inlet is open and hot air inlet is closed.

4. Start engine and keep idling.
   Immediately after starting engine, air control valve is in correct position if its cold air inlet is closed and hot air inlet is open.
5. Check that air control valve gradually opens to cold air inlet side as engine warms up. When environmental temperature around temperature sensor is low, allow more time for engine warming up to facilitate smooth operation of air control valve.

If the above test reveals any problem in the operation of air control valve, carry out the further inspection described in Section EF.

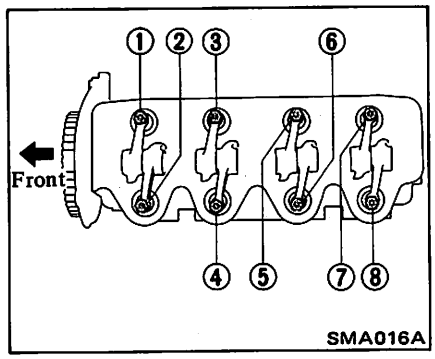
AFTER ENGINE WARM-UP

ADJUSTING INTAKE AND EXHAUST VALVE CLEARANCE

Adjustment should be made while engine is warm but not running.

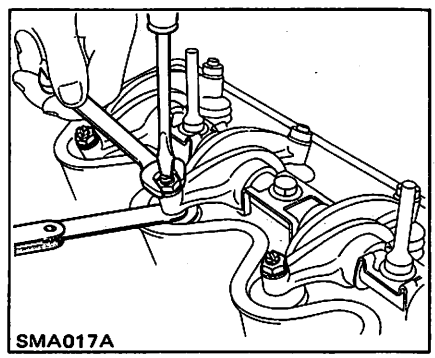
1. Start engine and warm it up until water temperature indicator points to middle of gauge. Then turn off engine.
2. Remove air cleaner securing bolts.
3. Remove valve rocker cover.
4. Rotate crankshaft.
5. Set No. 1 cylinder in top dead center on its compression stroke, and adjust valve clearance ①, ②, ③ and ⑥.
6. Set No. 4 cylinder in top dead center on its compression stroke and adjust valve clearance ④, ⑤, ⑦ and ⑧.

Valve clearance (Hot):
Intake and exhaust
0.28 mm (0.011 in)



(1) Loosen valve rocker adjusting screw lock nut and turn adjusting screw until specified clearance is obtained.
(2) After adjustment, tighten lock nut and recheck clearance.

Ⓣ : **Adjusting screw lock nut**
16 - 21 N-m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)



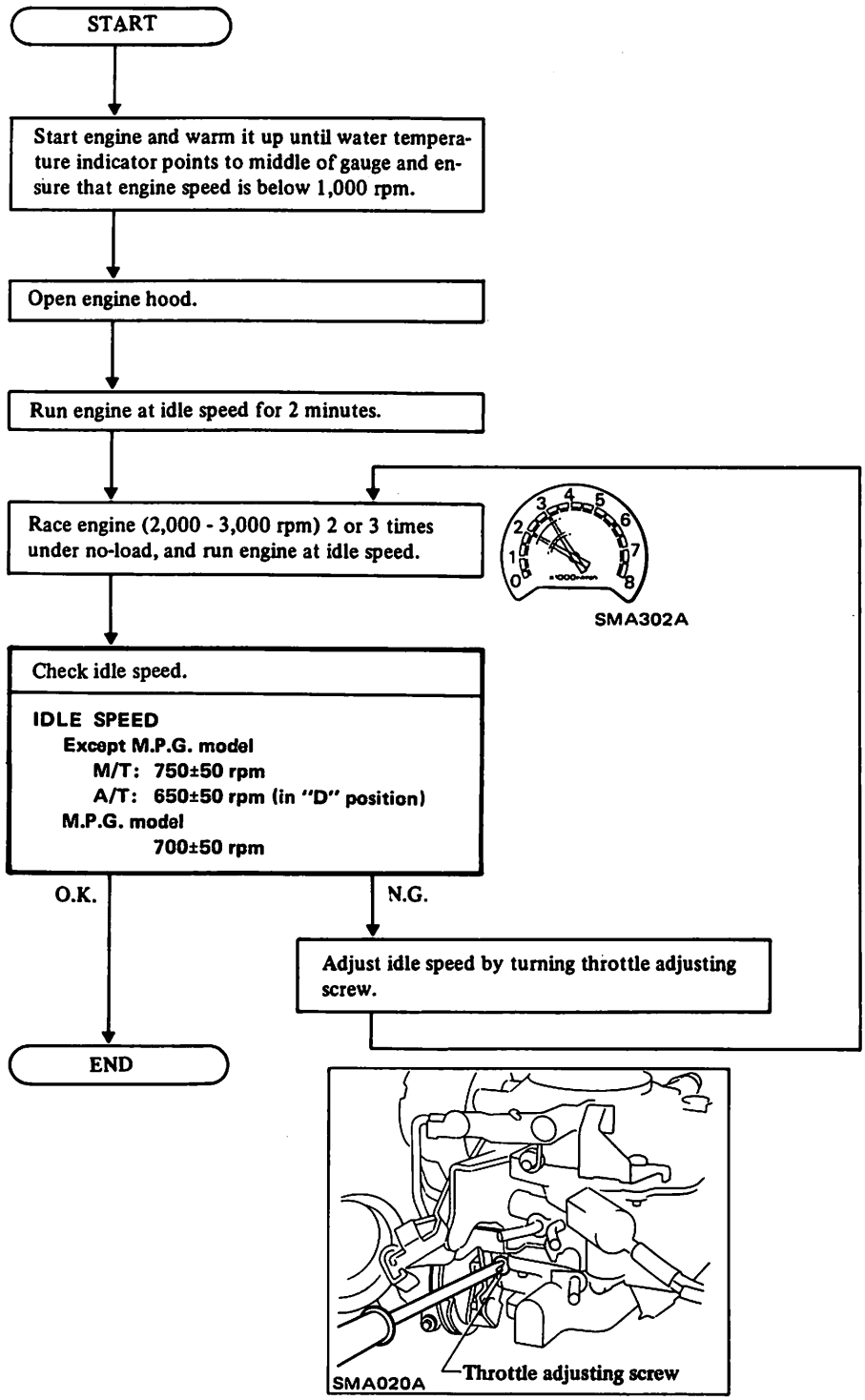
ADJUSTING IDLE RPM
(U.S.A. and Canada M.P.G. models)

Preparation

1. Connect engine tachometer in its proper position.
2. On air conditioner equipped models, the air conditioner system should be "OFF".
3. Apply parking brake and block both front and rear wheels with chocks.
4. The electrical components (lights, heater, all accessories, etc.) should be turned off so that idle speed can be inspected and/or adjusted accurately. (Refer to EF & EC section.)
5. Make the check after the radiator cooling fan has stopped. If it is operating, wait until it stops.

WARNING:
- **a. Inspections should be carried out while shift lever is in "D" position on automatic transaxle equipped models and in "Neutral" on manual transaxle equipped models.**
- **b. On automatic transaxle equipped models, racing the engine should be carried out while shift lever is in "N" or "P" position and brake pedal should be depressed.**
- **c. After adjustment has been made, shift the lever to "N" or "P" position.**

Maintenance procedure



ADJUSTING IDLE RPM, ADJUSTING IGNITION TIMING AND CHECKING MIXTURE RATIO

(Canada model except M.P.G.)

Preparation

1. Make sure that the following parts are in good order.
   - Ignition system
   - Engine oil and coolant levels
   - Valve clearance
2. Connect engine tachometer and timing light in their proper positions.
3. Insure that these switches and units are in the following positions:
   - Headlamp switch: OFF
   - Heater blower: OFF
   - Air conditioning switch: OFF (if equipped)
   - Steering: KEEP WHEELS STRAIGHT AHEAD (if equipped with power steering)
4. Make the check after the radiator cooling fan has stopped. If it is operating, wait until it stops.
5. Apply parking brake and block both front and rear wheels with chocks.
6. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.

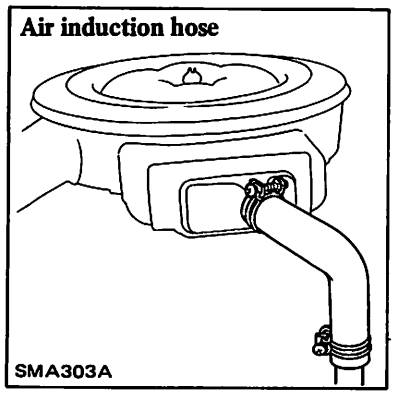
WARNING:

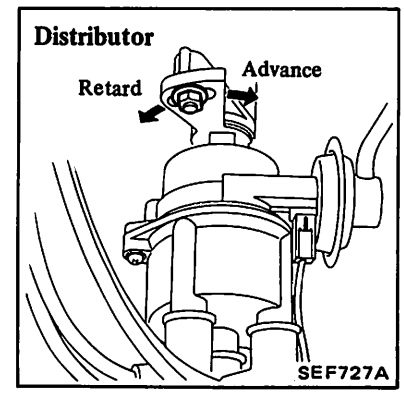
a. Inspections should be carried out while shift lever is in "D" position on automatic transaxle equipped models and in "Neutral" on manual transaxle equipped models.

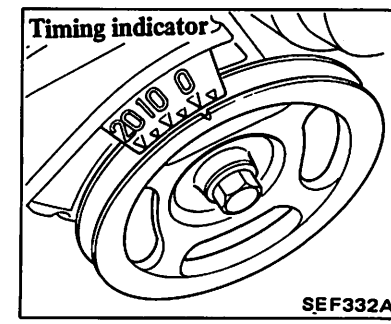
b. On automatic transaxle equipped models, racing the engine should be carried out while shift lever is in "N" or "P" position and brake pedal should be depressed.

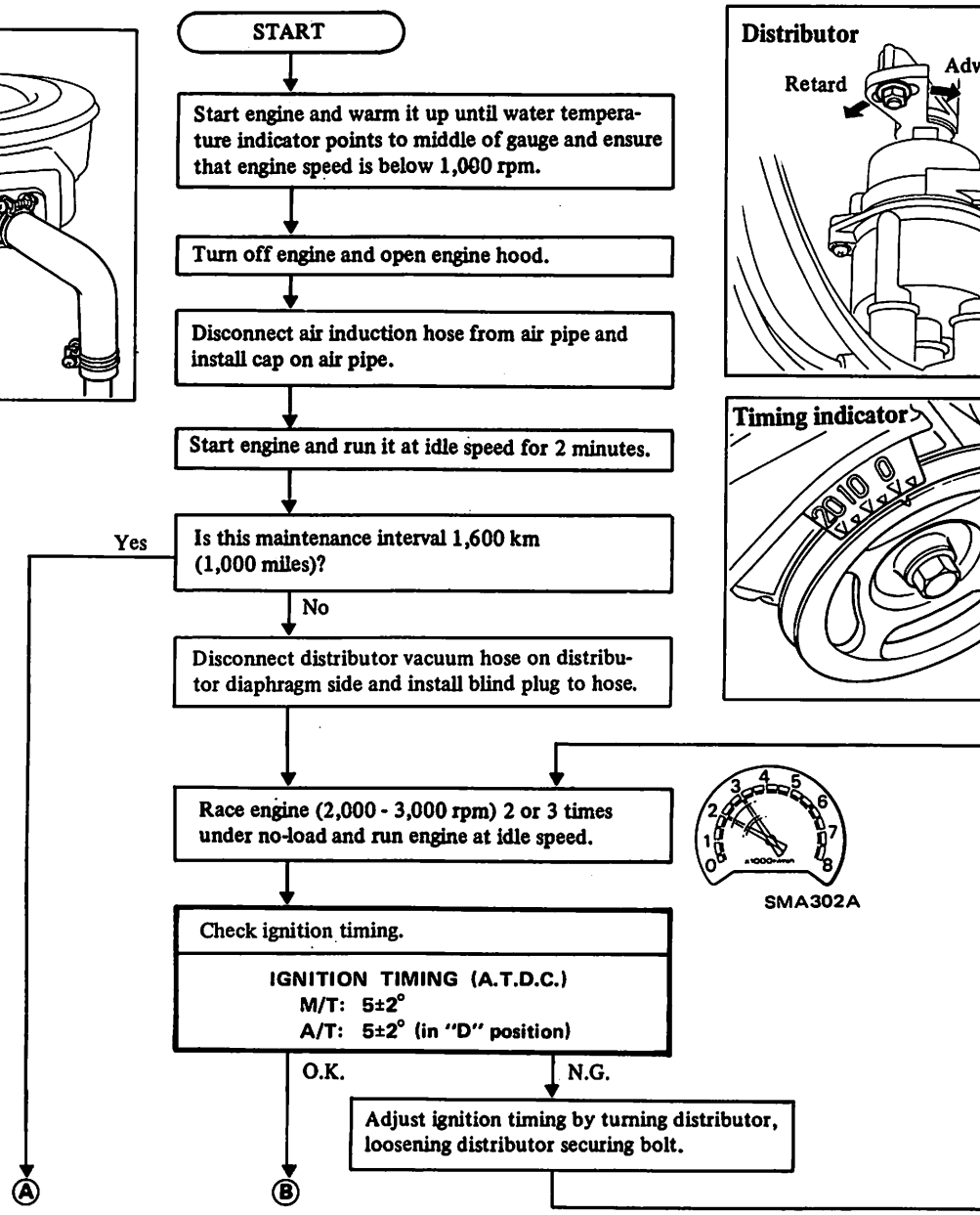
c. After adjustment has been made, shift the lever to "N" or "P" position.

Maintenance procedure









Ⓐ

Ⓑ

Connect distributor vacuum hose to distributor diaphragm.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load, and run engine at idle speed.



SMA302A

Check idle speed.

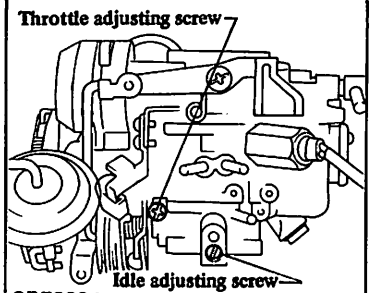
IDLE SPEED
M/T: 750±50 rpm
A/T: 650±50 rpm (in "D" position)

O.K.

N.G.

Adjust idle speed by turning throttle adjusting screw.

TAS & SAS



SEF333A

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load, and run engine at idle speed.



SMA302A

Check idle "CO"%.

IDLE "CO"%
M/T: 2±1
A/T: 2±1 (in "D" position)

O.K.

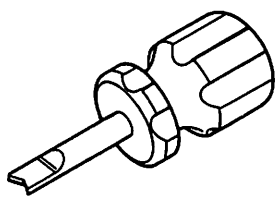
N.G.

Adjust idle "CO"% by turning idle adjusting screw. Refer to NOTE for idle limiter cap

Idle limiter cap

A Metal idle limiter cap has been adopted, so adjust idle adjusting screw with idle adjusting screwdriver.

KV10108300



SMA199A

Turn off engine and connect air induction hose to air pipe.

Start engine.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.



SMA302A

Check idle speed.

IDLE SPEED
M/T: 750±50 rpm
A/T: 650±50 rpm (in "D" position)

O.K.

N.G.

Adjust idle speed by turning throttle adjusting screw.

END

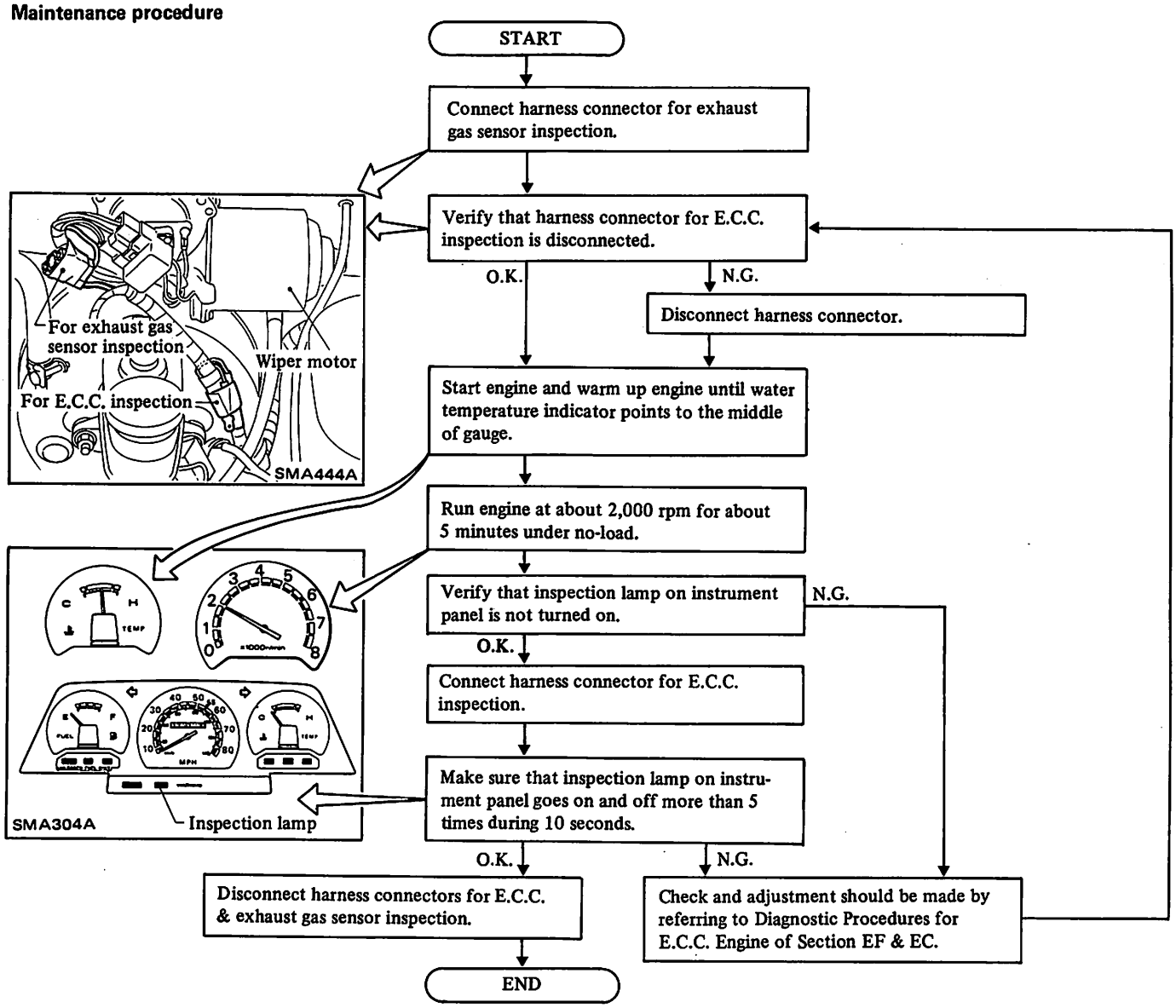
CHECKING EXHAUST GAS SENSOR
(California and M.P.G. models)

Preparation

When checking exhaust gas sensor, make sure that the following parts are in good order.

- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.C. component parts
- Main harness connectors
- Hoses
- Oil filler cap and oil level gauge
- Valve clearance, engine compression

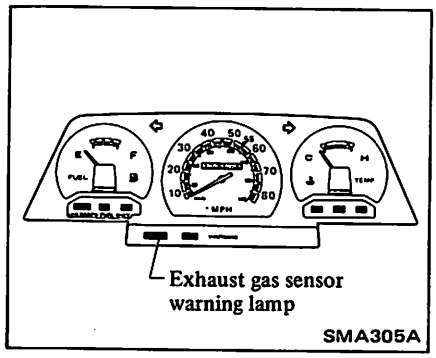
Maintenance procedure



48,000 km (30,000 miles) or 24 Months Service

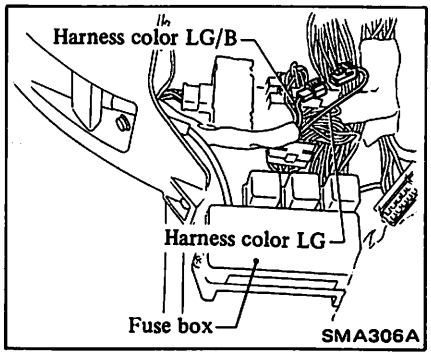
Exhaust gas sensor should be checked after 48,000 km (30,000 miles) or 24 months of operation.

After car has been operated for 48,000 km (30,000 miles), exhaust gas sensor warning lamp will come on to indicate that sensor should be inspected.



For California and U.S.A. M.P.G. models

After inspection, disconnect warning lamp harness connector so that warning lamp will not come on thereafter.



If sensor should be checked on the 24th month before 48,000 km (30,000 miles) of operation, also disconnect warning lamp harness connector.

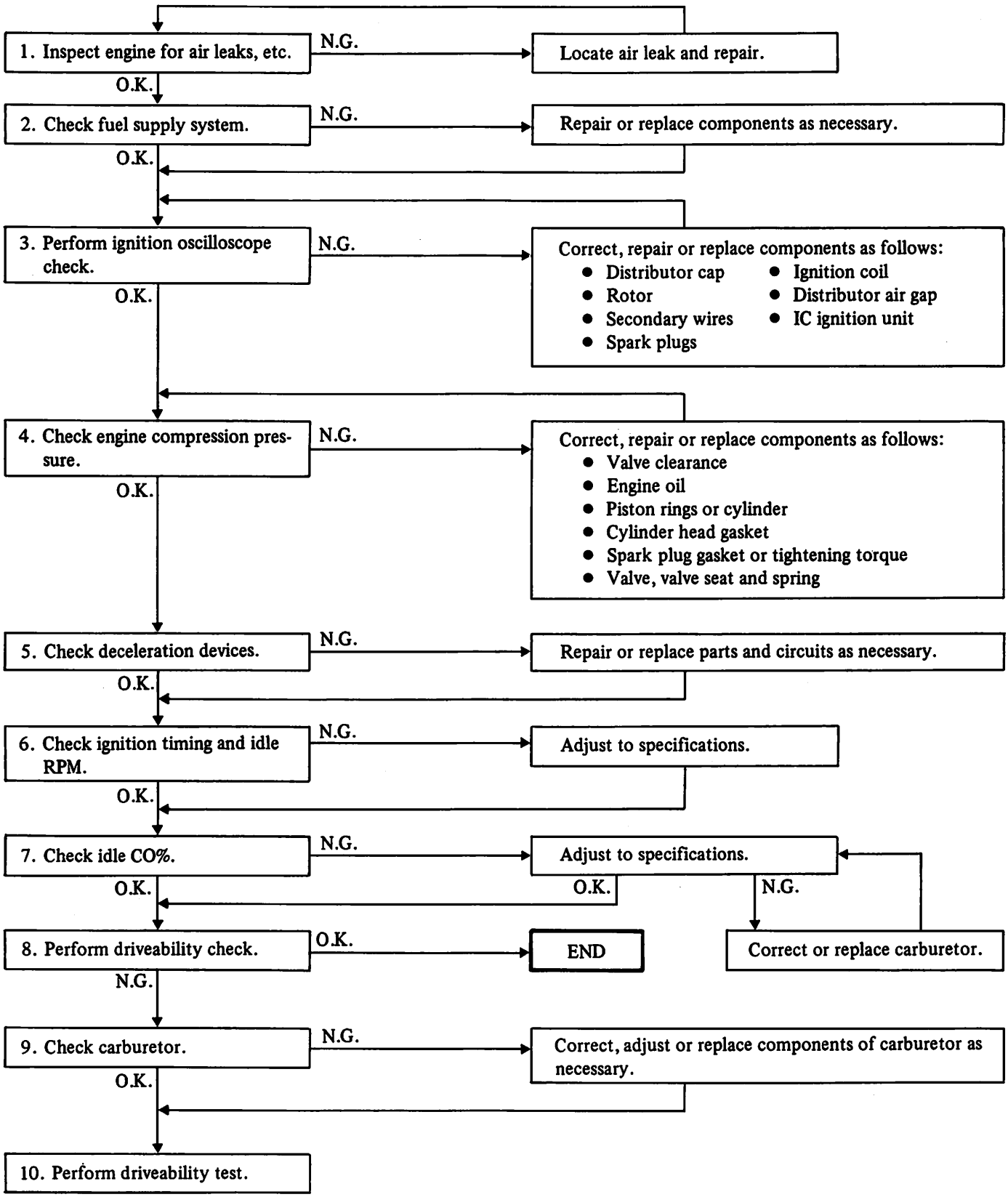
For Canada M.P.G. models

After inspection, disconnect the hold relay so that warning lamp will not come on thereafter.

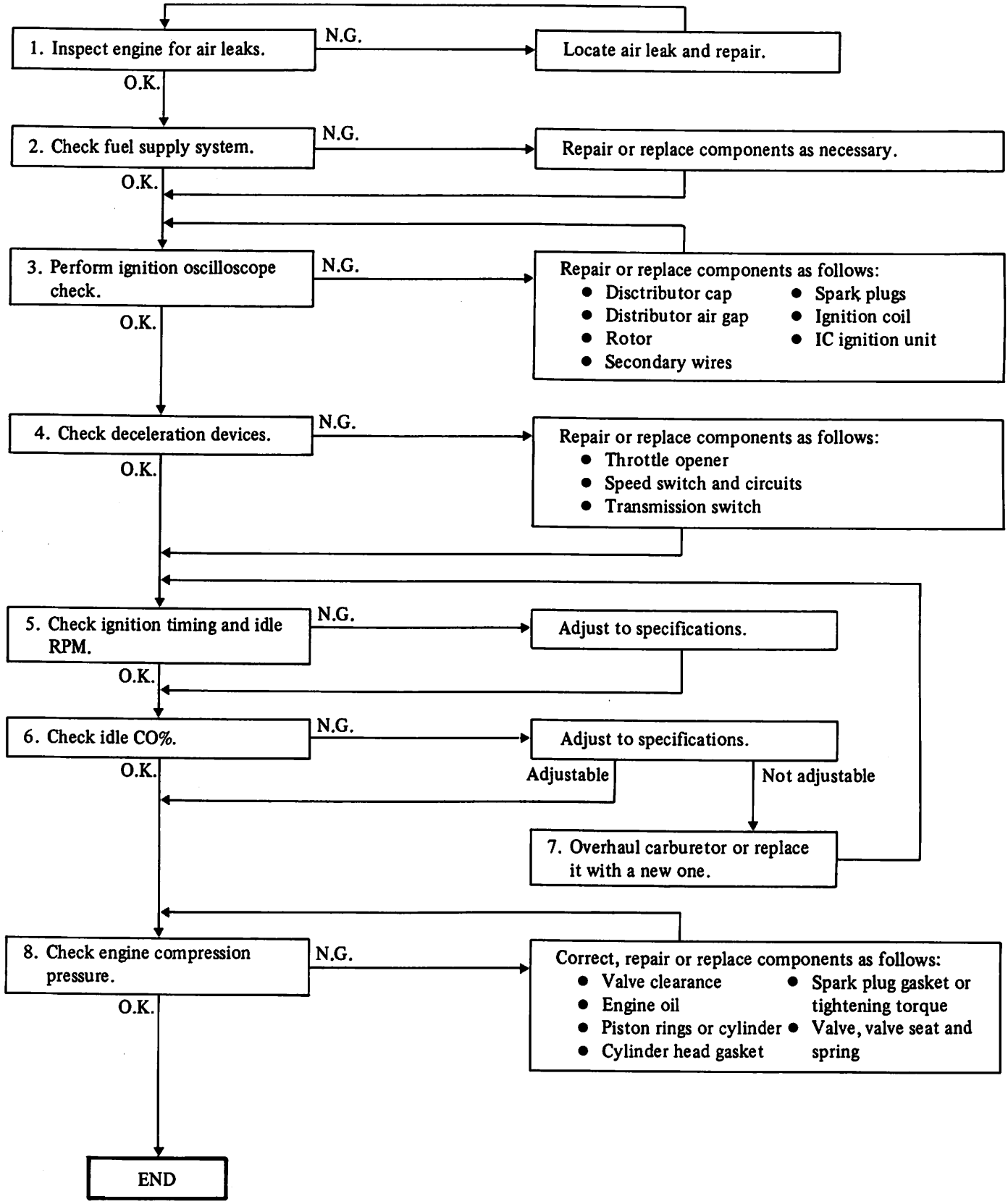
DIAGNOSTIC PROCEDURE FOR PROBLEMS

DIAGNOSTIC PROCEDURE FOR CARBURETOR ENGINES

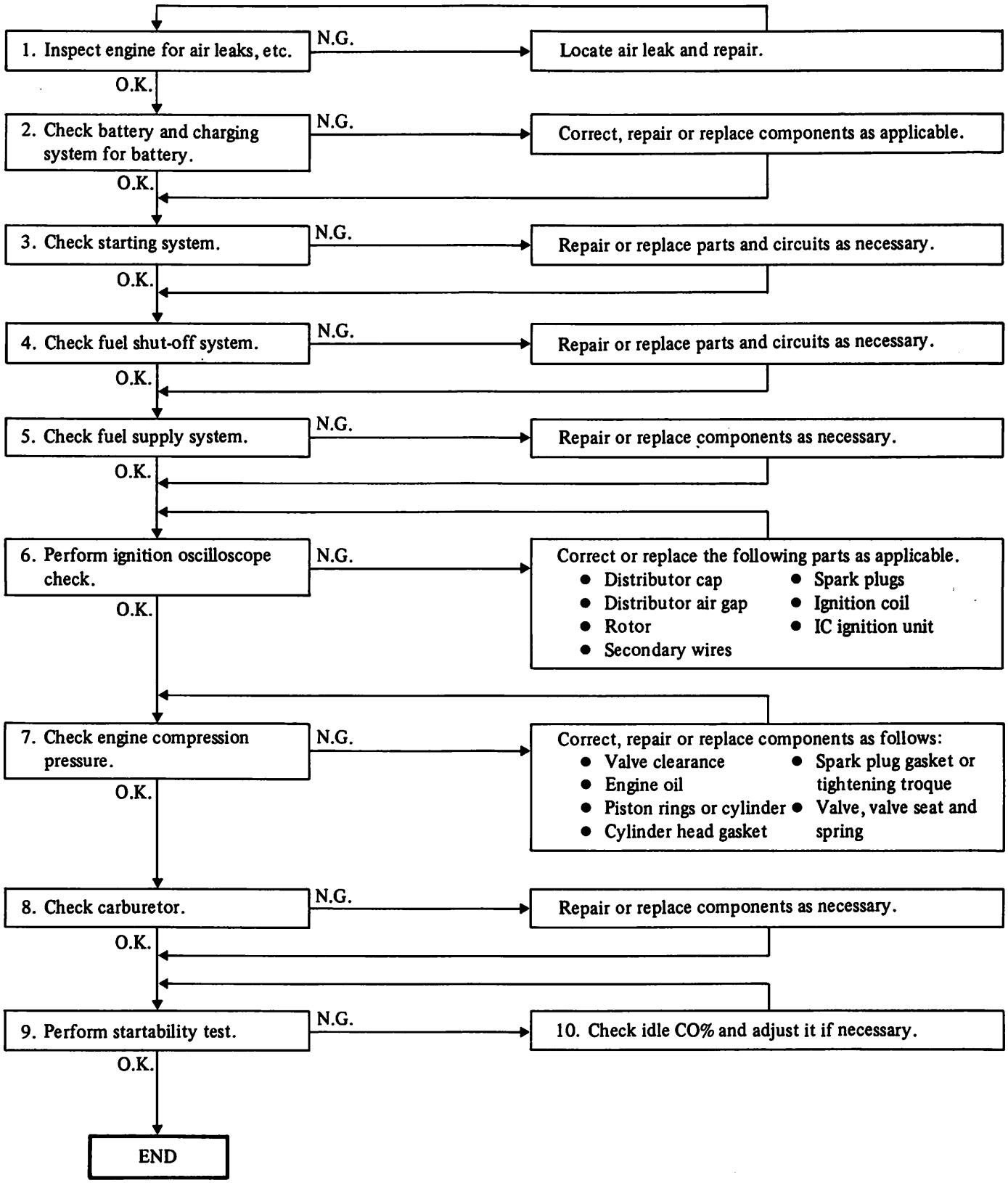
DRIVEABILITY (Hesitation, surging, flat spot, backfire, afterfire, lack of power, run-on, excessive fuel consumption, etc.)



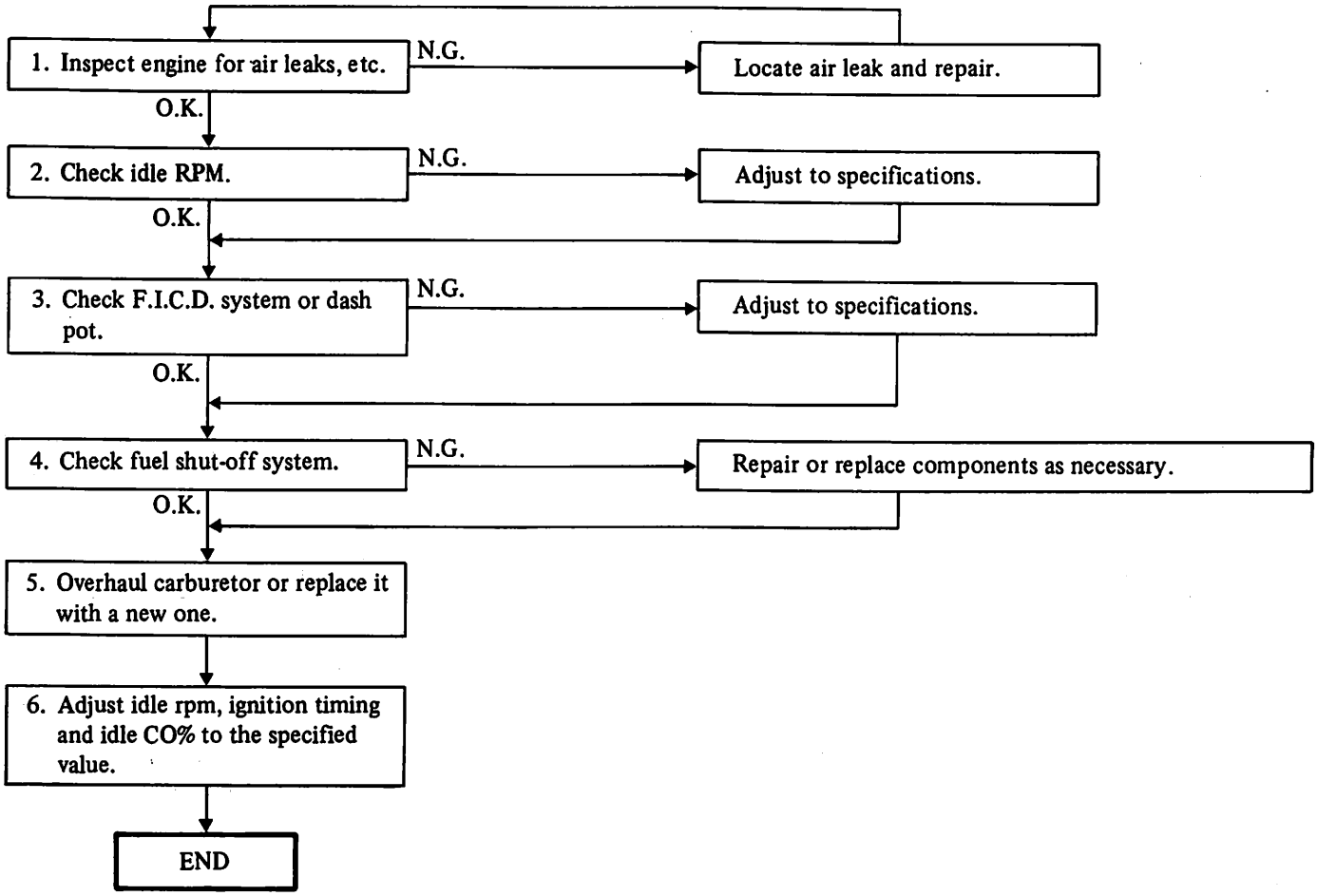
IMPROPER IDLING (Rough idle, no return to idle, high idle, etc.)



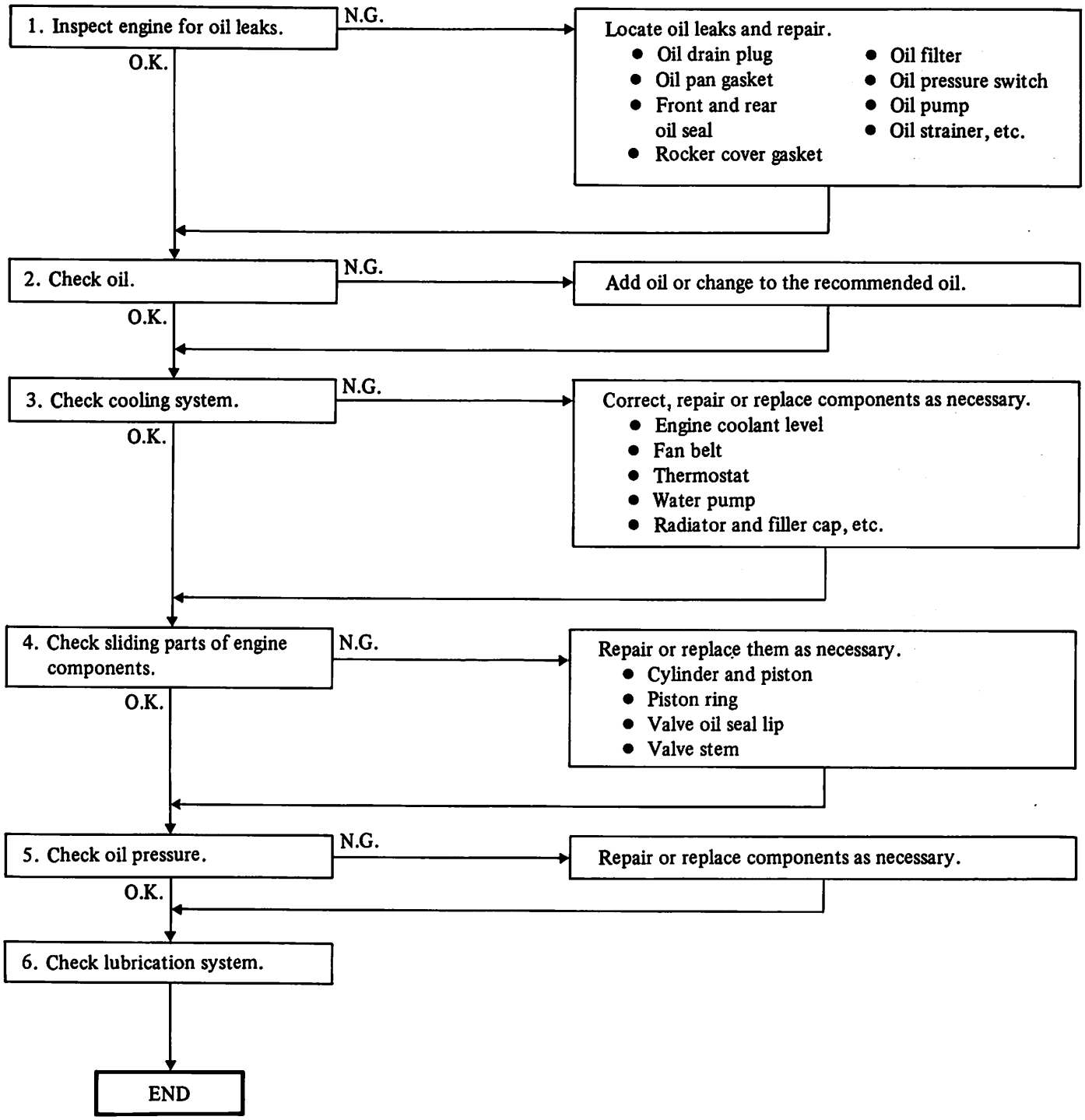
ENGINE STARTABILITY (Hard start, no start, hard restart, no restart, etc.)



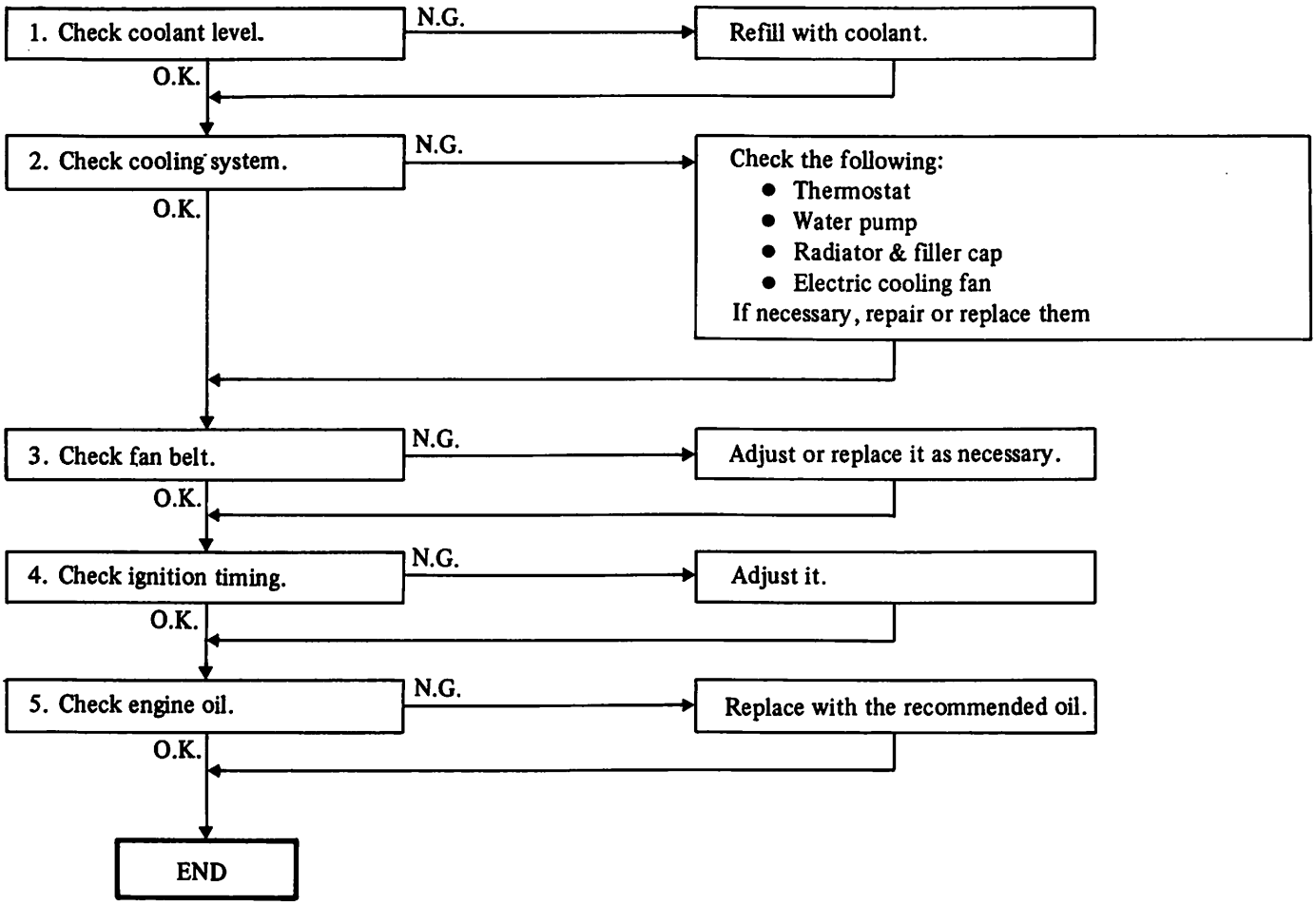
ENGINE STALL



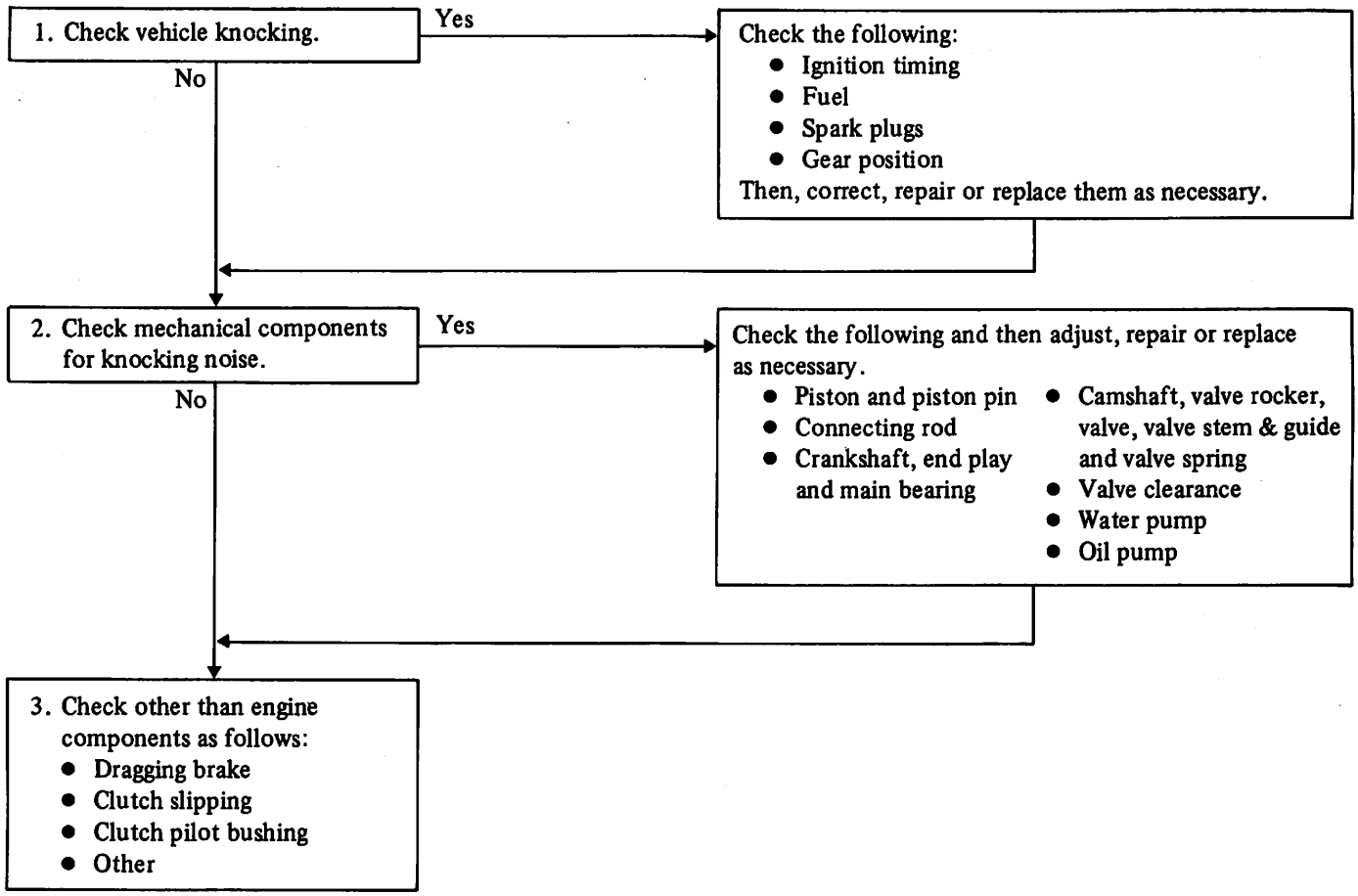
EXCESSIVE OIL CONSUMPTION



OVERHEATING



NOISY ENGINE



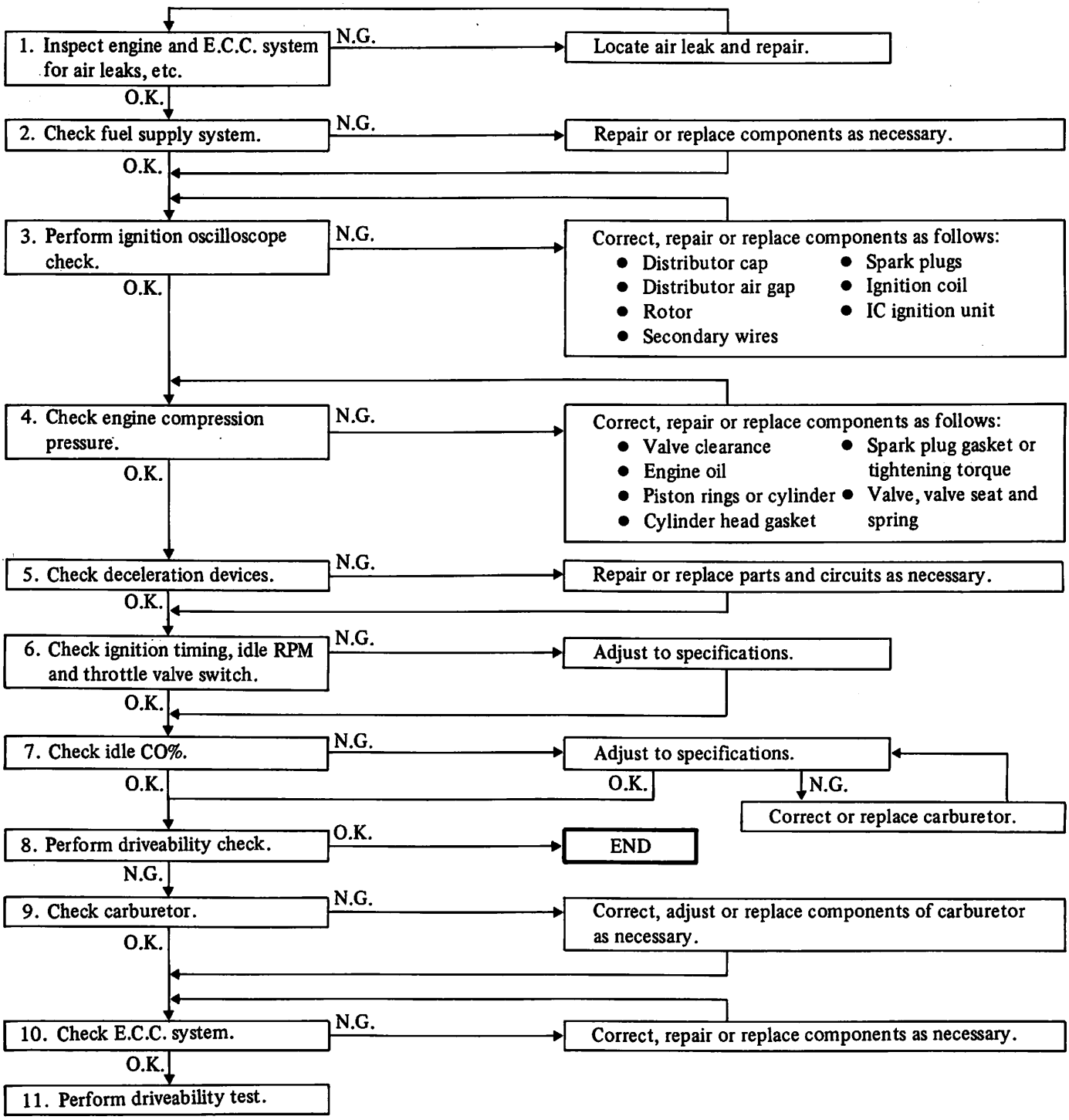
DIAGNOSTIC PROCEDURE FOR E.C.C. ENGINE

INTERMITTENT PROBLEM

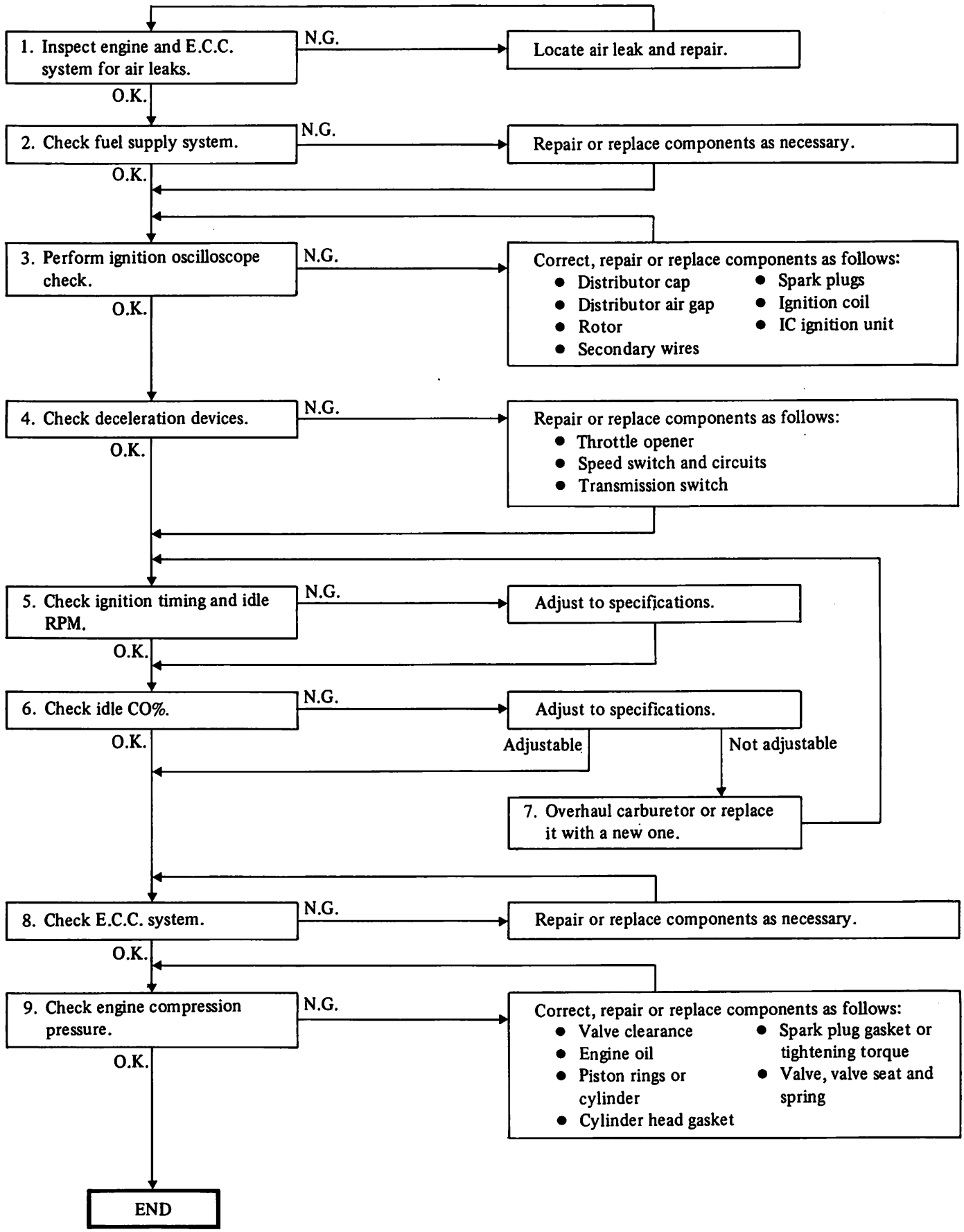
DIAGNOSTIC CHARTS CANNOT BE USED TO DIAGNOSE INTERMITTENT FAILURES. This is because many intermittent problems are caused at electrical connecitons, and if intermittent problems are not corrected, unnecessary component replacement will be indicated and the problems may remain. Therefore, DIAGNOSIS OF INTERMITTENT PROBLEMS SHOULD START WITH A VISUAL AND PHYSICAL INSPECTION OF THE CONNECTORS involved in the circuit, especially control unit, water temperature sensor and exhaust gas sensor connectors.

CAUTION:
When connecting or disconnecting E.C.C. harness connector to or from any E.C.C. unit, ensure that the ignition switch is in the "OFF" position and that the negative battery terminal is disconnected. Removing and installing these connectors with the ignition switch left in the "ON" position will damage control unit.

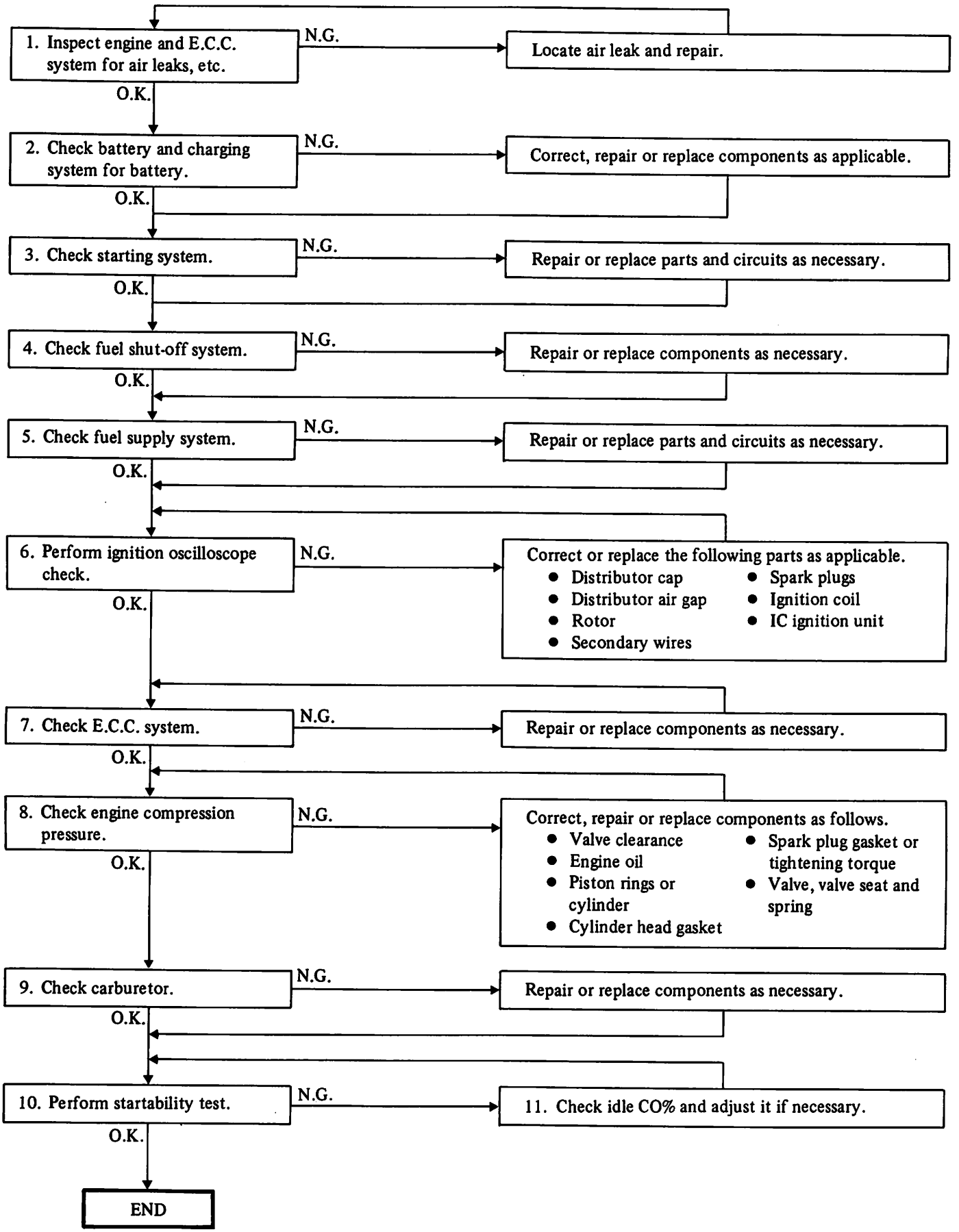
DRIVEABILITY (Hesitation, surging, flat spot, backfire, afterfire, lack of power, run-on, excessive fuel consumption, etc.)



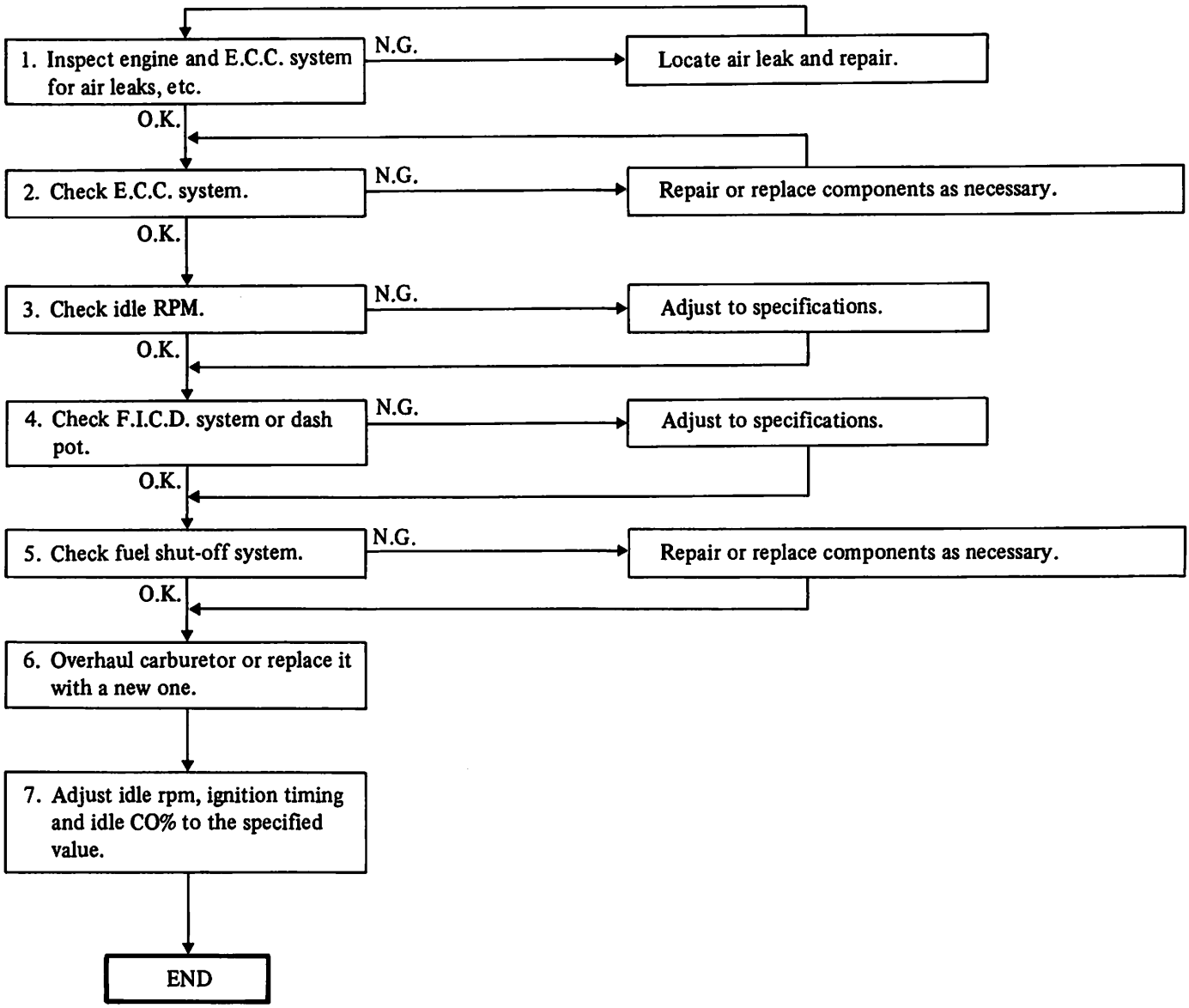
IMPROPER IDLING (Rough idle, no return to idle, high idle, etc.)



ENGINE STARTABILITY (Hard start, no start, hard restart, no restart, etc.)



ENGINE STALL



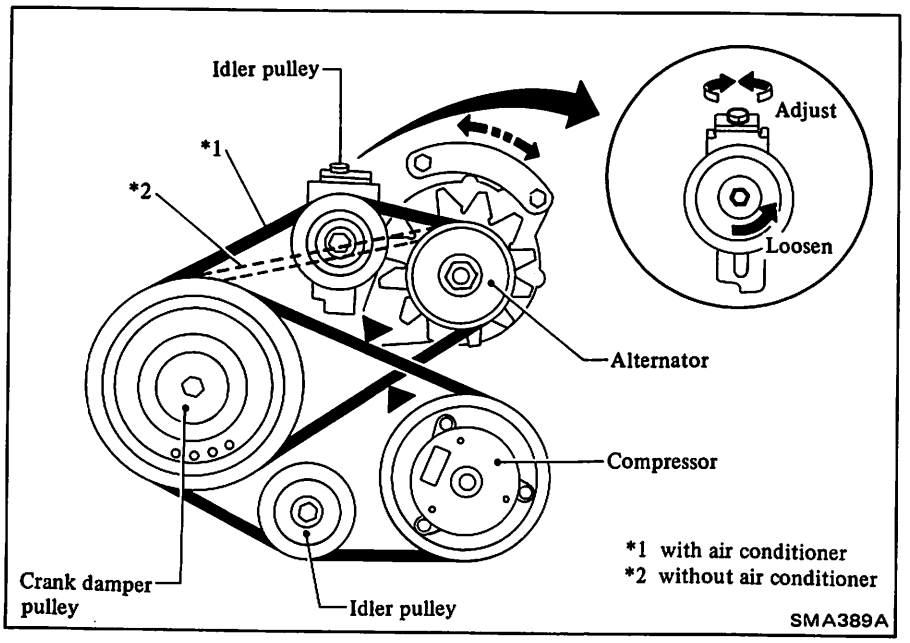
For diagnostic procedures for excessive oil consumption, overheating, noisy engine, refer to DIAGNOSTIC PROCEDURE FOR CARBURETOR ENGINES.

ENGINE MAINTENANCE (CD17)

BEFORE ENGINE START

CHECKING AND ADJUSTING DRIVE BELT

- The belts should not touch the bottom of the pulley groove.
- Check belt tension by pushing it when it is cold (30 minutes or more after engine stop).
- If alternator and compressor belts are not installed properly when replacing either or both of them, they may rub against the idler for the compressor and wear out.



Belt deflection

	Alternator	Compressor
Belt deflection mm (in)		
New belt	9 - 11 (0.35 - 0.43)	11 - 13 (0.43 - 0.51)
Used belt	11 - 13 (0.43 - 0.51)	12 - 14 (0.47 - 0.55)
Deflection limit	16 (0.63)	16 (0.63)
Pushing force N (kg, lb)	98 (10, 22)	

REPLACING AIR CLEANER FILTER

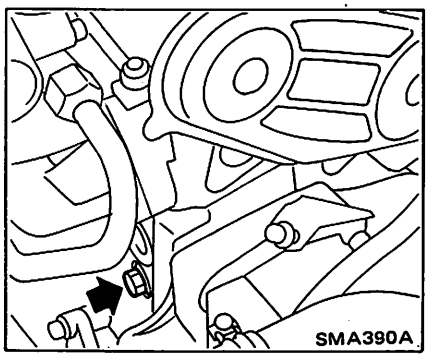
Clean inside of air cleaner housing and cover with compressed air.

CHANGING ENGINE COOLANT

WARNING:
To avoid being scalded, never attempt to change the coolant when engine is hot.

Always remove cylinder block drain plug when changing coolant.

Ⓣ : Water drain plug
54 - 74 N·m
(5.5 - 7.5 kg-m,
40 - 54 ft-lb)



When replacing engine coolant, proceed with the following procedure:

1. Set heater "TEMP" control lever to fully "HOT" position.
2. Fill radiator with coolant up to filler opening.
3. Install filler cap and fill reservoir tank with coolant up to "MAX" level.
4. Start engine and warm up engine until water temperature indicator points to the middle of gauge.
5. Stop engine and cool engine off completely.
6. Refill radiator with coolant up to filler opening if the coolant level is lower the specified level.
7. Also, refill reservoir tank with coolant up to "MAX" level.

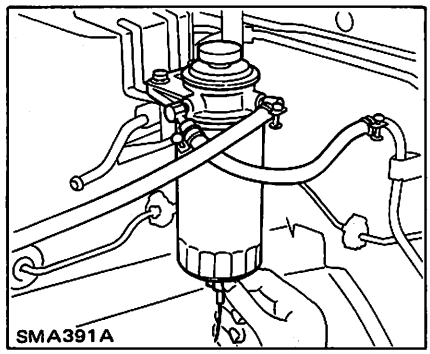
Unit: liter (US qt, Imp qt)

With heater	7.0 (7-3/8, 6-1/8)
Without heater	6.5 (6-7/8, 5-3/4)
Reservoir tank	0.7 (3/4, 5/8)

- When using anti-freeze coolant (L.L.C.), follow instruction attached to anti-freeze container for mixing ratio.

CHANGING FUEL FILTER

Install fuel filter sensor to new filter.



a Hand-tighten ONLY.
b Bleed fuel system.

DRAIN WATER

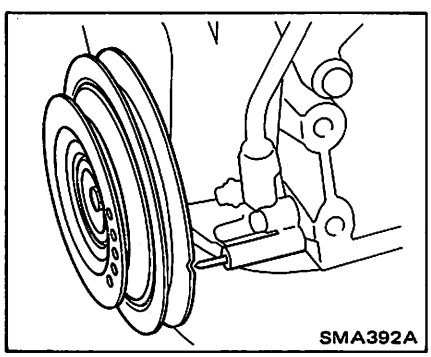
Remove fuel filter sensor and drain water.

a. Be sure to place a container or rug beneath fuel filter.
b. Pumping priming pump will quicken water draining.
c. Bleed fuel system.

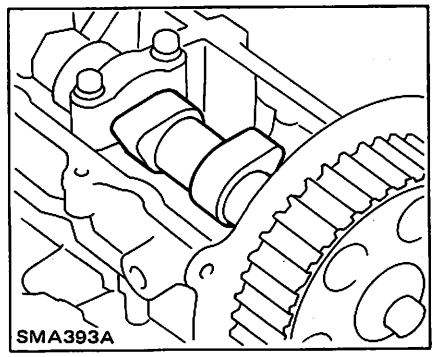
ADJUSTING INJECTION TIMING (Plunger lift)

1. Set No. 1 cylinder at Top Dead Center on its compression stroke.

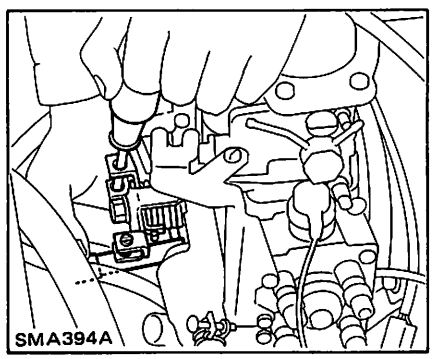
Make sure that indicator and crank damper pulley mark are aligned with each other.



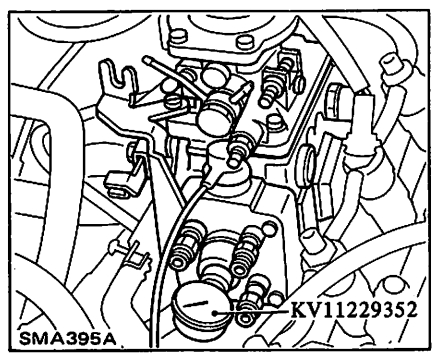
Make sure that No. 1 cam of camshaft is in the position as shown.



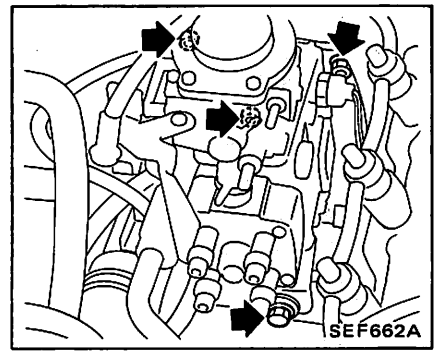
2. Remove all injection tubes.
3. Set cold start device to free.
(1) Turn cold start device linkage clockwise.
(2) Set block [length about 15 mm (0.59 in)] between cold start device and linkage.



4. Remove plug bolt from rear side of injection pump and, in its place, atatch Tool.



5. Loosen pump nuts and bracket bolt.



6. Plunger lift measurement and adjustment.
(1) Turn crankshaft counterclockwise 15 to 20 degrees from No. 1 cylinder at Top Dead Center.
(2) Find dial gauge needle rest point, then set the gauge to zero.
(3) Turn crankshaft clockwise until No. 1 cylinder is set at Top Dead Center on its compression stroke.
(4) Read dial gauge indication.

Plunger lift

For low altitudes

Unit: mm (in)

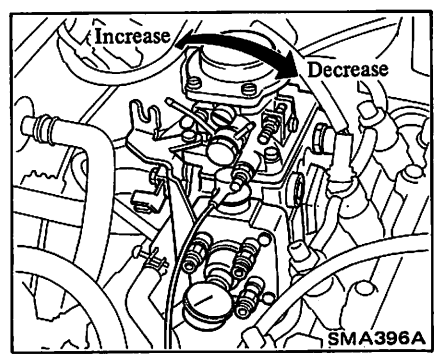
M/T	0.94±0.03 (0.0370±0.0012)
A/T	0.88±0.03 (0.0346±0.0012)

For high altitudes

Unit: mm (in)

M/T	1.00±0.03 (0.0394±0.0012)
A/T	0.94±0.03 (0.0370±0.0012)

(5) If dial gauge indication is not within the above range, turn pump body until it does.

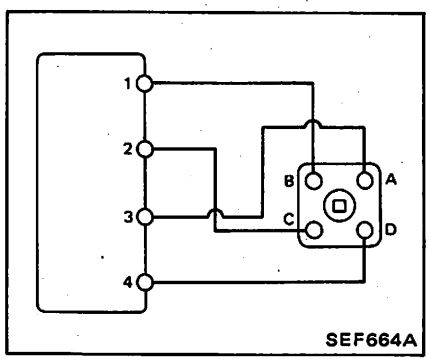


Always replace plug bolt gasket.

Ⓣ: Plug bolt
14 - 20 N·m
(1.4 - 2.0 kg-m,
10 - 14 ft-lb)
Injection pump nut
13 - 18 N·m
(1.3 - 1.8 kg-m,
9 - 13 ft-lb)
Injection pump to rear bracket
49 - 59 N·m
(5.0 - 6.0 kg-m,
36 - 43 ft-lb)

7. Connect fuel injection tube in the order of 4, 3, 2 and 1.

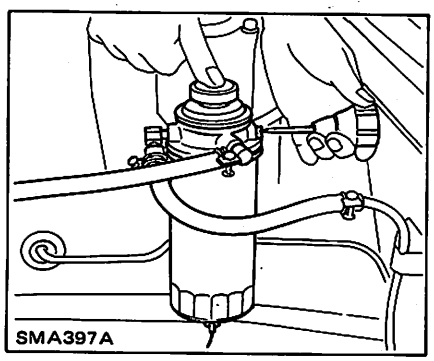
Ⓣ: Injection tube flare nut
22 - 25 N·m
(2.2 - 2.5 kg-m,
16 - 18 ft-lb)



BLEEDING FUEL SYSTEM

Air should be bled out of fuel system when injection pump is removed or fuel system is repaired.

1. Loosen priming pump vent screw and pumping. Make sure that fuel overflows at vent screw and tighten screw.



2. Disconnect fuel return hose on fuel line side.
3. Prime priming pump to make sure that fuel overflows at hose end and connect return hose.

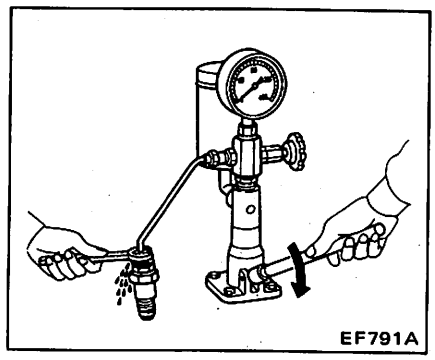
If engine will not start, loosen injection tubes at nozzle side and crank engine until fuel overflows from injection tubes.
Tighten injection tube flare nuts.

INJECTION NOZZLE

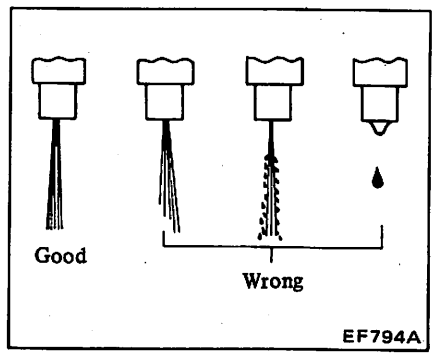
Inspection

a. Check initial injection pressure by pumping tester handle slowly (one time per second).

Initial injection pressure:
Used
12,259 - 13,239 kPa
(125 - 135 kg/cm^2,
1,778 - 1,920 psi)
New
13,239 - 14,024 kPa
(135 - 143 kg/cm^2,
1,920 - 2,033 psi)



b. A new nozzle is always used to check initial injection pressure.
b. Check spray pattern by pumping tester handle 4 to 6 times per second or more.



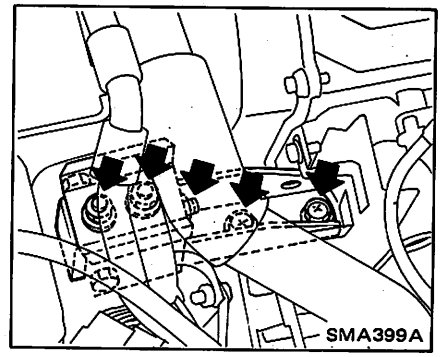
If the injection nozzle operation is not normal, correct injection nozzle.

For details, refer to INJECTION NOZZLE ASSYMBLY in EF section.

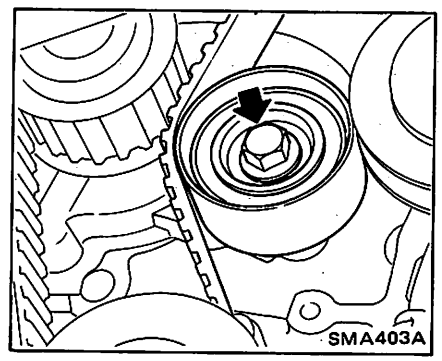
TIMING BELT REPLACEMENT

VALVE TIMING BELT

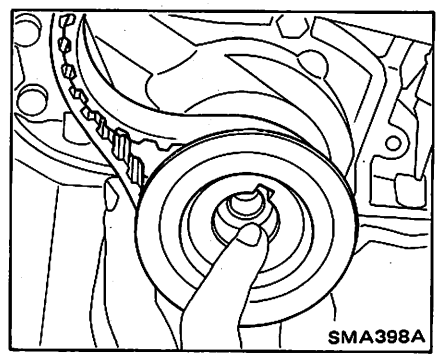
Support engine with a jack and remove right side engine mounting. Then jack up the engine to make room to work in.



1. Set No. 1 cylinder at Top Dead Center on its compression stroke.
2. Remove alternator and compressor drive belt.
3. Remove crank damper pulley.
4. Remove timing belt.
(1) Loosen tensioner pulley and set it to "free" position.
(2) Remove idler pulley.

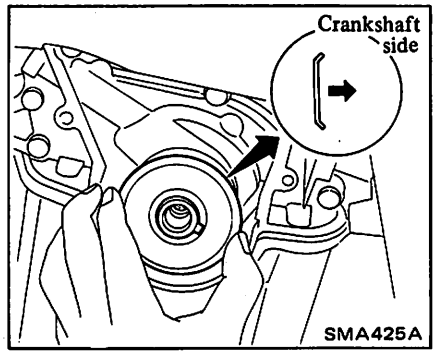


(3) Remove crankshaft pulley with timing belt.

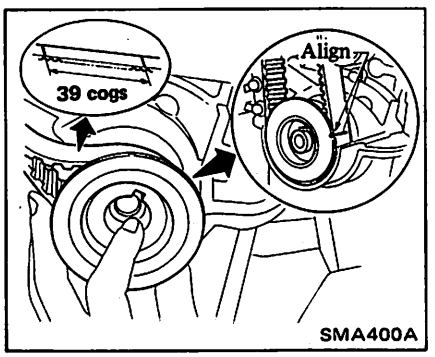


5. Install timing belt.

CAUTION:
a. Clean parts, such as pulley, tensioner, etc., which touch timing belt.
b. Ensure timing belt is clean and free from oil or dust when installing it.
c. When installing the crank pulley plate, install in the direction as follows:



(1) Put a mark on the timing belt at the 39th cog, if necessary.
(2) Align each mark and install crankshaft pulley with timing belt.

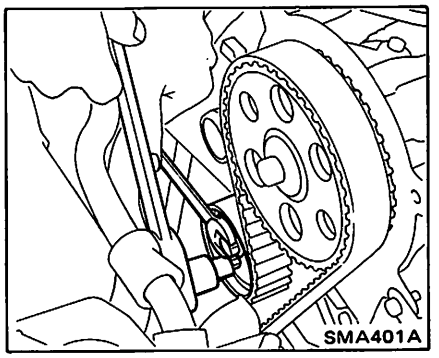


(3) Install idler pulley.
(4) Loosen tensioner bolt and turn crankshaft two times in its normal rotating direction.

Never turn crankshaft against its normal rotating direction.

(5) Tighten tensioner while holding it.

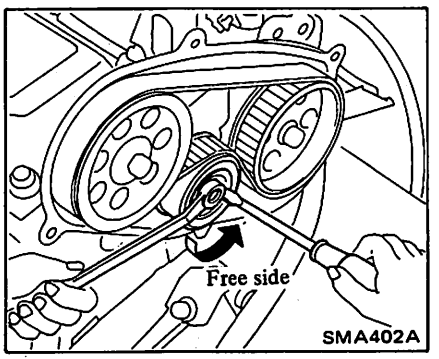
If tensioner rotates, it may cause timing belt to be overloaded, shortening its service life.



INJECTION TIMING BELT

Remove air cleaner housing with air duct.

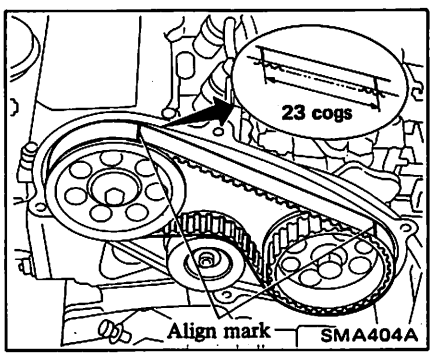
1. Set No. 1 cylinder at Top Dead Center on its compression stroke.
2. Remove timing belt.
(1) Set tensioner to free position.



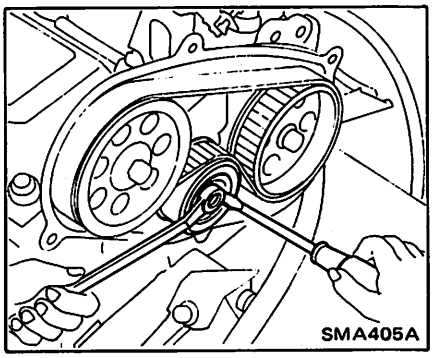
(2) Remove timing belt.
3. Install timing belt.

CAUTION:
a. Clean parts, such as pulley, tensioner, etc., which touch timing belt.
b. Ensure timing belt is clean and free from oil or dust when installing it.

(1) Put a mark on the timing belt at the 23rd cog, if necessary.
(2) Align each mark.



(3) Loosen tensioner and turn crankshaft two times in its normal rotating direction.
(4) Tighten tensioner while holding it.



AFTER ENGINE WARM-UP

ADJUSTING VALVE CLEARANCE

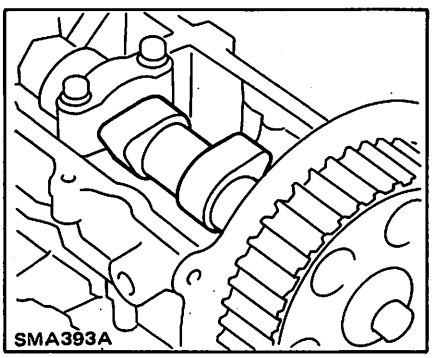
Adjustment should be made while engine is hot.

Warm up engine sufficiently.

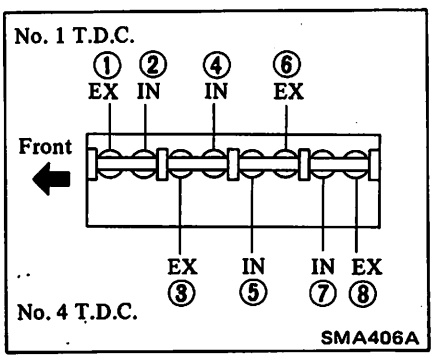
Checking valve clearance

1. Set No. 1 or No. 4 cylinder at Top Dead Center on its compression stroke.

Make sure that cam of camshaft is in the position as shown.



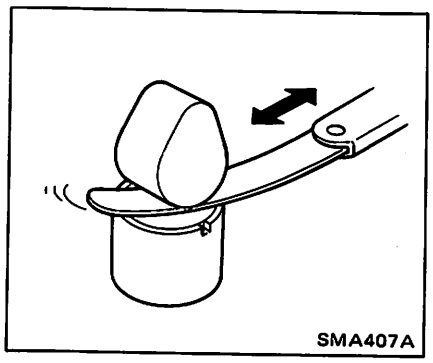
2. Adjust valve clearance as shown in the following illustration.



VALVE CLEARANCE

	Unit: mm (in)
Intake	0.20 - 0.30 (0.008 - 0.012)
Exhaust	0.40 - 0.50 (0.016 - 0.020)

Measure clearance between cam and valve lifter.

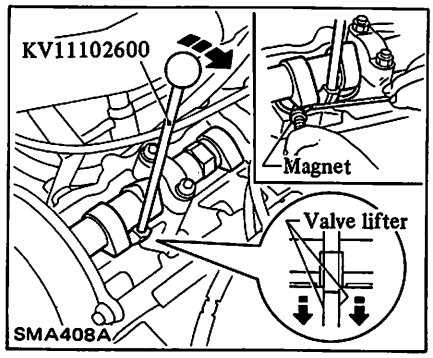


Changing lifter plate

- The valve clearance adjustment is performed to set each cylinder at Top Dead Center on its compression stroke.
- Make sure that cam of camshaft is in the same position as No. 1 cylinder at Top Dead Center.

(1) If clearance is not specified, select suitable lifter plate and change it.

Valve clearance is adjusted one cylinder at a time.



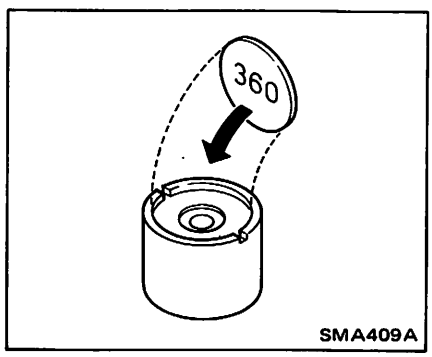
(2) Recheck valve clearance.

Example:

	Intake	Exhaust
Specified clearance	0.20 - 0.30 mm (0.008 - 0.012 in)	0.40 - 0.50 mm (0.016 - 0.020 in)
Measured clearance	0.32 mm (0.013 in)	0.36 mm (0.014 in)
Clearance	0.02 - 0.12 mm (0.001 - 0.005 in) large	0.04 - 0.14 mm (0.002 - 0.006 in) small
Thickness of plate that was used	3.60 mm (0.142 in)	3.55 mm (0.140 in)
Thickness of plate to be used	3.65 or 3.70 mm (0.144 or 0.146 in)	3.45 or 3.50 mm (0.136 or 0.138 in)

Refer to a Lifter plate in S.D.S.

Adjusting shim installation direction as follows:

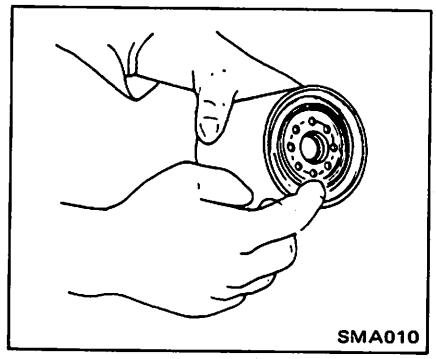


CHANGE ENGINE OIL AND OIL FILTER

WARNING:
Be careful not to burn yourself, as the engine oil may still be hot.

- **A milky oil indicates the presence of cooling water. Isolate the cause and take corrective measures.**
- **An oil with extremely low viscosity indicates the presence of diesel fuel.**

1. Smear a little engine oil on rubber lip of new oil filter.



2. Turn the oil filter until it touches the oil filter bracket.
Then turn it 1/2 turn further by hand.

If it is turned too far, oil leakage may occur.

Oil capacity: (Reference)

Unit: liter (US qt, Imp qt)

With oil filter	4.1 4-3/8, 3-5/8
Without oil filter	3.5 3-3/4, 3-1/8

CHECKING AND ADJUSTING IDLE SPEED

When checking and adjusting the idle speed, make sure to check that shift lever is Neutral (M/T model) or "D" range (A/T model).

Preparation

- Make sure that all electrical accessories are off.

WARNING:

a. When selector lever is shifted to "D" position, apply parking brake and block both front and rear wheels with chocks.

b. Depress brake pedal while accelerating engine to prevent car from surging forward.

c. After adjustment has been made, shift lever to "N" or "P" position and remove wheel chocks.

Checking

1. Srart engine and warm it up until water temperature indicator points to the middle of gauge.
2. Attach a diesel tacho tester's pick-up to No. 1 injection tube.

In order to obtain a more accurate reading of engine speed, remove clamps on No. 1 injection tube.

3. Run engine at about 2,000 rpm for two minutes under no-load.

Race engine two or three times.

Make sure that it returns to idle speed.

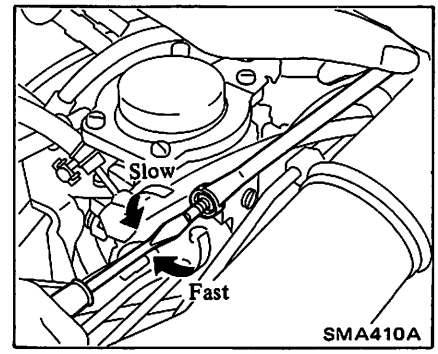
If not, check acceleration linkage for binding.

4. Run engine for one minute at idle speed.
5. Check idle speed.

Idle speed: 750 $^{+100}_{-50}$ rpm

Adjusting

Loosen idle screw lock nut and adjust idle speed.



CHECKING RUBBER HOSES
(Water, air, fuel, blow-by, oil hoses)

1. Check all hoses for leakage.
2. Tighten any loose connections and replace any damaged or deformed parts.

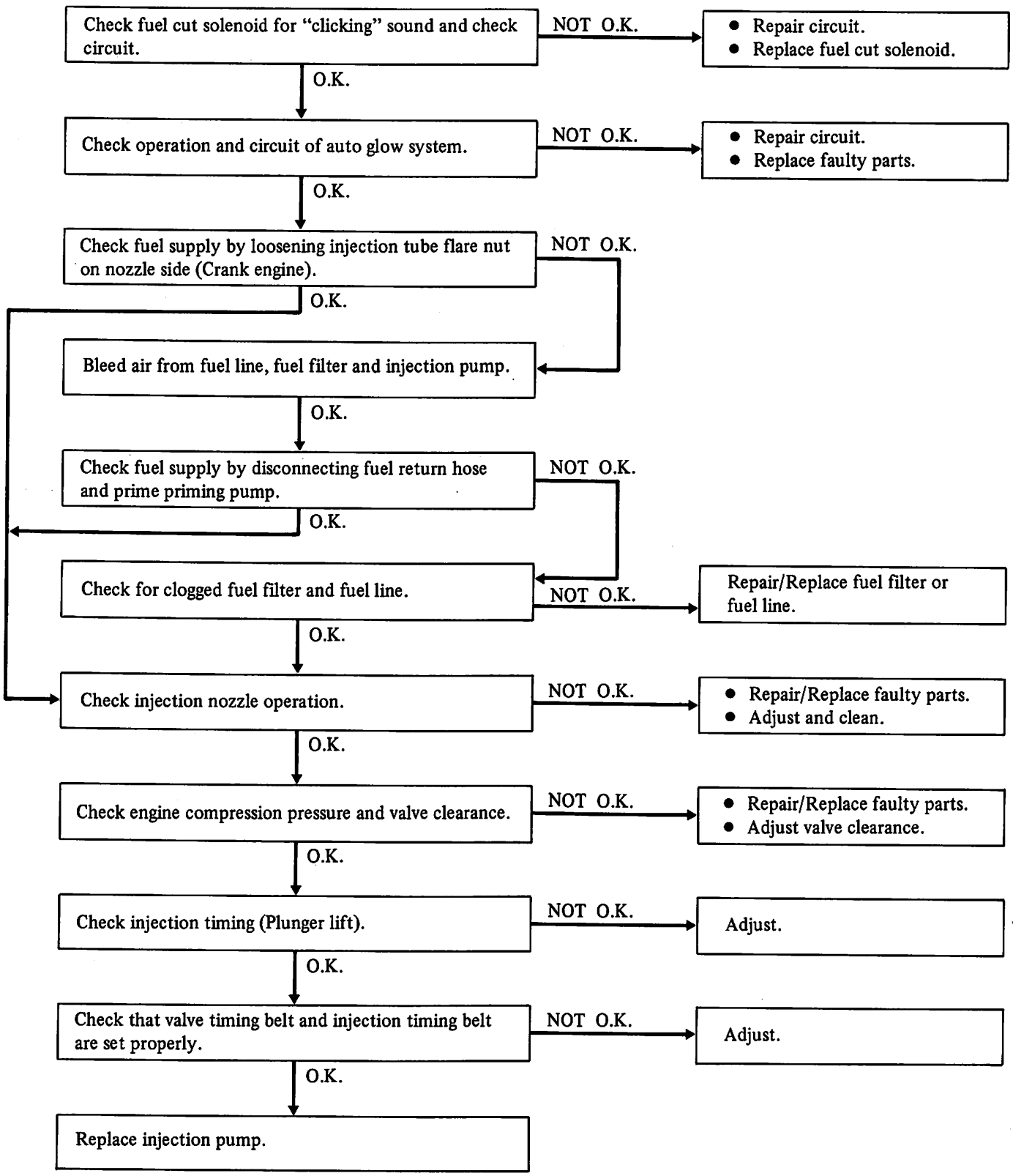
CHECKING FUEL LINES
(Hoses, piping, connections, etc.)

Check fuel lines for loose connections, cracks and deterioration. Retighten loose connections and replace any damaged or deformed parts.

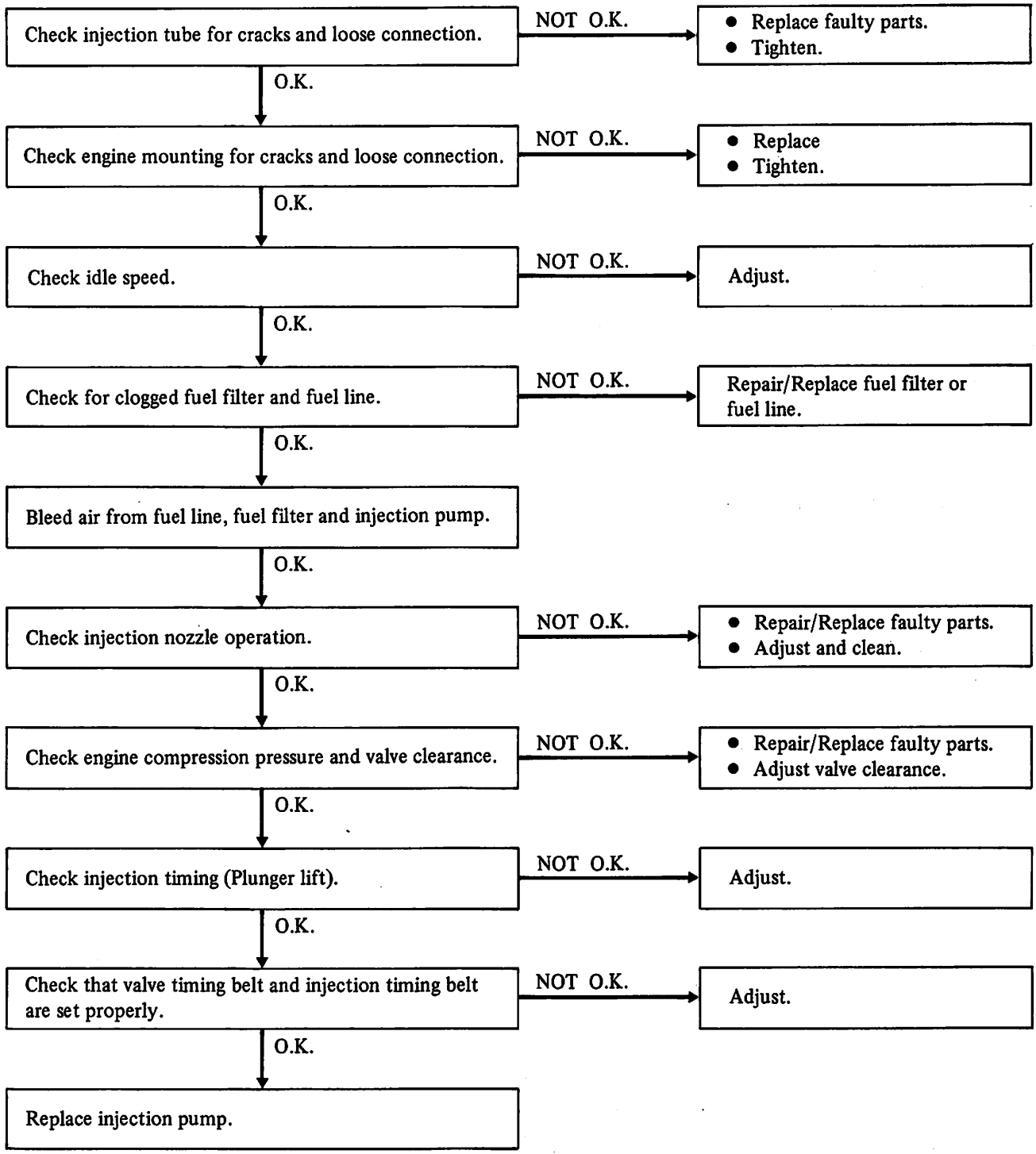
TROUBLE DIAGNOSES AND CORRECTIONS (CD17)

- Battery is fully charged.
- Fuel is in fuel tank.

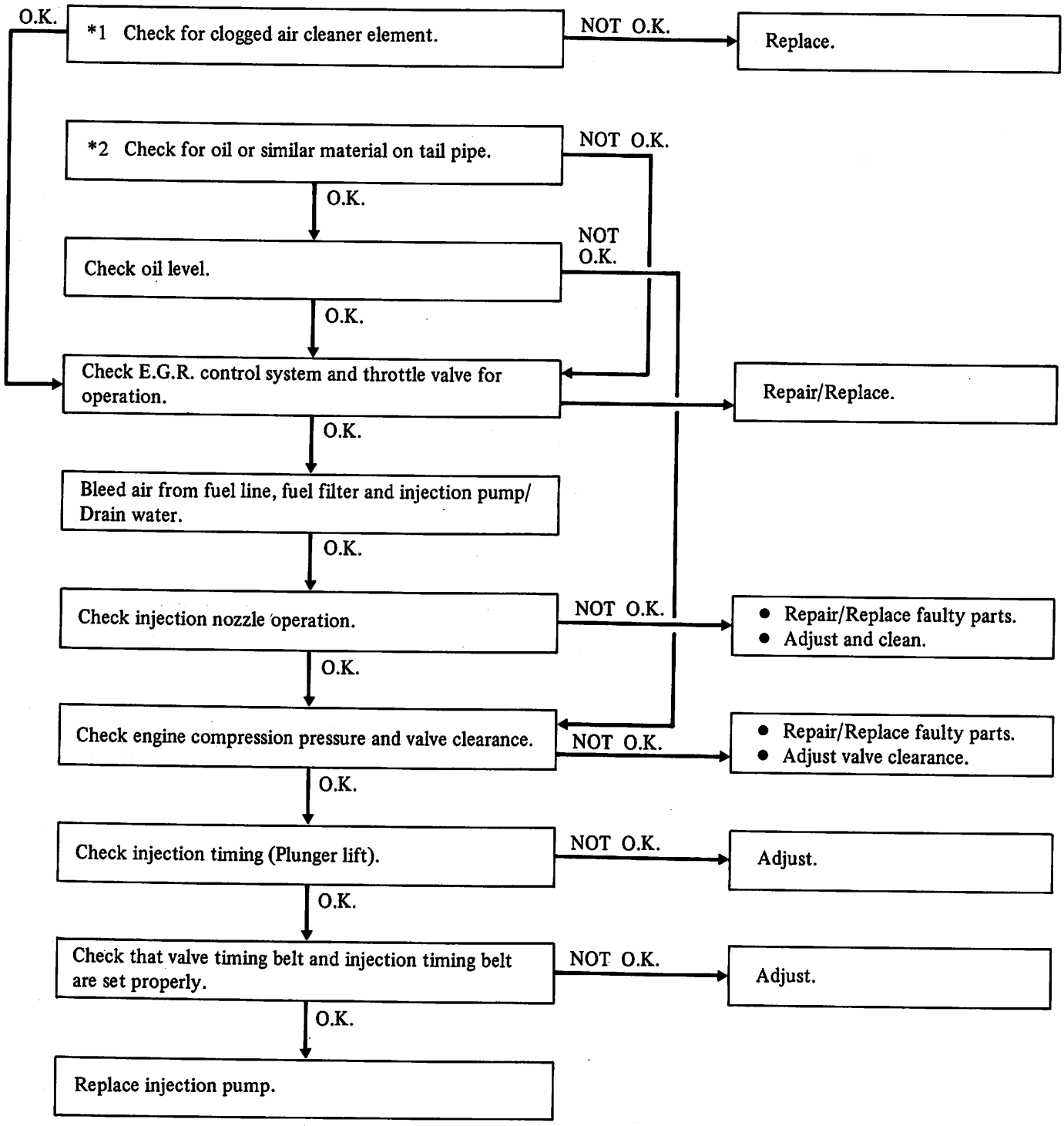
ENGINE DIFFICULT TO START OR DOES NOT START



ROUGH IDLE

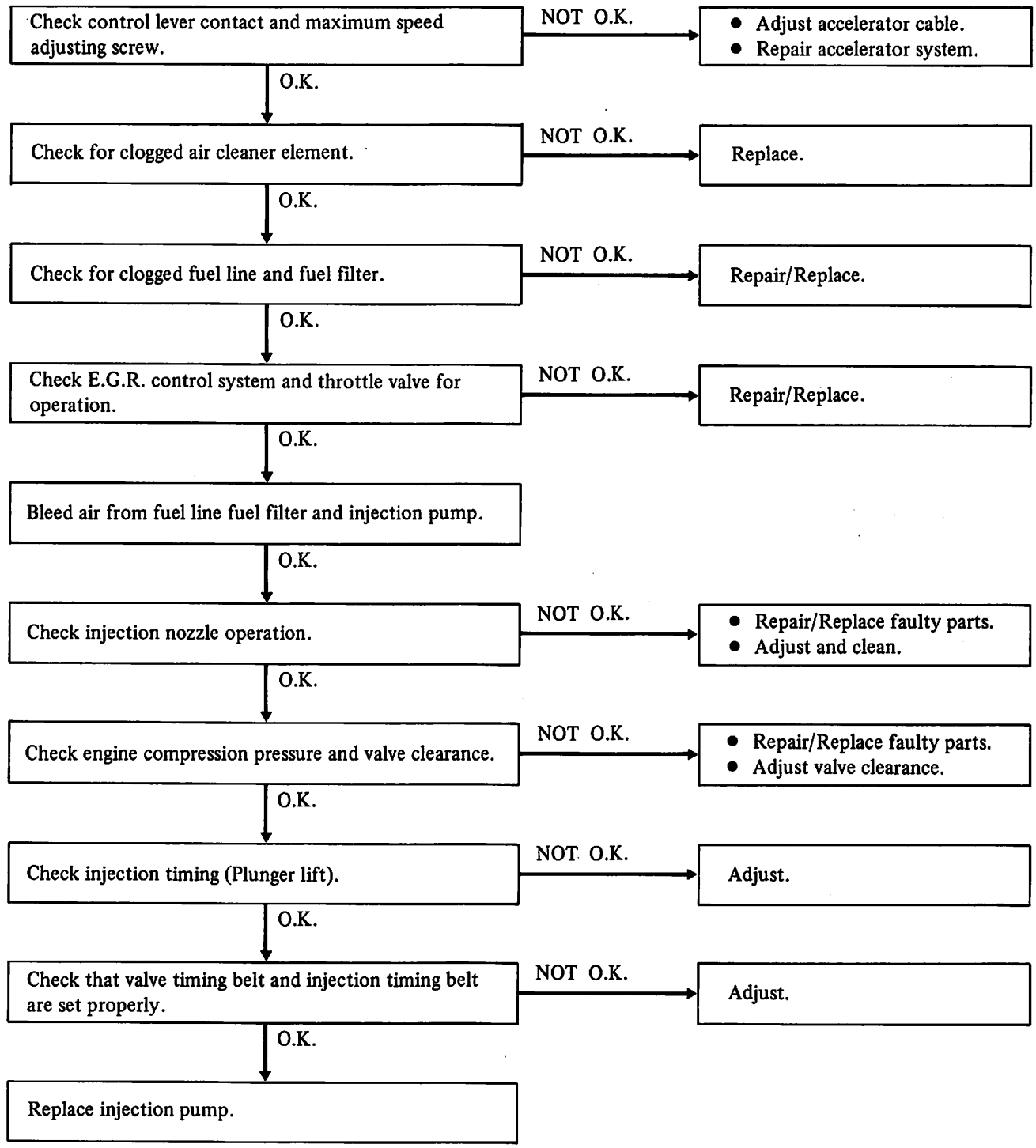

Check injection tube for cracks and loose connection.
NOT O.K.
• Replace faulty parts.
• Tighten.
O.K.
Check engine mounting for cracks and loose connection.
NOT O.K.
• Replace
• Tighten.
O.K.
Check idle speed.
NOT O.K.
Adjust.
O.K.
Check for clogged fuel filter and fuel line.
NOT O.K.
Repair/Replace fuel filter or fuel line.
O.K.
Bleed air from fuel line, fuel filter and injection pump.
O.K.
Check injection nozzle operation.
NOT O.K.
• Repair/Replace faulty parts.
• Adjust and clean.
O.K.
Check engine compression pressure and valve clearance.
NOT O.K.
• Repair/Replace faulty parts.
• Adjust valve clearance.
O.K.
Check injection timing (Plunger lift).
NOT O.K.
Adjust.
O.K.
Check that valve timing belt and injection timing belt are set properly.
NOT O.K.
Adjust.
O.K.
Replace injection pump.

EXCESSIVE WHITE OR BLACK SMOKE

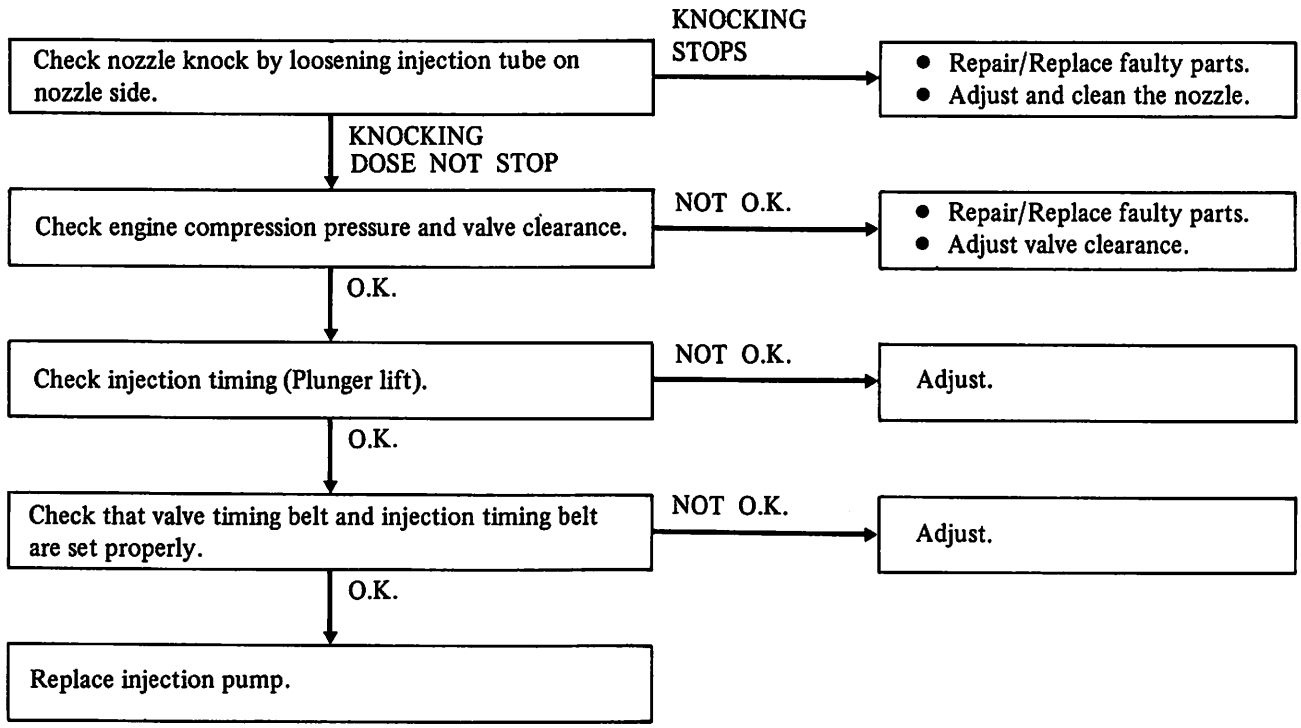


*1: If there is black smoke, start here.
*2: If there is white smoke, start here.

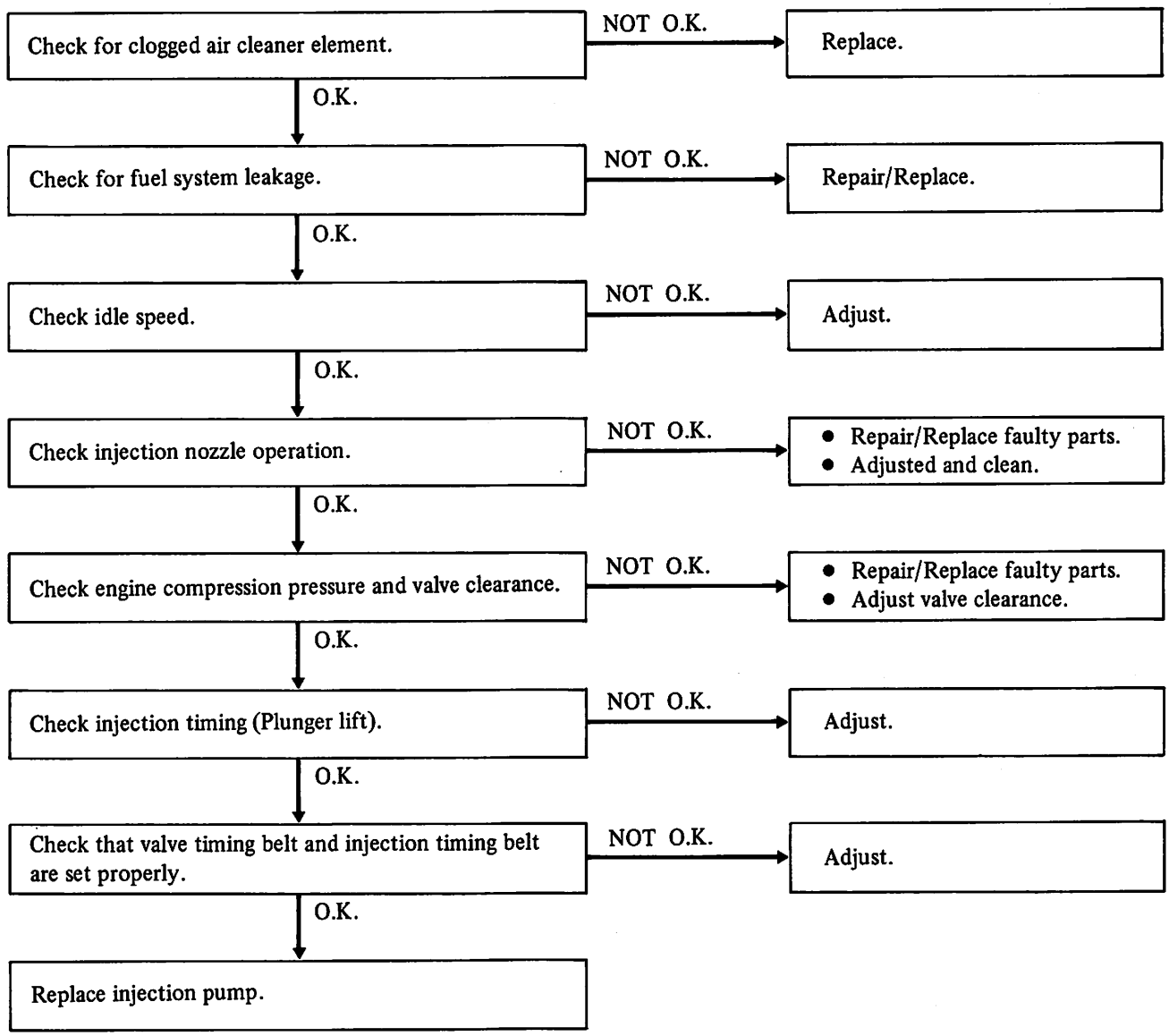
POOR OUTPUT


Check control lever contact and maximum speed adjusting screw.
NOT O.K.
• Adjust accelerator cable.
• Repair accelerator system.
O.K.
Check for clogged air cleaner element.
NOT O.K.
Replace.
O.K.
Check for clogged fuel line and fuel filter.
NOT O.K.
Repair/Replace.
O.K.
Check E.G.R. control system and throttle valve for operation.
NOT O.K.
Repair/Replace.
O.K.
Bleed air from fuel line fuel filter and injection pump.
O.K.
Check injection nozzle operation.
NOT O.K.
• Repair/Replace faulty parts.
• Adjust and clean.
O.K.
Check engine compression pressure and valve clearance.
NOT O.K.
• Repair/Replace faulty parts.
• Adjust valve clearance.
O.K.
Check injection timing (Plunger lift).
NOT O.K.
Adjust.
O.K.
Check that valve timing belt and injection timing belt are set properly.
NOT O.K.
Adjust.
O.K.
Replace injection pump.

EXCESSIVE KNOCKING



FUEL CONSUMPTION TOO HIGH

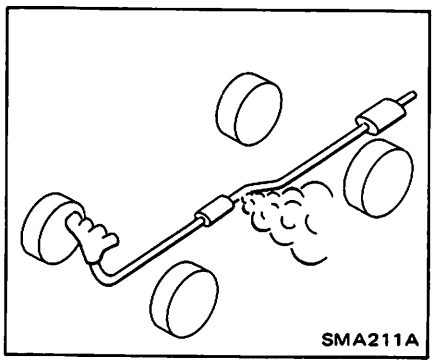


CHASSIS AND BODY MAINTENANCE

EXHAUST SYSTEMS

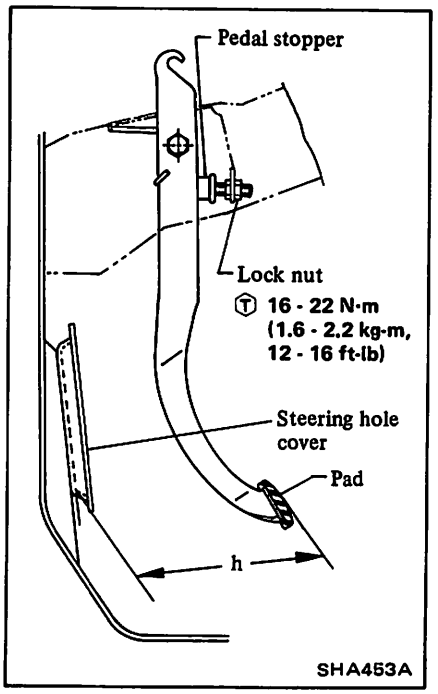
INSPECTING EXHAUST SYSTEMS

Visually check the exhaust pipes, muffler, and hangers for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.



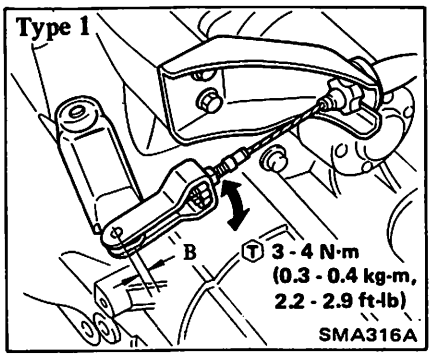
CLUTCH

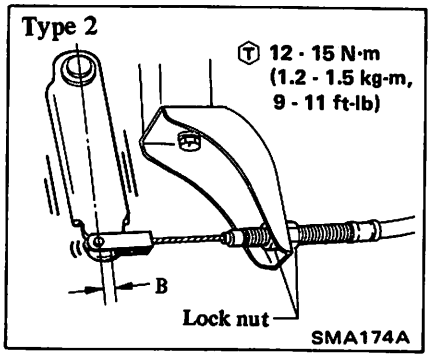
ADJUSTING CLUTCH PEDAL HEIGHT AND FREE TRAVEL



Pedal height "H"
Refer to S.D.S.
Pedal free travel "A":
11 - 21 mm (0.43 - 0.83 in)

1. Adjust pedal height with pedal stopper. Then tighten lock nut.
2. Adjust withdrawal lever play "B" with adjuster or lock nuts.





Withdrawal lever play "B":
2 - 4 mm (0.08 - 0.16 in)

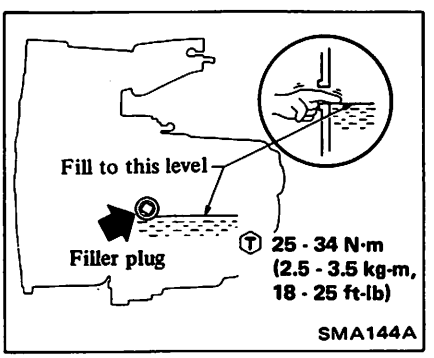
Depress and release clutch pedal over its entire stroke to ensure that the clutch linkage operates smoothly without squeak noise, interference and binding.

3. As a final check, measure pedal free travel "A" at center of pedal pad.

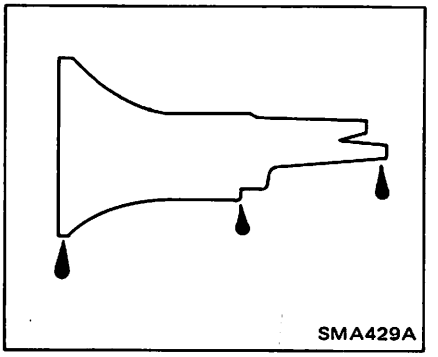
MANUAL TRANSAXLE

INSPECTING MANUAL TRANSAXLE OIL LEVEL

Never start engine while checking oil level.

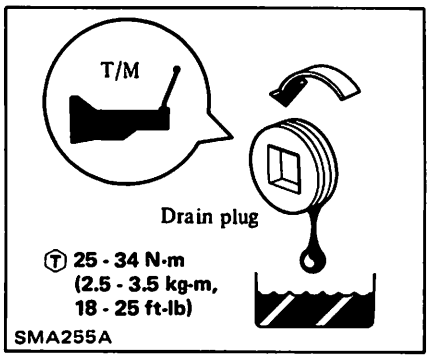


Visually inspect for signs of leakage.

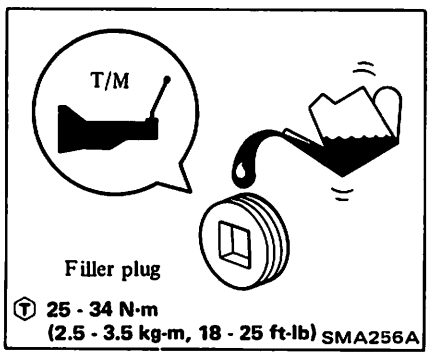


REPLACING MANUAL TRANSAXLE OIL

1. Drain oil completely.



2. Refill transaxle and check oil level.



Oil capacity:
5-speed
2.7 liters
(5-3/4 US pt, 4-3/4 Imp pt)
4-speed
2.3 liters
(4-7/8 US pt, 4 Imp pt)

AUTOMATIC TRANSAXLE

INSPECTING AUTOMATIC TRANSAXLE FLUID LEVEL

The transaxle has the proper amount of fluid if, 10 minutes after engine start and with the engine idling, the level is within the values described in the following table.

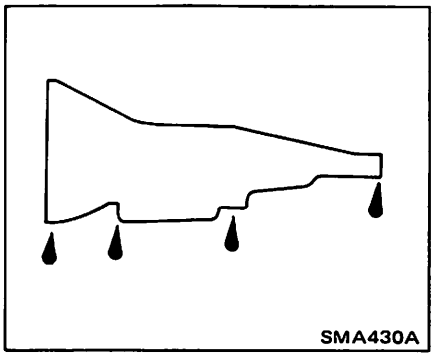
Proceed with fluid level check as follows:

1. Park the vehicle on a level surface and set the parking brake.
2. Start the engine and idle it for about 10 minutes and then move the selector lever through each gear range, ending in "P".
3. Check the fluid level with the engine idling.
4. Remove the dipstick and clean it with lint-free paper. Reinsert it into the charging pipe as far as it will go.
5. Remove the dipstick and note the reading.

Keep the fluid at the proper level.

- **Overfilling may blow off the fluid or break the transaxle.**
- **Underfilling may cause the clutches to slip, and finally break them.**

6. Visually inspect for signs of leakage.



Unit: mm (in)

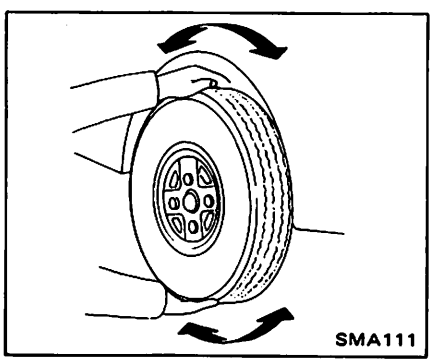
Ambient temperature	Fluid level	Ambient temperature	Fluid level
30 - 50°C (86 - 122°F)	Type 1. L H 2 (0.08) 2 (0.08) O.K. Type 2. COLD HOT	−10 - 10°C (14 - 50°F)	L H O.K. 5 (0.20) 20 (0.79) COLD HOT
10 - 30°C (50 - 86°F)	L H 10 (0.39) 5 (0.20) O.K. COLD HOT	−30 - −10°C (−22 - 14°F)	L H O.K. 15 (0.59) O.K. COLD HOT

SAT611

FRONT AXLE AND FRONT SUSPENSION

INSPECTING FRONT AXLE AND SUSPENSION PARTS

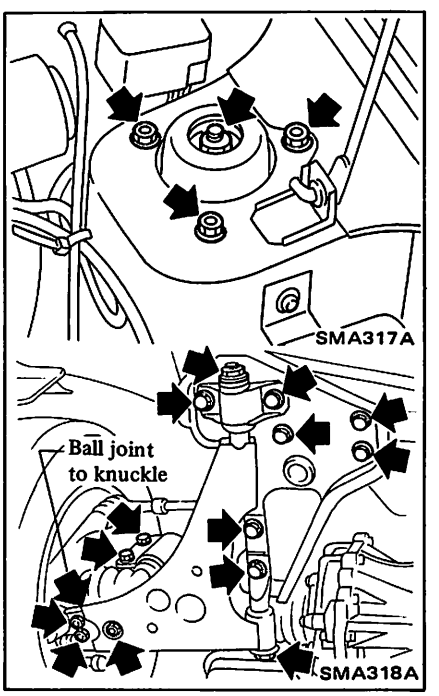
1. Block rear wheels with chocks and raise front of vehicle, and then support it with safety stand. Refer to Section GI.
2. Shake each front wheel by holding upper and lower surfaces of tires as shown.



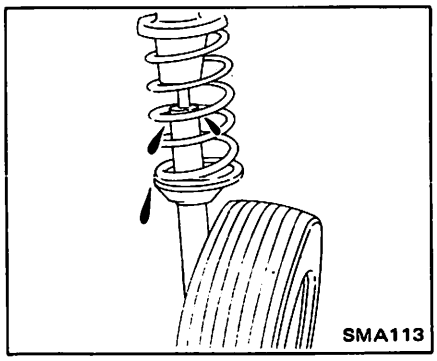
Check suspension parts for looseness, wear, or damage.

Retighten all loose nuts and bolts to the specified torque. Refer to Section FA for tightening torque.

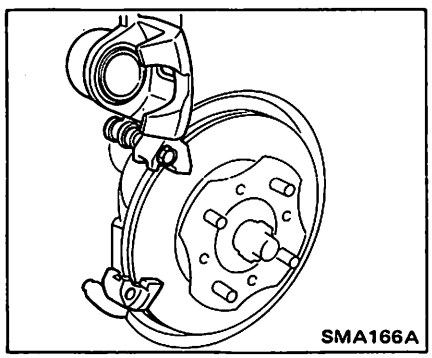
Replace all worn parts as described under Front Suspension (Section FA).



3. Check strut (Shock absorber) for oil leakage or damage.



4. Remove wheel and tire assembly.
5. Check front axle parts for crack or damage.
   Replace worn parts.
   Refer to Front Axle (Section FA).
6. Remove brake pads.
   Refer to section BR.
7. Check wheel bearing.
   If there is any axial end play or if wheel bearing does not smoothly turn, adjust bearing to specifications.
   Replace worn or damaged bearings.
   Refer to Front Axle (Section FA).



CHECKING DRIVE SHAFT BOOTS

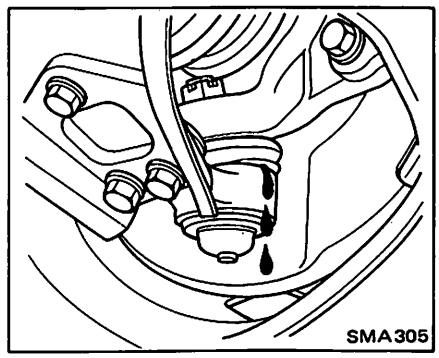
Check for damage, looseness and leakage of grease.

INSPECTING FRONT WHEEL BEARING GREASE

1. Block rear wheel with chocks and raise front of car, and then support it with safety stands. Refer to Lifting Points and Towing (Section GI).
2. Remove wheel and tire.
3. Check for grease leakage from front wheel bearing grease seals by observing the area around them. Replace worn or damaged grease seal. Refer to Front Axle (Section FA).
4. Check wheel bearing.
   If there is any axial end play or if wheel bearing does not turn smoothly, adjust bearing to specifications.
   Replace worn or damaged bearings.
   Refer to Front Axle (Section FA).

INSPECTING STEERING LINKAGE BALL JOINT & SUSPENSION BALL JOINT

Check the ball joints for damage, looseness and grease leakage.



CHECKING WHEEL ALIGNMENT

Before checking front wheel alignment, be sure to make a preliminary inspection of all front end parts.

- **Tire pressure**
- **Wheel bearing axial play**
- **Suspension ball joint**
- **Steering gear housing looseness at frame**
- **Steering linkage and connections**
- **Shock absorber operation**
- **Tighten each front axle and suspension parts.**
- **Measure vehicle height (when not loaded)**
- **Repair or replace the damaged portion or parts.**

Camber and caster

Camber and caster are preset at factory and cannot be adjusted.

The vehicle requires only toe-in and vehicle posture adjustment.

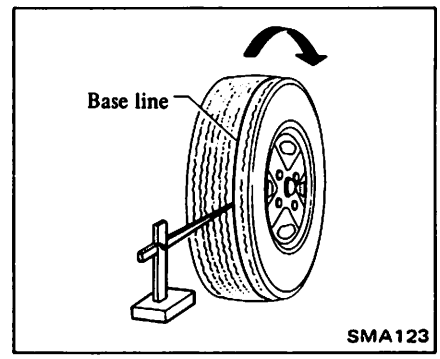
If camber or caster alignment is not within specifications, check associated parts. Repair or replace as necessary.

Camber, caster and kingpin inclination:
Refer to S.D.S.

Toe-in

Measure toe-in, and make necessary adjustment. Use the following procedure when making adjustments.

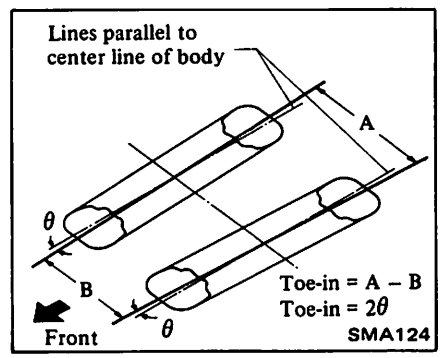
1. Raise front of vehicle and mark a base line across the tread of left and right wheels.



2. Set wheels in a straight-ahead position, and then lower front of vehicle.

After lowering front of vehicle, move it up and down to eliminate friction.

3. Measure toe-in and make necessary adjustments.



Toe-in (Unladen) and Side slip:
Refer to S.D.S.

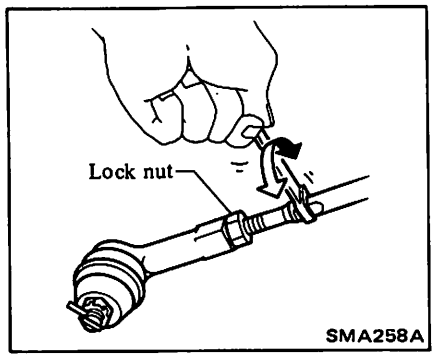
"Unladen"

- Fuel tank, radiator and engine oil tank all full.
- Spare tire, jack, hand tools, mats in position.
- All tires inflated to specified pressure.

- All accumulation of mud, dirt and road deposits removed from chassis and underbody.

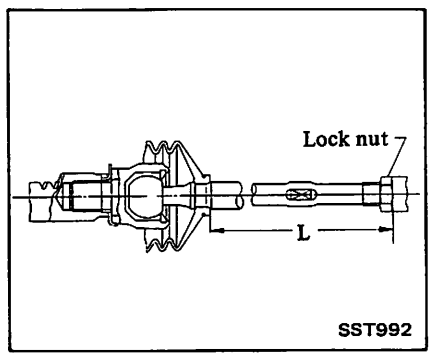
Toe-in can be adjusted by varying the length of steering tie rods.

Loosen lock nuts, and turn left and right adjusting bars equally.



If tie rods have been disassembled, set the distance between lock nuts to the specified value "L" prior to reasembling.

"L" dimension:
R25S
175.9 mm (6.93 in)
PR25S
175.9 mm (6.93 in)

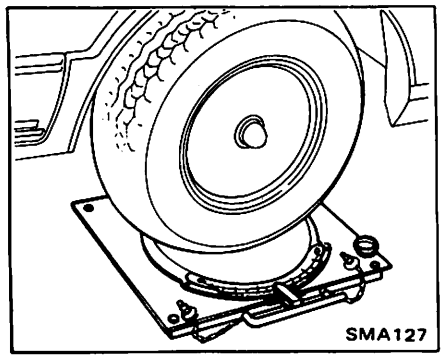


After correct toe-in has been obtained, tighten tie rod lock nuts.

Ⓣ : Tie rod outer socket lock nuts
37 - 46 N·m
(3.8 - 4.7 kg-m,
27 - 34 ft-lb)
Tie rod inner socket lock nuts
78 - 98 N·m
(8 - 10 kg-m,
58 - 72 ft-lb)

Front wheel turning angle

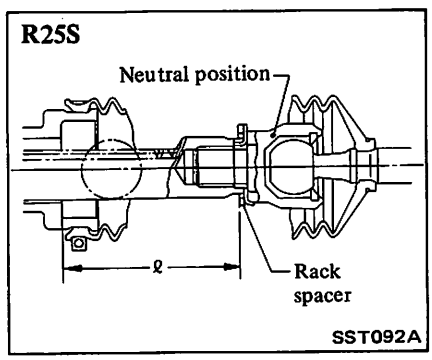
1. Set wheels in straight ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.

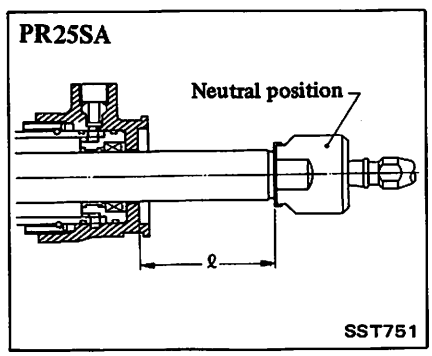


2. Rotate steering wheel all the way right and left; measure turning angle on inner wheel.

If it is not within specification, check arck stroke.

Turning angle:
Refer to S.D.S.
Rack stroke "ℓ" (both sides):
E engine equipped model
(Without rack spacer)
73.5 mm (2.894 in)
CD engine and manual transaxle equipped model
(With rack spacer)
70.0 mm (2.756 in)
CD engine and automatic transaxle equipped model
(With rack spacer)
65.5 mm (2.579 in)





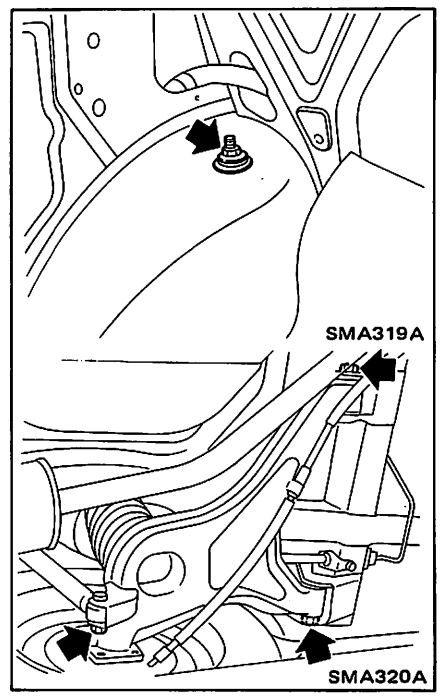
REAR AXLE AND REAR SUSPENSION

CHECKING REAR AXLE AND SUSPENSION PARTS

Check for damage looseness and leakage of oil or grease.

Retighten all loose nuts and bolts to the specified torque. Refer to Section RA for tightening torque.

Replace all worn parts as instructed under Rear Suspension (Section RA).



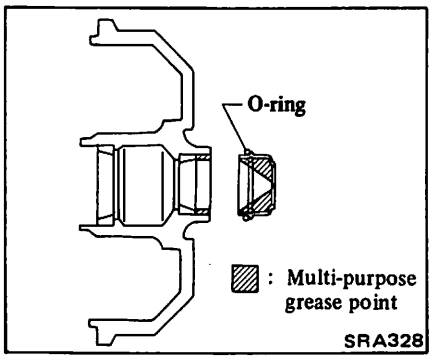
ADJUSTING WHEEL BEARING PRELOAD

After wheel bearing has been replaced or rear axle has been reassembled be sure to adjust wheel bearing preload as described below.

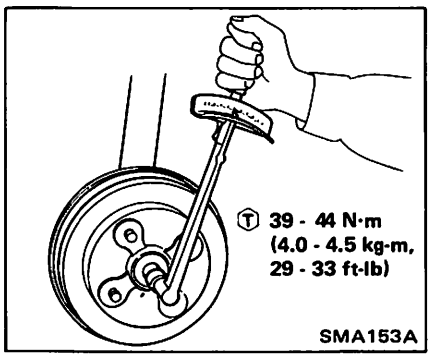
1. Before adjustment, thoroughly clean all parts to prevent possible entry of dirt.
2. Apply recommended multi-purpose grease sparingly to the following parts.

- Threaded portion of spindle.
- Contact surface between wheel bearing washer and outer wheel bearing.
- Hub cap and O-ring.

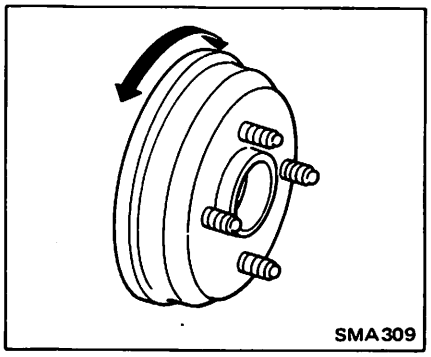
• Grease seal lip.



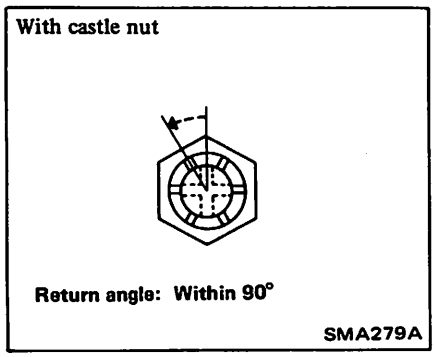
3. Tighten wheel bearing nut.



4. Turn wheel hub several times in both directions to seat wheel bearing correctly.



5. Again tighten wheel bearing nut.
6. Turn back wheel bearing nut within 90°.

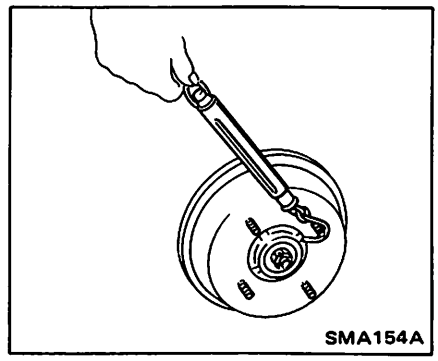


Install adjusting cap and align any of its slots with hole in spindle. If the above procedure fails to align hole and slot together, then tighten lock nut as much as 15 degrees until hole in spindle is aligned with any slot.

CAUTION:
Do not overtighten wheel bearing nuts, as this can cause wheel bearing seizure.

7. Turn hub in both directions two or three times, measuring its turning torque and axial play to see if they are within the specified ranges. If they are not, adjust.

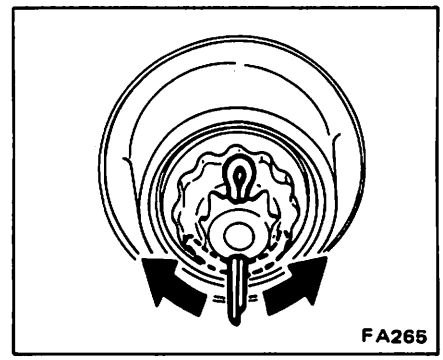
Axial play: 0 mm (0 in)
Wheel bearing starting torque:
With new grease seal
Less than
0.8 N·m (8 kg-cm, 6.9 in-lb)
As measured at wheel hub bolt
Less than
13.7 N (1.4 kg, 3.1 lb)
With used grease seal
Less than
0.4 N·m (4 kg-cm, 3.5 in-lb)
As measured at wheel hub bolt
Less than
6.9 N (0.7 kg, 1.5 lb)



Repeat above procedures until correct starting torque is obtained.

a. **Correctly measure rotation starting force toward tangential direction against hub bolt.**
b. **Above figures do not include "dragging" resistance. When measuring wheel bearing starting torque, be sure to confirm no "dragging" resistance exists.**
c. **Any slightest wheel bearing axial play cannot be tolerated.**

8. Spread cotter pin.



9. Install hub cap with new O-ring.

BRAKE SYSTEM

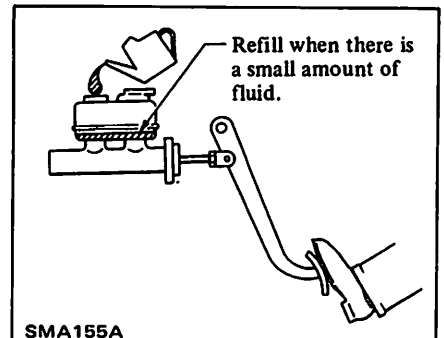
REPLACING BRAKE FLUID

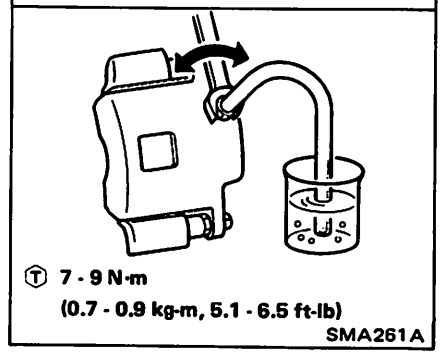
1. Change brake fluid.

Use same procedure as in air bleeding to change brake fluid in system. This operation should be done for one wheel at a time. Refer to Section BR.

CAUTION:
Never reuse brake fluid because its characteristic is changed by oxidization as well as contains the foreign material and dirt.

Recommended brake fluid specification:
DOT3 (F.M.V.S.S. No. 116)

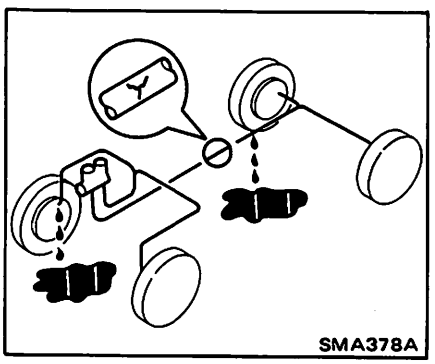


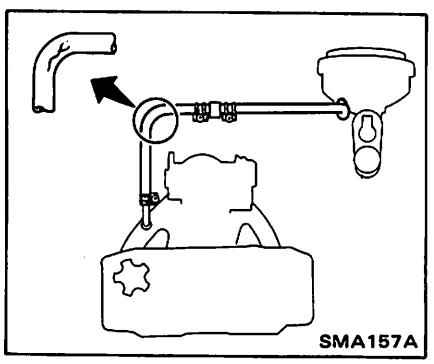


2. Check brake fluid level.
3. Check for leaks.

INSPECTING BRAKE LINES & HOSES

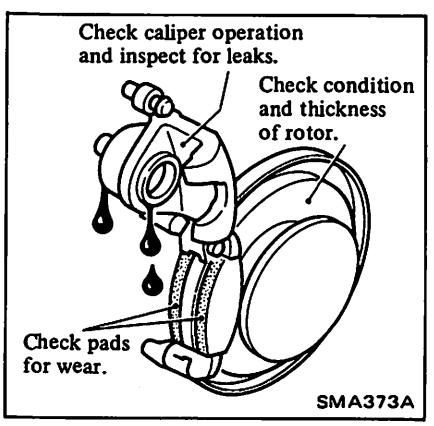
Check the brake lines and hoses (including brake booster vacuum hoses, connections & check valve) for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.



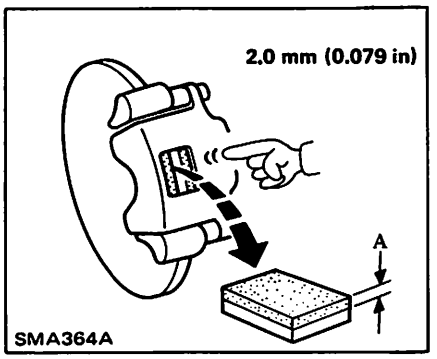


INSPECTING BRAKE PADS & DISCS

Check condition of disc brake components.

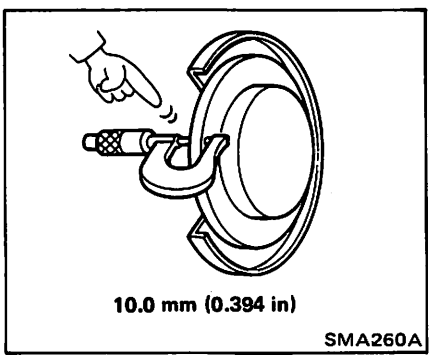


Pad wear limit



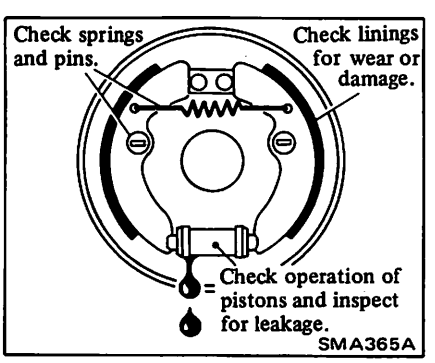
Refer to Section BR for pad replacement.

Rotor repair limit

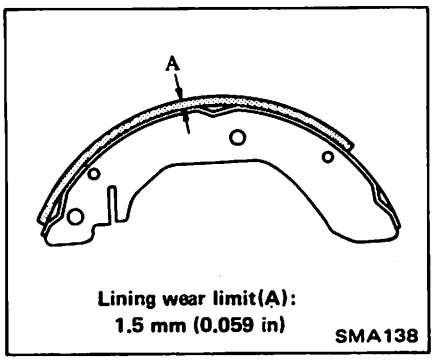


INSPECTING BRAKE DRUMS & LININGS

Check the brake lines and hoses (including brake booster vacuum hoses, connections & check valve) for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.

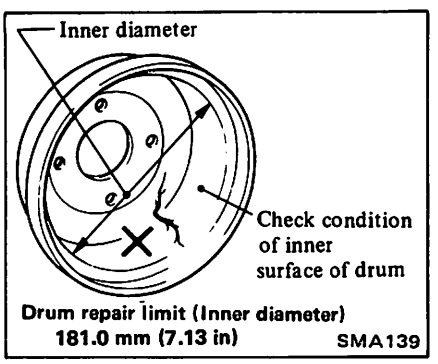


Lining wear limit



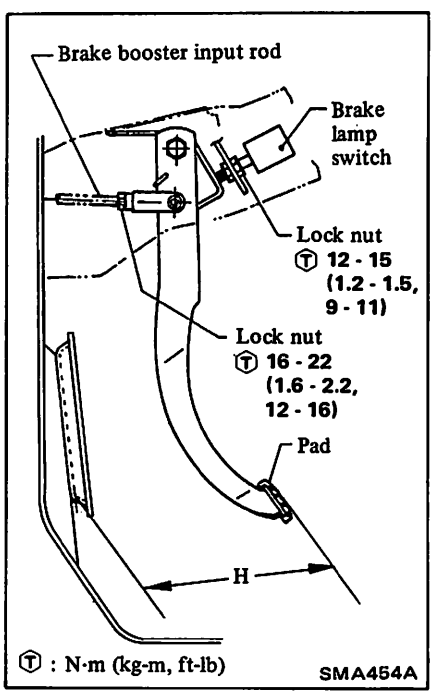
Refer to Section BR for shoe replacement.

Drum repair limit



CHECKING FOOT BRAKE

Check brake pedal free height from melt sheet.
Adjust if necessary.



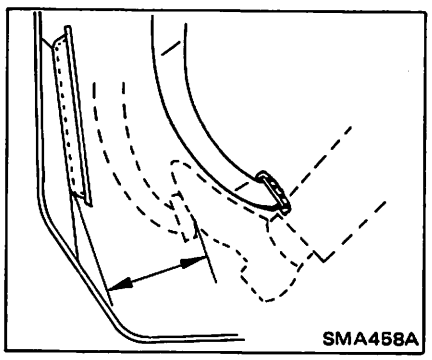
Pedal free height "h":
Refer to S.D.S.
Clearance "C" between pedal stopper rubber and threaded end of brake lamp switch:
0 - 1 mm (0 - 0.04 in)

(1) Adjust pedal free height with brake booster input rod. Then tighten lock nut.
(2) Adjust clearance "C" with brake lamp switch. Then tighten lock nut.

Make sure that no depressing force is on brake booster input rod and that brake lamp is off when pedal is released.

CHECKING BRAKE PEDAL DEPRESSED HEIGHT

Check brake pedal depressed height with engine running.



Depressed height
[Under force of 490 N (50 kg, 110 lb) with engine running]:
Refer to S.D.S.

If depressed height is below the specified value, check brake system for leaks, accumulation of air or any abnormality regarding component parts (master cylinder, adjuster, etc.), and make the necessary repairs.

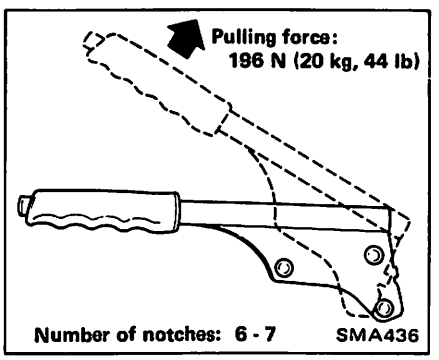
CHECKING BRAKE BOOSTER FUNCTION

Check the brake booster function in accordance with the following procedures.

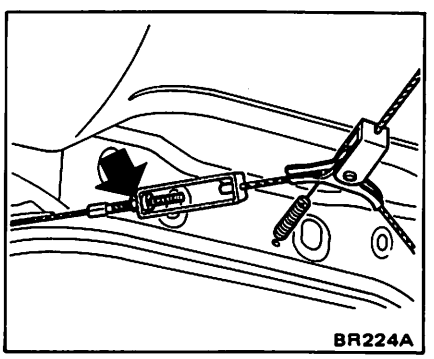
1. Park the vehicle on a level surface and set the parking brake.
2. With the engine stopped, depress the brake pedal several times to make sure that the pedal travel distance does not change. Then, while depressing the brake pedal, start the engine. At this time, the pedal should go down a little.
3. Depress the brake pedal while running the engine. With the brake pedal depressed, stop the engine. Keeping the pedal depressed for about 30 seconds, make sure that the depressed pedal height does not change.
4. Run the engine for a minute and then stop it. Depress the brake pedal several times and make sure that the pedal travel distance decreases gradually with each depression.

CHECKING PARKING BRAKE

1. Pull lever with specified amount of force.
   Measure lever stroke.



2. Use adjuster to adjust lever stroke.



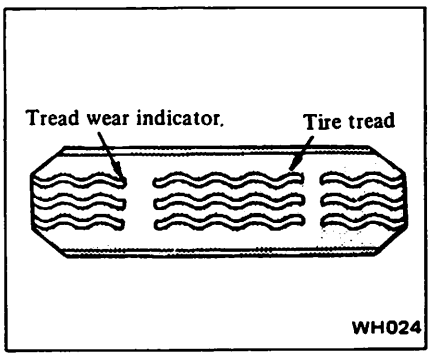
3. Bend hand brake warning lamp switch plate down so that brake warning light comes on when ratchet at hand brake lever is moved back one notch and goes out when returned to its original position.

WHEEL AND TIRE

CHECKING TIRE CONDITION

Tire condition

1. Tires are provided with "tread wear indicator" at six places around tire circumference, indicating 1.6 mm (1/16 in) tread depth. When tires wear and then marks appear, replace them with new ones.

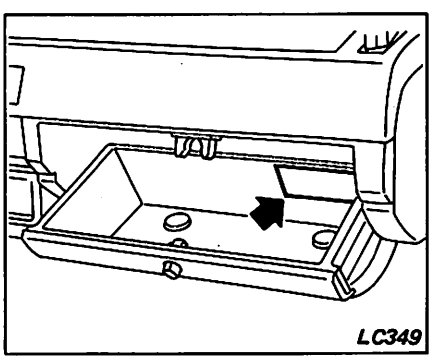


2. Remove pebbles, glass or any other foreign material embedded in tire treads.
3. Check tread and side walls for cracks, holes, separation or damage.
4. Check tire valves for air leakage.

Tire inflation

1. Check tire pressure. If necessary, adjust it to the specified value indicated in the label attached to the car, also found in S.D.S.

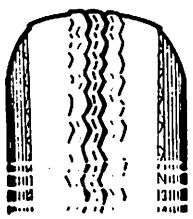
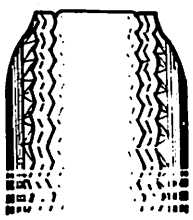
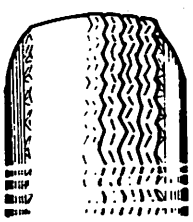
Tire pressure should be measured when tire is cold.



2. After inflating tires, valves should be checked for leakage. Whenever tire pressure is checked, be sure to tighten valve caps firmly by hand to keep dust and water out.

Abnormal tire wear

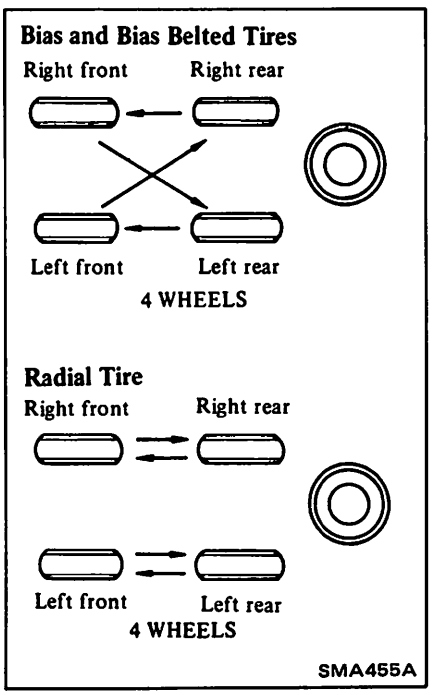
Correct abnormal tire wear according to the chart shown below.

Condition	Probable cause	Corrective action
 Shoulder wear	• Underinflation (both sides wear) • Incorrect wheel camber (one side wear) • Hard cornering • Lack of rotation	• Measure and adjust pressure. • Repair, or replace axle and suspension parts. • Reduce speed • Rotate tires.
 Center wear	• Overinflation • Lack of rotation	• Measure and adjust pressure. • Rotate tires.
Feathered edge  Toe-in or toe-out wear	• Incorrect toe	• Adjust toe-in.
 Uneven wear	• Incorrect camber or caster • Malfunctioning suspension • Unbalanced wheel • Out-of-round brake drum • Other mechanical conditions • Lack of rotation	• Repair, or replace axle and suspension parts. • Repair, replace or, if necessary, reinstall. • Balance or replace. • Correct or replace. • Correct or replace. • Rotate tires.

SMA068

TIRE ROTATION

1. Tires tend to wear unevenly and become unbalanced after a certain running distance. Uneven tire wear often results in tire noise which is attributed to rear axle gears, bearing, etc. Front tires also tend to wear unevenly because of improperly aligned front wheels.
2. Accordingly, to equalize tire wear, it is necessary to **rotate tires periodically.**



TIRE REPLACEMENT

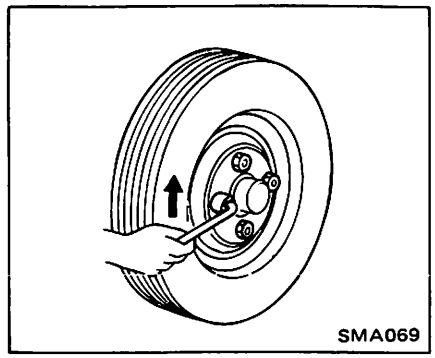
CAUTION:
Different types of tires, such as bias, bias belted and radial tires, must not be mixed under any circumstances. Mixed use of different types of tires can adversely affect vehicle handling and may cause driver to lose control.

a. When replacing a worn or damaged tire, use a replacement tire of the same size and load carrying capacity as that with which the car was equipped when manufactured. The use of different size and/or load capacity tires will not only shorten tire service life but may also result in a serious accident.
b. Do not use tires and wheels other than those recommended, and do not mix tires of different brands or tread patterns.
   The use of tires and wheels other than those recommended or the mixed use of tires of different brands or tread patterns can adversely affect the ride, braking, handling, ground clearance, body-to-tire clearance, and speedometer calibration.
c. It is recommended that new tires be installed in pairs on the same axle. When replacing only one tire, it should be paired with the most tread, to equalize braking traction.
d. When replacing original tires with those tires of an optional recommended size and of different diameter, the speedometer must be recalibrated.
e. When tire is installed, refer to the procedure 7 described in TIRE REPAIR.

1. To replace a tire with a jack in a safe manner, refer to Lifting Points (Section GI) for jacking up.

WARNING:
Never get under vehicle while it is supported only by jack.
Always use safety stands to support side member of body construction when you must get beneath vehicle.

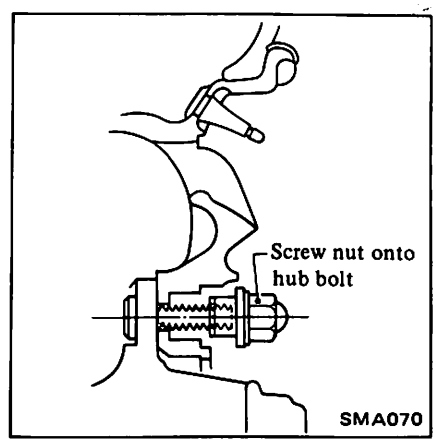
2. To install wheel, tighten wheel nuts in criss-cross fashion.


SMA069

Aluminum wheel

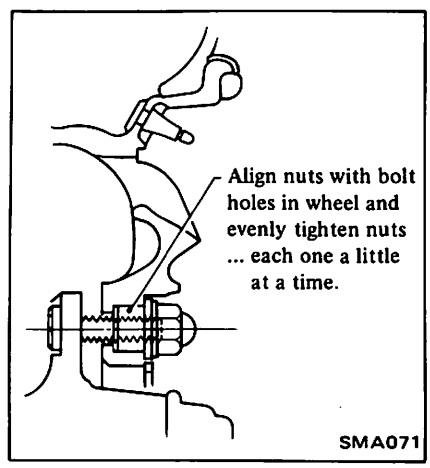
To install an aluminum wheel, proceed as follows:

1. Snugly tighten four nuts after the wheel is positioned.



SMA070

2. Slightly pull the wheel back to properly align the nuts with bolt holes in the wheel, and tighten the nuts as much as possible with your fingers.



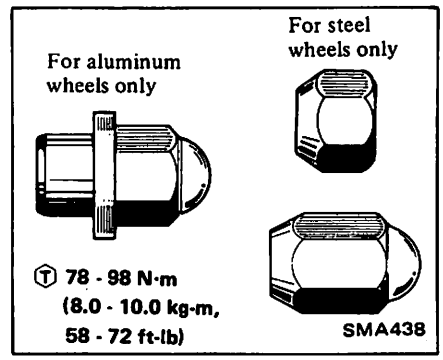
SMA071

3. Tighten wheel nuts evenly with a wheel wrench in criss-cross fashion.

Be sure to check the wheel nuts for tightness, after the aluminum wheel has been run for the first 1,000 km (600 miles) (also in case of repairing flat tires, tire rotation, etc.).
Replace if necessary.

Wheel nut

CAUTION:
Two types of wheel nuts are used; one is designed for use with steel wheel and the other for use with aluminum wheel. Do not mix different types of wheel nuts.



SMA438

Be careful not to smear threaded portion of bolt and nut, and seat of nut with oil or grease.

LIGHT WEIGHT SPARE TIRE (Size P155/80D13)

The light weight spare tire is designed for emergency use only.
The spare tire can be used repeatedly for emergency situations.

Precautions when using light weight spare tire

- **Periodically check tire inflation pressure, and always keep it at 35 psi (240 kPa).**
- **Do not drive vehicle at speed faster than 80 km/h (50 MPH).**
- **The light weight spare tire is designed only for temporary use as a spare. Dismount it and keep it as a spare as soon as the standard tire repair has been completed.**
- **Do not use tire chains on a light weight spare tire.**

- **Do not use the light weight spare tire on other vehicles.**
- **Do not make a sharp turn, or apply the brake suddenly while driving.**
- **As soon as the tread wear indicator becomes visible, replace the tire with a new one.**
- **Mounting and dismounting to and from the road wheel can be carried out in the same manner as any ordinary tire.**
- **Use of wheel balance is unnecessary.**

CAUTION:
If the vehicle is equipped with aluminum wheels, be sure to use the wheel nuts for steel wheel on the light weight spare tire wheel. Never use the wheel nuts for aluminum wheel on the spare tire wheel.
The spare tire wheel may come off the axle and cause personal injury if the wheel nuts for aluminum wheels are used on the spare tire wheel.

TIRE REPAIR

Inspect tire, following the procedure shown below. If any defect is present, repair or replace as necessary.

1. Apply soapy solution or submerge tire and wheel or tube in water after inflating it to specified pressure.
2. Inspect for leaks.
3. Specially inspect for leaks around valve or wheel rim and along tread.
4. Note bead and rim where leakage occurs. Wipe water away from any area which leaks air bubbles and then mark place with chalk.
5. Remove object which caused puncture and seal the point.

a. **When repairing a puncture, use a tire repair kit furnished by any tire dealer, following instructions provided with kit.**
b. **If a puncture is too large or there is some damage to tire fabric, repair should be carried out by authorized tire dealer.**

6. Discard when any of the following problems occurs:

- Broken or damaged bead wire.
- Ply or tread separation.
- Worn fabric damage on tubeless tire.
- Cracked or damaged side wall.
- Tires with tread wear indicator showing, etc.

CAUTION:
When replacing tire, take extra care not to damage tire bead, rim-flange and bead seat.

Do not use tire irons to force beads away from wheel rim-flange; that is, always use tire replacement device whenever tire is removed.

7. Install tire, noting the following items:

a. **Install valve core and inflate to proper pressure. Check the locating rings of the tire to be sure they show around the rim flanges on both sides.**
b. **Check valves for leakage after inflating tires.**
c. **Be sure to tighten valve caps firmly by hand.**

WARNING:
When, while tire is being inflated, bead snaps over safety hump, it might break. Thus, to avoid serious personal injury, never stand over tire when inflating it. Never inflate to a pressure greater than 40 psi (275 kPa). If beads fail to seat at that pressure, deflate the tire, lubricate it again, and then reinflate it. If the tire is overinflated, the bead might break possibly resulting in serious personal injury.

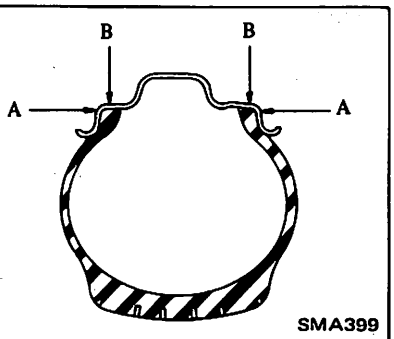
WHEEL INSPECTION

Inspect wheel, taking care of the following points, in order to ensure satisfactory steering condition as well as maximum tire life. If any defect is present, repair or replace as necessary.

1. Check wheel rim, especially rim flange and bead seat, for rust, distortion, cracks or other faults which might cause air leaks. Function of tubeless tire depends on a good seal between tire bead and wheel rim.
2. Thoroughly remove rust, dust, oxidized rubber or sand from wheel rim.

Rim bead seats should be cleaned with the following.
Steel wheel:
Wire brush, coarse steel wool, etc.
Aluminum wheel:
Neutral detergent, cloth, etc.

3. Examine wheel rim for lateral and radial runout, using dial gauge.



SMA399

Lateral runout (A) and radial runout (B):
Steel wheel ... Less than 1.0 mm (0.039 in)
Aluminum wheel ... Less then 0.5 mm (0.020 in)
Difference between right and left lateral runout:
Steel wheel ... Less than 0.5 mm (0.020 in)
Aluminum wheel ... Less than 0.2 mm (0.008 in)

4. Replace wheel when any of the following problems occurs.

- Bent, dented or heavily rusted
- Elongated bolt holes
- Excessive lateral or radial runout
- Air leaks through welds
- Wheel nuts will not stay tight

Wheel balance

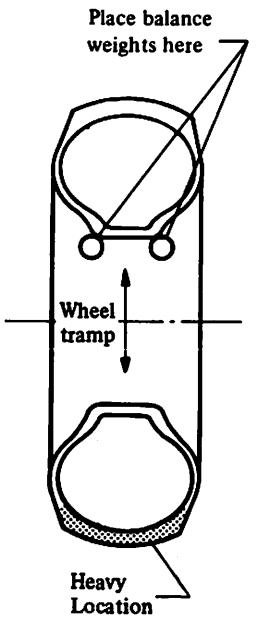
Inspect wheel and tire for wheel balance and correct it if unbalance is present, taking the following points into consideration.

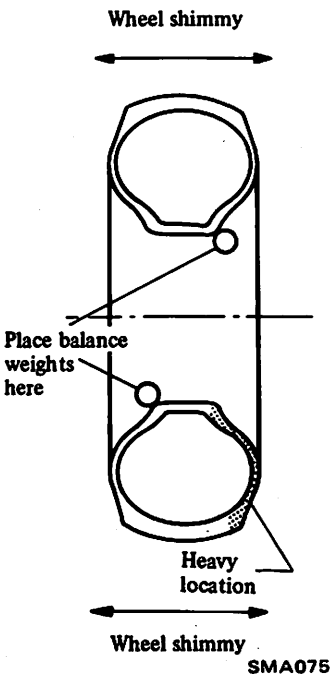
1. Correct unbalance when the symptom of unbalance appears as wheel tramps and wheel shimmy.
2. Balance wheel and tire both **statically and dynamically.**

Balancing wheels

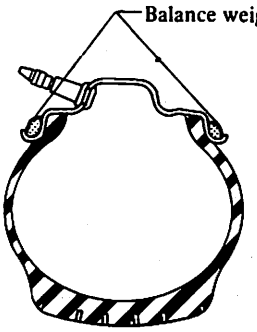
CAUTION:
Do not spin balance front wheels on the vehicle.
Transaxle damage will result.

Cause	Wheel static unbalance	Wheel dynamic unbalance
Symptom of unbalance	Wheel tramp Wheel shimmy	Wheel shimmy
Corrective action	Balance statically	Balance dynamically





SMA075



Maximum allowable unbalance at rim flange:
10 g (0.35 oz)
Balance weight:
10 - 60 g (0.35 - 2.12 oz)
at 10 g (0.35 oz) interval

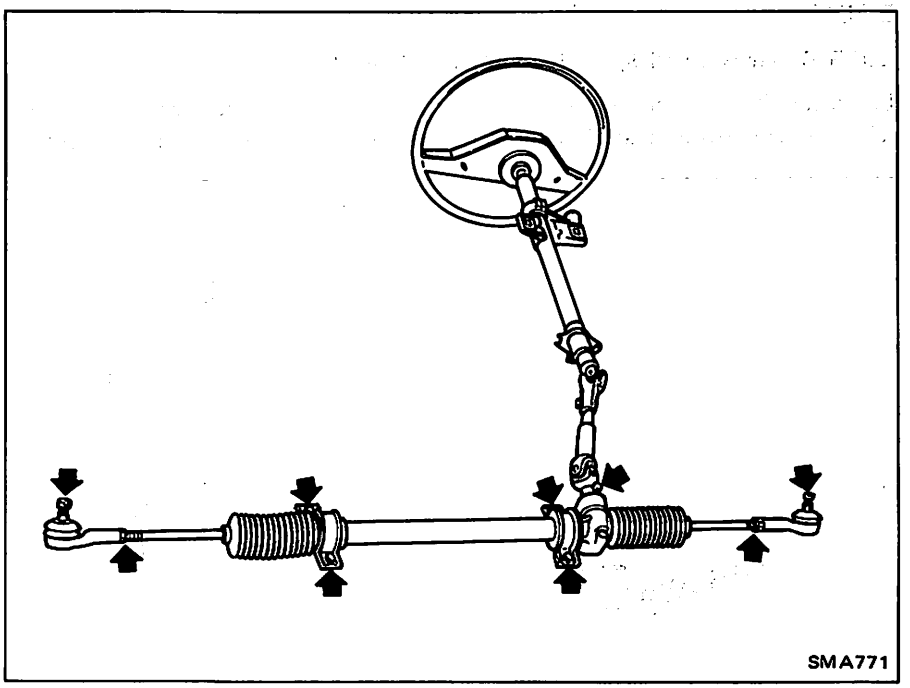
SMA076

a. Be sure to place correct balance weights on inner edge of rim.
b. Do not put more than two weights on each side.
c. Two types of balance weights are used; one is designed for use with steel wheel and the other for use with aluminum wheel. Do not mix different types of balance weights.
d. Properly rebalance the wheel and tire whenever puncture is repaired.

STEERING SYSTEM

INSPECTING STEERING GEAR AND LINKAGE

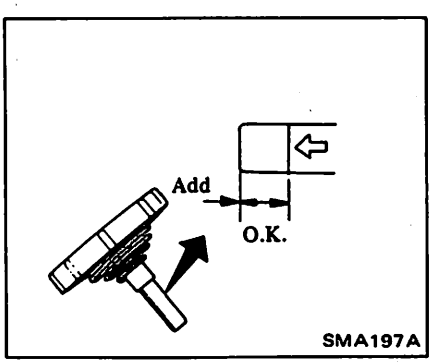
Check for damage, looseness and leakage of oil or grease.



CHECKING POWER STEERING FLUID LEVEL

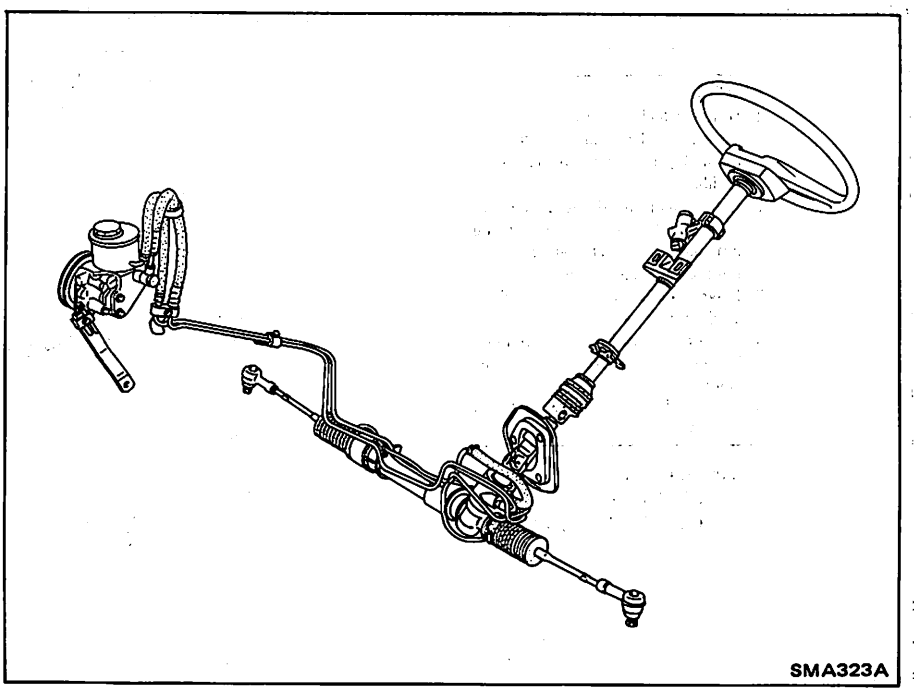
Check the fluid level in reservoir by observing the dipstick when the fluid is cold. Add fluid as necessary to bring the level into the proper range on dipstick.

CAUTION:
Do not overfill.



INSPECTING POWER STEERING LINES & HOSES

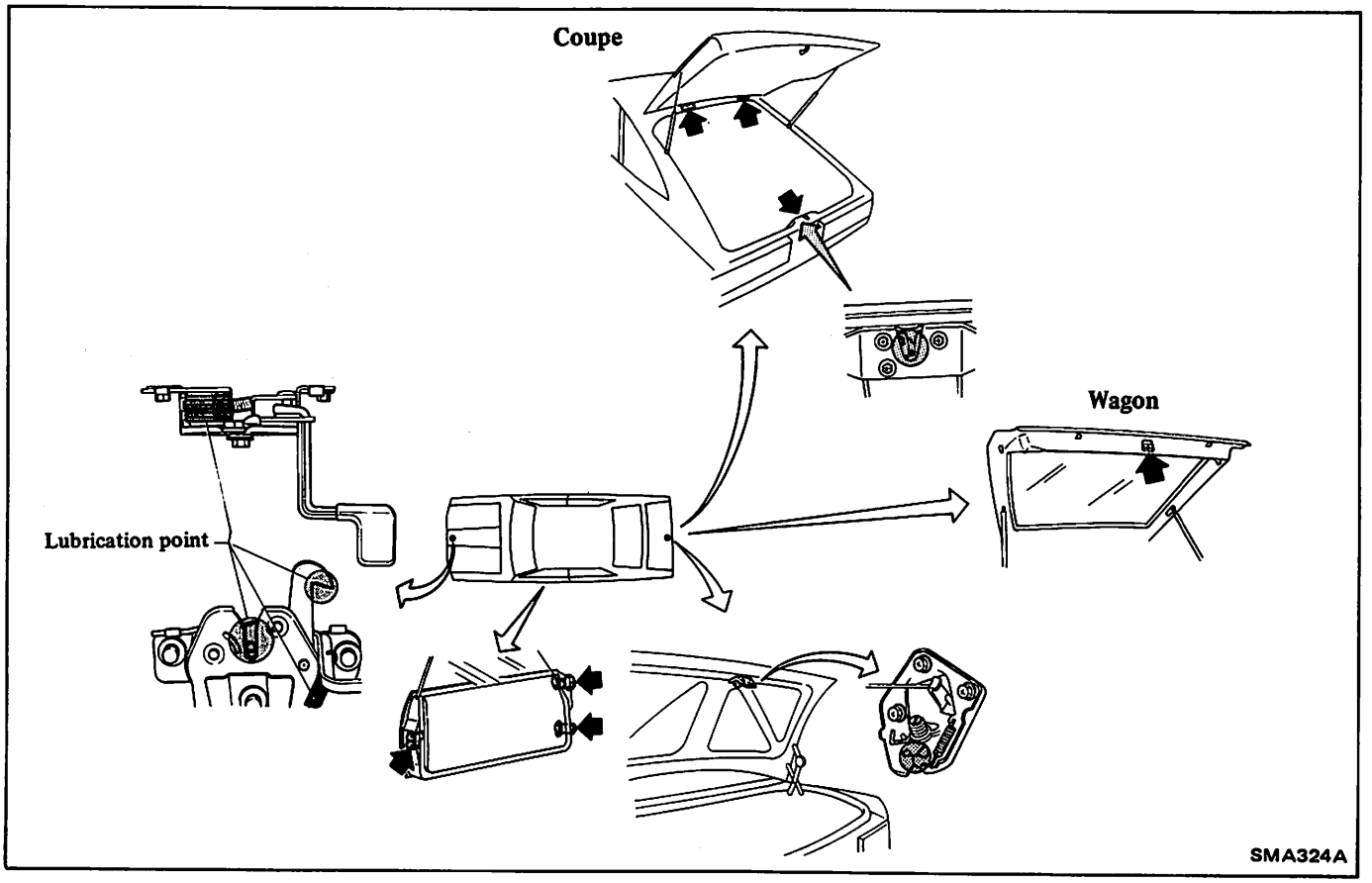
Check the lines & hoses for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.



BODY

LUBRICATING LOCKS, HINGES AND HOOD LATCH

Lubricate all locks and hinges on all doors including trunk lid, back hatch and hood latch. When driving in areas using road salt or other corrosive materials, inspection should be performed more frequently.

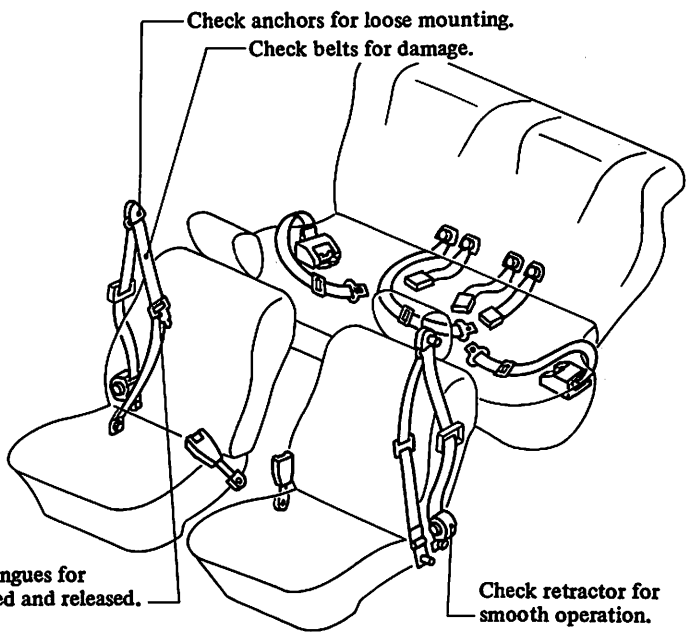


CHECKING SEAT BELTS, BUCKLES, RETRACTORS, ANCHORS AND ADJUSTER

Check for damage, deterioration, proper functioning, smooth operation and loose mounting.

CAUTION:
1. If the vehicle is collided or overturned, replace the entire belt assembly, regardless of nature of accident.
2. If the condition of any component of a seat belt is questionable, do not have seat belt repaired, but replaced as a belt assembly.
3. If webbing is cut, frayed, or damaged, replace belt assembly.
4. Do not spill drinks, oil etc. on inner lap belt buckle. Never oil tongue and buckle.
5. Use a NISSAN genuine seat belt assembly.

Ⓣ Anchor bolt
24 - 31 N·m
(2.4 - 3.2 kg-m, 17 - 23 ft-lb)



SERVICE DATA AND SPECIFICATIONS (S.D.S.)

ENGINE MAINTENANCE (E15 & E16)

INSPECTION AND ADJUSTMENT

Basic mechanical system

Valve clearance mm (in)	Hot	Intake	0.28 (0.011)
		Exhaust	0.28 (0.011)
	Cold*1	Intake	0.22 (0.009)
		Exhaust	0.22 (0.009)

Drive belt deflection (Cold)	Used*2	New*3
Alternator mm (in)	13 - 17 (0.51 - 0.67)	10 - 14 (0.39 - 0.55)
Air conditioner mm (in)	9 - 11 (0.35 - 0.43)	7 - 9 (0.28 - 0.35)
Power steering mm (in)	7 - 9 (0.28 - 0.35)	6.5 - 8.5 (0.256 - 0.335)
Pushing force N (kg, lb)	98 (10,22)	
Engine compression pressure kPa (kg/cm², psi) Standard	1,245 (12.7, 181)	
Minimum	981 (10.0, 142)	

*1 After checking valve clearance while engine is cold, also check it when engine is hot to see if it remains within the specific range. If it does not readjust it.
*2 Adjust deflection of used belt
*3 Set deflection of new belt

Ignition and fuel system

Spark plugs

Destination	Type			Gap mm (in)
	Standard	Hot	Cold	
U.S.A.	BPR5ES-11	BPR4ES-11	BPR6ES-11	1.0 - 1.1 (0.039 - 0.043)
Canada	BPR5ES	BPR4ES	BPR6ES	0.8 - 0.9 (0.031 - 0.035)
High tension cable resistance ohm	Less than 30,000			

Ignition timing, idle speed and idle "CO"% (For U.S.A.)

	Except M.P.G.		M.P.G.
	Manual	Automatic	Manual
Ignition timing/ Idle speed (A.T.D.C. degree/rpm)	*5±2° / 750±50	*5±2° / 650±50	*2±2° / 700±50
"CO"% at idle speed	Idle mixture screw is preset and sealed at factory.		

Ignition timing, idle speed and idle "CO"% (For Canada)

	Except M.P.G.		M.P.G.
	Manual	Automatic	Manual
Ignition timing/ Idle speed (A.T.D.C. degree/rpm)	*5±2° / 750±50	*5±2° / 650±50	*2±2° / 700±50
"CO"% at idle speed	2±1		Idle mixture screw is preset and sealed at factory.

* Measure with distributor vacuum hose disconnected and vacuum hose plugged up.

Emission control system

Unit: kPa (mmH_2O, inH_2O)

Vapor line leakage test	Supplied pressure	3.923 (400, 15.75)
	Pressure variation	Less than 0.245 (25, 0.98)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Valve rocker adjusting nut	16 - 21	1.6 - 2.1	12 - 15
Oil pan drain plug	35 - 47	3.6 - 4.8	26 - 35
Spark plug	20 - 29	2.0 - 3.0	14 - 22

ENGINE MAINTENANCE (CD17)

INSPECTION AND ADJUSTMENT

Valve clearance mm (in)	
Intake	0.20 - 0.30 (0.008 - 0.012)
Exhaust	0.40 - 0.50 (0.016 - 0.020)

Drive belt Deflection mm (in)	New	Used	Deflection limit
Fan	9 - 11 (0.35 - 0.43)	11 - 13 (0.43 - 0.51)	14 (0.55)
Compressor	11 - 13 (0.43 - 0.51)	12 - 14 (0.47 - 0.55)	15 (0.59)

Applied pressure force N (kg, lb)	98 (10, 22)

Lifter plate

Part number	Thickness mm (in)	Identification
13232-16A00	3.00 (0.1181)	300
13232-16A01	3.05 (0.1201)	305
13232-16A02	3.10 (0.1220)	310
13232-16A03	3.15 (0.1240)	315
13232-16A04	3.20 (0.1260)	320
13232-16A05	3.25 (0.1280)	325
13232-16A06	3.30 (0.1299)	330
13232-16A07	3.35 (0.1319)	335
13232-16A08	3.40 (0.1339)	340
13232-16A09	3.45 (0.1358)	345
13232-16A10	3.50 (0.1378)	350
13232-16A11	3.55 (0.1398)	355
13232-16A12	3.60 (0.1417)	360
13232-16A13	3.65 (0.1437)	365
13232-16A14	3.70 (0.1457)	370
13232-16A15	3.75 (0.1476)	375
13232-16A16	3.80 (0.1496)	380
13232-16A17	3.85 (0.1516)	385
13232-16A18	3.90 (0.1535)	390
13232-16A19	3.95 (0.1555)	395
13232-16A20	4.00 (0.1575)	400
13232-16A21	4.05 (0.1594)	405
13232-16A22	4.10 (0.1614)	410
13232-16A23	4.15 (0.1634)	415
13232-16A24	4.20 (0.1654)	420

Injection system

Idle speed	rpm	750^{+100}_{-50}
Plunger lift	mm (in)	
For low altitudes		
M/T		0.94±0.03 (0.0370±0.0012)
A/T		0.88±0.03 (0.0346±0.0012)
For high altitudes		
M/T		1.00±0.03 (0.0394±0.0012)
A/T		0.94±0.03 (0.0370±0.0012)
Initial injection pressure	kPa (kg/cm², psi)	
New		13,239 - 14,024 (135 - 143, 1,920 - 2,033)
Used		12,259 - 13,239 (125 - 135, 1,778 - 1,920)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Air cleaner bracket bolt	26 - 34	2.7 - 3.5	20 - 25
Alternator to bracket	49 - 59	5.0 - 6.0	36 - 43
Alternator to adjusting bar	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Crank damper pulley bolt	123 - 132	12.5 - 13.5	90 - 98
Front dust cover	3 - 5	0.3 - 0.5	2.2 - 3.6
Idler pulley bolt	36 - 44	3.7 - 4.5	27 - 33
Injection pump nut	13 - 18	1.3 - 1.8	9 - 13
Injection pump to rear bracket	49 - 59	5.0 - 6.0	36 - 43
Injection tube flare nut	22 - 25	2.2 - 2.5	16 - 18
Oil pan drain plug	37 - 45	3.8 - 4.6	27 - 33
Plug bolt	14 - 20	1.4 - 2.0	10 - 14
Rear dust cover	1 - 3	0.1 - 0.3	0.7 - 2.2
Rocker cover	1 - 3	0.1 - 0.3	0.7 - 2.2
Front tensioner	36 - 44	3.7 - 4.5	27 - 33
Rear tensioner	16 - 21	1.6 - 2.1	12 - 15
Water drain plug	54 - 74	5.5 - 7.5	40 - 54

CHASSIS AND BODY MAINTENANCE

INSPECTION AND ADJUSTMENT

Clutch

Unit: mm (in)

Pedal height "H"	194 - 204 (7.64 - 8.03)
Pedal free play "A"	11 - 21 (0.43 - 0.83)
Withdrawal lever play	2 - 4 (0.08 - 0.16)

Front axle and front suspension

Wheel alignment (Unladen*) Camber	degree	–35' - 1°05'
Caster	degree	45' - 2°15'
Kingpin inclination	degree	12°10' - 13°40'
Toe-in	mm (in)	3 - 5 (0.12 - 0.20)
Side slip (Reference data)	mm/m (in/ft)	Out 3 - In 3 (Out 0.036 - In 0.036)
Standard side rod length	mm (in)	175.9 (6.93)
Front wheel turning angle Toe-out turns (Inside/Outside)	degree	20/17°30'
Full turn (Inside/Outside)	degree	
E15		40° - 44°/31° - 35°
CD17 M/T		37° - 41°/29° - 33°
CD17 A/T		33° - 37°/27° - 31°

Rear axle and rear suspension

Axial play	mm (in)	0 (0)
Wheel bearing nut Tightening torque	N·m (kg-m, ft-lb)	39 - 44 (4.0 - 4.5, 29 - 33)
Return angle	degree	90°
Wheel bearing starting torque With new grease seal	N·m (kg-cm, in-lb)	Less than 0.8 (8, 6.9)
As measured at hub bolt	N (kg, lb)	Less than 13.7 (1.4, 3.1)
With used grease seal	N·m (kg-cm, in-lb)	Less than 0.4 (4, 3.5)
As measured at hub bolt	N (kg, lb)	Less than 6.9 (0.7, 1.5)

Brake

Unit: mm (in)

Disc brake Pad minimum thickness	2.0 (0.079)
Rotor minimum thickness	10.0 (0.394)
Drum brake Lining minimum thickness	1.5 (0.059)
Drum maximum inner dia.	181 (7.13), 203.2 (8.00)
Pedal Free height "h" MT	194 - 204 (7.64 - 8.03)
AT	197 - 207 (7.76 - 8.15)
Depressed height [Under force of 490 N (50 kg, 110 lb) with engine running]	More than 85 (3.35)
Parking brake Number of notches [at pulling force 196 N (20 kg, 44 lb)]	6 - 7 notches

Wheel and tire

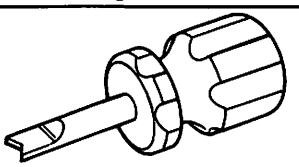
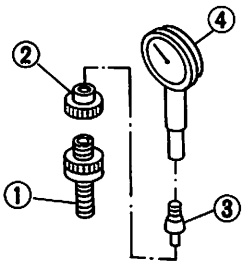
Recommended tire inflation pressure (Inflation pressure should be measured when tires are cold.) 155SR13	psi (kPa)	26 (180) 28 (200)*1
175/70SR13	psi (kPa)	26 (180)
P155/80D13 Spare tire	psi (kPa)	35 (240)
Wheel rim lateral and radial runout Steel wheel	mm (in)	Less than 1.0 (0.039)
Aluminum wheel	mm (in)	Less than 0.5 (0.020)
Difference between right and left lateral runout Steel wheel	mm (in)	Less than 0.5 (0.020)
Aluminum wheel	mm (in)	Less than 0.2 (0.008)
Wheel balance (Maximum allowable unbalance at rim flange)	gr (oz)	10 (0.35)
Tire balance weight	gr (oz)	10 - 60 (0.35 - 2.12) Spacing 10 (0.35)

*1: Only front wheels of E15 and CD17 engine equipped model.

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Clutch			
Pedal stopper lock nut	16 - 22	1.6 - 2.2	12 - 16
Cable adjuster lock nut	12 - 15	1.2 - 1.5	8.7 - 10.8
Manual transaxle			
Drain and filler plugs	25 - 34	2.5 - 3.5	18 - 25
Front axle and front suspension			
Side rod outer socket lock nut	37 - 46	3.8 - 4.7	27 - 34
Side rod inner socket lock nut	78 - 98	8 - 10	58 - 72
Brake system			
Air bleed valve	7 - 9	0.7 - 0.9	5.1 - 6.5
Brake lamp switch lock nut	16 - 22	1.6 - 2.2	12 - 16
Brake booster input rod lock nut	16 - 22	1.6 - 2.2	12 - 16
Wheel and tire			
Wheel nut	78 - 98	8.0 - 10.0	58 - 72

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	Engine application	
		E15 & E16	CD17
ST19320000 (J25664)	Oil filter wrench 	X	–
KV10108300 (–)	Idle adjusting screwdriver 	X	–
KV11229352 (J28827) ① KV11229350 (–) ② KV11229360 (–) ③ KV11229370 (–) ④ KV11254410	Measuring device Holder Nut Pin Dial gauge 	–	X
KV11102600 (–)	Lifter plate replacer 	–	X

ENGINE MECHANICAL

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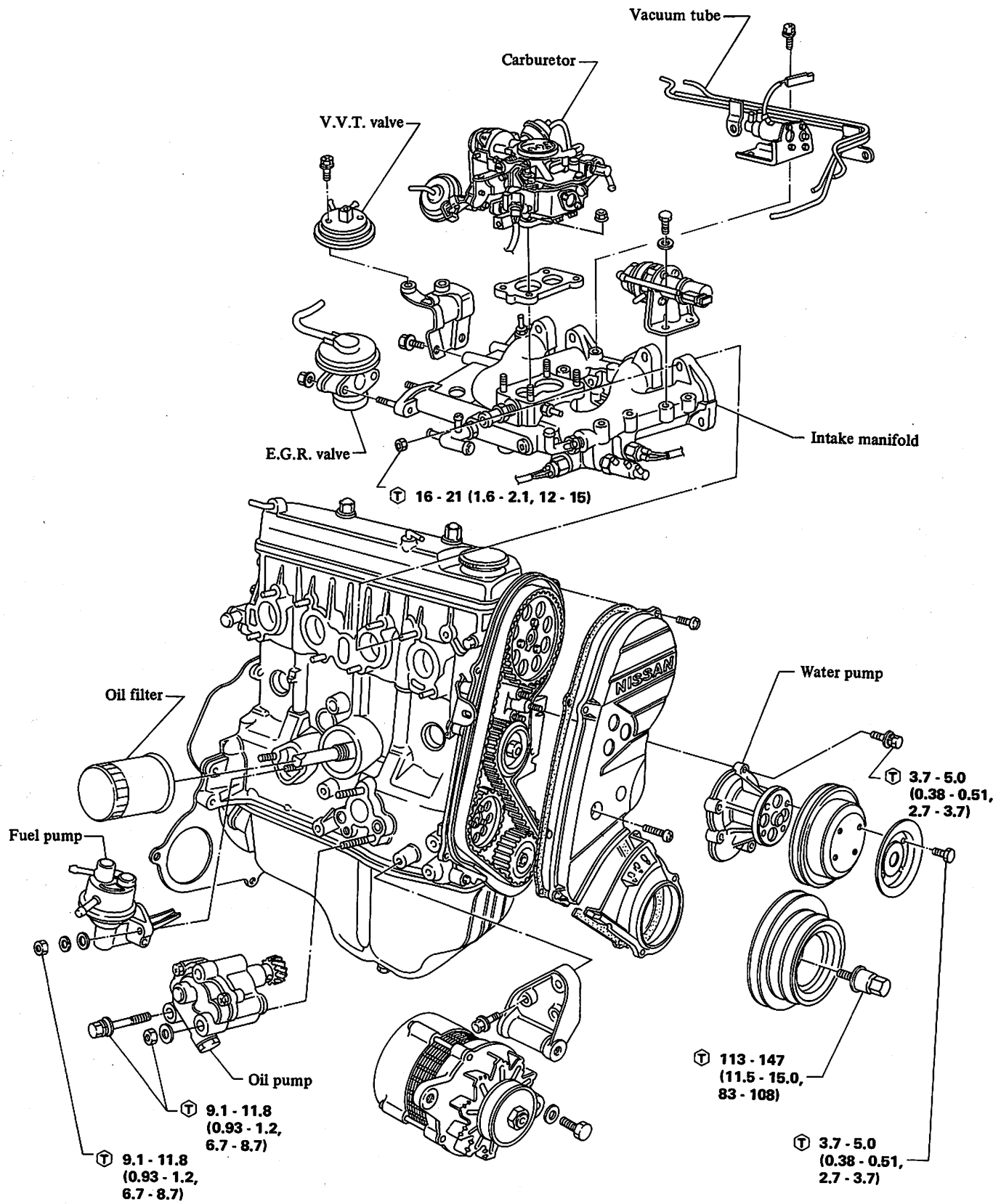
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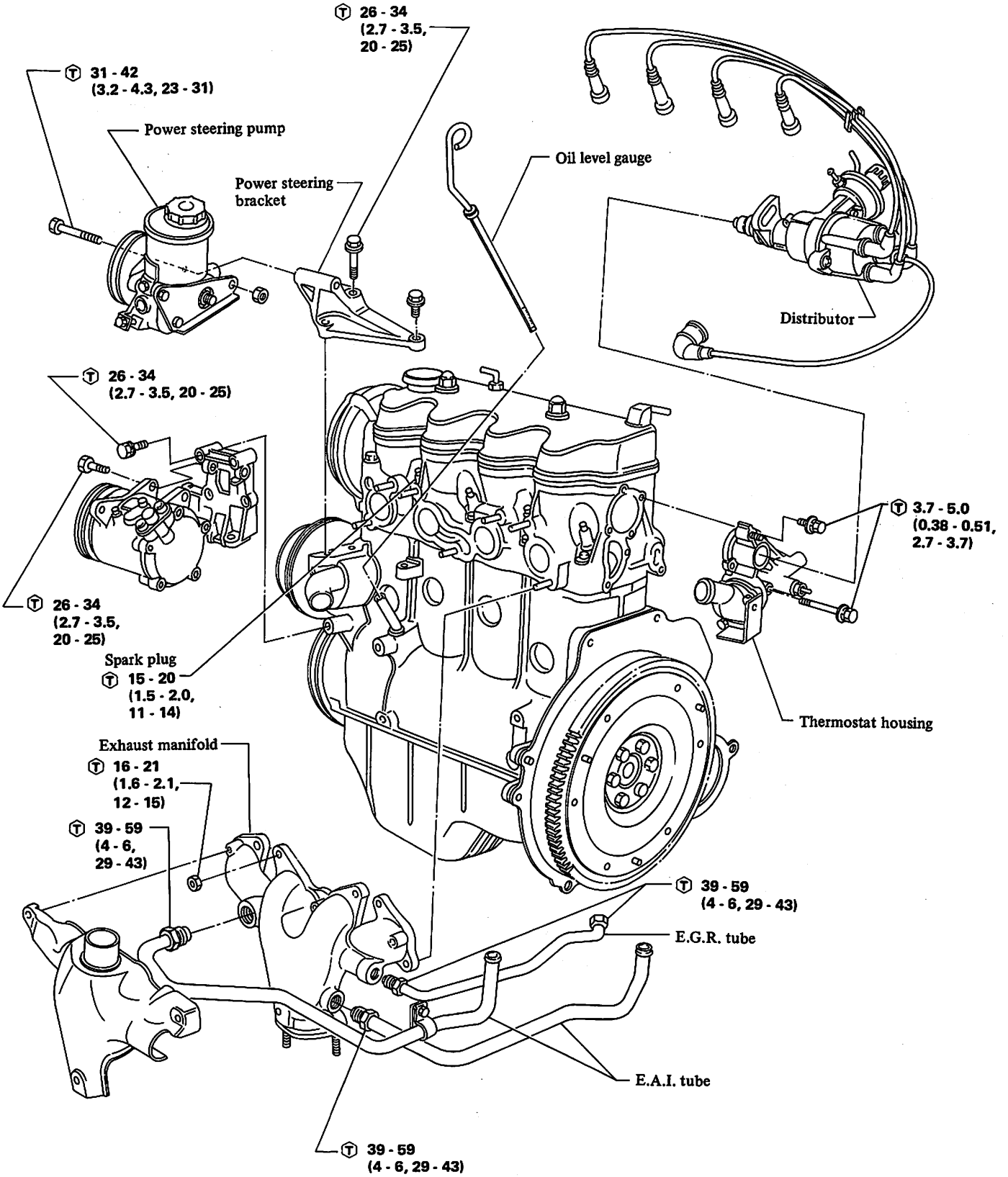
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ENGINE COMPONENTS (Outer parts)



Ⓣ : N·m (kg-m, ft-lb)

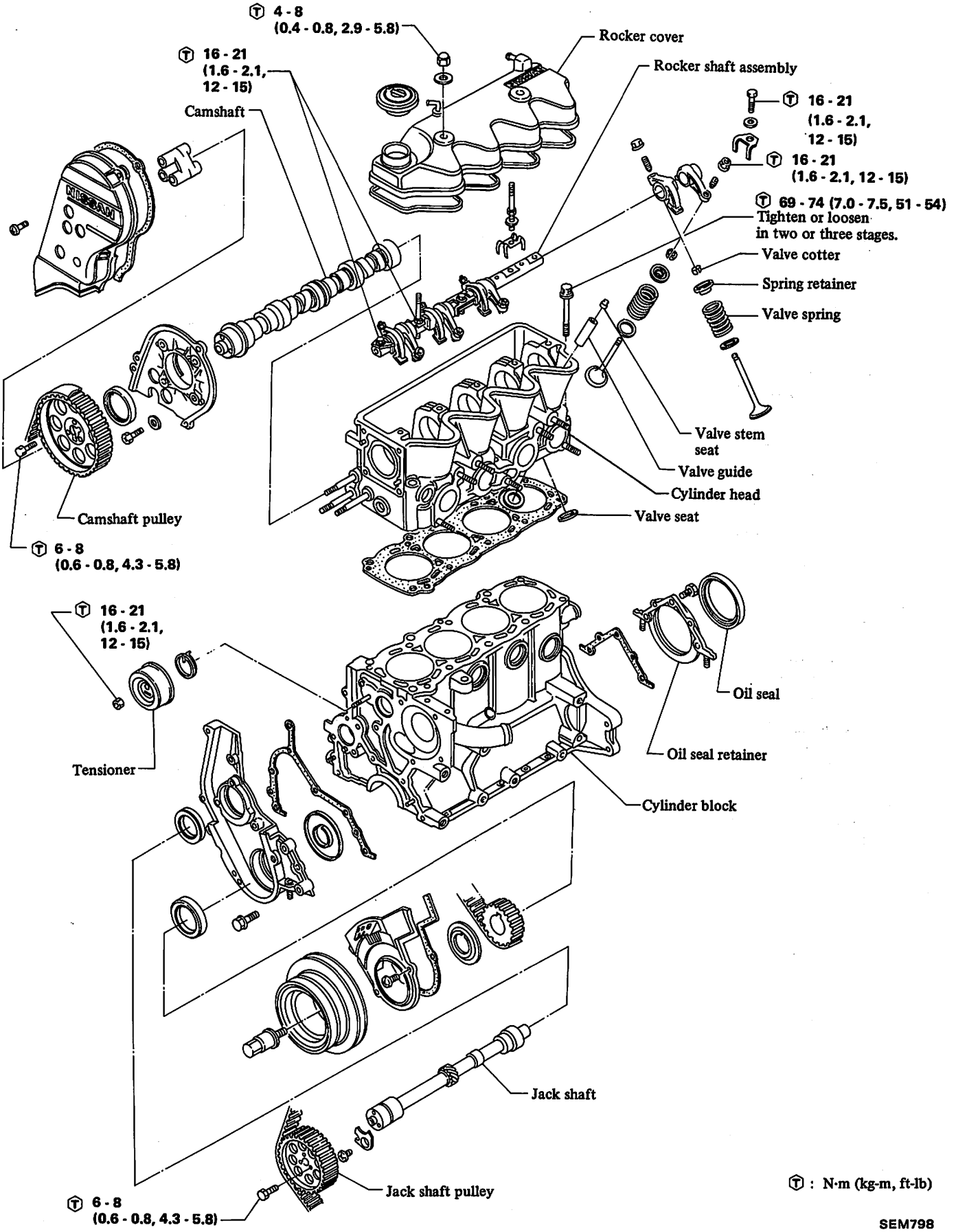
SEM796



Ⓣ : N·m (kg-m, ft-lb)

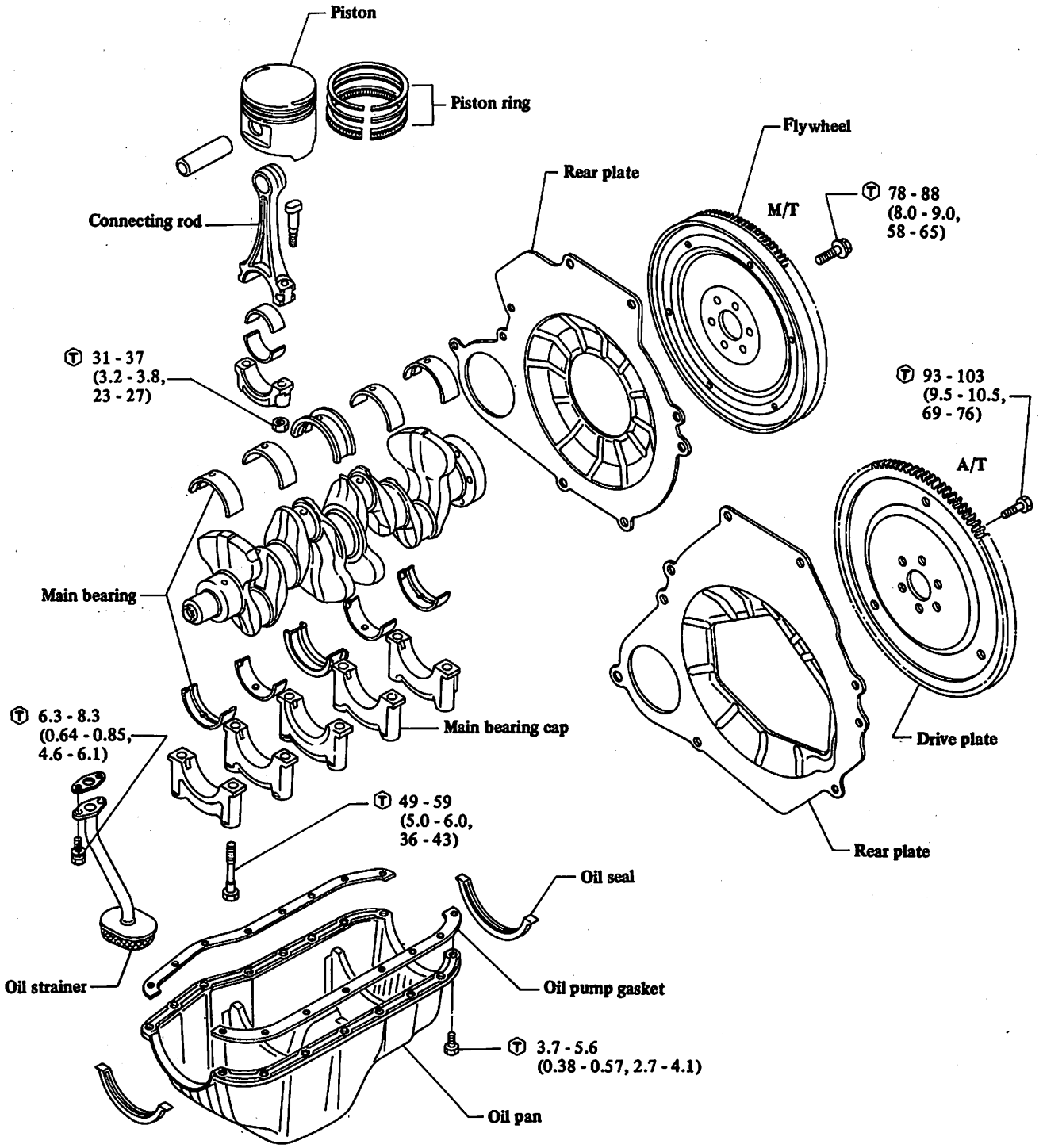
SEM797

ENGINE COMPONENTS (Internal parts)



Ⓣ : N·m (kg-m, ft-lb)

SEM798



T : N·m (kg-m, ft-lb)

SEM728

ENGINE DISASSEMBLY

PRECAUTIONS

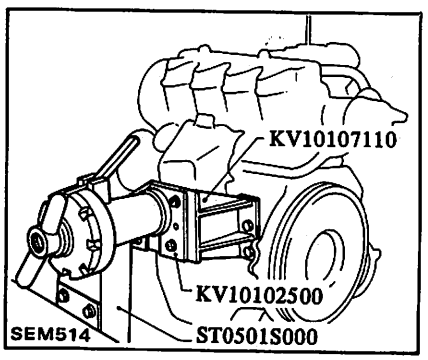
Arrange the disassembled parts on the parts stand in accordance with their assembled locations, sequence, etc., so that the parts will be reassembled in their original locations. Place mating marks on the parts if necessary.

ENGINE OVERALL

MOUNTING ENGINE ON ENGINE STAND

1. Remove parts at the rear of the engine.
- Transaxle assembly with starter motor
- Clutch unit

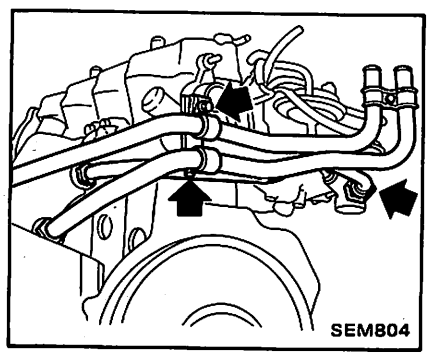
2. Install engine attachment on the engine.
3. Place engine on work stand.



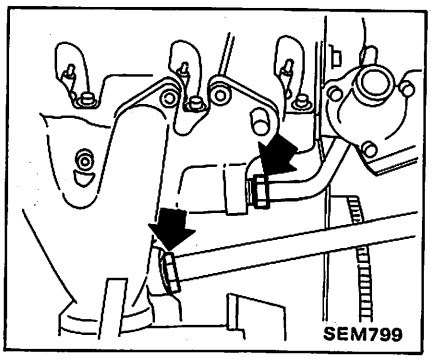
4. Drain engine oil and coolant.

OUTER PARTS

1. Parts at the rear of the engine.
(1) Remove distributor together with high tension cable.
(2) Remove E.A.I. pipes bracket and E.G.R. tube at E.G.R. valve side.

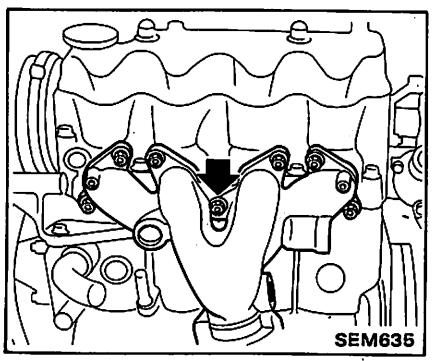


2. Parts on the left side of the engine.
(1) Disconnect E.G.R. and E.A.I. pipe.



(2) Remove exhaust manifold cover.
(3) Remove E.A.I. pipe.
(4) Remove exhaust manifold.

Exhaust manifold center nut has a different diameter from the other nut.

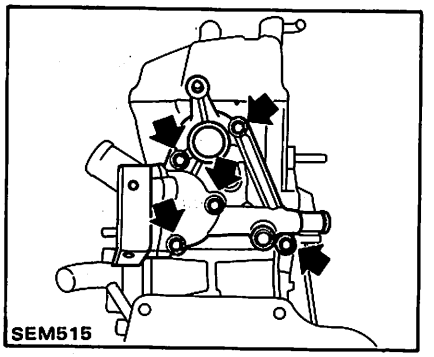


(5) Remove cooler compressor bracket and power steering pump bracket.
3. Parts on the right side of the engine.
(1) Remove intake manifold with carburetor.
(2) Loosen water pump pulley bolts.
(3) Remove alternator, alternator bracket and drive belt.
(4) Remove oil filter.
(5) Remove oil pump assembly with gasket.
(6) Remove fuel pump assembly with spacer.

INTERNAL PARTS

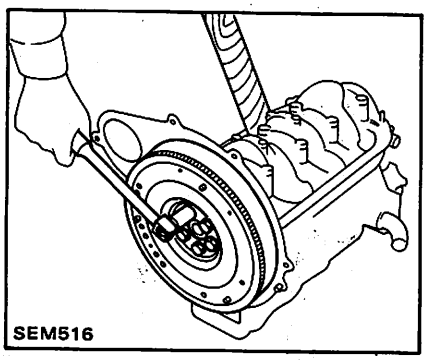
1. Bottom parts
(1) Remove oil pan, gasket and oil seal.
(2) Remove oil strainer.

2. Rear side parts
(1) Remove thermostat housing.

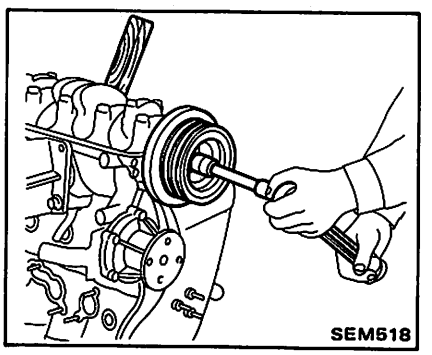


(2) Remove flywheel or drive plate, then remove rear plate.

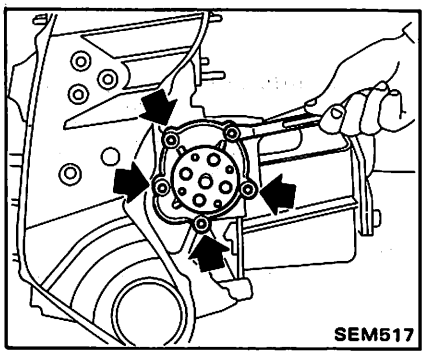
WARNING:
When removing flywheel, be careful not to drop it.



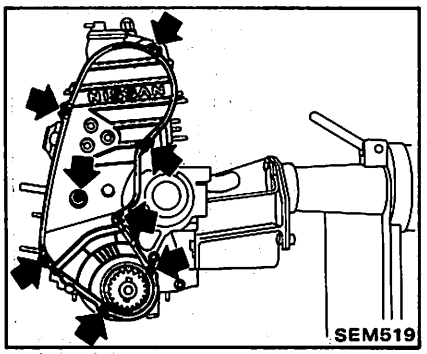
3. Front side parts
(1) Remove water pump pulley.
(2) Remove crankshaft pulley.



(3) Remove water pump assembly with gasket.



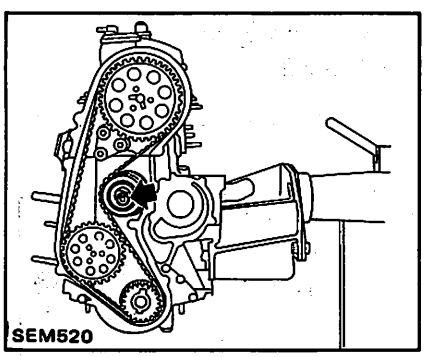
(4) Remove upper and lower dust cover.



(5) Remove tensioner pulley.
(6) Remove timing belt.

Mark rotating direction mark on timing belt.

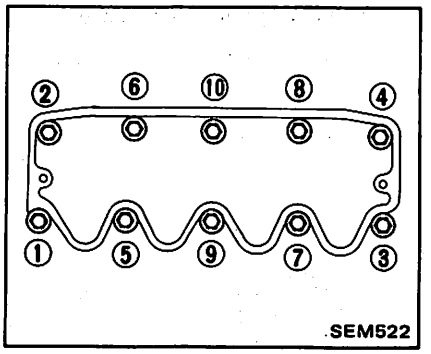
(7) Remove jack shaft pulley.



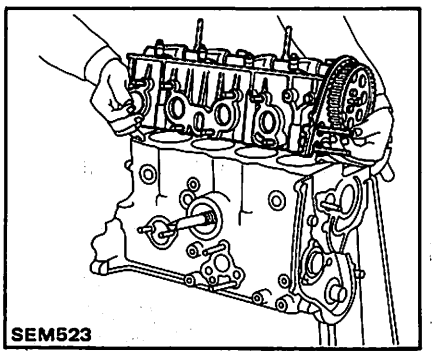
(8) Remove crankshaft timing pulley with spacer.

4. Separate cylinder head from cylinder block.
(1) Remove spark plugs.
(2) Remove valve rocker cover.
(3) Remove cylinder head bolts.

The bolts should be loosened in two or three stages.



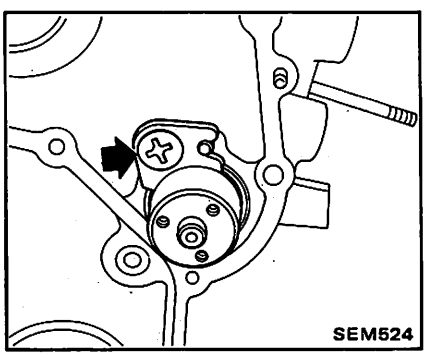
(4) Separate them.



5. Jack shaft
(1) Remove front cover.

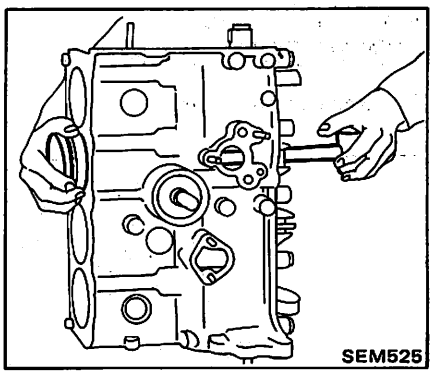
Be careful not to damage oil seal lip.

(2) Remove jack shaft locating plate.



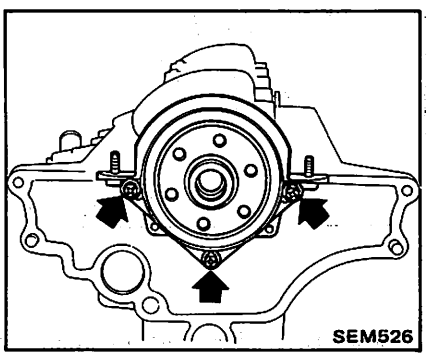
(3) Take out jack shaft.

6. Piston and connecting rod assembly.
(1) Remove connecting rod caps and bearings.
(2) Take out pistons together with connecting rods toward cylinder head side.

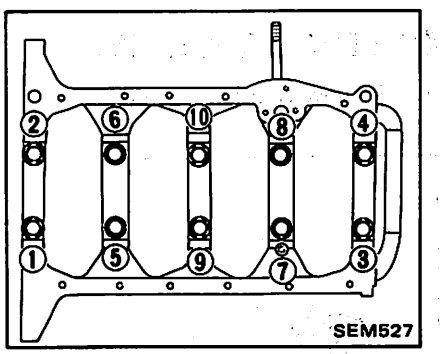


a. Piston can be easily removed by scraping carbon off top face of cylinder with a scraper.
b. Numbers are stamped on the connecting rod and cap corresponding to each cylinder. Care should be taken to avoid a wrong combination including bearing.

7. Crankshaft
(1) Remove oil seal retainer.



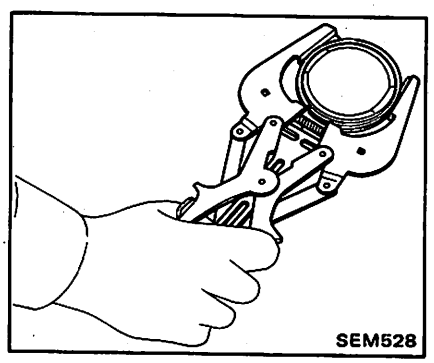
(2) Remove main bearing cap together with bearing.



(3) Remove crankshaft and bearings.

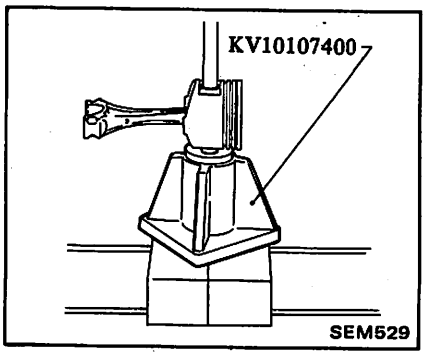
PISTON AND CONNECTING ROD

1. Remove piston rings.



Be careful not to scratch piston.

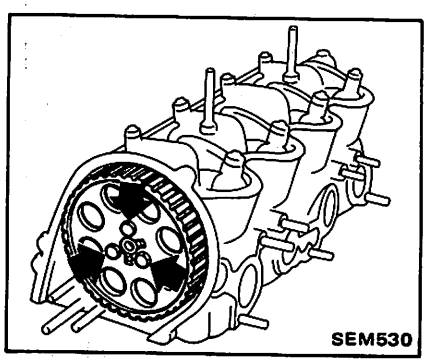
2. Press out piston pin.



Keep disassembled parts in order.

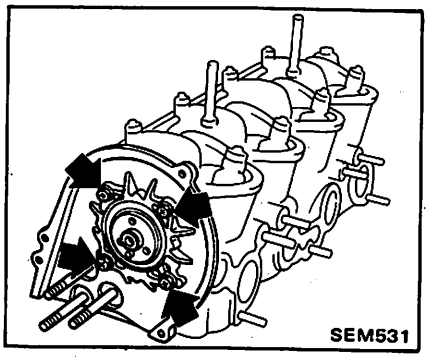
CYLINDER HEAD

1. Remove camshaft pulley.

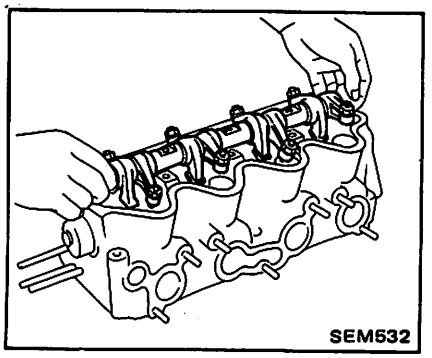


2. Remove cylinder head cover.

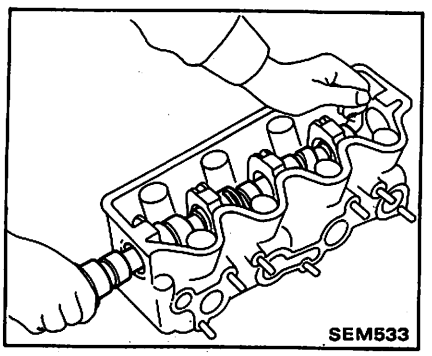
Be careful not to damage oil seal lip.



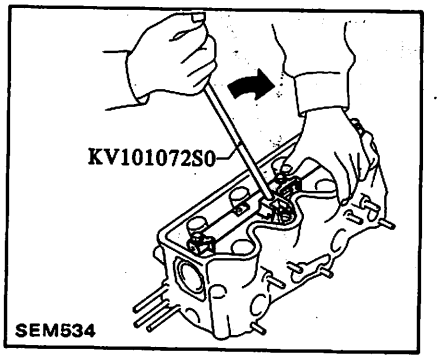
3. Remove rocker shaft assembly.



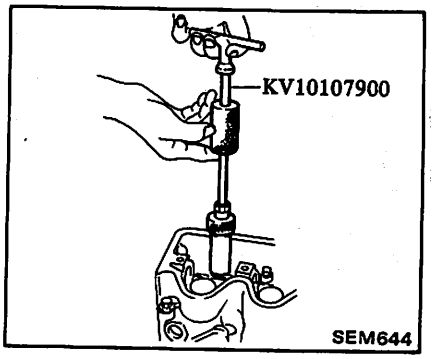
4. Take out camshaft.



5. Temporarily install rocker shaft and remove valve component parts.

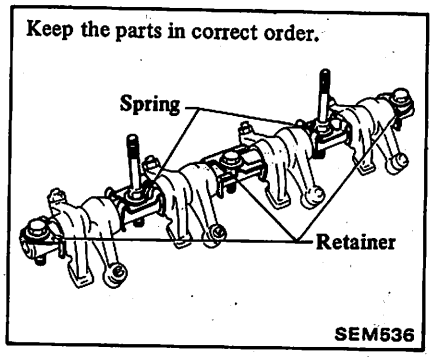


6. Remove valve oil seals.



ROCKER SHAFT ASSEMBLY

Remove rocker shaft springs and retainers.



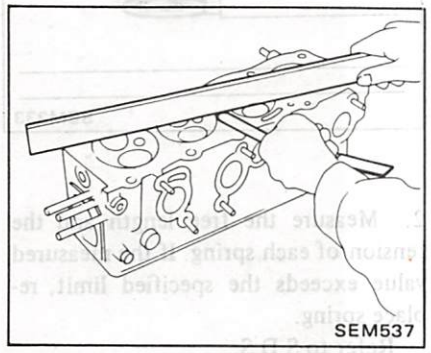
Keep them in correct order.

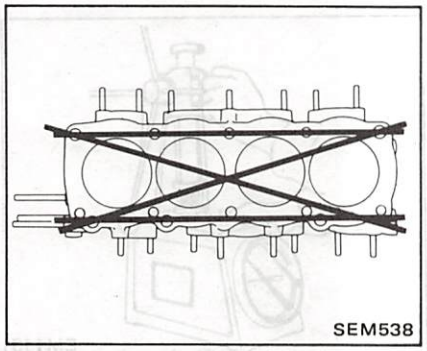
INSPECTION AND REPAIR

CYLINDER HEAD

CHECKING CYLINDER HEAD MATING FACE

1. Make a visual check for cracks and flaws.
2. Measure the surface of cylinder head (on cylinder block side) for warpage.


SEM537


SEM538

Warpage of surface:
Less than
0.1 mm (0.004 in)

If beyond the specified limit, correct with a surface grinder.

Surface grinding limit:
The grinding limit of cylinder head is determined by the cylinder block grinding in an engine.
Depth of cylinder head grinding is "A"
Depth of cylinder block grinding is "B"
The limit is as follows:
A + B = 0.2 mm (0.008 in)

VALVE GUIDE

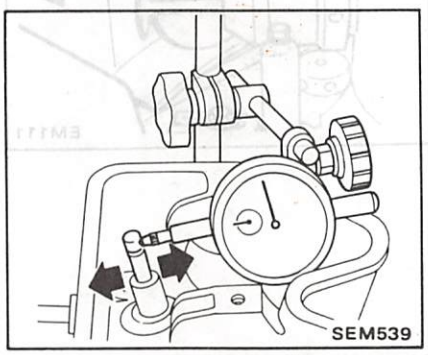
Measure the clearance between valve guide and valve stem. If the clearance exceeds the specified limit, replace the worn parts or both valve and valve guide. In this case, it is essential to determine if such a clearance has been caused by a worn or bend valve stem or by a worn valve guide.

Determining clearance

1. Precise method:
(1) Measure the diameter of valve stem with a micrometer in three places; top, center and bottom.
(2) Measure valve guide bore at center using telescope hole gauge.
(3) Subtract the highest reading of valve stem diameter from valve guide bore to obtain the stem to guide clearance.

Stem to guide clearance:
Maximum Limit
0.10 mm (0.0039 in)

2. Expedient method
Pry the valve in a lateral direction, and measure the deflection as stem tip with dial gauge.

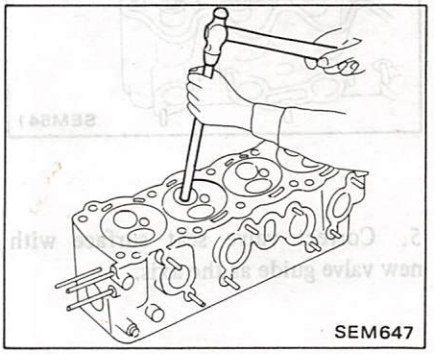

SEM539

Max. allowable deflection:
(Dial indicator reading)
0.2 mm (0.008 in)

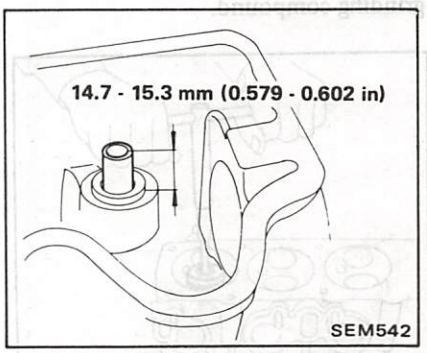
Valve should be moved in parallel with rocker arm. (Generally, a large amount of wear occurs in this direction.)

Replacement of valve guide

To remove old guides, use a press [under a 20 kN (2 t, 2.2 US ton, 2.0 Imp ton) pressure] or a hammer, and suitable tool.
1. Drive them out toward rocker cover side using suitable tool. Heating the cylinder head will facilitate the operation.


SEM647

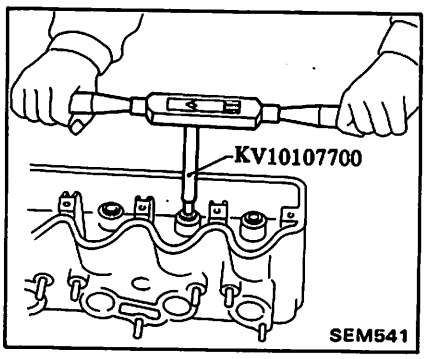
2. Ream cylinder head valve guide hole using Reamer ST11081000 [12.2 mm (0.480 in) dia.] at room temperature.
3. Install a service valve guide on cylinder head so that it protrudes about 15 mm (0.59 in) above the cylinder head surface. Heat cylinder head to 150 to 160°C (302 to 320°F) and press the guide onto cylinder head.



SEM542

4. Ream the bore using Tool KV10107700.

Reaming bore:
7.005 - 7.020 mm
(0.2758 - 0.2764 in)

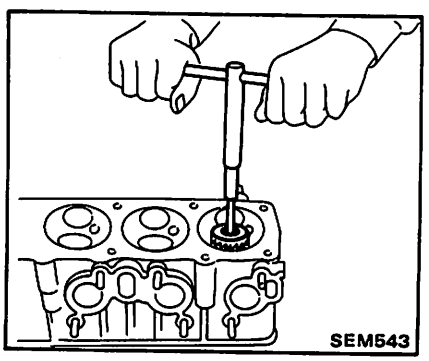


5. Correct valve seat surface with new valve guide as the axis.

VALVE SEAT INSERTS

Check valve seat inserts for any evidence of pitting at valve contact surface, and reseat or replace if worn out excessively.

Correct valve seat surface with suitable cutter or grinder and grind with a grinding compound.



a. When repairing valve seat, check valve and valve guide for wear beforehand. If worn, replace them. Then correct valve seat.

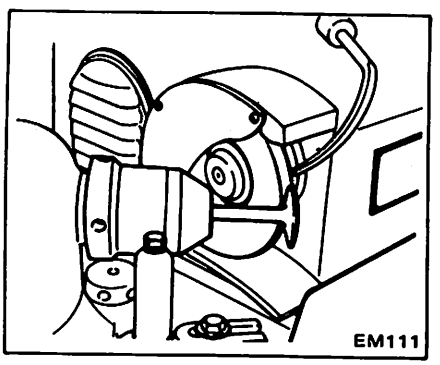
b. The cutting should be done with both hands for uniform cutting.

VALVE

1. Check each of the intake and exhaust valves for worn, damaged or deformed valve head or stem. Correct or replace the valve that is faulty.
2. Valve face or valve stem end surface should be refaced by using a valve grinder.

When valve head has been worn down to 0.5 mm (0.020 in) in-margin-thickness, replace the valve.

Grinding allowance for valve stem end surface is 0.2 mm (0.008 in) or less.

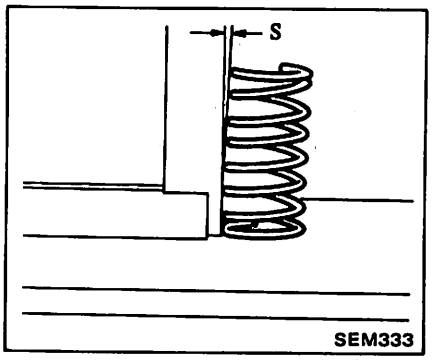


VALVE SPRING

1. Check valve spring for squareness using a steel square and surface plate.

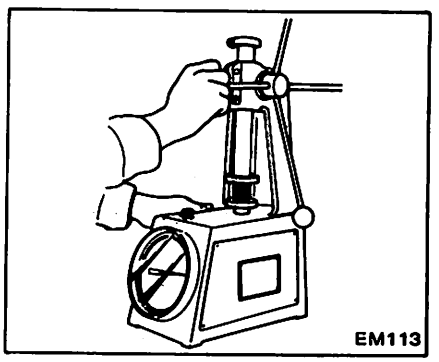
If spring is out of square "S" more than specified limit, replace with new ones.

Squareness limit:
2.0 mm (0.079 in)



2. Measure the free length and the tension of each spring. If the measured value exceeds the specified limit, replace spring.

Refer to S.D.S.



VALVE ROCKER ARM AND SHAFT

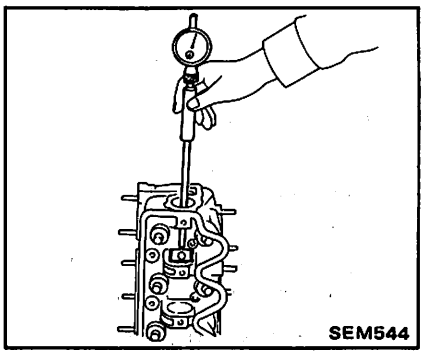
1. Check rocker arm bore and shaft for scores or scuffs.
2. Check valve end contact surface of rocker arm for abnormal wear or scuffs.

CAMSHAFT AND CAMSHAFT BEARING

CAMSHAFT BEARING CLEARANCE

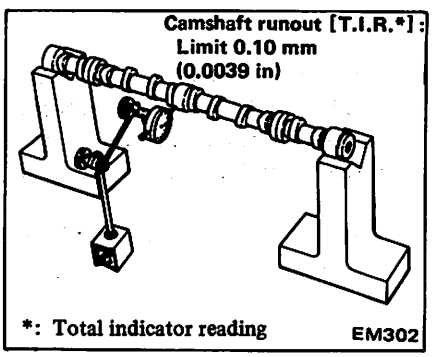
Measure the inside diameter of camshaft bearing with an inside dial gauge and the outside diameter of camshaft journal with a micrometer. If any malfunction is found, replace camshaft or cylinder head assembly.

Max. tolerance of camshaft bearing clearance:
No. 1, 3, 5
0.15 mm (0.0059 in)
No. 2, 4
0.20 mm (0.0079 in)



CAMSHAFT RUNOUT

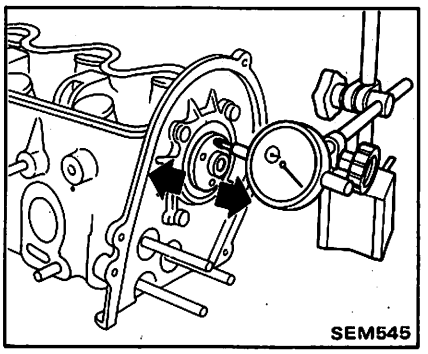
1. Check camshaft, camshaft journal and cam surface for bend, wear or damage. If beyond specified limits, replace them.
2. Camshaft can be checked for bend by placing it on V-blocks and using a dial gauge with its indicating finger resting on center journal.



3. Measure camshaft cam height. If beyond the specified limit, replace camshaft.

Wear limit of cam height:
0.20 mm (0.0079 in)

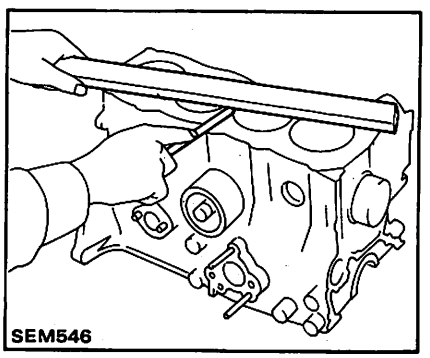
4. Measure camshaft end play. If beyond the specified limit, check camshaft contact surface part and replace faulty parts.

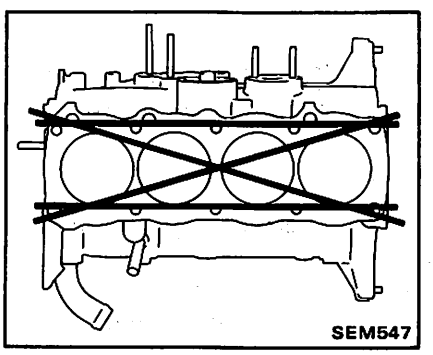


End play limit:
0.4 mm (0.016 in)

CYLINDER BLOCK

1. Visually check cylinder block for cracks or flaws.
2. Measure the top of cylinder block (cylinder head mating face) for warpage. If warpage exceeds the specified limit, correct with a grinder.





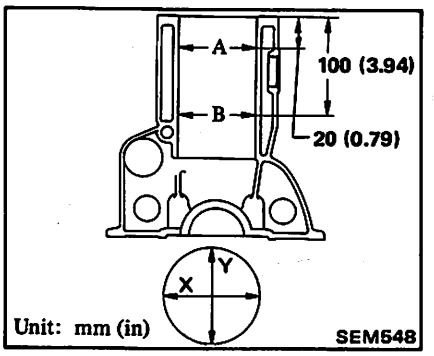
Warpage of surface:
Less than
0.1 mm (0.004 in)

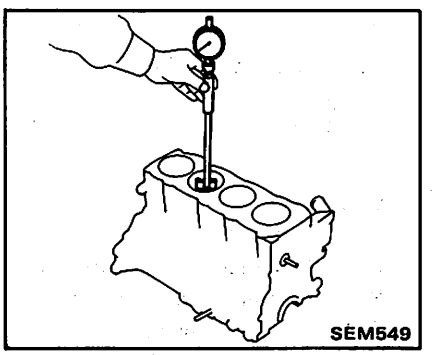
Surface grinding limit;
The grinding limit of cylinder block is determined by the cylinder head grinding in an engine.
Depth of cylinder head grinding is "A"
Depth of cylinder block grinding is "B"
The limit is as follows:
A + B = 0.2 mm (0.008 in)

3. Using a bore gauge, measure cylinder bore for wear, out-of-round or taper. If they are excessive, rebore the cylinder walls with a boring machine. Measurement should be taken along bores for taper and around bores for out-of-round.

Refer to S.D.S.

Out-of-round ..... **X-Y**
Taper ..... **A-B**





4. When wear, taper or out-of-round is minor and within the limit, remove the step at the topmost portion of cylinder using a ridge reamer or other similar tool.

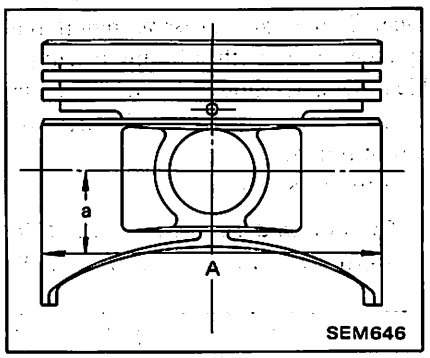
When installing service cylinder liner, interference fit of cylinder liner in cylinder block should be 0.080 to 0.090 mm (0.0031 to 0.0035 in).

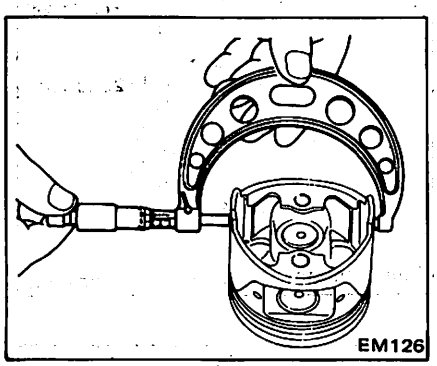
CYLINDER BORING

When any cylinder needs boring, all other cylinders must also be bored at the same time.

Determining bore size

1. Determine piston oversize according to amount of cylinder wear.
Refer to S.D.S.
2. The size to which cylinders must be honed is determined by adding piston-to-cylinder clearance to the piston skirt diameter.





Rebored size calculation

D = A + B – C = A + [0.005 to 0.025 mm (0.0002 to 0.0010 in)]

where,

- **D : Honed diameter**
- **A : Skirt diameter as measured**
- **B : Piston-to-wall clearance**
- **C : Honing allowance 0.02 mm (0.0008 in)**

Boring

1. Install main bearing caps in place, and tighten to the specified torque to prevent distortion of the cylinder bores in final assembly.
2. Cut cylinder bores.

- **Do not cut too much out of the cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so in diameter at a time.**
- **Bore the cylinders in the order of 2-4-1-3 to prevent heat strain due to cutting.**

3. Hone the cylinders to the required size referring to S.D.S.

- **Use clean sharp stones of proper grade.**
- **Cross-hatch pattern should be approximately 45°.**

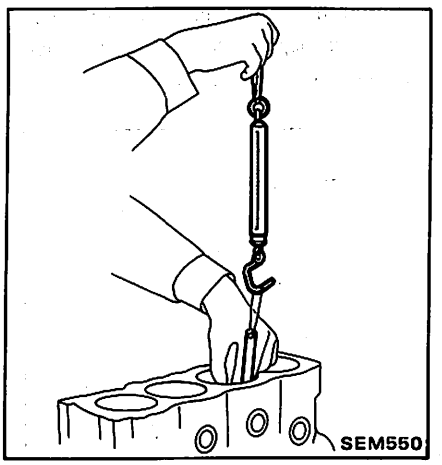
4. Measure the finished cylinder bore for out-of-round and taper.

Measuring piston-to-cylinder clearance

Measure the extracting force, and pull feeler gauge straight upward.

It is recommended that piston and cylinder be heated to 20°C (68°F).

Feeler gauge thickness:
0.04 mm (0.0016 in)
Extracting force:
4.9 - 14.7 N
(0.5 - 1.5 kg, 1.1 - 3.3 lb)

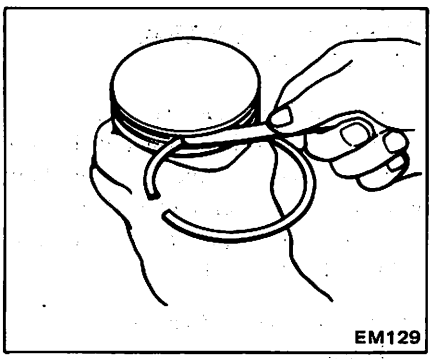


PISTON, PISTON PIN AND PISTON RING

PISTON

1. Scrape carbon off piston and ring grooves with a carbon scraper and a curved steel wire. Clean out oil slots in bottom land of oil ring groove.
2. Check for damage, scratches and wear. Replace if such a fault is detected.
3. Measure the side clearance of rings in ring grooves as each ring is installed.

Max. tolerance of side clearance:
0.2 mm (0.008 in)



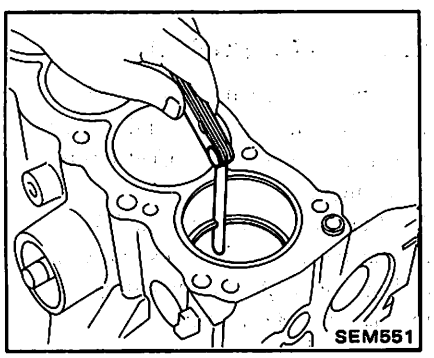
If side clearance exceeds the specified limit, replace piston together with piston ring.

PISTON RING

Measure ring gap with a feeler gauge, placing ring squarely in cylinder using piston.

Ring should be placed to diameter at upper or lower limit of ring travel.

Max. tolerance of ring gap:
1.0 mm (0.039 in)



- **a. When piston ring only is to be replaced, without cylinder bore being corrected, measure the gap at the bottom of cylinder where the wear is minor.**
- **b. Oversize piston rings are available for service.**

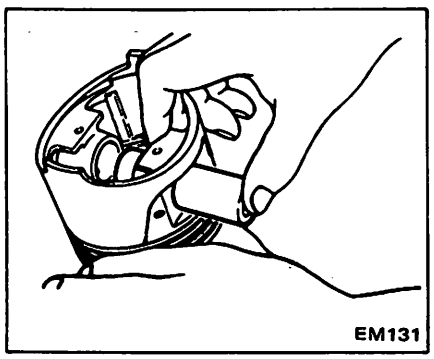
PISTON PIN

1. Check piston pin and piston pin hole for signs of sticking and other abnormalities.

2. Measure piston pin hole in relation to the outer diameter of pin. If wear exceeds the limit, replace such piston pin together with piston on which it is installed.

Piston pin to piston clearance:
0.008 - 0.012 mm
(0.0003 - 0.0005 in)

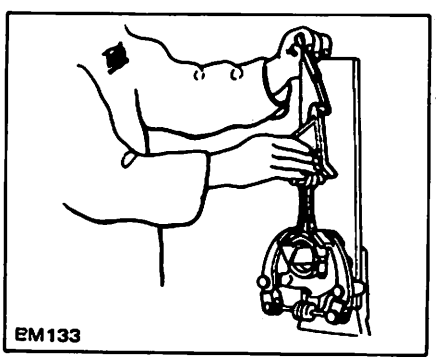
Determine the fitting of piston pin into piston pin hole to such an extent that it can be pressed smoothly by finger at room temperature.



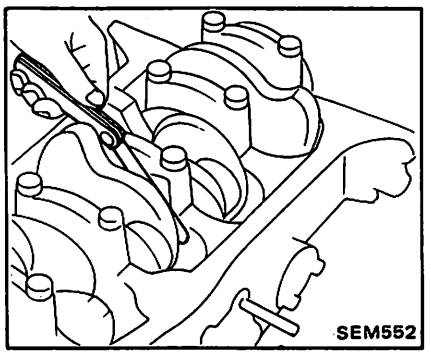
CONNECTING ROD

1. If a connecting rod has any flaw on both sides of the thrust face and the large end, correct or replace it.
2. Check connecting rod for bend or torsion using a connecting rod aligner. If bend or torsion exceeds the limit, correct or replace.

Bend and torsion
[per 100 mm (3.94 in) length]:
Less than
0.05 mm (0.0020 in)



3. Install connecting rods with bearings on to corresponding crank pins and measure the thrust clearance. If the measured value exceeds the limit, replace such connecting rod.



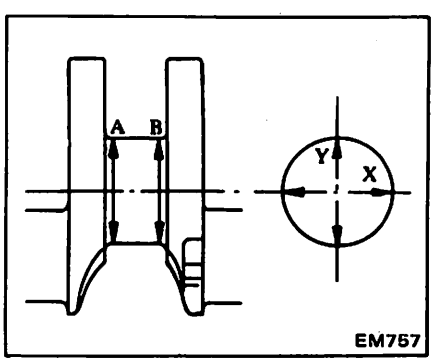
CRANKSHAFT

CRANK JOURNAL AND PIN

1. Repair or replace as required. If faults are minor, correct with fine crocus cloth.
2. Check journals and crank pins with a micrometer for taper and out-of-round. Measurement should be taken along journals for taper and around journals for out-of-round.

If out-of-round or taper exceeds the specified limit, replace or repair.

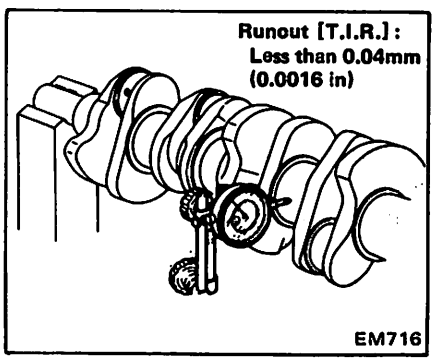
Out-of-round (X-Y) and
Taper (A-B):
Less than 0.01 mm (0.0004 in)



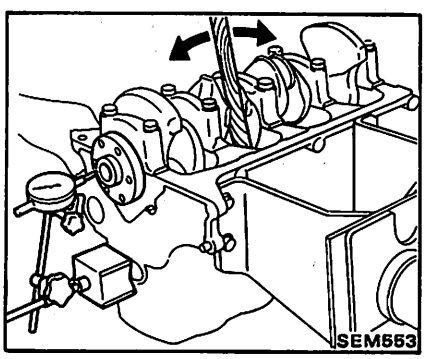
3. After regrinding crankshaft, finish it to the necessary size indicated in the chart under S.D.S. by using an adequate undersize bearing according to the extent of required repair.

RUNOUT AND END PLAY

1. Crankshaft can be checked for runout by placing it on V-blocks and using a dial gauge with its indicating finger resting on the center journal.
Runout value is half of the gauge reading obtained when crankshaft is turned one full revolution.
If bend exceeds the specified limit, replace or repair.



2. Install crankshaft in cylinder block and measure cranksahft free end play at the center bearing.



MAIN BEARING AND CONNECTING ROD BEARING

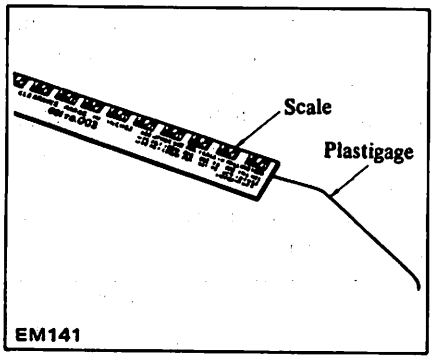
MAIN BEARING

1. Thoroughly clean all bearings and check for scratches, melt, score or wear.

Replace bearings, if any fault is detected.

2. Measure bearing clearance as follows:

(1) Cut a plastigage to the width of bearing and place it in parallel with crank journal, getting clear of the oil hole.



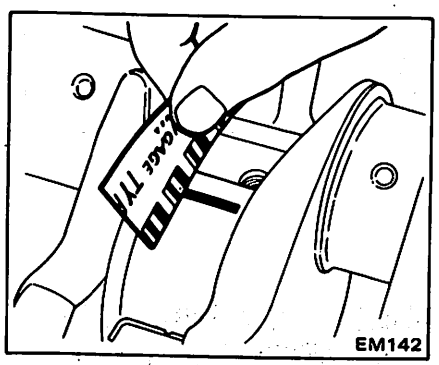
(2) Install crankshaft, bearings and bearing cap, with the bolts tightened to the specified torque.

Ⓣ : Main bearing cap
49 - 59 N·m
(5.0 - 6.0 kg-m,
36 - 43 ft-lb)

Do not turn crankshaft while the plastigage is being inserted.

(3) Remove cap, and compare width of the plastigage at its widest part with the scale printed in the plastigage envelope.

Max. tolerance of main bearing clearance:
0.10 mm (0.0039 in)



3. If clearance exceeds the specified value, replace bearing with an undersize bearing and grind crankshaft journal adequately.

Refer to S.D.S.

CONNECTING ROD BEARING

1. Measure connecting rod bearing clearance in the same manner as above.

Ⓣ : Connecting rod bearing cap
31 - 37 N·m
(3.2 - 3.8 kg-m,
23 - 27 ft-lb)

Max. tolerance of connecting rod bearing clearance:
0.10 mm (0.0039 in)

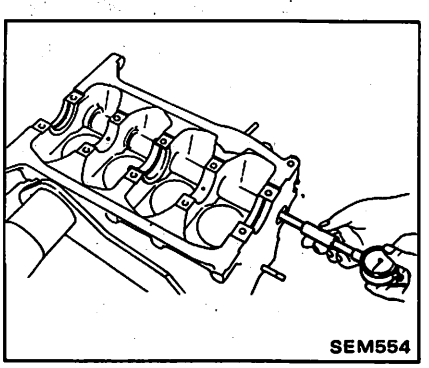
2. If clearance exceeds the specified value, replace bearing with an undersize bearing and grind the crankshaft journal adequately.

Refer to S.D.S.

JACK SHAFT AND JACK SHAFT BUSHING

JACK SHAFT BEARING CLEARANCE

Journal diameters should be checked with a micrometer, and bearings with an inside dial gauge. Measurements should then be compared to determine whether bearings are worn.

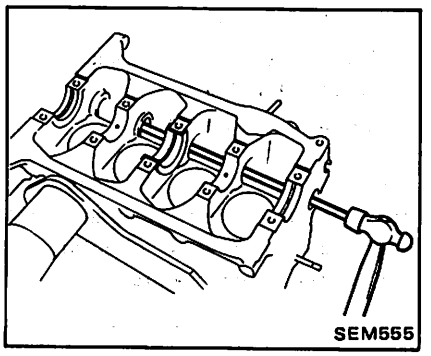


Max. tolerance of jack shaft bearing clearance:
0.15 mm (0.0059 in)

Replacing jack shaft bushing

1. Remove jack shaft bushings with suitable tool.
2. Install new bushings with suitable tool.

a. Align cylinder block oil hole and bushing oil hole.
b. Check bushing clearance.
c. Install welch plug into cylinder block, applying sealant.



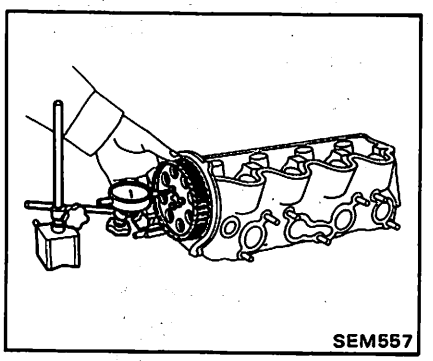
MISCELLANEOUS COMPONENTS

CAMSHAFT PULLEY

1. Check tooth surface for flaws or wear. Replace pulley if any fault is found.
2. Install camshaft pulley in position and check for runout.

If runout exceeds the specified limit, replace camshaft pulley.

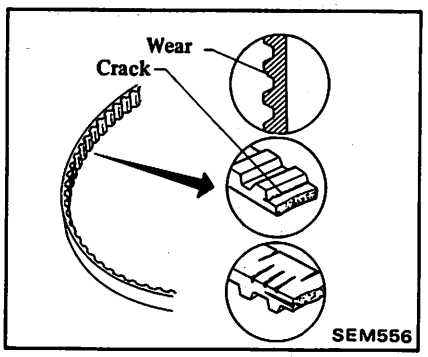
Runout:
(Total indicator reading)
Less than 0.1 mm (0.004 in)



TIMING BELT

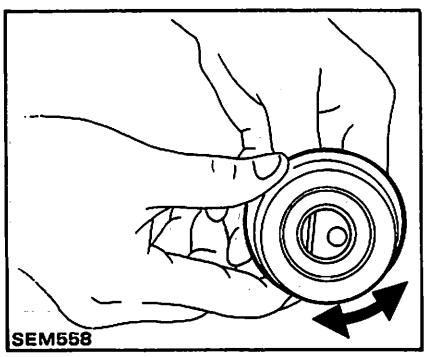
1. Check for oil or water. If soaked with oil or water, replace it.
2. Check for cracks and wear. If necessary, replace it.

3. If grooves of timing belt are damaged, replace it.



TENSIONER

1. Check to see that it turns smoothly. If it binds, replace assembly.



2. Check tensioner surface. If necessary, clean it.

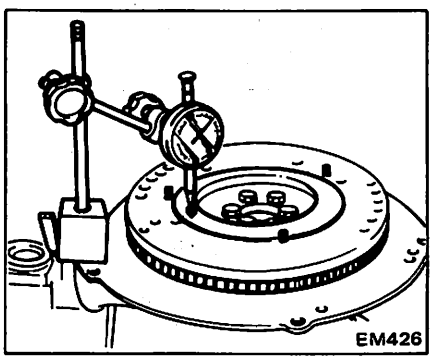
Do not use oil or grease.

3. Check for spring wear. If worn, replace it.

FLYWHEEL

1. Check the clutch disc contact surface on flywheel for damage or wear. Repair or replace if necessary.
2. Measure runout of the clutch disc contact surface with a dial gauge. If it exceeds the specified limit, replace it.

Runout:
(Total indicator reading)
Less than 0.15 mm (0.0059 in)



3. Check tooth surfaces of ring gear for flaws or wear.

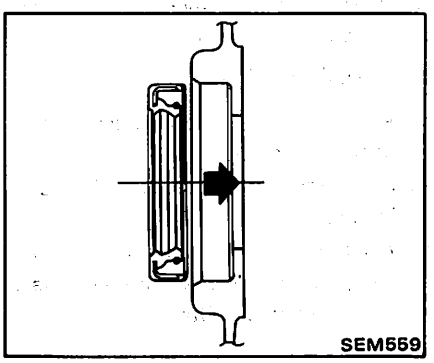
Replace if necessary.

Install ring gear on fly wheel, heating ring gear to about 180 to 220°C (356 to 428°F)

OIL SEAL

Check front, and rear oil seals for worn or folded over sealing lip and oil leakage. If necessary, replace with a new seal. When installing a new front or rear seal, pay attention to its mounting direction.

It is good practice to renew oil seal whenever engine is overhauled.



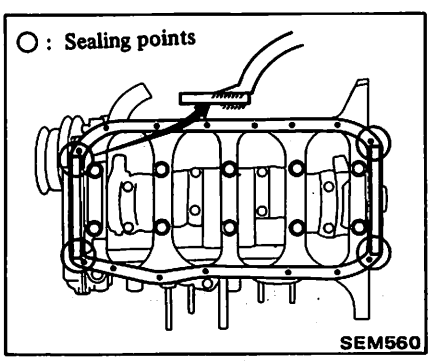
ENGINE ASSEMBLY

PRECAUTIONS

1. When installing sliding parts such as bearings, be sure to apply engine oil on the sliding surfaces.
2. Use new packings and oil seals.
3. Be sure to follow the specified order and tightening torque.
4. Applying sealant

Use sealant to eliminate water and oil leaks. **Do not apply too much sealant. Part requiring sealant is:**

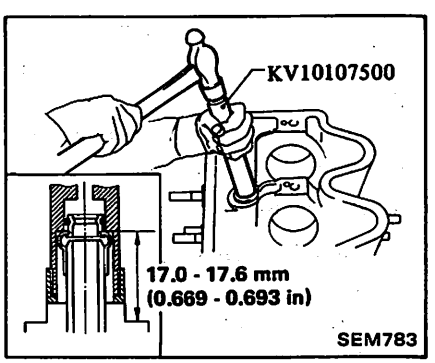
Mating surface of oil pan gasket and oil seals.



CYLINDER HEAD

CYLINDER HEAD

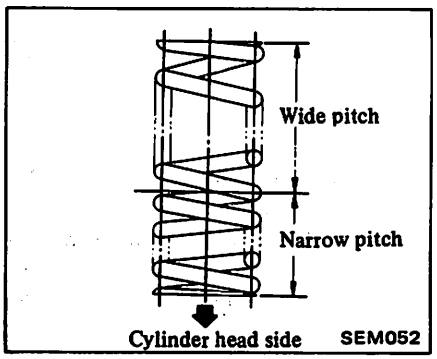
1. Install valve oil seal.



2. Install valve component parts.

a. When installing valve, apply engine oil to the valve stem and lip of valve oil seal.

b. Install valve spring (uneven pitch type) with its narrow pitch side toward cylinder head side.



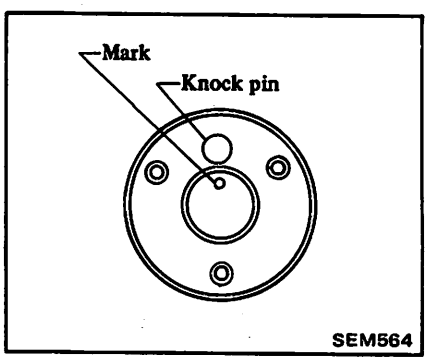
c. Make sure the valve face is free from foreign matter.

3. Install camshaft assembly.

a. Apply engine oil to camshaft and bearing interior.

b. Be careful not to damage the bearing interior.

c. When No. 1 cylinder is set at its compression stroke, the camshaft front face is as follows.



4. Install valve rocker shaft assembly.

5. Install cylinder head cover.

a. Be careful not to damage oil seal lip.

b. Apply engine oil to camshaft surface and oil seal lip.

6. Install camshaft pulley.

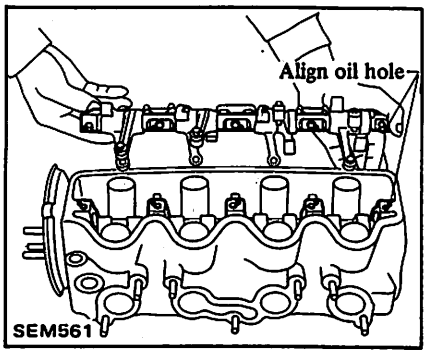
Ⓣ : Camshaft pulley bolt
6 - 8 N·m
(0.6 - 0.8 kg-m,
4.3 - 5.8 ft-lb)

ROCKER SHAFT

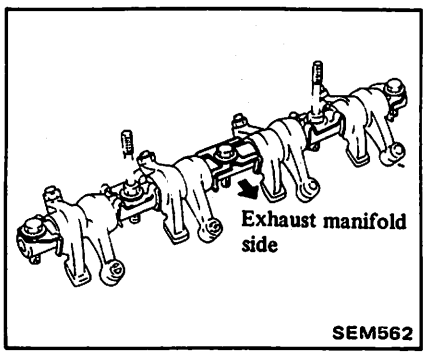
Assemble rocker shaft in the reverse order of removal, noting the following:

1. Apply engine oil to rocker shaft and interior of valve rocker.

2. Ensure that oil hole in rocker shaft faces downward when rocker shaft is installed.



3. Also ensure that cutout in center retainer of rocker shaft faces toward exhaust manifold.



Ⓣ : Rocker shaft bolt
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

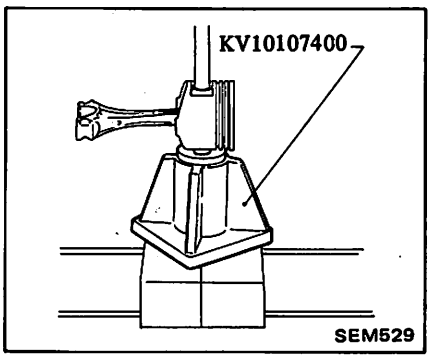
PISTON AND CONNECTING ROD

1. Assemble pistons, piston pins and connecting rods of the designated cylinders.

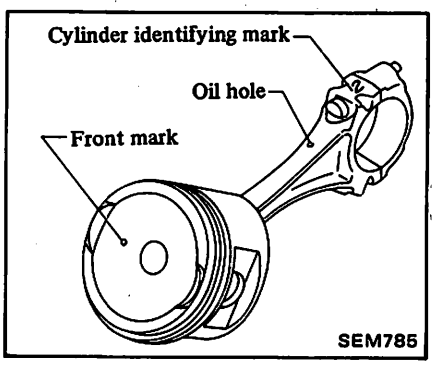
a. Piston pin is pressed into connecting rod, and fitting force should be within the specified limit.

Piston pin fitting force:
4.9 - 14.7 kN
(0.5 - 1.5 t, 0.6 - 1.7 US ton,
0.49 - 1.48 Imp ton)

When pressing piston pin in connecting rod, apply engine oil to pin and small end of connecting rod.



b. Arrange so that oil hole of connecting rod big end is directed toward the right side of cylinder block.

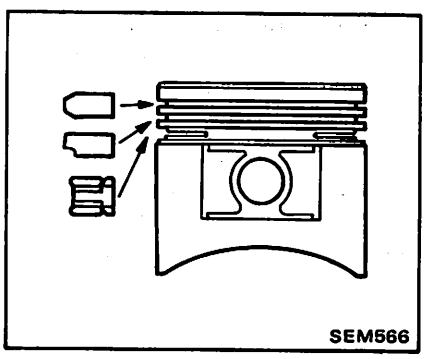


c. Connecting rods are marked at side of big end for identifying the designated cylinder.

d. Connecting rod with same weight tolerance is available only as a set of four.

2. Install piston rings.

Install so that stamped mark on ring faces upward.



ENGINE OVERALL

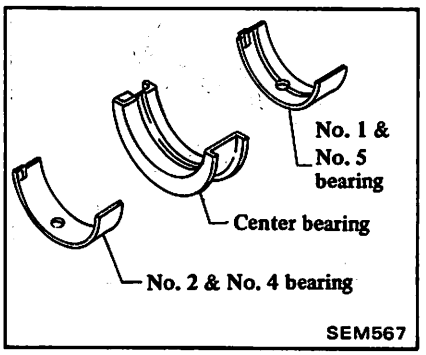
INTERNAL PARTS

First, mount cylinder block on engine stand (refer to Engine Disassembly).

1. Crankshaft

(1) Set upper main bearings at the proper portion of cylinder block.

a. Only center bearing (No. 3) is a flange type.
b. Front bearing (No. 1) is also the same type as rear bearing (No. 5).
c. Other inter bearings, except center bearing, are the same type.

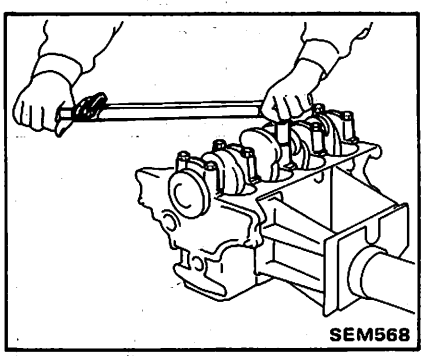


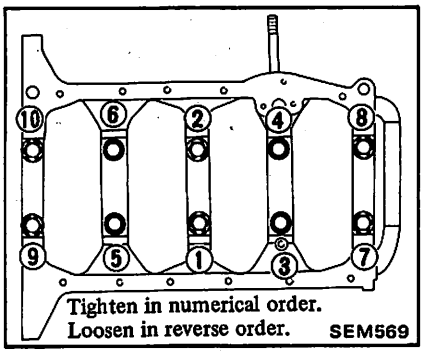
(2) Apply engine oil to main bearing surfaces on both sides of cylinder block and cap.

(3) Install crankshaft.

(4) Install main bearing cap and tighten bolts to specified torque.

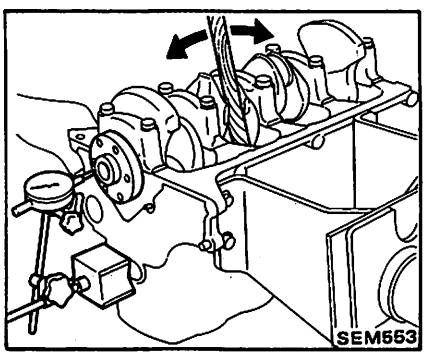
Ⓣ : Main bearing cap bolts
49 - 59 N·m
(5.0 - 6.0 kg-m,
36 - 43 ft-lb)



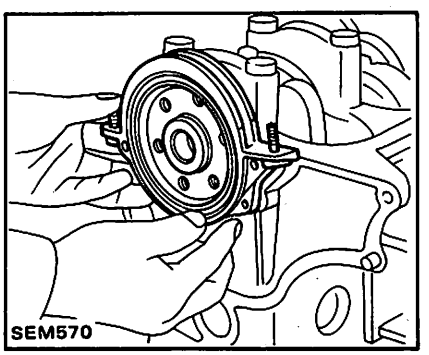


a. Arrange the parts so that the figure on bearing cap faces toward the water pump.
b. Prior to tightening bearing cap bolts, place bearing cap in proper position by shifting crankshaft in the axial direction.
c. Tighten bearing cap bolts gradually in separating two to three stages and in sequence outwardly from center bearing.
d. After securing bearing cap bolts, ascertain that crankshaft turns smoothly by hand.

(5) Make sure that there exists proper end play at crankshaft.



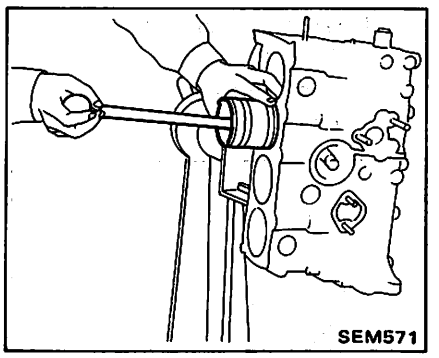
(6) Install oil seal retainer.



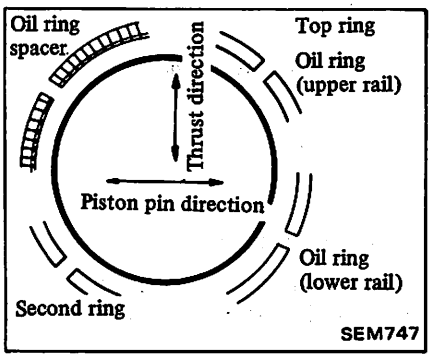
a. When installing oil seal retainer, give coating of engine oil to mating shaft to prevent scratches and folded lip. Also apply coating of oil to periphery of oil seal.
b. Install oil seal in the direction that dust seal lip faces to the outside of crankcase.

2. Piston with connecting rod.

(1) Install them into corresponding cylinders.

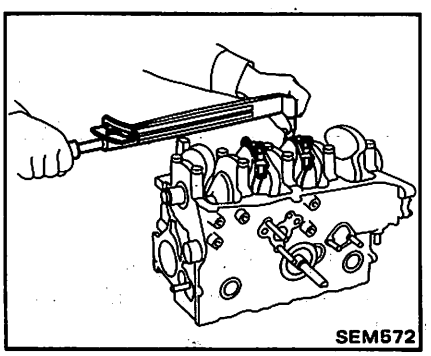


a. Apply engine oil to sliding parts.
b. Arrange so that the front mark on piston head faces to the front of engine.
c. Set piston rings as shown below.



(2) Install connecting rod caps.

Ⓣ : Connecting rod cap nuts
31 - 37 N·m
(3.2 - 3.8 kg-m,
23 - 27 ft-lb)

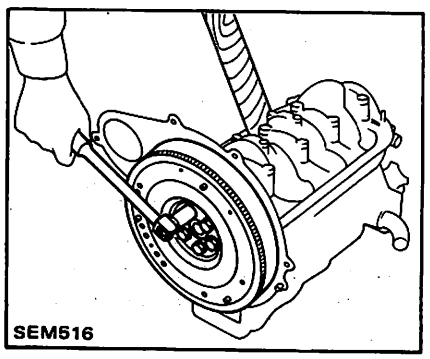


Arrange connecting rods and connecting rod caps so that the cylinder numbers face in the same direction.

(3) Make sure that there exists proper end play at connecting rod big end. Refer to Inspection and Repair.

3. Rear plate and flywheel or drive plate.

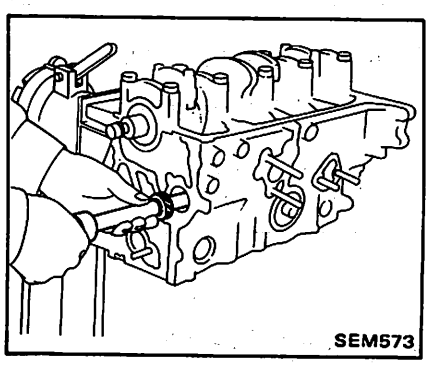
Ⓣ : **Flywheel fixing bolts**
78 - 88 N·m
(8.0 - 9.0 kg-m,
58 - 65 ft-lb)
Drive plate fixing bolts
93 - 103 N·m
(9.5 - 10.5 kg-m,
69 - 76 ft-lb)


SEM516

Do not lock at ring gear.

4. Install jack shaft.

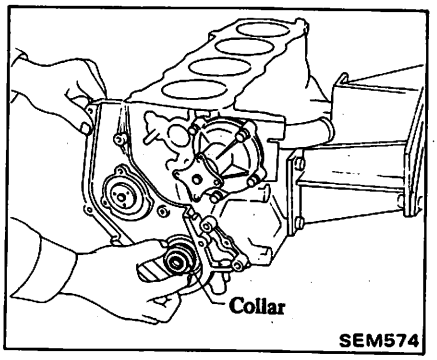
Be careful not to damage the inner surface of jack shaft bushing.


SEM573

5. Install jack shaft locating plate.
6. Install water pump assembly with new gasket.

7. Install crank oil thrower, then install cylinder block cover together with oil seal collar.

Be careful not to damage the oil seal lip.



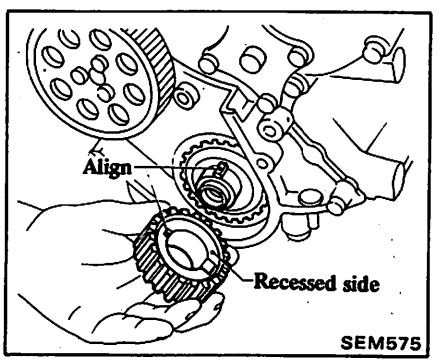
SEM574

8. Install jack shaft pulley.

Tighten jack shaft pulley bolt by holding pulley with hand.

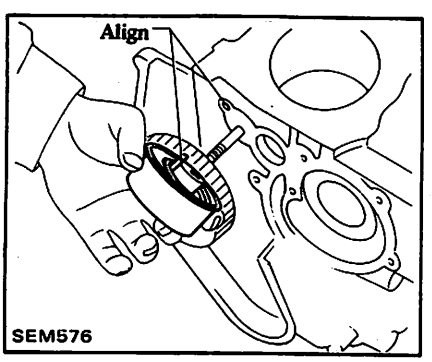
Ⓣ : **Jack shaft pulley fixing bolt**
6 - 8 N·m
(0.6 - 0.8 kg-m,
4.3 - 5.8 ft-lb)

9. Install crankshaft timing pulley.



SEM575

10. Temporarily install tensioner.



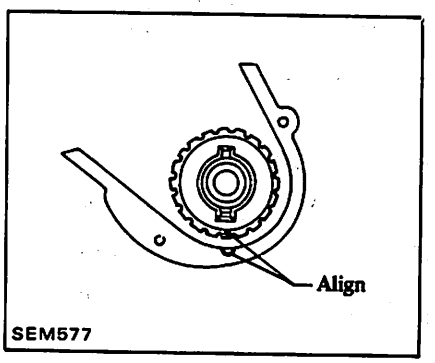
SEM576

11. Cylinder head assembly. Install it through gasket by accommodating knock pin of cylinder block as follows:

(1) Thoroughly clean cylinder block and head surface.

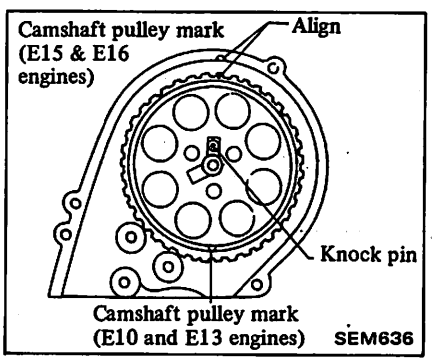
Do not apply sealant to any other part of cylinder block and head surface.

(2) Turn crankshaft and set No. 1 cylinder at top dead center on its compression stroke. This causes crankshaft timing pulley mark to be aligned with cylinder block cover mark.

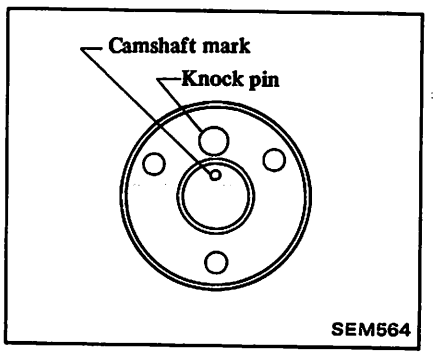


SEM577

(3) Align camshaft pulley mark with cylinder head cover mark. This causes valves for No. 1 cylinder to position at top dead center on compression stroke.



SEM636

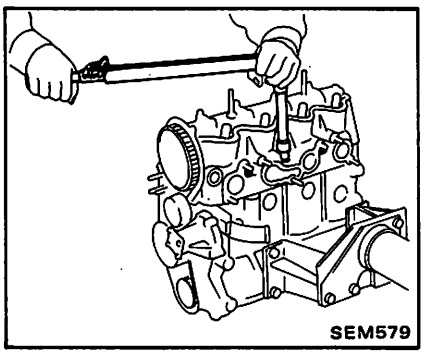


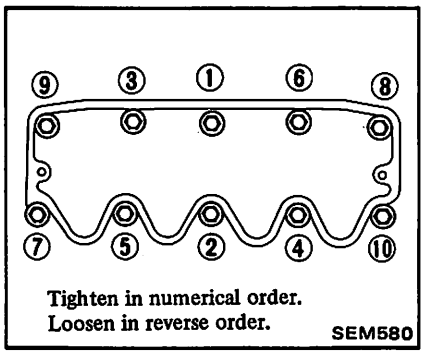
SEM564

(4) Install cylinder gasket and cylinder head assembly.
(5) Tighten cylinder head bolts.

Ⓣ : **Cylinder head bolt**
1st
39 - 44 N·m
(4.0 - 4.5 kg-m,
29 - 33 ft-lb)
2nd
69 - 74 N·m
(7.0 - 7.5 kg-m,
51 - 54 ft-lb)

Retighten head bolts after engine has been warmed up.


SEM579



Tighten in numerical order.
Loosen in reverse order.
SEM580

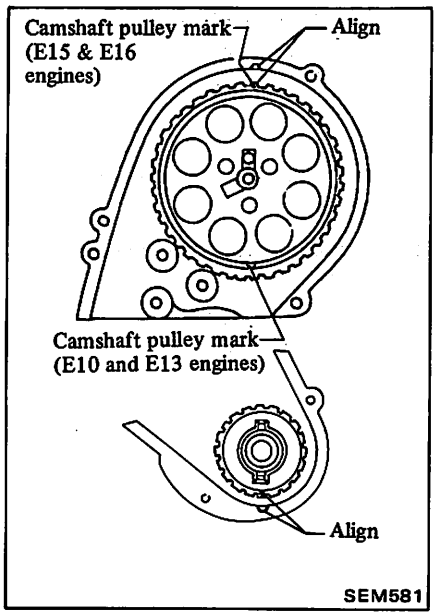
a. Do not rotate crankshaft and camshaft separately, because valves will hit piston heads.
b. Always use new cylinder head gasket.
c. There are three kinds of cylinder head bolts with different lengths.

(6) Install spark plugs.

Ⓣ : **15 - 20 N·m**
(1.5 - 2.0 kg-m,
11 - 14 ft-lb)

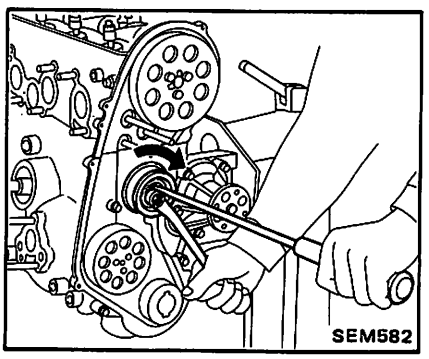
TIMING BELT

1. Ensure that marks on camshaft pulley and cylinder head cover and marks on crankshaft timing pulley and cylinder block cover are properly aligned.



SEM581

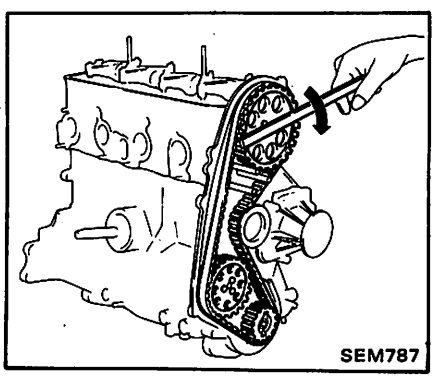
2. Rotate tensioner clockwise about 70 to 80° and temporarily tighten lock nut.


SEM582

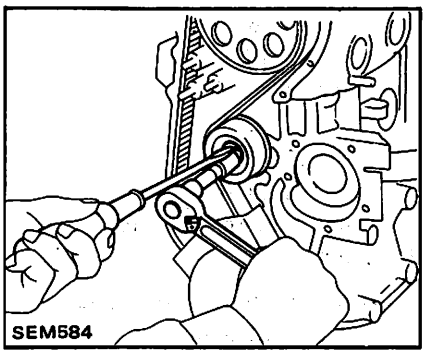
3. Place timing belt on pulleys.

a. When using used belt, be sure to install it with rotating direction mark facing engine rotating direction.
b. Ensure that belt is not loose around jack shaft and camshaft pulleys.

4. Loosen tensioner lock nut so that tensioner pushes on timing belt.
5. Turn camshaft pulley about 20° (2 cogs) clockwise.


SEM787

6. Tighten nut while preventing tensioner from turning in "free" direction.


SEM584

Ⓣ : **Tensioner lock nut**
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

FRONT SIDE PARTS

1. Install water pump pulley.
2. Install spacer and upper and lower dust cover.
3. Install crankshaft pulley.

Ⓣ : **Crankshaft pulley bolt**
113 - 147 N·m
(11.5 - 15.0 kg-m,
83 - 108 ft-lb)

LEFT SIDE PARTS

1. Install exhaust manifold.

Ⓣ : **Exhaust manifold fixing nut**
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

2. Install cooler compressor bracket and power steering bracket.

RIGHT SIDE PARTS

1. Install oil pump assembly with new gasket.

Ⓣ : **Oil pump bolt & nuts**
9.1 - 11.8 N·m
(0.93 - 1.2 kg-m,
6.7 - 8.7 ft-lb)

2. Install fuel pump assembly with insulator.

Ⓣ : **Fuel pump nuts**
9.1 - 11.8 N·m
(0.93 - 1.2 kg-m,
6.7 - 8.7 ft-lb)

Always replace gaskets.

3. Install oil filter.
4. Install alternator bracket and alternator.

Ⓣ : **Alternator bracket fixing bolt**
9.1 - 11.8 N·m
(0.93 - 1.2 kg-m,
6.7 - 8.7 ft-lb)

Alternator to bracket bolt
43 - 58 N·m
4.4 - 5.9 kg-m,
32 - 43 ft-lb)

5. Install intake manifold with carburetor.

Ⓣ : **Intake manifold fixing nuts**
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

REAR SIDE PARTS

1. Install thermostat housing with distributor.

Ⓣ : **Thermostat housing fixing bolt**
3.7 - 5.0 N·m
(0.38 - 0.51 kg-m,
2.7 - 3.7 ft-lb)

2. Install clutch unit using Tool KV30100900.

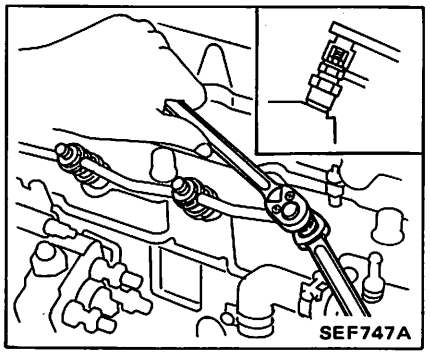
Ⓣ : **Clutch unit fixing bolt**
7 - 10 N·m
(0.7 - 1.0 kg-m,
5.1 - 7.2 ft-lb)

ENGINE SERVICE (On vehicle)

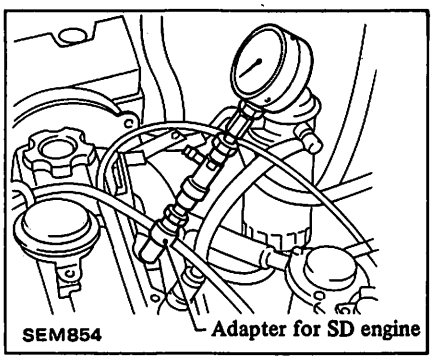
COMPRESSION PRESSURE

1. Warm up engine sufficiently.
2. Remove spill tube assembly.

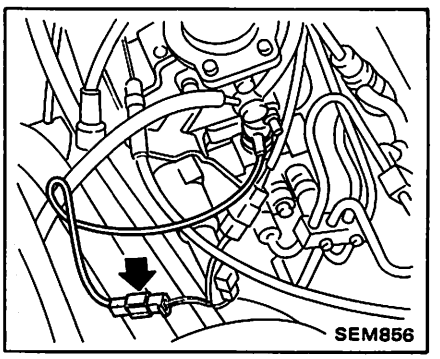
To prevent spill tube from breaking, remove it by gripping nozzle holder.



3. Remove injection nozzles and nozzle gaskets.
4. Fit compression gauge adapter to cylinder head.



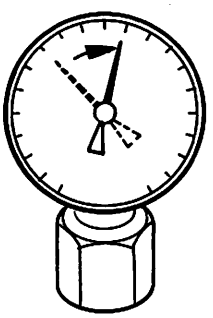
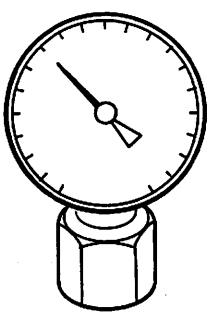
5. Disconnect fuel cut solenoid wire.



6. Crank engine and read gauge indication.

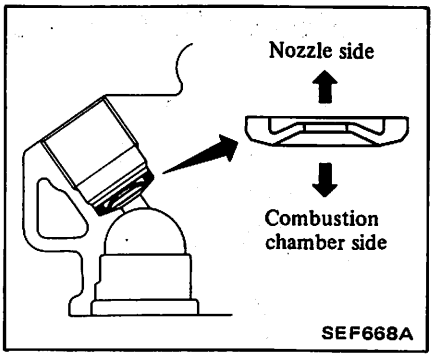
Crank speed:
200 rpm
Compression pressure:
Standard
2,942 - 3,236 kPa
(30 - 33 kg/cm^2, 427 - 469 psi)
Limit
1,961 kPa
(20 kg/cm^2, 284 psi)
Differential limit between cylinders:
490 kPa
(5 kg/cm^2, 71 psi)

7. If the pressure is low, pour about 3 mℓ (0.10 US fl oz, 0.11 Imp fl oz) of engine oil into cylinders through the nozzle hole and test again.

Gauge indication	Condition	Trouble points
 SEM857	Increased reading	• Piston rings are worn or damaged.
 SEM858	Same reading maintained	• Two adjacent cylinders are low, gasket is damaged. • Valve is sticking. • Valve seat or valve contact surface is incorrected.

8. Install nozzle gaskets and injection nozzles.

New nozzle gasket installation direction is as follows:

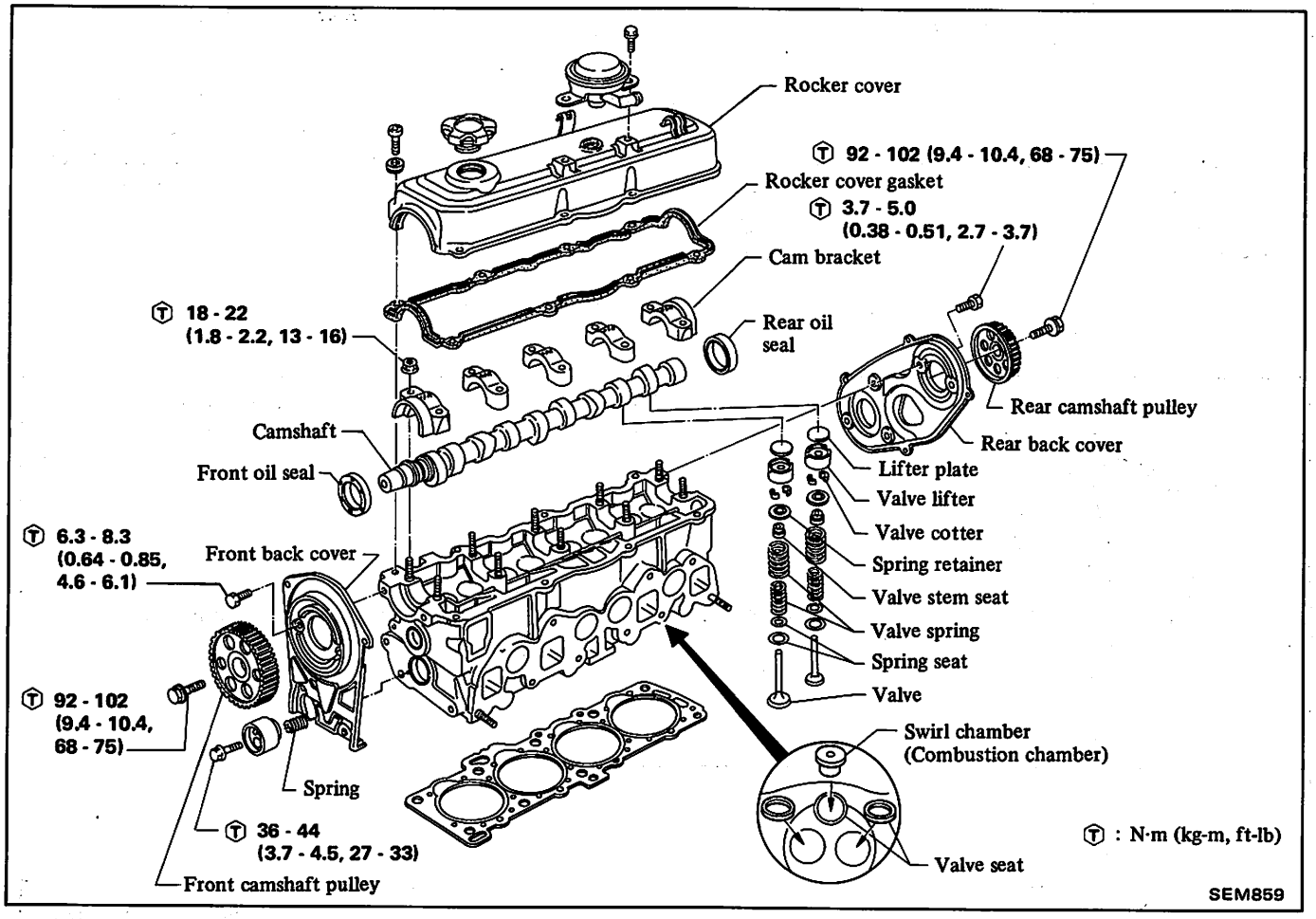


Ⓣ : Nozzle to cylinder head
59 - 69 N·m
(6.0 - 7.0 kg-m,
43 - 51 ft-lb)

9. Install spill tube by holding nozzle holder.

Ⓣ : Spill tube nut
39 - 49 N·m,
(4 - 5 kg-m,
29 - 36 ft-lb)

CYLINDER HEAD



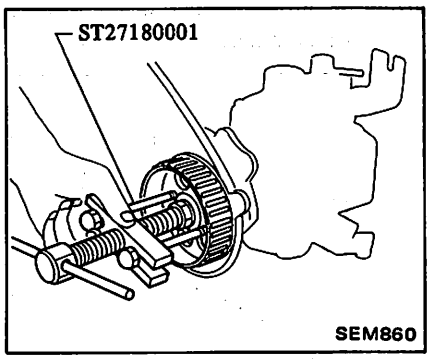
REMOVAL

1. Drain coolant and disconnect water hose.
2. Disconnect exhaust tube.
3. Set No. 1 cylinder at Top Dead Center on its compression stroke.
4. Remove valve timing belt on camshaft pulley side.
5. Remove injection timing belt.

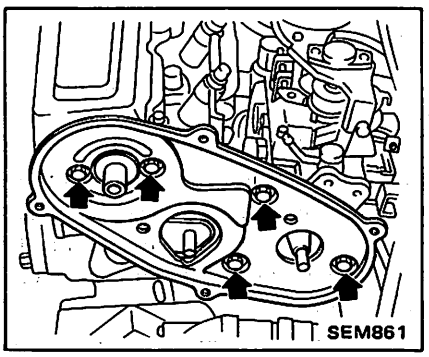
Refer to section MA for timing belt replacement.
Refer to section EM for timing belt inspection.

a. Ensure timing belt is clean and free from oil or water when installing it. Do not bend it.
b. Timing belt removed from camshaft pulley should not be rotated from the removed position.

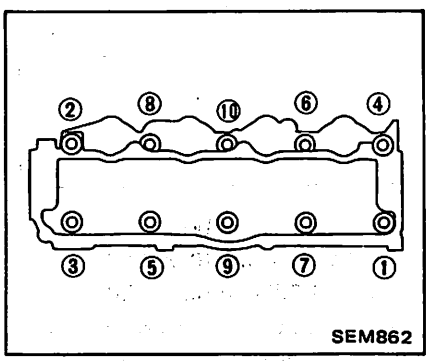
6. Loosen pump pulley nut and remove the pulley.



7. Remove back cover.



8. Remove all injection tubes.
9. Remove cylinder head.

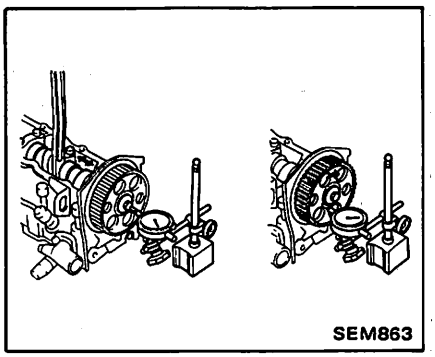


DISASSEMBLY

1. Measure camshaft end play and camshaft pulley runout.

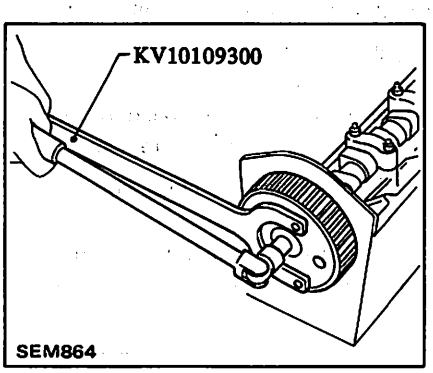
If the end play is not within specifications, replace camshaft or bracket caps.

If the runout is not within specifications, replace camshaft pulley.

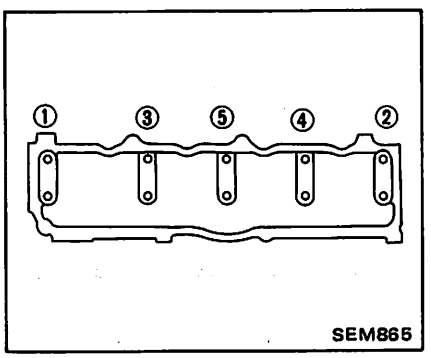


End play limit:
0.17 mm (0.0067 in)
Runout limit:
0.1 mm (0.004 in)

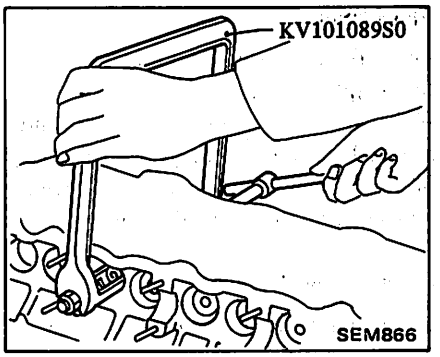
2. Remove intake and exhaust manifold.
3. Remove camshaft pulleys.



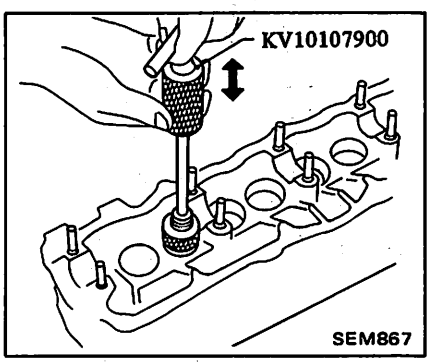
4. Remove camshaft bracket caps.



5. Remove camshaft and oil seals.
6. Take out valve lifter together with lifter plate.
7. Remove valve retaining parts, valve spring and valves.



8. Remove valve lip seals.



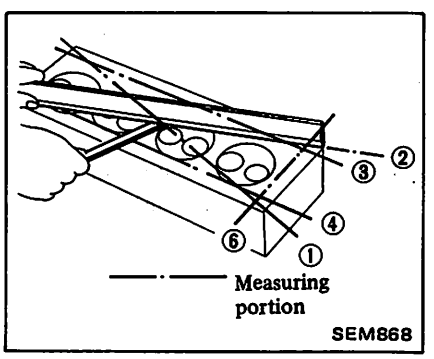
INSPECTION AND REPAIR

Mating face

1. Make a visual check for cracks and flaws.
2. Measure the surface of cylinder head (on cylinder block side) for warpage.

If beyond the specified limit, correct with a surface plate and grinding compound.

Warpage:
Limit 0.1 mm (0.004 in)



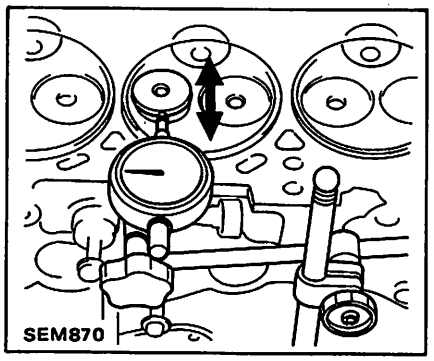
Correct amount limit (Including cylinder block side correct amount):
0.1 mm (0.004 in)

Valve guide

Insert the valve stem and move it back, forth and slide it.
If valve stem makes a clatter and moves back and forth excessively out of line, or if it does not slide well, replace valve or valve guide, or both.

Determining clearance

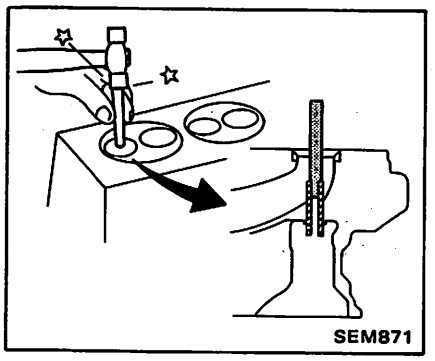
1. Install valve into the valve guide.
2. Measure the deflection.



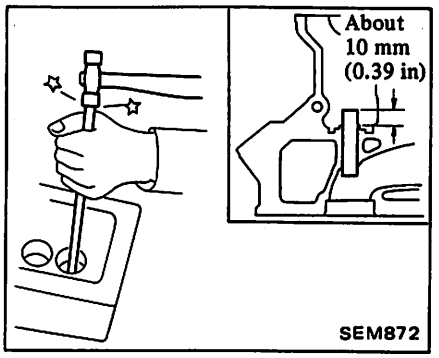
Stem to guide clearance limit:
0.1 mm (0.004 in)

Replacing valve guide

1. Heat cylinder head 150 to 160°C (302 to 320°F) in oil.
2. Remove the guide with suitable tool.



3. Drive in the new guide until it projects out 10 mm (0.39 in)



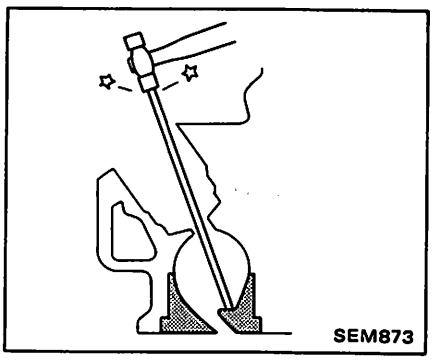
4. Ream the bore using suitable tool.

Reaming bore:
7.000 - 7.015 mm
(0.2756 - 0.2762 in)

Combustion chamber replacement

Usually combustion chamber should not be removed.
However, if there are cracks or extensive damage, it should be replaced.

1. Remove glow plug connecting plate and glow plugs.
2. Remove combustion chamber so that cylinder head will not be damaged.

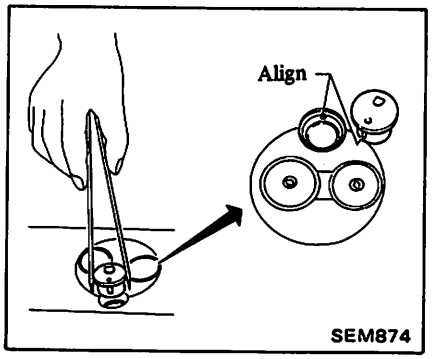


Be careful not to scratch inside of nozzle hole.

3. Install combustion chamber.
(1) Cool combustion chamber with dry ice for approximately 5 to 10 minutes.

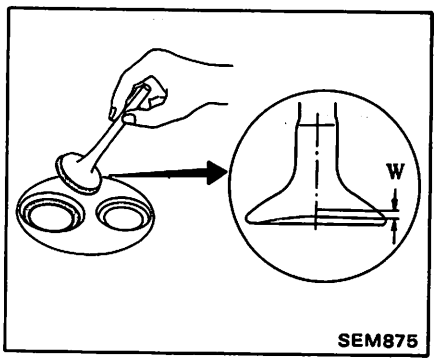
WARNING:
Do not touch cooled combustion chamber with bare hands.

(2) Align combustion chamber knock pin with cylinder head notch, and install it into cylinder head using a plastic-tip hammer.



Valve seat inserts

1. Check valve and valve seat inserts for contact.
Coat the valve face with prussian red lead. If contact is wrong, correct valve seat. If the valve red lead appears 360° around face, the valve stem and face are concentric. If not, repair or replace valve.



Valve seat contact W:
Intake 1.7 mm (0.067 in)
Exhaust 1.8 mm (0.071 in)

2. Check valve seat inserts for any evidence of pitting on valve contact surface, and reseat or replace if worn out excessively.
Correct valve seat surface.

When repairing valve seat, check valve and valve guide for wear beforehand. If worn, replace them. Then correct valve seat.

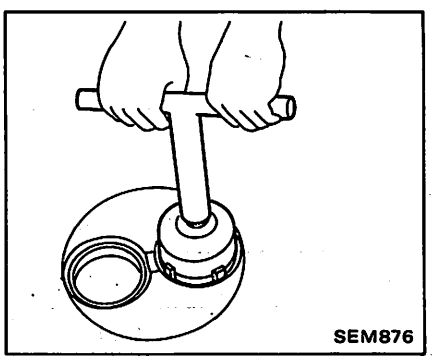
Replacement

1. Old insert can be removed by boring it out until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the insert recess in the cylinder head.
2. Select a suitable valve seat insert and check its outside diameter.
3. Machine the cylinder head recess in concentric circles which center on the valve guide.
4. Ream the cylinder head recess at room temperature.
5. Cool valve seat with dry ice for approximately 5 to 10 minutes.
6. Fit insert, ensuring that it bends on the bottom face of its recess, and caulk more than 4 points.

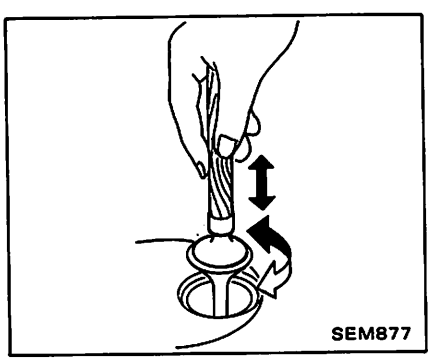
Resurfacing

1. Resurface the valve seat. Refer to S.D.S.

The cutting should be done with both hands for uniform cutting.

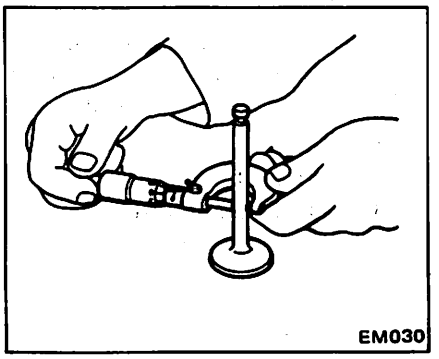


2. Apply small amount of fine grinding compound to valve contacting face and put valve into guide.
Lap valve against its seat until proper valve seating is obtained. Remove valve and then clean valve and valve seat.



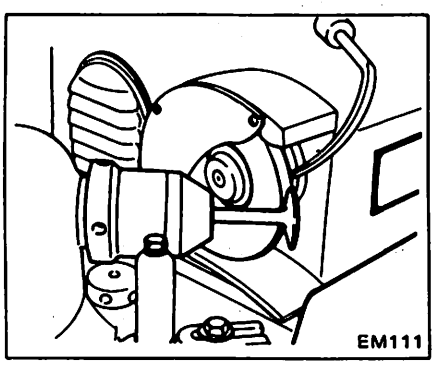
Valve

1. Check valve head diameter, stem diameter and seat angle. Repair or replace foulty parts.



2. Check each of the intake and exhaust valves for worn, damaged or deformed valve head or stem.
Correct or replace any valve that is faulty.
3. Valve face or valve stem end surface should be refaced by using a valve grinder.

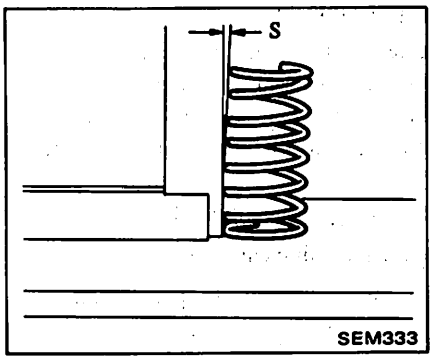
When valve head has been worn down to 0.5 mm (0.020 in) in-margin-thickness, replace the valve.
Grinding allowance for valve stem end surface is 0.5 mm (0.020 in) or less.



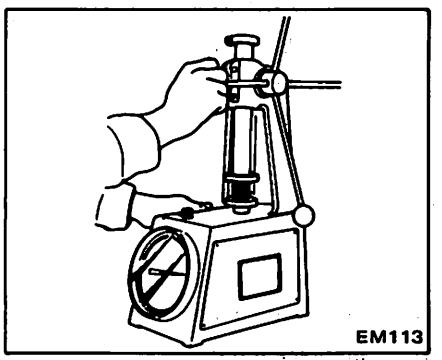
Valve spring

1. Check valve spring for squareness using a steel square and surface plate.
If spring is out of square "S" more than specified limit, replace with new one.

Out of square:
Outer 2.1 mm (0.083 in)
Inner 1.9 mm (0.075 in)

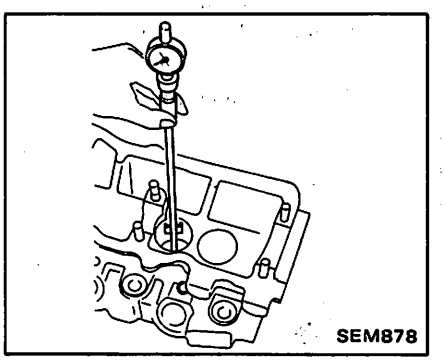


2. Measure the free length and the tension of each spring. If the measured value exceeds the specified limit, replace spring. Refer to S.D.S.



Valve lifter

1. Check valve lifter for scratches and excessive deformation.
2. Measure outside diameter of the lifter and inside diameter of valve lifter hole.



Valve lifter clearance limit:
0.1 mm (0.004 in)

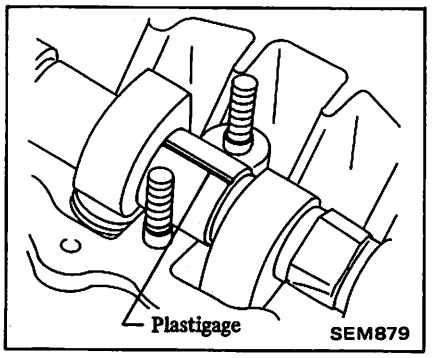
Lifter plate

Check plate surface (cam lobe contacting surface) for uneven wear and burrs. If worn unevenly, replace. If burred, smoothen with oil stone, etc.

Camshaft and cam bracket

Camshaft oil clearance

1. Wipe off oil from camshaft journal and bracket caps.
2. Set camshaft and lay the plastigage on each camshaft journal.



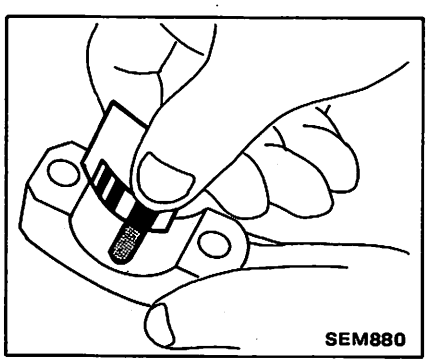
3. Tighten cam bracket caps.

Ⓣ : **Cam bracket nut**
18 - 22 N-m
(1.8 - 2.2 kg-m,
13 - 16 ft-lb)

Do not turn the camshaft.

4. Remove the cam bracket caps and measure the width of the Plastigage at its widest point.

Oil clearance:
Standard
0.02 - 0.06 mm
(0.0008 - 0.0024 in)
Limit
0.1 mm (0.004 in)

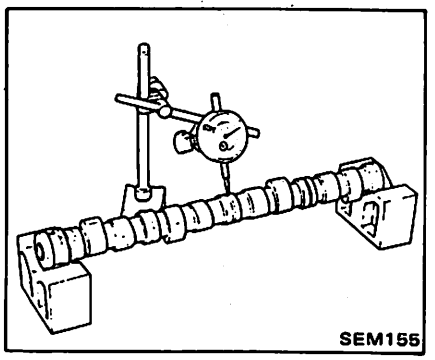


5. If clearance exceeds the limit, replace cam bracket caps, camshaft or cylinder head.

Camshaft alignment

1. Check camshaft, camshaft journal and cam surface for bend, wear or damage. If beyond the specified limits, replace the parts.

Camshaft bend:
Limit 0.05 mm (0.0020 in)



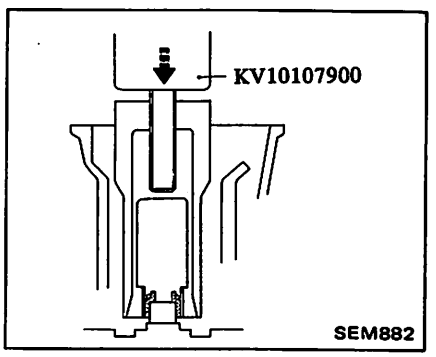
2. Measure camshaft cam height. If beyond the specified limit, replace camshaft.

Wear limit of cam height:
Intake
44.295 mm (1.7439 in)
Exhaust
45.295 mm (1.7833 in)

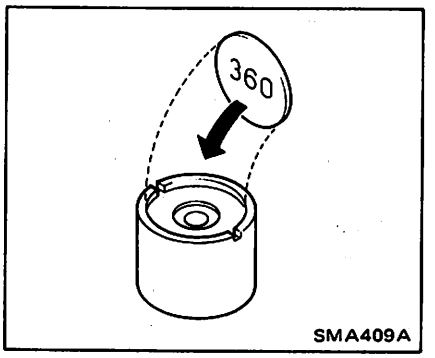
ASSEMBLY

Assemble cylinder head in reverse order of disassembly. Note the following.

1. Drive in valve stem seal until it contacts guide.

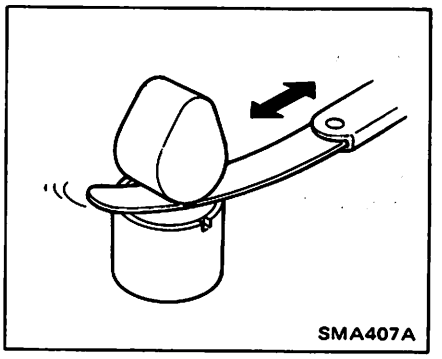


2. Set valve lifter plate so that mark faces the valve lifter side.



Make sure that the valve lifter rotates smoothly by hand.

3. Set camshaft and adjust valve clearance.
(1) Measure valve clearance.



Cold

Unit: mm (in)

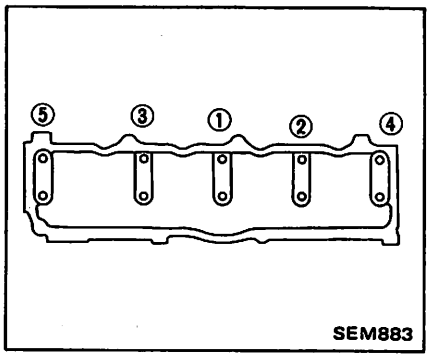
Intake	0.18 (0.0071)
Exhaust	0.4 (0.016)

(2) If out of specification, remove camshaft and replace lifter plate.

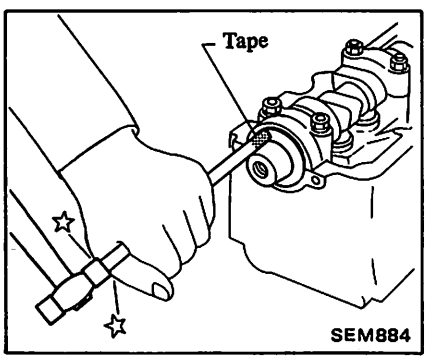
a. Use thick plate when clearance is large.
b. Use thin plate when clearance is small.

4. Install cam bracket caps.

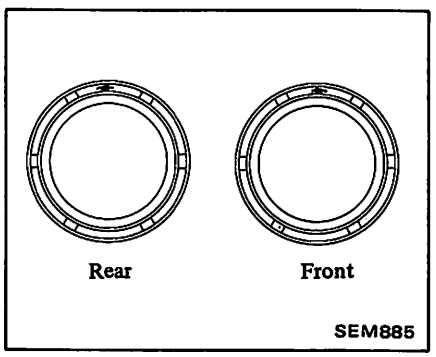
Ⓣ : Cam bracket nut
18 - 22 N·m
(1.8 - 2.2 kg-m,
13 - 16 ft-lb)



5. Apply engine oil to new oil seal and install them.



Be sure to use proper oil seal for front and rear as there is a different diameter for front and rear.
Install oil seal so that an arrow mark on oil seal surface is as shown below.



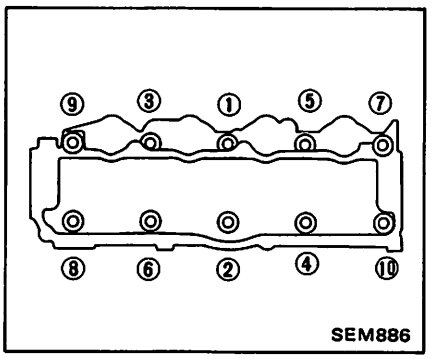
INSTALLATION

Install cylinder head in reverse order of removal. Note the following:

1. Install cylinder head with new gasket.

The new gasket should be the same as the one which was removed.

Ⓣ : Cylinder head bolt
1st
59 - 69 N·m
(6.0 - 7.0 kg-m,
43 - 51 ft-lb)
2nd
98 - 108 N·m
(10.0 - 11.0 kg-m,
72 - 80 ft-lb)



2. Install valve timing belt.
3. Install injection timing belt.

Refer to section MA for timing belt replacement.

Ensure timing belt is clean and free from oil or water when installing it. Do not bend it.

CAMSHAFT AND CAMSHAFT OIL SEAL REPLACEMENT

1. Remove timing belts.

Refer to section MA for timing belt replacement.

2. Remove front and rear camshaft pulleys.
3. Remove front and rear back covers.

When removing front back cover, loosen tensioner to remove the bolt at back of tensioner.

4.

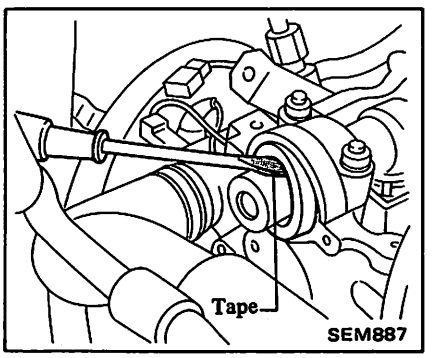
- Camshaft

(1) Remove cam bracket caps.
(2) Remove camshaft and oil seals.

- Camshaft oil seal

Do not remove camshaft.

(1) Remove oil seals.

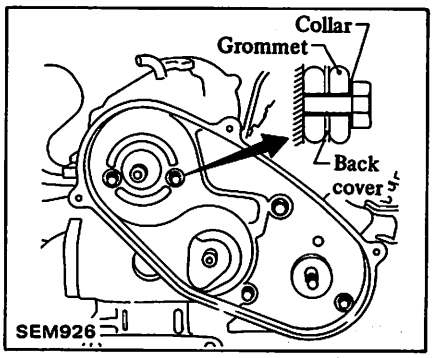


(2) Install oil seals.

Refer to cylinder head for assembly.

5. Install front and rear back covers.

Set tensioner to free side (turn counterclockside) after installing front back cover.



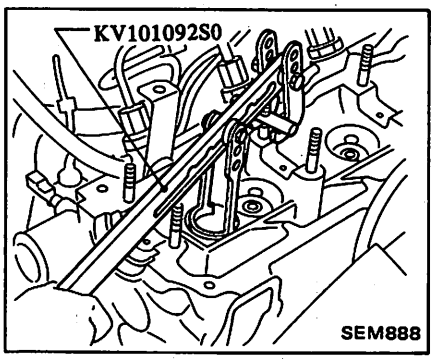
Ⓣ : Front back cover
6.3 - 8.3 N·m
(0.64 - 0.85 kg-m,
4.6 - 6.1 ft-lb)
Rear back cover
3.7 - 5.0 N·m
(0.38 - 0.51 kg-m,
2.7 - 3.7 ft-lb)

6. Install cylinder head. Refer to cylinder head for installation.
7. Install timing belts. Refer to section MA for timing belt replacement.

Ensure timing belt is clean and free from oil or water when installing it. Do not bend it.

VALVE STEM SEAL REPLACEMENT

1. Remove camshaft. Refer to CAMSHAFT AND CAMSHAFT OIL SEAL REPLACEMENT.
2. Remove valve spring retainer parts.

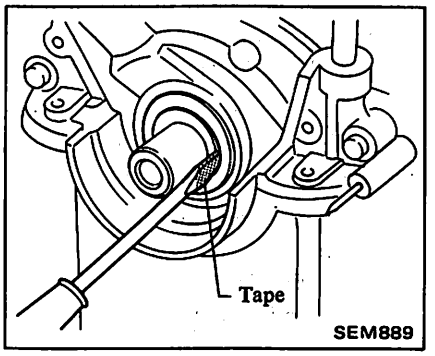


3. Replace valve stem seals.
Refer to cylinder head for assembly.
4. Install cam shaft. Refer to CAMSHAFT AND CAMSHAFT OIL SEAL REPLACEMENT.

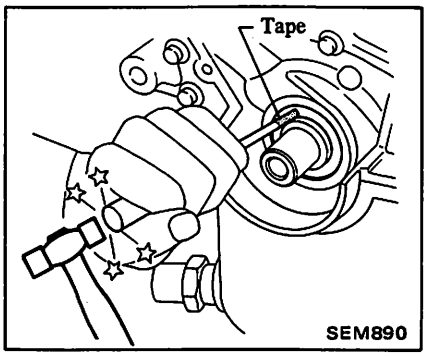
CRANKSHAFT OIL SEAL REPLACEMENT

FRONT OIL SEAL

1. Remove valve timing belt.
Refer to section MA.
2. Remove oil seal.



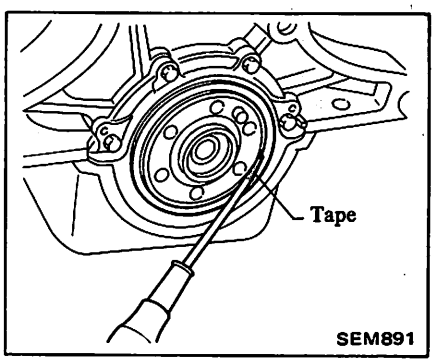
3. Coat new oil seal with engine oil and install it.



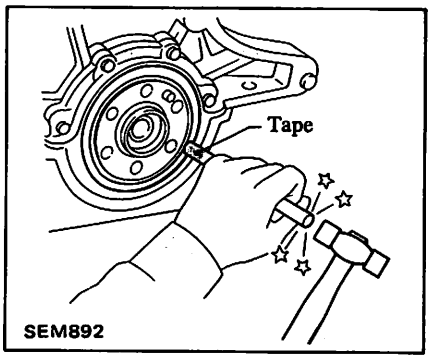
4. Installation is the reverse order of disassembly. Refer to section LC.

REAR OIL SEAL

1. Remove transmission assembly.
Refer to setion MT/AT.
2. Remove flywheel.
3. Remove oil seal.



4. Coat new oil seal with engine oil and install it.



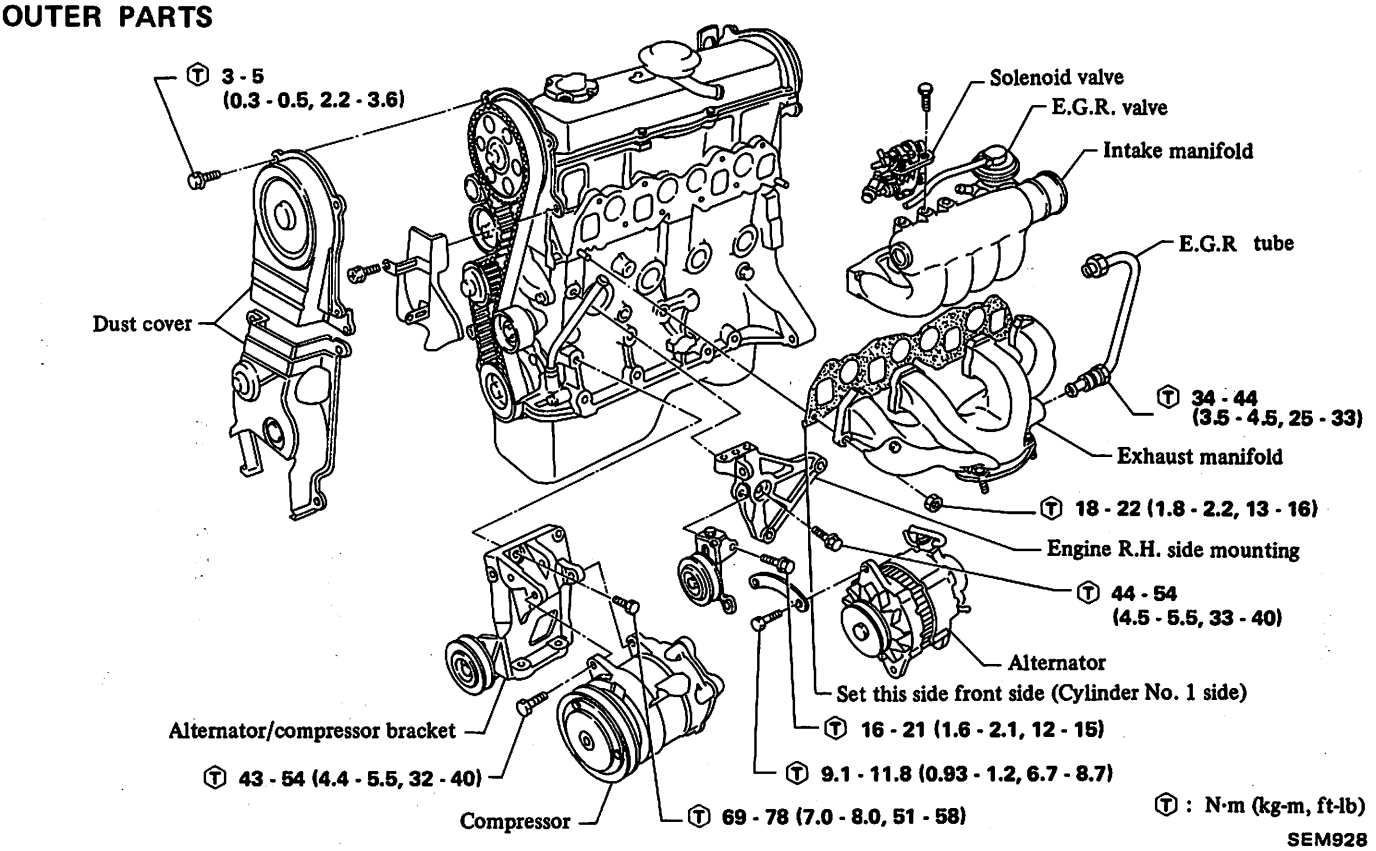
5. Install flywheel.

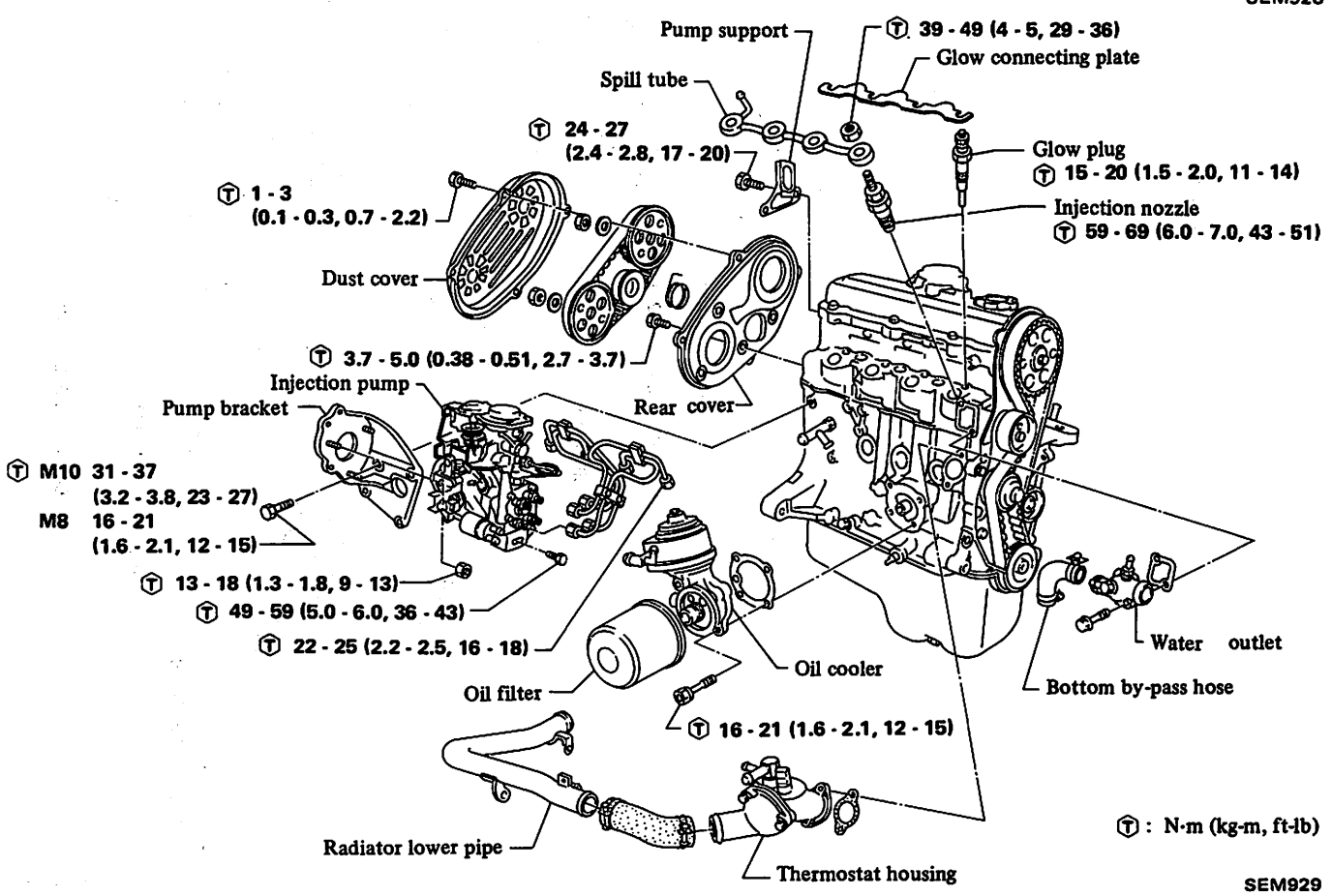
Ⓣ : **98 - 108 N·m (10.0 - 11.0 kg-m, 72 - 80 ft-lb)**

6. Install transmission.
Refer to section MT/AT.

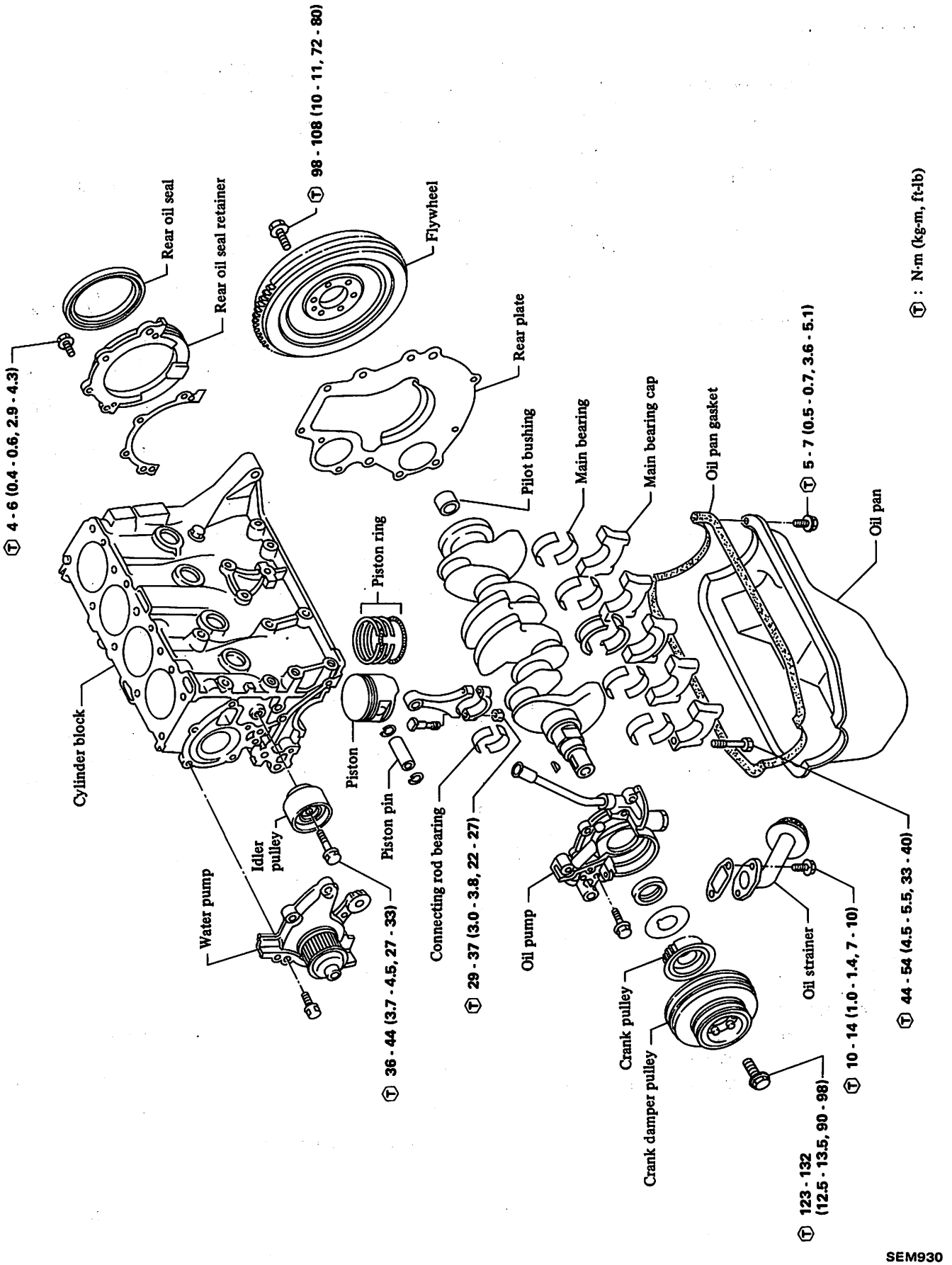
ENGINE COMPONENTS

OUTER PARTS





INTERNAL PARTS

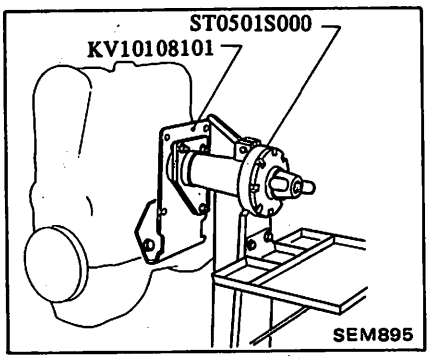


SEM930

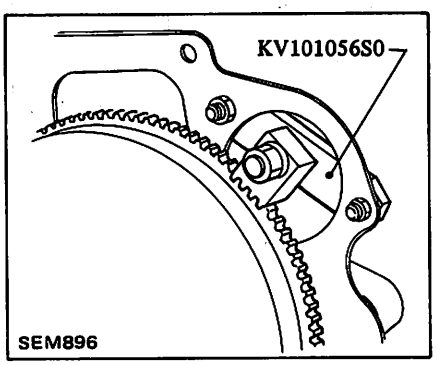
ENGINE DISASSEMBLY

MOUNTING ENGINE ON WORK STAND

1. Remove outer parts.
2. Install engine attachment and mount it on work stand.



3. Drain out engine oil and coolant.
4. Install flywheel stopper.



ENGINE OVERALL

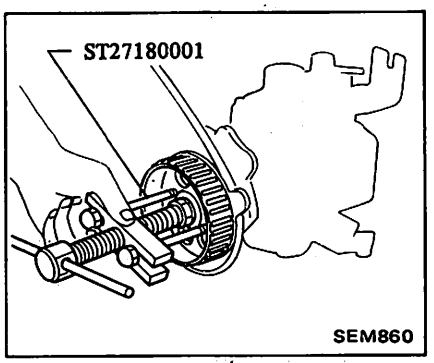
1. Remove front side parts.
2. Remove valve timing belt.

Refer to TIMING BELT REPLACEMENT in section MA.

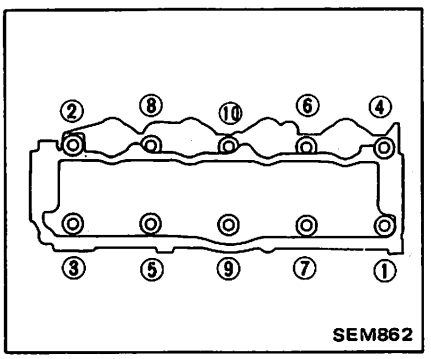
3. Remove rear side parts.
4. Remove injection timing belt.

Refer to TIMING BELT REPLACEMENT in section MA.

5. Loosen nut and remove injection pump pulley.



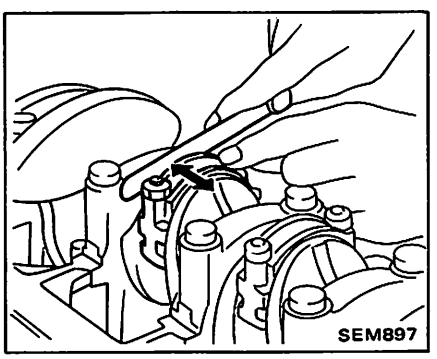
6. Remove injection pump.
7. Remove oil pan and oil pump.
8. Remove cylinder head.



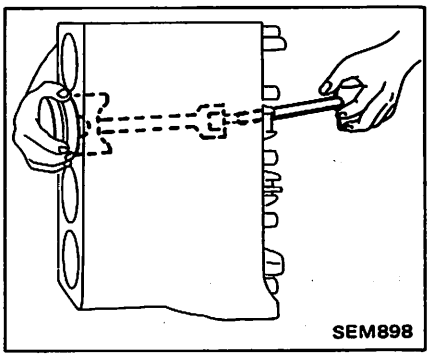
9. Remove piston & connecting rod.

(1) Measure connecting rod end play. If it exceeds the limit, replace connecting rod.

End play limit:
0.3 mm (0.012 in)

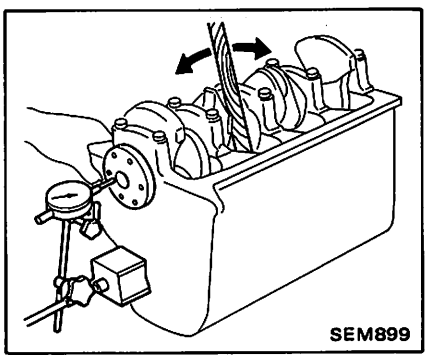


(2) Remove connecting rod caps and bearings.
(3) Push them out toward cylinder head side.



10. Remove crankshaft.

(1) Measure crankshaft end play. If the end play is not within specifications, replace main bearings as a set.



End play limit:
0.3 mm (0.012 in)

(2) Remove main bearing caps and bearings.

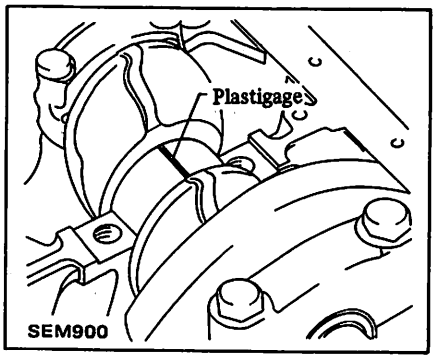
Do not mix the main bearings.

(3) Remove oil seal retainer together with oil seal.
(4) Remove crankshaft.

11. Check oil clearance.

(1) Clean crankshaft journals, main bearings and cap.

(2) Set plastigage on each journal pin and install bearing caps.

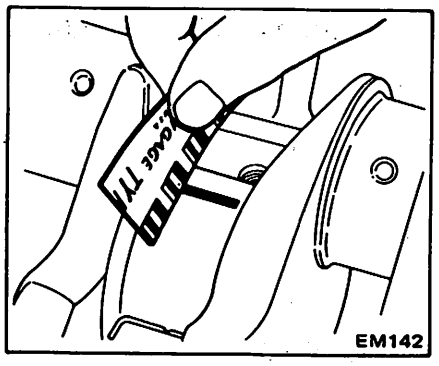


Do not turn the crankshaft.

Ⓣ : Main bearing cap bolt
44 - 54 N·m
(4.5 - 5.5 kg-m,
33 - 40 ft-lb)

Ⓣ : Connecting rod cap nut
31 - 37 N·m
(3.2 - 3.8 kg-m,
23 - 27 ft-lb)

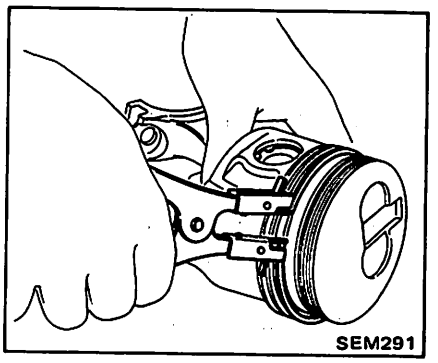
(3) Measure oil clearance.



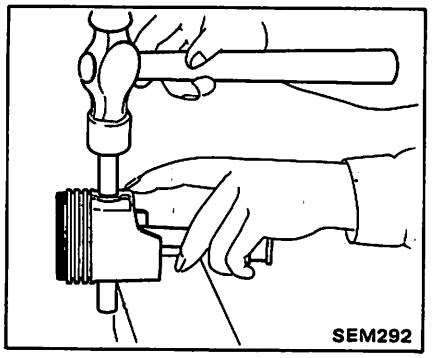
Oil clearance limit:
Crank journal
0.12 mm (0.0047 in)
Connecting rod
0.12 mm (0.0047 in)

PISTON AND CONNECTING ROD

1. Remove piston rings with ring expander.



2. Heat piston to between 60 and 70°C (140 and 158°F) using oil heater or hot water and take out piston pin with hand or suitable tool.

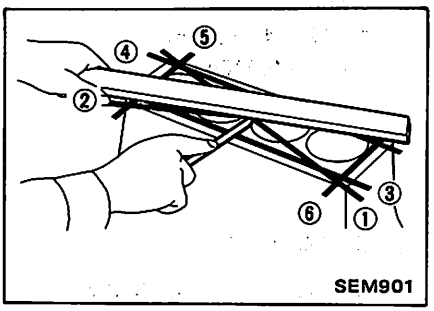


INSPECTION AND REPAIR

CYLINDER BLOCK

1. Visually check cylinder block for cracks or flaws.
2. Measure the top of cylinder block (cylinder head mating face) for warpage. If it exceeds the specified limit, correct with surface plate and grinding compound.

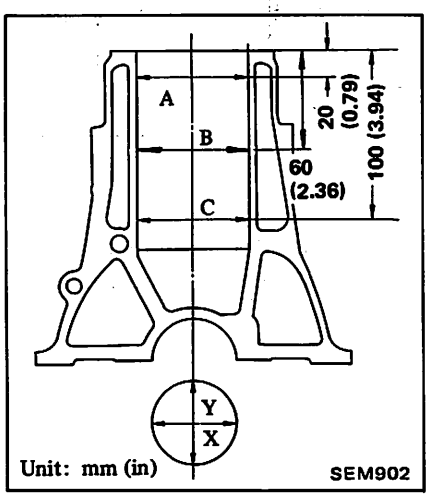
Warpage of surface:
Limit 0.1 mm (0.004 in)

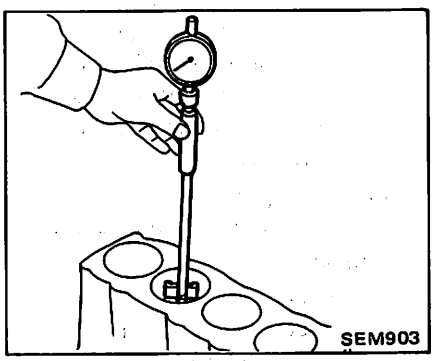


Correct amount limit (Including cylinder head side correct amount):
0.1 mm (0.004 in)

3. Using a bore gauge, measure cylinder bore for wear, out-of-round or taper. If, those are excessive, rebore the cylinder walls by means of a boring machine. Measurement should be taken along bores for taper and around bores for out-of-round.

Out-of-round:
X-Y
0.20 mm (0.0079 in)
Taper:
A-B-C
0.20 mm (0.0079 in)





4. When wear, taper or out-of-round is minor and within the limit, remove the step at the topmost portion of cylinder using a ridge reamer or other similar tool.

CYLINDER BORING

CAUTION:
a. To prevent strain due to cutting heat, bore the cylinders in the order of 2-4-1-3.
b. Before boring any cylinder, install main bearing caps in place and tighten to the specification so that the crankshaft bearing bores will not become distorted from the boring operation.
c. All cylinders should be bored at the same time.
d. The amount cut at one time should be 0.05 mm (0.0020 in).
e. Check piston and cylinder clearance.
f. Check cylinder bore for out-of-round and taper.

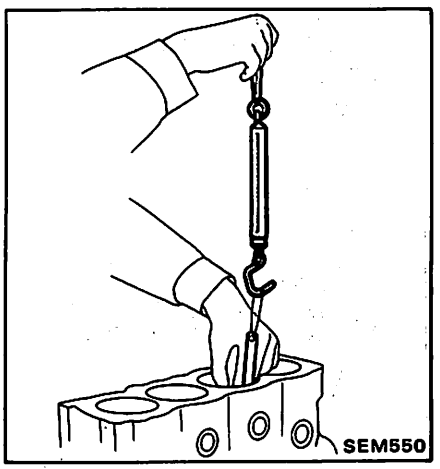
Refer to S.D.S.

Measuring piston-to-cylinder clearance

Check piston and cylinder clearance.

Feeler gauge used:
0.05 - 0.07 mm
(0.0020 - 0.0028 in)
Extracting force:
14.7 - 17.7 N
(1.5 - 1.8 kg, 3.3 - 4.0 lb)

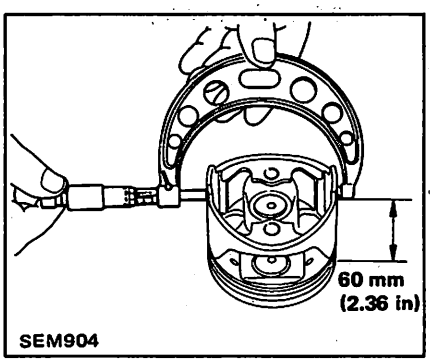
When measuring clearance, slowly pull feeler gauge straight upward.



PISTON, PISTON PIN AND PISTON RING

PISTON

1. Scrape carbon off piston and ring grooves with a carbon scraper and a curved steel wire. The wire will be useful in cleaning bottom land of ring groove. Clean out oil slots in bottom land of oil ring groove.
2. Check for damage, scratches and wear. Replace if such a fault is detected.
3. Check for wear.

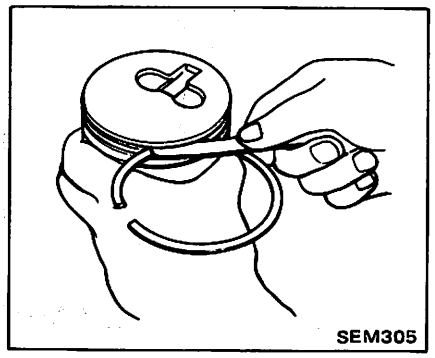


Standard:
79.94 - 79.99 mm
(3.1472 - 3.1492 in)

PISTON RING

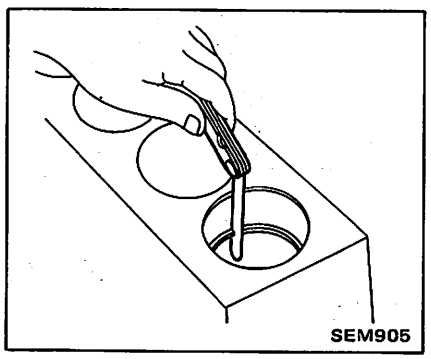
1. Measure the side clearance of rings in ring grooves as each ring is installed. If side clearance exceeds the specified limit, replace piston together with piston ring.

Side clearance:
Top ring
0.20 mm (0.0079 in)
Second ring
0.15 mm (0.0059 in)
Oil ring
0.10 mm (0.0039 in)



2. Measure ring gap with a feeler gauge, placing ring squarely in cylinder using piston.
Ring should be placed to diameter at upper or lower limit of ring travel.
If ring gap exceeds the specified limit, replace ring.

Ring gap:
Top ring
1.0 mm (0.039 in)
Second ring
0.7 mm (0.028 in)
Oil ring
0.6 mm (0.024 in)



When piston ring only is to be replaced, without cylinder bore being corrected, measure the gap at the bottom of cylinder where the wear is minor.

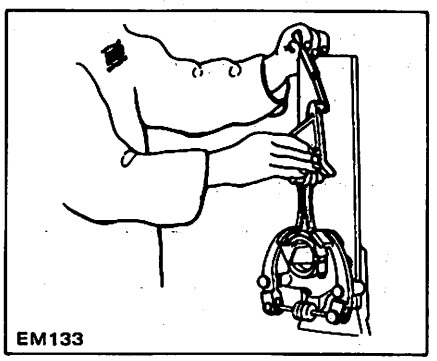
PISTON PIN

Check piston pin and piston pin hole for signs of sticking and other abnormalities.

CONNECTING ROD

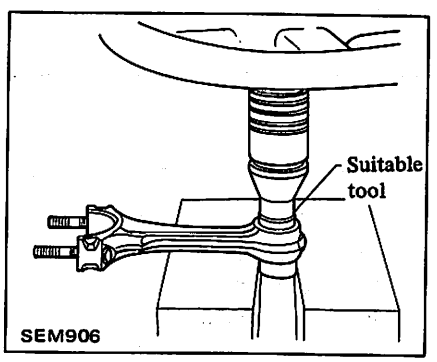
1. If a connecting rod has any flaw on both sides of the thrust face and the large end, correct or replace it.
2. Check connecting rod for bend or torsion using a connecting rod aligner.
If bend or torsion exceeds the limit, correct or replace.

Bend and torsion
[per 100 mm (3.94 in) length]:
Standard
Bend
Less than 0.15 mm
(0.0059 in)
Torsion
Less than 0.30 mm
(0.0118 in)

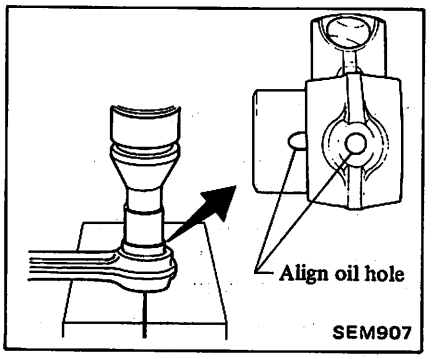


CONNECTING ROD BEARING REPLACEMENT

1. Replace bearing with suitable tool and press.



a. Coat new bearing with engine oil.
b. Align oil hole.



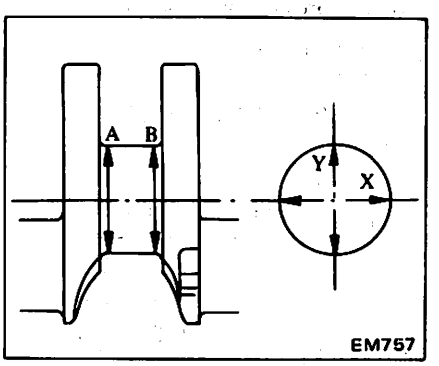
2. Grind the bore.
24.025 - 24.038 mm
(0.9459 - 0.9464 in)

CRANKSHAFT

CRANK JOURNAL AND PIN

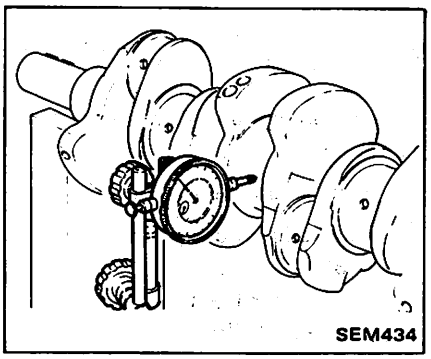
1. Repair or replace as required. If faults are minor, correct with fine crocus cloth.
2. Check journals and crank pins for taper and out-of-round.
If out-of-round or taper exceeds the specified limit, replace.

Out-of-round (X-Y):
Limit 0.03 mm (0.0012 in)
Taper (A-B):
Limit 0.03 mm (0.0012 in)



3. Check crankshaft for runout.
If bend exceeds the specified limit, replace.

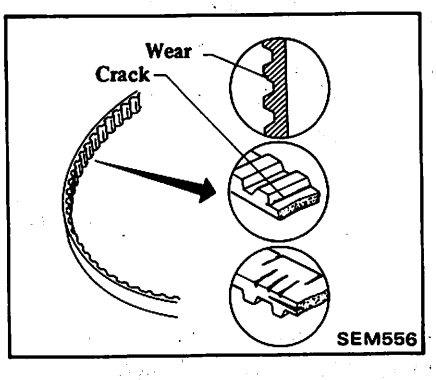
Runout:
Limit 0.05 mm (0.0020 in)



MISCELLANEOUS COMPONENTS

TIMING BELT

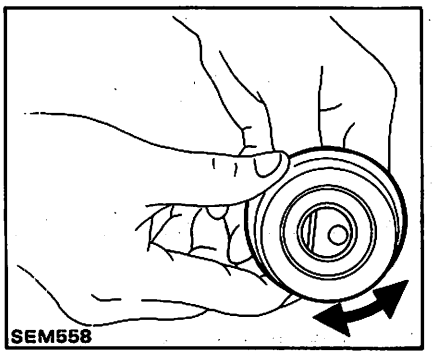
CAUTION:
a. Do not bend, twist or turn the belt inside out.
b. Ensure timing belt is clean and free from oil or water when installing it.



1. Check for oil or water. If soaked with oil or water, replace it.
2. Check for cracks and wear on the belt face. If there is noticeable cracks or wear, check the tensioner pulley. If necessary, replace it.
3. Check for cracks and damage on the cog face. If there is noticeable cracks or damage, check if any pulleys are locked.

TENSIONER

1. Check to see that it turns smoothly. If it binds, replace assembly.



2. Check tensioner surface. If necessary, clean it.

Do not use oil or grease.

3. Check for spring wear. If worn, replace it.

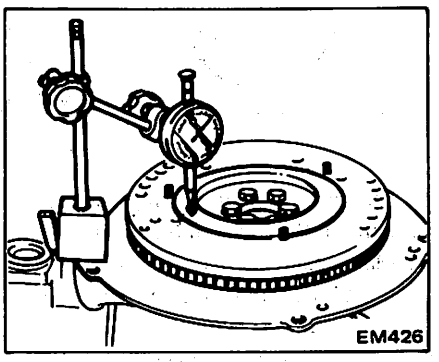
PULLEY

1. Remove oil and clean.
2. Check for harmful burrs. If burred, smoothen with oil stone, etc.

FLYWHEEL

1. Check the clutch disc contact surface on flywheel for damage or wear. Repair or replace if necessary.
2. Measure runout of the clutch disc contact surface with a dial gauge. If it exceeds the specified limit, replace it.

Runout:
(Total indicator reading)
Limit 0.15 mm (0.0059 in)



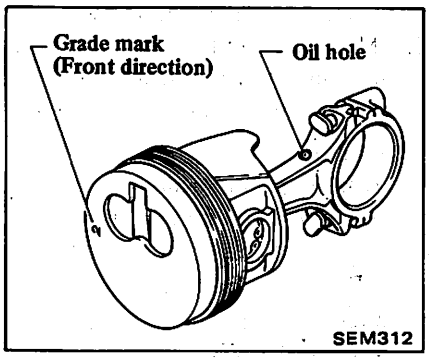
3. Check tooth surfaces of ring gear for flaws or wear.
Replace if necessary.

Replace ring gear at about 180 to 220°C (356 to 428°F).

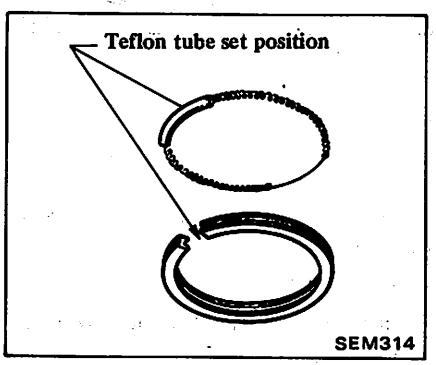
ENGINE ASSEMBLY

PISTON AND CONNECTING ROD

a. Ensure connecting rod oil hole and piston leaf are in the same direction.



b. Ensure mark side of ring faces up.
c. Align teflon tube and ring gap.
d. Make sure that the expander coil joint is at opposite side of ring gap.



1. Heat piston to between 60 and 70°C (140 and 158°F) using oil heater or hot water and install the pin.
2. Install the snap rings.
3. Install piston rings.

ENGINE OVERALL

1. Install crankshaft.

(1) Set main bearings on block.

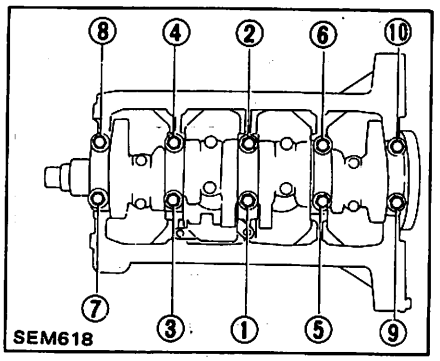
a. Do not coat block side and back of the bearings with oil.

b. The block side bearing has an oil hole and oil groove but cap side does not.

(2) Install crankshaft.

(3) Install main bearings and caps.

Ⓣ : **Main bearing cap bolt**
44 - 54 N·m
(4.5 - 5.5 kg-m,
33 - 40 ft-lb)



Make sure that crankshaft rotates smoothly by hand.

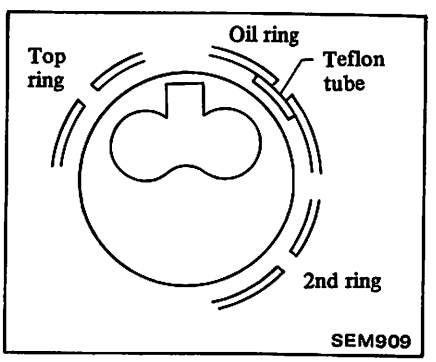
(4) Install rear oil seal retainer.

Ⓣ : **Oil seal retainer**
6.3 - 8.3 N·m
(0.64 - 0.85 kg-m,
4.6 - 6.1 ft-lb)

(5) Measure the end play.

2. Install piston and connecting rod.

(1) Set piston rings as shown below.



(2) Install piston into corresponding cylinders.

Ensure number on piston head faces front side.

(3) Install connecting rod caps.

Ⓣ : **Connecting rod cap nut**
31 - 37 N·m
(3.2 - 3.8 kg-m,
23 - 27 ft-lb)

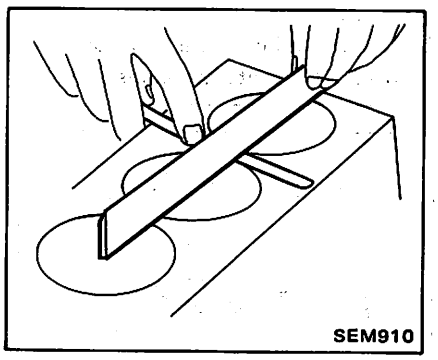
- **Apply engine oil to thread and seat.**
- **Ensure connecting rod numbers are aligned.**

(4) Measure the end play.

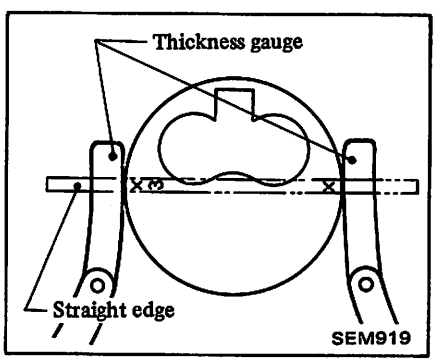
3. Select cylinder head gasket.

(1) Clean cylinder block surface.

(2) Measure all piston projections.



Be sure to measure the projection at two points for every cylinder.

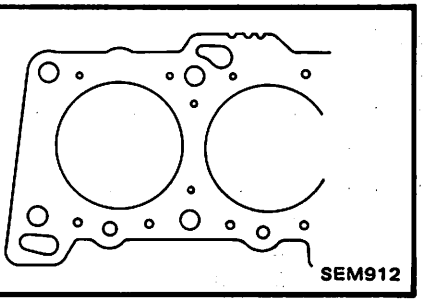


(3) Obtain average values of all piston projections and then determine gaskets to be used.

Relation between piston projection and cylinder head gasket

Unit: mm (in)

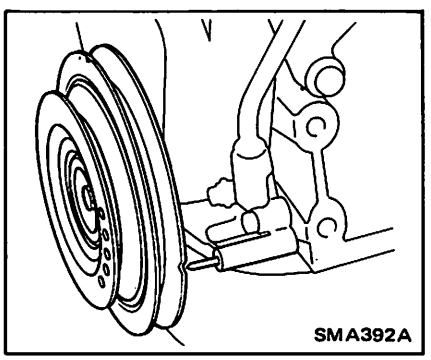
Grade	Average values piston projections	Gasket thickness	Number of cutouts
A	Less than 0.52 (0.0205)	1.15 (0.0453)	1
B	0.52 - 0.57 (0.0205 - 0.0224)	1.20 (0.0472)	2
C	More than 0.57 (0.0224)	1.25 (0.0492)	3


SEM912

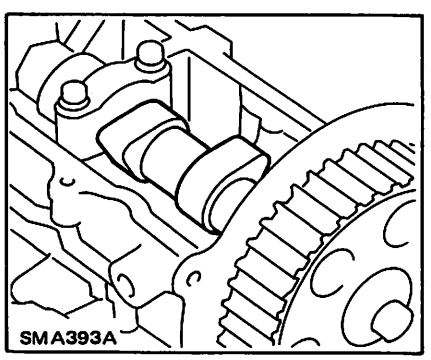
When maximum value of piston projection is larger by 0.050 mm (0.0020 in) than the average values of piston projections in each grade, use a gasket which is 1 grade thicker.

4. Install cylinder head.

(1) Make sure that No. 1 cylinder is at Top Dead Center.

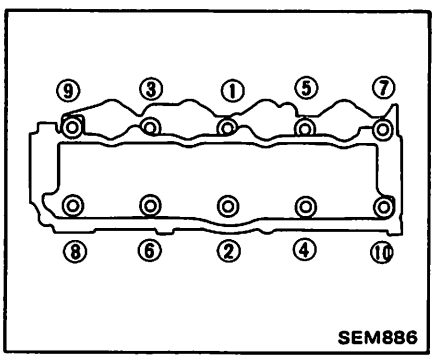

SMA392A

(2) Make sure that No. 1 cam of camshaft is in the position as shown.


SMA393A

(3) Tighten cylinder head bolts in the order shown.

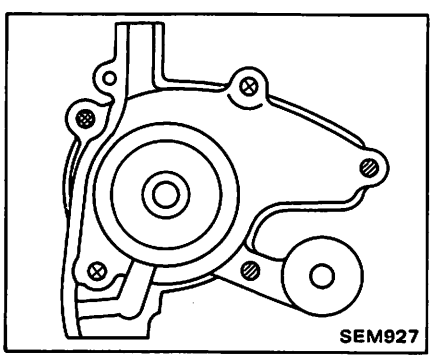
Ⓣ : **Cylinder head bolt**
1st
59 - 69 N·m
(6.0 - 7.0 kg-m,
43 - 51 ft-lb)
2nd
98 - 108 N·m
(10.0 - 11.0 kg-m,
72 - 80 ft-lb)



SEM886

INSTALLING VALVE TIMING BELT

1. Install water pump.


SEM927

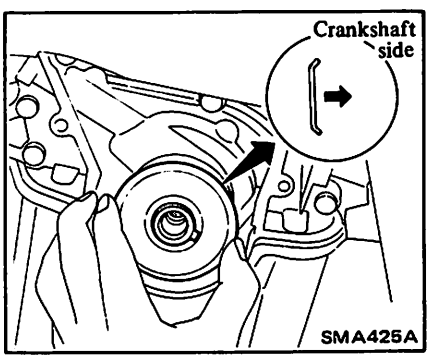
Ⓣ : **Water pump to cylinder block**
- **16 - 20 N·m**
  (1.6 - 2.0 kg-m,
  12 - 14 ft-lb)
- **16 - 21 N·m**
  (1.6 - 2.1 kg-m,
  12 - 15 ft-lb)

2. Install camshaft pulley.

Ⓣ : **Camshaft pulley bolt**
92 - 102 N·m
(9.4 - 10.4 kg-m,
68 - 75 ft-lb)

3. Install oil pump and oil pan.
Refer to section LC.

4. Install crank pulley plate.



SMA425A

5. Install valve timing belt.
Refer to TIMING BELT REPLACEMENT in section MA.

Ⓣ : **Dust cover**
3 - 5 N·m
(0.3 - 0.5 kg-m,
2.2 - 3.6 ft-lb)

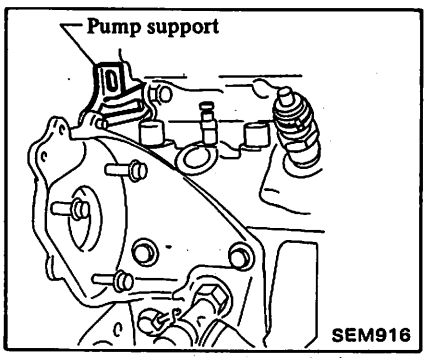
6. Install crank damper pulley.

Ⓣ : **Crank damper pulley bolt**
123 - 132 N·m
(12.5 - 13.5 kg-m,
90 - 98 ft-lb)

INSTALLING INECTION TIMING BELT

1. Install water pipe.
2. Set pump support before installing back cover.

Ⓣ : **Injection pump bracket support**
24 - 27 N·m
(2.4 - 2.8 kg-m,
17 - 20 ft-lb)



3. Install camshaft pulley.

Ⓣ : **Camshaft pulley bolt**
92 - 102 N·m
(9.4 - 10.4 kg-m,
68 - 75 ft-lb)

4. Install injection nozzles, glow plugs and glow connecting plate.

Ⓣ : **Glow plug to cylinder head**
15 - 20 N·m
(1.5 - 2.0 kg-m,
11 - 14 ft-lb)
Nozzle to cylinder head
59 - 69 N·m
(6.0 - 7.0 kg-m,
43 - 51 ft-lb)

5. Install injection pump bracket and injection pump temporarily.

6. Adjust injection timing.
Refer to ADJUSTING INJECTION TIMING in section MA.

Ⓣ : **Pump bracket bolt**
M10
31 - 37 N·m
(3.2 - 3.8 kg-m,
23 - 27 ft-lb)
M8
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

7. Install injection pump pulley.

Ⓣ : **Injection pump pulley**
59 - 69 N·m
(6.0 - 7.0 kg-m,
43 - 51 ft-lb)

8. Install injection timing belt.
Refer to TIMING BELT REPLACEMENT in section MA.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

E15 & E16

INSPECTION AND ADJUSTMENT

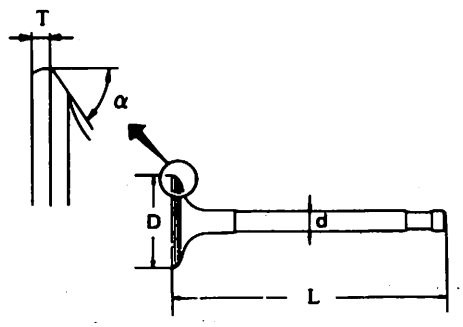
CYLINDER HEAD

Unit: mm (in)

	Standard	Limit
Head surface flatness	Less than 0.05 (0.0020)	0.1 (0.004)

VALVE

Unit: mm (in)



SEM188

Valve head diameter "D"	Intake	37.0 (1.457)	
	Exhaust	30.0 (1.181)	
		E15	E16
Valve length "L"	Intake	118.4 - 119.0 (4.66 - 4.69)	116.4 - 117.0 (4.58 - 4.61)
	Exhaust	117.75 - 118.35 (4.64 - 4.66)	115.75 - 116.35 (4.56 - 4.58)
Valve stem diameter "d"	Intake	6.970 - 6.985 (0.2744 - 0.2750)	
	Exhaust	6.945 - 6.960 (0.2734 - 0.2740)	
Valve face angle "α"		45°15' - 45°45'	
Valve margin "T" Limit		0.5 (0.020)	
Valve stem end surface grinding limit		0.2 (0.008)	

Valve spring

Free height mm (in)	46.70 (1.8386)
Assembled height mm/N (mm/kg, in/lb)	39.2/229.78 (39.2/23.43, 1.543/51.66)
Out of square "S" mm (in)	2.0 (0.079)

Valve guide

Unit: mm (in)

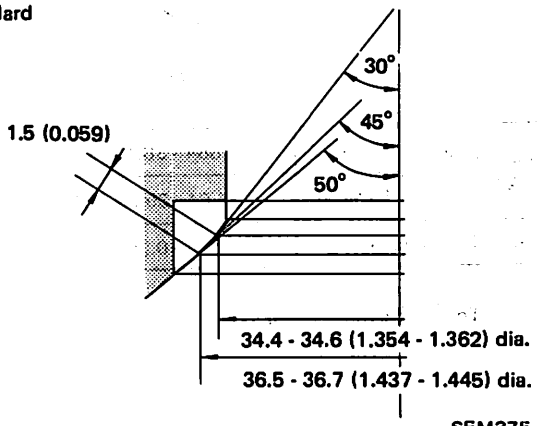
		Standard	Service
Valve guide Outer diameter		12.033 - 12.044 (0.4737 - 0.4742)	12.256 - 12.274 (0.4825 - 0.4832)
Valve guide Inner diameter [Finished size]		7.005 - 7.020 (0.2758 - 0.2764)	
Cylinder head valve guide hole diameter		11.970 - 11.988 (0.4713 - 0.4720)	12.200 - 12.211 (0.4803 - 0.4807)
Interference fit of valve guide		0.045 - 0.074 (0.0018 - 0.0029)	
		Standard	Max. tolerance
Stem to guide clearance	Intake	0.02 - 0.05 (0.0008 - 0.0020)	0.1 (0.004)
	Exhaust	0.045 - 0.075 (0.0018 - 0.0030)	
Valve deflection limit		0.2 (0.008)	

Valve seat

Unit: mm (in)

INTAKE

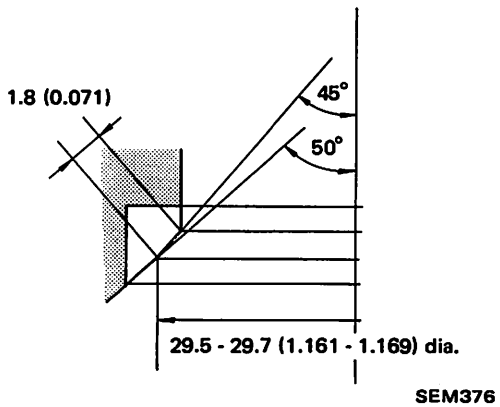
Standard



SEM375

EXHAUST

Standard

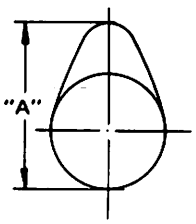


SEM376

CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

		Standard	Max. tolerance
Camshaft journal to bearing clearance	No. 1,3,5	0.035 - 0.076 (0.0014 - 0.0030)	0.15 (0.0059)
	No. 2, 4	0.078 - 0.119 (0.0031 - 0.0047)	0.20 (0.0079)
Inner diameter of camshaft bearing		42.000 - 42.025 (1.6535 - 1.6545)	–
Outer diameter of camshaft journal	No. 1,3,5	41.949 - 41.965 (1.6515 - 1.6522)	–
	No. 2, 4	41.906 - 41.922 (1.6498 - 1.6505)	
Camshaft bend [T.I.R*]		Less than 0.02 (0.0008)	0.1 (0.004)
Camshaft end play		0.15 - 0.29 (0.0059 - 0.0114)	0.4 (0.016)



EM671

Cam height "A"	Intake	35.884 - 36.134 (1.4128 - 1.4226)
	Exhaust	35.64 - 35.89 (1.4031 - 1.4130)
Wear limit of cam height		0.20 (0.0079)

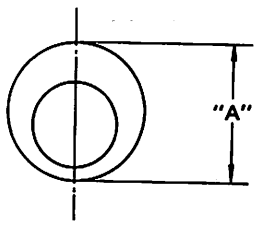
* Total indicator reading

JACK SHAFT AND JACK SHAFT BUSHING

Unit: mm (in)

		Standard	Max. tolerance
Jack shaft journal to bushing clearance	FR	0.020 - 0.098 (0.0008 - 0.0039)	0.15 (0.0059)
	RR		
Inner diameter of jack shaft bushing	FR	32.020 - 32.085 (1.2606 - 1.2632)	
	RR	28.620 - 28.685 (1.1268 - 1.1293)	
Outer diameter of jack shaft journal	FR	31.987 - 32.000 (1.2593 - 1.2598)	
	RR	28.587 - 28.600 (1.1255 - 1.1260)	
Jack shaft end play		0.045 - 0.105 (0.0018 - 0.0041)	

Fuel pump cam



SEM734

Cam height "A"	27.8 - 27.9 (1.094 - 1.098)	–

CYLINDER BLOCK

Unit: mm (in)

		Standard	Wear limit
Surface flatness		Less than 0.05 (0.0020)	0.10 (0.0039)
Cylinder bore	Inner diameter	76.00 - 76.05 (2.9921 - 2.9941)	76.20 (3.0000)
	Out-of-round (X-Y)	Less than 0.015 (0.0006)	–
	Taper (A-B)	Less than 0.02 (0.0008)	–
Difference in inner diameter between cylinders		Less than 0.05 (0.0020)	–
Piston clearance to cylinder block		0.023 - 0.043 (0.0009 - 0.0017)	–

PISTON, PISTON RING AND PISTON PIN

Piston

Unit: mm (in)

Piston skirt diameter "A"	Standard		75.967 - 76.017 (2.9908 - 2.9928)
	Oversize	0.02 (0.0008)	75.987 - 76.037 (2.9916 - 2.9936)
		0.50 (0.0197)	76.467 - 76.517 (3.0105 - 3.0125)
"a" dimension			17.5 (0.689)
Piston pin hole diameter			19.003 - 19.012 (0.7481 - 0.7485)

Piston ring

Unit: mm (in)

		Standard	Limit
Side clearance	Top	0.040 - 0.073 (0.0016 - 0.0029)	0.2 (0.008)
	2nd	0.030 - 0.063 (0.0012 - 0.0025)	
	Oil	0.050 - 0.145 (0.0020 - 0.0057)	—
Ring gap	Top	0.20 - 0.35 (0.0079 - 0.0138)	1.0 (0.039)
	2nd	0.15 - 0.30 (0.0059 - 0.0118)	
	Oil (rail ring)	0.30 - 0.90 (0.0118 - 0.0354)	

Piston pin

Unit: mm (in)

Piston pin outer diameter	18.995 - 19.000 (0.7478 - 0.7480)
Piston pin to piston clearance	0.008 - 0.012 (0.0003 - 0.0005)
Interference fit of piston pin to connecting rod	0.017 - 0.038 (0.0007 - 0.0015)

CONNECTING ROD

Unit: mm (in)

Bend, torsion [per 100 mm (3.94 in)]	Limit	0.05 (0.0020)
Piston pin bore dia.		18.962 - 18.978 (0.7465 - 0.7472)
Big end play	Standard	0.1 - 0.37 (0.004 - 0.0146)
	Limit	0.5 (0.020)

CRANKSHAFT

Unit: mm (in)

Main journal dia. "Dm"		49.943 - 49.964 (1.9663 - 1.9671)
Pin journal dia. "Dp"		39.954 - 39.974 (1.5730 - 1.5738)
Out-of-round (X-Y) and taper (A-B)	Standard	Less than 0.01 (0.0004)
	Limit	0.03 (0.0012)
Bend [T.I.R.]	Standard	Less than 0.05 (0.0020)
	Limit	0.10 (0.0039)
Free end play	Standard	0.05 - 0.18 (0.0020 - 0.0071)
	Limit	0.30 (0.0118)

BEARING

Bearing clearance

Except M.P.G. model

Unit: mm (in)

	Standard	Limit
Main bearing clearance Nos. 1 and 5	0.031 - 0.076 (0.0012 - 0.0030)	0.10 (0.0039)
Nos. 2, 3 and 4	0.031 - 0.092 (0.0012 - 0.0036)	
Connecting rod bearing clearance	0.030 - 0.060 (0.0012 - 0.0024)	0.10 (0.0039)

M.P.G. model

Unit: mm (in)

	Standard	Limit
Main bearing clearance Nos. 1, 3 and 5	0.047 - 0.076 (0.0019 - 0.0030)	0.10 (0.0039)
Nos. 2 and 4	0.031 - 0.092 (0.0012 - 0.0036)	0.10 (0.0039)
Connecting rod bearing clearance	0.030 - 0.060 (0.0012 - 0.0024)	0.10 (0.0039)

Main bearing undersize

Unit: mm (in)

		Crank main journal diameter "Dm"
Standard		49.943 - 49.964 (1.9663 - 1.9671)
Undersize	0.25 (0.0098)	49.701 - 49.714 (1.9567 - 1.9572)
	0.50 (0.0197)	49.451 - 49.464 (1.9469 - 1.9474)
	0.75 (0.0295)	49.201 - 49.214 (1.9370 - 1.9376)

Connecting rod bearing undersize

Unit: mm (in)

		Crank pin journal diameter "Dp"
Standard		39.954 - 39.974 (1.5730 - 1.5738)
Undersize	0.08 (0.0031)	39.874 - 39.894 (1.5698 - 1.5706)
	0.25 (0.0098)	39.704 - 39.724 (1.5631 - 1.5639)
	0.50 (0.0197)	39.454 - 39.474 (1.5533 - 1.5541)
	0.75 (0.0295)	39.204 - 39.224 (1.5435 - 1.5442)

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Camshaft pulley Runout [T.I.R.]	Less than 0.1 (0.004)
Flywheel Runout [T.I.R.]	Less than 0.15 (0.0059)

TIGHTENING TORQUE

Engine outer parts

Unit	N·m	kg-m	ft-lb
Alternator bracket bolt	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Alternator to adjusting bar bolt	16 - 21	1.6 - 2.1	12 - 15
Clutch cover fixing bolt	7 - 10	0.7 - 1.0	5.1 - 7.2
Engine mounting bracket to cylinder block	29 - 39	3.0 - 4.0	22 - 29
Engine mounting bracket to cylinder head	16 - 21	1.6 - 2.1	12 - 15
Fuel pump attaching nut	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Intake & exhaust manifold nut	16 - 21	1.6 - 2.1	12 - 15
Oil pump securing nut	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Oil pump securing bolt	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Power steering pump bracket	26 - 34	2.7 - 3.5	20 - 25
Power steering pump fixing bolt	31 - 42	3.2 - 4.3	23 - 31
Spark plug	15 - 20	1.5 - 2.0	11 - 14
Water pump pulley bolt	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
Water pump bolt	9 - 14	0.9 - 1.4	6.5 - 10.1
Compressor bracket bolt	26 - 34	2.7 - 3.5	20 - 25
Compressor to bracket	26 - 34	2.7 - 3.5	20 - 25
Crank pulley bolt	113 - 147	11.5 - 15.0	83 - 108
Dust cover screw	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
E.G.R. valve to E.G.R. tube	39 - 59	4 - 6	29 - 43
E.A.I. tube nut	39 - 59	4 - 6	29 - 43
Thermostat housing bolt	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7

Engine internal parts

Unit	N·m	kg-m	ft-lb
Camshaft pulley bolt	6 - 8	0.6 - 0.8	4.3 - 5.8
Connecting rod nut	31 - 37	3.2 - 3.8	23 - 27
Cylinder head bolt 1st	39 - 44	4.0 - 4.5	29 - 33
Cylinder head bolt 2nd	69 - 74	7.0 - 7.5	51 - 54
Cylinder head front cover	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
Flywheel bolt	78 - 88	8.0 - 9.0	58 - 65
Drive plate bolt	93 - 103	9.5 - 10.5	69 - 76
Front cover bolt	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
Jack shaft pulley bolt	6 - 8	0.6 - 0.8	4.3 - 5.8
Main bearing cap bolt	49 - 59	5.0 - 6.0	36 - 43
Oil pan bolt & nut	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
Oil pan drain plug	35 - 47	3.6 - 4.8	26 - 35
Oil strainer bolt	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Rocker shaft bolt	16 - 21	1.6 - 2.1	12 - 15
Tensioner lock nut	16 - 21	1.6 - 2.1	12 - 15
Rocker cover nut	4 - 8	0.4 - 0.8	2.9 - 5.8
Rocker arm lock nut	16 - 21	1.6 - 2.1	12 - 15

CD17

INSPECTION AND ADJUSTMENT

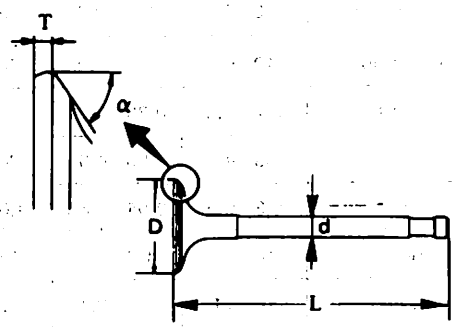
CYLINDER HEAD

Unit: mm (in)

Head surface flatness	
Standard	Less than 0.05 (0.0020)
Limit	0.1 (0.004)

VALVE

Unit: mm (in)



SEM188

Valve head diameter "D"	
Intake	36.00 (1.4173)
Exhaust	31.00 (1.2205)
Valve length "L"	
Intake	100.45 - 100.750 (3.9547 - 3.9665)
Exhaust	100.25 - 100.550 (3.9468 - 3.9587)
Valve stem diameter "d"	
Intake	6.965 - 6.980 (0.2742 - 0.2748)
Exhaust	6.945 - 6.960 (0.2734 - 0.2740)
Valve seat angle "α"	45°30'
Valve margin "T" Limit	0.5 (0.020)
Valve stem end surface grinding limit	0.5 (0.020)

Valve spring

Free height mm (in)	
Outer	46.40 (1.8268)
Inner	43.20 (1.7008)
Assembled height mm/N (mm/kg, in/lb)	
Outer	39.5/150.0 (39.5/15.3, 1.555/33.7)
Inner	36.0/85.3 (36.0/8.7, 1.417/19.2)
Out of square ("S") mm (in)	
Outer	2.1 (0.083)
Inner	1.9 (0.075)

Valve guide

Unit: mm (in)

	Standard	Service
Valve guide Outer diameter	11.023 - 11.034 (0.4340 - 0.4344)	
Valve guide Inner diameter [Finished size]	7.000 - 7.018 (0.2756 - 0.2763)	
Cylinder head valve guide hole diameter	10.975 - 10.996 (0.4321 - 0.4329)	
Interference fit of valve guide	0.027 - 0.059 (0.0011 - 0.0023)	

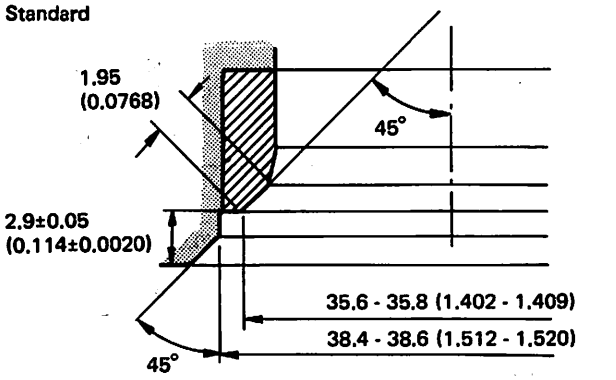
	Standard	Max. tolerance
Stem to guide clearance		
Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.1 (0.04)
Exhaust	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.04)
Valve deflection limit		0.2 (0.008)

Valve seat resurfacing

Unit: mm (in)

Intake

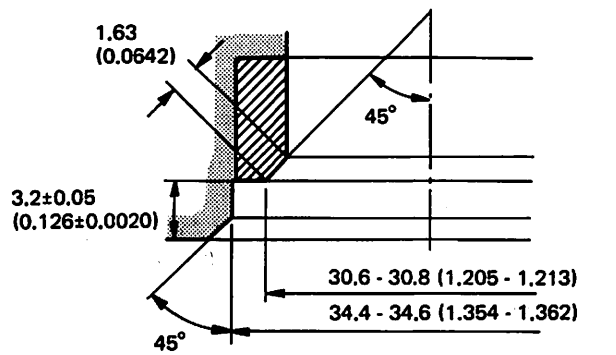
Standard



SEM917

Exhaust

Standard



SEM918

VALVE LIFTER

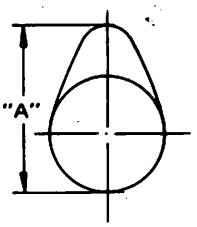
Unit: mm (in)

Valve lifter outer diameter	
Standard	34.959 - 34.975 (1.3763 - 1.3770)
Cylinder head valve lifter hole diameter	34.988 - 35.013 (1.3775 - 1.3785)
Clearance	
Standard	0.013 - 0.054 (0.0005 - 0.0021)
Limit	0.1 (0.004)

CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

	Standard	Max. tolerance
Camshaft journal to bearing clearance	0.02 - 0.06 (0.0008 - 0.0024)	0.1 (0.004)
Inner diameter of camshaft bearing	30.000 - 30.021 (1.1811 - 1.1819)	–
Outer diameter of camshaft journal	29.960 - 29.980 (1.1795 - 1.1803)	–
Camshaft bend	Less than 0.02 (0.0008)	0.05 (0.0020)
Camshaft end play		0.17 (0.0067)



EM671

Cam height "A"	
Intake	44.495 - 44.500 (1.7518 - 1.7520)
Exhaust	45.495 - 45.500 (1.7911 - 1.7913)
Wear limit of cam height	0.15 (0.0059)

CYLINDER BLOCK

Unit: mm (in)

Surface flatness	
Wear limit	0.1 (0.004)
Cylinder bore	
Inner diameter	
Standard	80.000 - 80.050 (3.1496 - 3.1516)
Wear limit	0.2 (0.008)
Out-of-round (X-Y)	
Wear limit	0.2 (0.008)
Taper (A-B)	
Wear limit	0.2 (0.008)
Difference in inner diameter between cylinders	
Standard	Less than 0.05 (0.0020)
Wear limit	0.2 (0.008)
Piston to cylinder clearance	
Standard	0.05 - 0.07 (0.0020 - 0.0028)
Feeler gauge extracting force [with gauge thickness 0.06 mm (0.0024 in)] N (kg, lb)	7.8 - 14.7 (0.8 - 1.5, 1.8 - 3.3)

Cylinder boring

Unit: mm (in)

Piston size	Cylinder hone diameter
0.5 (0.020) O/S	80.500 - 80.550 (3.1693 - 3.1713)
1.0 (0.039) O/S	81.000 - 81.050 (3.1890 - 3.1909)

PISTON, PISTON RING AND PISTON PIN

Piston

Unit: mm (in)

Piston skirt diameter	
Standard	79.94 - 79.99 (3.1472 - 3.1492)
Oversize	0.5 (0.020) 1.0 (0.039)
Measure position (From top)	60 (2.36)
Piston pin hole diameter	23.991 - 23.999 (0.9445 - 0.9448)

Piston ring

Unit: mm (in)

Side clearance	
Top	
Standard	0.060 - 0.10 (0.0024 - 0.0039)
Limit	0.2 (0.008)
2nd	
Standard	0.040 - 0.080 (0.0016 - 0.0031)
Limit	0.15 (0.0059)
Oil	
Standard	0.03 - 0.07 (0.0012 - 0.0028)
Limit	0.1 (0.004)
Ring gap	
Top	
Standard	0.20 - 0.35 (0.0079 - 0.0138)
Limit	1.0 (0.039)
2nd	
Standard	0.20 - 0.35 (0.0079 - 0.0138)
Limit	0.7 (0.028)
Oil (Rail ring)	
Standard	0.30 - 0.45 (0.0118 - 0.0177)
Limit	0.6 (0.024)

Piston pin

Unit: mm (in)

Piston pin outer diameter	23.994 - 24.000 (0.9446 - 0.9449)
Piston pin to piston clearance	0 - 0.004 (0 - 0.0002)
Interference fit of piston pin to connecting rod	0.025 - 0.044 (0.0010 - 0.0017)

CONNECTING ROD

Unit: mm (in)

Bend [per 100 mm (3.94 in)] Standard	Less than 0.15 (0.0059)
Torsion Standard	Less than 0.30 (0.0118)
Piston pin bore dia.	24.025 - 24.038 (0.9459 - 0.9464)
Big end play Limit	0.3 (0.012)

CRANKSHAFT

Unit: mm (in)

Main journal dia.	52.951 - 52.964 (2.0847 - 2.0852)
Pin journal dia.	44.961 - 44.974 (1.7701 - 1.7706)
Out-of-round (X-Y) and taper (A-B)	
Standard	Less than 0.01 (0.0004)
Limit	0.03 (0.0012)
Bend	
Standard	Less than 0.025 (0.0010)
Limit	0.05 (0.0020)
Free end play	
Standard	0.05 - 0.18 (0.0020 - 0.0071)
Limit	0.3 (0.012)

BEARING

Bearing clearance

Unit: mm (in)

Main bearing clearance	
Standard	0.039 - 0.066 (0.0015 - 0.0026)
Limit	0.12 (0.0047)
Connecting rod bearing clearance	
Standard	0.024 - 0.066 (0.0009 - 0.0026)
Limit	0.12 (0.0047)

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Camshaft sprocket Runout [T.I.R.]	Less than 0.1 (0.004)
Flywheel Runout [T.I.R.]	Less than 0.15 (0.0059)

TIGHTENING TORQUE

ENGINE OUTER PARTS

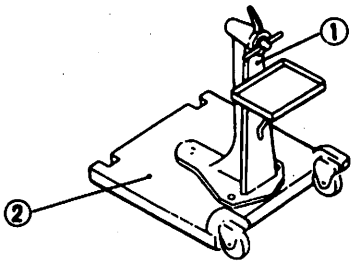
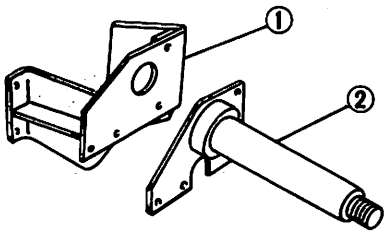
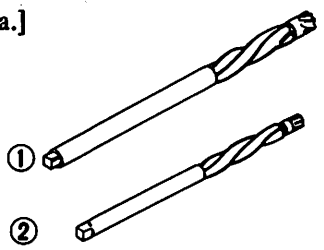
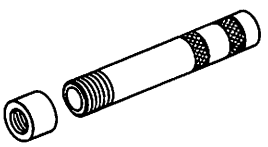
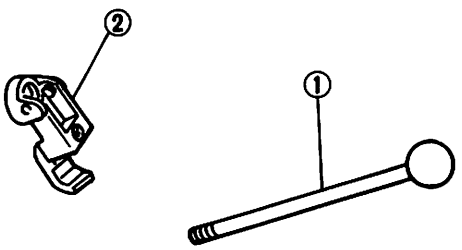
Unit	N·m	kg-m	ft-lb
Adjusting bar to engine mounting	16 - 21	1.6 - 2.1	12 - 15
Alternator bracket	43 - 58	4.4 - 5.9	32 - 43
Alternator to bracket	49 - 59	5.0 - 6.0	36 - 43
Alternator to adjusting bar	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Compressor bracket	69 - 78	7.0 - 8.0	51 - 58
Compressor to bracket	43 - 54	4.4 - 5.5	32 - 40
Crank damper pulley bolt	123 - 132	12.5 - 13.5	90 - 98
Front dust cover	3 - 5	0.3 - 0.5	2.2 - 3.6
Engine mounting bracket	44 - 54	4.5 - 5.5	33 - 40
Engine slinger	30 - 40	3.1 - 4.1	22 - 30
Glow plug to cylinder head	15 - 20	1.5 - 2.0	11 - 14
Idler pulley bracket	16 - 21	1.6 - 2.1	12 - 15
Idler pulley nut	19 - 25	1.9 - 2.6	14 - 19
Injection pump nut	13 - 18	1.3 - 1.8	9 - 13
Injection pump bracket M10	31 - 37	3.2 - 3.8	23 - 27
M8	16 - 21	1.6 - 2.1	12 - 15
Injection pump rear bracket	24 - 27	2.4 - 2.8	17 - 20
Injection pump to rear bracket	49 - 59	5.0 - 6.0	36 - 43
Injection pump bracket support	24 - 27	2.4 - 2.8	17 - 20
Injection pump pulley nut	59 - 69	6.0 - 7.0	43 - 51
Injection tube flare nut	22 - 25	2.2 - 2.5	16 - 18
Nozzle to cylinder head	59 - 69	6.0 - 7.0	43 - 51
Manifold	18 - 22	1.8 - 2.2	13 - 16
Oil filter bracket	16 - 21	1.6 - 2.1	12 - 15
Rear dust cover	1 - 3	0.1 - 0.3	0.7 - 2.2
E.G.R. valve	18 - 23	1.8 - 2.3	13 - 17
E.G.R. tube flare nut	34 - 44	3.5 - 4.5	25 - 33

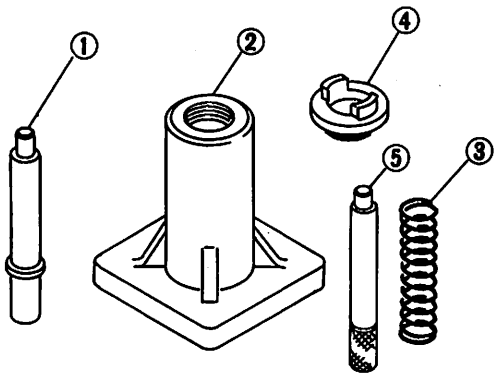
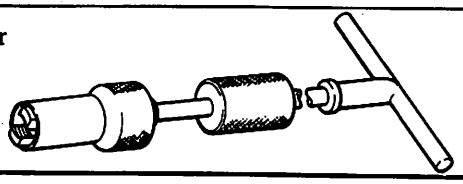
ENGINE BODY PART

Unit	N·m	kg-m	ft-lb
Cam bracket nut	18 - 22	1.8 - 2.2	13 - 16
Camshaft pulley bolt	92 - 102	9.4 - 10.4	68 - 75
Connecting rod cap nut	31 - 37	3.2 - 3.8	23 - 27
Cylinder head bolt			
1st	59 - 69	6.0 - 7.0	43 - 51
2nd	98 - 108	10.0 - 11.0	72 - 80
Front back cover	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Front tensioner	36 - 44	3.7 - 4.5	27 - 33
Flywheel	98 - 108	10.0 - 11.0	72 - 80
Idler pulley bolt	36 - 44	3.7 - 4.5	27 - 33
Main bearing cap bolt	44 - 54	4.5 - 5.5	33 - 40
Oil pan	5 - 7	0.5 - 0.7	3.6 - 5.1
Oil pan drain plug	37 - 45	3.8 - 4.6	27 - 33
Oil pump to cylinder block	12 - 16	1.2 - 1.6	9 - 12
Oil strainer	10 - 14	1.0 - 1.4	7 - 10
Oil seal retainer	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Rear back cover	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
Rear tensioner	16 - 21	1.6 - 2.1	12 - 15
Rocker cover	1 - 3	0.1 - 0.3	0.7 - 2.2
Water pump to cylinder block	16 - 20 16 - 21	1.6 - 2.0 1.6 - 2.1	12 - 14 12 - 15
Water drain plug	54 - 74	5.5 - 7.5	40 - 54

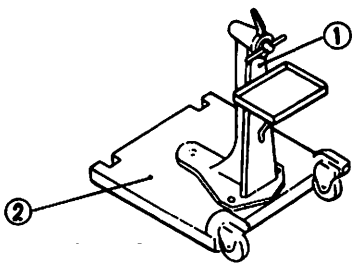
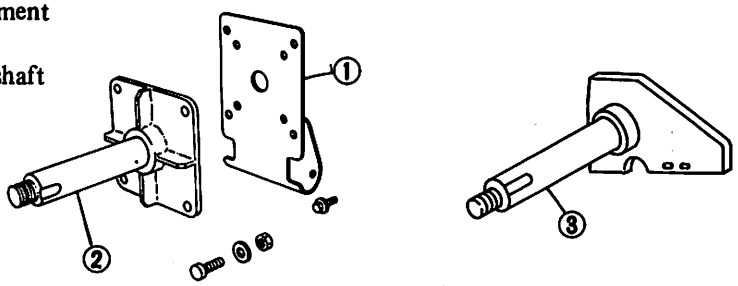
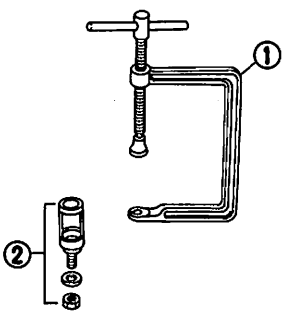
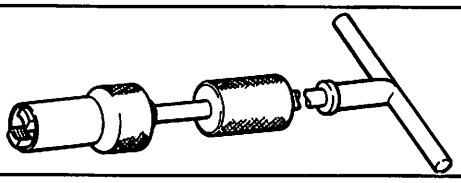
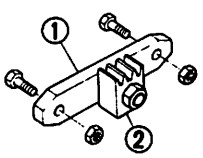
SPECIAL SERVICE TOOLS

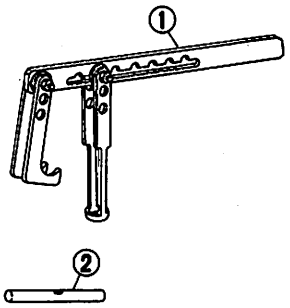
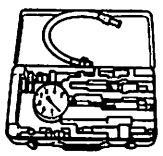
E15 & E16

Tool number (Kent-Moore No.)	Tool name
ST0501S000 (J26023) ① ST05011000 (J26023-2) ② ST05012000 (J26023-1)	Engine stand assembly Engine stand Base 
① KV10107110 (–) ② KV10102500 (J26097)	Engine attachment assembly Engine attachment Sub attachment 
① ST11081000 (J25618-3) ② KV10107700 (J25618-2)	Reamer [12.2 mm (0.480 in) dia.] [7 mm (0.28 in) dia.] 
KV10107500 (–)	Valve lip seal drift 
KV101072S0 (–) ① KV10107210 (–) ② KV10107220 (–)	Valve spring compressor Handle Head 

Tool number (Kent-Moore No.)	Tool name
KV10107400 (–) ① KV10107310 (–) ② ST13040020 (–) ③ ST13040030 (–) ④ KV10107320 (–) ⑤ ST13040050 (–)	Piston pin press stand Center shaft Stand Spring Cap Drift 
KV30101000 (–)	Clutch aligning bar 
KV10107900 (–)	Valve lip seal puller 

CD17

Tool number (Kent-Moore No.)	Tool name
ST0501S000 (J26023) ① ST05011000 (J26023-2) ② ST05012000 (J26023-1)	Engine stand assembly Engine stand Base 
① KV10108101 (–) ② KV10106500 (–) or ③ KV10102500 (J26097)	Engine attachment Engine stand shaft 
KV101089S0 (–) ① KV10108910 (–) ② KV10108920 (–)	Valve lifter Body Head 
KV10107900 (–)	Valve lip seal puller 
KV101056S0 (–) ① KV10105610 (–) ② KV10105630 (–)	Engine stopper 

Tool number (Kent-Moore No.)	Tool name	
KV101092S0 (–) ① KV10109210 (–) ② KV10109220 (–)	Valve spring compressor Compressor Adapter	
KV10109300 (–)	Pulley holder	
ED19600000 (–)	Compression gauge set	
KV11100300 (–)	Nozzle holder socket	

ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

CONTENTS

E15 & E16

ENGINE LUBRICATION SYSTEM ..... LC- 2
- Lubrication circuit ..... LC- 2
- Oil pump ..... LC- 3
- Oil filter ..... LC- 4

COOLING SYSTEM ..... LC- 5
- Cooling circuit ..... LC- 5
- Water pump ..... LC- 6
- Thermostat ..... LC- 7
- Radiator and cooling fan ..... LC- 8

CD17

LUBRICATION SYSTEM LC-11
- Lubrication circuit LC-11
- Oil pump LC-12
- Oil pressure regulator valve LC-13
- Oil pressure relief valve LC-13
- Oil cooler LC-13

COOLING SYSTEM LC-15
- Cooling circuit LC-15
- Radiator and electric cooling fan LC-16
- Thermostat LC-18
- Water pump LC-19

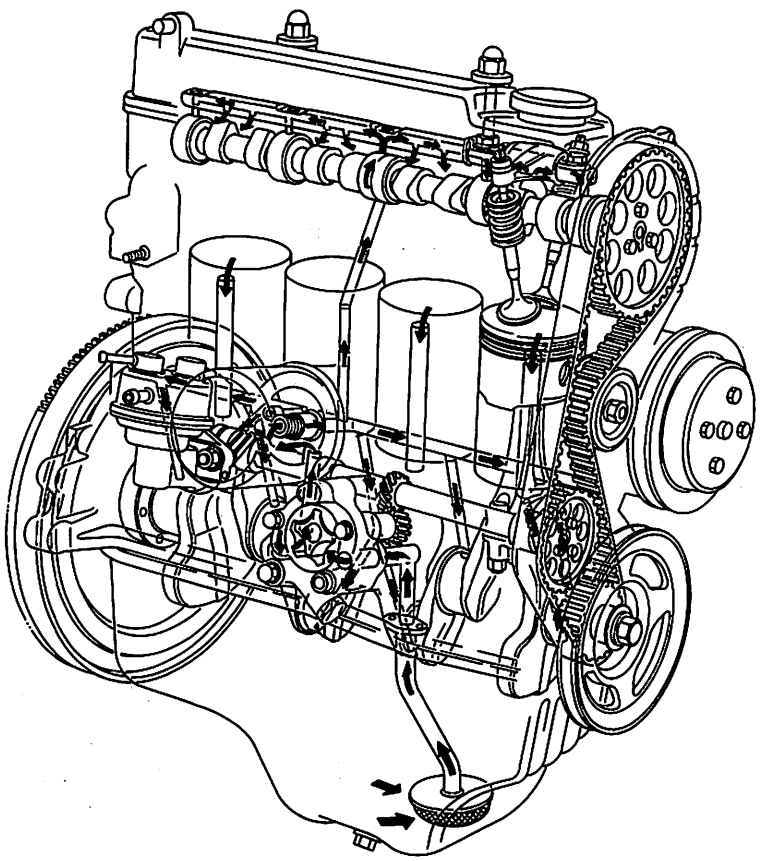
E15, E16 & CD17

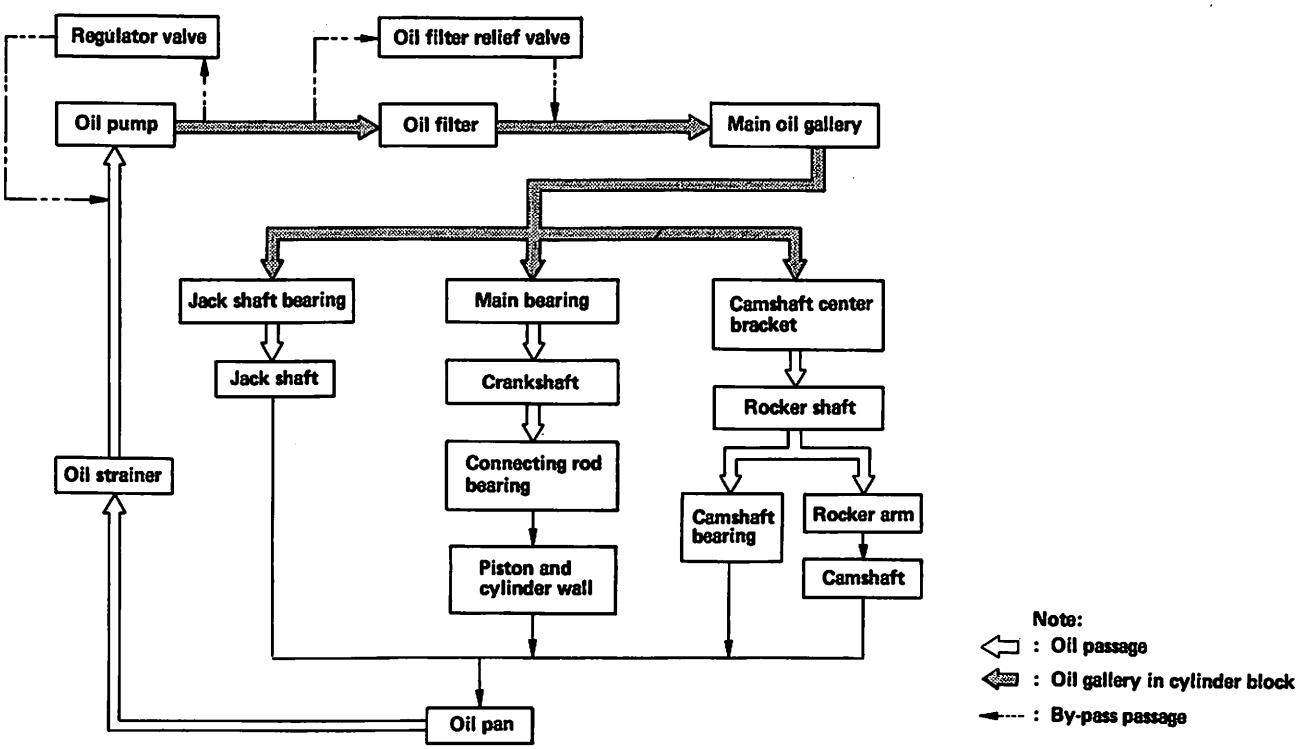
SERVICE DATA AND SPECIFICATIONS (S.D.S.) LC-20
- Engine lubrication system LC-20
- Engine cooling system LC-20
- Inspection and adjustment LC-21
- Tightening torque LC-21

SPECIAL SERVICE TOOLS LC-22

ENGINE LUBRICATION SYSTEM

LUBRICATION CIRCUIT



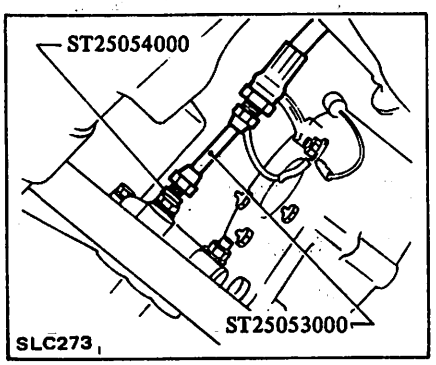


SLC265

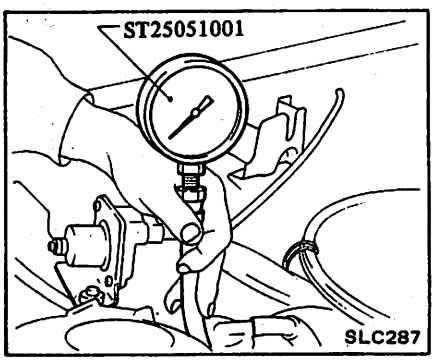
OIL PUMP

OIL PRESSURE CHECK

1. Warm up engine.
2. Remove oil pressure switch.
3. Install pressure gauge and gauge adapter to oil pressure switch hole.



4. Start engine and check oil pressure.



Engine rpm	Discharge pressure kPa (kg/cm², psi)
1,050	196 (2, 28)
1,700	294 (3, 43)
5,150	392 (4, 57)

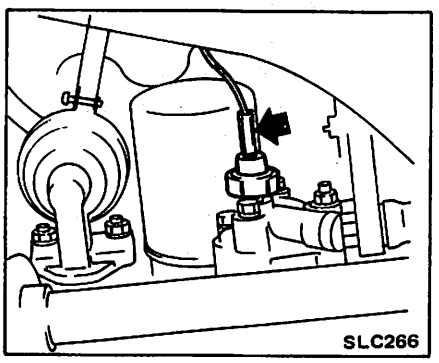
The above table shows data tested when SEA 20W-20 oil is used and oil temperature is between 73 and 83°C (163 and 181°F). Slight difference will be found because of oil grade or oil temperature. If difference is extreme, check oil passage, oil pump, and for oil leaks.

5. Remove pressure gauge and gauge adapter.
6. Install oil pressure switch.

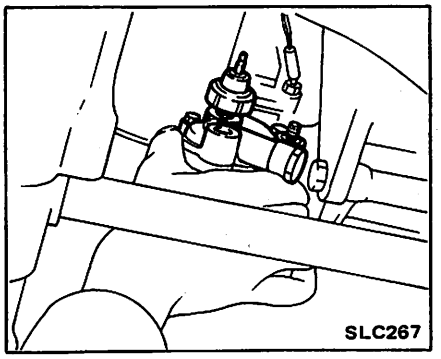
If oil pressure is outside the specifications, check pump for clogged oil passage, leaks, etc.

REMOVAL

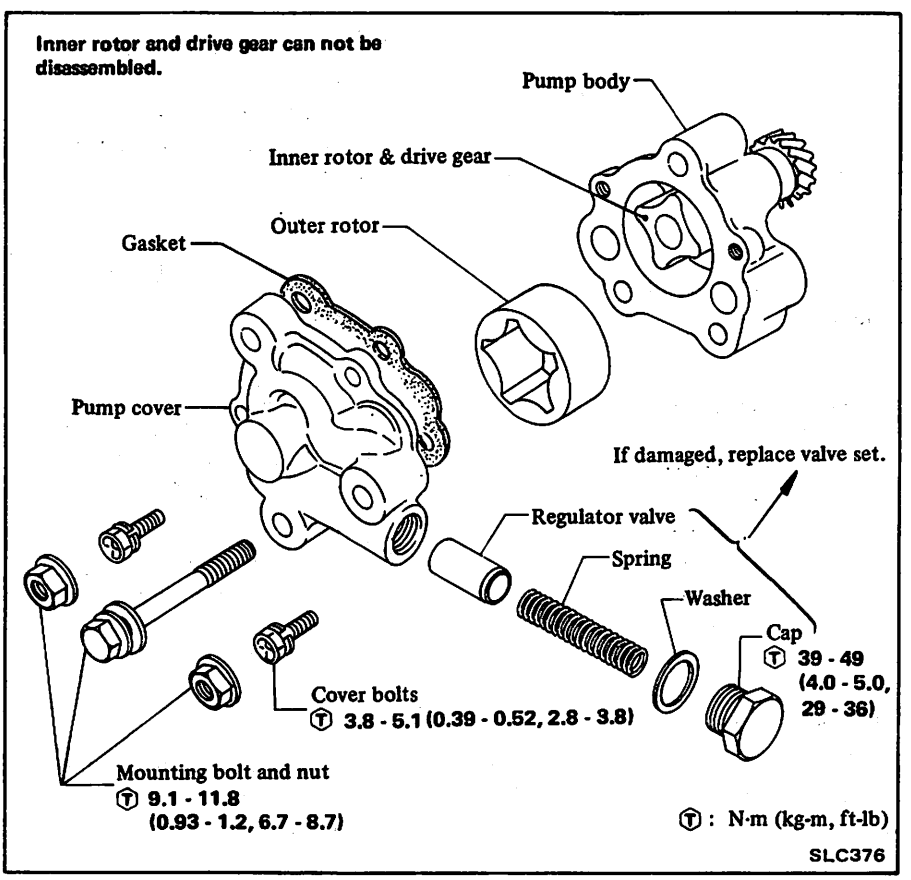
1. Loosen alternator lower bolts.
2. Remove alternator belt and adjusting bar bolt. Move alternator aside so there is ample room to work.
3. Disconnect oil pressure gauge harness.



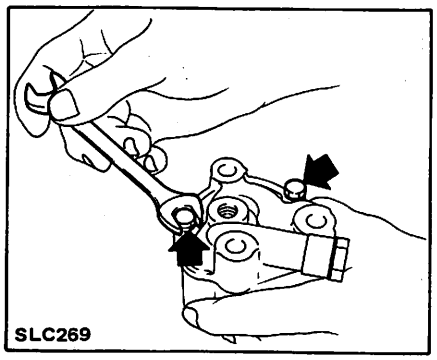
4. Remove oil pump assembly.



DISASSEMBLY AND ASSEMBLY



1. Remove pump cover bolts.

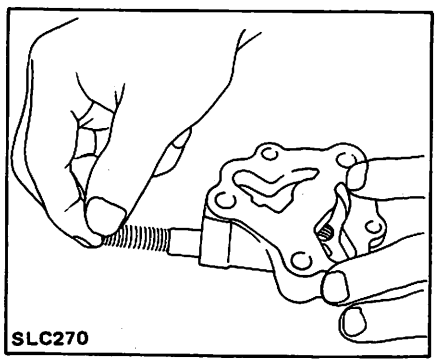


2. Take out outer rotor.

Inner rotor and drive gear cannot be disassembled.

3. Remove regulator valve.

When placing oil pump in a vise, use extreme care not to distort pump body and cover in the jaws.



4. Assemble oil pump in the reverse order of removal.

Use new gasket.

Ⓣ : **Regulator valve cap nut:**
39 - 49 N·m
(4.0 - 5.0 kg-m,
29 - 36 ft-lb)
Oil pump cover bolt:
3.8 - 5.1 N·m
(0.39 - 0.52 kg-m,
2.8 - 3.8 ft-lb)

INSPECTION

1. Inspect pump body and cover for cracks or excessive wear.
2. Inspect pump rotors for excessive wear.
3. Check inner rotor shaft for looseness in pump body.

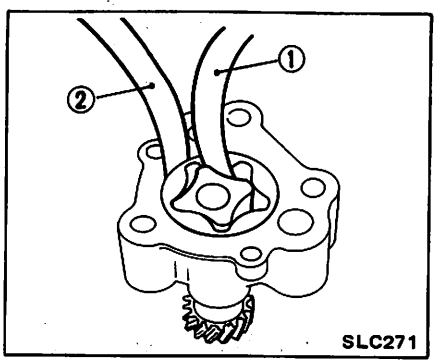
If pump rotors or body are damaged or worn, replacement of the entire oil pump assembly is necessary.

4. Check oil pressure regulator valve sliding surface and vlave spring.

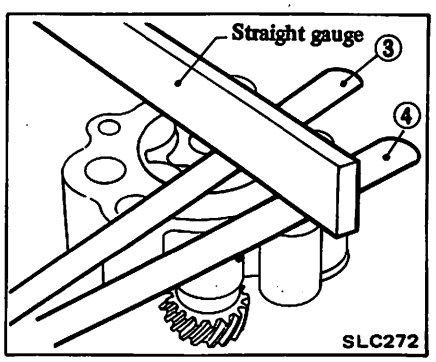
If damaged, replace valve set.

5. Using a feeler gauge, check the following clearances.

Rotor tip clearance ①:
Less than
0.12 mm (0.0047 in)
Outer rotor to body clearance ②:
0.15 - 0.21 mm
(0.0059 - 0.0083 in)



Rotor to straight edge ③:
Less than
0.05 mm (0.0020 in)
Oil pump body to straight edge ④:
Less than
0.02 mm (0.0008 in)



INSTALLATION

1. Apply engine oil to pump drive gear and shaft.
2. Charge engine oil into pump and turn pump drive gear several times.
3. Using a new gasket, install oil pump assembly.

Ⓣ : **Oil pump mounting bolt & nuts**
9.1 - 11.8 N·m
(0.93 - 1.2 kg-m,
6.7 - 8.7 ft-lb)

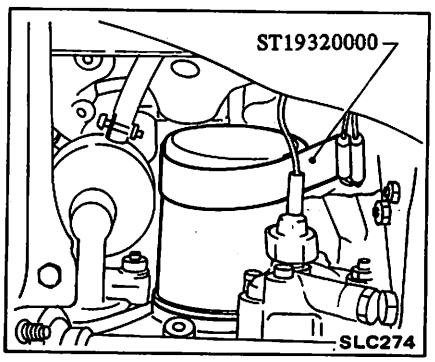
4. Refill engine with oil.

After installation, run engine for a few minutes, and check for leaks.

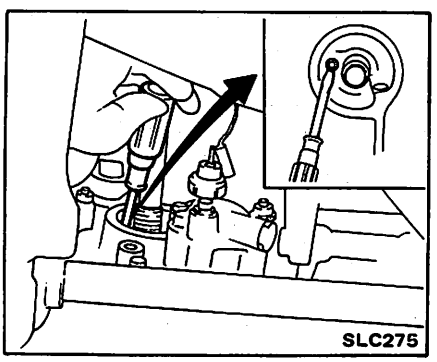
OIL FILTER

REPLACEMENT

1. Remove oil filter.



2. Check oil pressure relief valve for a cracked or broken valve. If necessary remove valve by prying it out with a screwdriver. Install a new valve by tapping it in place.



3. Install oil filter.

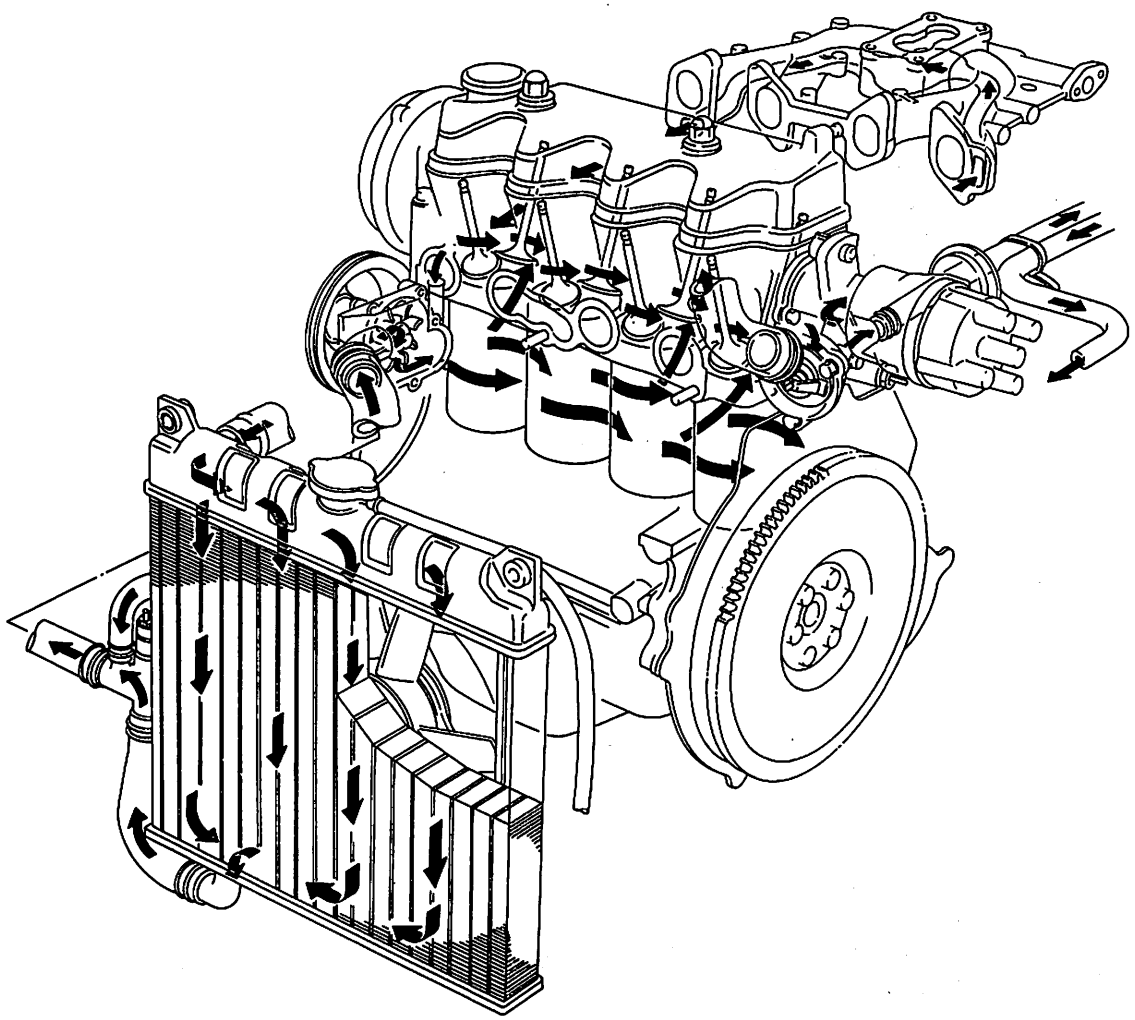
Hand-tighten only.
Do not use a wrench to tighten the filter.

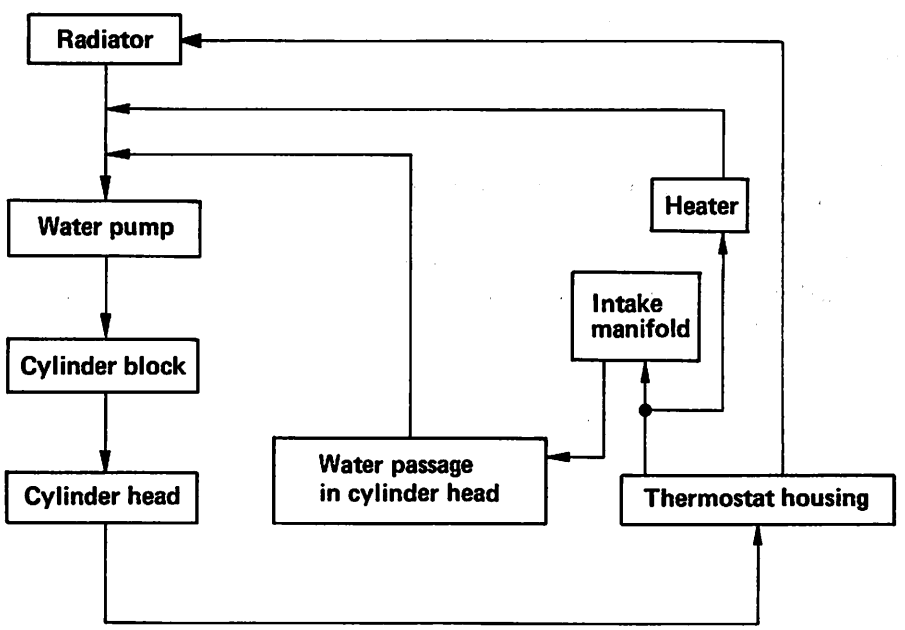
4. Refill with the specified quantity of engine oil.

After installation, run engine for a few minutes, and check for leaks.

COOLING SYSTEM

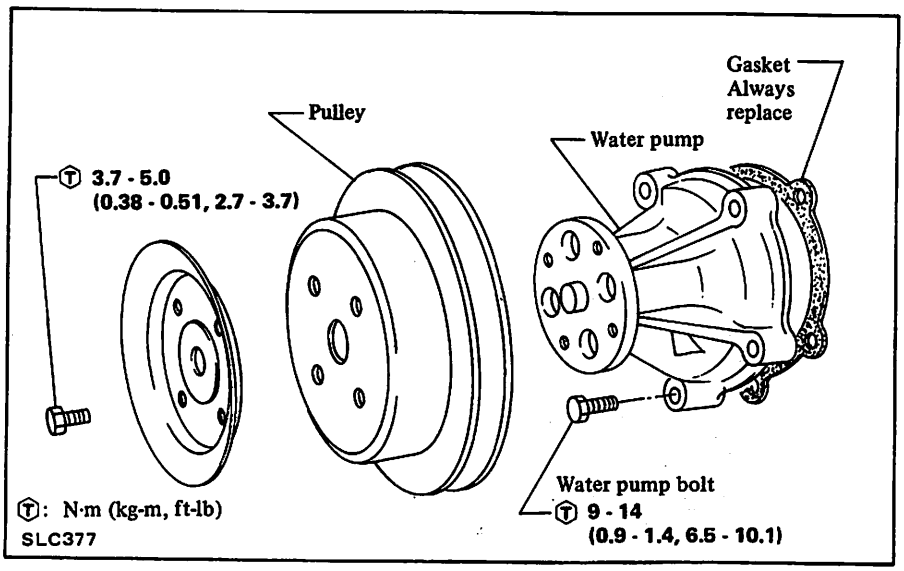
COOLING CIRCUIT





SLC276

WATER PUMP



REMOVAL

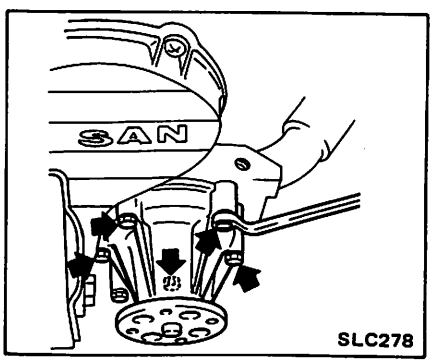
1. Open radiator drain cock and radiator cap, and drain coolant.

WARNING:
To avoid the danger of being scalded, never attempt to drain the coolant when the engine is hot.

2. Remove power steering drive belt.
3. Remove power steering oil pump.

Do not drain power steering oil.

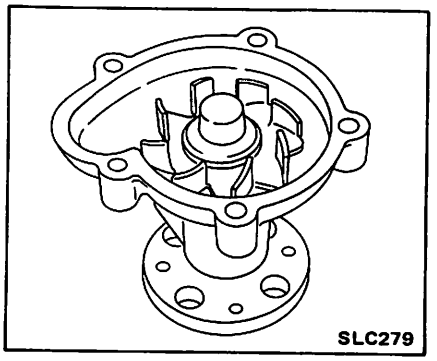
4. Remove water pump (alternator) drive belt.
(1) Loosen alternator securing bolts.
(2) Move alternator toward the engine.
5. Remove water pump pulley.
6. Remove water pump with gasket.



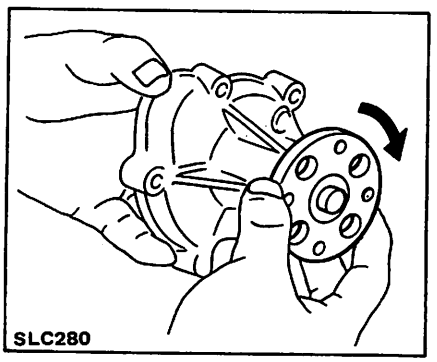
INSPECTION

The water pump cannot be disassembled and should be replaced as a unit.

1. Inspect water pump body and vane for rust or corrosion.



2. Inspect water pump bearing.
Check for excessive end play or rough operation.



INSTALLATION

1. Install water pump, alternator, power steering oil pump and drive belts in the reverse order of removal.

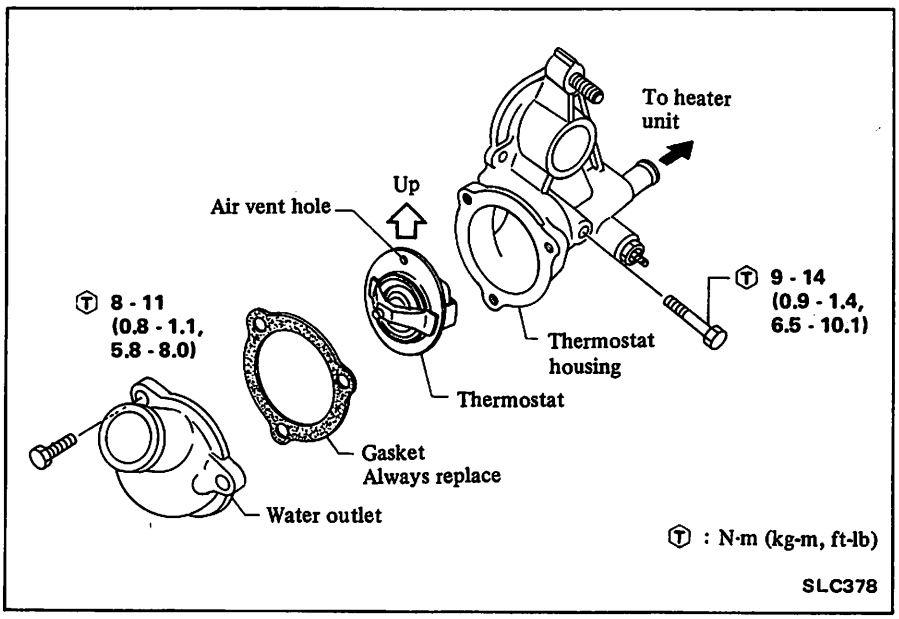
Always use new gasket.

: Water pump bolt
9 - 14 N·m
(0.9 - 1.4 kg-m,
6.5 - 10.1 ft-lb)

2. Adjust drive belt deflection.
Refer to Section MA for drive belt deflection.
3. Fill radiator with coolant.

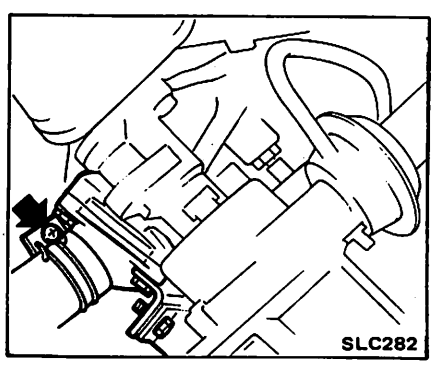
After installation, run engine for a few minutes, and check for leaks.

THERMOSTAT

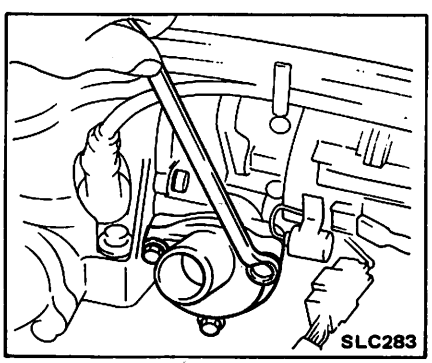


REMOVAL

1. Drain coolant so that its level is below the thermostat housing.
2. Disconnect radiator upper hose on water outlet side.



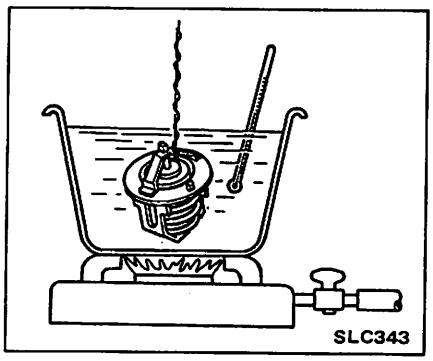
3. Remove E.A.I. tube clamp bolts.
4. Remove water outlet, then remove thermostat with gasket.



INSPECTION

Inspect thermostat for the following and replace if necessary.

1. Valve seating condition at ordinary temperature. It should seat tightly.
2. Valve opening temperature and maximum valve lift. (Refer to S.D.S.)

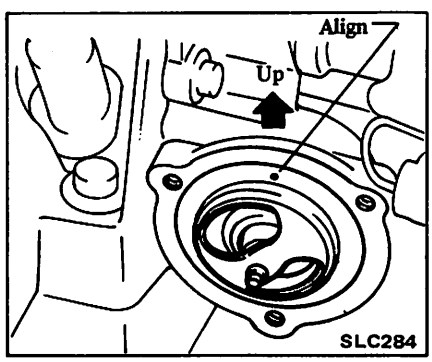


3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

It is necessary to check the new thermostat before installing it.

INSTALLATION

1. Install thermostat to thermostat housing with jiggle valve or air vent facing upward.



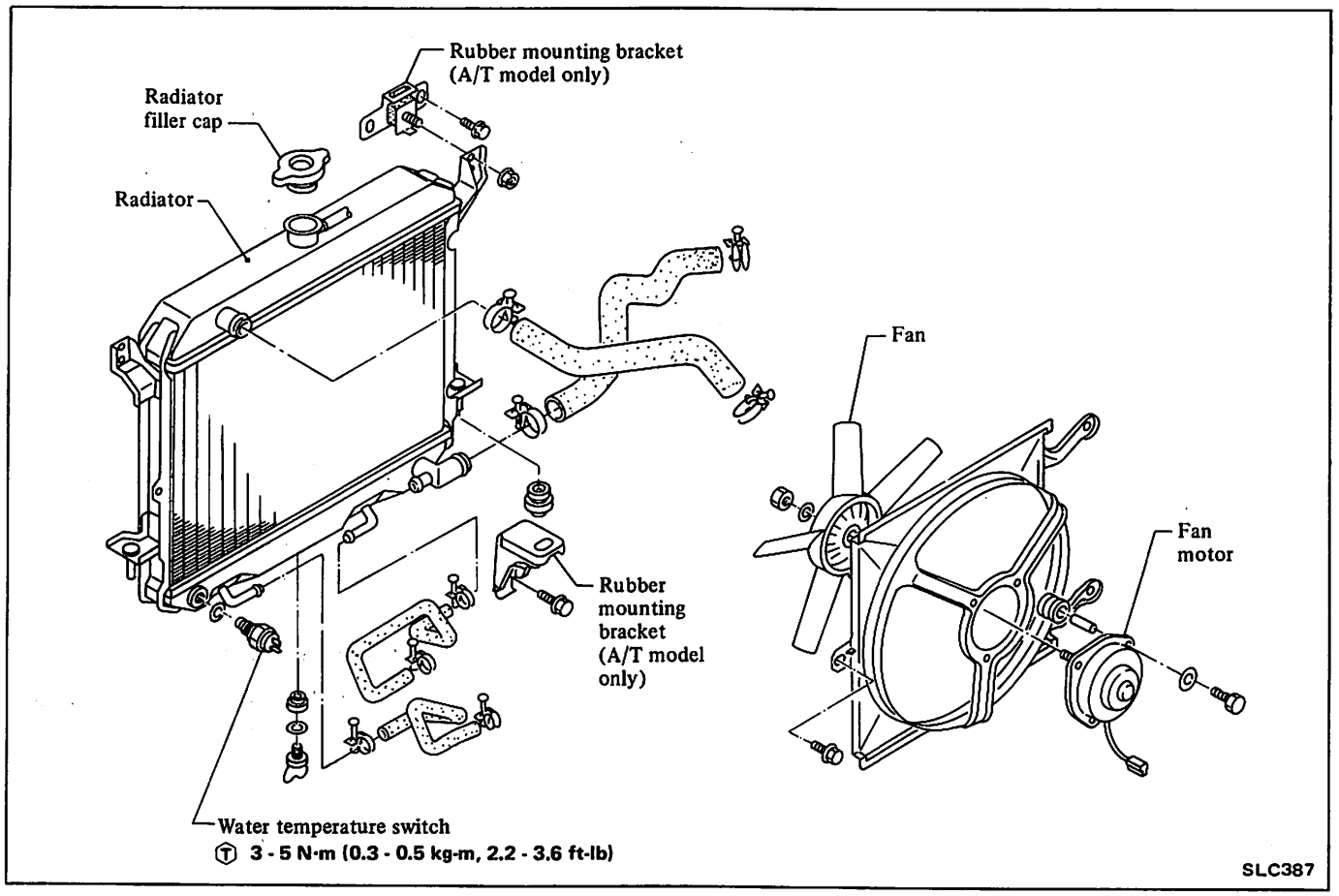
2. Install water outlet together with new gasket.

Ⓣ : Attaching bolt
8 - 11 N·m
(0.8 - 1.1 kg-m,
5.8 - 8.0 ft-lb)

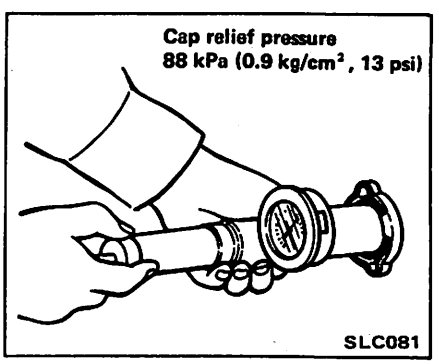
3. Connect radiator upper hose.
4. Fill radiator with coolant.

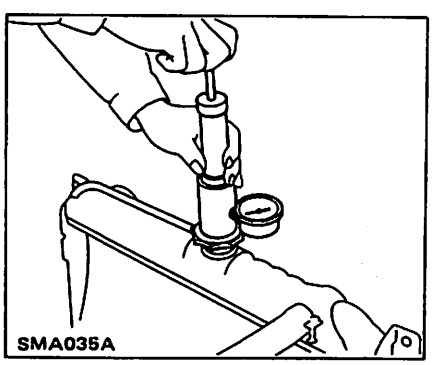
After installation, run engine for a few minutes, and check for leaks.

RADIATOR AND COOLING FAN



WARNING:
Never remove the radiator cap when the engine is hot; serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap and carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape and then turn the cap all the way off.





INSPECTION

Checking radiator cap

Using cap tester, check the radiator cap relief pressure.

If the pressure gauge drops rapidly and excessively, replace the radiator cap.

Checking cooling system for leaks

Attach pressure tester. Then pump the tester to the specified pressure.

Check for drop in pressure.

If the pressure drops, check for leaks from hoses, radiator, or water pump.

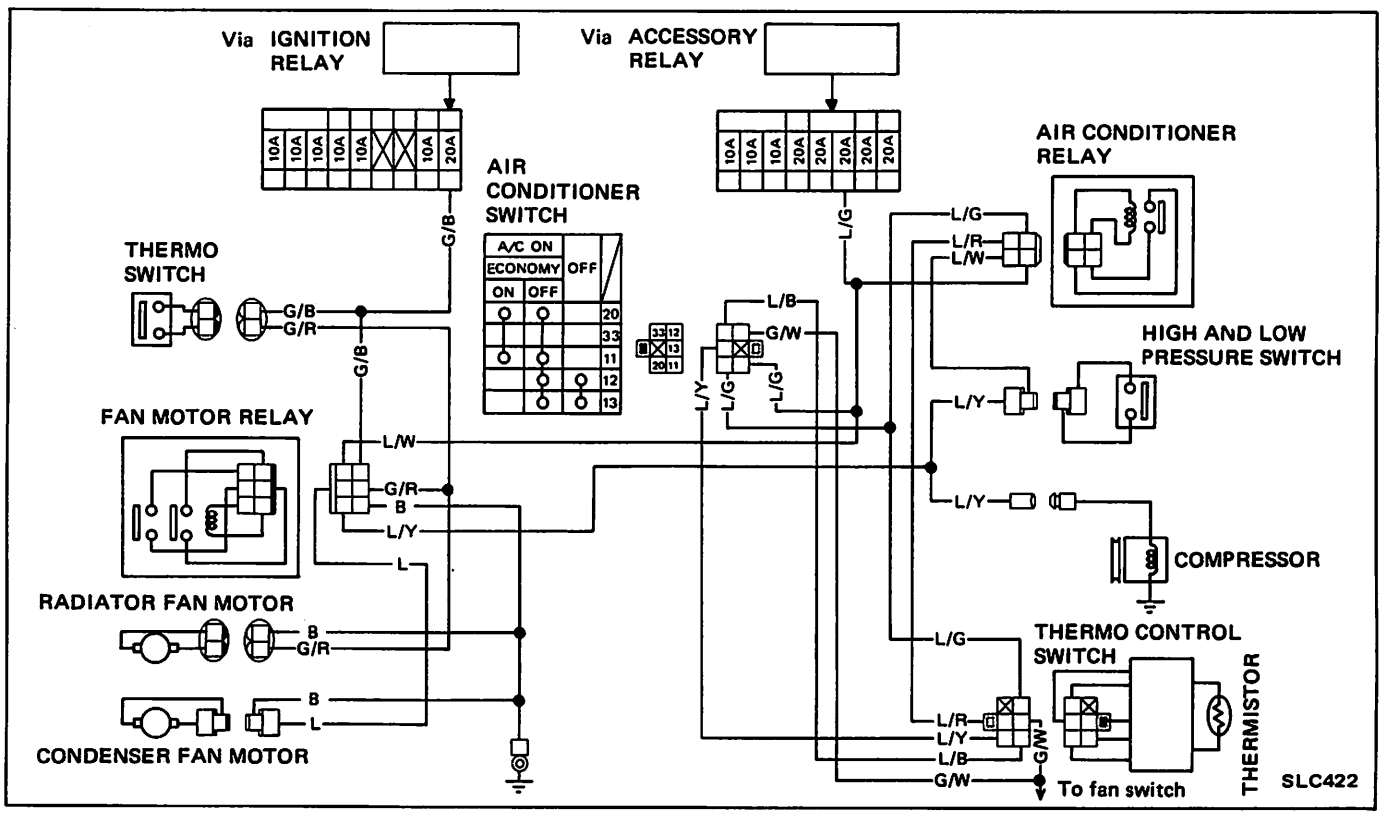
If no external leaks are found, check heater core, block and head.

Operation

Water temperature °C (°F)	Air conditioner compressor	Fan motor
Below 90 (194)	Does not operate	Does not operate
	Operates	Operates
Above 90 (194)	Does not operate	
	Operates	

On models not equipped with air conditioner, a fan motor does not operate below a water temperature of 90°C (194°F).

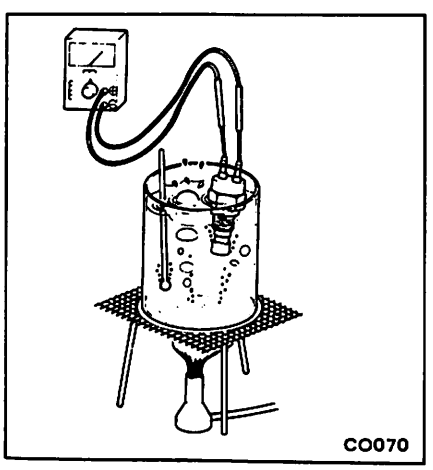
ELECTRIC CIRCUIT



INSPECTION

1. Disconnect fan motor connector, thermo switch, and high and low pressure switch. Then, check voltage between their harness terminals to see if it is 12 volts.
2. If it is not, check switch and relay harnesses for loose connections. If necessary, retighten loose connections.
3. If connections are not tight and secure, check condition of the following switches and relay.

- Thermo switch
  Check water temperature sensing switch for proper operation. If switch does not operate properly at specified temperature, replace it.



- High and low pressure switch
- Air conditioner switch
- Fan switch

} Refer to HA section.

- Motor relay
- Air conditioner relay

} Refer to EL section.

REMOVAL AND INSTALLATION

1. Open radiator drain cock and allow to drain coolant into a suitable container.

WARNING:
To avoid the danger of being scalded, never attempt to drain the coolant when the engine is hot.

2. Disconnect radiator upper hose and lower hose.
3. Remove lower hose adapter.

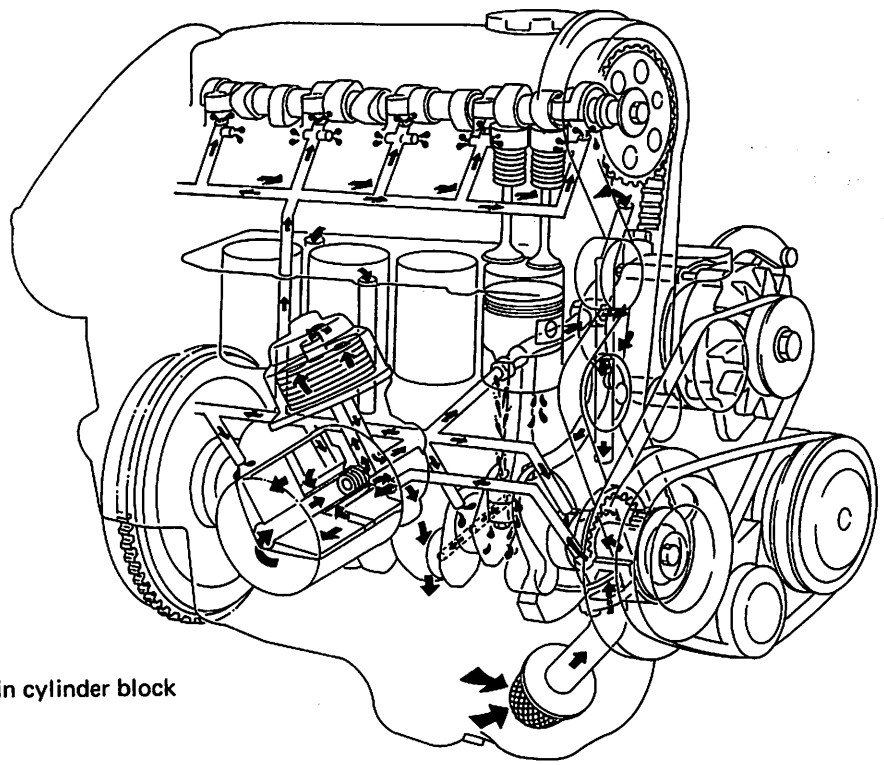
On a car with automatic transaxle, disconnect cooler inlet and outlet hoses from radiator.

4. Disconnect fan motor wire and water temperature switch wire and remove radiator.
5. Install radiator in the reverse order of removal.
6. Fill radiator with the specified quantity of coolant.

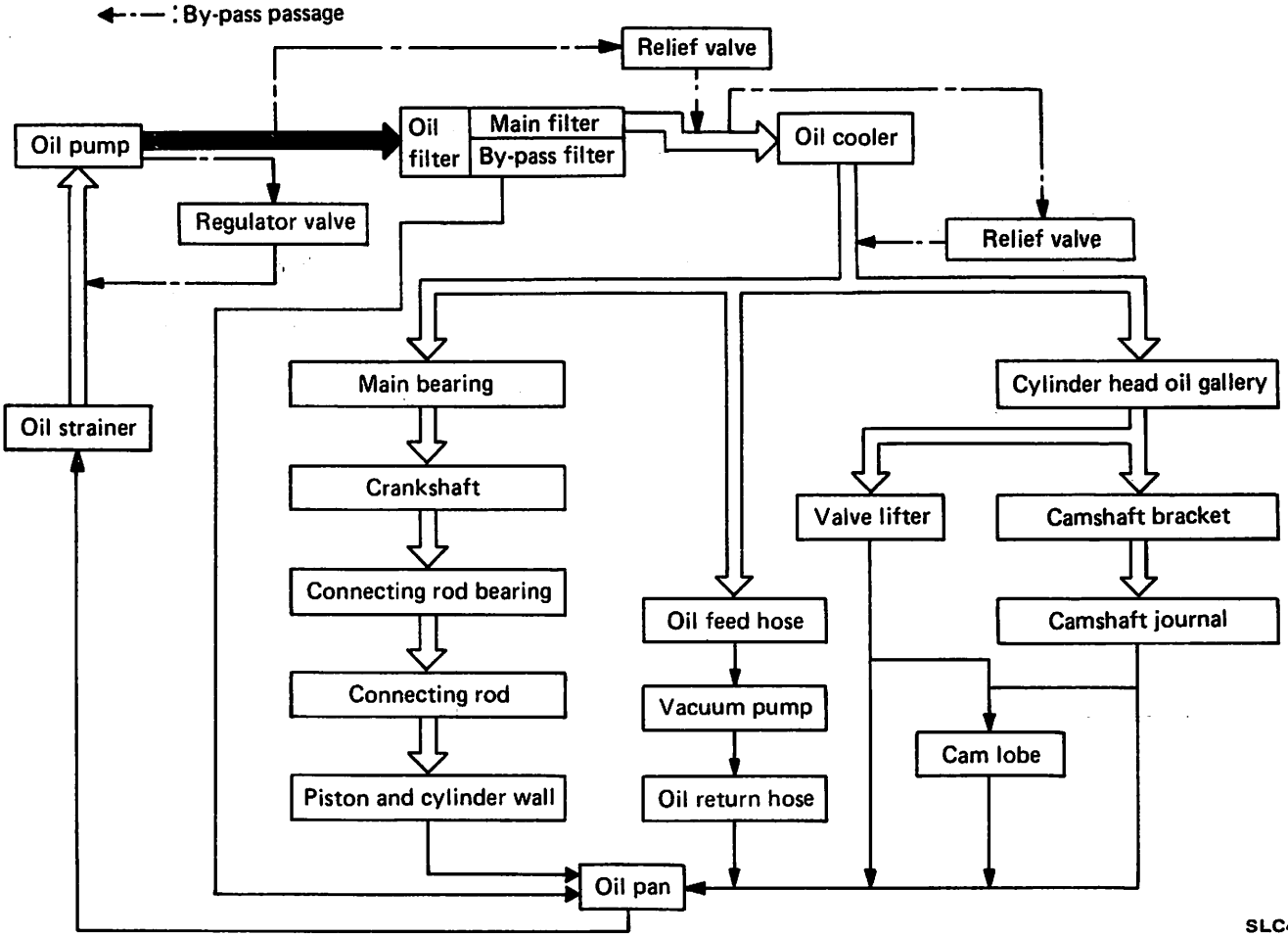
After installation, run engine for a few minutes, and check for leaks.

LUBRICATION SYSTEM

LUBRICATION CIRCUIT



Note: : Oil gallery in cylinder block
: Oil passage
: By-pass passage



SLC410

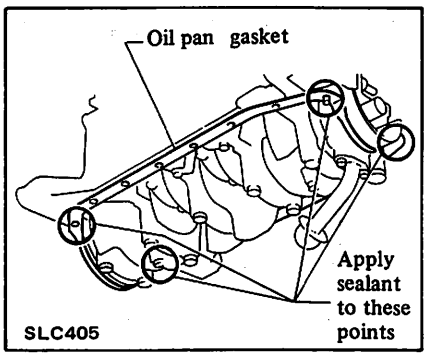
OIL PUMP

REMOVAL AND INSTALLATION

1. Remove valve timing belt.
Refer to section MA for TIMING BELT REPLACEMENT.
2. Drain oil and remove oil pan.
3. Remove oil pump.

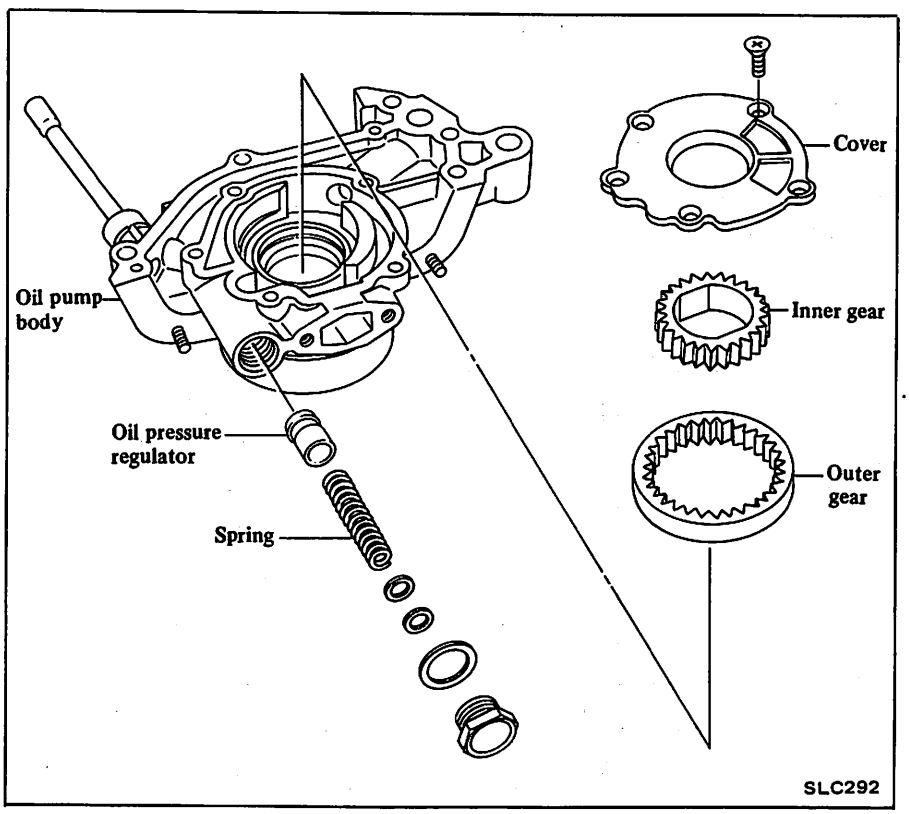
To prevent oil seal from damaging, remove crankshaft key.

4. Install oil pump in the reverse order of removal, noting the following.
(1) Align locating notches and install oil pump.
(2) Apply sealant to new oil pan gasket as follows. Do not apply too much sealant.
(3) Never reuse oil pump gasket.



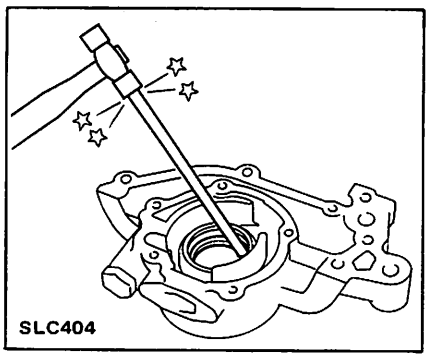
Ⓣ : **Oil pump to cylinder block**
12 - 16 N·m
(1.2 - 1.6 kg-m, 9 - 12 ft-lb)
Oil pan
5 - 7 N·m
(0.5 - 0.7 kg-m, 3.6 - 5.1 ft-lb)

DISASSEMBLY AND ASSEMBLY

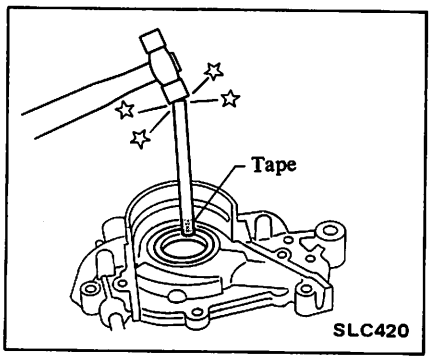


OIL SEAL REPLACEMENT

1. Remove oil seal.



2. Coat with engine oil and install the seal.

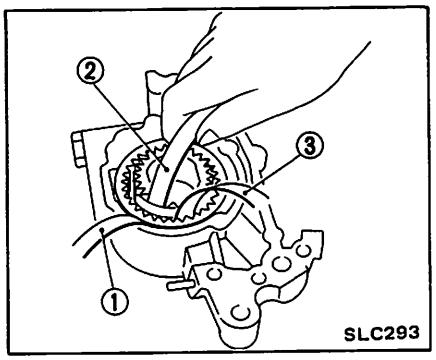


INSPECTION

1. Inspect the following for wear or damage.
- Pump body and cover

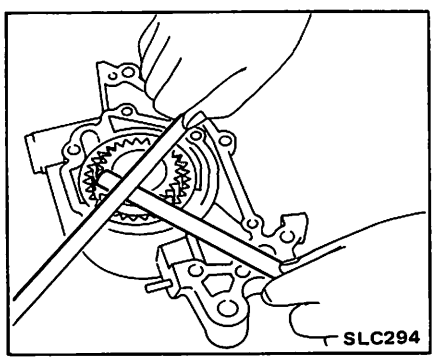
2. Using a feeler gauge, check the following clearances.

Body to outer gear clearance ① :
0.11 - 0.2 mm
(0.0043 - 0.0079 in)
Inner gear to crescent clearance ② :
0.12 - 0.23 mm
(0.0047 - 0.0091 in)
Outer gear to crescent clearance ③ :
0.21 - 0.32 mm
(0.0083 - 0.0126 in)



3. Using a feeler gauge and a straight edge, check the following gap.

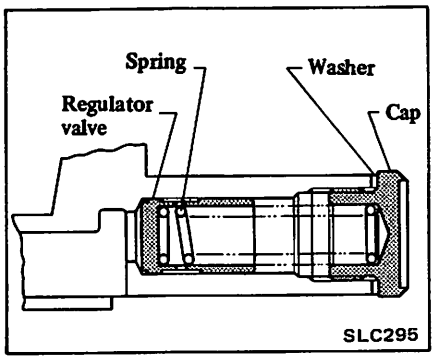
Housing to gear clearance:
0.05 - 0.10 mm
(0.0020 - 0.0039 in)



OIL PRESSURE REGULATOR VALVE

INSPECTION

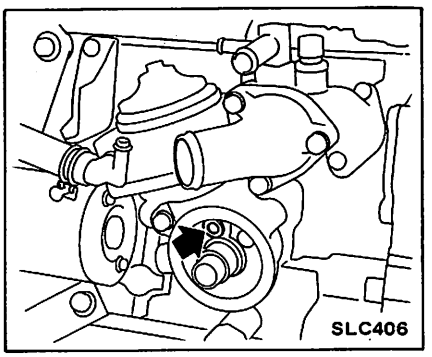
Check valve sliding surface and valve spring, and replace entire valve assembly if necessary.



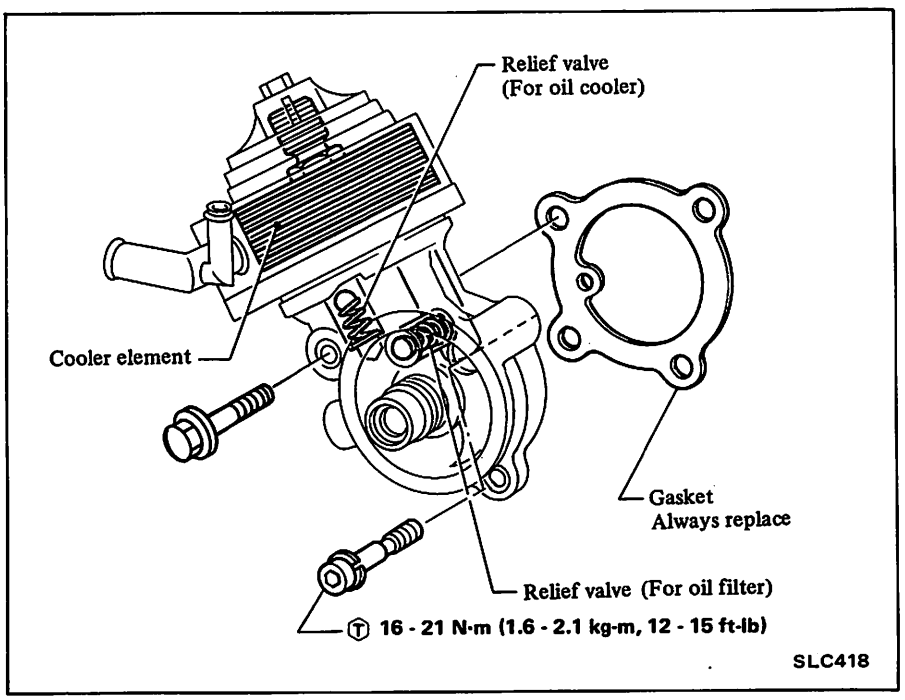
OIL PRESSURE RELIEF VALVE

INSPECTION

With oil filter removed, check the condition of the valve unit. Inspect for a cracked or broken valve.
If replacement is necessary, remove valve by prying it out with a screwdriver. Install a new valve in place by tapping it.

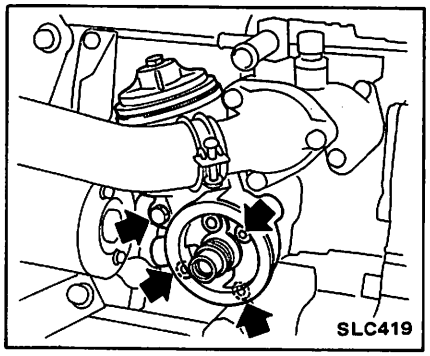


OIL COOLER

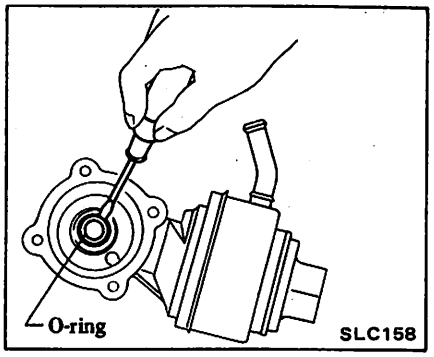


REMOVAL

1. Drain coolant.
2. Remove coolant hoses.
3. Remove oil filter.
4. Remove oil cooler attaching bolts.



5. Remove O-ring from bracket.



INSTALLATION

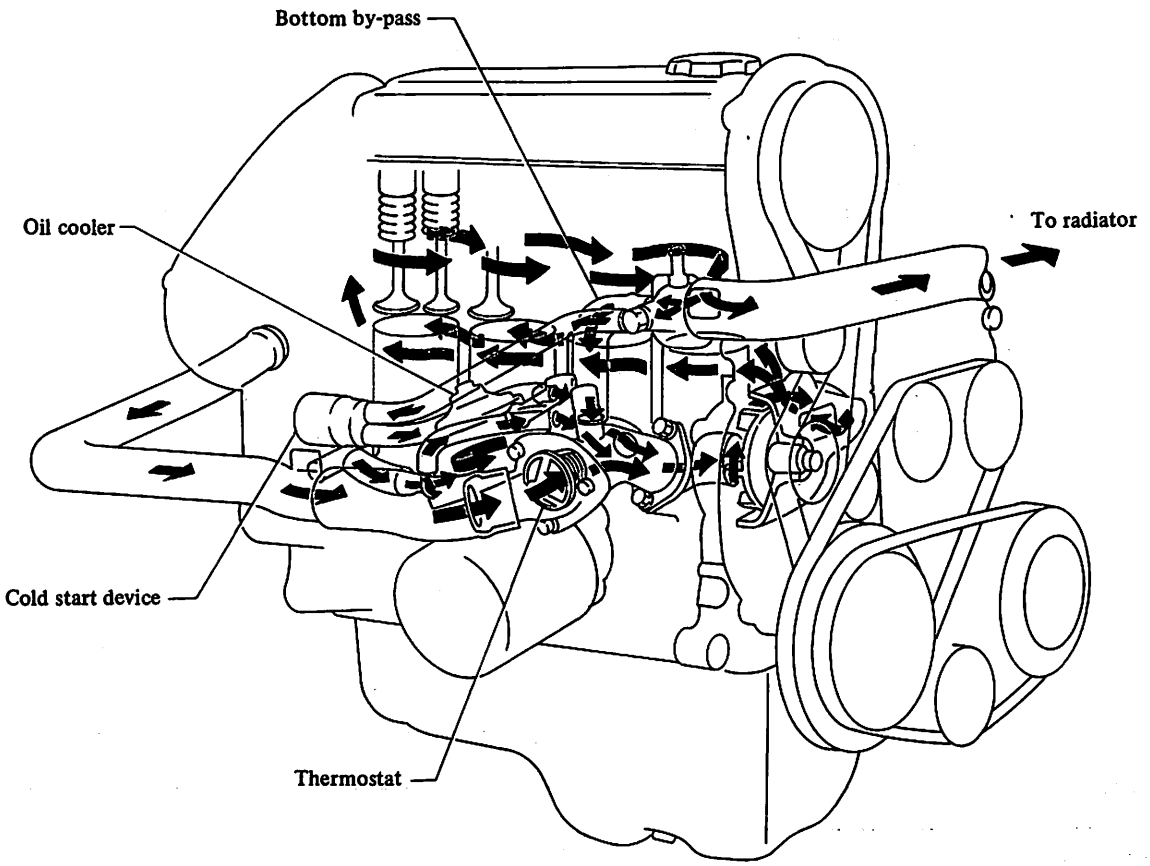
Install oil cooler in the reverse order of removal.

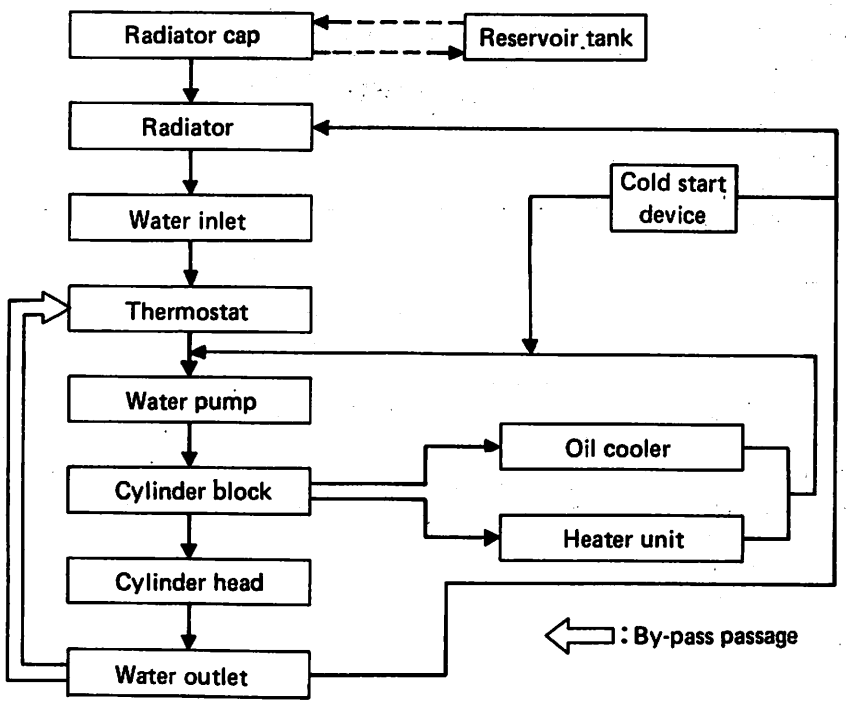
Ⓣ : **Oil cooler fixing bolt**
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

a. **Install oil filter referring to section MA.**
b. **After installing, run engine for a few minutes, and check for leaks.**

COOLING SYSTEM

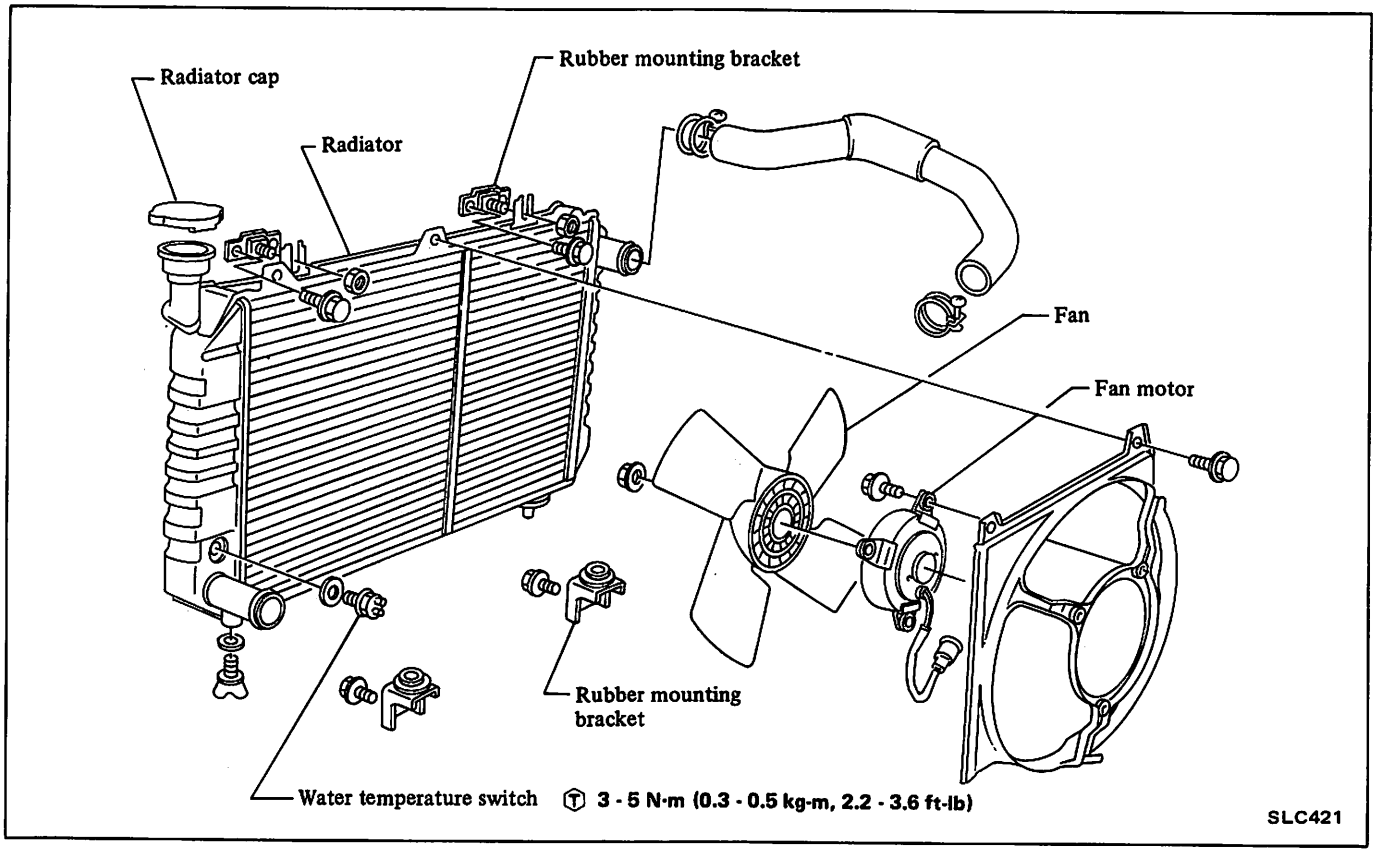
COOLING CIRCUIT





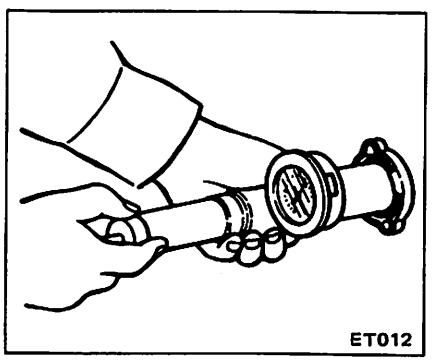
SLC407

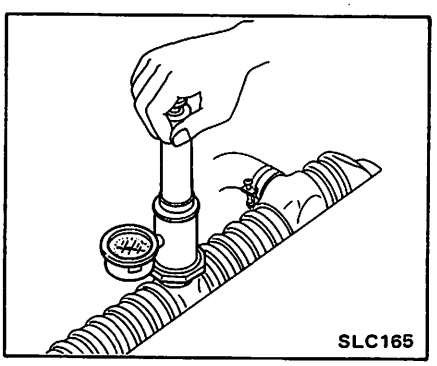
RADIATOR AND ELECTRIC COOLING FAN



RADIATOR

WARNING:
To avoid serious personal injury, never remove radiator cap quickly when engine is hot. Sudden release of cooling system pressure is very dangerous.
If it is necessary to remove radiator cap when radiator is hot, turn cap slowly counterclockwise to the first stop. After all pressure in the cooling system is released, turn cap passing the stop and remove it.





Inspection

Inspect radiator cap and water leakage using cap tester.

1. Inspection of radiator cap.

First, check rubber seal on cap for tears, cracks or deterioration after cleaning it. Then, install radiator cap on a tester. If cap does not hold or will not release at the specified pressure, replace cap.

Cap relief pressure:
88 kPa (0.9 kg/cm^2, 13 psi)

2. Inspection of water leakage.

With radiator cap removed, apply test pressure to radiator on the vehicle.
If leakage is detected, repair or replace radiator.

Leakage test pressure:
157 kPa (1.6 kg/cm^2, 23 psi)

ELECTRICAL COOLING FAN

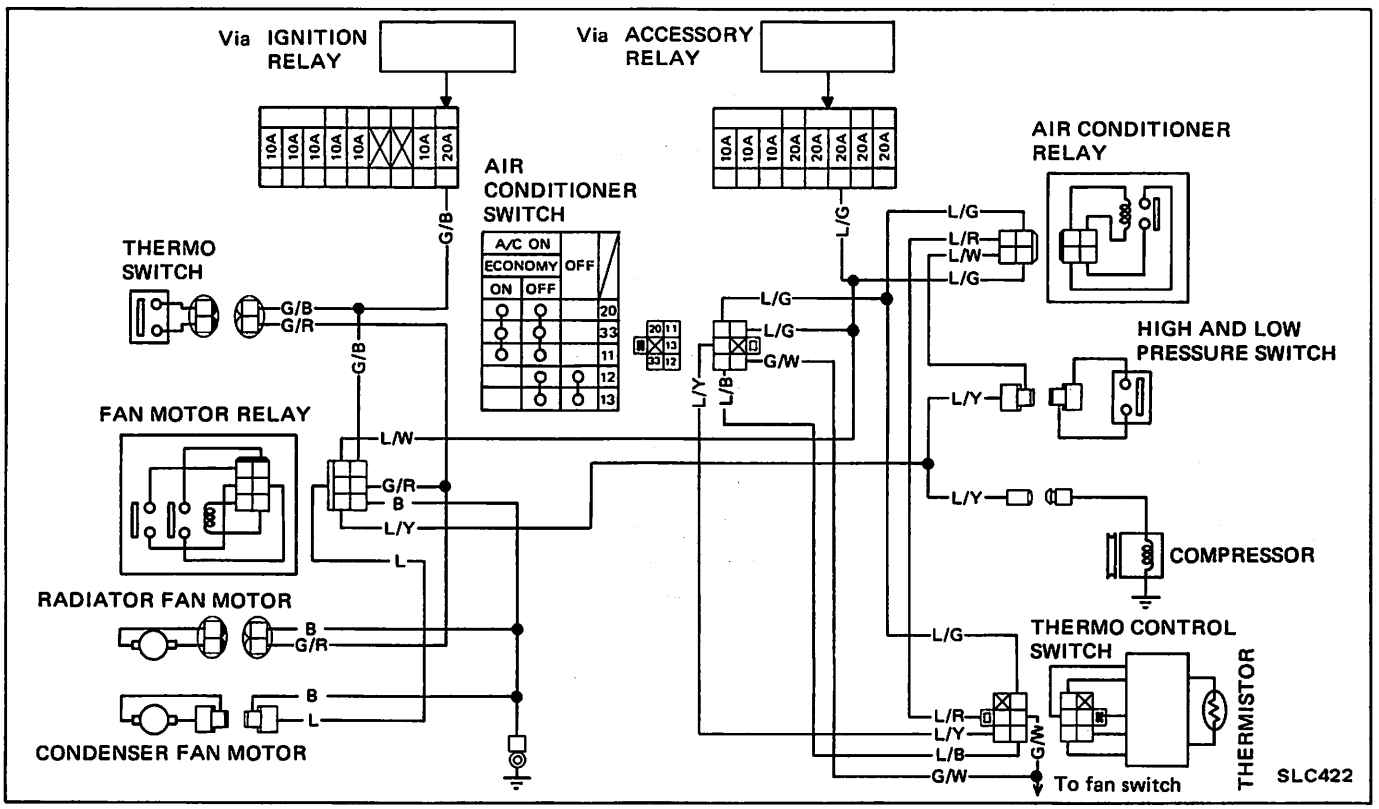
The cooling fan is driven by an electric fan motor which monitors the temperature of coolant and the operating of air conditioner compressor.

Operation

Water temperature °C (°F)	Air conditioner compressor	Fan motor
Below 90 (194)	Does not operate	Does not operate
	Operates	Operates
Above 90 (194)	Does not operate	
	Operates	

On models not equipped with air conditioner, a fan motor does not operate below a water temperature of 90°C (194°F).

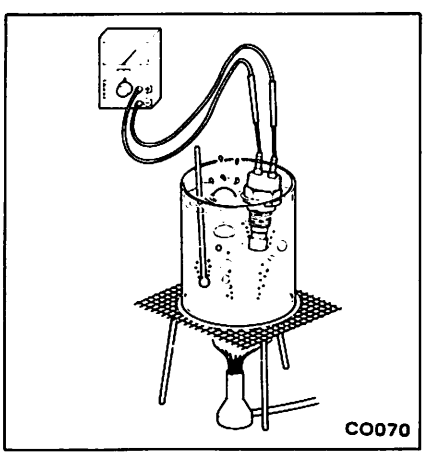
ELECTRIC CIRCUIT



INSPECTION

1. Disconnect fan motor connector, thermo switch, and high and low pressure switch. Then, check voltage between their harness terminals to see if it is 12 volts.
2. If it is not, check switch and relay harnesses for loose connections. If necessary, retighten loose connections.
3. If connections are not tight and secure, check condition of the following switches and relay.

- Thermo switch
  Check water temperature sensing switch for proper operation. If switch does not operate properly at specified temperature, replace it.



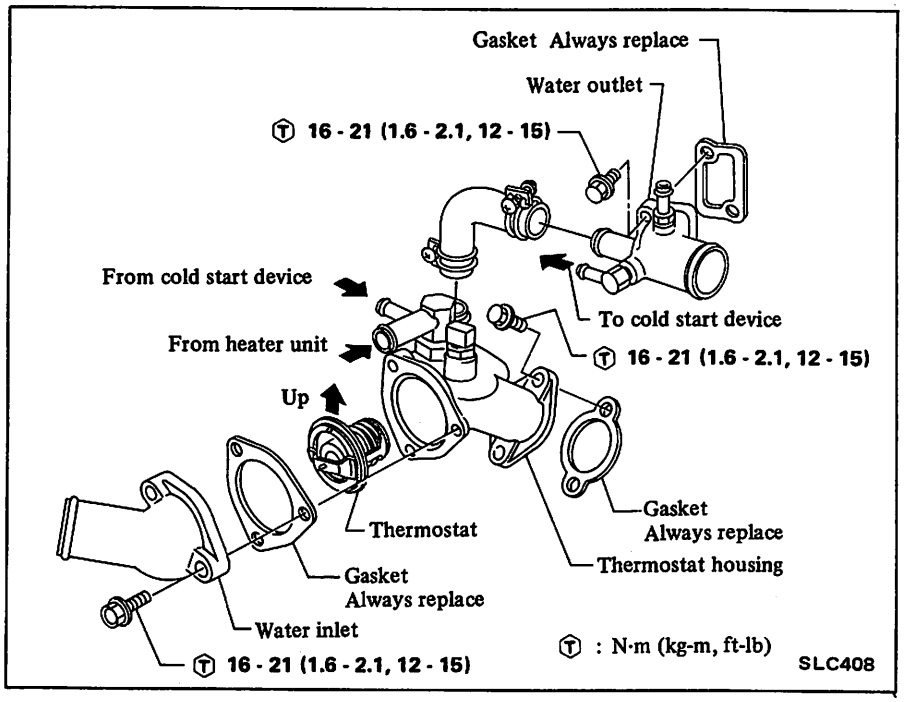
- High and low pressure switch
- Air conditioner switch
- Fan switch

Refer to HA section.

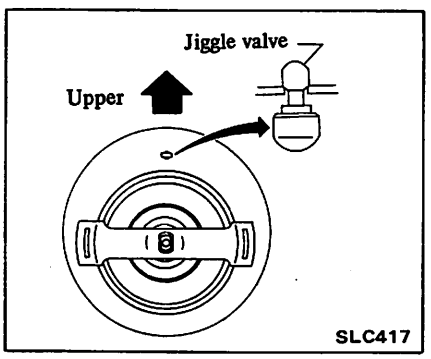
- Motor relay
- Air conditioner relay

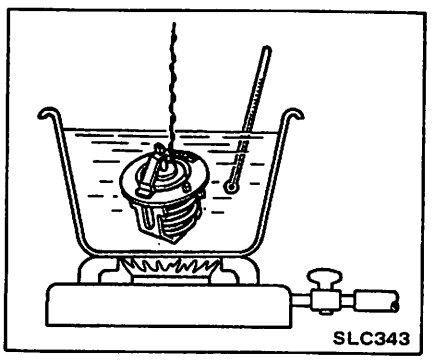
Refer to EL section.

THERMOSTAT



Ensure that thermostat is positioned with jiggle valve facing upward when it is installed.





3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

INSPECTION

Inspect thermostat for the following and replace if necessary.

1. Valve seating condition at ordinary temperature. It should seat tightly.
2. Valve opening temperature and maximum valve lift. (Refer to S.D.S.)

WATER PUMP

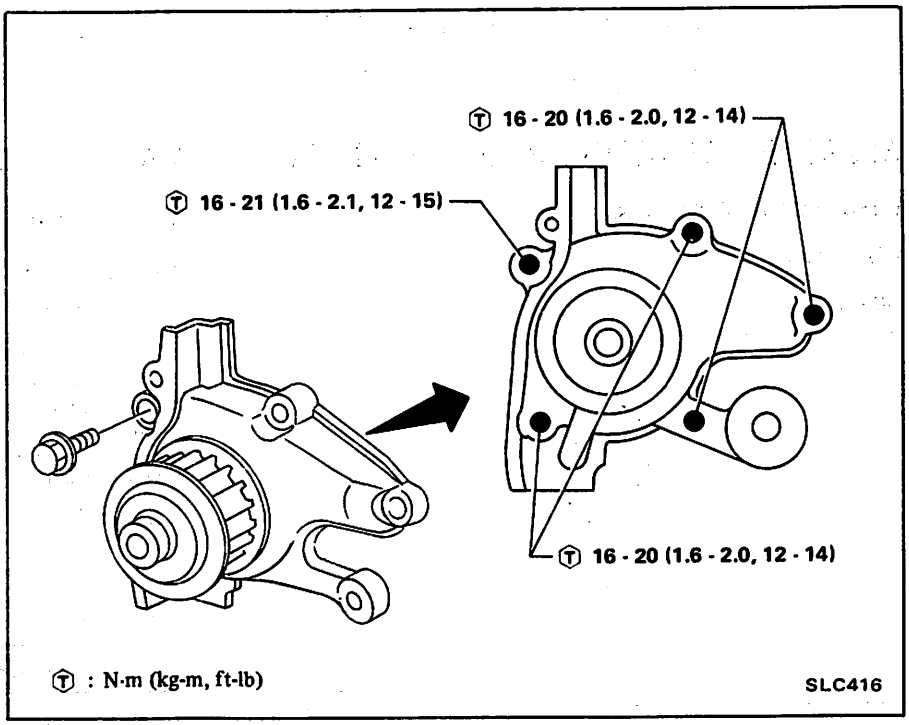
Water pump should not be disassembled. Only replace as an assembly.

INSPECTION

Inspect pump assembly for the following conditions and replace if necessary.

1. Badly rusted or corroded body assembly and vane.
2. Excessive end play or roughness of bearings in operation.

If excessive mechanical seal squeak occurs when engine is running, use suitable water pump seal lubricant to prevent squeak.



SERVICE DATA AND SPECIFICATIONS (S.D.S.)

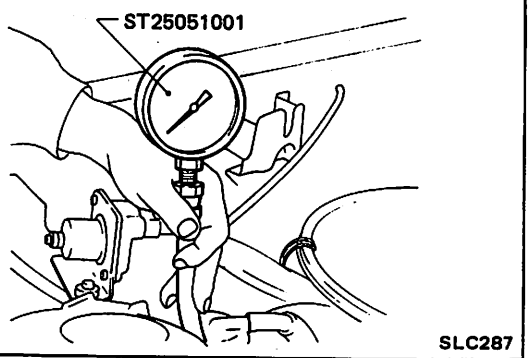
E15 & E16

ENGINE LUBRICATION SYSTEM

INSPECTION AND ADJUSTMENT

Oil pump

Oil pressure



Engine rpm	Discharge pressure kPa (kg/cm², psi)
1,050	196 (2, 28)
1,700	294 (3, 43)
5,150	392 (4, 57)

Pump unit

Unit: mm (in)

Outer rotor to body clearance ①	Less than 0.12 (0.0047)
Rotor tip clearance ②	0.15 - 0.21 (0.0059 - 0.0083)
Gap between outer rotor and inner rotor ③	Less than 0.05 (0.0020)
Gap between rotor and body ④	Less than 0.02 (0.0008)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Oil pump securing bolt & nuts	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Oil pump cover bolt	3.8 - 5.1	0.39 - 0.52	2.8 - 3.8
Regulator valve cap nut	39 - 49	4.0 - 5.0	29 - 36

ENGINE COOLING SYSTEM

INSPECTION AND ADJUSTMENT

Thermostat

	Frigid type	Standard type	Tropical type
Valve opening temperature °C (°F)	88 (190)	82 (180)	76.5 (170)
Max. valve lift mm/°C (in/°F)	8/100 (0.31/212)	8/95 (0.31/203)	8/90 (0.31/194)

Radiator

Cap relief pressure	kPa (kg/cm², psi)	88 (0.9, 13)
Leakage test pressure	kPa (kg/cm², psi)	157 (1.6, 23)

Water temperature switch

Operating temperature OFF → ON °C (°F)	90 (194)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Water pump securing bolt	9 - 14	0.9 - 1.4	6.5 - 10.1
Water outlet securing bolt	8 - 11	0.8 - 1.1	5.8 - 8.0

CD17

INSPECTION AND ADJUSTMENT

OIL PUMP

Unit: mm (in)

Body to outer gear clearance	0.11 - 0.2 (0.0043 - 0.0079)
Inner gear to crescent clearance	0.12 - 0.23 (0.0047 - 0.0091)
Outer gear to crescent clearance	0.21 - 0.32 (0.0083 - 0.0126)

RADIATOR

Unit: kPa (kg/cm², psi)

Cap relief pressure	88 (0.9, 13)
Leakage test pressure	157 (1.6, 23)

THERMOSTAT

	Standard	Frigid type
Valve opening temperature °C (°F)	82 (180)	88 (190)
Max. valve lift mm/°C (in/°F)	8/95 (0.31/203)	8/100 (0.31/212)

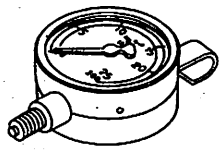
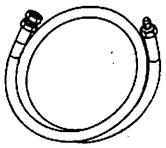
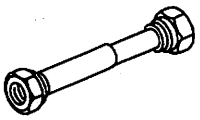
WATER PUMP

Alternator belt deflection mm (in)/N (kg, lb)	9 - 15 (0.35 - 0.59)/ 98 (10, 22)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Oil pump mounting bolt	12 - 16	1.2 - 1.6	9 - 12
Oil pump cover bolt	4 - 5	0.4 - 0.5	2.9 - 3.6
Oil pan	5 - 7	0.5 - 0.7	3.6 - 5.1
Oil cooler fixing bolt	16 - 21	1.6 - 2.1	12 - 15
Regulator valve cap	39 - 49	4 - 5	29 - 36
Water pump securing bolt	16 - 20 16 - 21	1.6 - 2.0 1.6 - 2.1	12 - 14 12 - 15

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
ST25051001 (J25695-1)	Oil pressure gauge 
ST25052000 (J25695-2)	Hose 
ST25053000 (J25695-3)	Joint pipe 
ST25054000 (J25695-4) or 11025-61501 (Part No.)	Adapter 

ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

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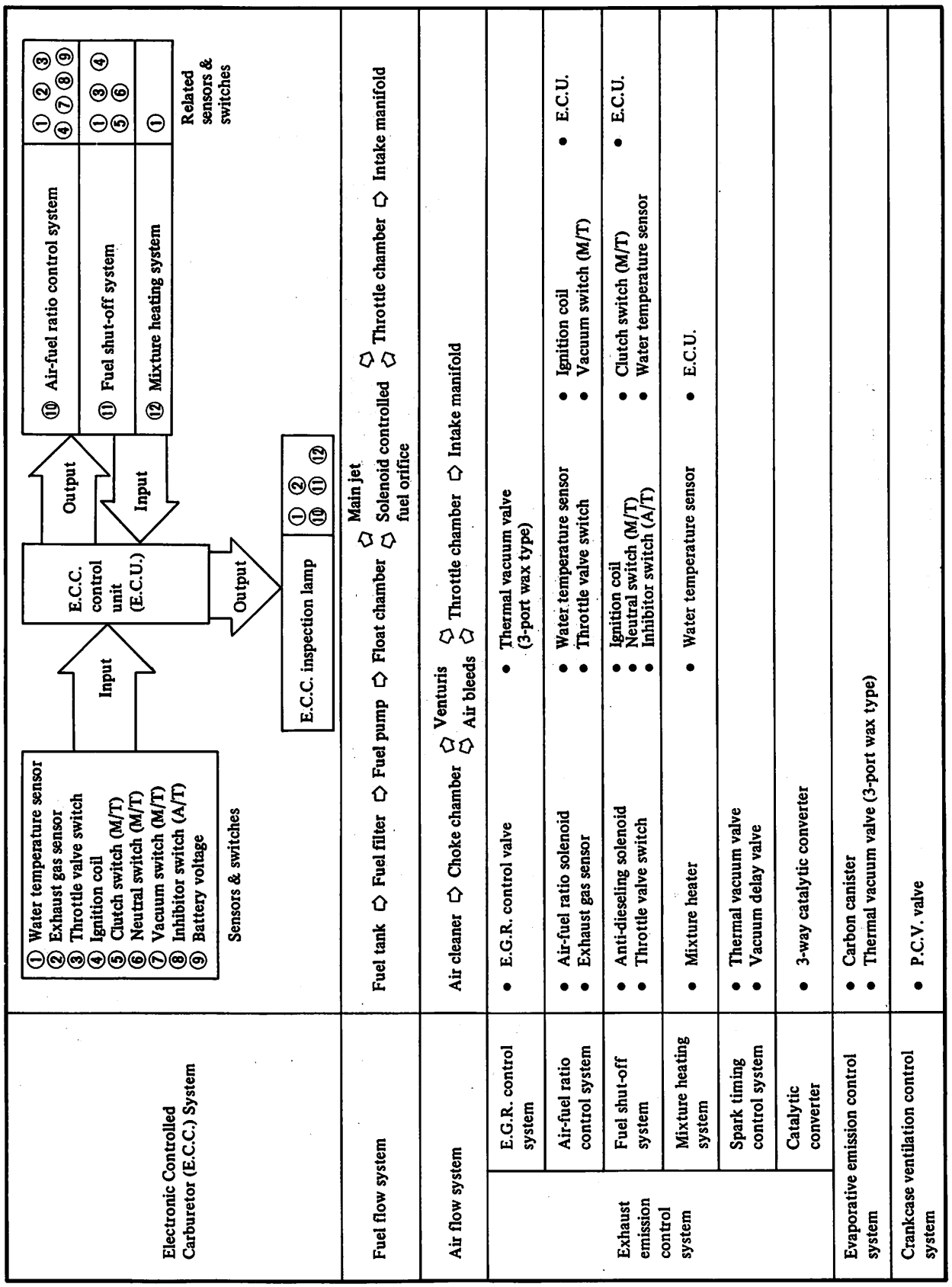
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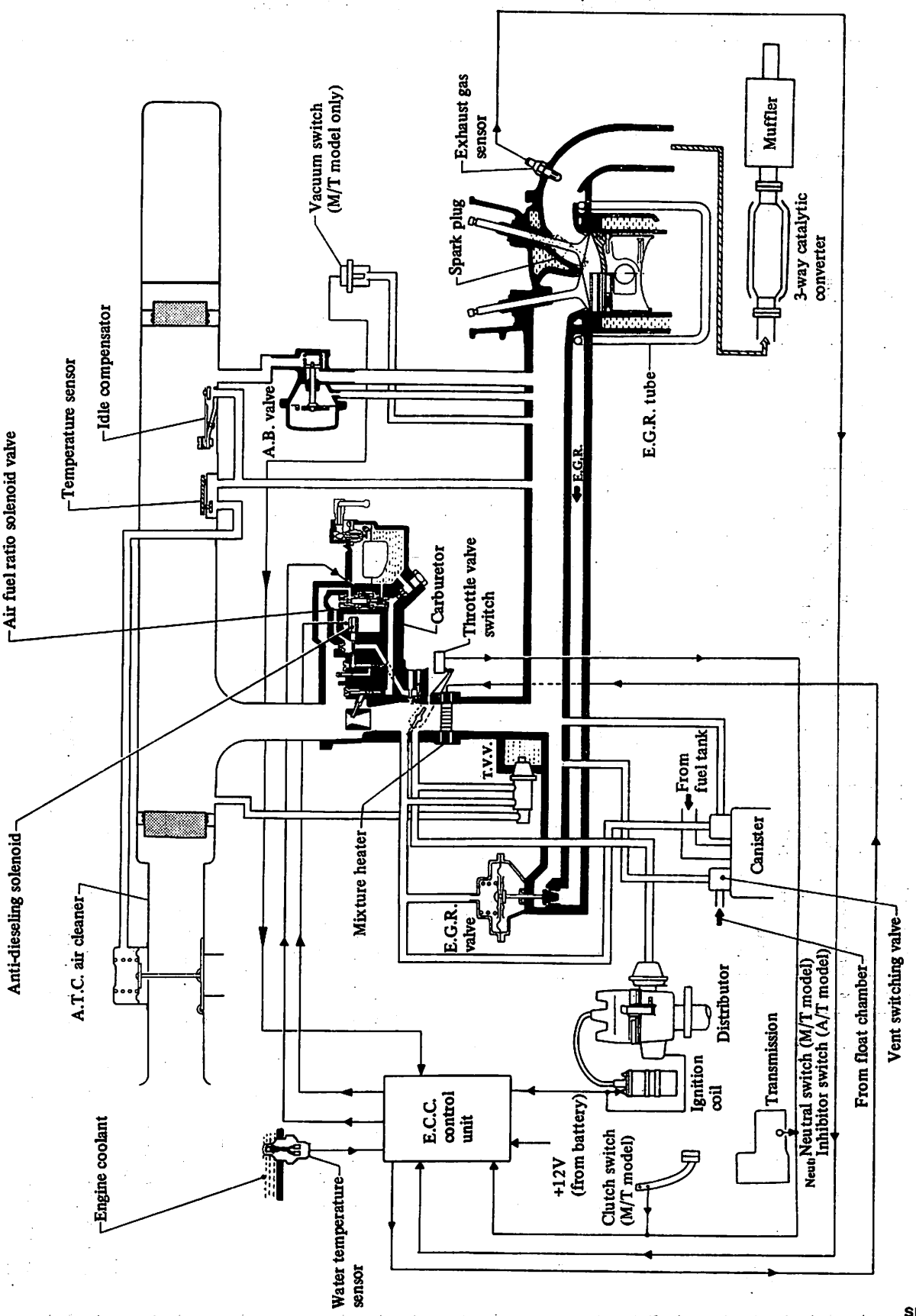
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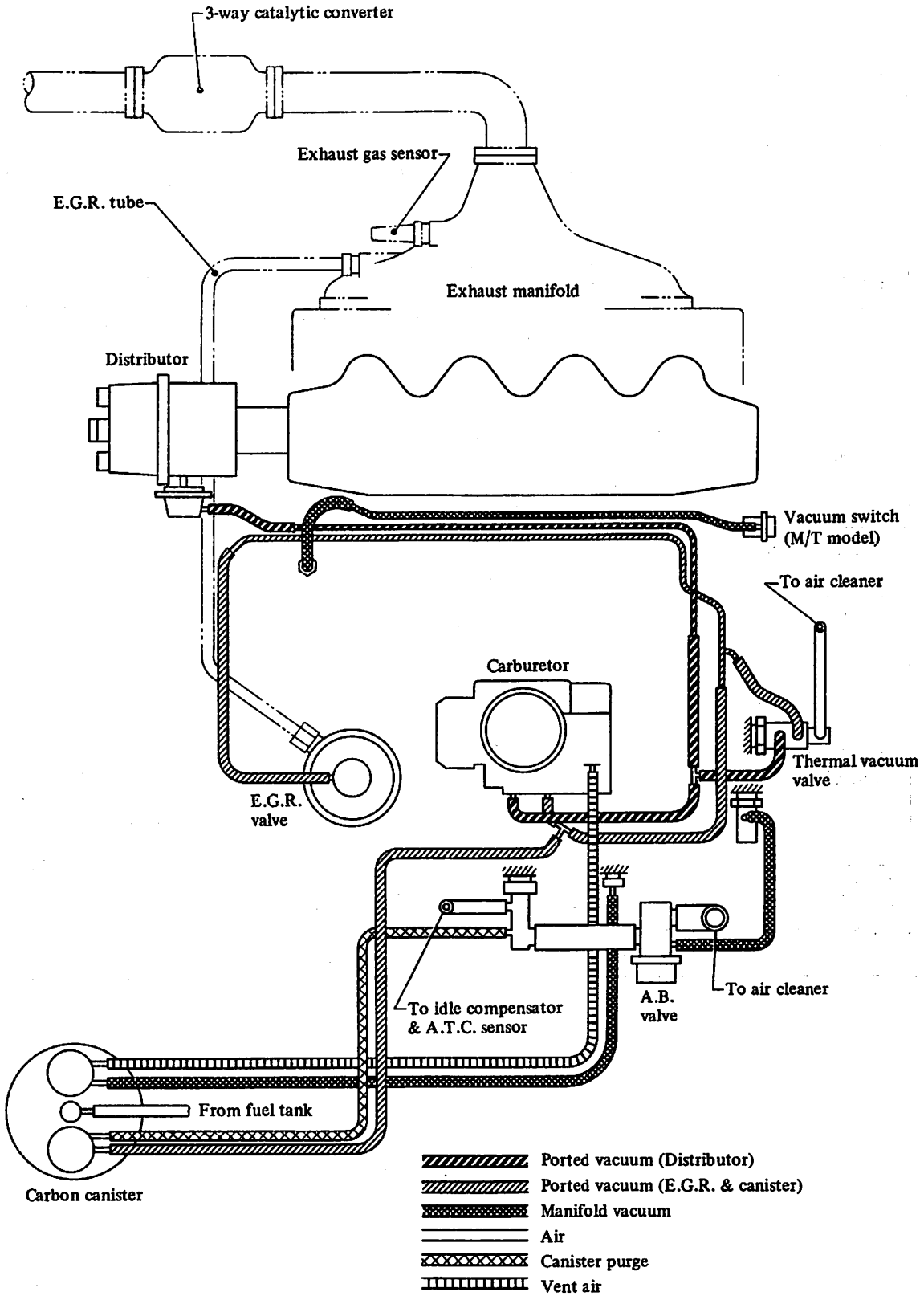
ENGINE AND EMISSION CONTROL SYSTEM CHART OF ELECTRONIC CONTROLLED CARBURETOR (E16 E.C.C.) ENGINE FOR CALIFORNIA



ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM A OF E16 E.C.C. ENGINE FOR CALIFORNIA



ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM B OF E16 E.C.C. ENGINE FOR CALIFORNIA

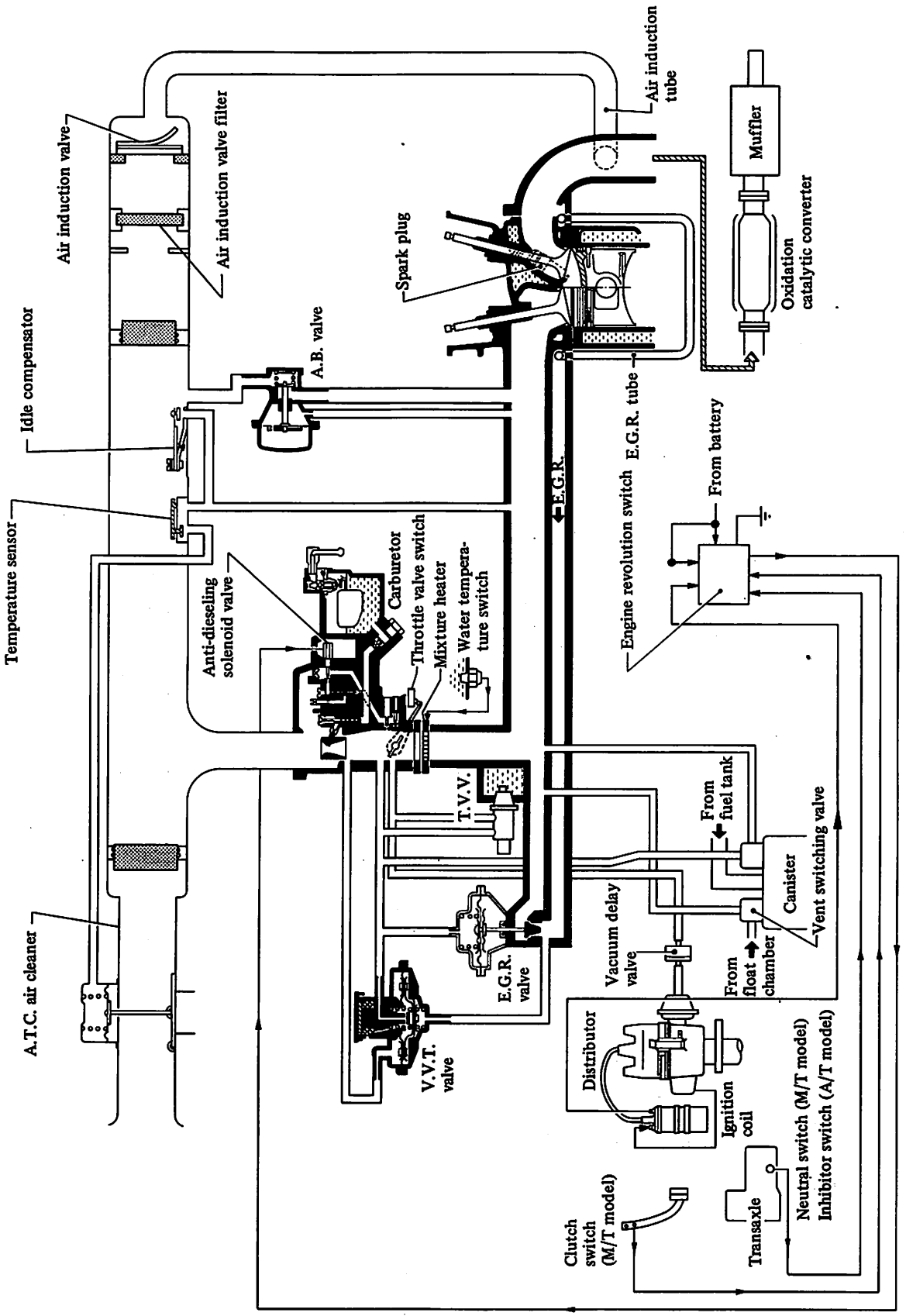


SEF717A

ENGINE AND EMISSION CONTROL SYSTEM TABLE OF CARBURETOR ENGINES FOR NON-CALIFORNIA

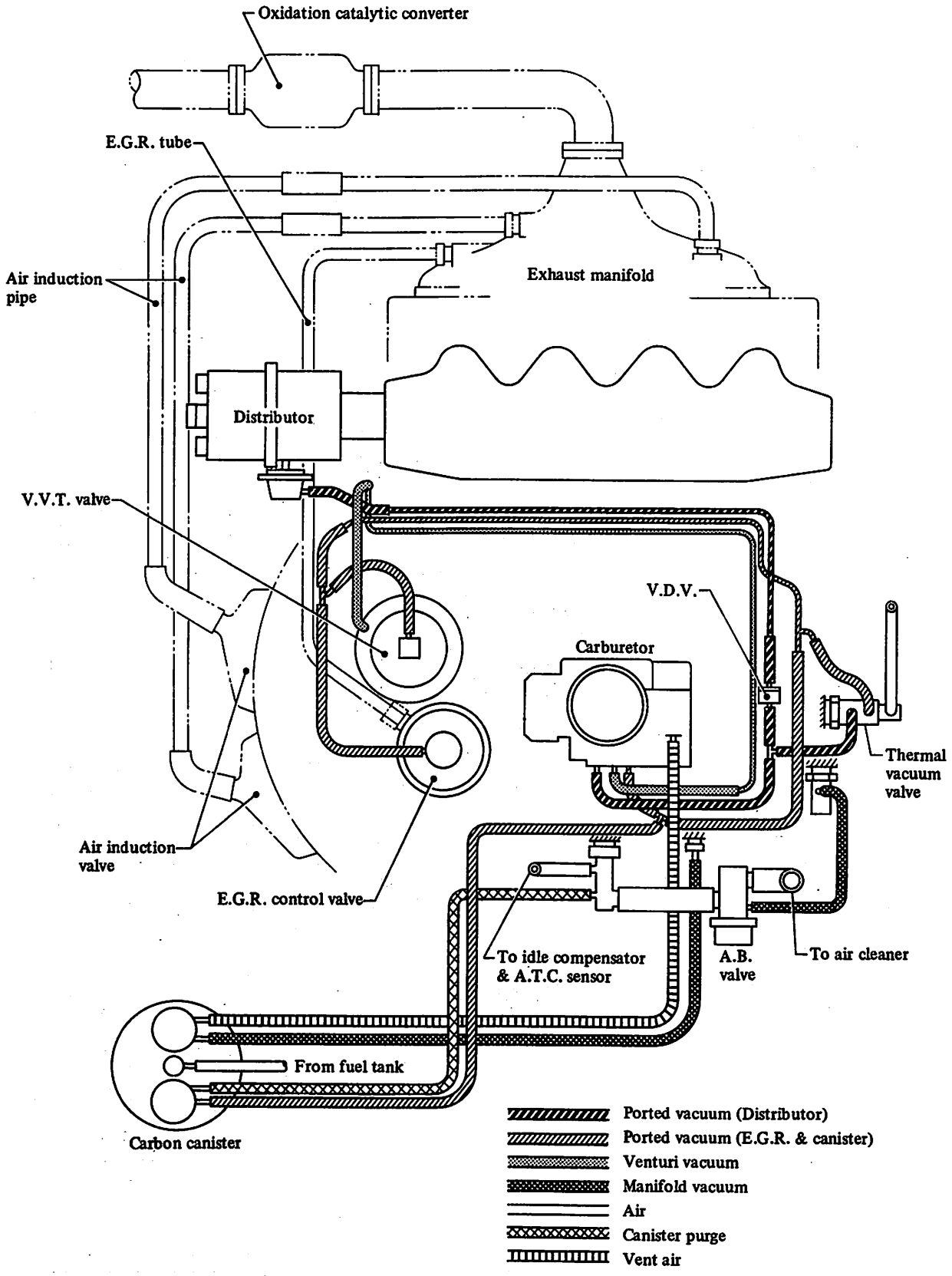
Item \ Car model		U.S.A. Non-California	Canada
Crankcase emission control system		• P.C.V. valve	
Exhaust emission control system	Air induction system (A.I.S.)	• Air induction valve (2 valves) • Air induction pipe (2 pipes) • A.B. valve	• Air induction valve (1 valve) • Air induction pipe (1 pipe) • A.B. valve
	E.G.R. control system	• E.G.R. control valve • V.V.T. valve • Thermal vacuum valve (3-port wax type) [50°C (122°F)]	• E.G.R. control valve • Thermal vacuum valve (2-port bimetal type)
	Fuel shut-off system	• Anti-dieseling solenoid valve • Engine revolution switch • Throttle valve switch • Ignition coil • Inhibitor switch (A/T) • Neutral switch (M/T) • Clutch switch (M/T)	–
	Mixture heating system	• Mixture heater • Water temperature switch	
	Spark timing control system	• Thermal vacuum valve (3-port wax type) • Vacuum delay valve	–
	Throttle opener control system	–	• Throttle opener servo diaphragm • Throttle opener solenoid valve • Vacuum control valve • Speed detecting switch and amplifier (M/T) • Inhibitor switch (A/T)
	Catalyzer	• Oxidation catalytic converter	–
Evaporative emission control system		• Carbon canister • Thermal vacuum valve (3-port wax type)	• Carbon canister

ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM A FOR NON-CALIFORNIA



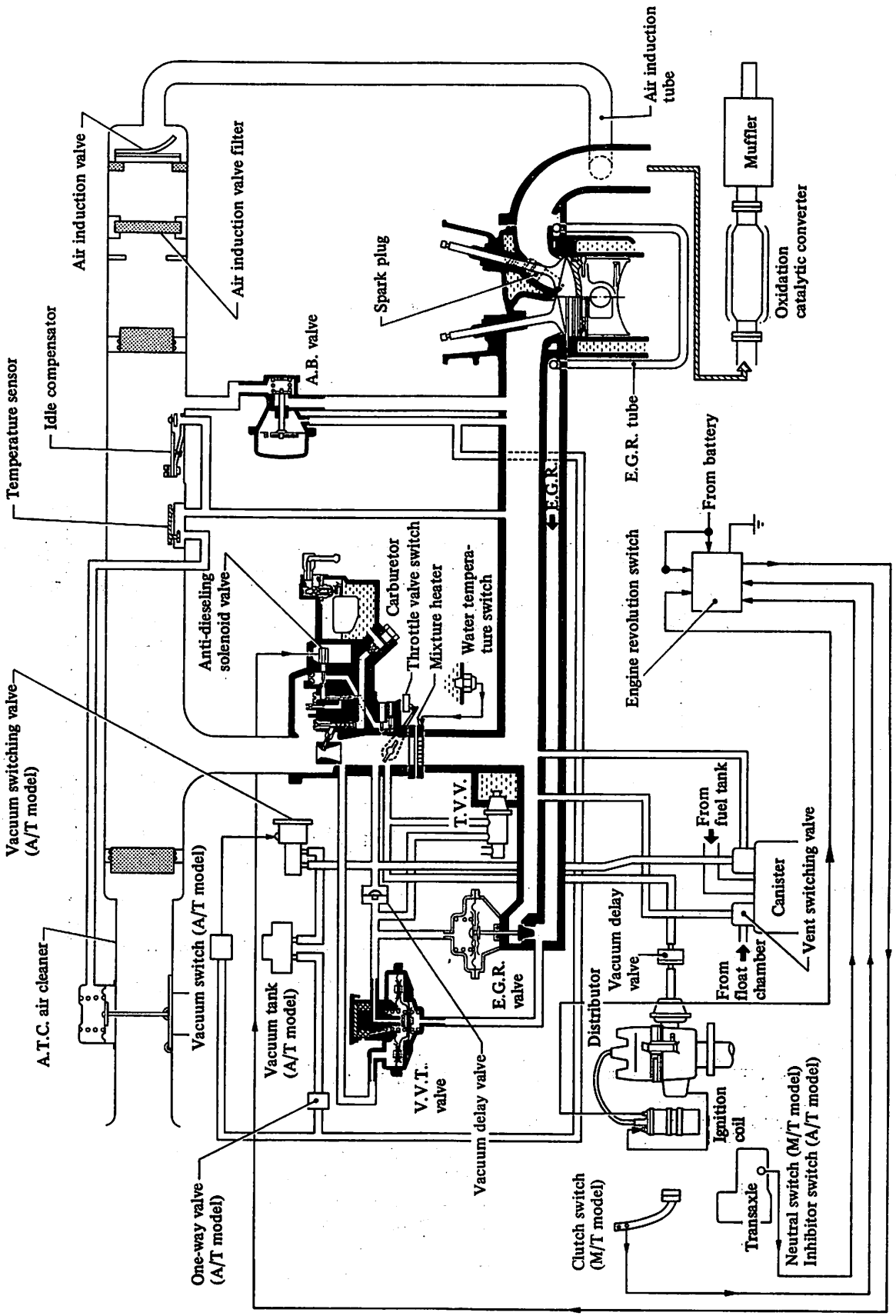
SEF718A

ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM B FOR NON-CALIFORNIA



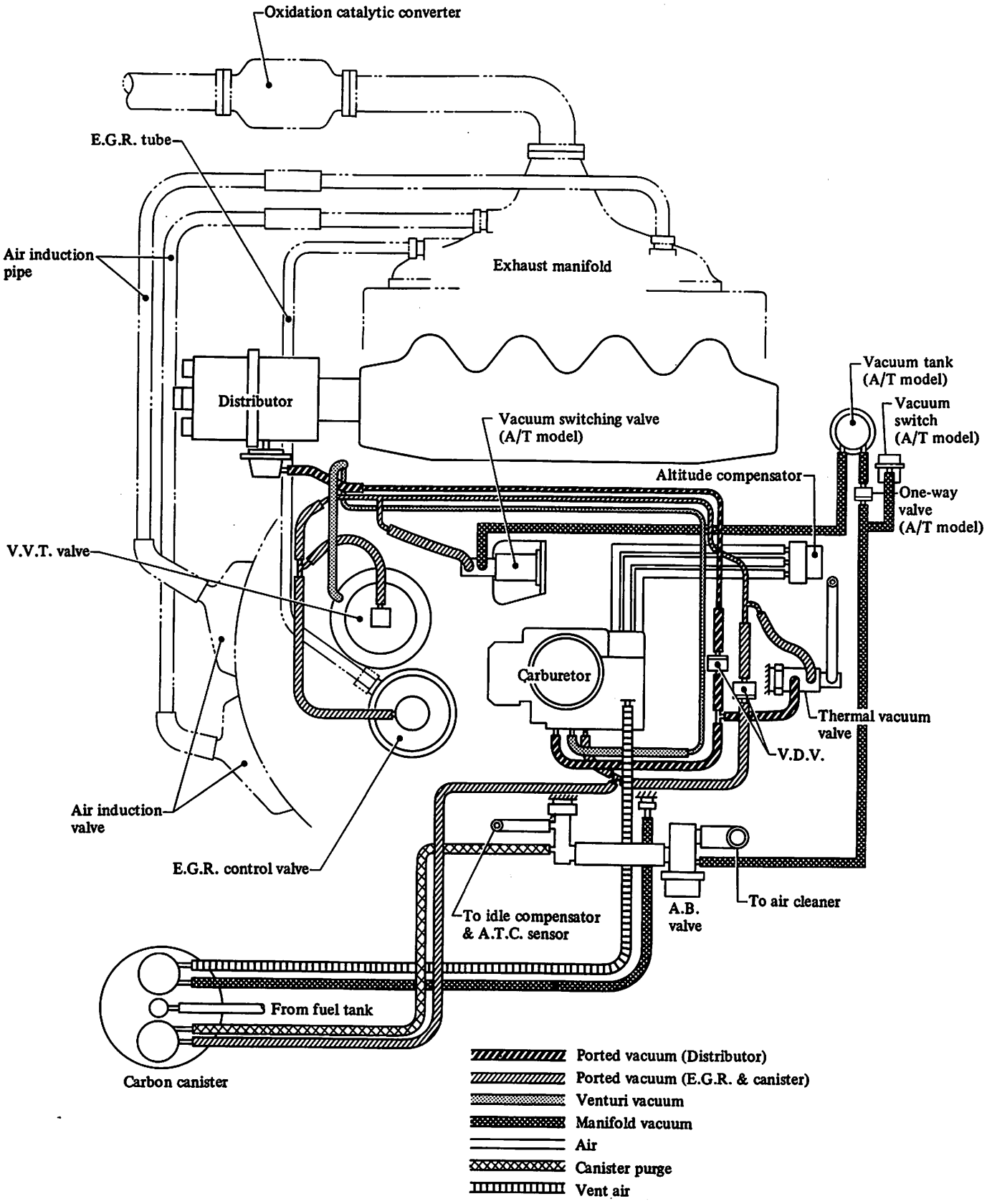
SEF719A

ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM A FOR NON-CALIFORNIA OF HIGH ALTITUDES



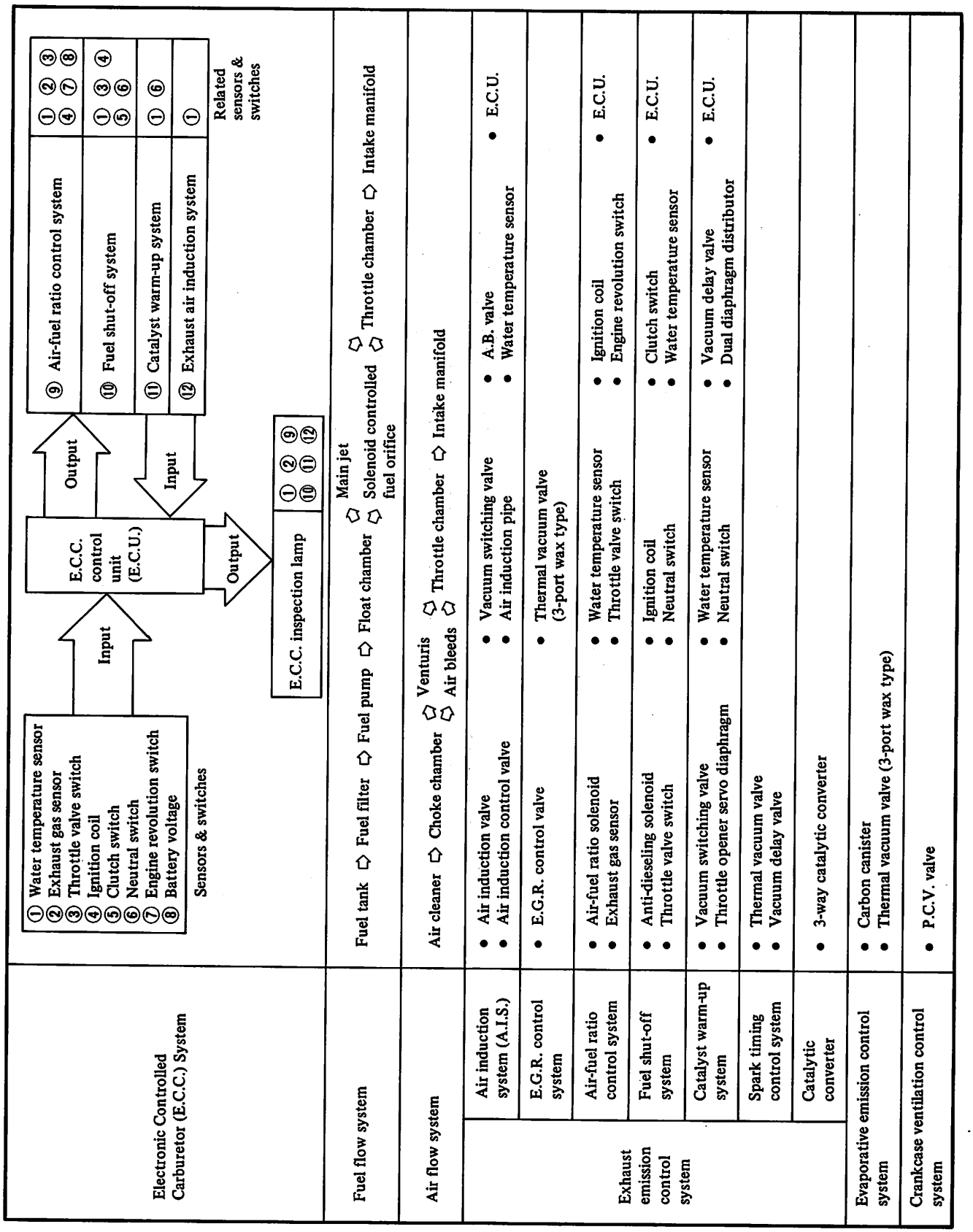
SEF739A

ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM B FOR NON-CALIFORNIA OF HIGH ALTITUDES

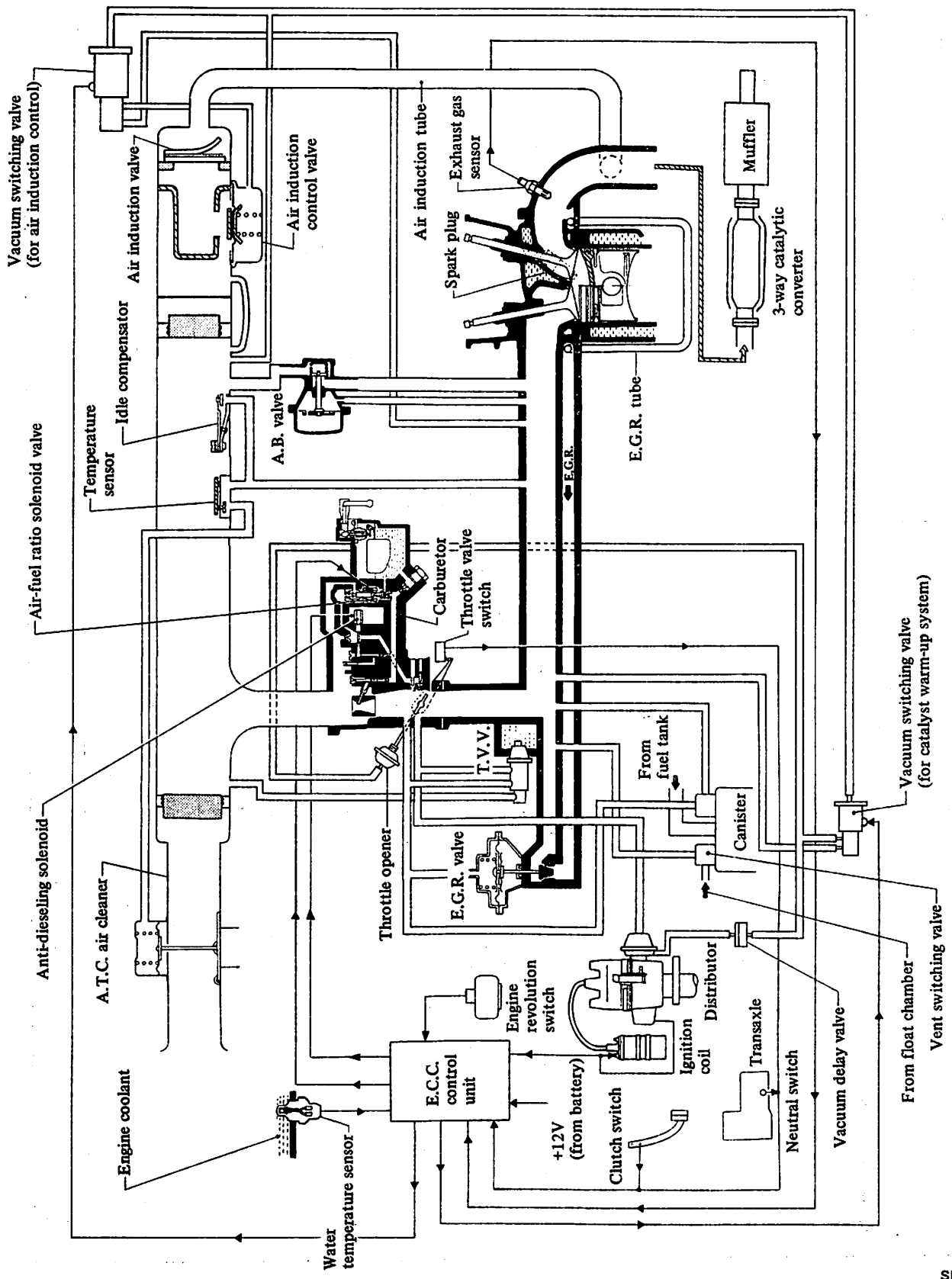


SEF742A

ENGINE AND EMISSION CONTROL SYSTEM CHART OF ELECTRONIC CONTROLLED CARBURETOR (E.C.C.) ENGINE FOR M.P.G.

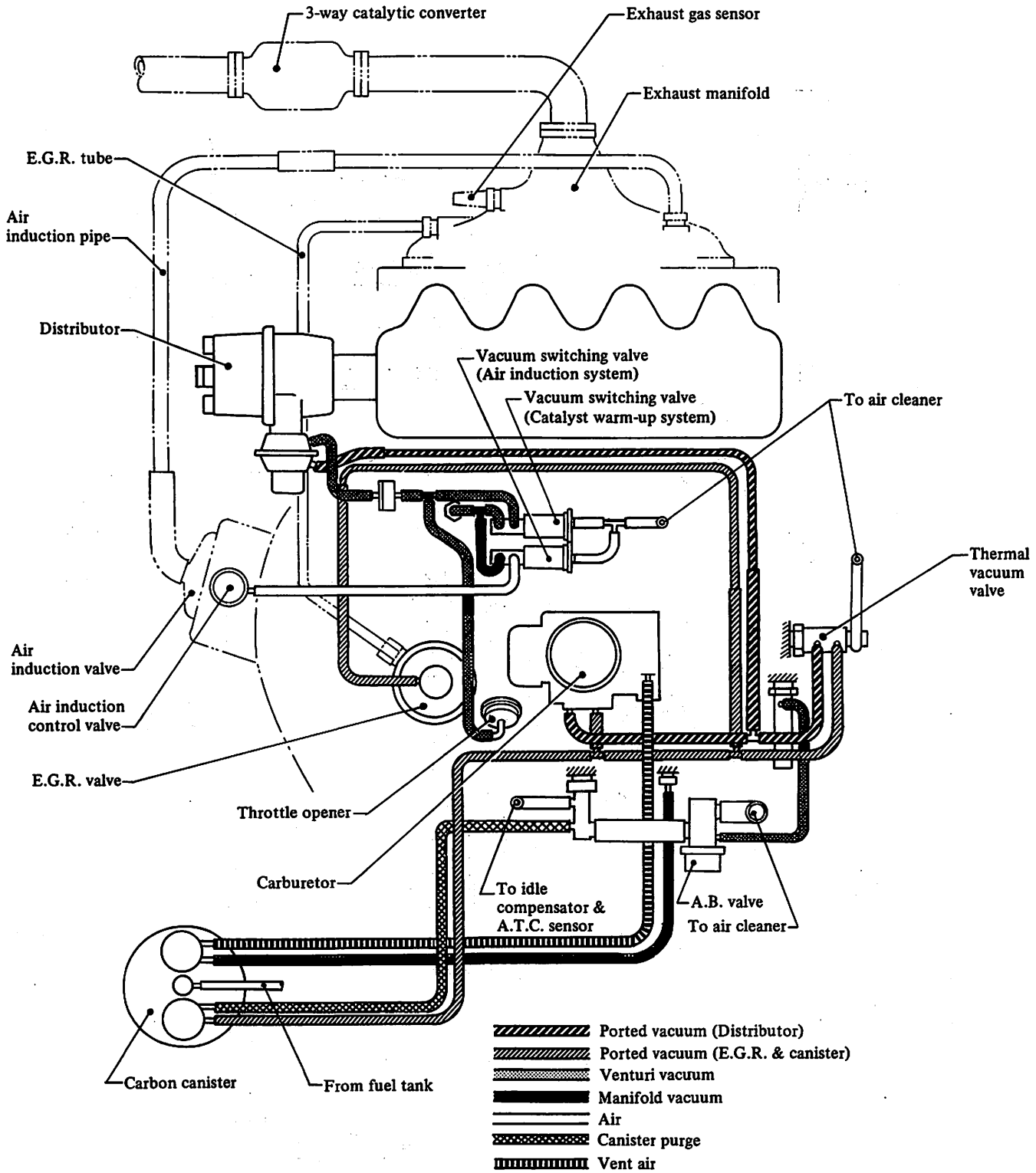


ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM A OF E.C.C. ENGINE FOR M.P.G.



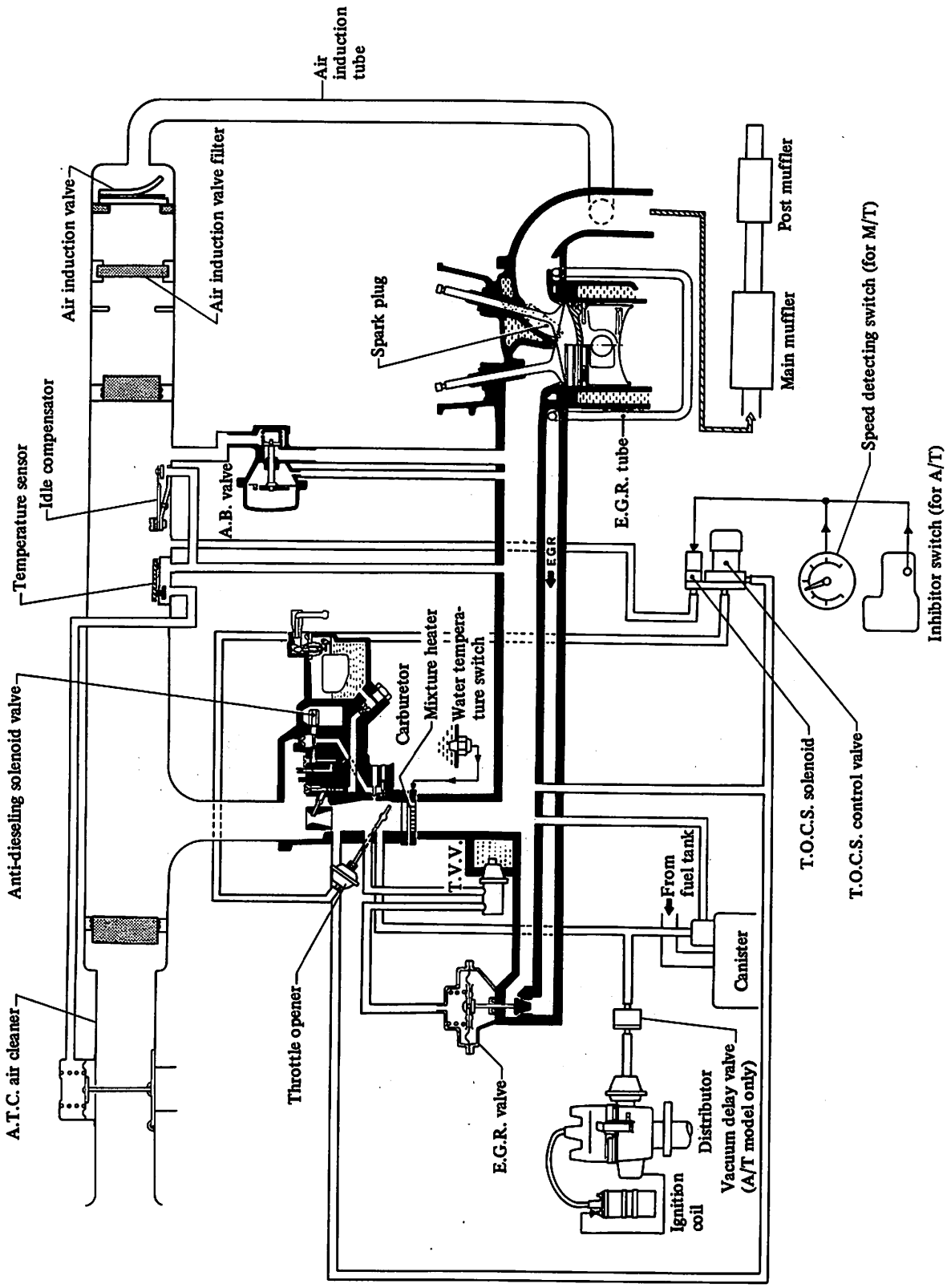
SEF579A

ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM B OF E.C.C. ENGINE FOR M.P.G.



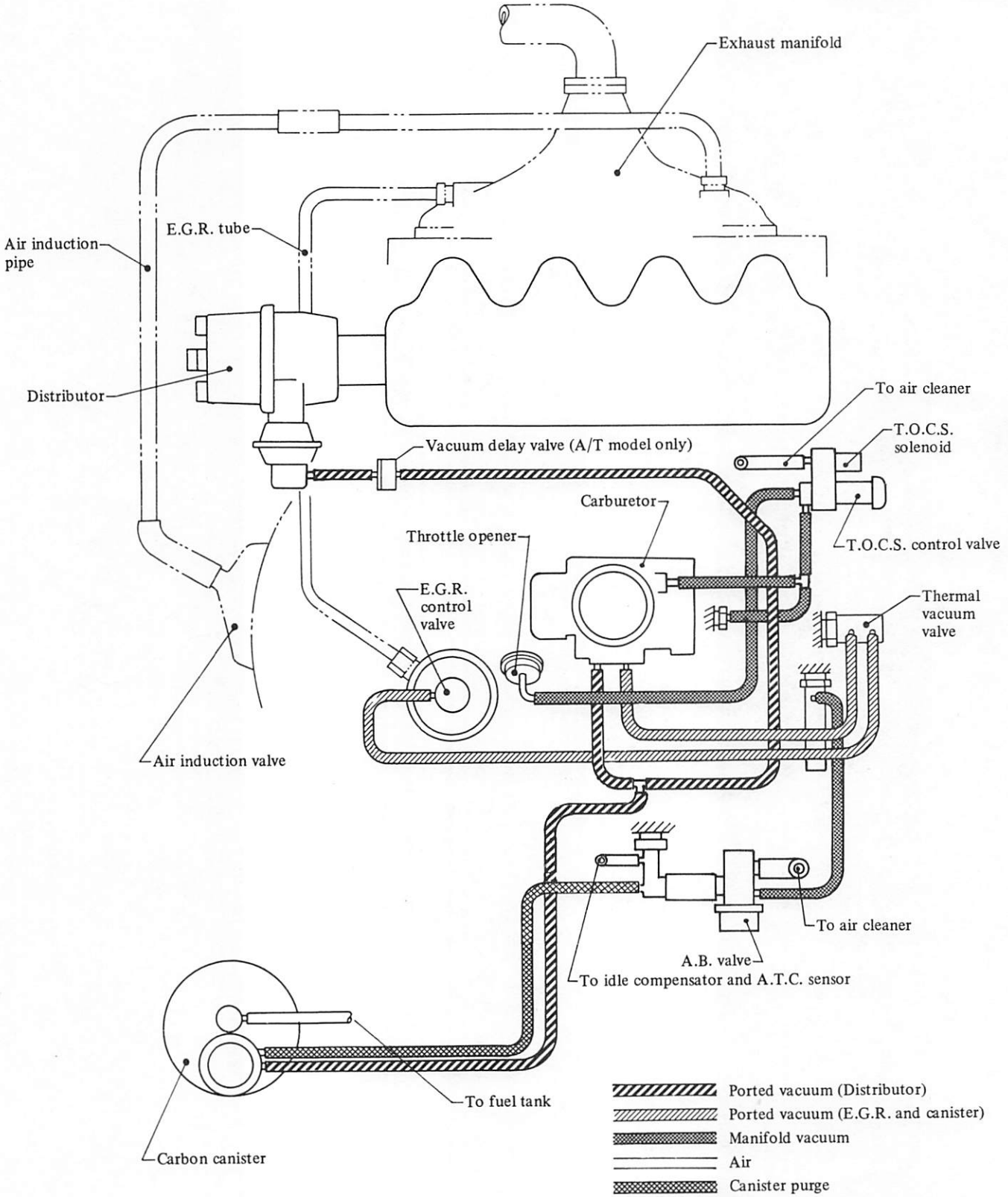
SEC962

ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM A FOR CANADA



SEF720A

ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM B FOR CANADA



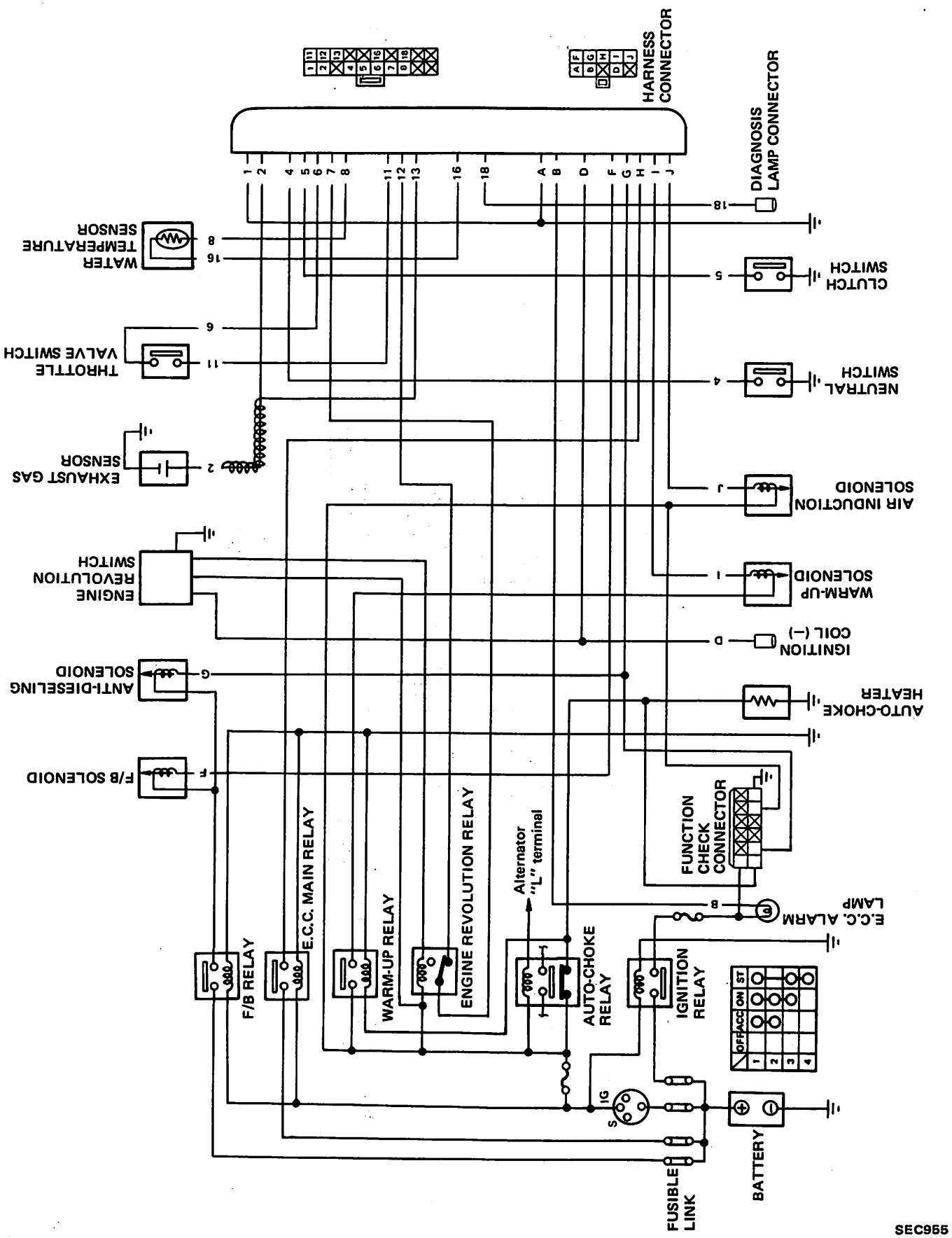
SEF721A

ELECTRICAL CIRCUIT DIAGRAM

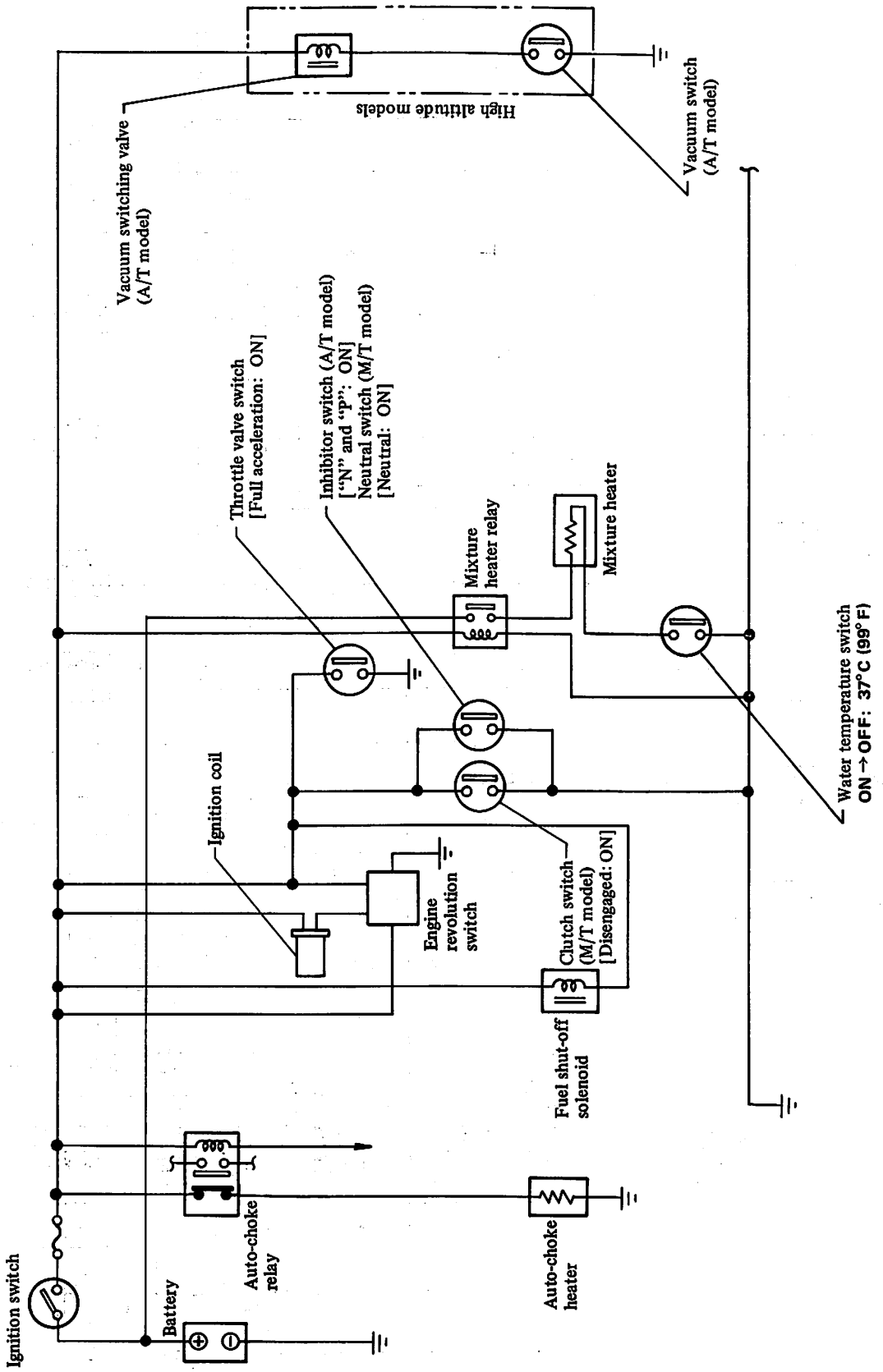
E.C.C. CIRCUIT DIAGRAM (California)

Refer to Harness Diagram.

E.C.C. CIRCUIT DIAGRAM (M.P.G.)

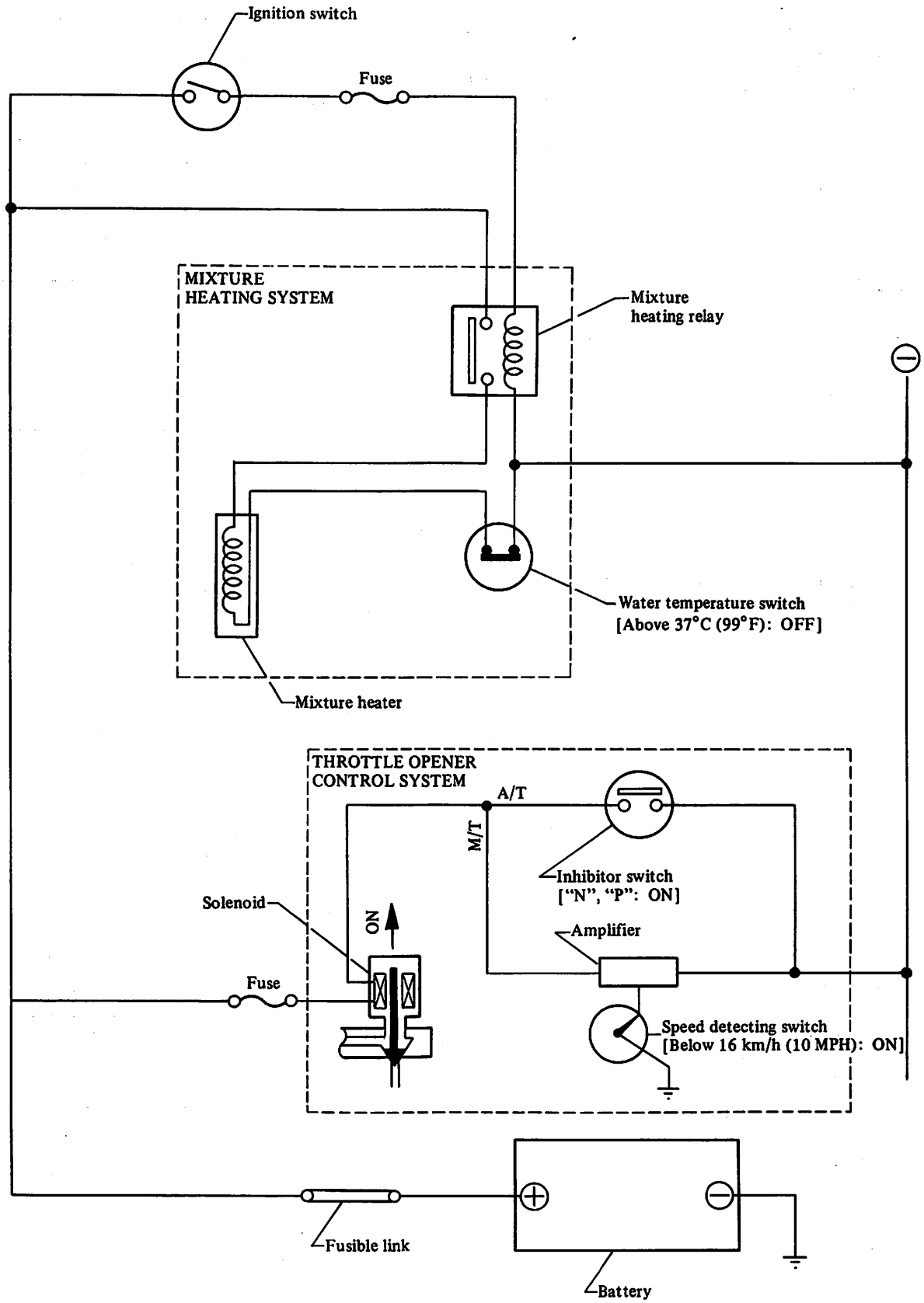


ELECTRICAL CIRCUIT OF EMISSION CONTROL SYSTEMS (Non-California)



SEF723A

ELECTRICAL CIRCUIT OF EMISSION CONTROL SYSTEMS (Canada)



SEF724A

DIAGNOSTIC PROCEDURE FOR PROBLEMS

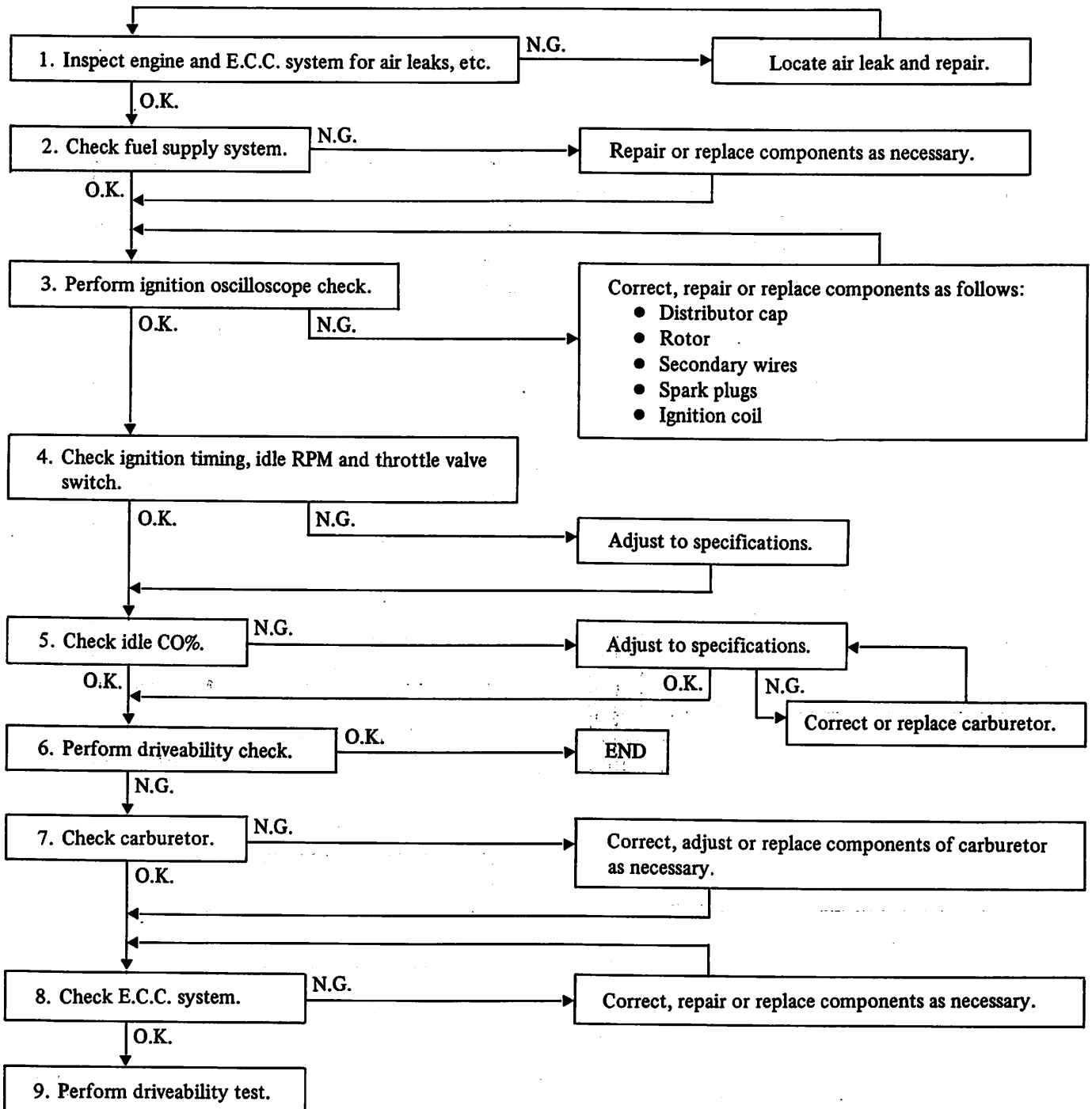
DIAGNOSTIC PROCEDURE FOR E.C.C. ENGINE

INTERMITTENT PROBLEM

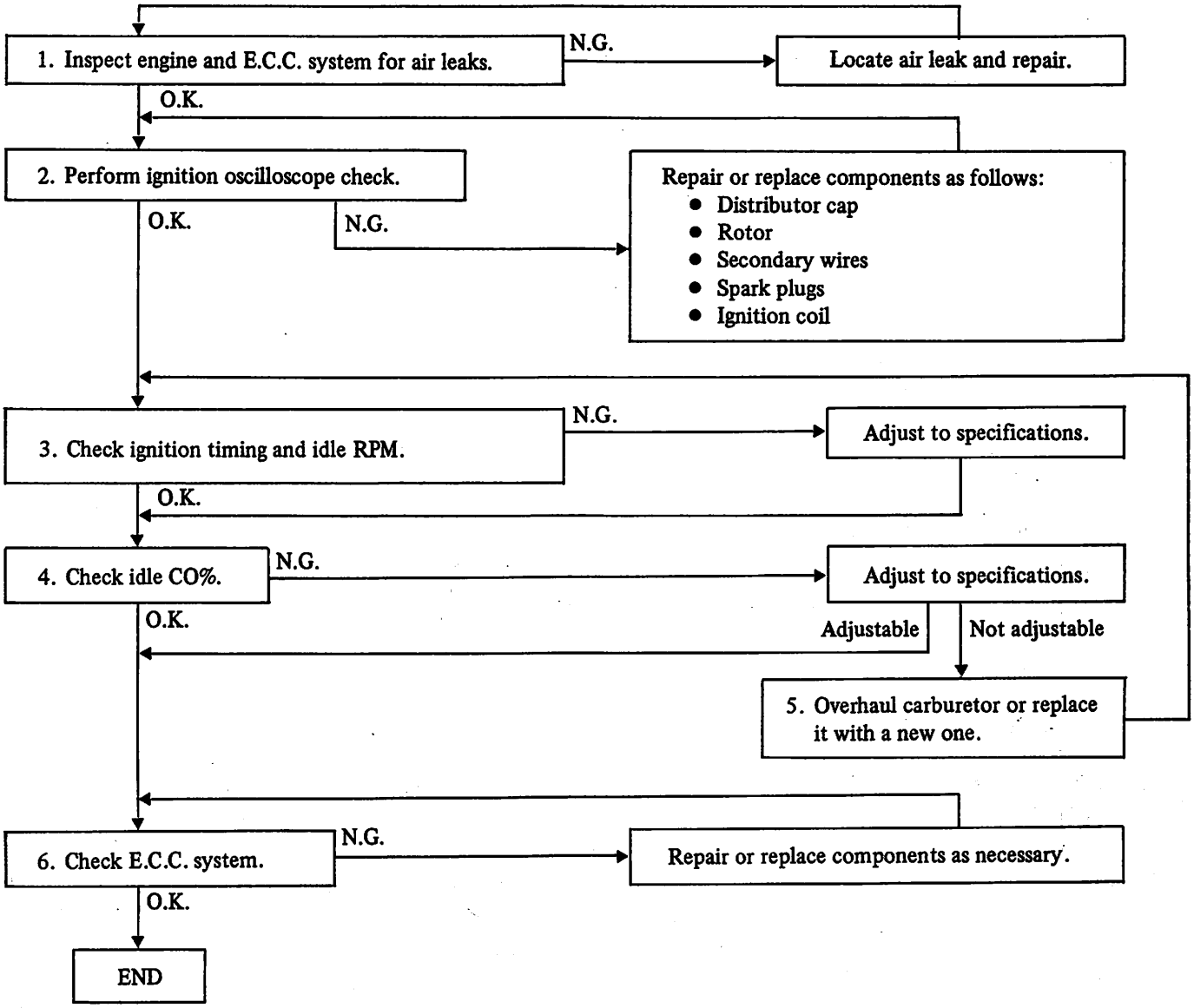
DIAGNOSTIC CHARTS CANNOT BE USED TO DIAGNOSE INTERMITTENT FAILURES. This is because many intermittent problems are caused at electrical connections, and if intermittent problems are not corrected, unnecessary component replacement will be indicated and the problems may remain. Therefore, DIAGNOSIS OF INTERMITTENT PROBLEMS SHOULD START WITH A VISUAL AND PHYSICAL INSPECTION OF THE CONNECTORS involved in the circuit, especially control unit, water temperature sensor and exhaust gas sensor connectors.

CAUTION:
When connecting or disconnecting E.C.C. harness connector to or from any E.C.C. unit, ensure that the ignition switch is in the "OFF" position and that the negative battery terminal is disconnected. Removing and installing these connectors with the ignition switch left in the "ON" position will damage control unit.

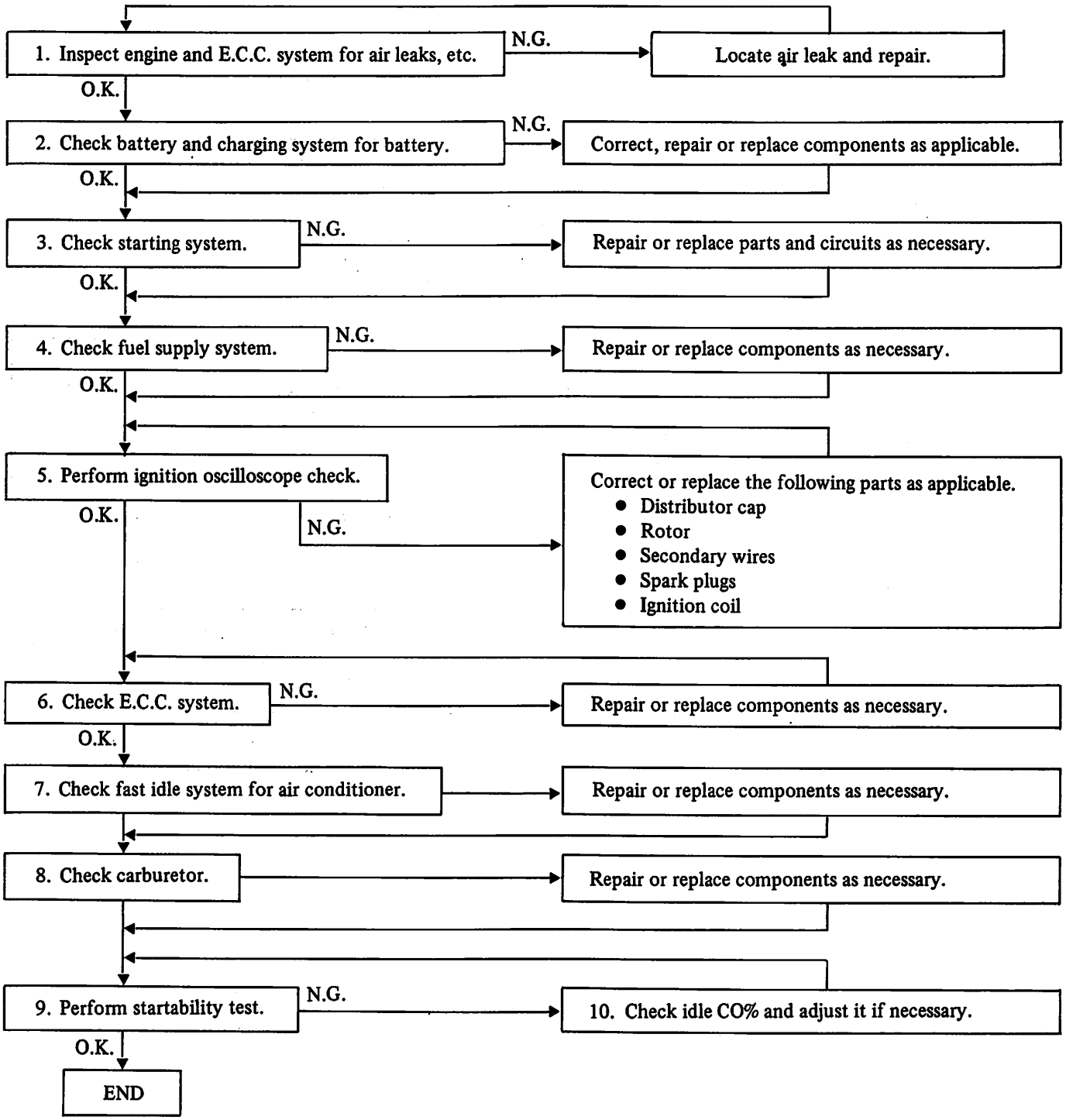
DRIVEABILITY



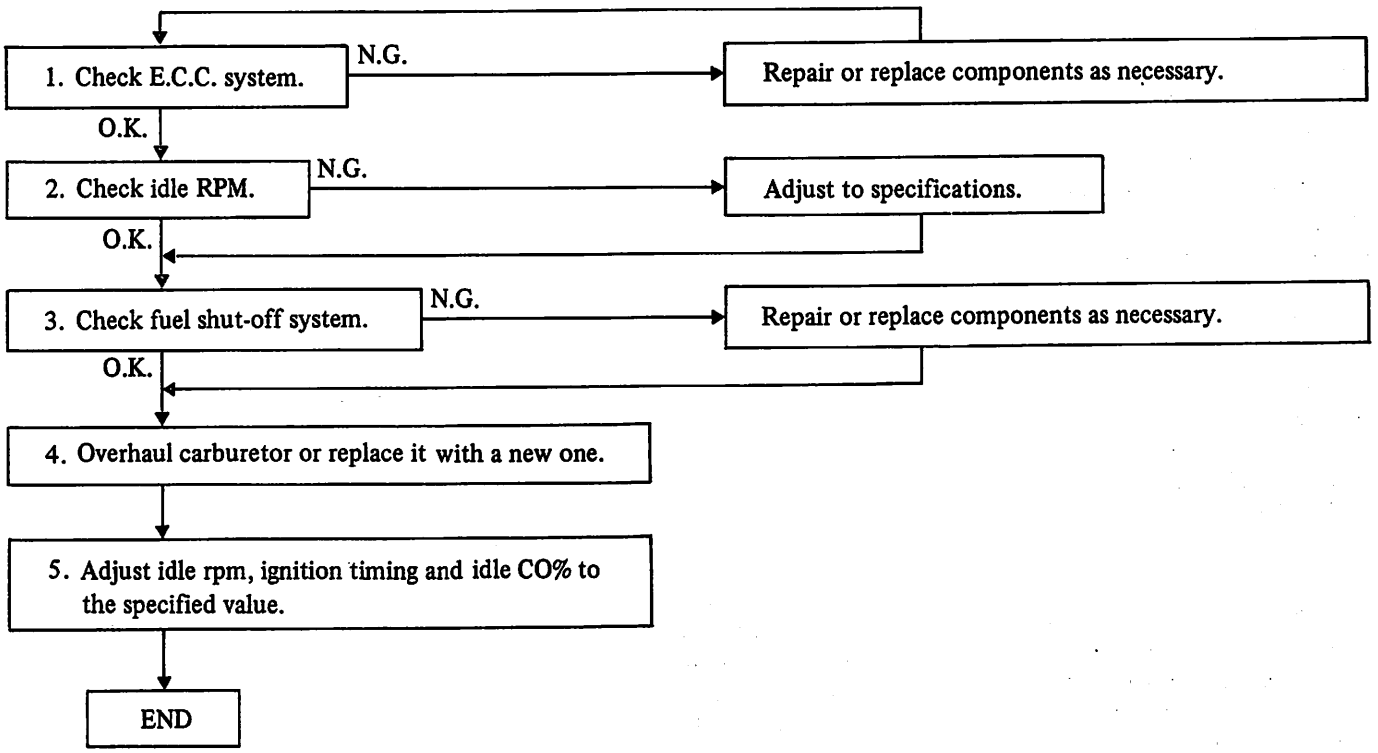
IMPROPER IDLING



ENGINE STARTABILITY



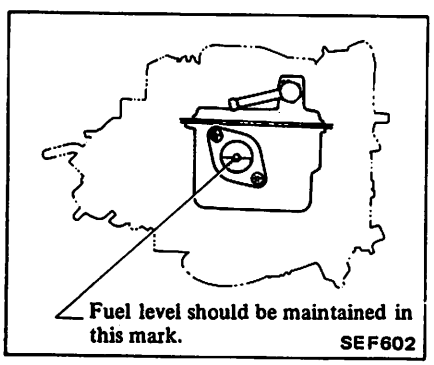
ENGINE STALL



DIAGNOSTIC STEPS FOR DRIVEABILITY

1. Inspect engine and E.C.C. system for leaks.
(1) Check clamps at all air intake components.
(2) Check vacuum hoses for leakage.
(3) Check air cleaner filter for clogging.
(4) Visually inspect for leaks at the following:
- Dipstick
- A.B. valve hose
- Air induction hose (M.P.G. only)
- Intake manifold gasket
- Valve rocker cover
- E.G.R. valve gasket
- Oil filler cap

(5) Check E.G.R. valve seat and operation.
(6) Check air induction control valve operation. (M.P.G. only)
(7) Check A.B. valve operation.
2. Check fuel supply system
(1) Make sure proper fuel is used.
(2) Visually check fuel filter for clogging.
(3) Visually check fuel lines for leaks.
(4) With engine idling, visually check fuel level.

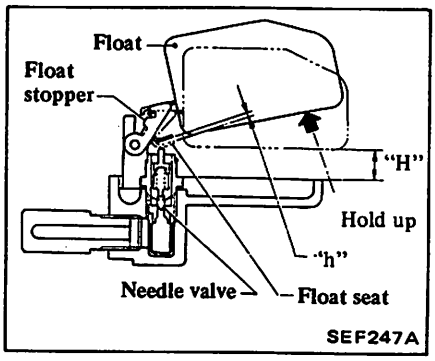


If not correct, adjust as follows.
a) Turn off engine and remove choke chamber.
b) Turn down choke chamber and adjust "H" by bending float seat.

"H":
approximately 12 mm (0.47 in)

c) Adjust "h" by bending float stopper as required.

"h":
1.3 - 1.7 mm (0.051 - 0.067 in)



d) Install choke chamber and recheck fuel level with engine idling.
3. Perform ignition oscilloscope test.
(1) Warm engine to operating temperature.
(2) Check ignition system for unusually high or low firing voltage.
(3) If firing voltage is abnormal, determine cause and repair.
4. Check ignition timing, idle rpm and throttle valve switch.
(1) Checking and adjusting ignition timing and idle rpm.

Checks and adjustments are made with the air conditioning compressor "OFF".

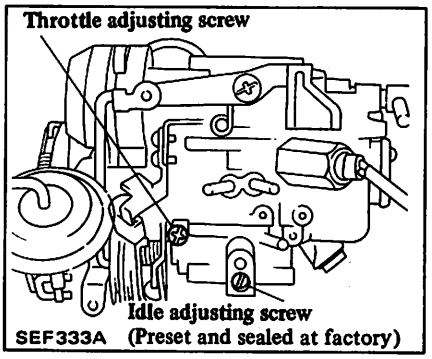
a) Disconnect air induction hose and install proper cap on air induction pipe. (M.P.G. only)
b) Verify that the engine is still at operating temperature.
c) Rev the engine to 2,000 to 3,000 rpm two or three times under no-load, then allow it to run at idle speed for one minute.
d) Disconnect distributor vacuum hose from distributor vacuum controller, and plug hose with proper plug. Then, check ignition timing with a timing light.

E15 (M.P.G.)
2°±2° A.T.D.C.
E16
5°±2° A.T.D.C.

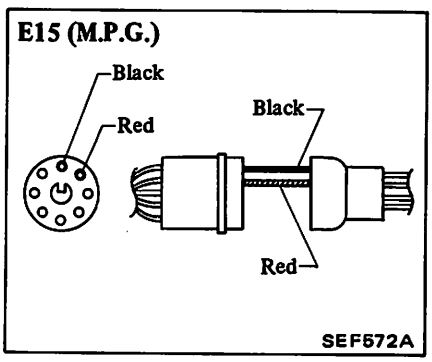
Adjust as necessary.
e) Connect distributor vacuum hose and check idle speed.

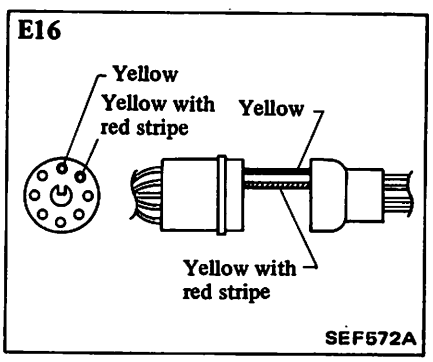
E15 (M.P.G.)
700±100 rpm
E16
MT 750±100 rpm
AT 650±100 rpm
(in "D" position)

If necessary, adjust to the specified rpm by turning the idle speed adjusting screw.

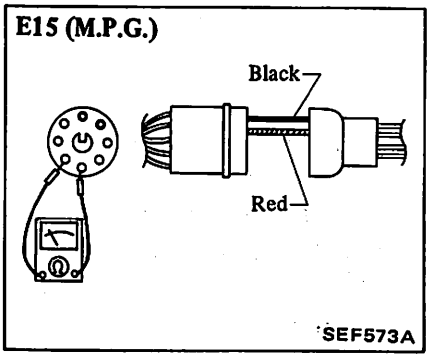


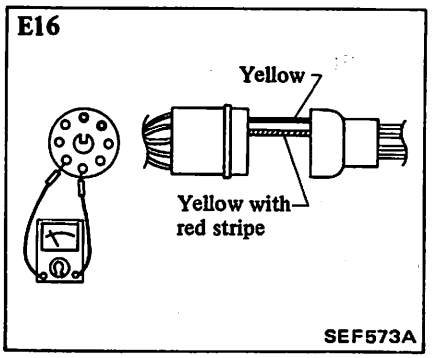
(2) Check throttle valve switch adjustment.
a) Turn off engine and disconnect harness connector on carburetor.
b) Connect proper wires between the anti-dieseling solenoid harness terminals.





c) Verify that continuity does not exist between the throttle valve switch harness terminals.

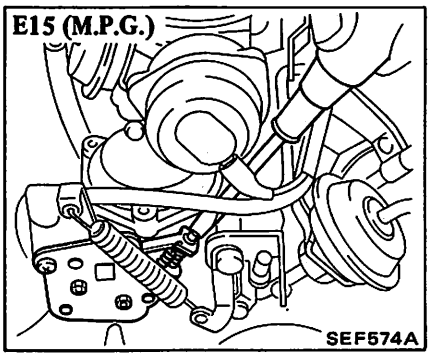




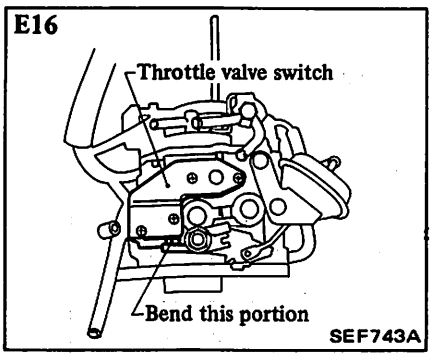
d) Start engine and increase engine speed to about 2,000 rpm.
e) At this time, verify that continuity exists between the throttle valve harness terminals.
f) Then, decrease engine speed gradually to 1,200±50 rpm, and at that point the circuit should break and cause the ohmmeter to indicate an open circuit. If incorrect, adjust as follows:
1) Hold engine speed at 1,200 rpm by manually opening the throttle.

Important: Do not use the idle speed screw.

2) E15 (M.P.G.):
Slowly rotate the adjusting screw counterclockwise or clockwise until the ohmmeter indicates an open circuit.



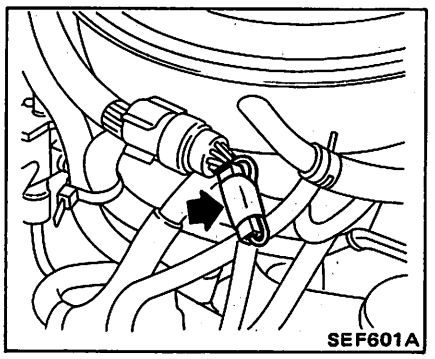
E16:
Bend plate until the ohmmeter indicates an open circuit.



3) Recheck the adjustment.
4) Reset idle speed if necessary.
g) Connect carburetor harness connector.
5. Check idle CO%.

The checking or adjustment of idle CO% requires the use of a CO meter. It is essential that the meter be fully warmed up and calibrated before any adjustment is made.

(1) Make sure that air induction hose is disconnected.
(2) Verify that the engine is at operating temperature.
(3) With the hood open, run the engine at 2,000 rpm for 2 minutes at no-load to stabilize its condition.
(4) Turn the ignition switch to the "OFF" position.
(5) Disconnect air-fuel ratio solenoid harness connector.



(6) Rev the engine to 2,000 to 3,000 rpm 2 or 3 times under no-load, finally, allow it to run at idle speed for one minute.
(7) Reset idle speed to the specified speed.
(8) Check CO% as per Table A, Column 1 and if necessary, adjust to the specified point as per Table A, Column 2. The CO% adjustment is made by turning the idle mixture screw.

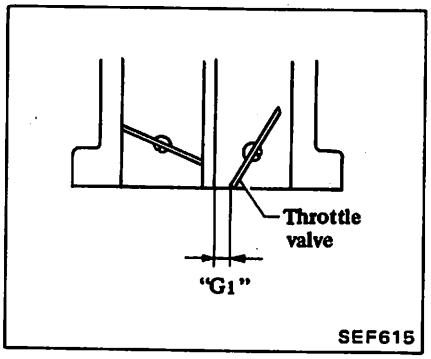
Table A

Engine	Transaxle	Check idle CO% Column 1	Adjust idle CO% Column 2
E15	M/T	4.0±2.0%	4.0±1.0%
E16	M/T	3.0±2.0%	3.0±1.0%
	A/T		

(9) Stop engine, and reconnect air-fuel ratio solenoid harness connector.
(10) Check the idle speed. Readjust to the specified speed.
(11) Connect air induction hose. (M.P.G. only)
6. Perform driveability test.
(1) Evaluate effectiveness of adjustments by driving vehicle.
(2) If unsatisfactory, proceed to step 7.
7. Check carburetor.
(1) With engine stopped, check each linkage and throttle valve for smooth operation. At the same time, make sure fuel is injected smoothly through the accelerating injection nozzle.

(2) Check choke valve opening.
a) Ensure that choke valve is fully open when engine is at operating temperature.
b) If not, turn off engine and check choke heater circuit.
c) If circuit is O.K., replace choke chamber assembly.
(3) Check interlock opening of primary and secondary throttle valves.
a) Remove carburetor from engine.
b) Turn throttle arm until adjusting plate comes in contact with lock lever at point Ⓐ and check clearance "G_1".

Clearance "G_1":
E16
6.28±0.60 mm
(0.2472±0.024 in)
E15 (M.P.G.)
5.83±0.50 mm
(0.2295±0.0197 in)



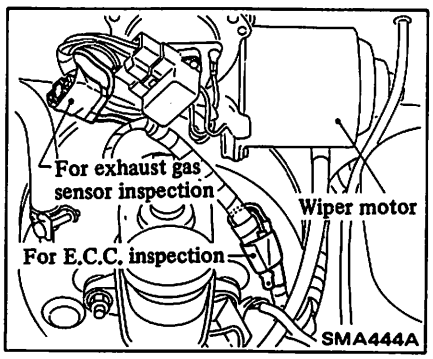
c) If out of specification, adjust by bending tongue of throttle arm.
(4) Clean jets, emulsion tubes and passages.

CAUTION:
a. Be sure to use a screwdriver of proper size.
b. Be careful not to scratch or nick jet.
c. To clean jet, use solvent and compressed air.

a) Remove choke chamber and verify that the numbers stamped on the jets are correct.
b) Remove jets and emulsion tubes carefully, and clean them. If necessary, clean passages.
c) Replace faulty jets and emulsion tubes.
d) Install in the reverse order of removal using a new packing.
e) Install carburetor to engine.
(5) Check idle CO%, following the procedure in step 5.

8. Check E.C.C. system.

(1) Verify that harness connector for E.C.C. inspection is disconnected.



(2) Connect harness connector for exhaust gas sensor inspection.
(3) Turn ignition switch "ON" and check E.C.C. inspection lamp on instrument panel.

"ON": Proceed to operation (4).
"OFF": Replace bulb of inspection lamp.

(4) Start engine and warm to operating temperature.

When engine speed increases to more than 200 rpm, inspection lamp turns "OFF".

(5) After warming up engine, run it at 2,000 rpm for about 5 minutes.
(6) Then, recheck inspection lamp.

"OFF": No trouble exists. Proceed to step 9.
"ON": Perform operation (7).

(7) Turn off engine and connect harness connector for E.C.C. inspection and check inspection lamp for lighting interval.

	Lighting interval	Faulty part or circuit	Next step
Case 1	ON / OFF	• Air-fuel ratio solenoid • Anti-dieseling solenoid • Vacuum switching solenoid (for catalyst warm-up, E15 engine only) • Vacuum switching solenoid (for air induction control, E15 engine only)	Proceed to step (8)
Case 2	ON / OFF	• Exhaust gas sensor • Water temperature sensor	Proceed to step (9)

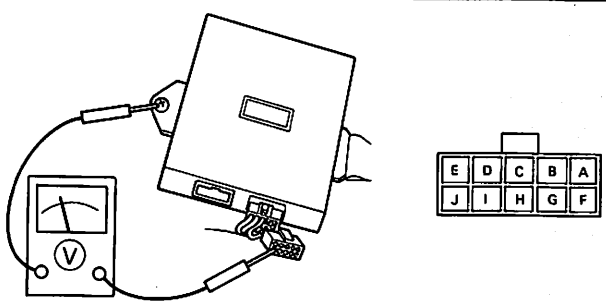
(8) Case 1: Check each solenoid.
a) Turn ignition switch "OFF".
b) Verify that each harness connector is connected securely. If not, correct and return to operation (4).
c) Disconnect each harness connector.
d) Measure the resistance of each solenoid. If out of specification, replace solenoid and return to operation (4).

Solenoid	Resistance (Ω)
Air-fuel ratio solenoid	30 - 50
Anti-dieseling solenoid	25 - 45
Vacuum switching solenoid (for catalyst warm-up, E15 engine only)	
Vacuum switching solenoid (for air induction control, E15 engine only)	

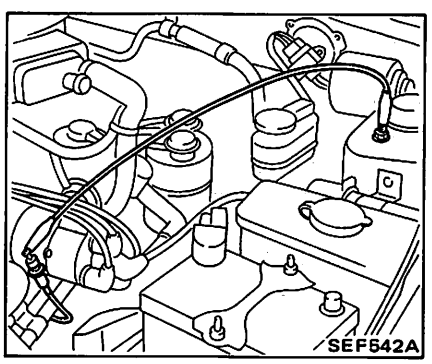
e) Reconnect harness connectors.
f) Disconnect E.C.C. 10-pin connector from control unit.
g) Turn ignition switch "ON".
h) Measure the voltage between each terminal and ground.

N.G.: Repair or replace harness.
O.K.: Replace control unit and return to operation (1).

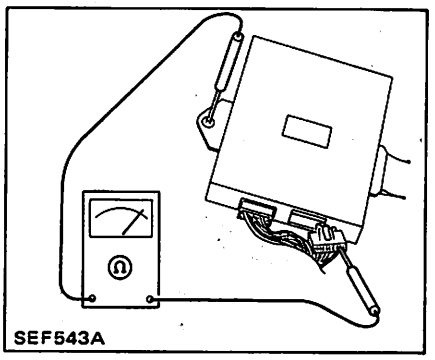
Solenoid	Check terminals		Voltage [V]
Air-fuel ratio solenoid	F	Body ground	12 - 14
Anti-dieseling solenoid	G		
Vacuum switching solenoid (for catalyst warm-up, E15 engine only)	I		
Vacuum switching solenoid (for air induction control, E15 engine only)	J		



(9) Case 2: Check each sensor.
a) Turn ignition switch "OFF".
b) Verify that each harness connector is connected securely. If not, correct and return to operation (4).
c) Disconnect E.C.C. 20-pin connector from control unit.
d) Disconnect exhaust gas sensor harness connector and connect terminal for exhaust gas sensor to ground with a jumper wire.



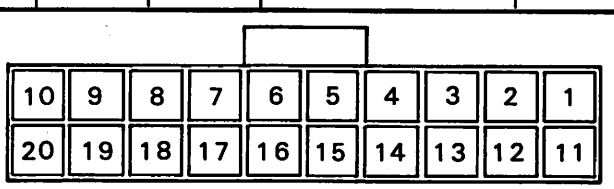
e) Check for continuity between terminal No. 2 of E.C.C. 20-pin connector and ground metal on car body.



Continuity exists:
Replace exhaust gas sensor.
Continuity does not exist:
Repair or replace E.C.C. harness.

f) If alarm lamp still indicates lighting interval of case 2 during operation (6), proceed to g).
g) Measure the water temperature sensor resistance between terminal No. 8 and No. 16 of E.C.C. 20-pin connector.

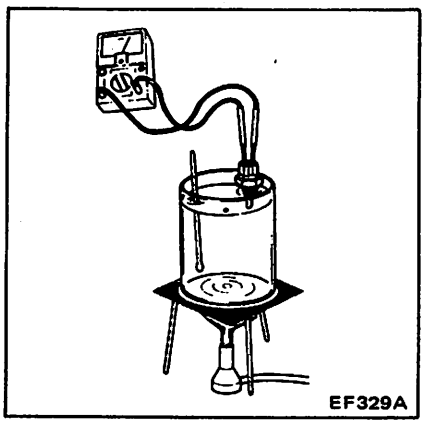
Circuit tester	Check terminals		Condition	Standard value
	+	–		
Ω	8	16	20°C (68°F) or above	Below 2.9 kΩ
			Below 20°C (68°F)	2.1 kΩ or above

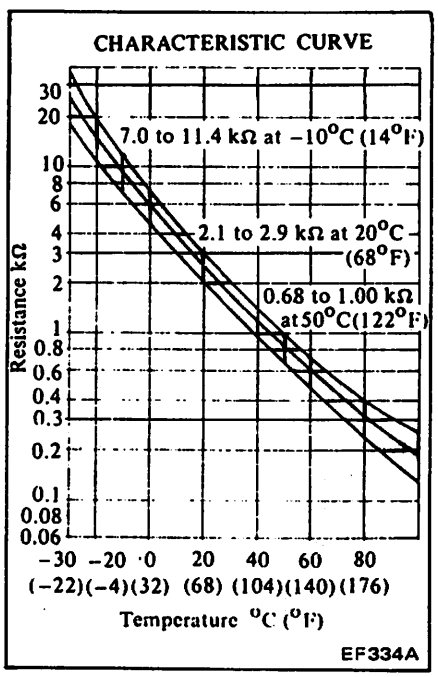


O.K.: Replace control unit and return to operation (1).

N.G.: Perform water temperature sensor check as follows.

h) Dip the water temperature sensor into water maintained at a temperature of 20°C (68°F), 80°C (176°F), etc., and read its resistance.





O.K.: Correct or replace E.C.C. harness.

N.G.: Replace water temperature sensor.

Then, return to operation (1).

9. Perform driveability test. Re-evaluate vehicle performance.

DIAGNOSTIC STEPS FOR IMPROPER IDLING

1. Inspect engine and E.C.C. system for leaks.
2. Perform ignition oscilloscope test.
3. Check ignition timing and idle rpm.
4. Check idle CO%.
5. Overhaul carburetor or replace it with a new one.
6. Check E.C.C. system.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY on the inspection procedure of each item.

ENGINE STARTABILITY

1. Inspect engine and E.C.C. system for leaks.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

2. Check battery and charging system for battery.

(1) Check battery voltage.

(2) If poor battery voltage, check charging system for battery.

- Alternator
- Voltage regulator
- Others

Refer to EL section.

3. Check starting system.

(1) Check starter operation.

(2) If it does not operate, check the following:

- Starter
- Ignition relay
- Ignition switch
- Others

Refer to EL section.

4. Check fuel supply system.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

5. Perform ignition oscilloscope test.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

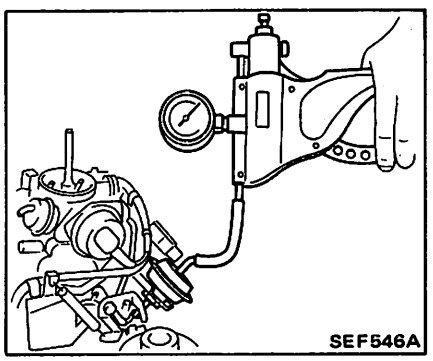
6. Check E.C.C. system.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

7. Check catalyst warm-up or fast idle system for air conditioner.

(1) Disconnect vacuum hose at throttle opener.

(2) Check throttle opener operation using a vacuum handy pump. Replace if faulty.



8. Check carburetor.

(1) With engine cold, visually check that choke valve is fully closed.

(2) In this condition, check vacuum break diaphragm operation using a vacuum handy pump.

Clearance "R":

E16

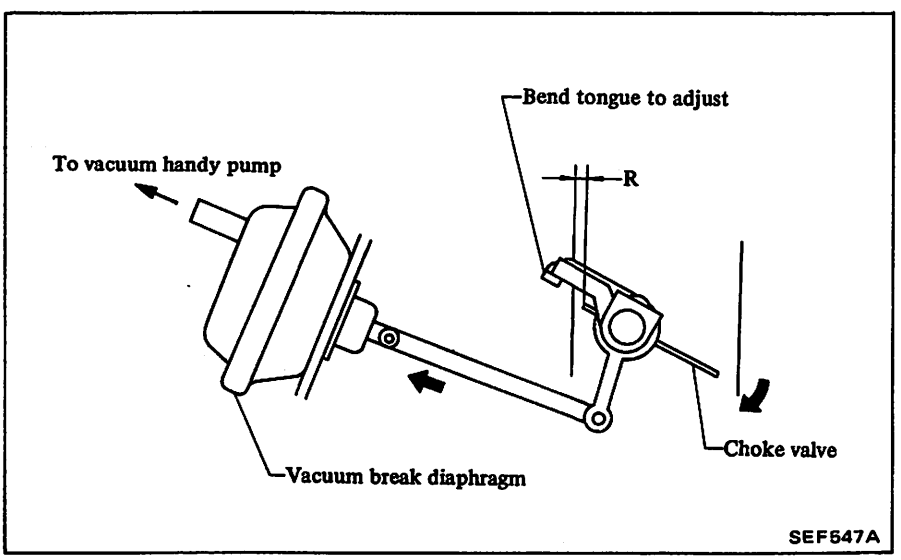
2.60±0.09 mm

(0.1024±0.0035 in)

E15 (M.P.G.)

1.53±0.09 mm

(0.0602±0.0035 in)

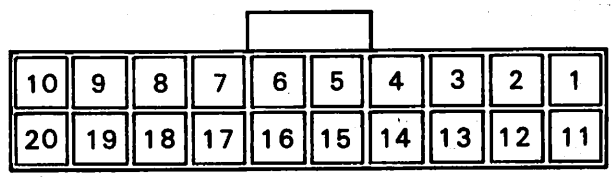


(3) If out of specification, adjust clearance by bending adjusting tongue.
9. Perform startability test.
(1) Start engine with the recommended starting procedure.
(2) If engine does not start, proceed to step 10.
10. Check and adjust idle CO%.
Check idle CO%. Follow the procedure from step 5, operations (1) through (8) in DIAGNOSTIC STEP FOR DRIVEABILITY.

ENGINE STALL

1. Check E.C.C. system.
Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.
2. Check idle rpm.
Check idle rpm. Follow the procedure from step 4-(1), operations a) through c) in DIAGNOSTIC STEP FOR DRIVEABILITY.
3. Check fuel shut-off system.
(1) Check clutch switch and neutral switch circuits for continuity.
a) Turn ignition switch "OFF".
b) Disconnect E.C.C. 20-pin connector.
c) Check for continuity.

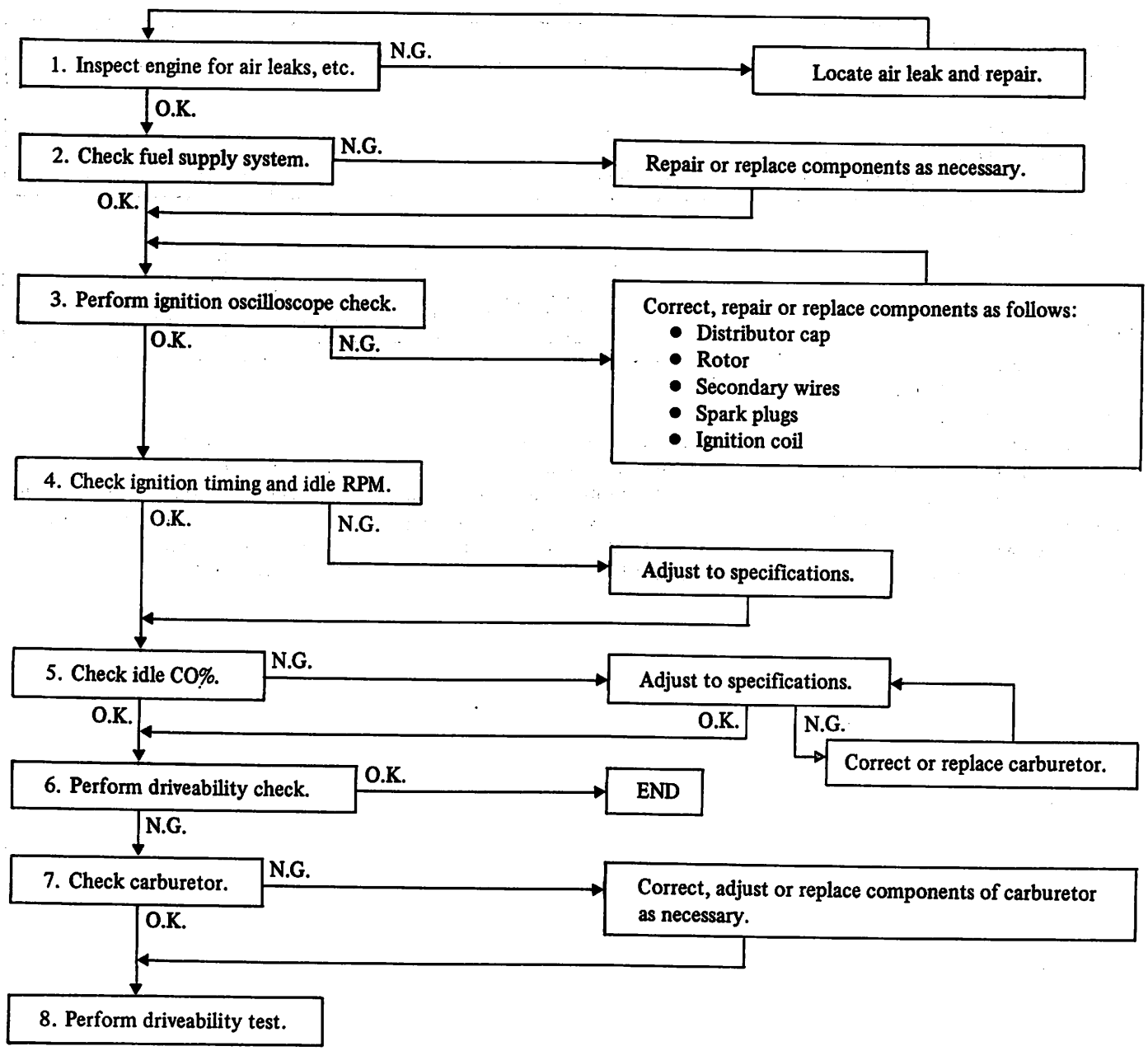
Check circuit	Check terminals		Note
	+	–	
Clutch switch	5	Body ground	With clutch disengaged
Neutral switch	4		In neutral position



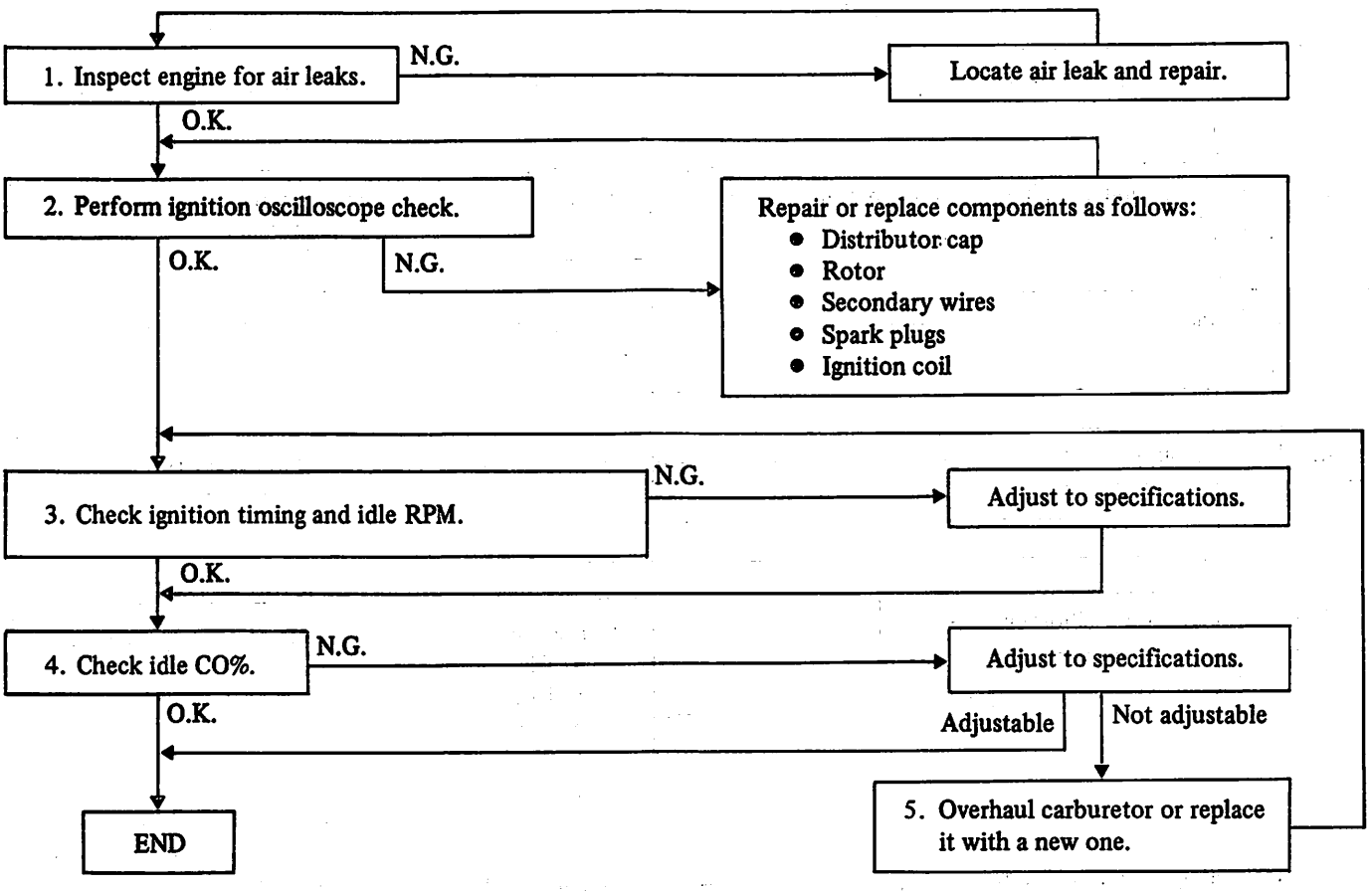
d) If continuity does not exist, check harness or component.
(2) Check throttle valve switch adjustment. Follow the procedure step 4-(2) in DIAGNOSTIC STEP FOR DRIVEABILITY.
4. Overhaul carburetor or replace it with a new one.
5. Adjust idle rpm, ignition timing and idle CO% to the specified values.
Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

DIAGNOSTIC PROCEDURE FOR CARBURETOR ENGINE

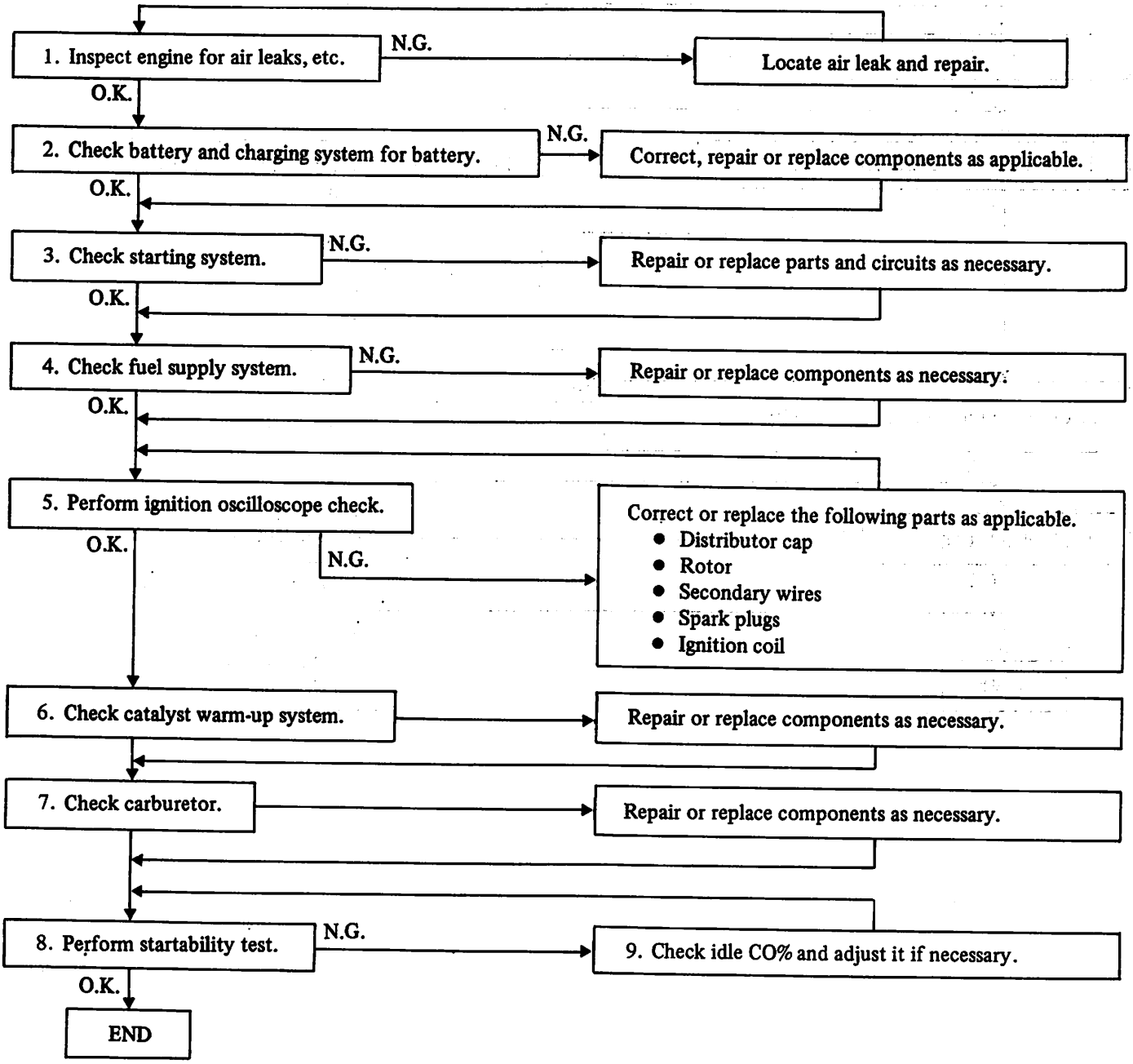
DRIVEABILITY



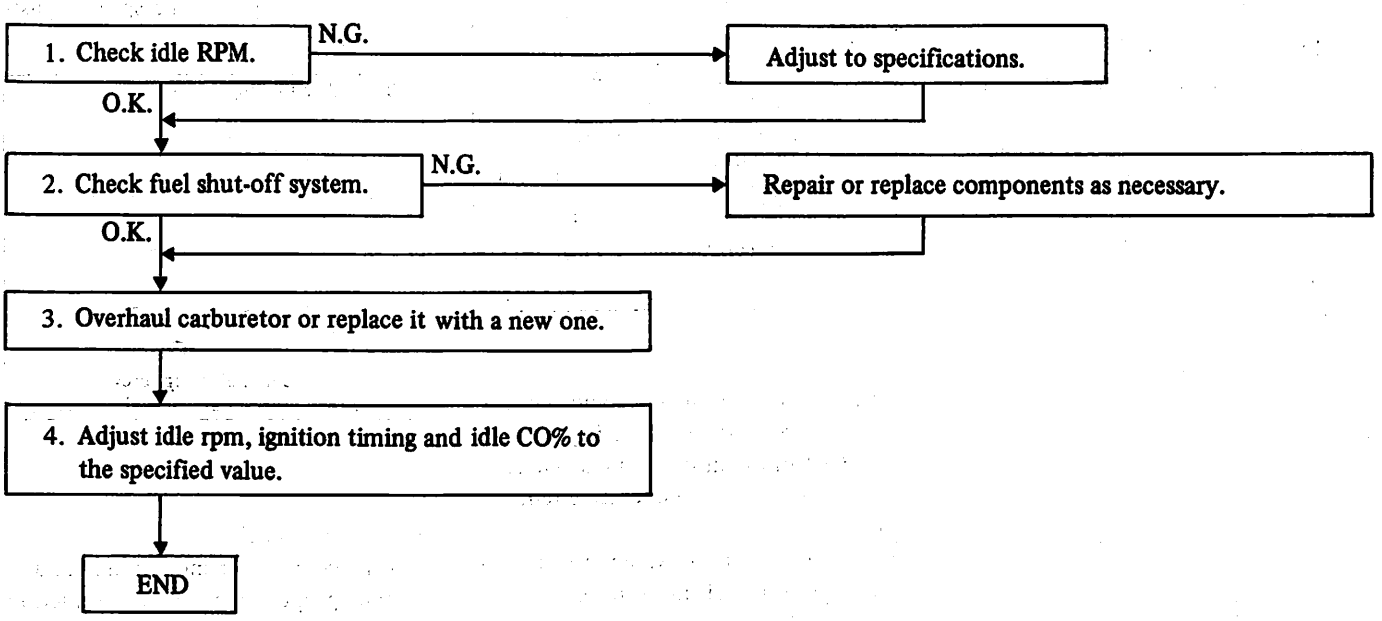
IMPROPER IDLING



ENGINE STARTABILITY



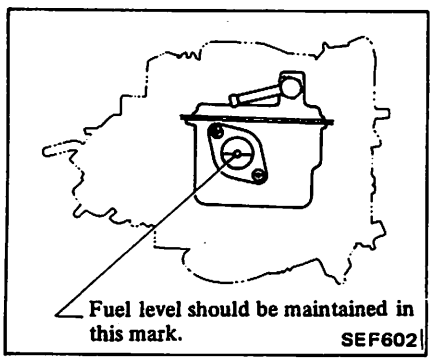
ENGINE STALL



DIAGNOSTIC STEPS FOR DRIVEABILITY

1. Inspect engine for leaks.
(1) Check clamps at all air intake components.
(2) Check vacuum hoses for leakage.
(3) Check air cleaner filter for clogging.
(4) Visually inspect for leaks at the following:
- Dipstick
- A.B. valve hose
- Air induction hose
- Intake manifold gasket
- Valve rocker cover
- E.G.R. valve gasket
- Oil filler cap

(5) Check E.G.R. valve seat and operation.
(6) Check A.B. valve operation.
2. Check fuel supply system
(1) Make sure proper fuel is used.
(2) Visually check fuel filter for clogging.
(3) Visually check fuel lines for leaks.
(4) With engine idling, visually check fuel level.

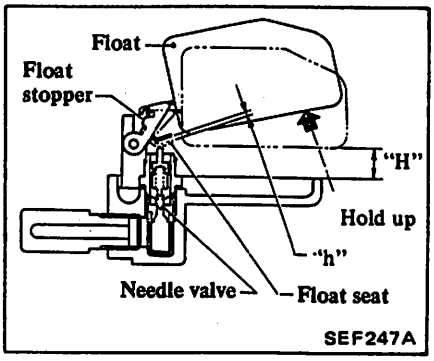


If not correct, adjust as follows.
a) Turn off engine and remove choke chamber.
b) Turn down choke chamber and adjust "H" by bending float seat.

"H":
Approximately 12 mm (0.47 in)

c) Adjust "h" by bending float stopper as required.

"h":
1.3 - 1.7 mm (0.051 - 0.067 in)



d) Install choke chamber and recheck fuel level with engine idling.
3. Perform ignition oscilloscope test.
(1) Warm engine to operating temperature.
(2) Check ignition system for unusually high or low firing voltage.
(3) If firing voltage is abnormal, determine cause and repair.
4. Check ignition timing and idle rpm.

Checks and adjustments are made with the air conditioning compressor "OFF".

- Non-California models

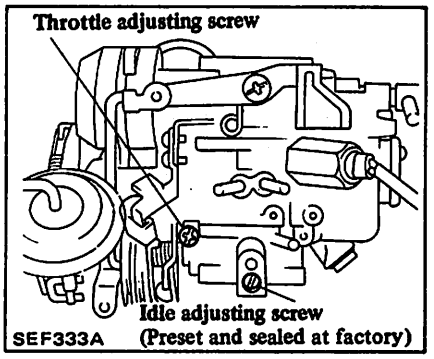
(1) Disconnect air induction hoses and install proper caps on air induction pipes.
(2) Verify that the engine is still at operating temperature.
(3) Rev the engine to 2,000 to 3,000 rpm two or three times under no-load, then allow it to run at idle speed for one minute.
(4) Disconnect distributor vacuum hose from distributor vacuum controller, and plug hose with proper plug. Then, check ignition timing with a timing light.

M/T:
5°±2° A.T.D.C.
A/T:
5°±2° A.T.D.C.
(in "D" position)

Adjust as necessary.
(5) Connect distributor vacuum hose and check idle speed.

M/T:
750±100 rpm
A/T:
650±100 rpm
(in D position)

If necessary, adjust to the specified rpm by turning the idle speed adjusting screw.



- Canada models

(1) Disconnect air induction hose and install proper cap on air induction pipe.
(2) Verify that the engine is still at operating temperature.
(3) Rev the engine to 2,000 to 3,000 rpm two or three times under no-load, then allow it to run at idle speed for one minute.
(4) Disconnect distributor vacuum hose from distributor vacuum controller, and plug hose with proper plug. Then, check ignition timing with a timing light.

M/T:
5°±2° A.T.D.C.
A/T:
5°±2° A.T.D.C.
(in "D" position)

Adjust as necessary. (Refer to section MA.)
(5) Connect distributor vacuum hose and check idle speed.

M/T:
750±100 rpm
A/T:
650±100 rpm (in D position)

If necessary, adjust to the specified rpm by turning the idle speed adjusting screw.

5. Check idle CO%.

The checking or adjustment of idle CO% requires the use of a CO meter. It is essential that the meter be fully warmed up and calibrated before any adjustment is made.

(1) Make sure that air induction hose is disconnected.
(2) Verify that the engine is at operating temperature.
(3) With the hood open, run the engine at 2,000 rpm for 2 minutes at no-load to stabilize its condition.
(4) Rev the engine to 2,000 to 3,000 rpm 2 or 3 times under no-load, finally, allow it to run at idle speed for one minute.
(5) Reset idle speed to the specified speed.
(6) Check CO% as per Table A, Column 1 and if necessary, adjust to the specified point as per Table A, Column 2. The CO% adjustment is made by turning the idle mixture screw.

Table A

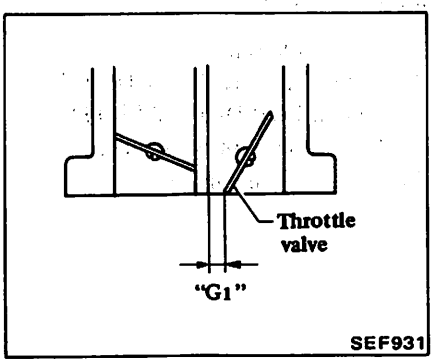
Vehicle model	Trans-axle	Check idle CO% Column 1	Adjust idle CO% Column 2
U.S.A.	M/T	Less than 4%	1.5 $^{+1.0}_{-0.7}$%
	A/T	Less than 4% (in "D" range)	1.5 $^{+1.0}_{-0.7}$% (in "D" range)
Canada	M/T	2±1%	
	A/T	2±1% (in "D" range)	

(7) Check the idle speed. Readjust to the specified speed.
(8) Connect air induction hose.

6. Perform driveability test.
(1) Evaluate effectiveness of adjustments by driving vehicle.
(2) If unsatisfactory, proceed to step 7.

7. Check carburetor.
(1) With engine stopped, check each linkage and throttle valve for smooth operation. At the same time, make sure fuel is injected smoothly through the accelerating injection nozzle.
(2) Check choke valve opening.
a) Ensure that choke valve is fully open when engine is at operating temperature.
b) If not, turn off engine and check choke heater circuit.
c) If circuit is O.K., replace choke chamber assembly.
(3) Check interlock opening of primary and secondary throttle valves.
a) Remove carburetor from engine.
b) Turn throttle arm until adjusting plate comes in contact with lock lever at point Ⓐ and check clearance "G_1".

Clearance "G_1":
6.28±0.6 mm
(0.2472±0.024 in)



c) If out of specification, adjust by bending tongue of throttle arm.
(4) Clean jets, emulsion tubes and passages.

CAUTION:
a. Be sure to use a screwdriver of proper size.
b. Be careful not to scratch or nick jet.
c. To clean jet, use solvent and compressed air.

a) Remove choke chamber and verify that the numbers stamped on the jets are correct.
b) Remove jets and emulsion tubes carefully, and clean them. If necessary, clean passages.
c) Replace faulty jets and emulsion tubes.
d) Install in the reverse order of removal using a new packing.
e) Install carburetor to engine.
(5) Check idle CO%, following the procedure in step 5.

8. Perform driveability test. Re-evaluate vehicle performance.

DIAGNOSTIC STEPS FOR IMPROPER IDLING

1. Inspect engine for leaks.
2. Perform ignition oscilloscope test.
3. Check ignition timing and idle rpm.
4. Check idle CO%.
5. Overhaul carburetor or replace it with a new one.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY on the inspection procedure of each item.

ENGINE STARTABILITY

1. Inspect engine for leaks.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

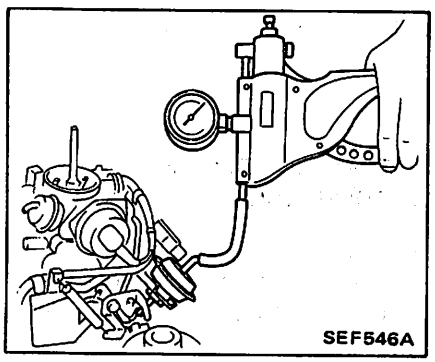
2. Check battery and charging system for battery.
(1) Check battery voltage.
(2) If poor battery voltage, check charging system for battery.
- Alternator
- Voltage regulator
- Others

Refer to EL section.

3. Check starting system.
(1) Check starter operation.
(2) If it does not operate, check the following:
- Starter
- Ignition relay
- Ignition switch
- Others

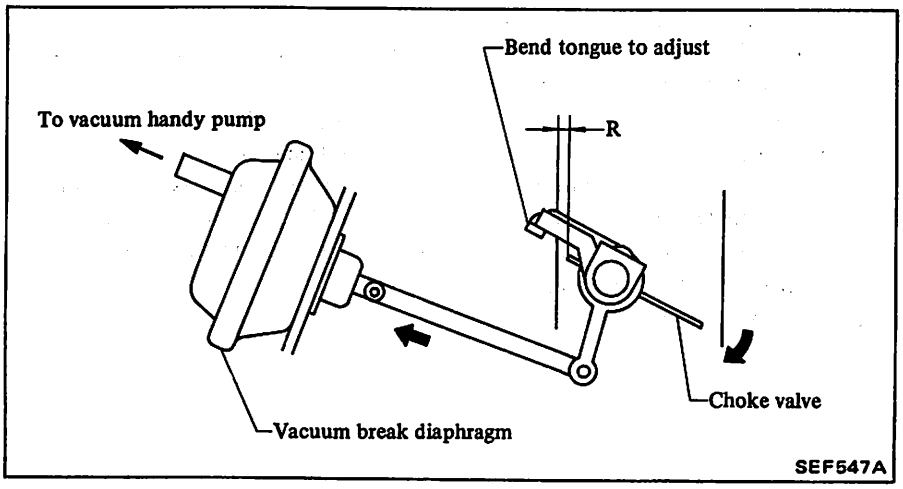
Refer to EL section.

4. Check fuel supply system.
Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.
5. Perform ignition oscilloscope test.
Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.
6. Check fast idle system. (Air conditioner equipped model)
(1) Disconnect vacuum hose at throttle opener.
(2) Check throttle opener operation using a vacuum handy pump. Replace if faulty.


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7. Check carburetor.
(1) With engine cold, visually check that choke valve is fully closed.
(2) In this condition, check vacuum break diaphragm operation using a vacuum handy pump.

Clearance "R":
Non-California
2.60±0.09 mm
(0.1024±0.0035 in)
Canada
2.06±0.09 mm
(0.0811±0.0035 in)

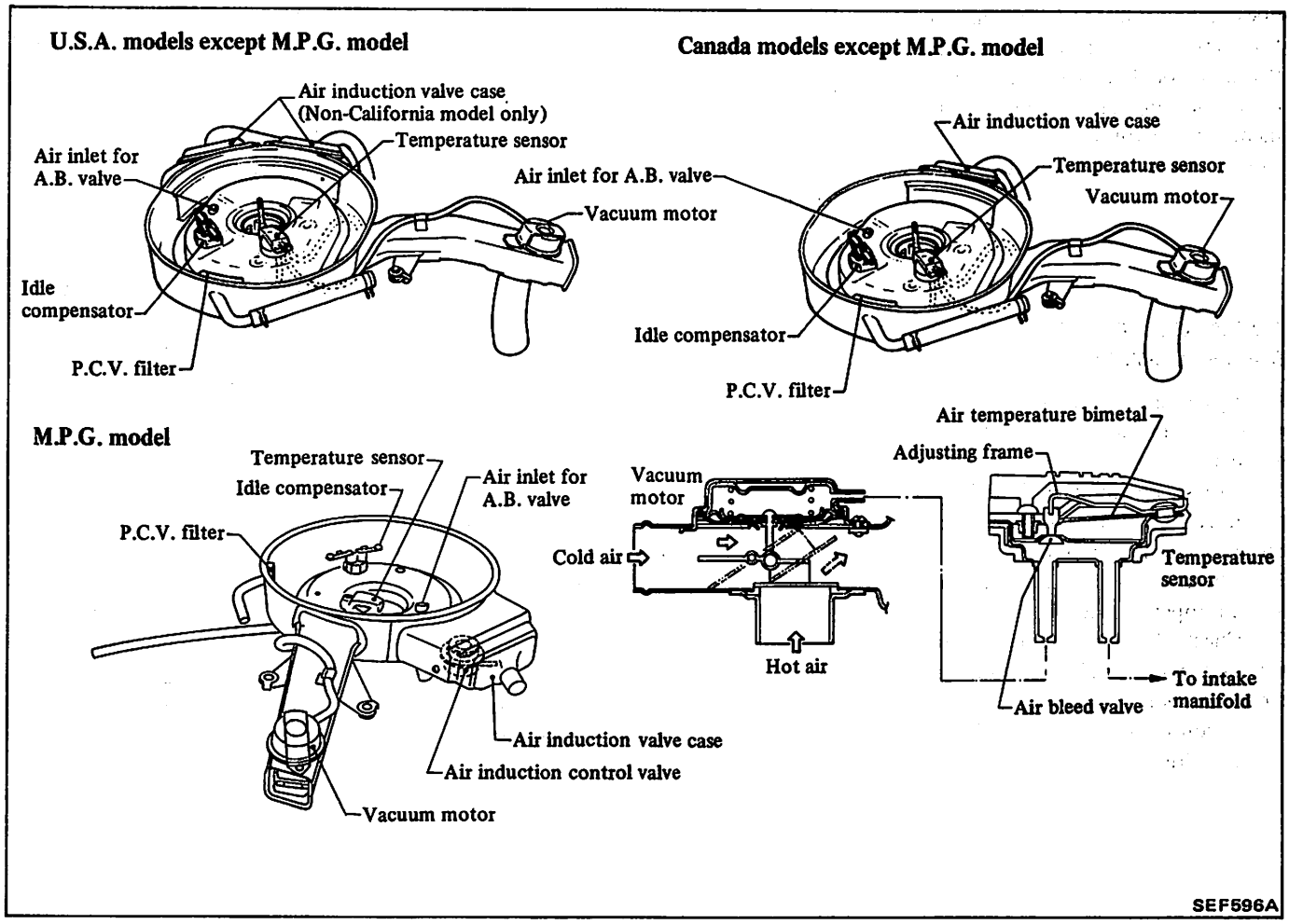


(3) If out of specification, adjust clearance by bending adjusting tongue.
8. Perform startability test.
(1) Start engine with the recommended starting procedure.
(2) If engine does not start, proceed to step 9.
9. Check and adjust idle CO%.
Check idle CO%. Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

ENGINE STALL

1. Check idle rpm.
Check idle rpm. Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.
2. Check fuel shut-off system.
(1) Non-California models
a) Turn ignition switch "ON" and run engine under no-load. Increase and decrease engine rpm to check operating sound of anti-dieseling solenoid valve.
b) if N.G., repair or replace solenoid valve or harness.
(2) Canada models
a) Turn ignition switch "ON" and check operating sound of anti-dieseling solenoid valve.
b) If N.G., repair or replace solenoid valve or harness.
3. Overhaul carburetor or replace it with a new one.
4. Adjust idle rpm, ignition timing and idle CO% to the specified values.
Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

AUTOMATIC TEMPERATURE CONTROL (A.T.C.) AIR CLEANER



OPERATION

The automatic temperature control system of the air cleaner is controlled by the inlet air temperature and the load condition of the engine. The inlet air temperature is detected by the sensor, and the vacuum motor is actuated by the engine intake vacuum.

Temperature sensor		Vacuum motor		Inlet air
Ambient temperature around sensor °C (°F)	Operation	Intake manifold vacuum kPa (mmHg, inHg)	Operation	
Below 38 (100)	Close	Above 21.3 (160, 6.30)	Raise	Hot
		5.3 - 21.3 (40 - 160, 1.57 - 6.30)	Partially raise	Cold + Hot
		Below 5.3 (40, 1.57)	Down	Cold
Above 53 (127)	Open	Any value	Down	

The temperature sensor partially opens between 38°C and 53°C (100°F and 127°F) so that the intake manifold vacuum will be reduced. This causes the motor to activate, which in turn opens the cold air passage wide, for cold air to be taken in.

INSPECTION

AIR CLEANER FILTER

Viscous paper type air cleaner filter does not require any cleaning operation until it is replaced periodically. Brushing or blasting operation will cause clogging and result in enrichment of carburetor mixture, and should never be conducted.

AUTOMATIC TEMPERATURE CONTROL SYSTEM

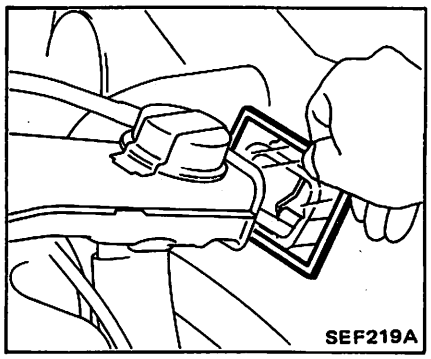
- Engine stall or hesitation
- Increase in fuel consumption
- Lack of power

If these phenomena should occur, check A.T.C. system before carrying out inspection of carburetor.

1. Check hoses for cracks, distortion and improper position.
2. Check A.T.C. system for proper function, while engine is cold. Check air control valve position.

Air control valve is correct if it is in lower position.

3. Start engine and immediately check air control valve position. If it rises, it is correct.


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4. Make sure that air control valve rises and lowers when engine speed is quickly increased and decreased.
5. Make sure that air control valve partially rises when engine warm-up advances.

If the above test reveals any problem in the operation of air control valve, carry out the following test:

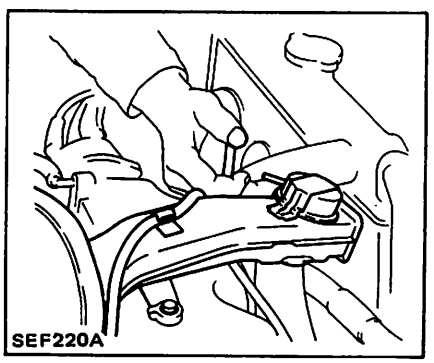
VACUUM MOTOR

Disconnect vacuum motor inlet vacuum hose, and connect another hose to the inlet to apply vacuum to vacuum motor. Then, confirm that the air control valve moves.

TEMPERATURE SENSOR

While engine is cold and idling, disconnect vacuum motor inlet vacuum hose and make sure that intake vacuums is present at end of vacuum hose.

If vacuum is weak or is not present at all, check vacuum hoses for leakage. Replace temperature sensor if vacuum hoses are in good order.


SEF220A

IDLE COMPENSATOR

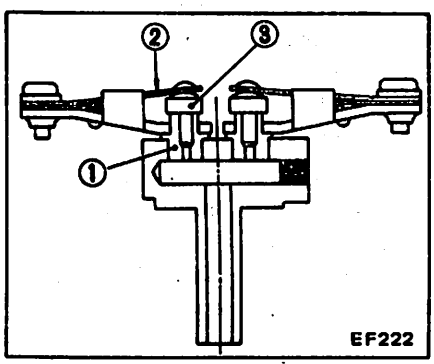
DESCRIPTION

The idle compensator is basically a thermostatic valve which functions to introduce the air directly from the air cleaner to the intake manifold to compensate for abnormal enrichment of mixture in high idle temperature.

The bi-metal attached to the idle compensator detects the temperature of intake air, and opens or closes the valve. Two idle compensators having different temperature characteristics are installed.

Idle compensator opening temperature

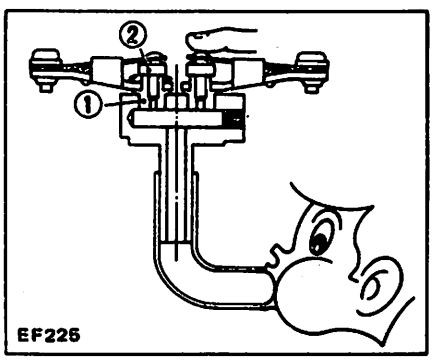
No. 1	60 - 70°C (140 - 158°F)
No. 2	70 - 80°C (158 - 176°F)



1 Orifice
2 Bimetal
3 Rubber valve

INSPECTION

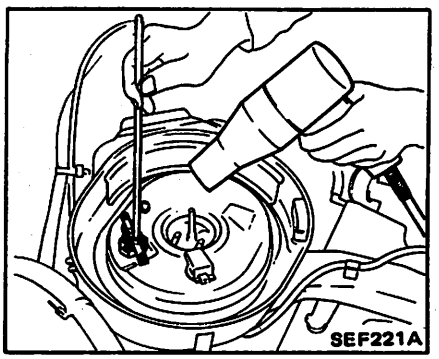
1. Check that valve is in closed position when bimetal temperature is lower than operating temperature. To check, breathe air into tube or suck air. If excessive air leakage is found at the valve, replace idle compensator as an assembly. Note that two idle compensators are mounted to air cleaner, and that it is necessary to plug the valve of one of these idle compensators so as to prevent air leak while checking the other one.



1 Orifice
2 Rubber valve

2. Warm up engine completely.
3. Open engine hood and remove air cleaner cover.
4. Direct warm air to idle compensator with a heat gun.

And measure operating temperature of idle compensator.



Place thermometer as close as possible to idle compensator sensor.

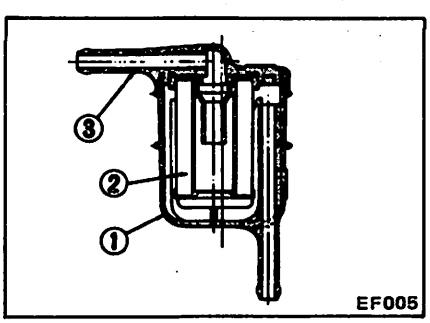
5. Idle compensator is in good order if a "hissing" sound is heard when its temperature reaches operating temperature.

If not, replace idle compensator.

FUEL FILTER

DESCRIPTION

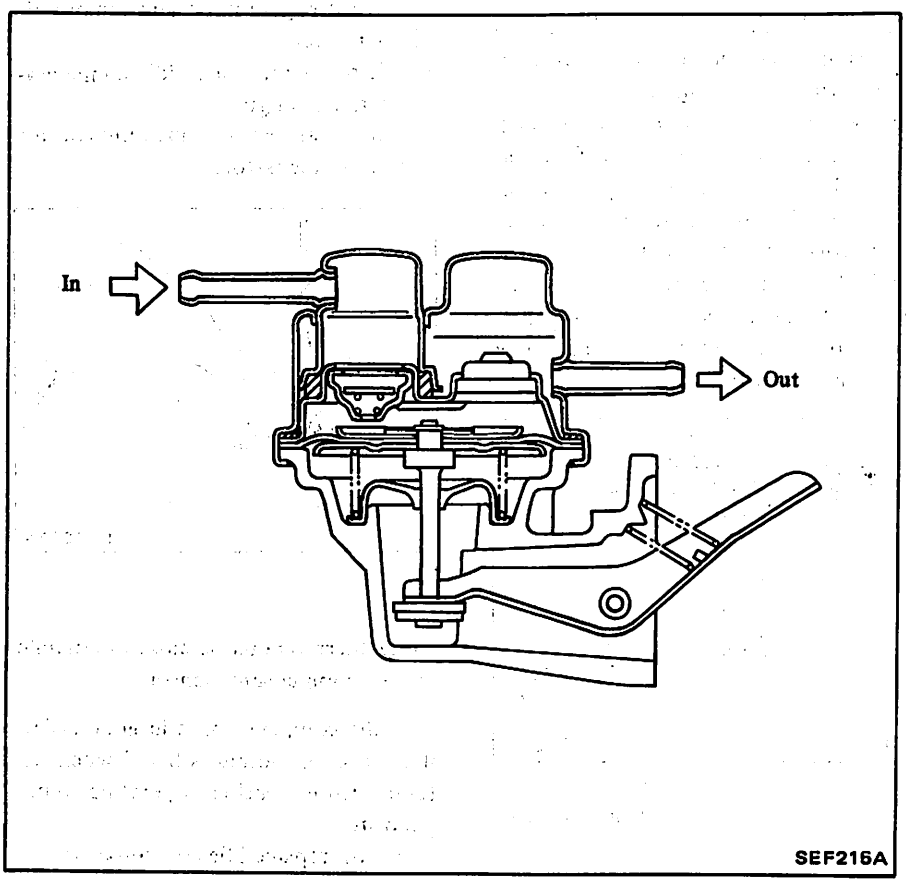
The fuel filter is a cartridge type. It uses a paper element.



1 Body
2 Paper element
3 Cover

FUEL PUMP

The fuel pump can not be disassembled.



When disconnecting fuel hoses, use a container to receive fuel remaining in fuel hoses.

OPERATING TEST

STATIC PRESSURE TEST

1. Disconnect fuel hose between carburetor and fuel pump.
2. Connect a rubber hose to each open end of a T-connector, and connect this connector-hose assembly between carburetor and fuel pump.

Locate this T-connector as close to carburetor as possible.

3. Connect a suitable pressure gauge to the opening of T-connector, and fasten the hose between carburetor and T-connector securely with a clip.
4. Start and run the engine at various speeds.
5. The pressure gauge indicates static fuel pressure in the line. The gauge reading should be within the specified value.

Fuel pump pressure:
21.6 - 26.5 kPa
(0.22 - 0.27 kg/cm², 3.1 - 3.8 psi)

If pressure is not within the specified limit, remove pump as an assembly.

CAPACITY TEST

The capacity test is conducted only when static pressure is within the specification. To conduct this test, proceed as follows:

1. Disconnect pressure gauge from T-connector and, in its vacant place, install a suitable container as a fuel sump.
2. Start engine and run at 750 rpm.
3. Pump should deliver the specified amount of fuel.

If little or no fuel flows from open end of pipe, it is an indication that fuel line is clogged or pump is malfunctioning.

Fuel pump capacity:
More than 1,300 mℓ
(44.0 US fl oz, 45.8 Imp fl oz)/min
at 600 rpm

If the fuel in the carburetor float chamber has run out and engine has stopped, remove clip and pour fuel into carburetor. Fasten clip securely and repeat static pressure test.

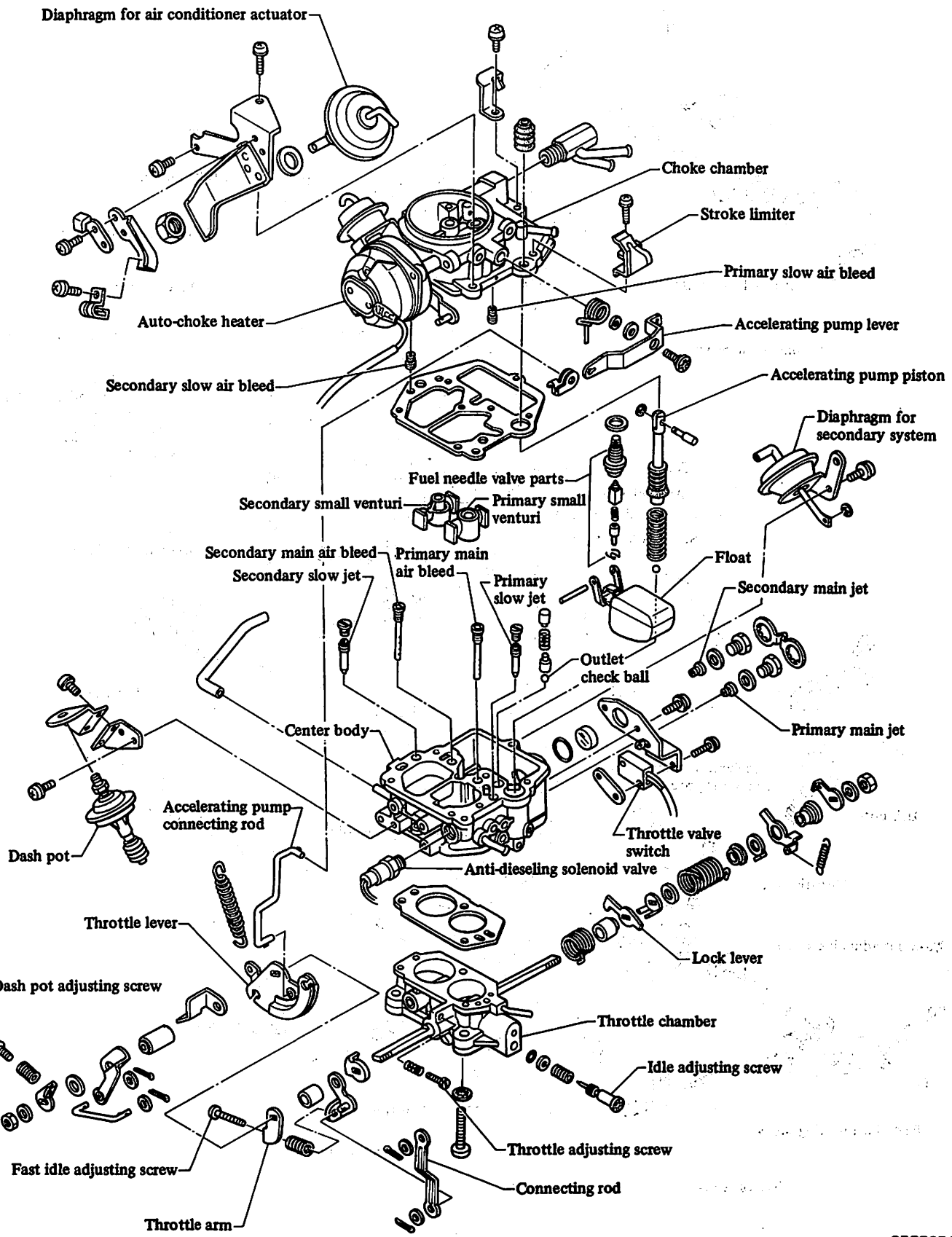
INSPECTION

Test the function as follows.

1. Position fuel pump assembly about 1 meter (3.3 ft) above fuel level of fuel strainer and connect a pipe from strainer to fuel pump.
2. Operate rocker arm by hand. If fuel is drawn up soon after rocker arm is released, fuel pump is functioning properly.

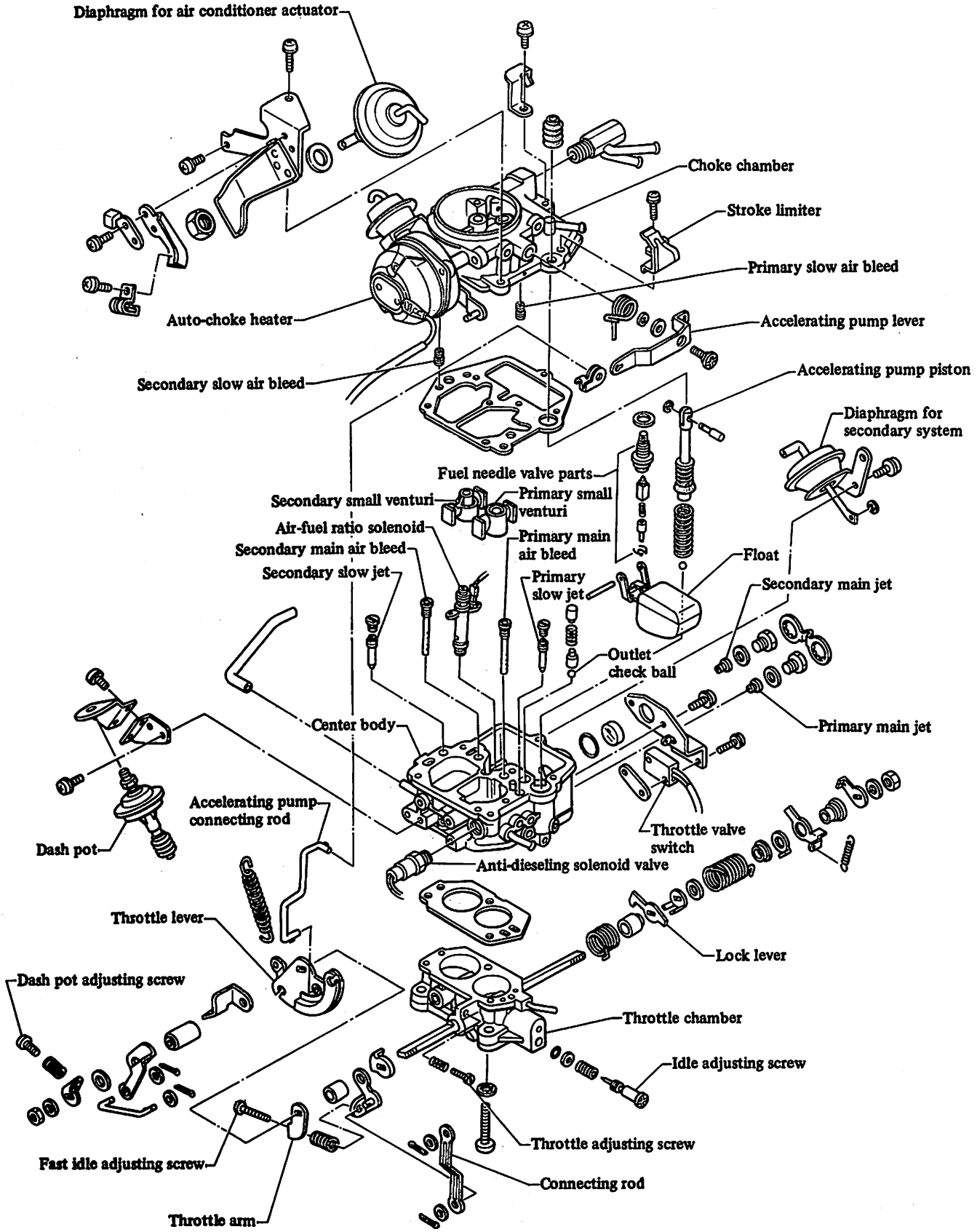
CARBURETOR

Except California and M.P.G. models



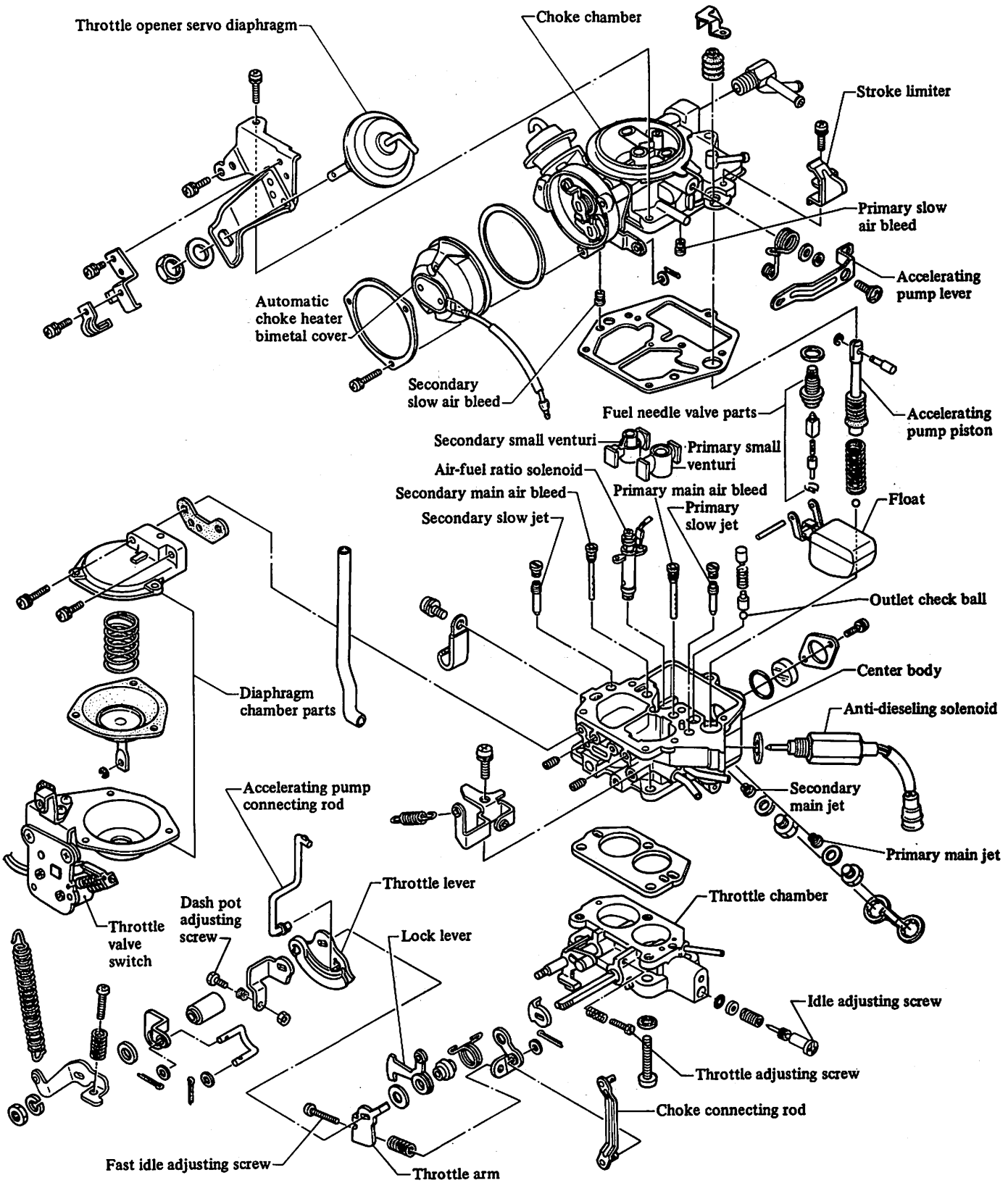
SEF725A

California models



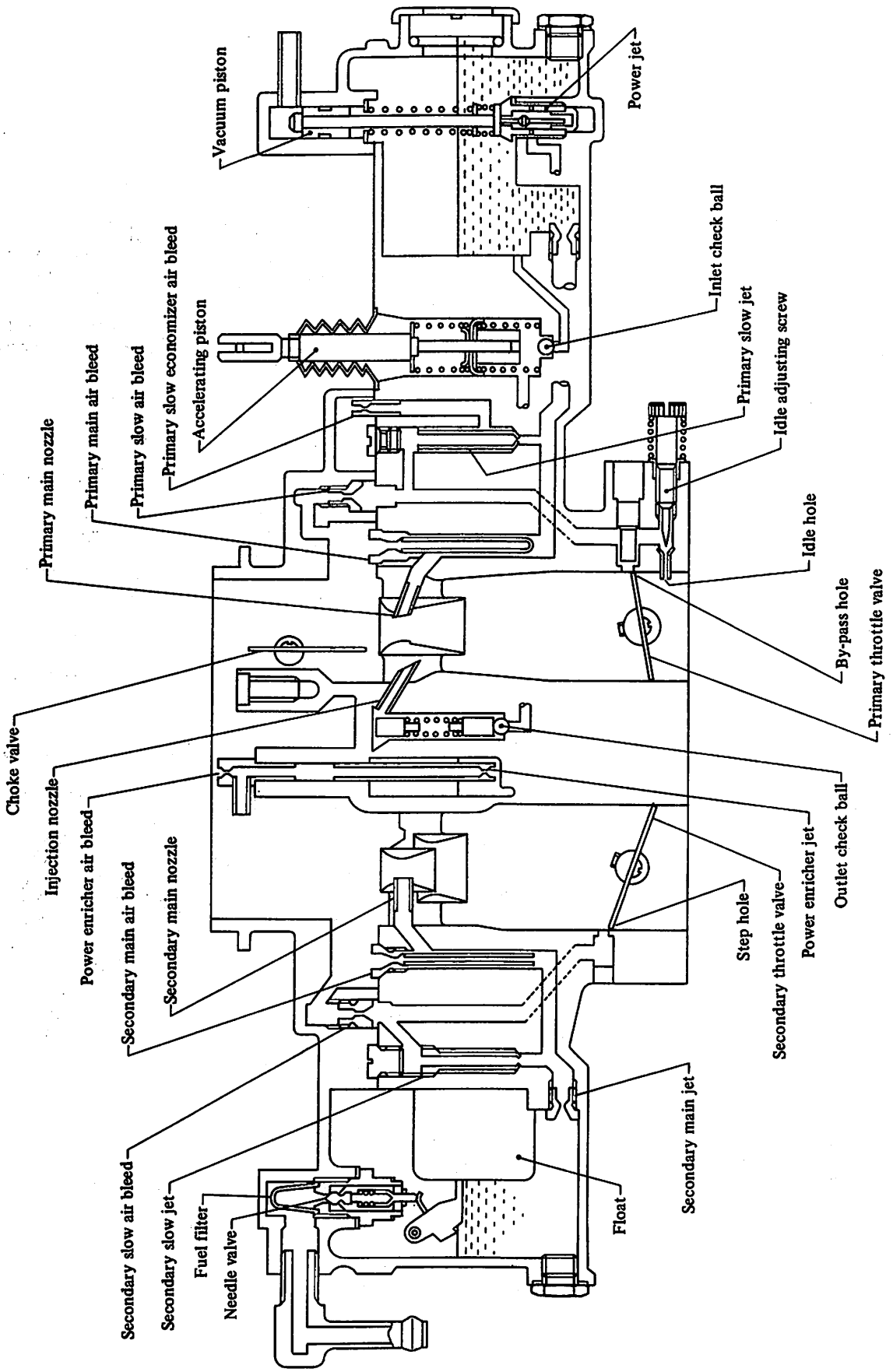
SEF726A

M.P.G. models



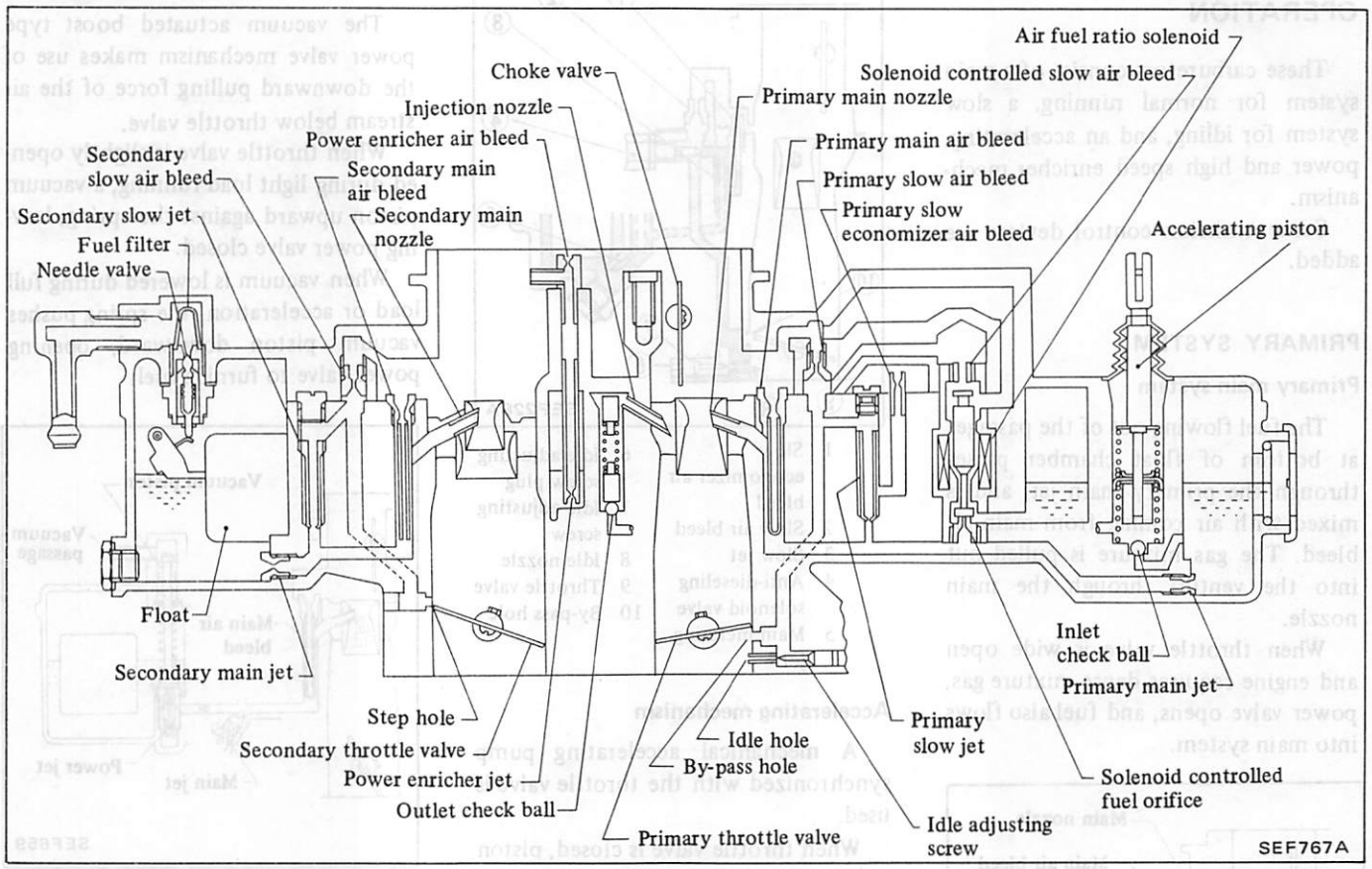
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Except California and M.P.G. models

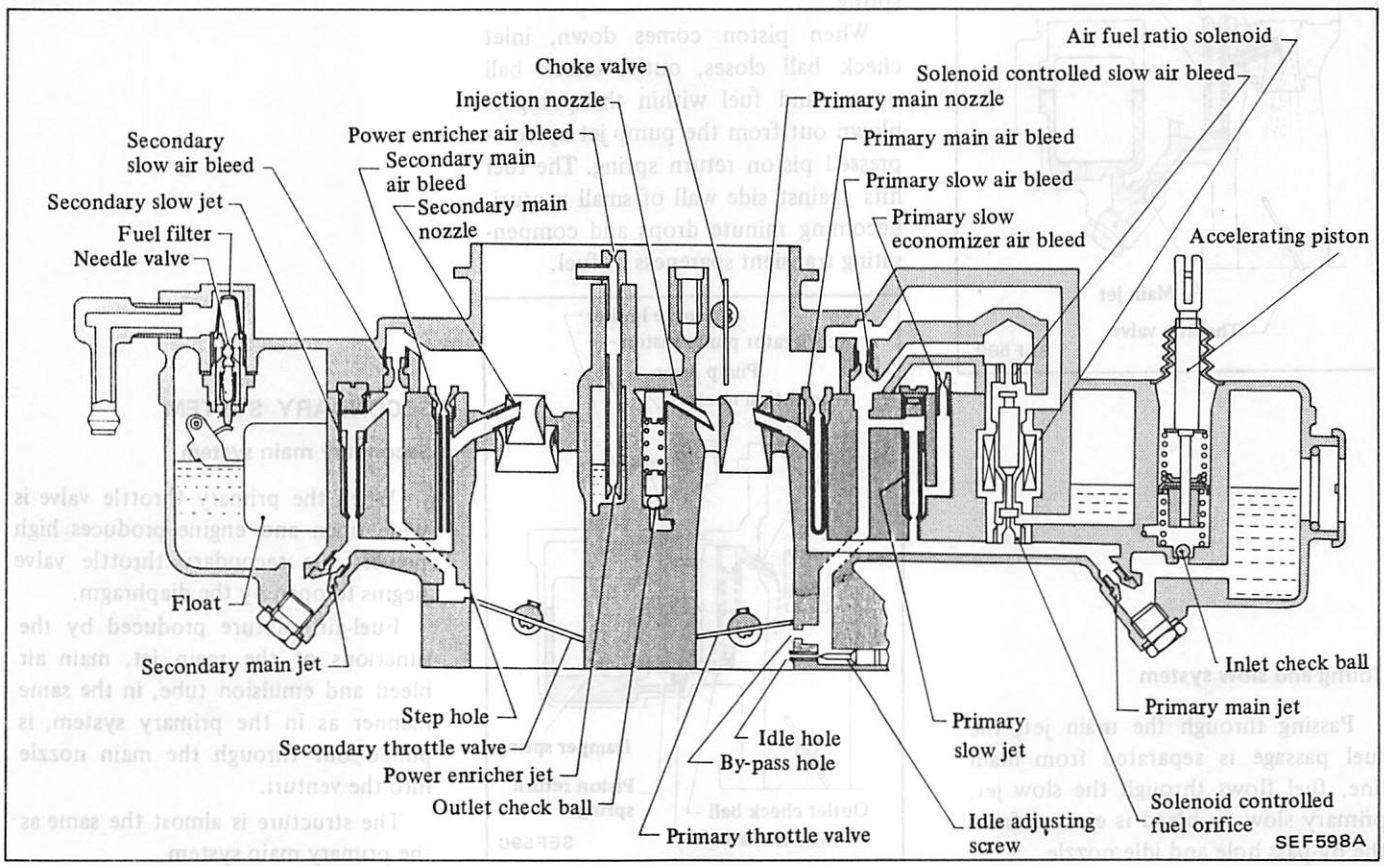


SEF762A

California models



M.P.G. models



STRUCTURE AND OPERATION

These carburetors consist of a main system for normal running, a slow system for idling, and an accelerating, power and high speed enricher mechanism.

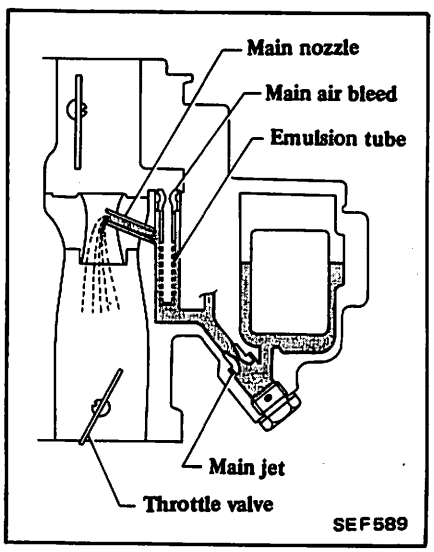
Some emission control devices are added.

PRIMARY SYSTEM

Primary main system

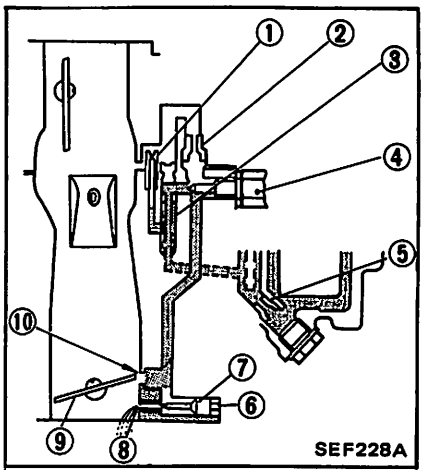
The fuel flowing out of the passages at bottom of float chamber passes through the primary main jet, and is mixed with air coming from main air bleed. The gas mixture is pulled out into the venturi through the main nozzle.

When throttle valve is wide open and engine requires dense mixture gas, power valve opens, and fuel also flows into main system.



Idling and slow system

Passing through the main jet, the fuel passage is separated from main line, fuel flows through the slow jet, primary slow air bleed is ejected from the by-pass hole and idle nozzle.



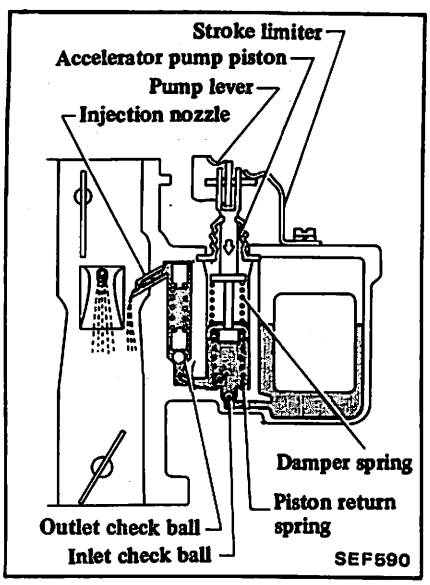
1 Slow economizer air bleed
2 Slow air bleed
3 Slow jet
4 Anti-dieseling solenoid valve
5 Main metering jet
6 Idle adjusting screw plug
7 Idle adjusting screw
8 Idle nozzle
9 Throttle valve
10 By-pass hole

Accelerating mechanism

A mechanical accelerating pump synchronized with the throttle valve is used.

When throttle valve is closed, piston rod is pushed up with linkage, which pushes up piston through piston return spring.

When piston comes down, inlet check ball closes, outlet check ball opens, and fuel within the pump is blown out from the pump jet by compressed piston return spring. The fuel hits against side wall of small venturi, becoming minute drops and compensating transient spareness of fuel.

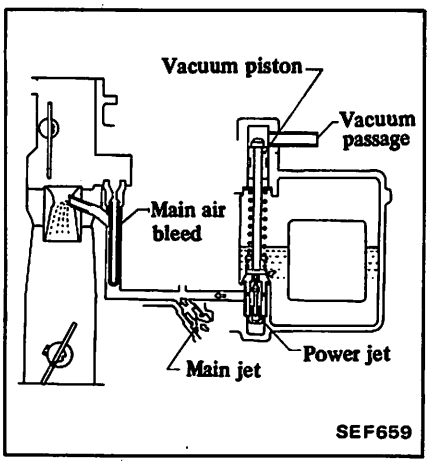


Power valve mechanism

The vacuum actuated boost type power valve mechanism makes use of the downward pulling force of the air stream below throttle valve.

When throttle valve is slightly opened during light load running, a vacuum piston upward against the spring, leaving power valve closed.

When vacuum is lowered during full load or acceleration, the spring pushes vacuum piston downward, opening power valve to furnish fuel.



SECONDARY SYSTEM

Secondary main system

When the primary throttle valve is wide open and engine produces high power, the secondary throttle valve begins to open by the diaphragm.

Fuel-air mixture produced by the functions of the main jet, main air bleed and emulsion tube, in the same manner as in the primary system, is pulled out through the main nozzle into the venturi.

The structure is almost the same as the primary main system.

Secondary switchover mechanism

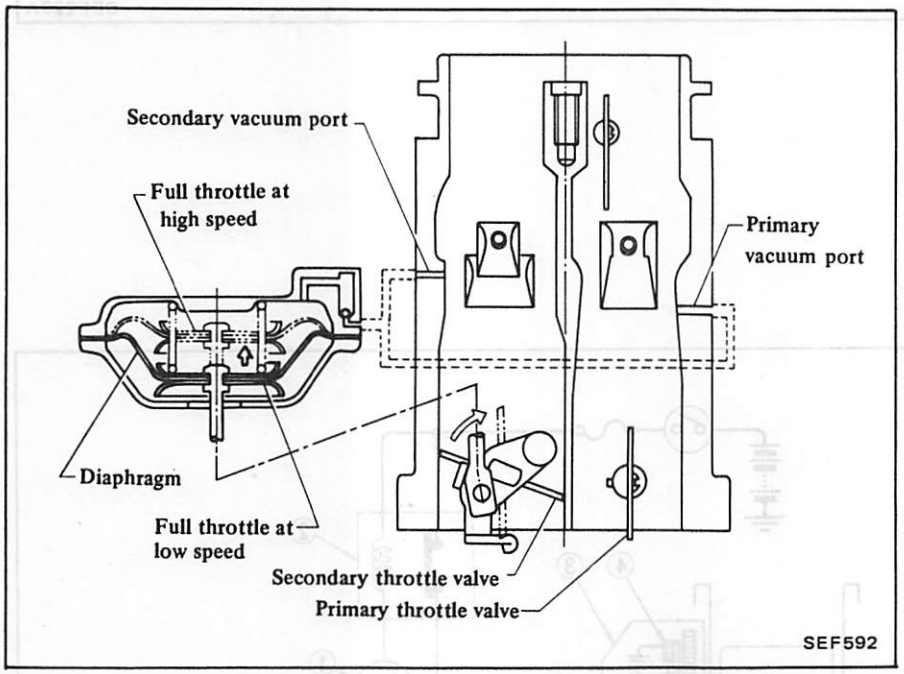
The secondary throttle valve is linked to the diaphragm which is actuated by the vacuum created in the venturi. A vacuum port is provided at each of the primary and secondary venturis, and the composite vacuum of these ports actuates the diaphragm.

As the linkage causes the secondary throttle valve to close until the primary throttle valve opening reaches approximately 48°, fuel consumption during normal operation is not excessive.

During high speed running, as the vacuum at the venturi is increased, the diaphragm is pulled against the diaphragm spring force, and then secondary throttle valve is opened.

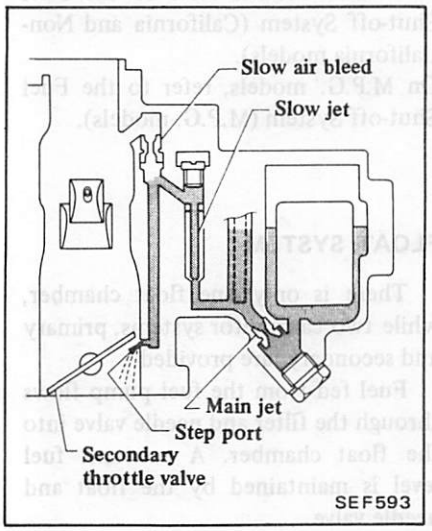
The other side, during low speed running (as the primary throttle valve opening does not reach 48°), the secondary throttle valve is locked to close completely by the locking arm which is interlocked with primary throttle arm by linkage.

When the primary throttle valve opening reaches wider position than 48°, the secondary throttle valve is ready to open, because the locking arm revolves and leaves from the secondary throttle arm.



Secondary slow system (Step system)

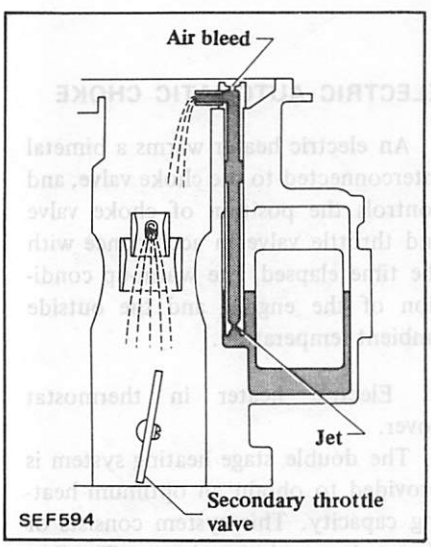
This system aims at the power filling up of the gap when fuel supply is transferred from the primary system to the secondary system.



High speed enricher

The high speed enricher improves high engine output performance during high speed driving.

When the velocity of suction air flowing through the carburetor secondary bore increases, additional fuel is drawn out of the enricher nozzle.

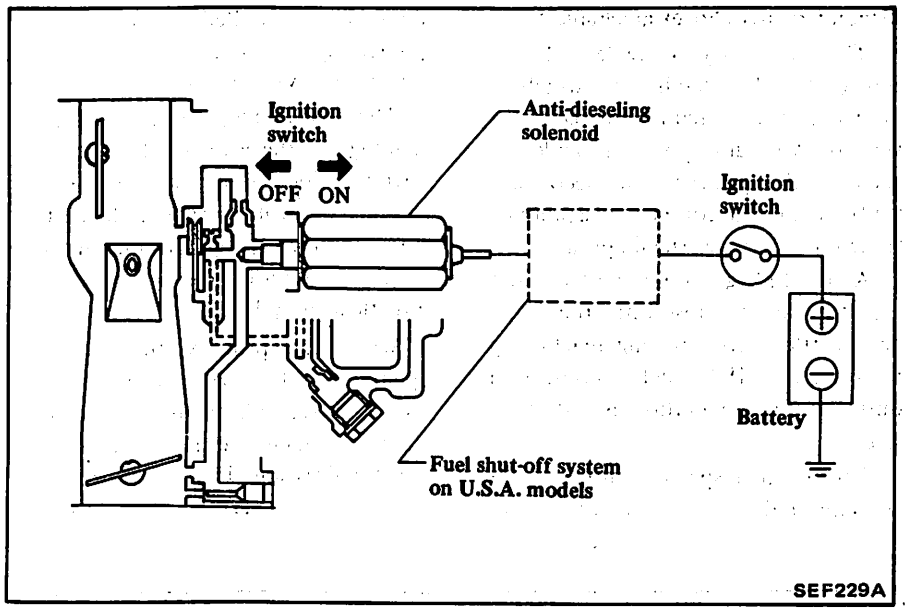


ANTI-DIESELING SYSTEM

As the ignition switch turned off, the valve is brought into operation, shutting off the supply of fuel to the slow circuit.

On U.S.A. models refer to the Fuel Shut-off System (California and Non-California models).

On M.P.G. models, refer to the Fuel Shut-off System (M.P.G. models).



FLOAT SYSTEM

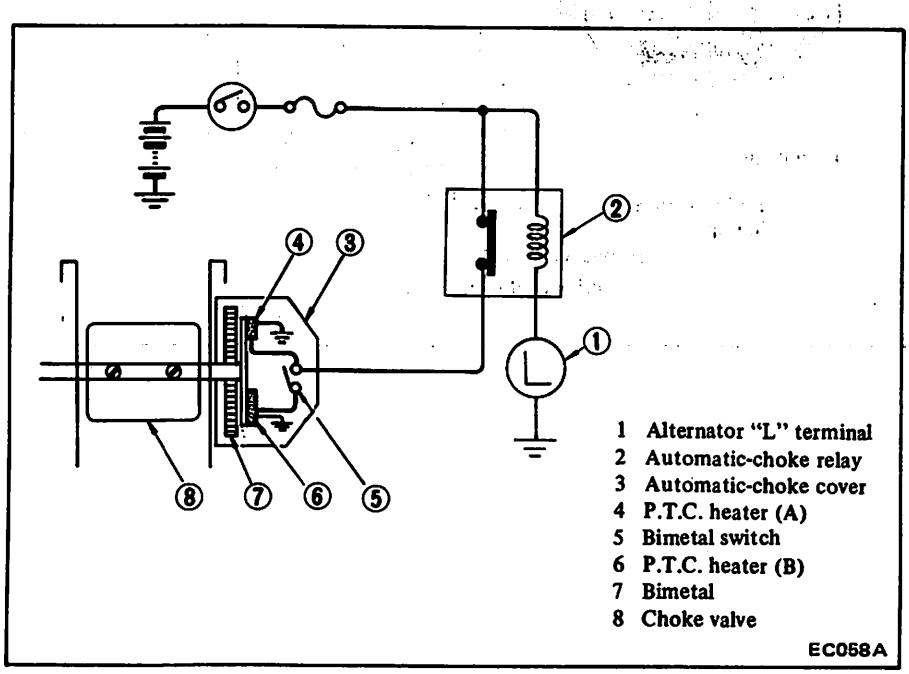
There is only one float chamber, while two carburetor systems, primary and secondary, are provided.

Fuel fed from the fuel pump flows through the filter and needle valve into the float chamber. A constant fuel level is maintained by the float and needle valve.

Because of the inner air vent type float chamber ventilation, fuel consumption is not affected by dirt accumulated in the air cleaner.

The needle valve includes special hard steel ball and will not wear for all its considerably long use.

Besides, the insertion of a spring will prevent the flooding at rough road running.



ELECTRIC AUTOMATIC CHOKE

An electric heater warms a bimetal interconnected to the choke valve, and controls the position of choke valve and throttle valve in accordance with the time elapsed, the warm-up condition of the engine, and the outside ambient temperature.

1. Electric heater in thermostat cover.

The double stage heating system is provided to obtain an optimum heating capacity. This system consists of first and second stage heater. The first stage heater (A) always operates to heat the bimetal during the time when electric current flows through the auto-choke circuit, and in addition to the first stage operation, the second stage heater (B) begins to operate when the bimetal temperature reaches to the level of about 15°C (59°F) so that the choke valve opens more early. This operation of the second stage heater is controlled by a thermo switch attached to the bimetal.

2. Bimetal

Electric current flows through the heater as the engine starts, and warms the bimetal. The deflection of the bimetal is transmitted to the choke valve through the choke valve lever.

3. Fast idle cam

The fast idle cam determines the opening of the throttle valve so that the proper amount of mixture corresponding to the opening of the choke valve will be obtained. The opening of the choke valve is dependent upon the warm-up condition of the engine.

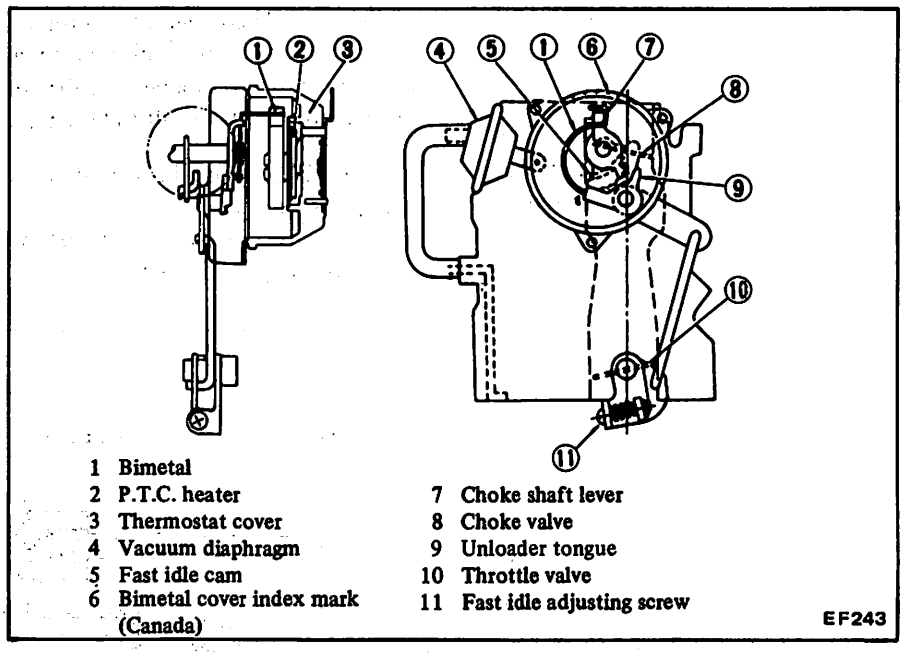
4. Choke unloader

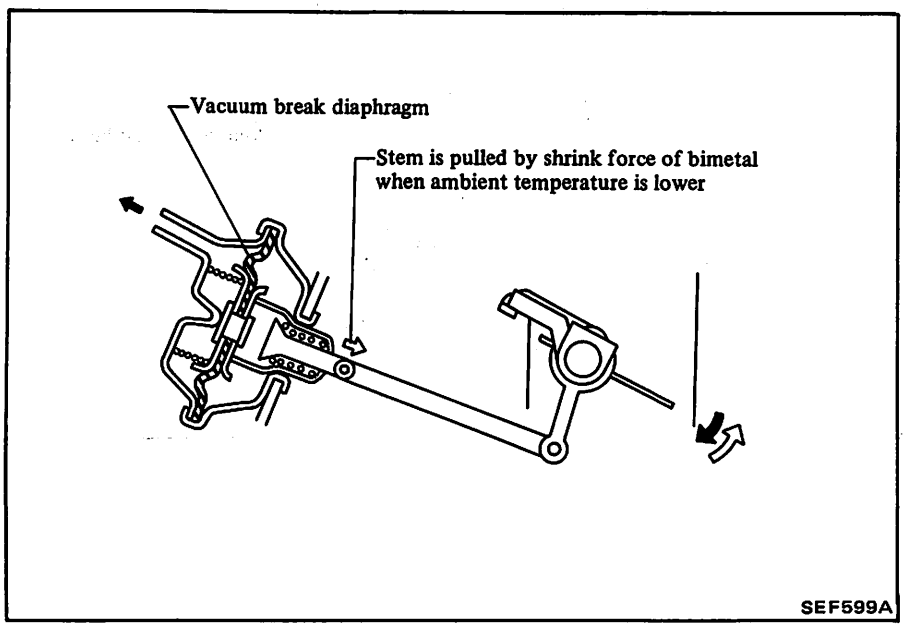
When accelerating the engine during the warm-up period, that is, before the choke valve opens sufficiently, this unloader forces the choke valve open a little so as to obtain an adequate air-fuel mixture.

5. Vacuum break diaphragm

After the engine has been started by cranking, this diaphragm forces the choke valve open to the predetermined extent so as to provide the proper air-fuel ratio.

A two stage-acting type vacuum diaphragm is employed.





DASH POT SYSTEM (Canada)

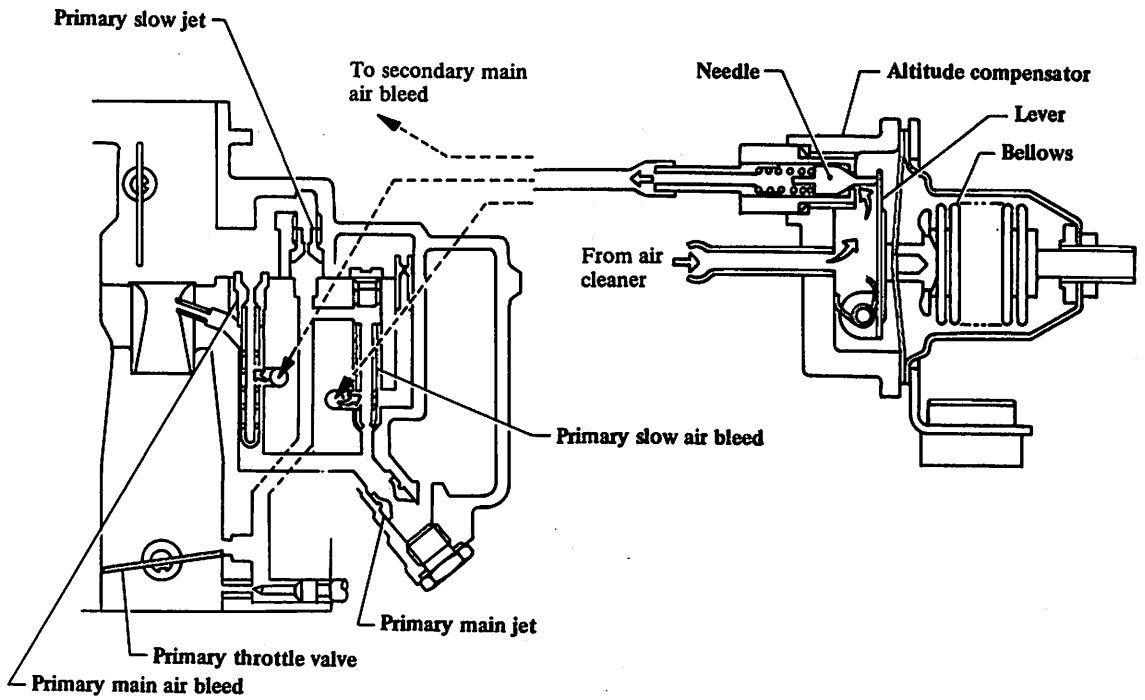
In automatic transmission models, a dash pot prevents engine stall resulting from quick application of the brake or from quick release of the accelerator pedal after it has been tread upon slightly.

ALTITUDE COMPENSATOR
(Non-California high altitude models)

The higher the altitude is, the thinner the density of air becomes. At a higher altitude, therefore, the carburetor produces too rich air-fuel mixture.

The altitude compensator automatically corrects air-fuel mixture to an optimum ratio. It operates in the following sequence when altitude is high.

1. The bellows in the altitude compensator extends.
2. The lever attached to the bellows then pushes up the needle.
3. When the needle is pushed up, the air passage becomes wider, allowing larger amount of air to flow from altitude compensator to the carburetor. As a result, the fuel becomes thinner.
4. With this additional air in the carburetor, air-fuel mixture becomes thin to a proper ratio.



SEF327A

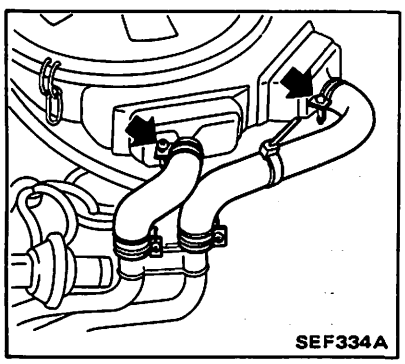
INSPECTION AND ADJUSTMENT

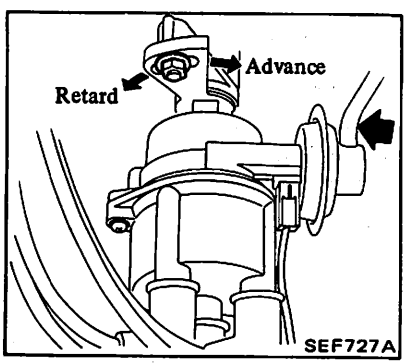
CARBURETOR IDLE-RPM AND MIXTURE RATIO (U.S.A. models)

The idle mixture adjusting screw which has been preset at the factory should be adjusted only in the event of a major carburetor overhaul, throttle body replacement or to lower exhaust emissions as directed by official inspections.

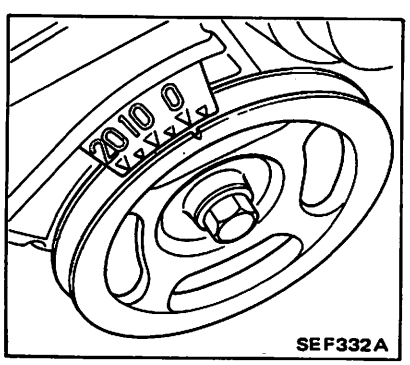
The plug which seals this screw should not be removed during routine maintenance.

Checking and adjusting procedure for Non-California


SEF334A



SEF727A


SEF332A

Adjusting mixture using other than the method below may violate Federal, or other state and Provincial laws.

Preparation

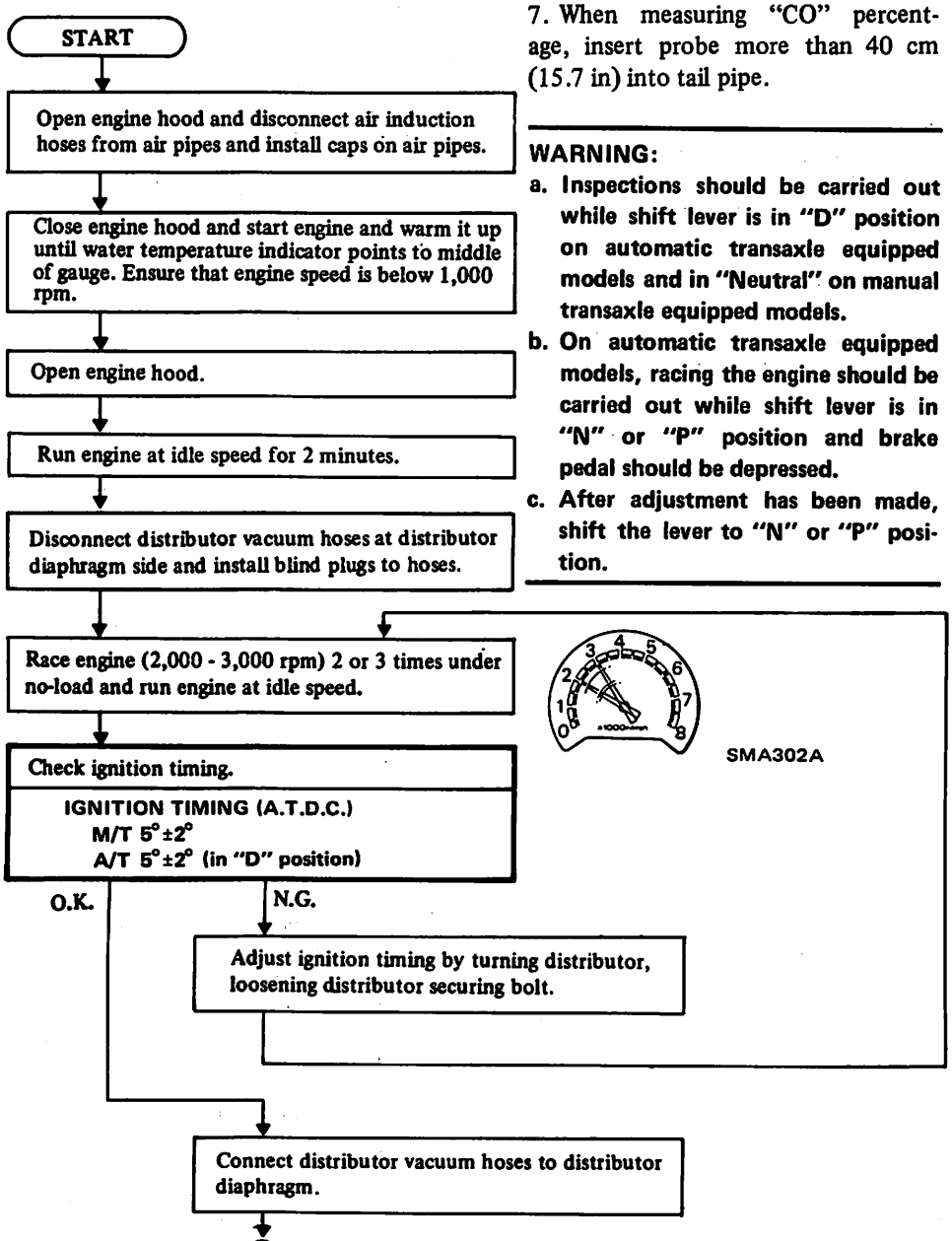
1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.C. component parts
- Main harness connector
- Hoses
- Oil filler cap and oil level gauge
- Valve clearance

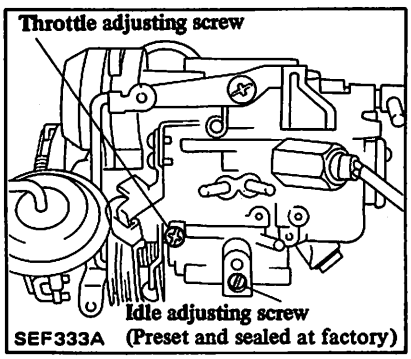
2. Connect engine techometer and timing light in their proper positions.
3. On air conditioner equipped models, the air conditioner system should be "OFF".
4. Apply parking brake and block both front and rear wheels with chocks.
5. Insure that these switches and units are in the following positions:
- Headlamp switch: OFF
- Heater blower: OFF
- Air conditioning switch: OFF (if equipped)
- Steering: KEEP WHEELS STRAIGHT AHEAD (if equipped with power steering)

6. Make the check after the radiator cooling fan has stopped. If it is operating, wait until it stops.
7. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.

WARNING:
- **a. Inspections should be carried out while shift lever is in "D" position on automatic transaxle equipped models and in "Neutral" on manual transaxle equipped models.**
- **b. On automatic transaxle equipped models, racing the engine should be carried out while shift lever is in "N" or "P" position and brake pedal should be depressed.**
- **c. After adjustment has been made, shift the lever to "N" or "P" position.**

SMA302A





SEF333A

*a. This check or adjustment should be performed under the following conditions:
- Headlamp switch: OFF
- Heater blower: OFF
- Air conditioning switch: OFF (if equipped)
- Steering: KEEP WHEELS STRAIGHT AHEAD (if equipped with power steering)

b. Make the check after the radiator cooling fan has stopped. If it is operating, wait until it stops.

Ⓐ

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.


SMA302A

* Check idle speed.

IDLE SPEED
M/T 750±100 rpm
A/T 650±100 rpm (in "D" position)

O.K. — N.G.

* Adjust idle speed by turning throttle adjusting screw. (Refer to Section MA.)

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.


SMA302A

* Check idle "CO" %.

IDLE "CO"%
M/T Less than 4%
A/T Less than 4% (in "D" position)

O.K. — N.G.

Does engine turn smoothly?

YES. — NO.

Check the following.
- Vacuum hoses for proper connections
- Air leaks at carburetor mounting and intake manifold

O.K. — N.G.

Correct or replace malfunctioning parts.

* Adjust idle mixture ratio until idle "CO" $1.5^{+1.0}_{-0.7}$% is obtained and install idle mixture seal plug. (Refer to IDLE MIXTURE ADJUSTING PROCEDURE.)

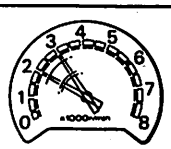
O.K. — N.G.

Correct or replace carburetor.

Turn off engine and connect air induction hoses to air pipes.

Start engine.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load, and run engine at idle speed.


SMA302A

* Check idle speed.

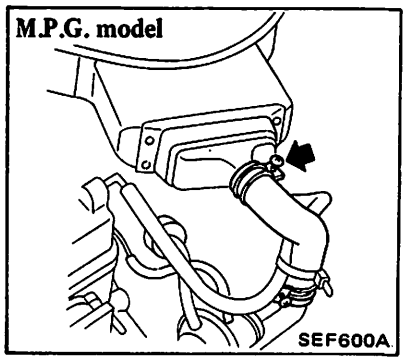
IDLE SPEED
M/T 750±100 rpm
A/T 650±100 rpm (in "D" position)

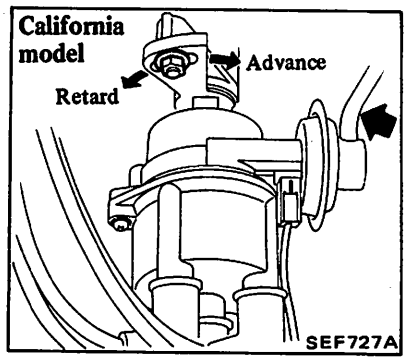
O.K. — N.G.

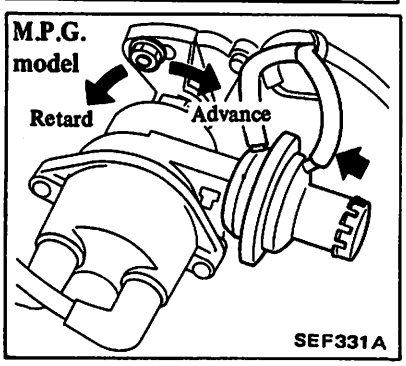
Adjust idle speed by turning throttle adjusting screw. (Refer to Section MA.)

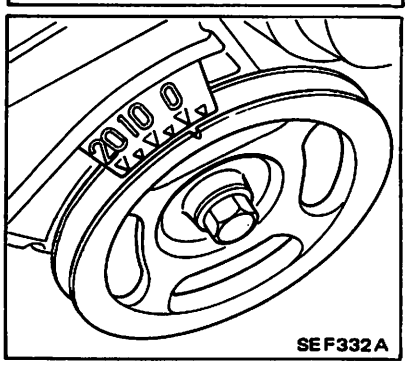
END

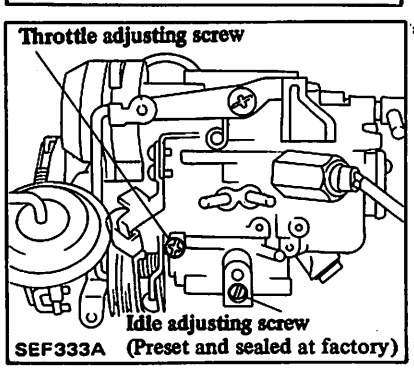
Checking and adjusting procedure for California and M.P.G. models











START

Open engine hood and disconnect air induction hoses from air pipes and install caps on air pipes (M.P.G. model only)

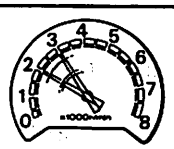
Close engine hood and start engine and warm it up until water temperature indicator points to middle of gauge. Ensure that engine speed is below 1,000 rpm.

Open engine hood.

Run engine at idle speed for 2 minutes.

Disconnect distributor vacuum hoses at distributor diaphragm side and install blind plugs to hoses.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.



Check ignition timing.

IGNITION TIMING (A.T.D.C.)
E15 (M.P.G.) 2° ±2°
E16 MT 5° ±2°
AT 5° ±2° (in "D" position)

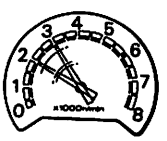
O.K.

N.G.

Adjust ignition timing by turning distributor, loosening distributor securing bolt.

Connect distributor vacuum hoses to distributor diaphragm.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.



* Check idle speed.

IDLE SPEED:
E15 (M.P.G.) 700±100 rpm
E16 MT 750±100 rpm
AT 650±100 rpm (in "D" position)

O.K.

N.G.

* Adjust idle speed by turning throttle adjusting screw. (Refer to Section MA.)

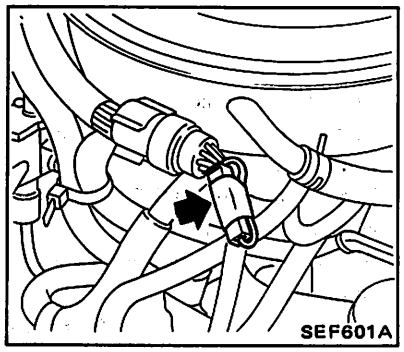
Ⓐ

Ⓑ

***a. This check or adjustment should be performed under the following conditions:**

- **Headlamp switch: OFF**
- **Heater blower: OFF**
- **Air conditioning switch: OFF (if equipped)**
- **Steering: KEEP WHEELS STRAIGHT AHEAD (if equipped with power steering)**

b. Make the check after the radiator cooling fan has stopped. If it is operating, wait until it stops.


SEF601A


SMA302A

*a. This check or adjustment should be performed under the following conditions:
- Headlamp switch: OFF
- Heater blower: OFF
- Air conditioning switch: OFF (if equipped)
- Steering: KEEP WHEELS STRAIGHT AHEAD (if equipped with power steering)

b. Make the check after the radiator cooling fan has stopped. If it is operating, wait until it stops.

Ⓐ

Turn off engine and disconnect air-fuel ratio solenoid harness connector.

Start engine.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load and run engine at idle speed.

* Check idle "CO" %.

IDLE "CO"%
E15 (M.P.G.) 2 - 6%
E16 1 - 5%

O.K. / N.G.

Does engine turn smoothly?

YES. / NO.

Check the following.
- Vacuum hoses for proper connections
- Air leaks at carburetor mounting and intake manifold

O.K. / N.G.

Correct or replace malfunctioning parts.

* Adjust idle mixture ratio until idle "CO" 4.0±1.0% (E15 M.P.G.) or 3.0±1.0% (E16) is obtained and install idle mixture seal plug. (Refer to IDLE MIXTURE ADJUSTING PROCEDURE.)

O.K. / N.G.

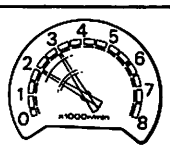
Correct or replace carburetor.

Turn off engine and connect air induction hoses to air pipes (M.P.G. model only).

Connect air-fuel ratio solenoid harness connector.

Start engine.

Race engine (2,000 - 3,000 rpm) 2 or 3 times under no-load, and run engine at idle speed.


SMA302A

* Check idle speed.

IDLE SPEED
E15 (M.P.G.) 700±100 rpm
E16 MT 750±100 rpm
AT 650±100 rpm (in "D" position)

O.K. / N.G.

Adjust idle speed by turning throttle adjusting screw. (Refer to section MA.)

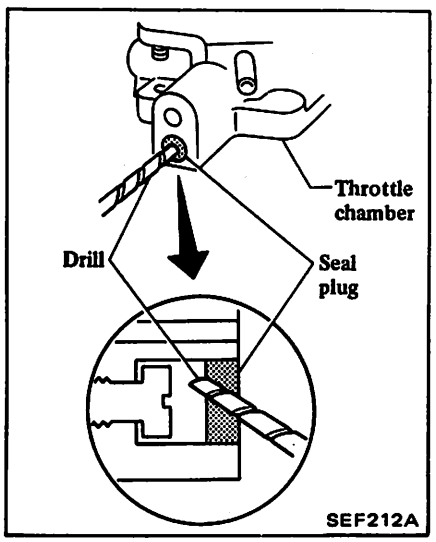
END

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IDLE MIXTURE ADJUSTING PROCEDURE (U.S.A. and M.P.G. models)

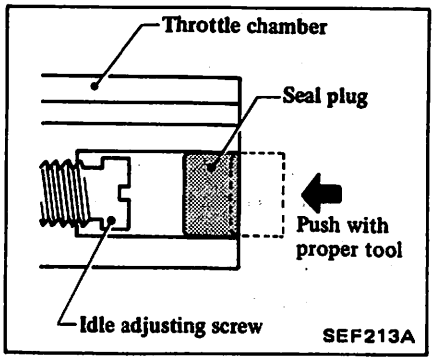
CAUTION:
a. Removal of idle adjusting screw seal plug should be performed only when idle mixture adjustment or carburetor overhaul is necessary.
b. When installing carburetor, be sure to tighten nuts to specified torque.

1. Remove carburetor from engine.
2. Carefully drill idle adjusting screw seal plug and remove it from plug hole with suitable tool.



a. Be careful to prevent metal chips from entering carburetor, and be sure that sliding surface of link and shaft are not scratched.
b. When drilling seal plug, be carefull not to damage head of idle adjusting screw.

3. After performing step 2, mount carburetor on engine.
4. Start engine, adjust idle RPM (Refer to Section MA) and adjust idle CO% by turning idle adjusting screw.
5. If proper idle CO% is not obtained by adjustment, turn off engine and overhaul carburetor or replace it with a new one. Then adjust idle CO% by turning idle adjusting screw.
6. After adjusting carburetor idle-rpm and mixture ratio, turn off engine and install new seal plug on carburetor.



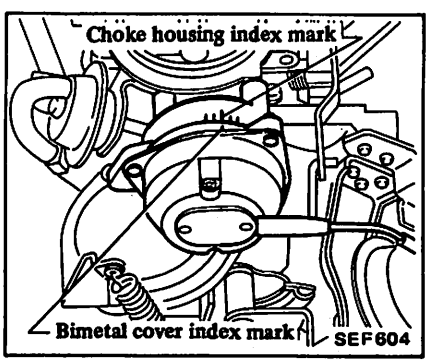
7. Finally, check idle CO% again. If idle CO% becomes abnormal, readjust it by starting from step 4.

AUTOMATIC CHOKE

Automatic choke mechanism

1. Before starting engine, fully open throttle valve and ensure that choke valve closes properly.
2. Push choke valve with a finger, and check for smooth rotation.
3. Check to be sure that bimetal cover index mark is set at the center of choke housing index mark.

On Canada models, when bimetal cover is replaced, set bimetal cover index mark at the center of choke housing index mark.



4. Check automatic choke heater source wiring for proper connection, then start engine.
5. After warming up the engine, ensure that choke valve is fully open.
6. If automatic choke heater source wiring is normal and choke valve does not operate after warm-up, check choke heater circuit, choke heater and choke relay.

Automatic choke heater circuit

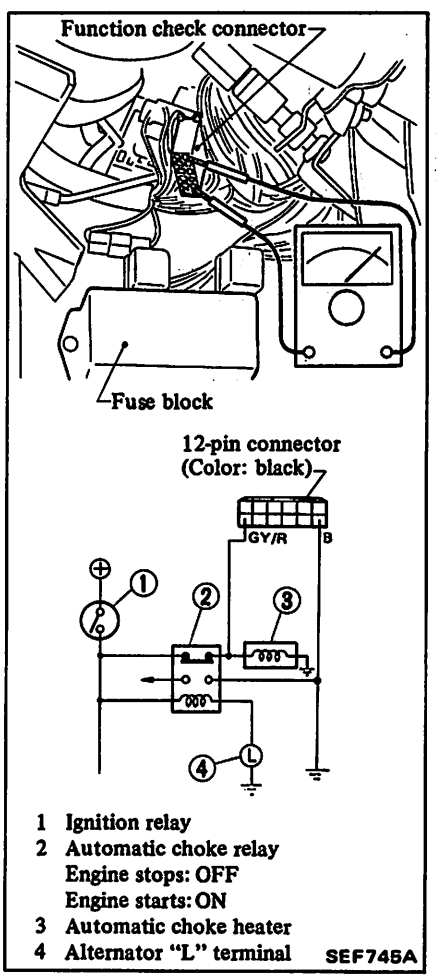
Checking heater circuit with function connector

CAUTION:
Do not attach test leads of a circuit tester to those other than designated.

1. With engine not running, check for continuity between GY/R and B.
- If continuity exists, heater is functioning properly.
- If continuity does not exist, check for disconnected connector or open P.T.C. heater circuit.

2. With engine running at idle, check for presence of voltage across GY/R and B.
- If voltmeter reading is 12 volts, heater circuit is functioning properly.
- If voltmeter reading is zero, check for disconnected connector, open circuit, or faulty automatic choke relay.

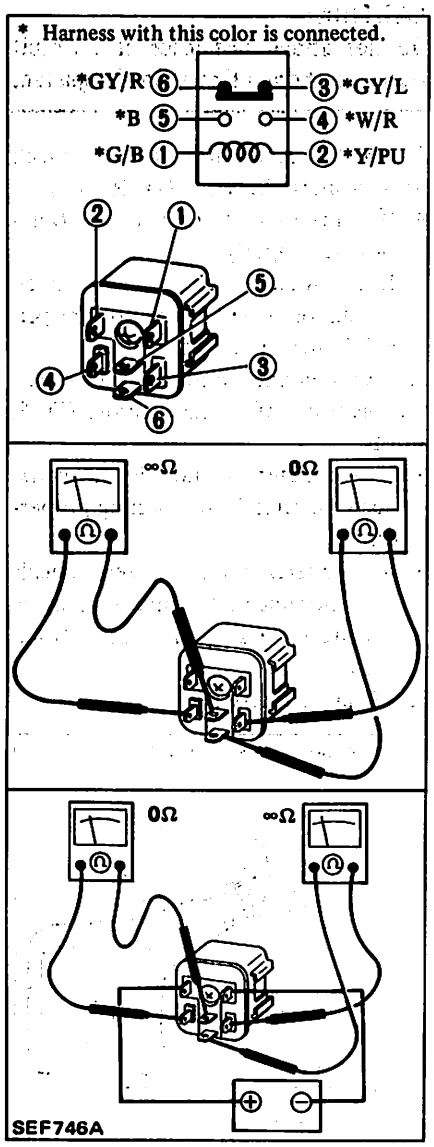
3. Replace faulty parts.



1 Ignition relay
2 Automatic choke relay
Engine stops: OFF
Engine starts: ON
3 Automatic choke heater
4 Alternator "L" terminal
SEF745A

Automatic choke relay

The automatic choke relay is located in the relay box in the engine compartment.



FAST IDLE

1. Warm up engine sufficiently and set fast idle arm on 2nd step of fast idle cam.

a. On Canada models, remove bimetal cover and then set fast idle arm.

b. On U.S.A. models, manually operate throttle valve and choke valve, and set fast idle arm.

2. Read engine speed.

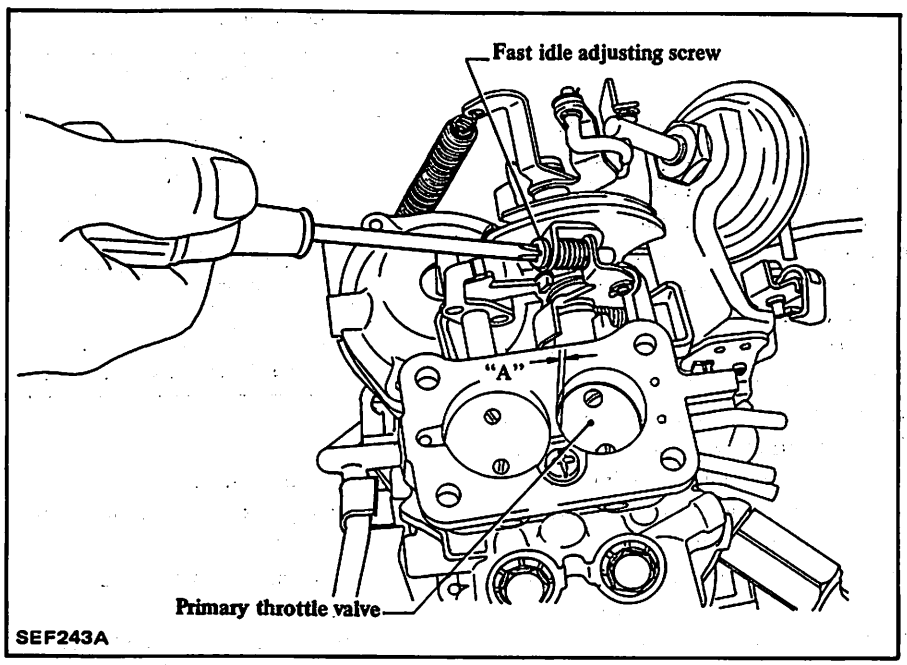
Fast idle speed (at 2nd cam step):
E16
California
2,600 - 3,400 rpm (M/T)
2,900 - 3,700 rpm (A/T)
Non-California
2,400 - 3,200 rpm (M/T)
2,700 - 3,500 rpm (A/T)
Canada
1,900 - 2,700 rpm (M/T)
2,400 - 3,200 rpm (A/T)
E15 (M.P.G.)
2,400 - 3,200 rpm

3. If out of specifications, adjust it by turning fast idle adjusting screw.

4. If necessary, remove carburetor from engine and make fast idle adjustments as follows.
(1) Place fast idle arm on 2nd step of fast idle cam, in the same manner as in step 1 above.
(2) Adjust clearance "A" between primary throttle valve and inner carburetor wall by turning fast idle adjusting screw.

Clearance "A":
E16
U.S.A. model
0.86±0.07 mm (M/T)
(0.0339±0.0028 in)
1.15±0.07 mm (A/T)
(0.0453±0.0028 in)
Canada model
0.72±0.07 mm (M/T)
(0.0283±0.0028 in)
1.00±0.07 mm (A/T)
(0.0394±0.0028 in)
E15 (M.P.G.)
0.80±0.07 mm
(0.0315±0.0028 in)

5. After adjusting clearance "A", install carburetor on engine and check engine speed.
6. Install automatic heater bimetal cover (Canada model).



CHOKE UNLOADER

1. With engine in cold condition, close choke valve completely.
2. Turn throttle lever until primary throttle valve completely opens.

Make sure that throttle valve opens fully when carburetor is mounted on car.

If throttle valve fails to open fully, unloader becomes inoperative, resulting in poor acceleration after engine is started.

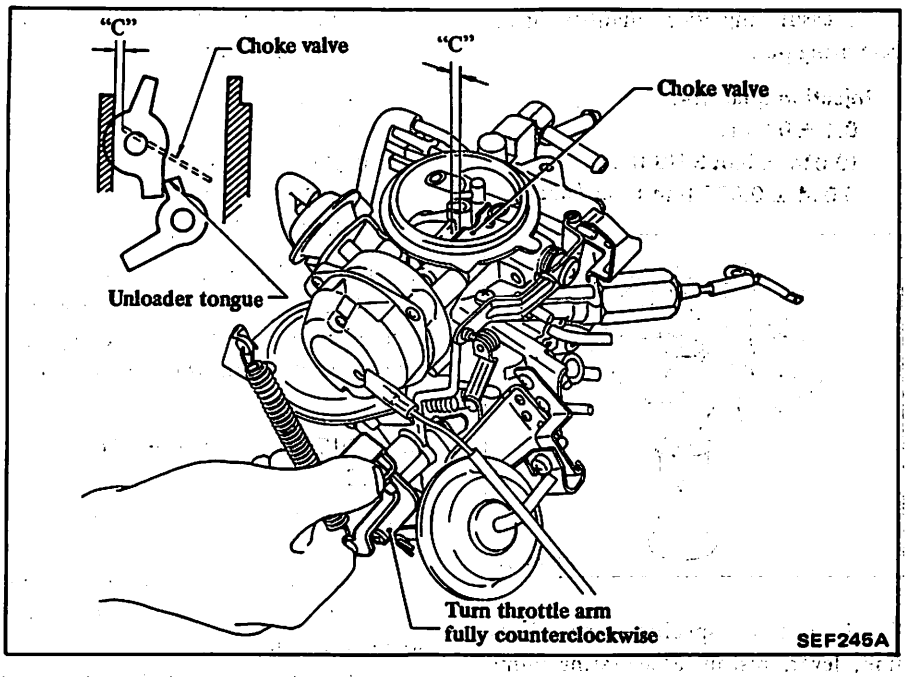
3. In this condition, check clearance "C" between choke valve and carburetor body.

Clearance "C":
E15 (M.P.G.)
2.36 mm (0.0929 in)
E16
2.96 mm (0.1165 in)

4. If out of specifications, make adjustments as follows:

(1) On Canada models, after removing bimetal cover and adjust it by bending unloader tongue.

(2) On U.S.A. models, replace choke chamber assembly.



ACCELERATING PUMP

1. With engine stopped, turn the throttle lever and ensure that the fuel is injected smoothly through the injector located in primary port.

A pump stroke limiter is used on the U.S.A. models and serves to inject fuel slightly right after throttle lever movement.

2. If accelerating pump is out of order, check link, lever pump piston, limiter etc.

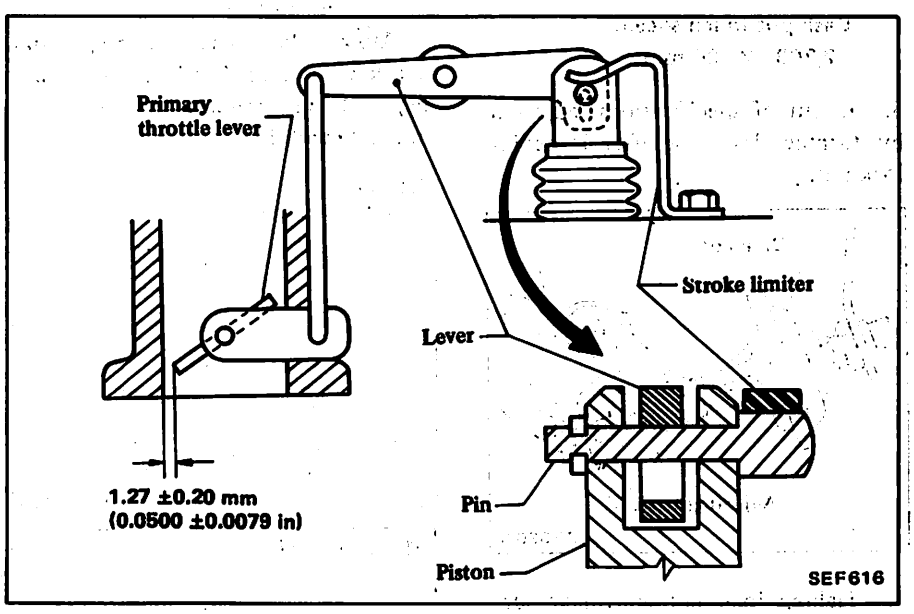
Do not bend stroke limiter.

3. If necessary, check the injection quantity and the pump stroke limiter (if so equipped) as follows:

(1) Remove carburetor from engine.

(2) Check the gap between primary throttle valve and inner carburetor wall when pump lever comes in contact with piston pin.

Stroke limiter gap:
1.27 ± 0.20 mm
(0.0500 ± 0.0079 in)



(3) If out of specifications, adjust it by bending stroke limiter.

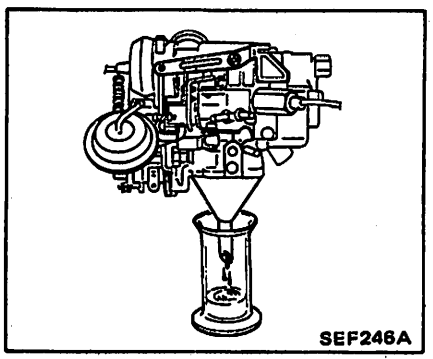
4. Pour gasoline into fuel float chamber.

5. Fully open choke valve.

6. Slowly turn throttle lever about 10 times, from fully closed position to fully open position, keeping throttle lever fully open at least 3 seconds per stroke.

7. Measure injection quantity of accelerating pump.

Injection quantity:
0.4 ± 0.1 mℓ
(0.014 ± 0.003 US fl oz,
0.014 ± 0.004 Imp fl oz)/stroke



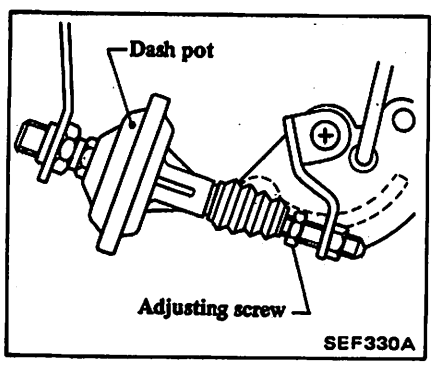
8. If out of specifications, check link, lever, piston, accelerating pump fuel line, etc.

DASH POT (Canada)

1. Idle speed of engine and mixture must be well tuned up and engine sufficiently warm.
2. Turn throttle valve by hand, and read engine speed when dash pot just touches stopper lever.

Dash pot touch speed:
2,300 - 2,500 rpm

3. If out of specifications, adjust it by turning dash pot after loosening lock nut.



4. Tighten lock nut and make sure that engine speed drops smoothly from 2,000 to 1,000 rpm in approximately three seconds.
5. If it becomes necessary to remove carburetor for dash pot adjustment, proceed as follows:
(1) Adjust gap between primary throttle valve and inner carburetor wall when dash pot stem comes in contact with throttle arm.

Dash pot gap:
0.72±0.10 mm (M/T)
(0.0283±0.0039 in)
0.56±0.10 mm (A/T)
(0.0220±0.0039 in)

(2) Tighten dash pot lock nut.
(3) After reinstalling carburetor on engine, ensure dash pot touching engine speed is within the specifications.

ANTI-DIESELING SOLENOID VALVE

Start the engine and keep at idle speed.

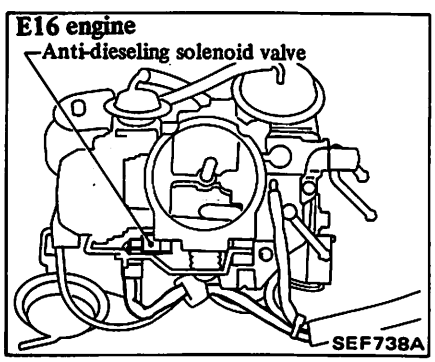
If the engine does not stop when the lead wire is disconnected, the solenoid is stuck.

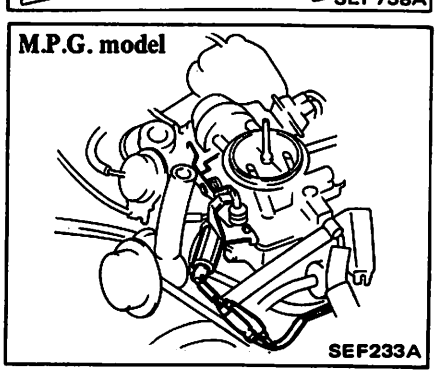
If the engine does not stop when the ignition switch is turned off, this indicates that the striking solenoid valve is stuck or short-circuited.

If the harness is in good condition, replace the solenoid valve as a unit.

Ⓣ : Anti-dieseling solenoid
18 - 22 N·m
(1.8 - 2.2 kg-m,
13 - 16 ft-lb)

After replacement, start engine and check to be sure that fuel is not leaking, and that anti-dieseling solenoid is in good condition.





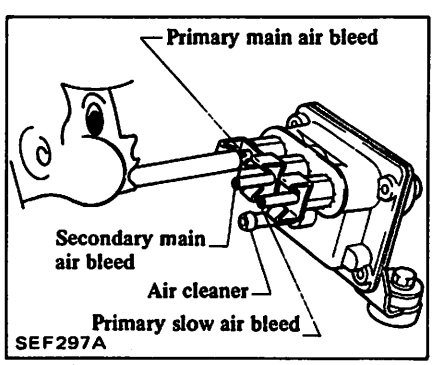
ALTITUDE COMPENSATOR
(California models and Non-California high altitude models)

a. The altitude compensator is set to operate above an altitude of approximately 500 m (1,641 ft). It should be carefully checked.
b. When making this check, ensure that all other parts are working properly.
c. The altitude compensator cannot be adjusted; if it is found to be functioning unsatisfactorily, it must be replaced as an assembly.
d. The hoses are color-coded. When connecting them, be sure to align them with the proper color marks on the unit.

Compensator at low altitudes

If the compensator should be operating at low altitudes, any of the following four symptoms may result:
1. Hesitation (a) and stumble (b) when engine is started.
2. Surge (c) when cruising at approximately 80 km/h (50 MPH).
3. Stumble (b) when accelerating in the 80 to 112 km/h (50 to 70 MPH) range.
4. Poor acceleration at full throttle (it takes too long to attain full acceleration).

When the compensator is malfunctioning, check it by sucking or blowing air through the inlet and outlet hoses. If air flows through smoothly, replace the unit as an assembly.



Compensator at high altitudes

If the compensator should not be operating at high altitudes, any of the following four symptoms may result:

1. Engine speed does not increase in proper response to accelerator depression under no-load condition.
2. Hesitation (a) and stumble (b) when engine is started.
3. Poor acceleration at full throttle (it takes too long to attain full acceleration).
4. Smooth running at partial throttle begins to depends upon altitude.

When the compensator is malfunctioning, check it by sucking or blowing air through the inlet and outlet hoses. If air does not flow through smoothly replace the unit as an assembly.

a. Hesitation:
A temporary lack of initial response in acceleration rate.

b. Stumble:
A short, sharp reduction in acceleration rate.

c. Surge:
A continued condition of short, sharp fluctuations in power. These may be cyclic or random, and can occur at any speed and/or load. Surge is usually caused by excessively lean carburetor mixtures.

MAJOR SERVICE OPERATION

The perfectly adjusted carburetor delivers the proper fuel and air ratios at all speeds for the particular engine for which it was designed. By completely disassembling at regular intervals, which will allow cleaning of all parts and passages, the carburetor can be maintained in its original condition and will continue to deliver the proper ratios.

To maintain accurate carburetion of passages and discharge holes, extreme care must be taken in cleaning.

Use only carburetor solvent and compressed air to clean all passages and discharge holes. Never use wire or other pointed instrument to clean or carburetor calibration will be affected.

REMOVAL

Remove carburetor from engine, taking sufficient care to the following:

PRECAUTIONS:
a. When disconnecting fuel lines, do not spill fuel from fuel pipe.
b. When removing carburetor, do not drop any nut or bolt into intake manifold.
c. Be careful not to bend or scratch any part.

CLEANING AND INSPECTION

Dirt, gum, water or carbon contamination in or on exterior moving parts of a carburetor are often responsible for unsatisfactory performance. For this reason, efficient carburetion depends upon careful cleaning and inspection while servicing.

1. Blow all passages and castings with compressed air and blow off all parts until dry.

Do not pass drills or wires through calibrated jets or passages as this may enlarge orifice and seriously affect carburetor calibration.

2. Check all parts for wear. If wear is noted, damaged parts must be replaced. Note especially the following:
(1) Check float needle and seat for wear. If wear is noted, assembly must be replaced.
(2) Check throttle and choke shaft bores in throttle chamber and choke chamber for wear or out-of-roundness.
(3) Inspect idle adjusting needle for burrs or ridges. Such a condition requires replacement.
3. Inspect gaskets to see if they appear hard or brittle or if edges are torn or distorted. If any such condition is noted, they must be replaced.
4. Check filter screen for dirt or lint. Clean, and if screen is distorted or remains plugged, replace.
5. Check linkage for operating condition.
6. Inspect operation of accelerating pump. Pour fuel into float chamber and make throttle lever operate. Check condition of fuel injection from the accelerating nozzle.
7. Push connecting rod of diaphragm chamber and block passage of vacuum with finger. When connecting rod becomes free, check for leakage of air or damage to diaphragm.

Jets

Carburetor performance depends on jets and air bleeds. That is why these components must be fabricated with utmost care. To clean them, use cleaning solvent and blow air on them. Larger inner numbers stamped on the jets indicate larger diameters. Accordingly, main and slow jets with larger numbers provide richer mixture; the smaller numbers the leaner mixture. Conversely, the main and slow air bleeds, through which air to passes, make the fuel leaner if they bear larger numbers; the smaller numbers the richer fuel.

ASSEMBLY

1. Thoroughly wash all the parts before assembling.
2. Inspect gaskets to see if they appear hard or brittle or if edges are torn or distorted.

If any of such undesirable conditions is noted, they must be replaced.

3. Install jet and air bleed having the same size number as that of original one.
4. After reassembling carburetor, check each rotating portion or sliding portion for smooth operation.

CRANKCASE EMISSION CONTROL SYSTEM

DESCRIPTION

This system returns blow-by gas to both the intake manifold and carburetor air cleaner.

The positive crankcase ventilation (P.C.V.) valve is provided to conduct crankcase blow-by gas to the intake manifold.

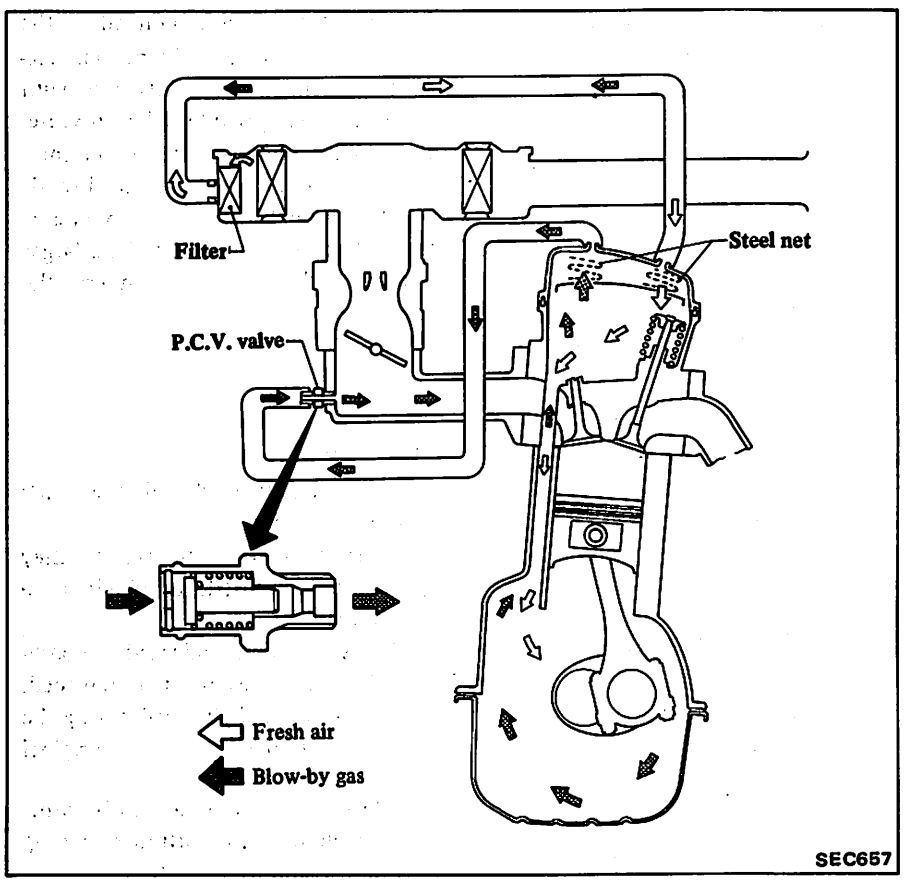
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is then drawn from the carburetor air cleaner, through the hose connecting carburetor air cleaner to rocker cover, into the crankcase.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.

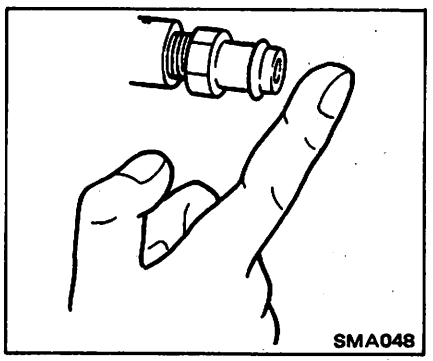
On cars with an excessively high blow-by some of the flow will go through the hose connection to the carburetor air cleaner under all conditions.



INSPECTION

P.C.V. VALVE AND FILTER

With engine idling, remove the ventilator hose from P.C.V. valve. If the valve is working, a hissing noise will be heard as air passes through the valve and a strong vacuum should be felt immediately when a finger is placed over valve inlet.



VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air.

If any hose cannot be freed of obstructions, replace.

EXHAUST EMISSION CONTROL SYSTEM

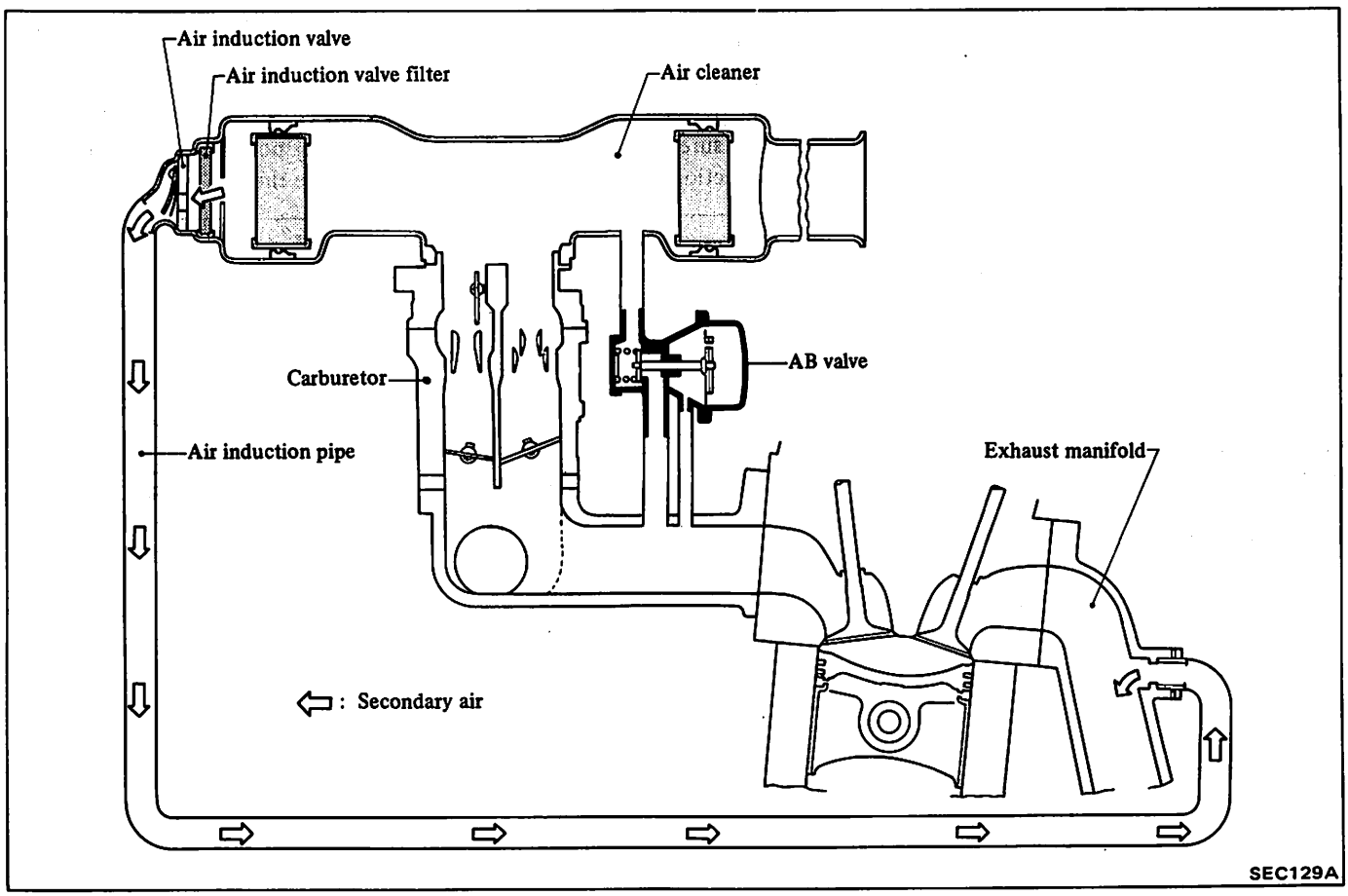
AIR INDUCTION SYSTEM (Non-California models)

The air induction system (A.I.S.) is designed to send secondary air to the exhaust manifold, utilizing a vacuum caused by exhaust pulsation in the exhaust manifold.

The exhaust pressure in the exhaust manifold usually pulsates in response to the opening and closing of the exhaust valve and it decreases below atmospheric pressure periodically.

If a secondary air intake is opened to the atmosphere under vacuum conditions, secondary air can be drawn into the exhaust manifold in proportion to the vacuum.

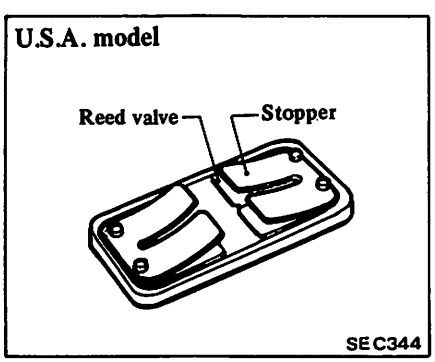
Therefore, the air induction system (A.I.S.) reduces CO and HC emissions in exhaust gases.

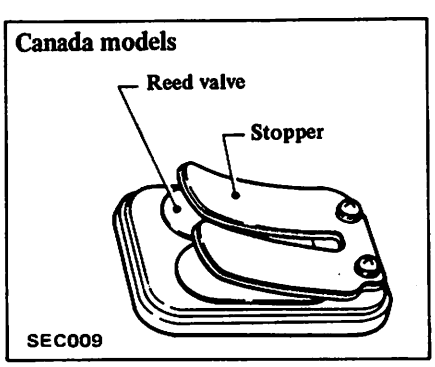


Air induction valve

When the exhaust pressure is below atmospheric pressure (negative pressure), secondary air is sent to the exhaust manifold.

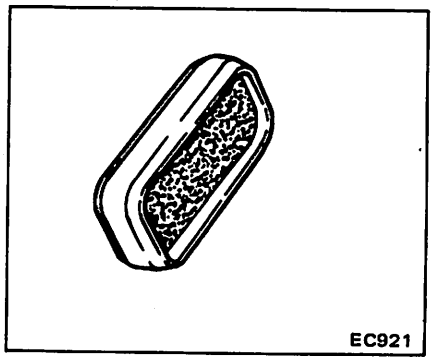
When the exhaust pressure is above atmospheric pressure, the reed valve prevents secondary air from being sent back to the air cleaner.





Air induction valve filter

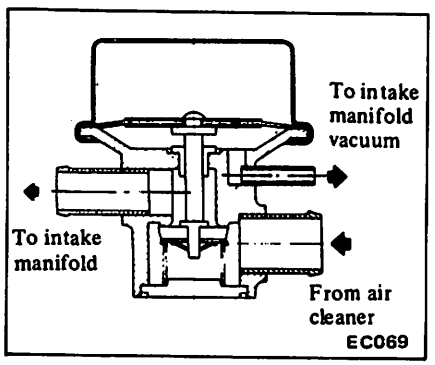
The air induction valve filter purifies secondary air to be sent to the exhaust manifold. The filter element should be replaced periodically in accordance with the Maintenance Schedule.



A.B. valve

This valve is actuated by intake manifold vacuum to prevent after burning in the exhaust system at the initial period of deceleration.

At this period, the mixture in the intake manifold becomes too rich to ignite and burn in the combustion chamber and burns easily in the exhaust system with injected air in the exhaust manifold.



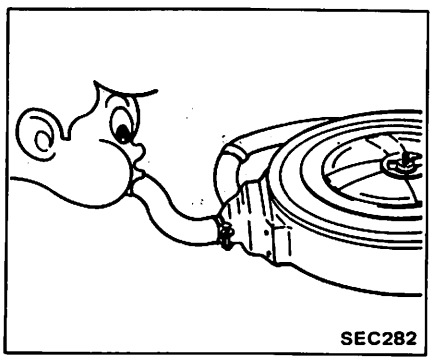
INSPECTION

Preliminary inspection

Check hose for looseness, flatting, damage or faulty connections, and each part for proper installation. If necessary, replace.

Air induction valve and filter

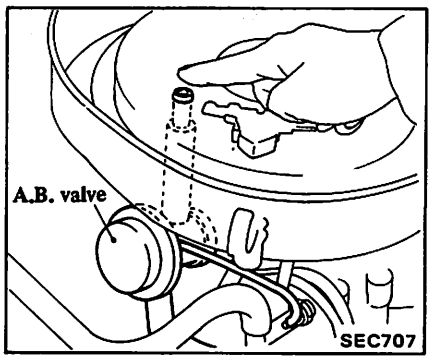
1. Disconnect air induction hose at air induction pipe side. Suck or blow hose to make sure that air flows only on the air induction pipe side.



2. Check air induction valve for binding or damage. At the same time, check filter for damage or plugging. If necessary, replace.

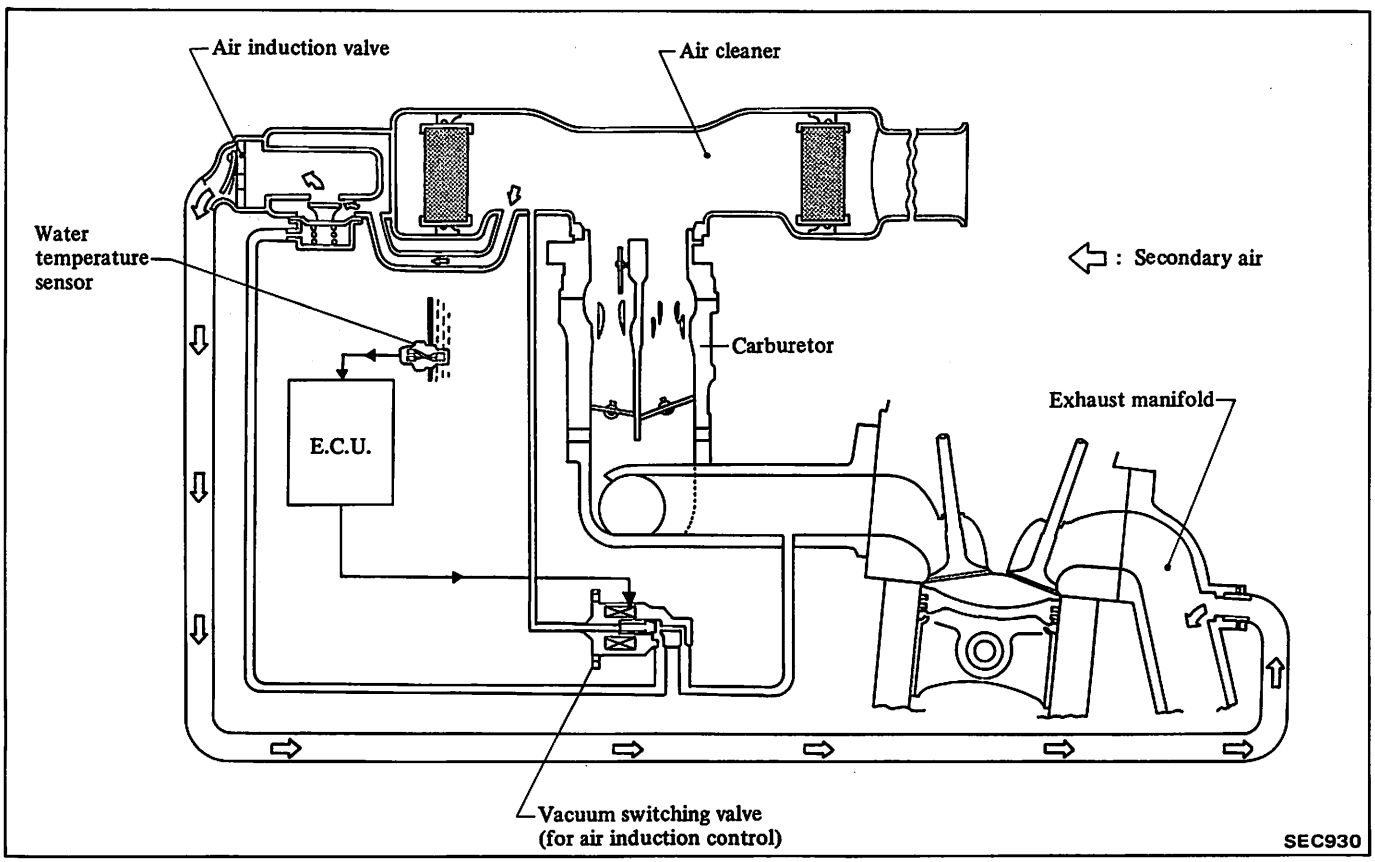
A.B. valve

1. Warm up engine thoroughly.
2. Disconnect hose from air cleaner, and place a finger near the outlet.
3. Run engine at about 3,000 rpm under no load, then quickly return it to idling. If you feel a pull or suction force on your finger, the A.B. valve is functioning normally. If no suction is felt, replace the A.B. valve.



AIR INDUCTION SYSTEM (M.P.G. models)

The air induction system for M.P.G. models is designed to send secondary air to the exhaust manifold, utilizing a vacuum caused by exhaust pulsation in the exhaust manifold.
However, it is not necessary to operate this system under normal engine conditions because a 3-way catalytic converter is adopted.
Therefore, this sytem is designed to send secondary air to the exhaust manifold when engine is cold.



Operation

Water temperature °C (°F)	Vacuum switching valve for air induction control	Air induction control valve	Air induction control system
Below 50 (122)	ON	Open	Operated
Above 50 (122)	OFF	Closed	Not operated

INSPECTION

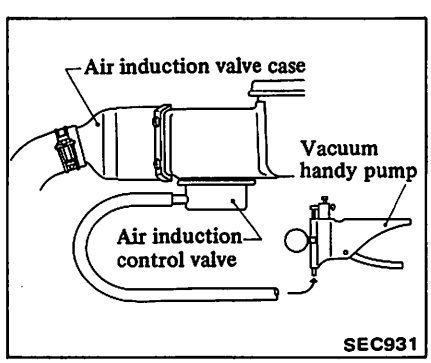
Entire system

Refer to Diagnostic Procedure for E.C.C. Engine.

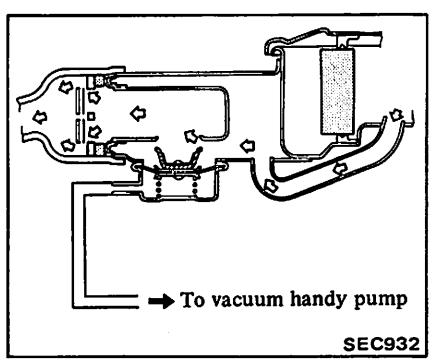
Air induction valve and air induction control valve

1. Disconnect air induction hose at air induction pipe side. Suck or blow hose to make sure that air flow does not exist.

2. Set a vacuum handy pump to the air induction control valve.



3. Suck or blow air induction hose to make sure that air flows only on the air induction pipe side while control valve is operated.



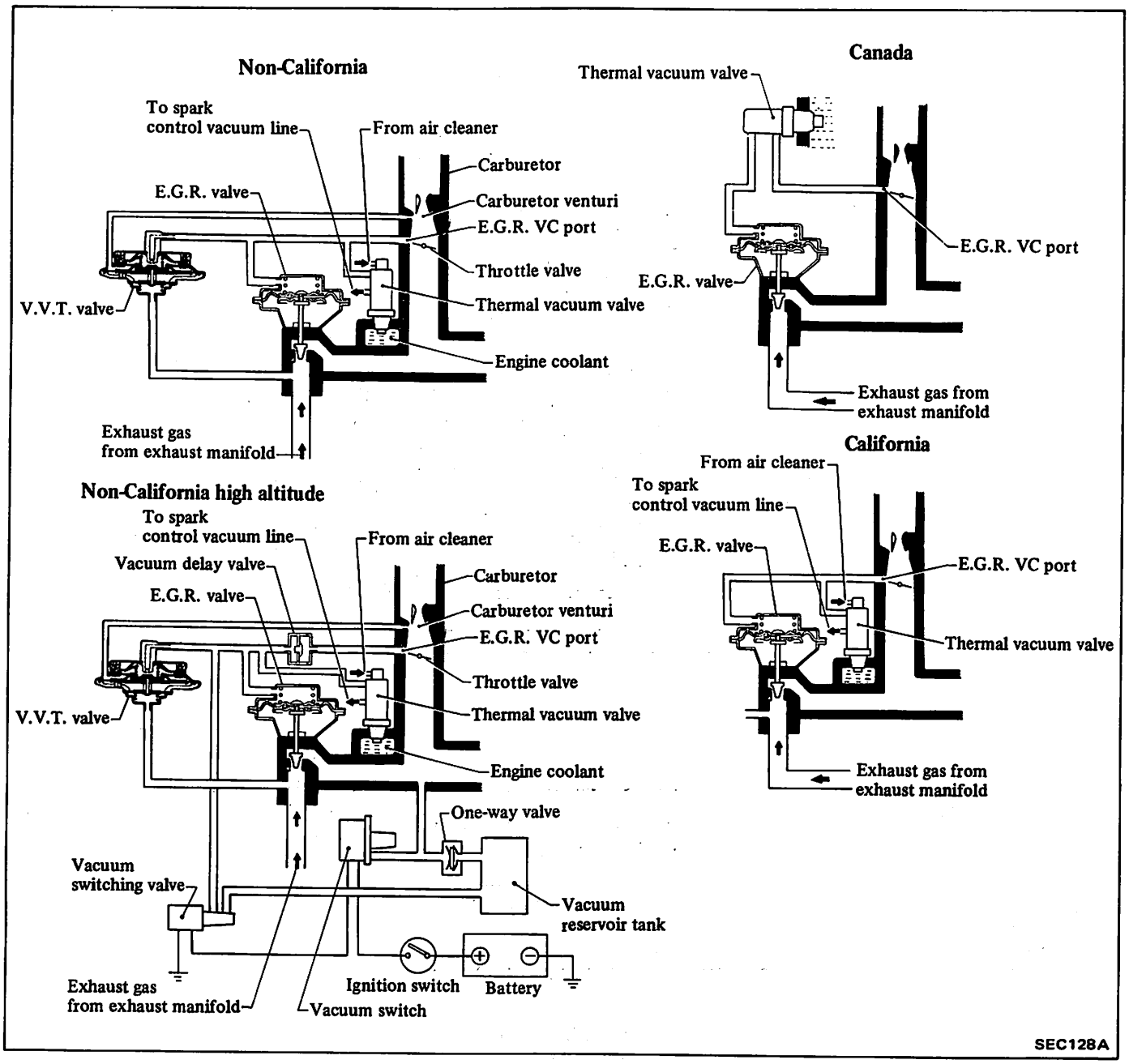
4. Check air induction valve and air induction control valve for binding or damage. If necessary, replace.

A.B. valve

Refer to Air Induction System (Except M.P.G. models).

EXHAUST GAS RECIRCULATION (E.G.R.) CONTROL SYSTEM

In the exhaust gas recirculation system, a part of the exhaust gas is returned to the combustion chamber to lower the spark flame temperature during combustion. This results in a reduction of nitrogen oxide (NOx) content in the exhaust gas.



Non-California

Thermal vacuum valve		V.V.T. valve			E.G.R. system
Water temp. °C (°F)	Operation	Venturi vacuum	Exhaust gas pressure	Operation	
Below 50 (122)	Open *1	Any conditions			Not actuated
Above 50 (122)	Closed *1	High	High	Closed *2	Actuated
			Low		
		Low	High		
			Low	Open *2	Not actuated

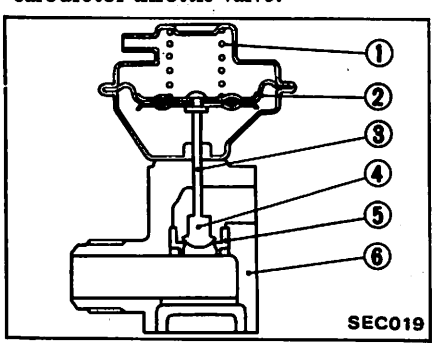
*1: To atmospheric pressure
*2: For E.G.R. valve vacuum line

California, M.P.G. and Canada

Thermal vacuum valve			E.G.R. system
Water temperature °C [°F]	Operation		
	Canada (2-port type)	California and M.P.G. (3-port type)	
Below 50 (122)	Closed	Open	Not actuated
Above 50 (122)	Open	Closed	Actuated

E.G.R. control valve

The E.G.R. control valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the valve connected to the diaphragm, to which vacuum is applied in response to the opening of the carburetor throttle valve.

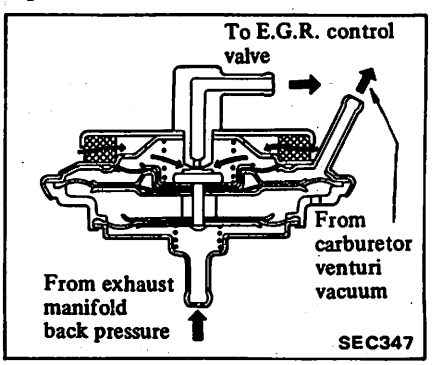


1 Diaphragm spring
2 Diaphragm
3 Valve shaft
4 Valve
5 Valve seat
6 Valve chamber

V.V.T. valve

The venturi vacuum transducer (V.V.T.) valve, monitors exhaust pressure and venturi vacuum in order to activate the diaphragm, controlling carburetor throttle vacuum applied to the E.G.R. control valve.

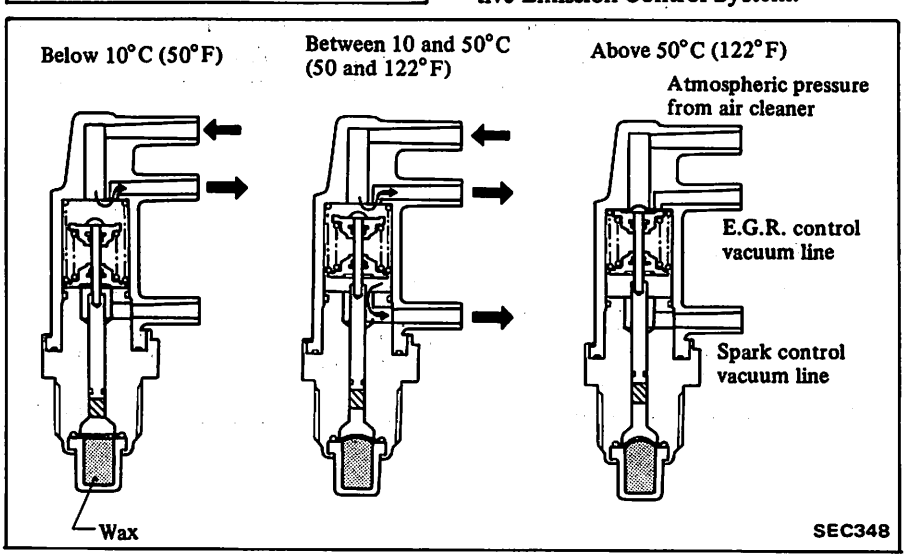
In other words, the amount of recirculated exhaust gas varies with the position of the E.G.R. valve regulated by the operating condition of the engine.



Thermal vacuum valve (3-port wax type)

It detects engine coolant temperature by means of wax expansion and opens or closes the air passage from the air cleaner.

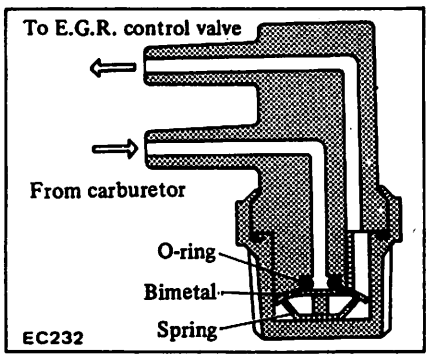
When the air passage is closed, the carburetor vacuum signal is applied to the diaphragm of the E.G.R. control valve to actuate the taper valve connected to the diaphragm. This valve is also co-used as a component for the Catalyst Warm-up System & Evaporative Emission Control System.



Thermal vacuum valve (2-port bimetal type)

This thermal vacuum valve is mounted on the front side of the intake manifold. It detects engine coolant temperature by means of a built-in bimetal, and opens or closes the vacuum passage in the thermal vacuum valve.

When the vacuum passage is open, the carburetor vacuum signal is applied to the diaphragm of the E.G.R. control valve to actuate the taper valve connected to the diaphragm.



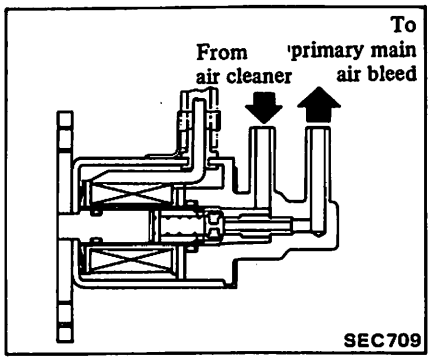
Vacuum delay valve

The vacuum delay valve is utilized for the purpose of reducing NOx emissions emitted during rapid acceleration. This valve, installed in the vacuum control line to the E.G.R. valve, restricts the air flow in the line to reduce the rate of vacuum change when the throttle valve is opened rapidly. Reduced rate of vacuum change provides the E.G.R. vacuum control unit with some delay time.

When the vacuum of the vacuum source decreases, the E.G.R. vacuum control unit responds normally because a one way function is provided to the valve.

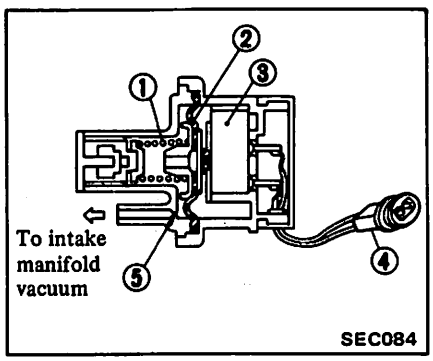
Vacuum switching valve

The vacuum switching valve is controlled by current flowing from the vacuum switch. Its purpose is to supply vacuum from the vacuum reservoir tank to the E.G.R. control valve.



Vacuum switch

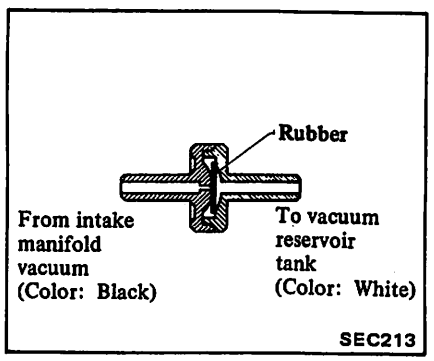
When the intake manifold vacuum increases during deceleration, this switch is activated, thereby interrupting the electrical signal which is sent to the vacuum switching valve.



1 Spring
2 Diaphragm
3 Micro switch
4 Connector
5 Orifice

One-way valve

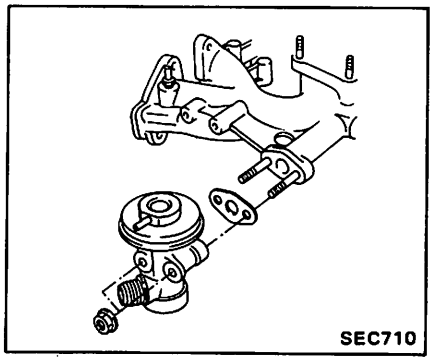
The one-way valve is used to maintain intake manifold vacuum in the vacuum reservoir tank.



REMOVAL AND INSTALLATION

E.G.R. control valve

Disconnect vacuum hose and remove nuts securing E.G.R. control valve to E.G.R. passage. The E.G.R. control valve can then be taken out.



Thermal vacuum valve

The thermal vacuum valve is made of plastic. Consequently take care not to damage it.

1. Drain engine coolant about one liter (1-1/8 US qt, 7/8 Imp qt).
2. Disconnect vacuum hoses and unscrew the thermal vacuum valve. The valve can then be taken out.
3. Install thermal vacuum valve in the reverse order of removal.

Be sure to apply sealer to threads of the valve prior to installing new valve.

Ⓣ : Thermal vacuum valve
Less than 22 N·m (2.2 kg-m, 16 ft-lb)

INSPECTION

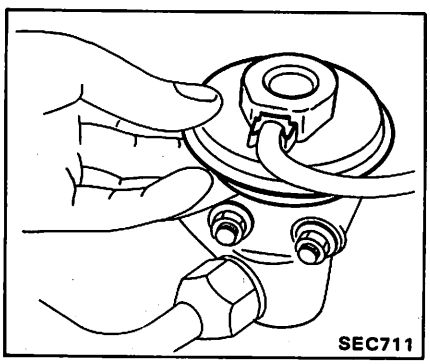
Entire system

1. Make a thorough visual check of E.G.R. control system. If necessary, wipe away oil to facilitate inspection. If any hoses are cracked or broken, replace.
2. With engine stopped, inspect E.G.R. control valve for any indication of binding or sticking by moving diaphragm of control valve upwards with a finger.

3. With engine running, inspect E.G.R. control valve and thermal vacuum valve for normal operation.
(1) When engine coolant temperature is low:

Make sure that E.G.R. control valve does not operate when engine speed is increased from idling to 3,000 to 3,500 rpm.

Place a finger on the diaphragm of E.G.R. control valve to check for valve operation.



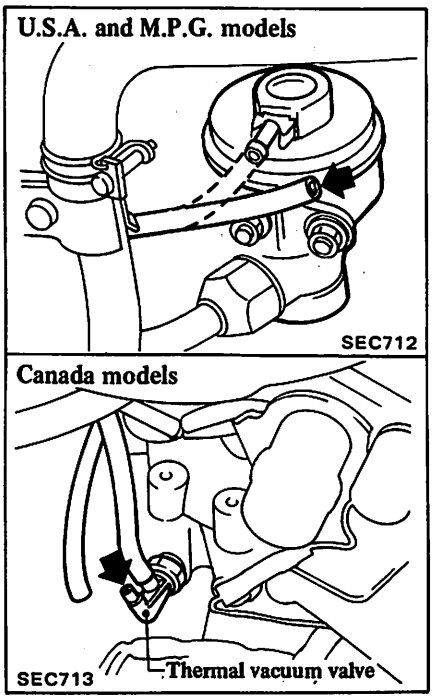
(2) When engine coolant temperature is high:

Make sure that E.G.R. control valve operates when engine speed is increased from idling to 3,000 to 3,500 rpm. Place fingers on the diaphragm of E.G.R. control valve to check for valve operation.

If E.G.R. control valve does not operate, check as follows:

- Disconnect one end (E.G.R. control valve side) of vacuum hose connecting thermal vacuum valve to E.G.R. control valve (California , M.P.G. and Canada models) or V.V.T. valve (Non-California models).
- Increase engine speed from idling to 3,000 to 3,500 rpm.
- Make sure that thermal vacuum valve is open (2-port type), or closed (3-port type) and that carburetor vacuum is present at the end (E.G.R. control valve side) of vacuum hose.

  If vacuum is weak or nonexistent, replace thermal vacuum valve. If vacuum is present, check E.G.R. control valve or V.V.T. valve.

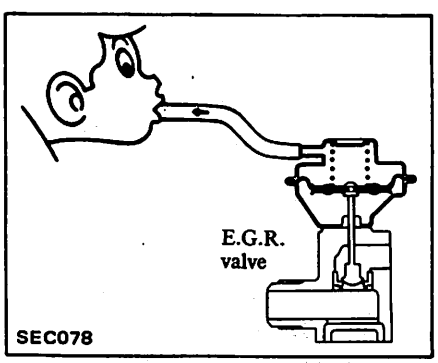


If any difficulty is encountered in judging the condition of any component during above inspection, check the questionable component independently as follows:

E.G.R. control valve

1. Apply vacuum to E.G.R. control valve, referring to the following figure. If the valve moves to full position, it is normal.

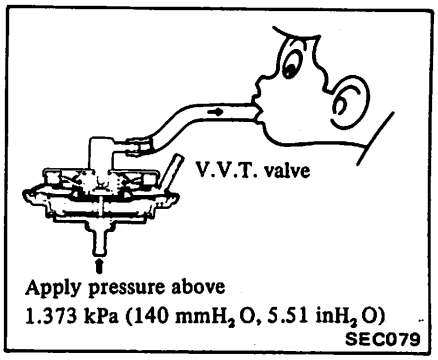
E.G.R. control valve will remain open for more than 30 seconds after vacuum has cut off.



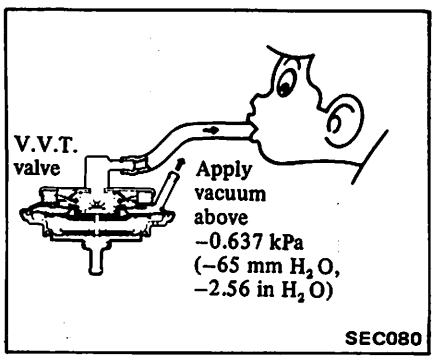
2. Visually check E.G.R. control valve for damage, wrinkle or deformation.

V.V.T. valve

1. Apply a pressure above 1.373 kPa (140 mmH_2O, 5.51 inH_2O) to V.V.T. valve and check it for leakage as shown below. If a leak is discovered, replace valve.



2. Apply vacuum pressure above 0.637 kPa (65 mmH_2O, 2.56 inH_2O) to V.V.T. valve and check it for leakage as shown below. If a leak is discovered, replace valve.



Thermal vacuum valve

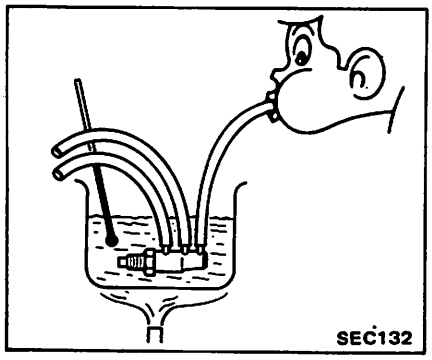
Remove thermal vacuum valve from engine. Inhale air from port of E.G.R. system and check to be sure that thermal vacuum valve opens or closes in response to its temperature.

Before dismounting, drain engine coolant about one liter (1-1/8 US qt, 7/8 Imp qt).

CAUTION:
Do not allow water to get inside the thermal vacuum valve.

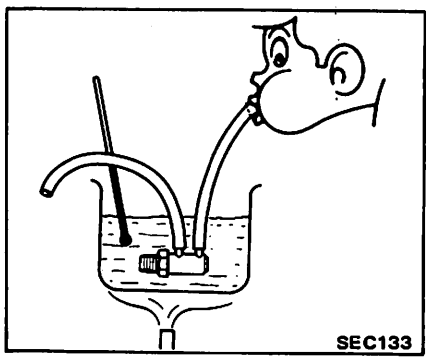
3-port wax type

Water temperature °C (°F)	Valve
Below 50 (122)	Open
Above 50 (122)	Closed



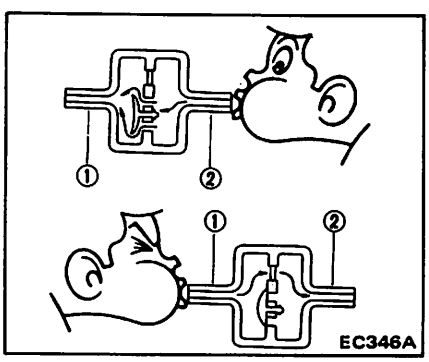
2-port bimetal type

Water temperature °C (°F)	Valve
Above 50 (122)	Open
Below 50 (122)	Closed



Vacuum delay valve

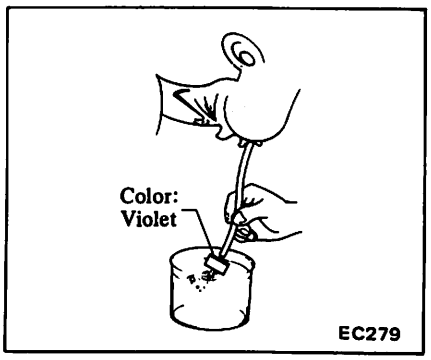
1. Blow air from the port of the E.G.R. control valve side. The valve is in good condition if the air flows through the valve.
2. Try again from the opposite side of the valve. The valve is in good condition if the air flow resistance is greater than the step 1 above.



1 Thermal vacuum valve side
2 V.V.T. valve side

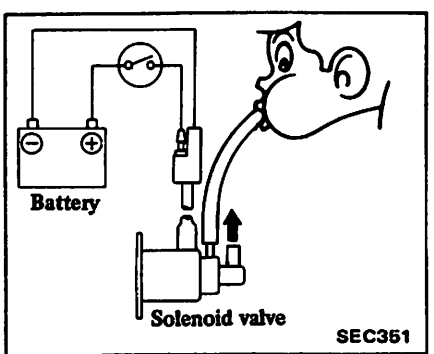
3. If the condition of vacuum delay valve is questionable, dip port into a cup filled with water. Blow air from violet face side. Small air bubbles should appear.

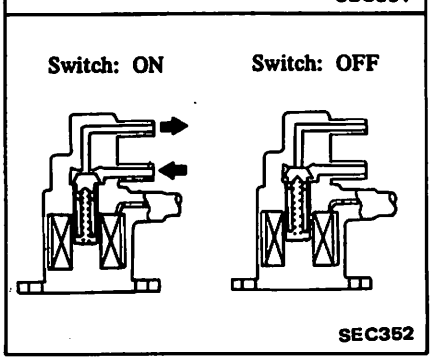
CAUTION:
Be careful to avoid entry of oil or dirt into valve.



Vacuum switching valve

1. Remove both hoses and harness. Remove screws which secure the solenoid valve, and detach the valve.
2. Operate the solenoid valve using the battery to determine if air flows through the valve properly.



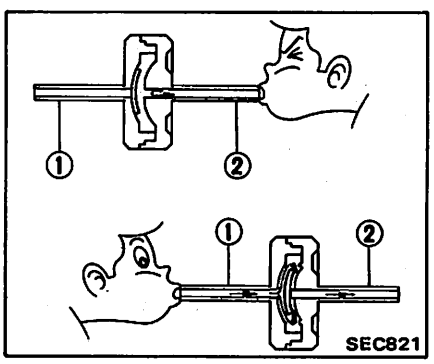


Vacuum switch

Intake manifold vacuum kPa (mmHg, inHg)	Switch
Above 6.3 - 7.7 (47 - 58, 1.85 - 2.28)	ON
Below 6.3 - 7.7 (47 - 58, 1.85 - 2.28)	OFF

One-way valve

1. Blow air from the port of the intake manifold side. The one-way valve is in good condition if the air does not flow through the valve.
2. Try again from the opposite side (White face side) of the valve. The valve is in good condition if the air flow resistance is greater.



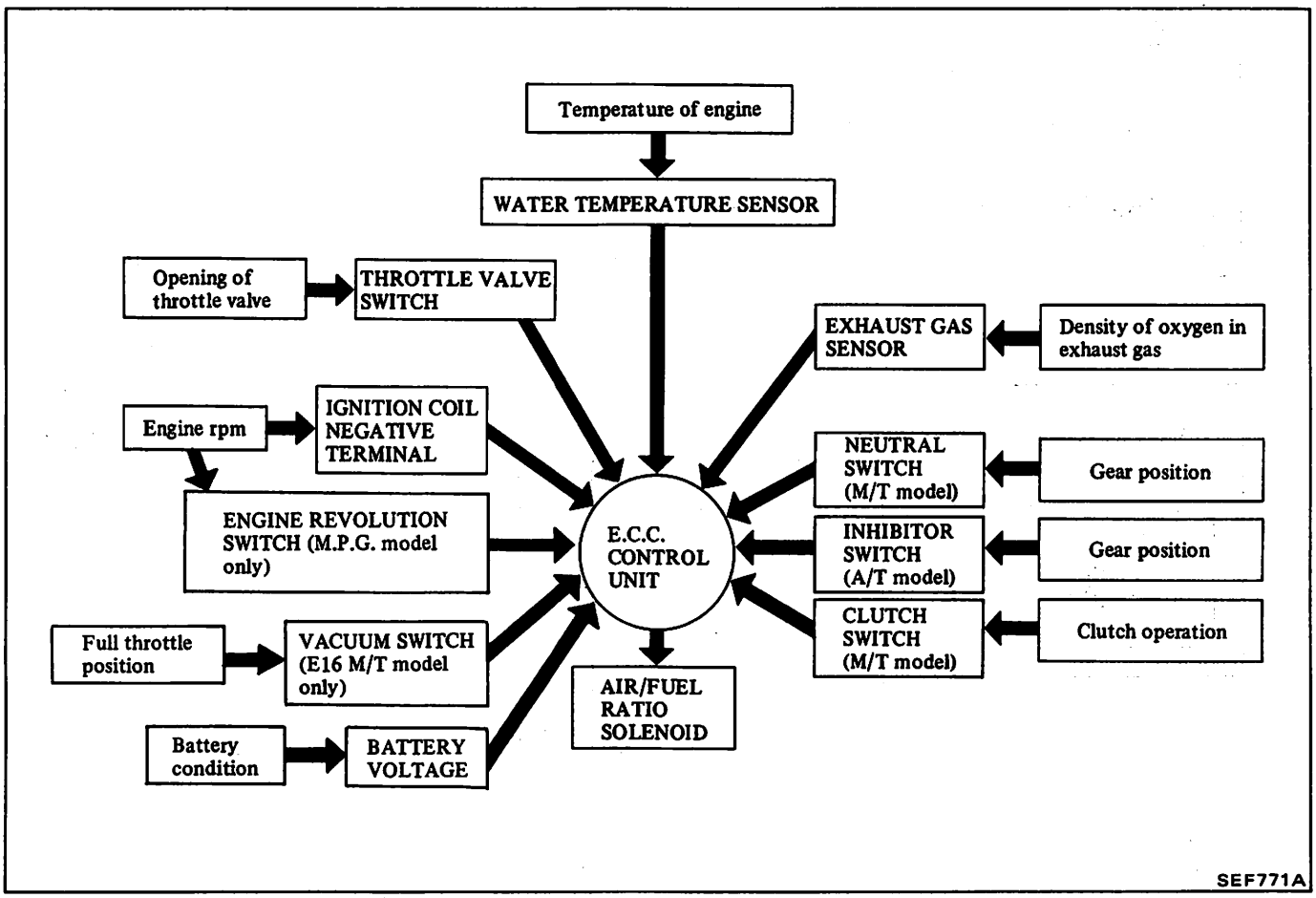
1 Vacuum tank side
2 Intake manifold side

3. If the condition of the one-way valve is questionable, dip port (On intake manifold side) into a cup filled with water. Blow air from white face side. Air bubbles should not appear.

CAUTION:
Be careful to avoid entry of oil or dirt into valve.

AIR-FUEL RATIO CONTROL SYSTEM

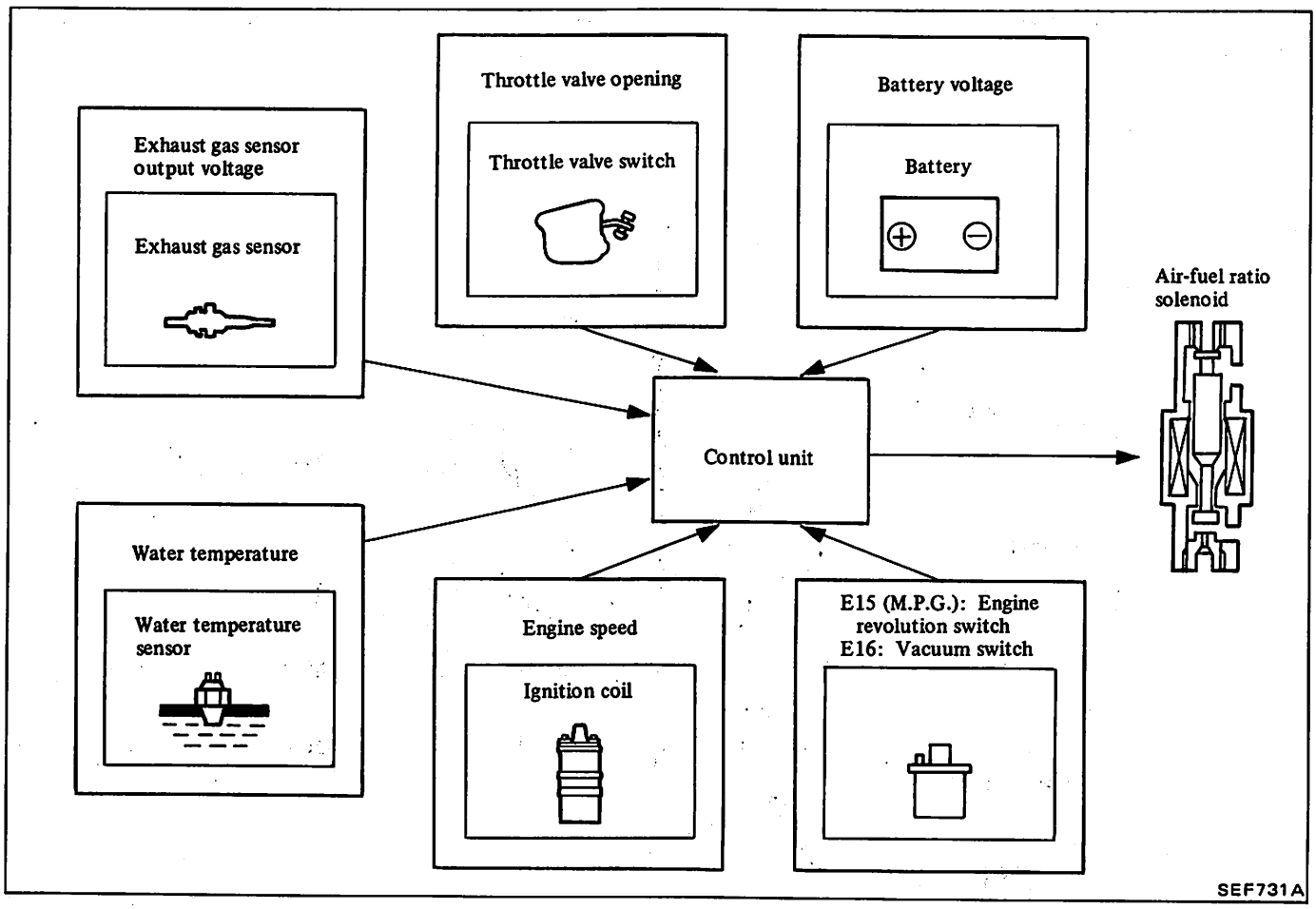
There are two ways to control air-fuel ratio: closed-loop control and open-loop control. Which one is used depends on water temperature, engine rpm, exhaust gas sensor, etc.



OPEN-LOOP CONTROL

For improved driveability, air-fuel ratio solenoid is controlled by open-loop control under the following conditions:

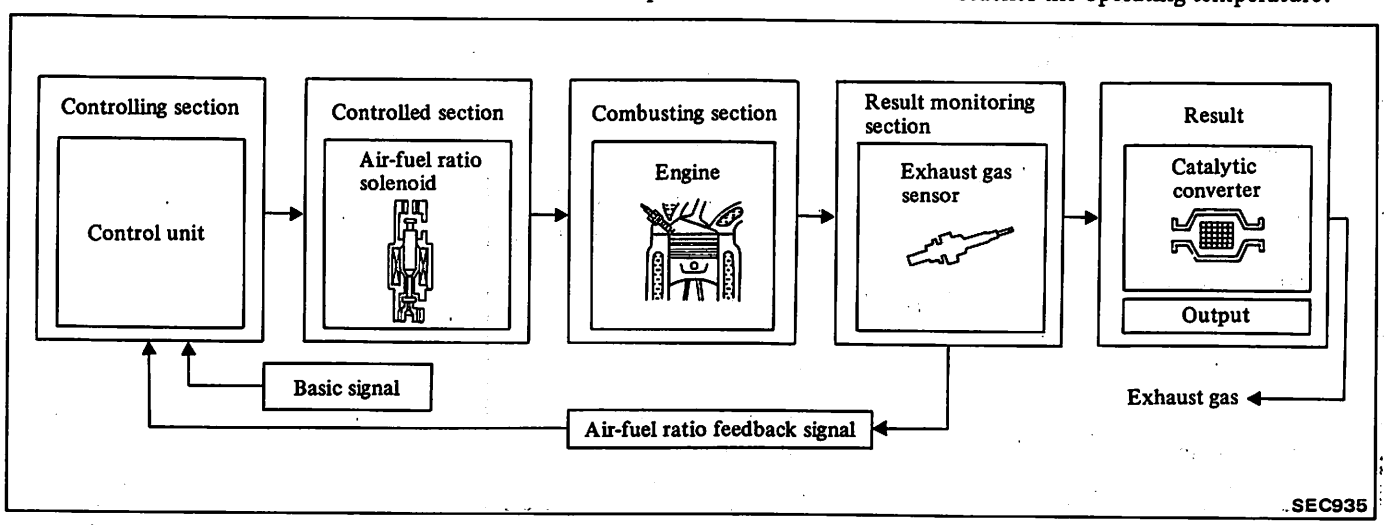
a	When battery voltage is too low	Battery voltage $\leqq$ 10 [V]
b	When starting engine	Engine speed $<$ 400 rpm
c	When engine is cold	Water temperature $<$ M/T 50°C (122°F) $<$ A/T 60°C (140°F)
d	When exhaust gas sensor is not activated	Output voltage $<$ 250±50 [mV]
e	During deceleration	Fuel shut-off system is in operation
f	When driving at high speeds	M.P.G.: Engine speed (Engine revolution switch: OFF) $\geqq$ 3,600 rpm E16: Engine speed $\geqq$ 3,425 rpm



With open-loop control, the air-fuel ratio is determined by the E.C.C. control unit.

CLOSED-LOOP CONTROL (Air-fuel ratio feedback control)

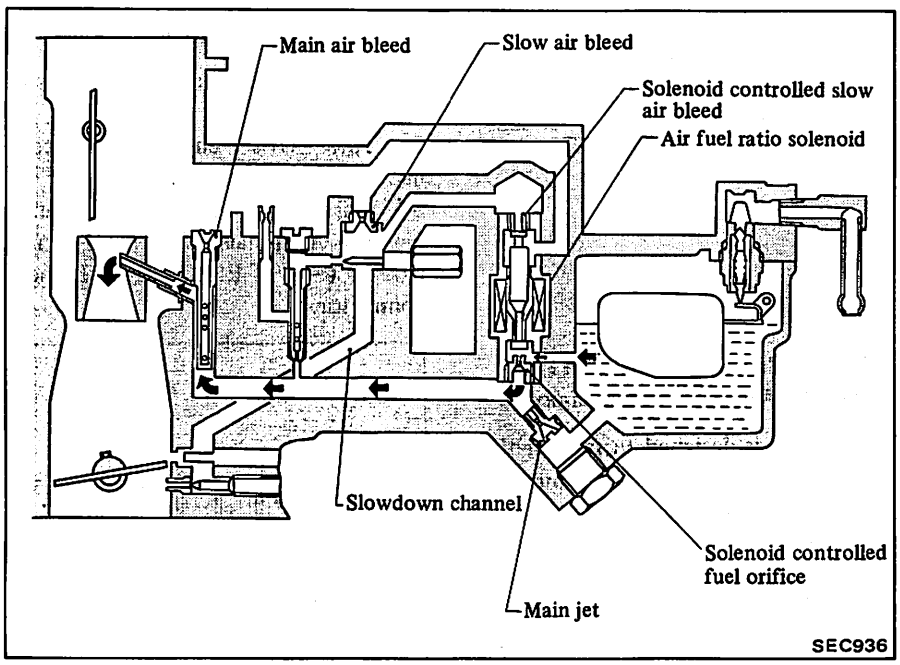
This system is designed to control the air-fuel ratio precisely to the stoichiometric point so that the three-way catalyst can minimize CO, HC and NOx emissions simultaneously. The system uses the exhaust gas sensor located in the exhaust manifold to give an indication of whether the air-fuel ratio is richer or leaner than the stoichiometric point. The sensor transmits a nonlinear voltage to the E.C.C. control unit. The control unit adjusts the feedback pulse width according to the sensor voltage so the mixture ratio will be within the narrow window of the three-way catalyst. During engine warm-up period, however, this system becomes open until the sensor reaches the operating temperature.



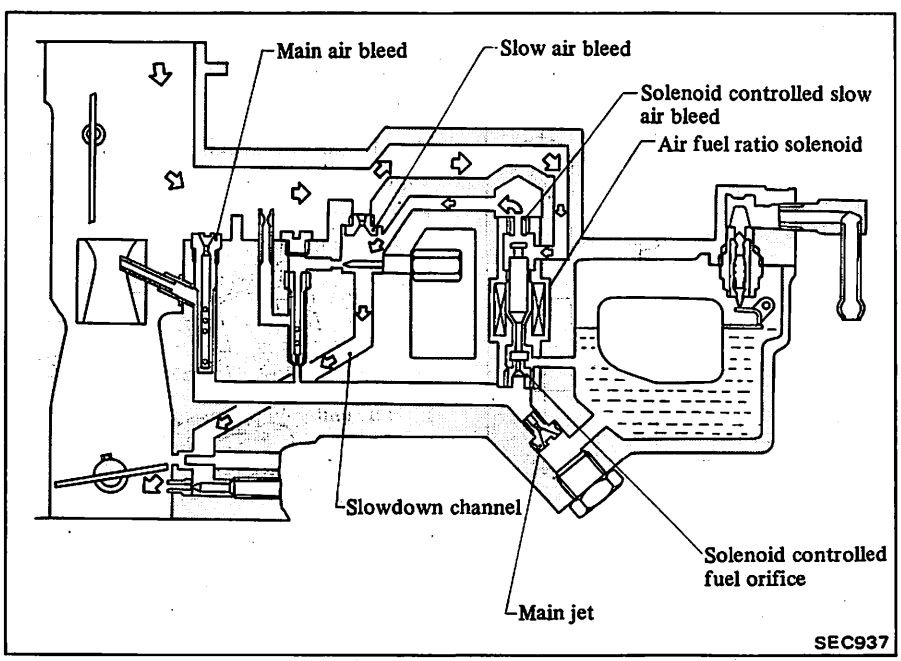
AIR-FUEL RATIO CONTROL SOLENOID VALVE

This solenoid valve is operated repeatedly by the signal from E.C.C. control unit.

OFF:



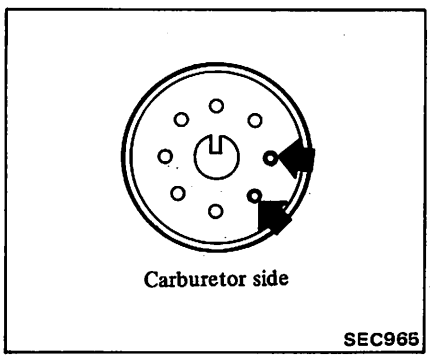
ON:



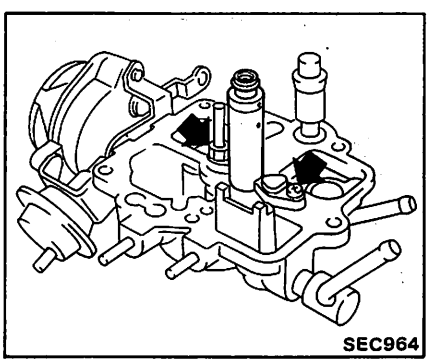
Removal and installation

Air-fuel ratio solenoid valve should be replaced only in the event of a major carburetor overhaul or when diagnosed as faulty in Diagnostic Procedure For E.C.C. Engine.

1. Disconnect carburetor harness connector.
2. Remove carburetor from engine.
3. Remove air-fuel ratio solenoid harness pin from carburetor harness connector.



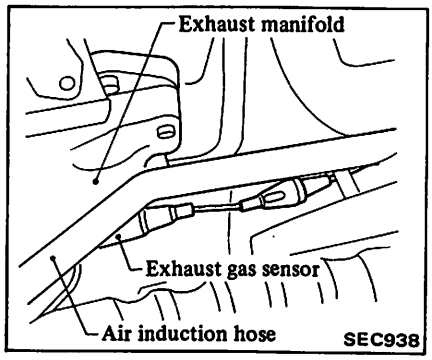
4. Remove choke chamber and turn it up.
5. Remove richer jet and screw.

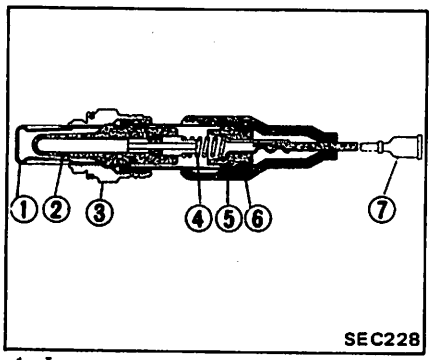


6. Remove air-fuel ratio solenoid valve.
7. To install, reverse the order of removal.

EXHAUST GAS SENSOR

The exhaust gas sensor, which is built into the exhaust manifold, monitors the density of oxygen in the exhaust gas. It consists of a closed-end tube made of ceramic zirconia and other components. Porous platinum electrodes cover the tubes inner and outer surfaces. The closed-end of the tube is exposed to the exhaust gas in the exhaust manifold. The tubes outer surface contacts the exhaust gas while the inner surface contacts the air.

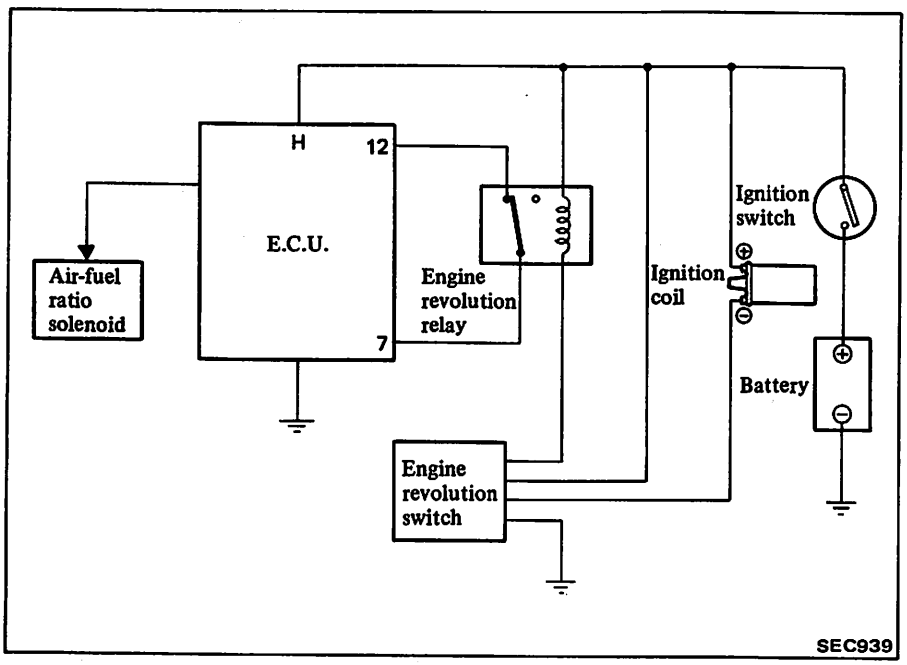




1 Louver
2 Zirconia tube
3 Holder
4 Spring
5 Terminal support
6 Boots
7 Connector

ENGINE REVOLUTION SWITCH AND RELAY (M.P.G. model only)

This system is designed to protect the 3-way catalytic converter from extremely high temperatures at high engine speeds.
Engine revolution switch is mounted on junction block.
Relay is mounted above fuse block (Refer to EL section).



Operation

Engine speed rpm	Engine revolution switch	Engine revolution relay	E.C.C. control
Below 3,600	ON	OFF	Closed-loop control
Above 3,600	OFF	ON	Open-loop control

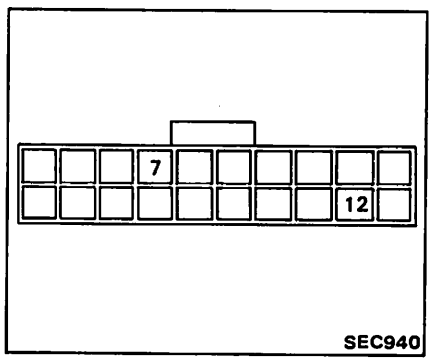
INSPECTION

Entire system

Refer to Diagnostic procedure for E.C.C. Engine.

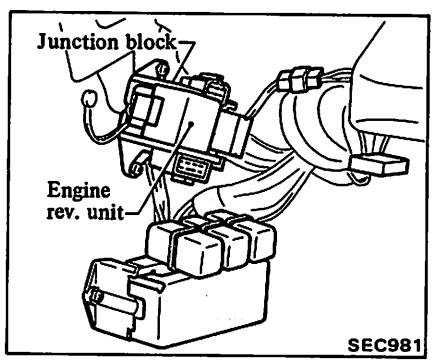
Engine revolution switch and relay

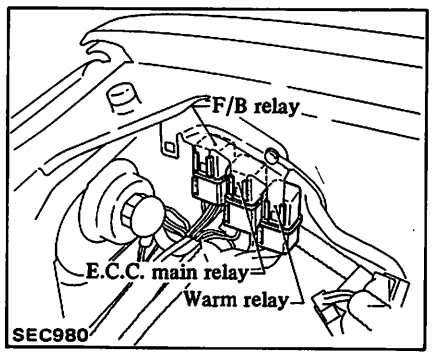
1. Warm engine to operating temperature.
2. Turn "OFF" engine and disconnect E.C.C. 20-pin connector.
3. Start engine and check continuity between terminals No. 7 (⊕) and No. 12 (⊖) of E.C.C. 20-pin harness connector.



Below about 3,600 rpm: continuity does not exist.
Above about 3,600 rpm: continuity exists.

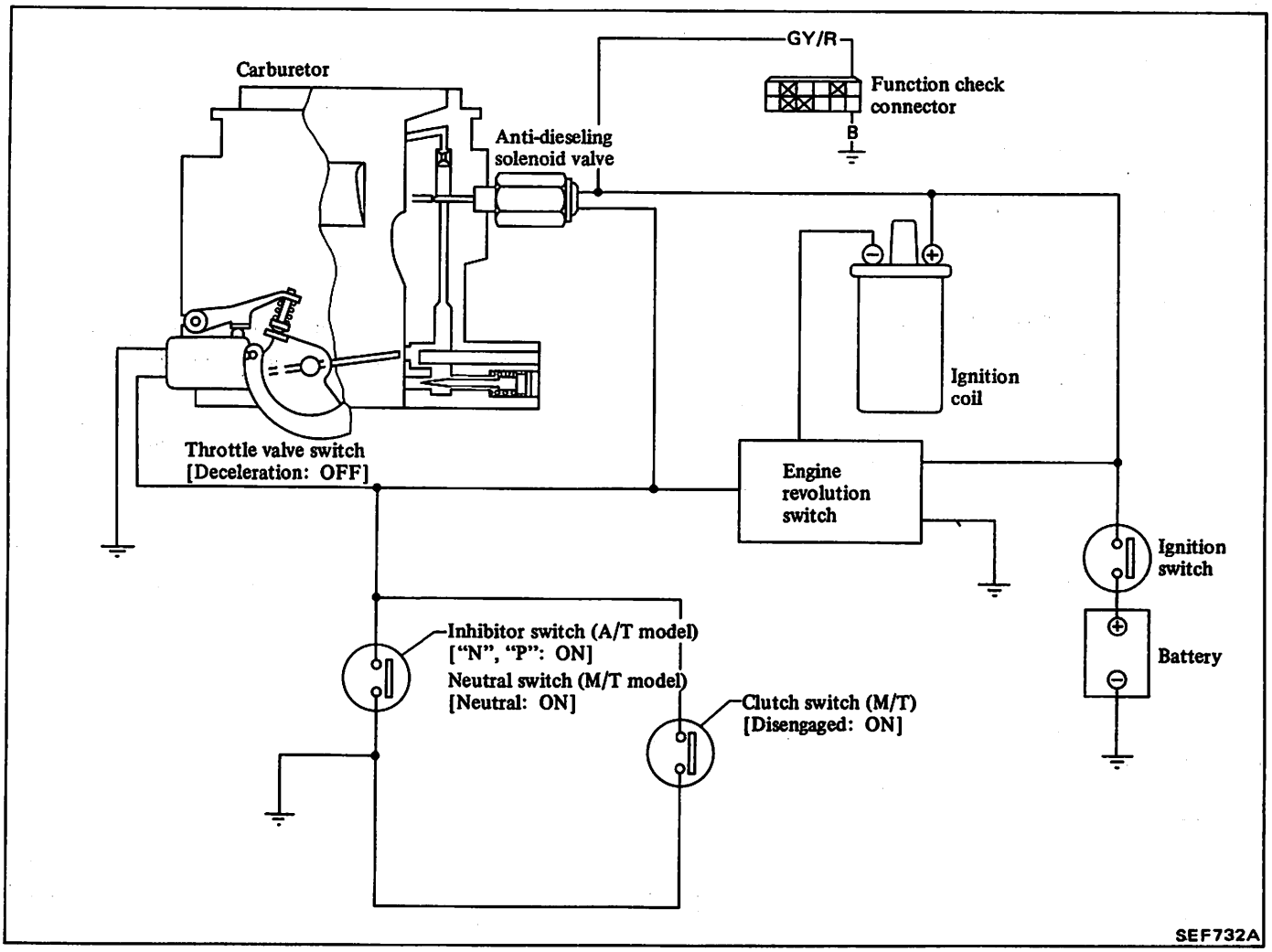
4. If out of specification, repair or replace.





FUEL SHUT-OFF SYSTEM (Non-California models)

The fuel shut-off system cuts off fuel during deceleration at high speeds when the manifold vacuum increases to a very high level. The purpose of this system is to improve fuel economy.

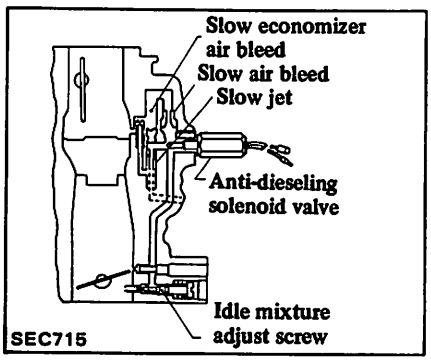


OPERATION

Ignition key	Engine speed	Switch operation						Fuel shut-off system
		Engine revolution switch	Throttle valve switch	Neutral switch (M/T)	Clutch switch (M/T)	Inhibitor switch (A/T)	Anti-dieseling solenoid	
OFF	Any condition							Not operated
ON	Higher than 1,650 rpm	OFF	OFF	ON	–		ON	Not operated
				OFF	ON		ON	Not operated
					OFF		OFF	Operated
						ON	ON	Not operated
						OFF	OFF	Operated
			ON	–	–	–	ON	Not operated
	Lower than 1,650 rpm	–	–	–	–	–	ON	Not operated

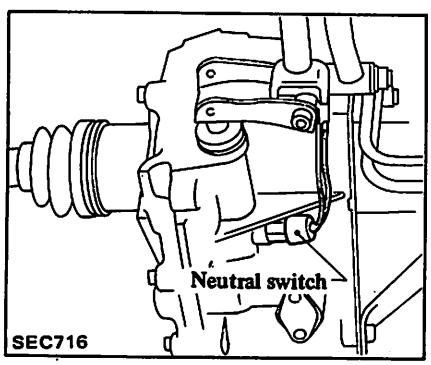
Anti-dieseling solenoid valve

The anti-dieseling solenoid valve is attached to the carburetor with its needle valve facing the fuel passage of the primary slow system. When current flows through the anti-dieseling solenoid valve, the needle valve retracts, allowing the current to flow through the primary slow system. When current does not flow through this system, the fuel will be shut off:



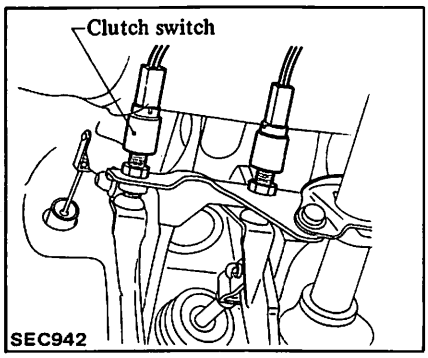
Neutral switch

When transaxle gears are in Neutral, this switch causes an electric current to flow through the vacuum switch.



Clutch switch

The clutch switch is attached to the clutch bracket. When the clutch is disengaged, this switch causes an electric current to flow through the vacuum switch.



Engine revolution switch

This switch is designed to detect the engine rpm when the fuel shut-off system is operated. It is mounted on junction block.

INSPECTION

Entire system

1. Visually check fuel shut-off system. If any switches are broken, replace.

CAUTION:

a. Before checking, make sure engine is warmed up and choke valve is fully open.

b. Keep clutch pedal held down with your foot while depressing accelerator pedal when shift lever is in any position other than neutral. Otherwise car will surge forward abruptly.

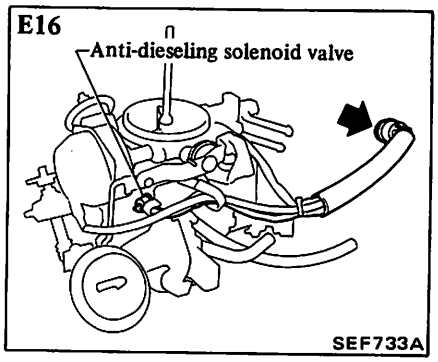
Do not attach test leads of a circuit tester to terminals other than those designated.

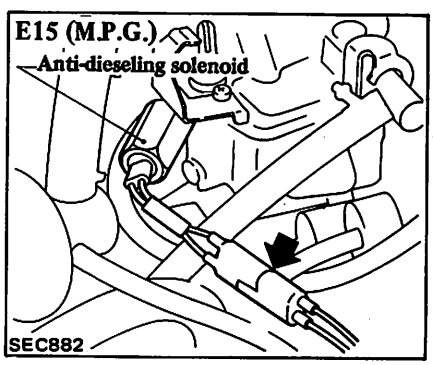
2. Connect circuit tester to the function check connector.
3. Turn the ignition switch to "ON" position.
4. Check for presence of voltage across G/B and B.

Clutch	Voltage
Disengaged (Pedal pressed)	12V
Engaged (Pedal free)	0V

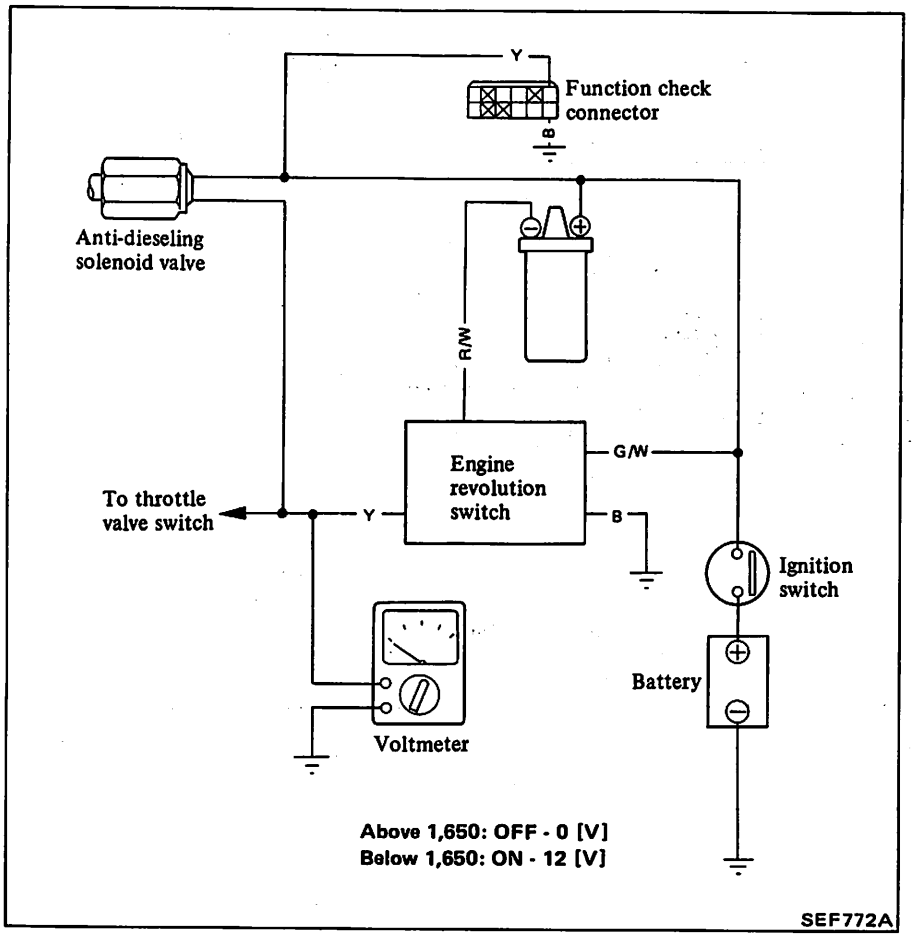
Gear position	Voltage
Neutral	12V
Others	0V

Connect vacuum hose and connector.
5. Start engine and warm it up.
6. Disconnect anti-dieseling solenoid valve connector or vacuum switch connector and make sure that engine does not keep idling. If it does, replace anti-dieseling solenoid valve assembly.





7. Set voltage meter as shown below.



8. Set control lever in "N" position and run engine under no load. Increase engine rpm to check engine rev unit condition. If voltmeter indicates zero V when engine rpm is above 1,650 rpm, engine rev switch is correct. If not, replace it.

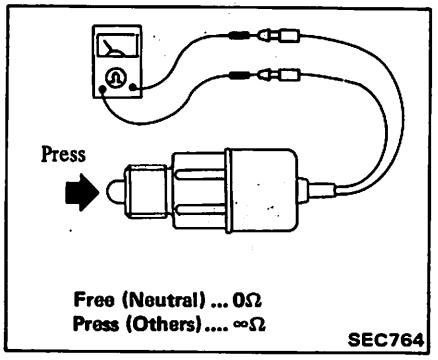
9. Check for presence of voltage across Br and B.

Vehicle speed km/h (MPH)	Voltage
Below 65 (40)	12V
Above 65 (40)	0V

Be sure that speedometer reading does not exceed 89 km/h (55 MPH).

Neutral switch

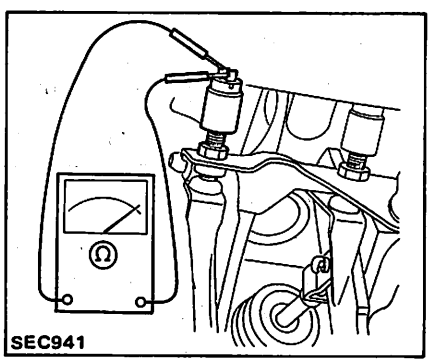
For ON-OFF characteristics, see schematic diagram. If operation is questionable, remove switches.



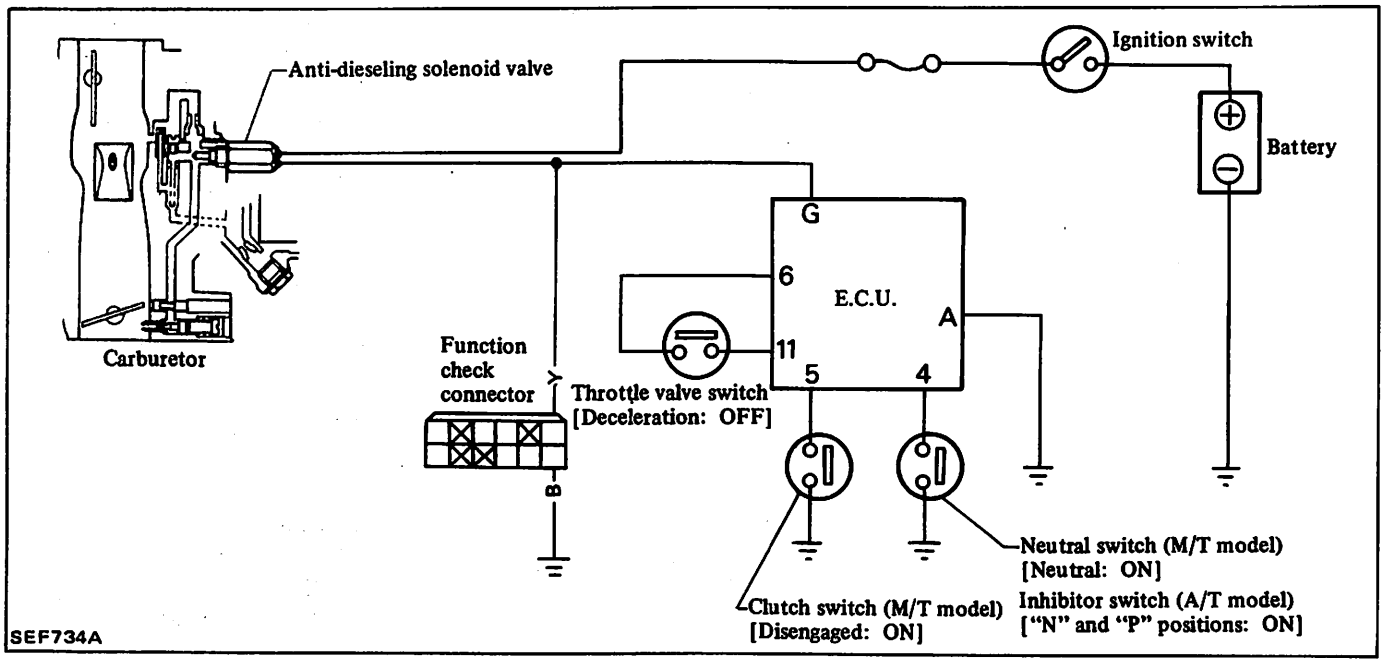
Ⓣ : **20 - 29 N-m (2.0 - 3.0 kg-m, 14 - 22 ft-lb) With locking sealant**

Clutch switch

Clutch	Continuity
Disengaged	0Ω
Engaged	∞Ω



FUEL SHUT-OFF SYSTEM (California models)

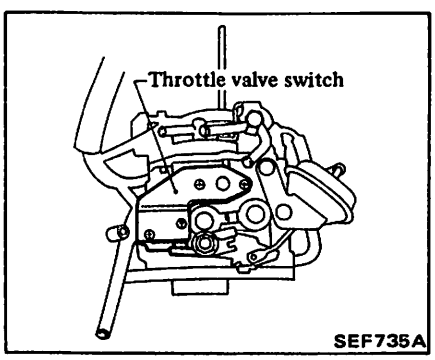


OPERATION

Water temperature °C (°F)	Engine speed rpm	Throttle valve	Transaxle		Fuel shut-off system
			Gear position	Clutch	
M/T: Below 50 (122) A/T: Below 60 (140)	Any conditions				Not operated
M/T: Above 50 (122) A/T: Above 60 (140)	Any conditions			Disengaged	
			Neutral		
		Open	Any conditions		
	Below 2,000				
	Above 2,000	Closed	Others	Engaged	Operated

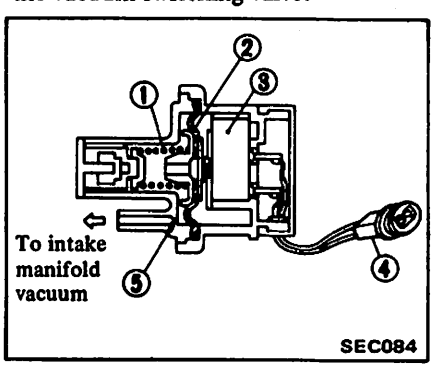
Throttle valve switch

The throttle valve switch is attached to the E.C.C. and actuates in response to the throttle valve movement.



Vacuum switch

When the intake manifold vacuum increases during deceleration, this switch is activated, thereby interrupting the electrical signal which is sent to the vacuum switching valve.



1 Spring
2 Diaphragm
3 Micro switch
4 Connector
5 Orifice

INSPECTION

Entire system

Refer to Diagnostic Procedure for E.C.C. Engine.

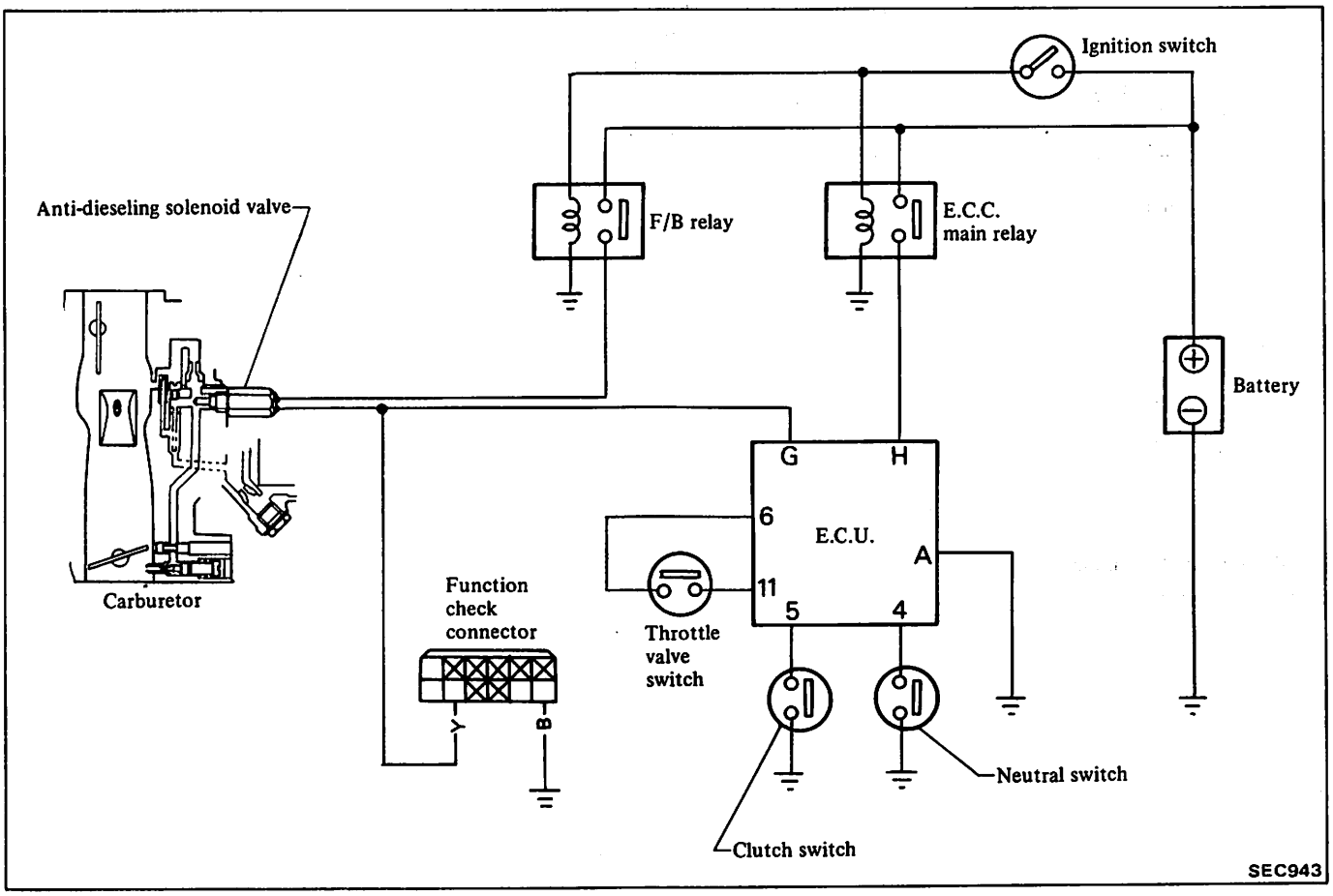
Vacuum switch

Intake manifold vacuum kPa (mmHg, inHg)	Switch
Above 10.7 - 11.7 (80 - 88, 3.15 - 3.46)	ON
Below 8.9 - 11.1 (67 - 83, 2.64 - 3.27)	OFF

FUEL SHUT-OFF SYSTEM (M.P.G. models)

This system does not operate under cold engine conditions or no-load conditions to prevent engine from stalling.

In addition, the recovery system from fuel shut-off is also operated when engine speed is below 2,000 rpm.

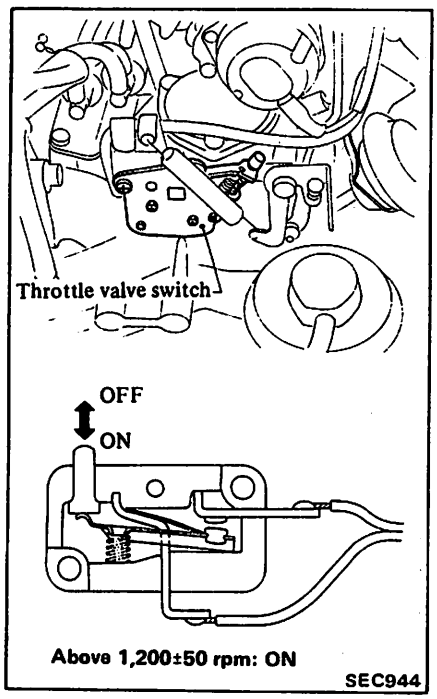


OPERATION

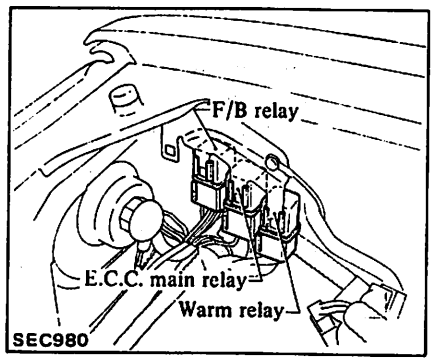
Water temperature °C (°F)	Engine speed rpm	Throttle valve	Transaxle		Fuel shut-off system
			Gear position	Clutch	
Below 50 (122)	Any conditions				Not operated
Above 50 (122)	Any conditions			Disengaged	
			Neutral		
		Open	Any conditions		
	Below 2,150				
	Above 2,150	Closed	Others	Engaged	Operated

Throttle valve switch

The throttle valve switch is attached to the E.C.C. and actuates in response to the throttle valve movement.



Relays

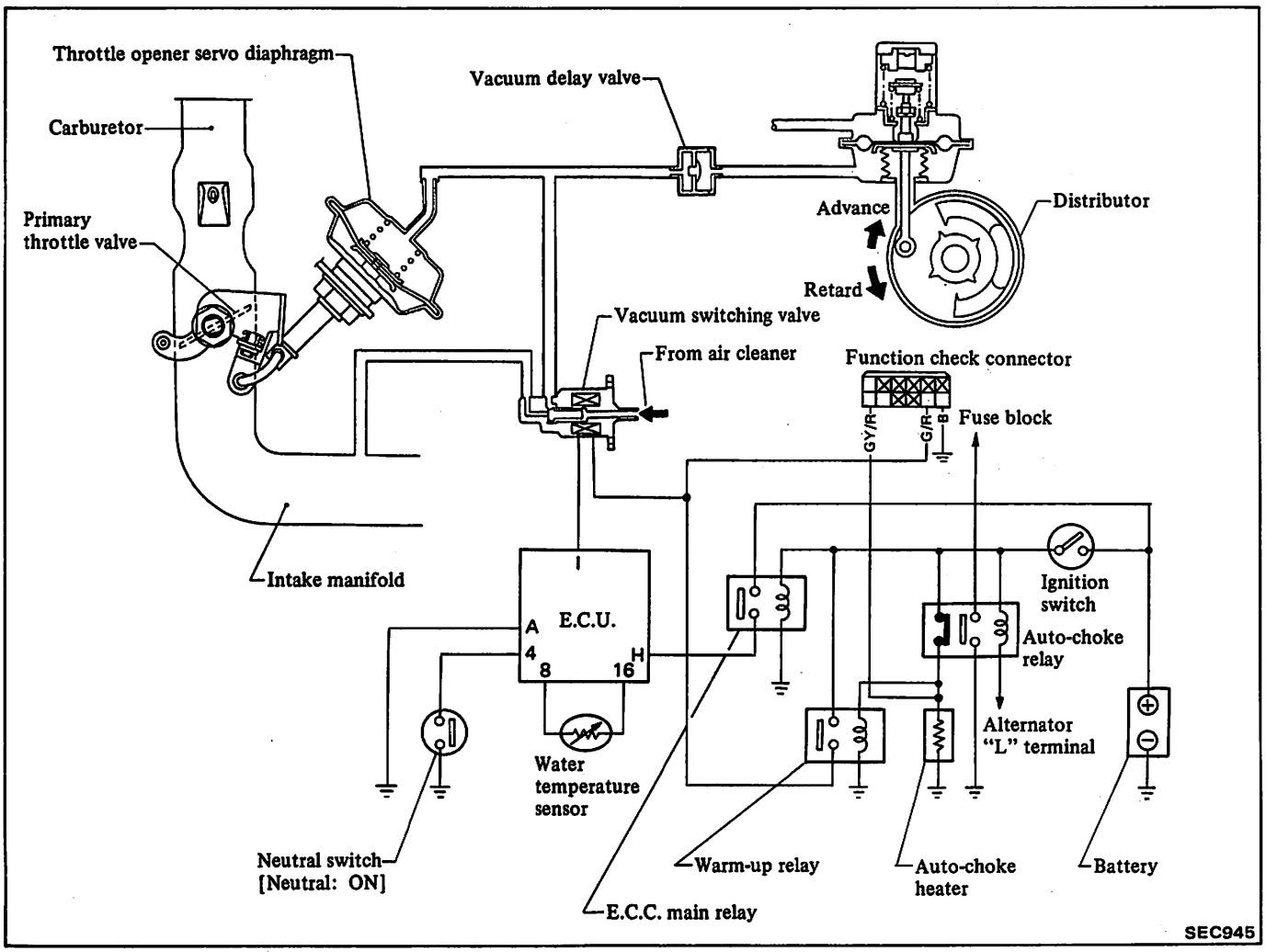


INSPECTION

Entire system

Refer to Diagnostic Procedure for E.C.C. Engine.

CATALYST WARM-UP SYSTEM (M.P.G. models)



OPERATION

Water temperature sensor °C (°F)	Transaxle gear position	Vacuum switching valve	Throttle opener	Spark timing
Below 17 (63)	Any position	Closed	Not operated	Advance
17 - 35 (63 - 95)	Neutral	Open	Operated	Retard
	Others	Closed	Not operated	Advance
Above 35 (95)	Any position			

INSPECTION

Entire system

Refer to Diagnostic Procedure for E.C.C. Engine.

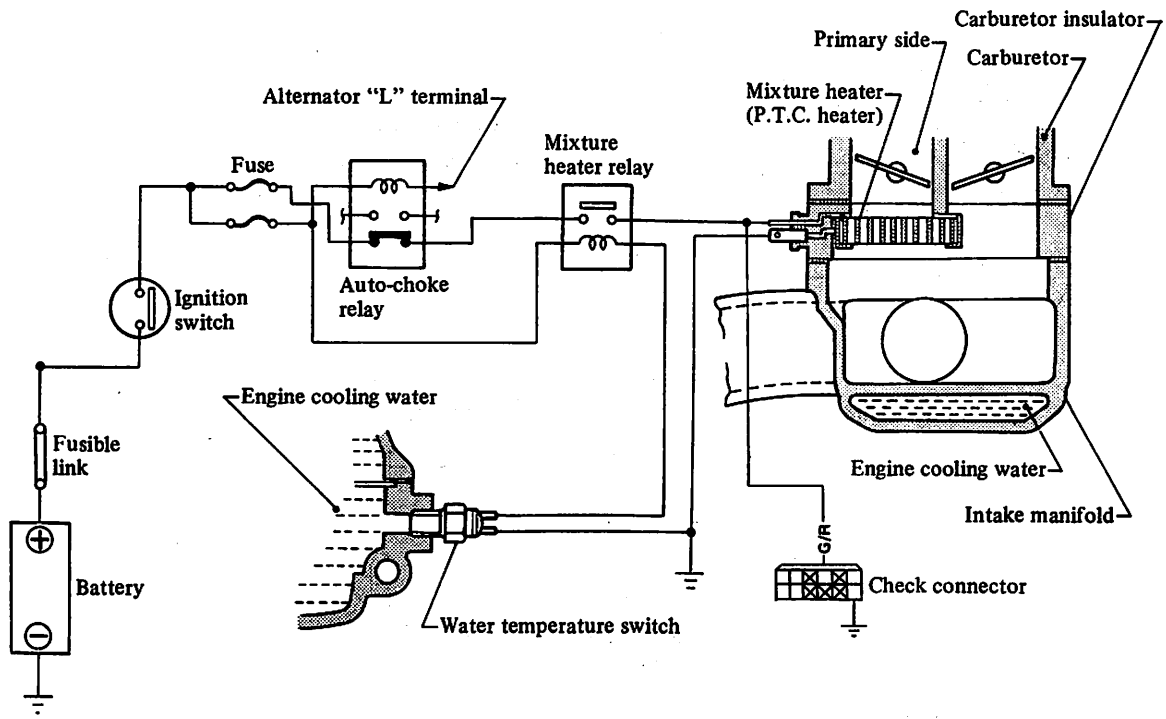
MIXTURE HEATING SYSTEM (Non-California and Canada models)

In order to reduce emissions and improve driveability during engine warm-up, the positive temperature coefficient (P.T.C.) heater is installed between carburetor and intake manifold.

When engine starts, P.T.C. heater is electrically energized and the air-fuel mixture which passes through this heater is heated.

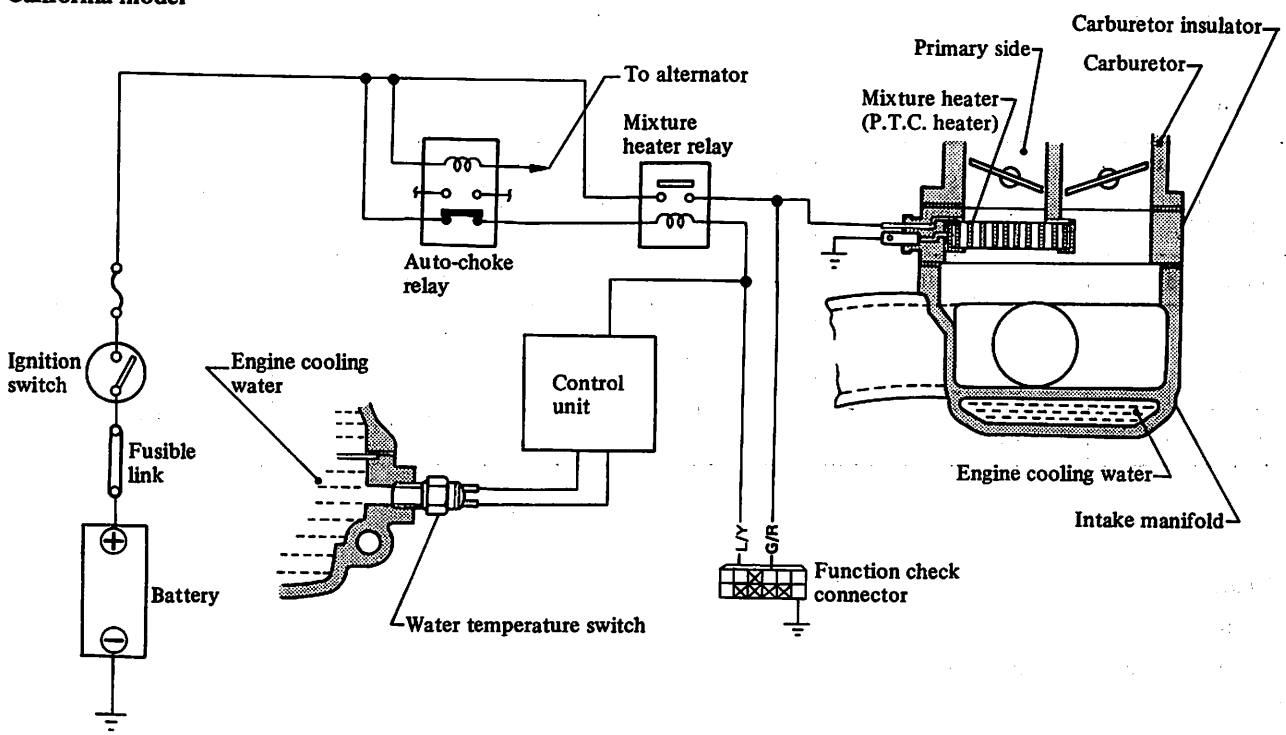
When engine warm-up is completed, the heater current is cut off by the water temperature switch.

Non-California and Canada models



SEC131A

California model



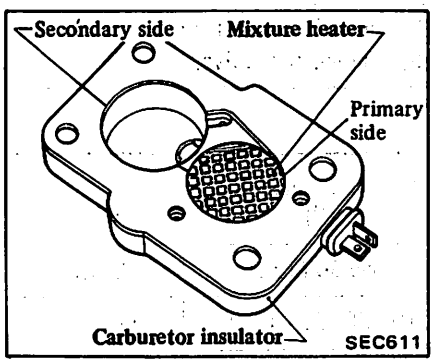
SEC130A

OPERATION

The operation of the system is as follows:

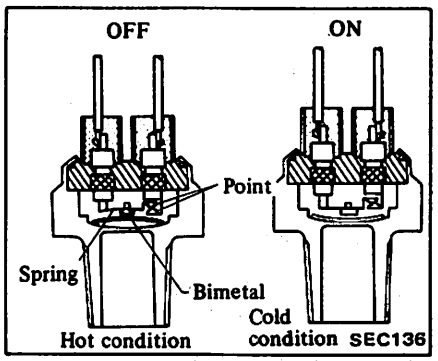
Water temperature °C (°F)	Mixture heating system
Below 37 (99)	Activated
Above 37 (99)	Deactivated

Mixture heater



The mixture heater uses a honeycomb P.T.C. heater design and is situated in the primary side of the carburetor insulator. With this design, resistance to current flow increases as the temperature increases, and vice versa. As a result, the current flow is maintained constant.

Water temperature switch

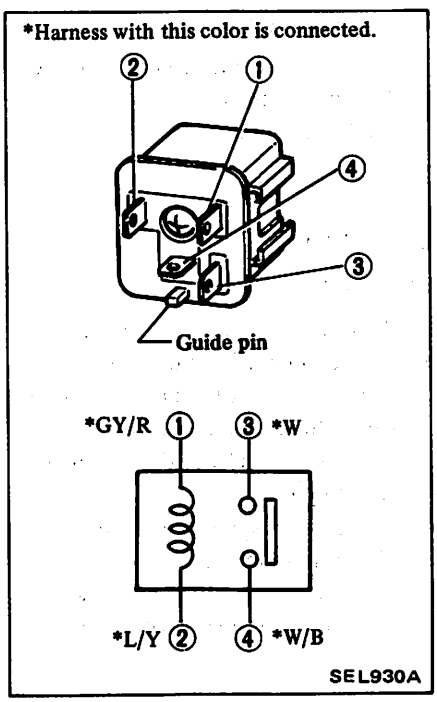


Water temperature switch is installed on thermostat housing.

Mixture heater relay

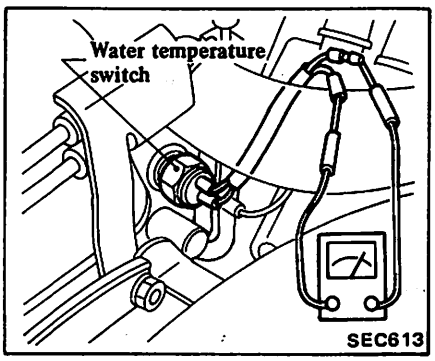
This unit is located in the relay bracket (Except M.P.G. model) or junction block near fuse box (M.P.G. model).

Mixture heater relay is "1M" type standardized relay.



INSPECTION

1. Check continuity between terminals of mixture heater. If resistance is too large, replace carburetor insulator.
2. When ignition switch is turned "ON" while engine is "OFF", confirm the presence of battery voltage at mixture heater harness connector. If no battery voltage is present, check water temperature switch and mixture heater relay.
3. Check continuity between terminals of water temperature switch at connector.



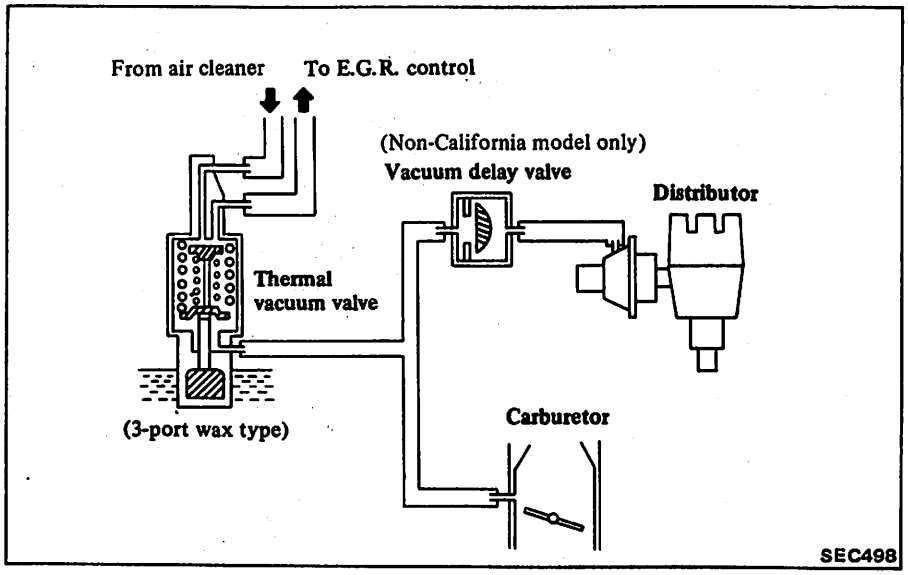
4. Check mixture heater relay.

If necessary, check wiring harness and automatic choke relay which is "1M·1B" standardized relay.

Refer to Idle Mixture Adjusting Procedure for automatic choke relay.

SPARK TIMING CONTROL SYSTEM

The spark timing control system is designed to control the distributor vacuum advance under varying driving conditions so as to reduce HC and NOx emissions.



OPERATION

Water temperature °C (°F)	Thermal vacuum valve	Spark timing control system
Below 10 (50)	Closed	Actuated
10 - 50 (50 - 122)	Open	Not actuated
Above 50 (122)	Closed	Actuated

Thermal vacuum valve

Refer to "Thermal Vacuum Valve" of E.G.R. control system for description.

Vacuum delay valve

Refer to Vacuum Delay Valve of catalyst warm-up system for description and inspection.

INSPECTION

Entire system

1. Ensure that vacuum hoses are properly connected in position.
2. Ensure that distributor vacuum controller functions properly.
3. Set timing light and start engine when it is cold.
4. Check the spark timing referring to "Operation table".
5. If the spark timing does not change, check thermal vacuum valve.

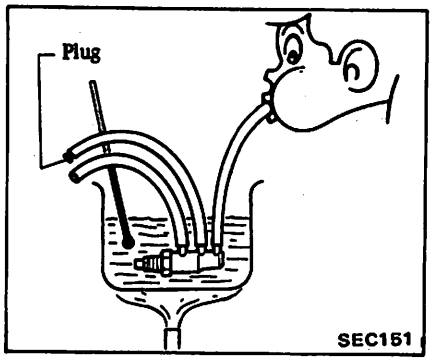
Thermal vacuum valve

Remove thermal vacuum valve from engine. Inhale air from port of spark timing control system and check to be sure that thermal vacuum valve opens or closes in response to its temperature.

Before removing valve, drain engine coolant about one liter (1-1/8 US qt, 7/8 Imp qt).

CAUTION:
Do not allow water to get inside the thermal vacuum valve.

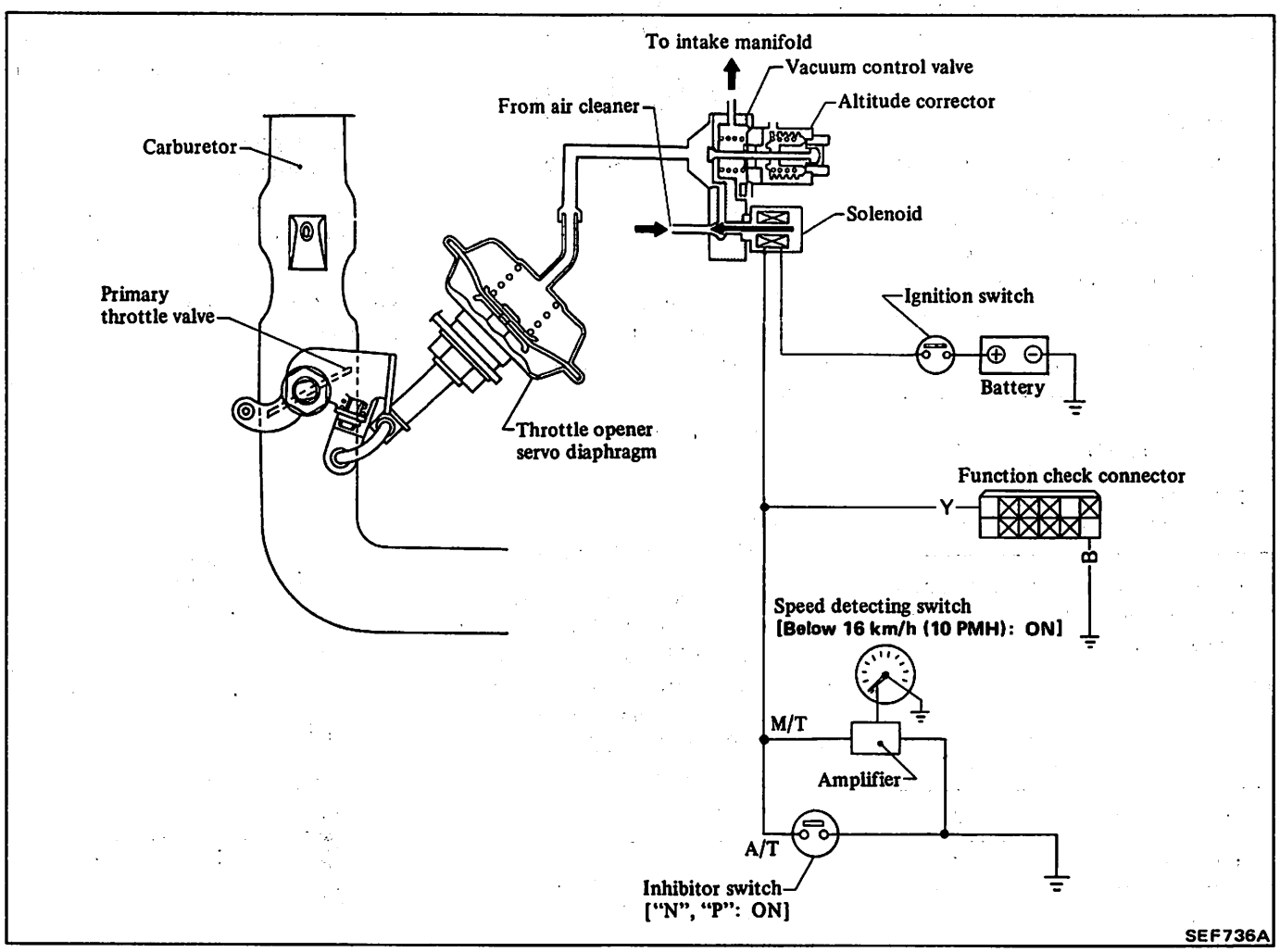
Water temperature °C (°F)	Valve
Above 50 (122)	Closed
10 - 50 (50 - 122)	Open
Below 10 (50)	Closed



THROTTLE OPENER CONTROL SYSTEM (T.O.C.S.) FOR CANADA

The function of the throttle opener is to open the throttle valve of the carburetor slightly while the car decelerating. During deceleration, the manifold vacuum rises and the quantity of mixture in the engine is not sufficient for normal combustion to continue; consequently, a great amount of unburned HC is emitted.

Carburetors equipped with the throttle opener supply the engine with an adequate charge of combustible mixture to maintain proper combustion during deceleration, resulting in a dramatic reduction in HC emission.



OPERATION

Transaxle	Gear position	Vehicle speed km/h (MPH)	T.O.C.S. operation
Manual	Any position	Below 16 (10)	Operated
		Above 16 (10)	Not operated
Automatic	"N" or "P"	Any speed	Operated
	Others		Not operated

INSPECTION AND ADJUSTMENT

Entire system

When idling speed is too high and does not drop to idling speed, the throttle opener control system should be checked.

1. Check for continuity between "G/R" and "B" terminals specified in function check connector with ignition switch OFF.

If continuity does not exist, solenoid may be faulty. Replace throttle opener control valve assembly.

2. Turn on ignition switch and check voltage across terminals "G/R" and "B".

M/T models

Remove speedometer cable from combination meter. Then spin speedometer in combination meter with fingers and confirm that the speedometer pointer indicates more than 16 km/h (10 MPH) temporarily. Voltage between "G/R" and "B" terminals should be changed as follows:

Above 16 km/h (10 MPH)	0V
Below 16 km/h (10 MPH)	12V

If not, amplifier or speed detecting switch may be faulty; replace parts with new ones.

A/T models

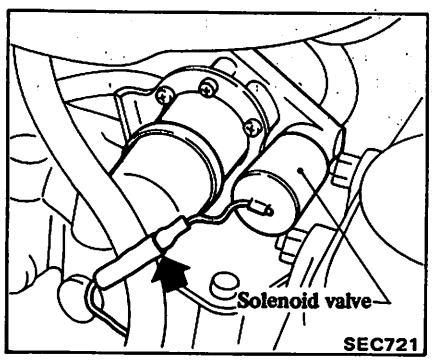
Voltage between two terminals should be changed as follows:

"N" or "P" position	12V
Other position	0V

If not, replace inhibitor switch.

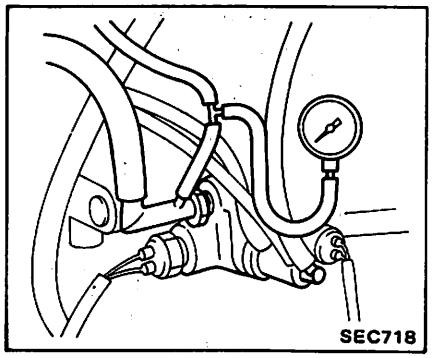
Throttle opener operating pressure

1. Remove harness of solenoid valve.



2. Connect rubber hose between vacuum gauge and intake manifold.

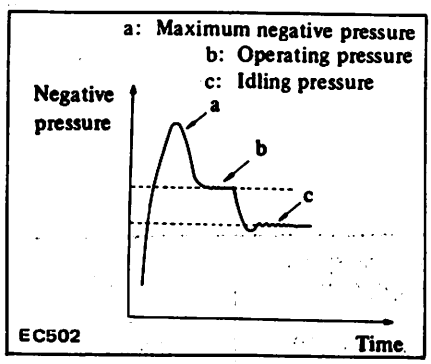
A quick-response type boost gauge such as Bourdon's type is recommended; a mercury-type manometer should not be used.



3. Warm up engine until it reaches operating temperature. Then confirm that engine idling speed is specified value.

Engine idling speed:
M/T:
750 rpm
A/T:
650 rpm (in "D" position)

4. Run engine under no load. Increase engine speed to 3,000 or 3,500 rpm, then quickly close throttle valve.
5. At that time, manifold vacuum pressure increase abruptly to −80.0 kPa (−600 mmHg, −23.62 inHg) or above and then decreases to the level set at idling.



6. Check that the T.O.C.S. operating pressure is within the specified pressure.

Specified pressure [0 m (0 ft), sea level and 101.3 kPa (760 mmHg, 29.92 inHg), atmospheric pressure]:

−69.3 ± 2.7 kPa
(−520 ± 20 mmHg,
−20.47 ± 0.79 inHg)

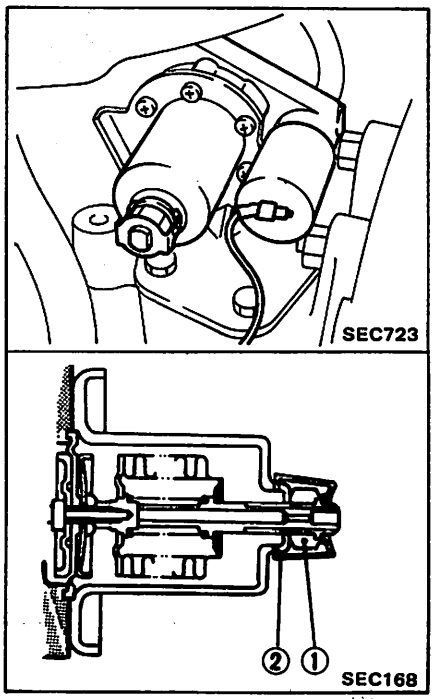
7.
(1) If it is lower than the specified level, turn the adjusting screw or nut in the following direction until correct adjustment is made.

Adjusting nut:
Clockwise

(2) If it is higher than the specified level, turn the adjusting screw or nut in the following direction until correct adjustment is made.

Adjusting nut:
Counterclockwise

When adjusting T.O.C.S., turn adjusting nut in or out with lock spring in place. Always set lock spring properly to prevent changes in set pressure.



1 Adjusting nut
2 Lock spring

The operating pressure varies in proportion to altitude.

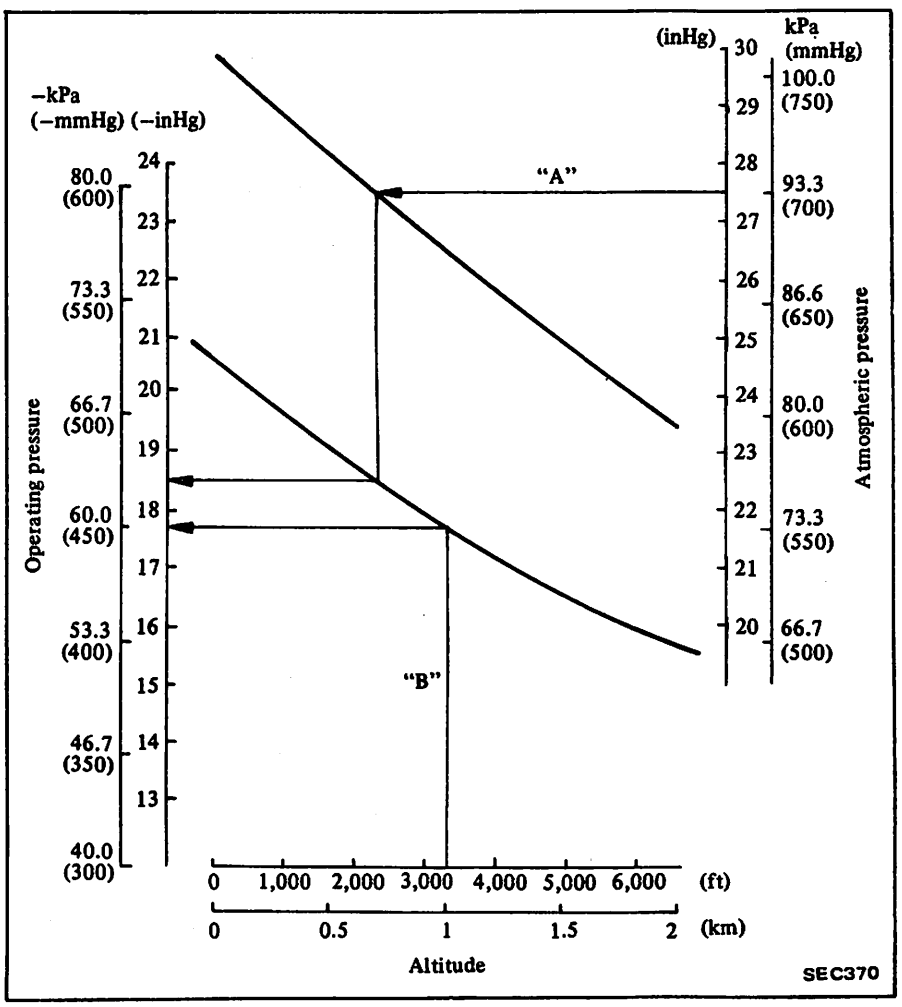
a. **When atmospheric pressure is known, operating pressure will be found by tracing the arrow line "A". When altitude is known, operating pressure will be found by tracing the arrow line "B".**
b. **When checking T.O.C.S. operating pressure, note atmospheric pressure and elevation in which check is to be made, and determine set pressure by the information furnished.**

For example, if above sea level is 1,000 m (3,280 ft), operating pressure will then be –63.3 kPa (–475 mm Hg, –18.70 inHg).
In other words, T.O.C.S. operates at –63.3 kPa (–475 mmHg, –18.70 inHg).

8. Race engine and check for adjustment.
9. If engine speed does not drop to idling speed when checking throttle opener operating pressure, proceed as follows:

(1) Turn adjusting screw counterclockwise so that throttle opener operating pressure is on high vacuum side, 3.3 kPa (25 mmHg, 0.98 inHg) above the specified value.
(2) Turn adjusting screw 1/4 of a turn clockwise so that throttle opener operating pressure drops by 3.3 kPa (25 mmHg, 0.98 inHg).
10. If throttle opener operating pressure cannot be observed clearly even in step 9, proceed as follows.
(1) Turn adjusting screw counterclockwise so that throttle opener operating pressure is on high vacuum side 6.7 kPa (50 mmHg, 1.97 inHg) above the mid-point of the specified range.
(2) Turn adjusting screw ½ of a turn clockwise.

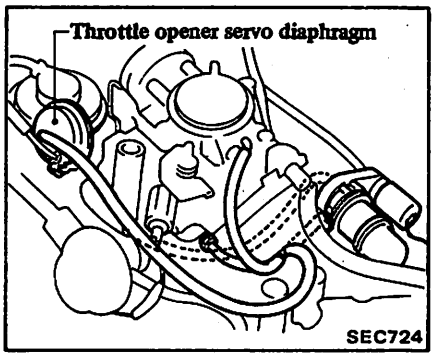
The throttle opener operating pressure should be correctly set within the specified range after the above adjustments, even if the engine speed cannot be decreased to idling.



Servo diaphragm stroke

1. Connect engine tachometer.
2. Warm up engine until it reaches operating temperature.
3. Disconnect rubber hose between servo-diaphragm and vacuum control valve.

Then, connect rubber hose to intake manifold.

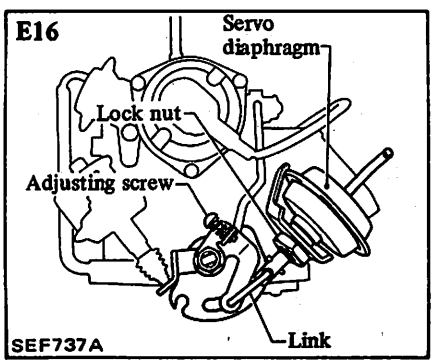


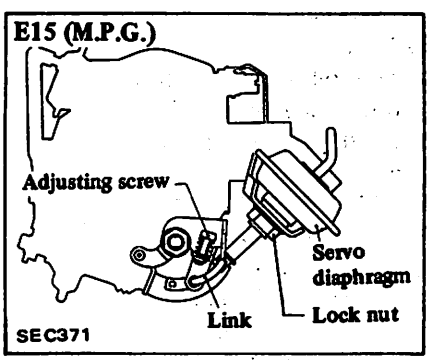
4. Servo-diaphragm is functioning properly, if engine speed comes into the specified range.

Specified engine speed:
1,650 - 1,850 rpm

5. If necessary, adjust engine speed until it is in the specified range, using servo-diaphragm adjusting screw.

When engine speed is lower than the prescribed range:
Turn adjusting screw clockwise.
When engine speed is higher than the prescribed range:
Turn adjusting screw counterclockwise.



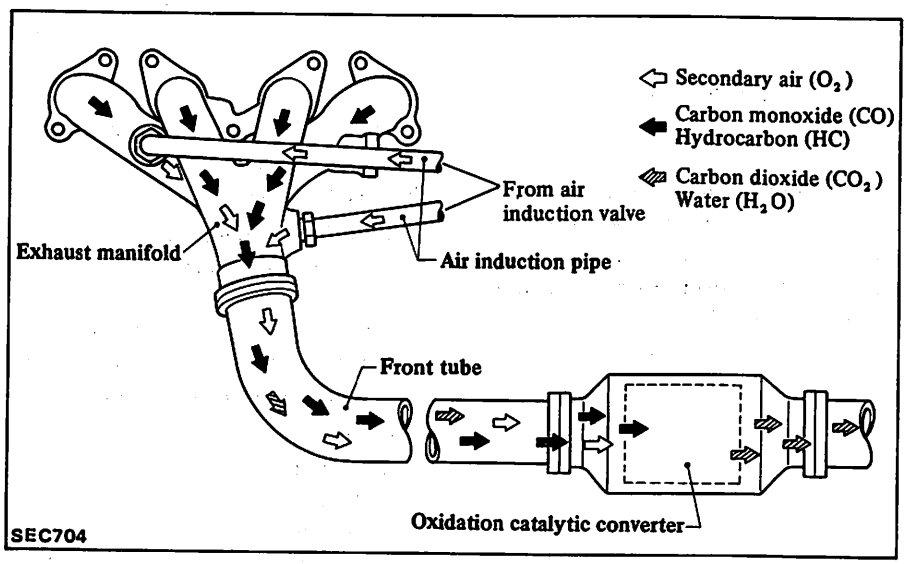


CATALYTIC CONVERTER

Exhaust gas emitted from the engine contains some harmful gases due to incomplete combustion in the combustion chamber.

The air induction system (A.I.S.) is designed to reduce the content of such gases in the exhaust gas.

The catalytic converter further cleans engine exhaust gas. Through catalytic action, it changes residual hydrocarbons (HC) and carbon monoxide (CO) contained in exhaust gas into water (H_2O) and carbon dioxide (CO_2) before exhaust gas is discharged to the atmosphere.



REMOVAL AND INSTALLATION

1. Jack up the car.

Apply parking brake and place wheel chocks.

2. Remove screws securing lower shelter of catalytic converter.

Loosen flange bolts connecting catalytic converter to front and rear exhaust tubes.

Catalytic converter assembly can then be taken out.

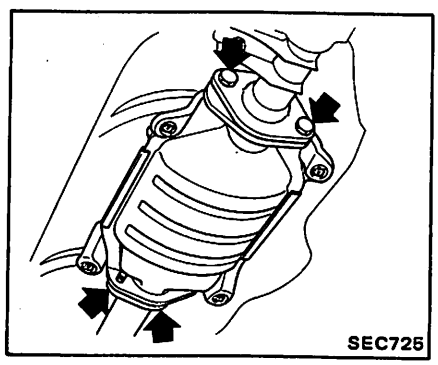
3. Installation is in the reverse order of removal.

CAUTION:

a. Be careful not to damage catalytic converter when handling.

b. Never wet catalyzer with water, oil, etc.

Ⓣ : **Catalytic converter bolts**
31 - 42 N·m
(3.2 - 4.3 kg-m,
23 - 31 ft-lb)
Lower shelter bolts
6.3 - 8.3 N·m
(0.64 - 0.85 kg-m,
4.6 - 6.1 ft-lb)



INSPECTION

Preliminary inspection

Visually check condition of all component parts including hoses, tubes and wires. Replace if necessary.

Refer to Air Induction System for inspection.

Catalytic converter

Whether catalytic converter is normal or not can be checked by observing variation in CO percentage. The checking procedure is as follows:

Apply parking brake. Shift gears into "Neutral" position.

1. Visually check catalytic converter for damage or cracks.
2. Adjust engine idling speed. Refer to Adjusting Idle RPM for adjustment. (Section MA).
3. Race engine (2,000 to 3,000 rpm) two or three times under no load.
4. If idling speed increases, readjust it to specified speed with throttle adjusting screw.
5. Warm up engine for about four minutes at 2,000 rpm under no load.
6. Measure CO percentage at idling speed. After step 5 has been completed, wait for one minute before making CO percentage measurement.
7. If CO percentage measured in step 6 is less than 0.3%, the catalytic converter is normal.
8. If CO percentage measured in step 6 is over 0.3%, check A.I.S. and replace air induction valve. Then, perform inspection steps 5 and 6.
9. If CO percentage is still over 0.3% in step 8, catalytic converter is malfunctioning. Replace catalytic converter.

VACUUM HOSES OF EMISSION CONTROL SYSTEMS

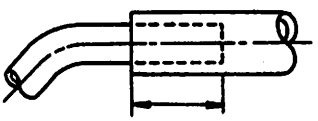
The following show the various conditions for connecting emission control vacuum hoses and air hoses. Pay careful attention to the remarks below.

1. Hoses are colored according to their function and purpose as shown below.

Yellow: Vacuum line to distributor
White: Vacuum line for E.G.R. system
Green: Manifold vacuum line
Pink: Atmospheric pressure
Blue: Venturi vacuum line to V.V.T. valve

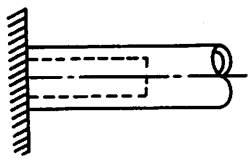
2. Insert hose into pipe as shown below.

a. When inserting tolerance is not limited.



SEC521

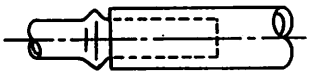
b. When stopper is equipped.
If connector length is under 20 mm (0.79 in).



Insert pipe until it stops.

SEC523

c. When pipe has a bulge.



Insert hose up to bulge.

SEC522

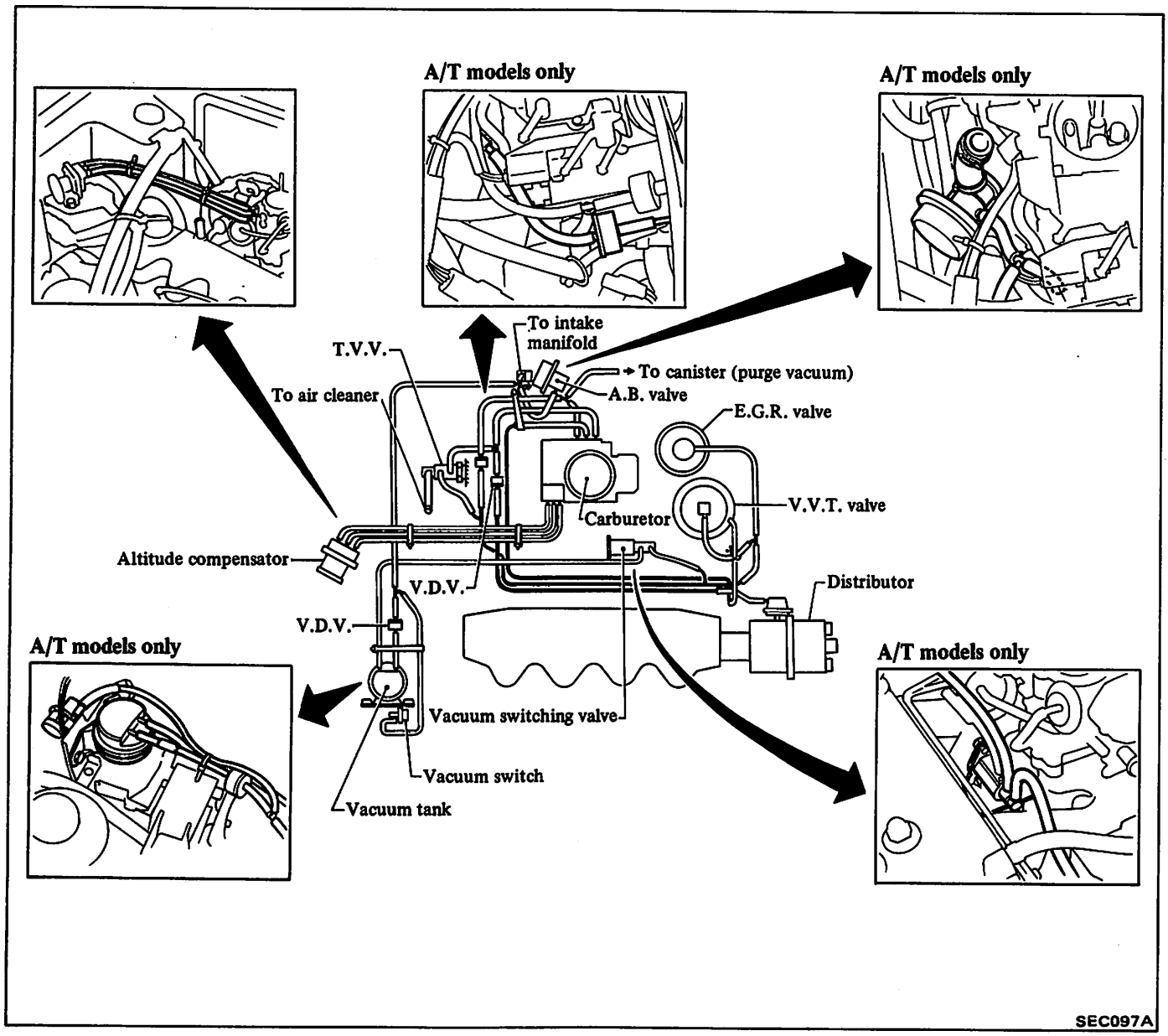
HIGH ALTITUDE EMISSION CONTROL SYSTEM

DESCRIPTION

In vehicles operated at high altitudes, where the air is thinner, mixture ratio and intake manifold boost vary, and exhaust emission increases. In order to decrease exhaust emission, certain devices have to be added/changed.
The following devices have to be added.
1. Altitude compensator ... For control of mixture ratio.
2. Additional E.G.R. control system ... For modification of E.G.R. control system. (A/T models only)

Control devices and system charts are as follows:

	Parts
Modification of mixture ratio	Altitude compensator with bracket
	Vacuum hoses
Additional E.G.R. control system (A/T models)	Vacuum tank with bracket
	Vacuum delay valve (2 pieces)
	Vacuum switching valve with bracket
	Vacuum switch
	Vacuum hoses and connectors



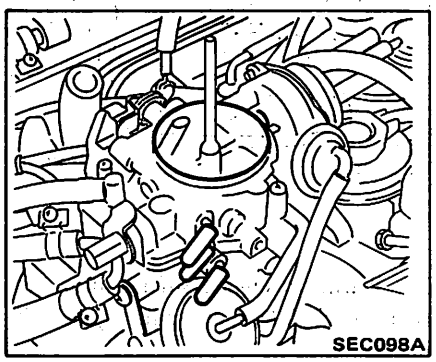
To install devices, refer to procedures in INSTALLATION AND MODIFICATION PROCEDURE.

INSTALLATION AND MODIFICATION PROCEDURE

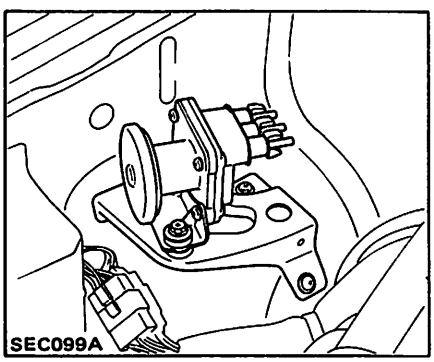
Before installation or modification, assemble applicable components into subassemblies if necessary.

ALTITUDE COMPENSATOR

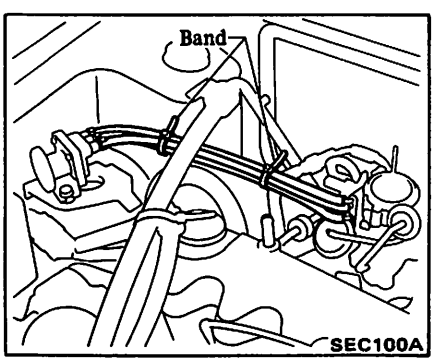
1. Remove air cleaner from engine.
2. Remove blind caps attached to altitude compensation pipes of carburetor.



3. Install an altitude compensator on the vehicle.

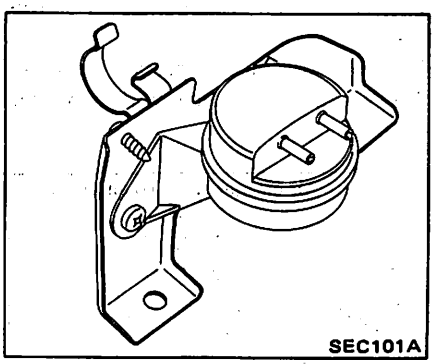


4. Then, connect vacuum hoses between carburetor and altitude compensator.

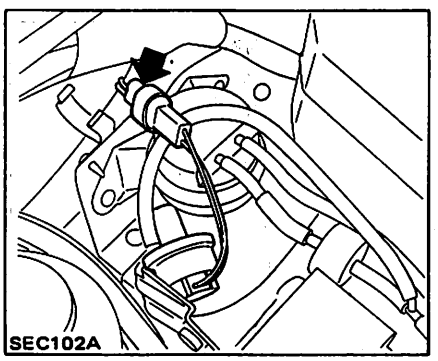


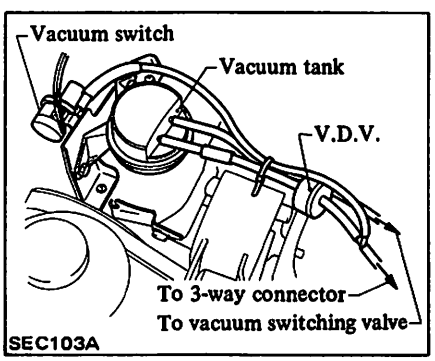
ADDITIONAL E.G.R. CONTROL SYSTEM (A/T models)

1. Assemble vacuum tank and brackets into subassembly.

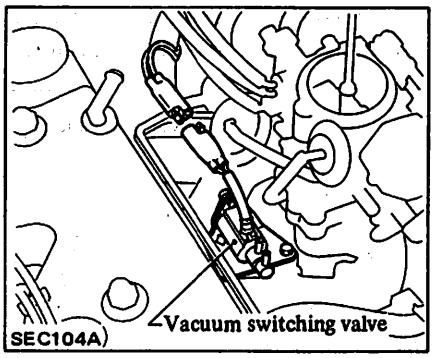


2. Install the subassembly on the vehicle, and connect vacuum switch harness connector to engine room harness connector.
Then, connect vacuum hoses.

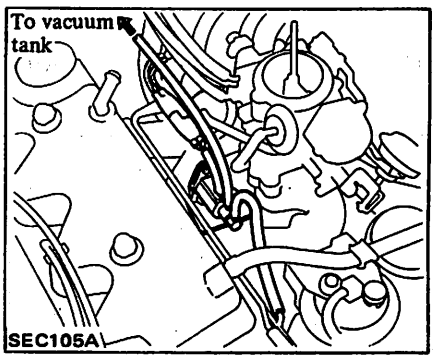




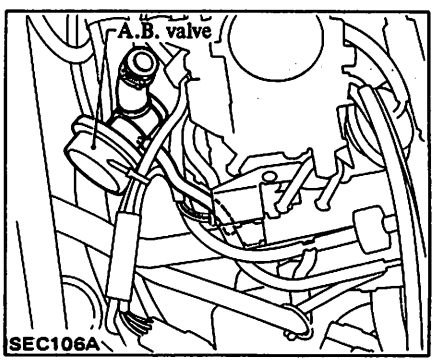
3. Install a vacuum switching valve with bracket on the vehicle, and connect the connector to engine room harness connector.



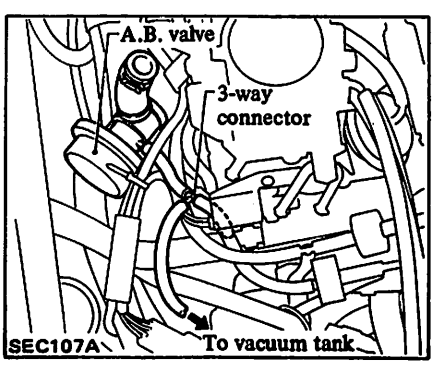
Then, connect vacuum hoses.



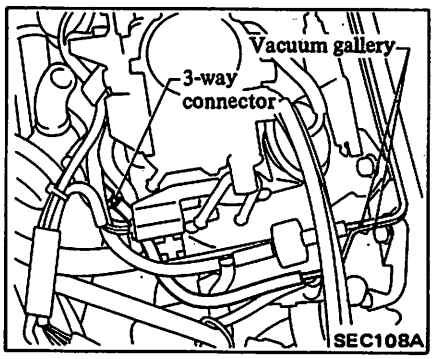
4. Disconnect vacuum hose between A.B. valve and intake manifold.



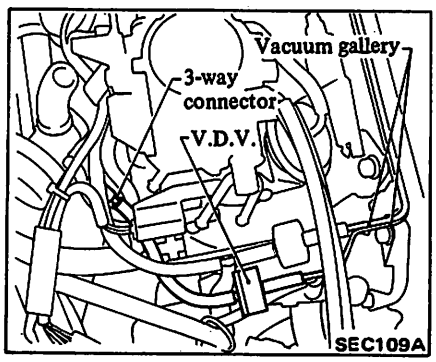
Then, connect vacuum hoses and 3-way connector.



5. Disconnect vacuum hose between vacuum gallery and 3-way connector.



Then, connect vacuum hoses with V.D.V.

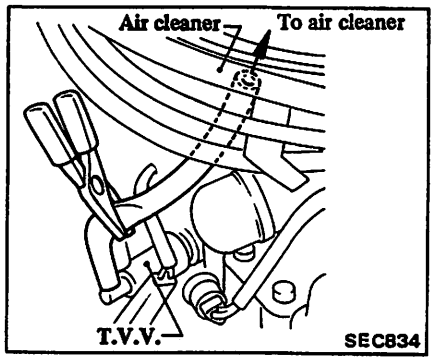


6. Install air cleaner.

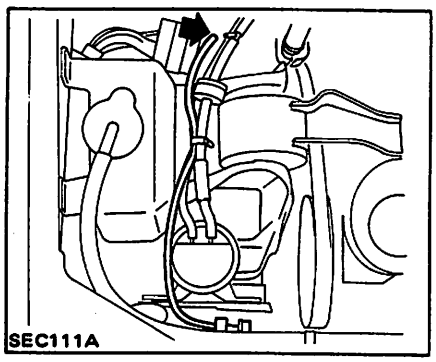
INSPECTION

1. Start the engine, and check air and vacuum lines for leaks, particularly around new connections.
2. Check new E.G.R. system as follows:

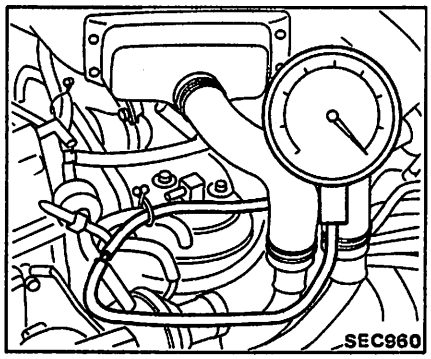
(1) Shut off the air passage between T.V.V. and air cleaner with a proper tool.



(2) At this time, also disconnect vacuum hose from vacuum switch.



(3) Then, connect vacuum gauge to check for proper functioning of new E.G.R. system. If the vacuum gauge indicates weak vacuum, the system is O.K. If the intake manifold vacuum is not present, recheck air and vacuum lines, especially around new connections.

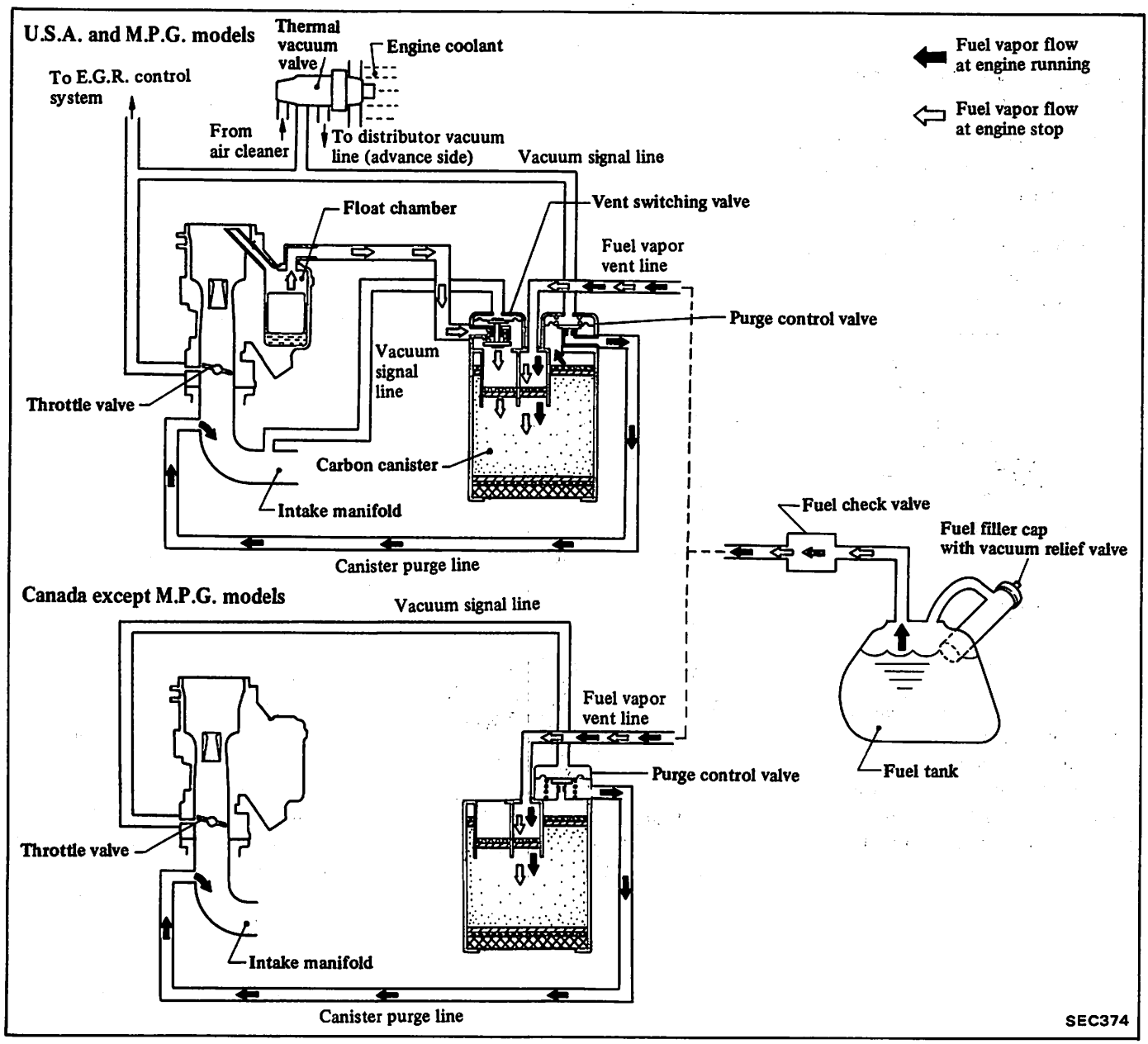


3. Warm up engine sufficiently, and then check idle speed and adjust it if necessary.

EVAPORATIVE EMISSION CONTROL SYSTEM

DESCRIPTION

The evaporative emission control system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.



OPERATION

At engine stop

Fuel vapor from the sealed fuel tank is led into the carbon canister which is filled with activated carbon and stroke there.

On U.S.A. and MPG models, the vapor in the carburetor float chamber is also led into the canister through the outer vent pipe because the vent switching valve is normally open.

During engine operation

The canister retains the vapor until the canister is cleaned by air drawn through the purge line to the intake manifold.

As engine speed increases, the ported vacuum rises and purge control valve opens the orifice allowing the vapor to travel through the purge line to the intake manifold.

On U.S.A. and MPG models, when the engine coolant temperature is lower than 60°C (140°F), the purge control valve closes by the movement of the thermal vacuum valve. This prevents vapor from flowing into the intake manifold.

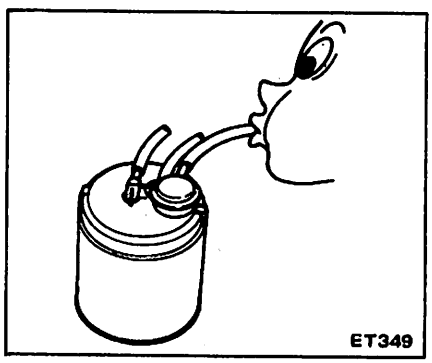
INSPECTION

FUEL TANK AND VAPOR VENT LINE

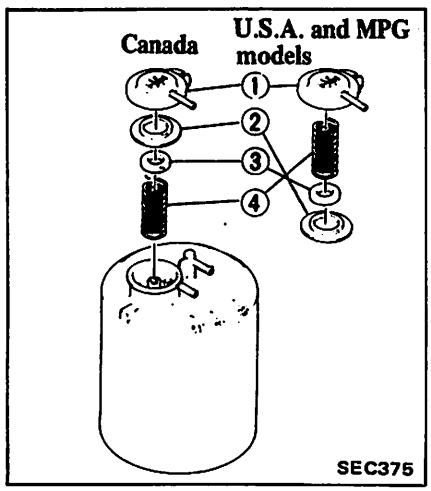
Refer to MA section for inspection of fuel tank and vapor vent line.

CARBON CANISTER PURGE CONTROL VALVE

1. Disconnect rubber hose, in the line, between T-connector and carbon canister at T-connector.
2. Inhale air from the opening of the rubber hose running to the vacuum hole in the carbon canister and ensure that there is no leak.



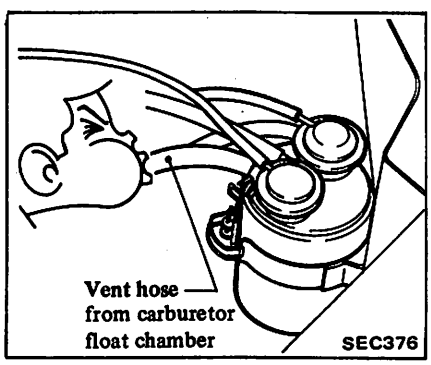
3. If there is a leak, remove top cover from purge control vavle and check for dislocated or cracked diaphragm. If necessary, replace diaphragm kit (which is made up of a retainer, diaphragm and spring).



1 Cover
2 Diaphragm
3 Retainer
4 Diaphragm spring

VENT SWITCHING VALVE

1. Disconnect vent line hose from carburetor float chamber.
2. With engine running, inhale on the vent line of the carbon canister and ensure there is no leak.



3. With engine off, make sure there is a leak.

THERMAL VACUUM VALVE

The thermal vacuum valve is used with the E.G.R. control system. Inspection procedures are the same for both valves.

FUEL CHECK VALVE

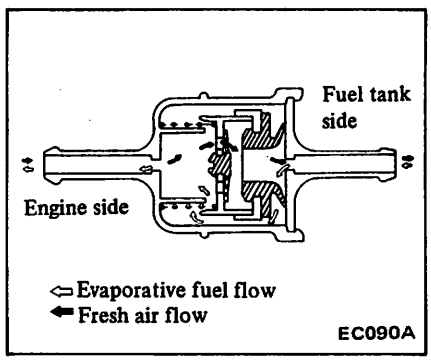
1. Blow air through connector on fuel tank side.

A considerable resistance should be felt at the mouth and a portion of air flow be directed toward the engine.

2. Blow air through connector on engine side.

Air flow should be smoothly directed toward fuel tank.

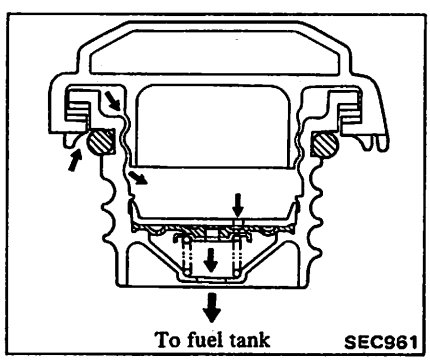
3. If fuel check valve is suspected of not being properly functioning in steps 1 and 2 above, replace.



FUEL TANK VACUUM RELIEF VALVE

Remove fuel filler cap and see it functions properly.

1. Wipe clean valve housing and have it in your mouth.
2. Inhale air. A slight resistance accompanied by valve indicates that valve is in good mechanical condition. Note also that, by further inhaling air, the resistance should be disappeared with valve clicks.
3. If valve is clogged, or if no resistance is felt, replace cap as an assembled unit.



INJECTION SYSTEM

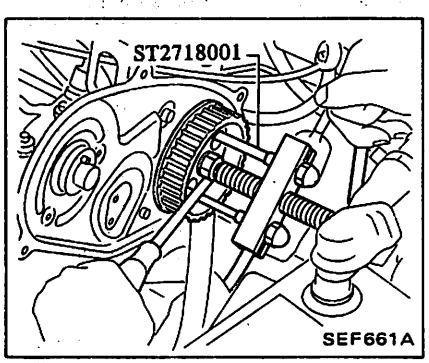
CAUTION:
a. Disassembling, assembling or adjusting this VE-type pump may be done only in service shops authorized by the pump manufacturer.
b. Under no circumstances should screws sealed with wire or paint be tampered with by anyone other than peronnel in authorized service shops.
c. In case of pump failure or damage, the pump must be replaced as an assembly, except for certain simple parts on the outside of the pump.

INJECTION PUMP

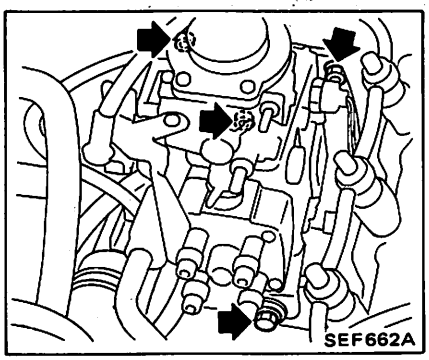
REMOVAL

1. Disconnect battery ground cable.
2. Drain coolant.
3. Disconnect wires and hoses.
- Accelerators wire
- Overflow hose (at spill tube side)
- Fuel cut solenoid connector
- Fuel return hose
- Potentiometer connector
- Engine speed sensor connector
- Cold start device water hoses

4. Remove injection timing belt.
Refer to section MA for replacement of timing belt.
5. Loosen nut and remove injection pump pulley.



6. Remove all injection tubes.
7. Remove injection pump fixing nuts and bracket bolt.



8. Take out injection pump.

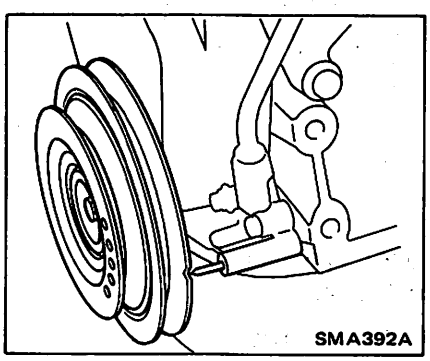
INSPECTION

For inspection of injection timing belt, tensioner pulley, tensioner spring and pulley, refer to instructions under "Inspection and Repair" in section EM.

INSTALLATION

Install injection pump assembly in the reverse order of removal, observing the following.

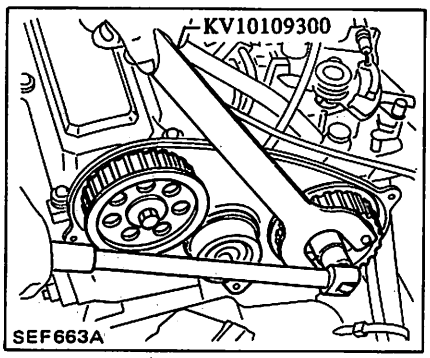
Make sure that No. 1 cylinder is at T.D.C. on its compression stroke.



1. Install injection pump.

Temporarily tighten fuel injection pump.

2. Install pump pulley.



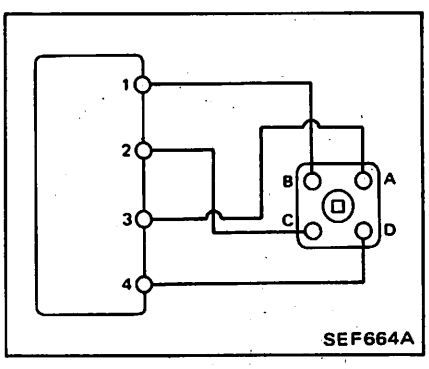
Ⓣ : Pump pulley nut
59 - 69 N·m
(6.0 - 7.0 kg-m, 43 - 51 ft-lb)

3. Install drive belt.
Refer to section MA for replacement of timing belt.

4. Adjust injection timing.
Refer to "Adjusting Injection Timing" in section MA.
5. Tighten injection pump securely.

Ⓣ : Injection pump nut
13 - 18 N·m
(1.3 - 1.8 kg-m, 9 - 13 ft-lb)
Injection pump to rear bracket
45 - 60 N·m
(4.6 - 6.1 kg-m, 33 - 44 ft-lb)

6. Connect injection tubes in the order of 4, 3, 2 and 1.



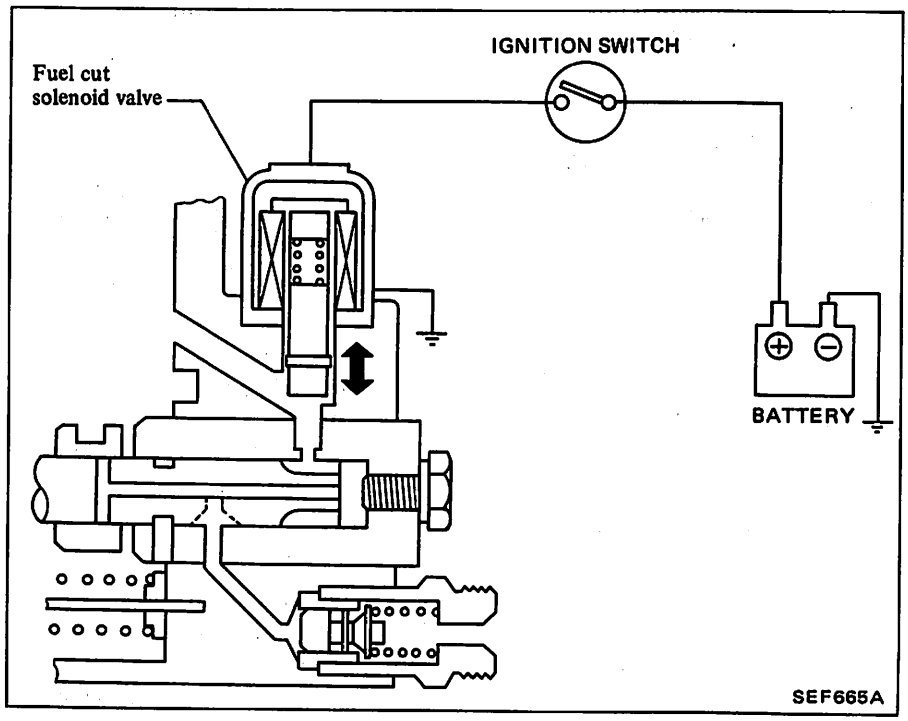
Ⓣ : Injection tube flare nut
22 - 25 N·m
(2.2 - 2.5 kg-m, 16 - 18 ft-lb)

7. Install dust cover.

Ⓣ : 3 - 5 N·m
(0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb)

8. Bleed air.
Refer to "Bleeding Fuel System" in section MA.

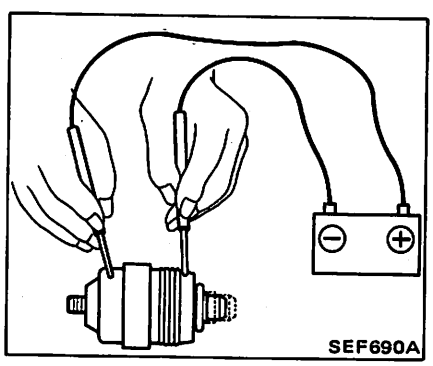
FUEL SUPPLY CONTROL SYSTEM



INSPECTION

Fuel cut solenoid valve

1. Turn ignition switch "ON" and listen for "clicking" sound. If not "clicking" sound is heard, check fuel cut solenoid valve.
2. Apply battery charge to fuel cut solenoid valve to test plunger. If it does not move, check for dust particles, etc.



Be careful of plunger being sprung out when battery charge is removed.

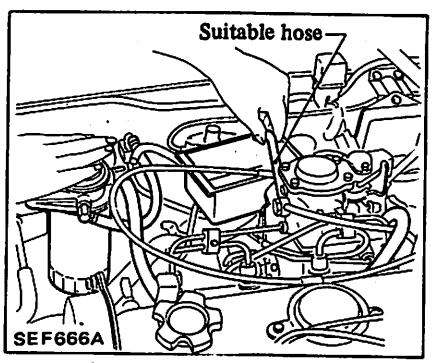
3. If fuel cut solenoid valve is in good order, check condition of power supply.

CHECKING PRIMING PUMP

1. Disconnect fuel return hose and install suitable hose on it.

Place a container or jug beneath hose end.

2. Prime priming pump to make sure that fuel overflows at hose end. If not, replace priming pump.

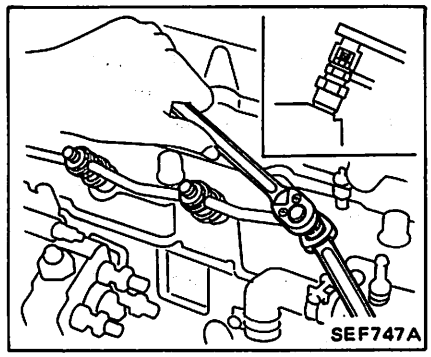


INJECTION NOZZLE ASSEMBLY

REMOVAL AND INSTALLATION

1. Remove injection tubes on nozzle side and loosen injection tubes on pump side.
2. Remove spill tube assembly.

To prevent spill tube from breaking, remove it by gripping nozzle holder.

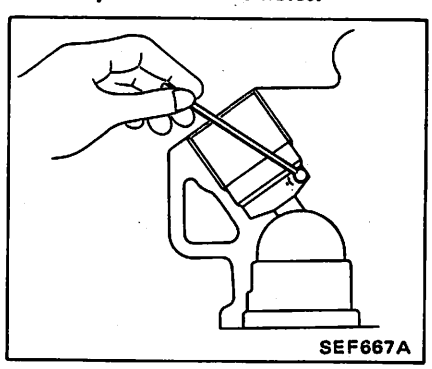


Ⓣ : **Spill tube nut**
39 - 49 N·m
(4 - 5 kg-m,
29 - 36 ft-lb)

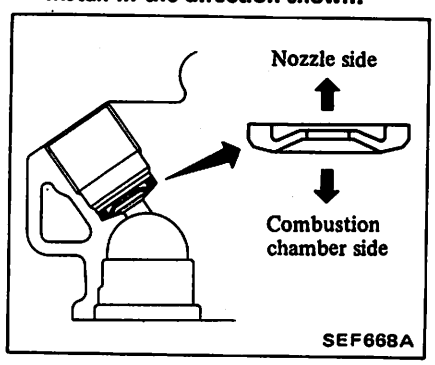
3. Remove injection nozzle and gasket.
4. Install injection nozzle in the reverse order of removal.

Ⓣ : **Injection nozzle to engine**
59 - 69 N·m
(6 - 7 kg-m,
43 - 51 ft-lb)
Injection tube flare nut
22 - 25 N·m
(2.2 - 2.5 kg-m,
16 - 18 ft-lb)

a. Always clean nozzle holes.

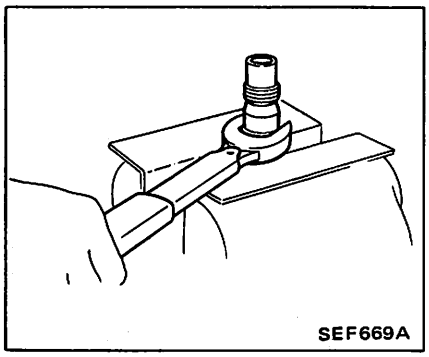


b. Always replace nozzle gasket and install in the direction shown.

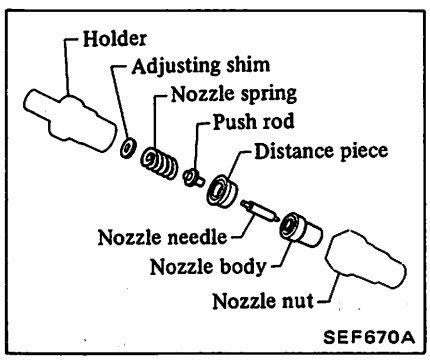


DISASSEMBLY

1. Loosen nozzle nut while preventing nozzle top from turning.



2. Arrange all of disassembled parts in the order shown below.



INSPECTION

Thoroughly clean all disassembled parts with fresh kerosene or solvent..

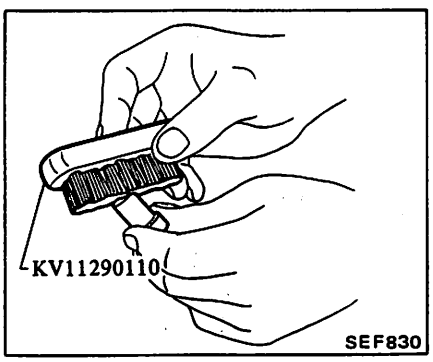
- If nozzle needle is damaged or fused, replace nozzle assembly with a new one.
- If end of nozzle needle is seized or excessively discolored, replace nozzle assembly.
- Check nozzle body and distance piece for proper contact. If excessively worn or damaged, replace nozzle assembly or distance pieces.
- Check distance piece and nozzle holder for proper contact. If excessively worn or damaged, replace distance piece or nozzle holder.
- Check nozzle spring for excessive wear or damage. If excessively worn or damaged, replace it with a new spring.

CLEANING

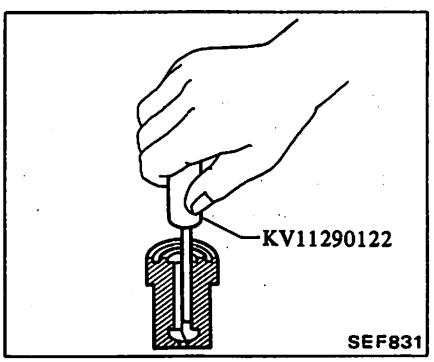
a. Do not touch the nozzle mating surface with your fingers.

b. To wash the nozzles, use a wooden stick and brass brush with clean diesel fuel.

1. Remove any carbon from exterior of nozzle body (except wrapping angle portion) by using Tool.

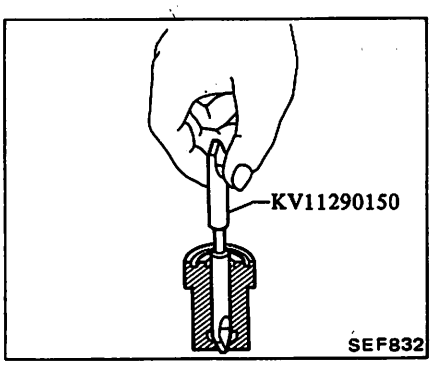


2. Remove oil sump of nozzle body using Tool.



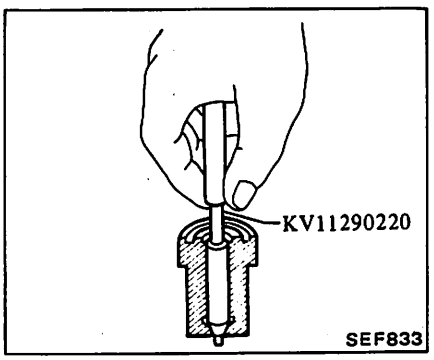
3. Clean nozzle seat by using Tool.

This job should be performed with extra precautions, since efficiency of nozzle depends greatly on a good nozzle seat.

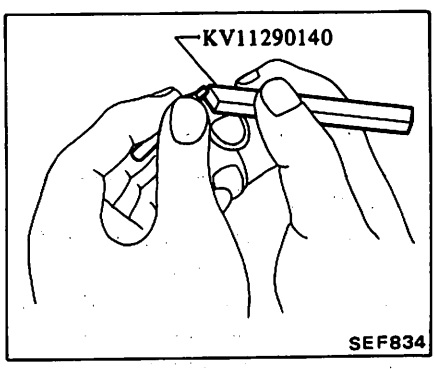


4. Clean spray hole of nozzle body by using Tool.

To prevent spray hole from canting, always clean it by starting with inner side and working towards outside.



5. Decarbonate nozzle needle tip by using Tool.



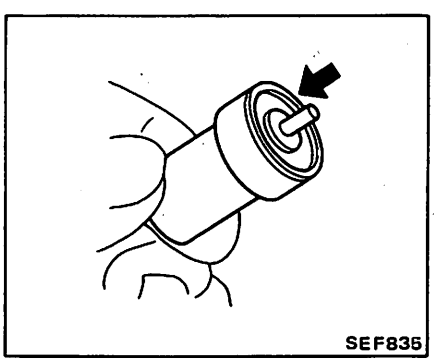
6. Check sinking test.

(1) Pull needle about halfway out from body and then release it.

(2) Needle should sink into body very smoothly form just its own weight.

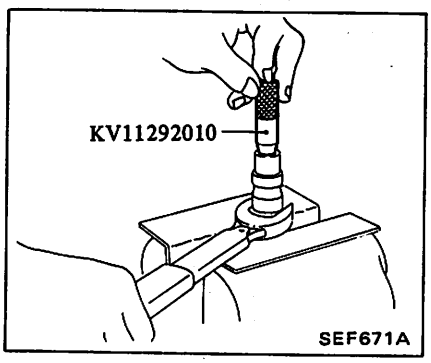
(3) Repeat this test and rotate needle slightly each time.

If needle fails to sink smoothly from any position, replace both needle and body as a unit.



ASSEMBLY

Assemble in the reverse order of disassembly, observing the following.



If nozzle body is not installed properly. Tool cannot be removed and it may be damaged.

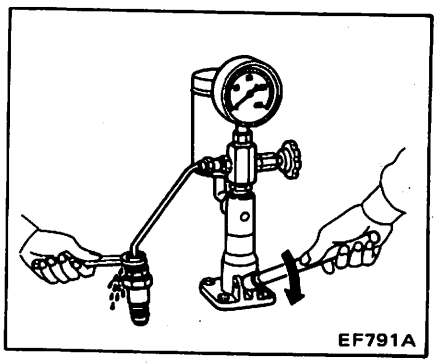
Ⓣ : Holder to nozzle nut
78 - 98 N·m
(8.0 - 10.0 kg-m,
58 - 72 ft-lb)

TEST AND ADJUSTMENT

WARNING:
When using nozzle tester, be careful not to allow diesel fuel sprayed from nozzle to come into contact with your hand or body, and make sure that your eyes are properly protected with goggles.

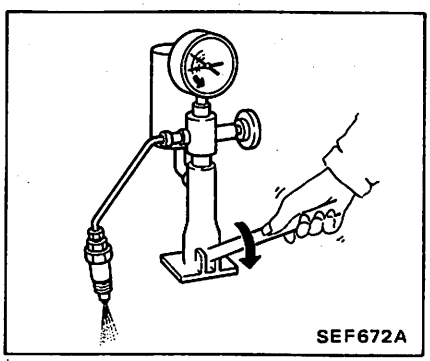
Injection pressure test

1. Install nozzle to injection nozzle tester and bleed air from flare nut.



2. Pump the tester handle slowly (one time per second) and watch the pressure gauge.

3. Read the pressure gauge when the injection pressure just starts dropping.

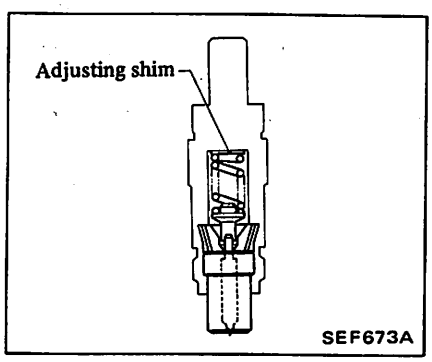


Initial injection pressure:
Used
12,259 - 13,239 kPa
(125 - 135 kg/cm², 1,778 - 1,920 psi)
New
13,239 - 14,024 kPa
(135 - 143 kg/cm², 1,920 - 2,033 psi)

New nozzle is required to always check initial injection pressure.

4. To adjust injection pressure, change adjusting shims.

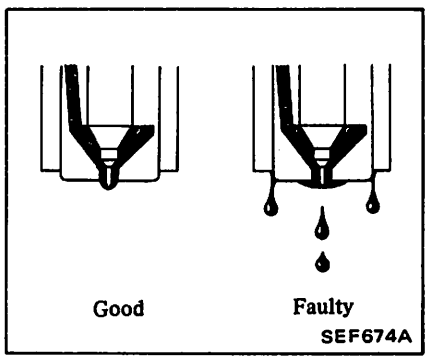
a. Increasing the thickness of adjusting shims increases initial injection pressure. Decreasing thickness reduces initial pressure.
b. A shim thickness of 0.04 mm (0.0016 in) corresponds approximately to a difference of 471 kPa (4.8 kg/cm², 68 psi) in initial injection pressure.



Leakage test

1. Maintain the pressure at about 981 to 1,961 kPa (10 to 20 kg/cm², 142 to 284 psi) below initial injection pressure.

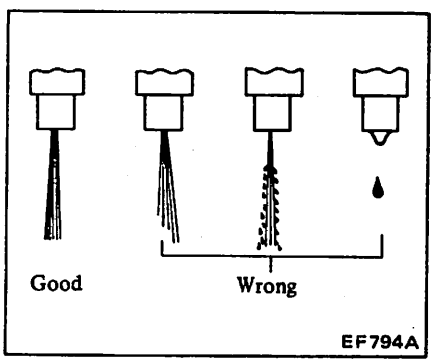
2. Check that there is no dripping from the nozzle tip or around the body.



3. If there is leakage, clean, overhaul or replace it.

Spray pattern test

1. Pump the tester handle 4 to 6 times per second or more.
2. Check the spray pattern.



3. If the spray pattern is not correct, clean or replace it.

EMISSION CONTROL DEVICE

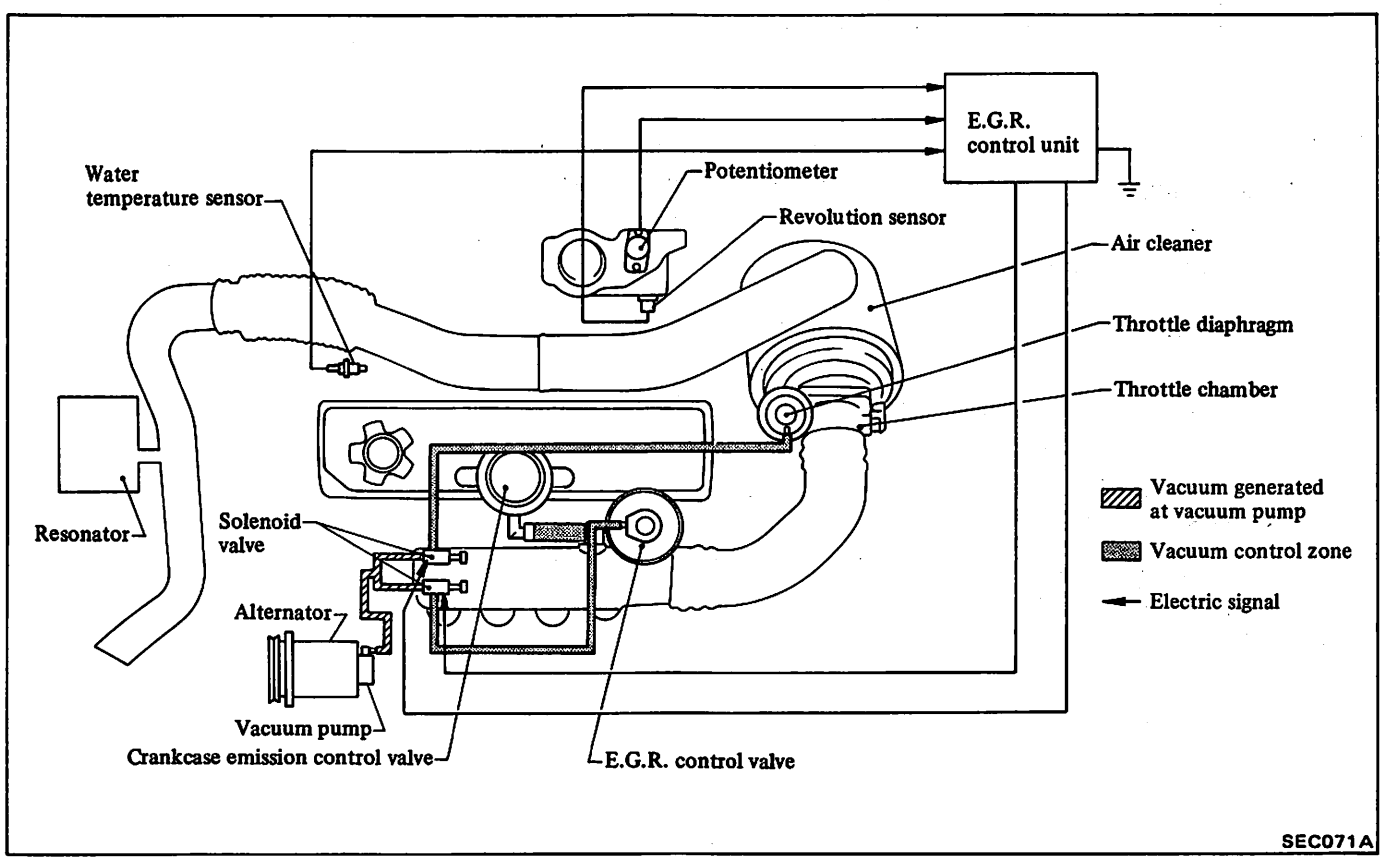
Item		Engine model	CD17	
		Destination	California	Non-California
Crankcase emission control system	Crankcase emission control valve		X	X
E.G.R. control system	E.G.R. control valve		X	X
	E.G.R. control unit		X	X
	Throttle chamber (1-barrel)		X	X
	Potentiometer		X	X
	Revolution sensor		X	X
	Solenoid valve		X	X
	Water temperature sensor		X	X
Altitude emission control system	Altitude compensator		X	X
	E.G.R. control unit			
	For low altitude		X	X
	For high altitude		–	X

GENERAL DESCRIPTION

There are three types of control systems which are as follows:

1. Closed type crankcase emission control system
2. Exhaust emission control system
3. High altitude emission control system

Periodic inspection and necessary servicing of these systems should be performed to keep harmful emissions to a minimum.



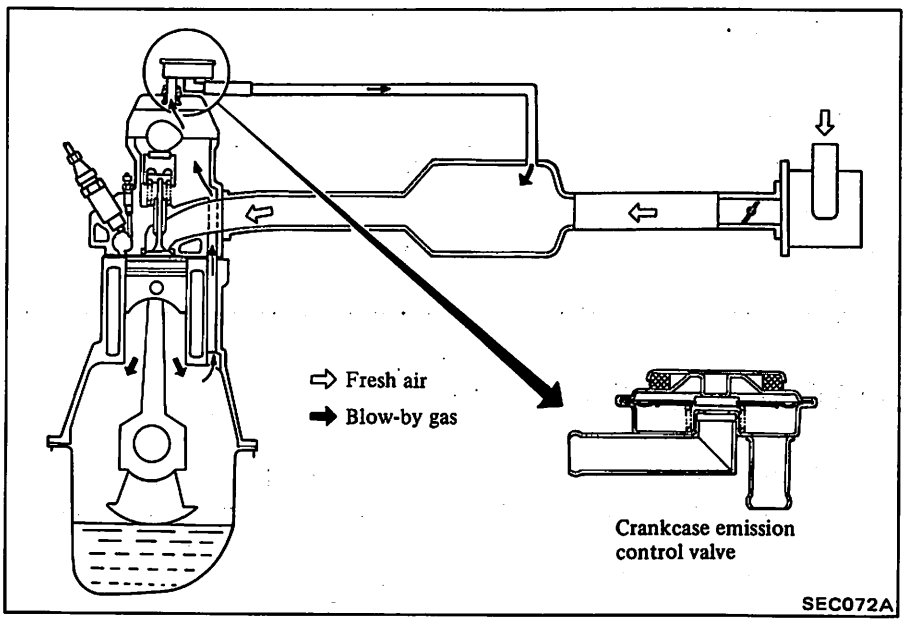
CRANKCASE EMISSION CONTROL SYSTEM

DESCRIPTION

The closed-type crankcase emission control system prevents blow-by gas from entering the atmosphere and keeps the internal crankcase pressure constant.

During the valve operation, the blow-by gas is fed into the intake manifold by the crankcase emission control valve.

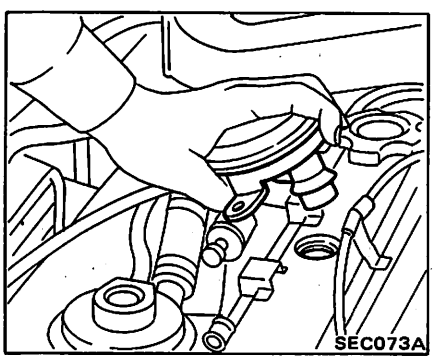
This is activated by the internal rocker cover pressure. When the intake air flow is restricted by the throttle chamber, the internal rocker cover pressure decreases. At this point, the crankcase emission control valve keeps the internal rocker cover pressure constant so that air or dust is not sucked in around the crankshaft oil seal.



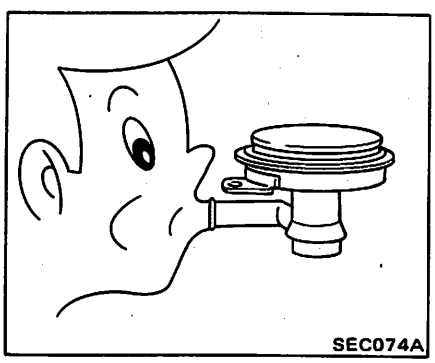
INSPECTION

CRANKCASE EMISSION CONTROL VALVE

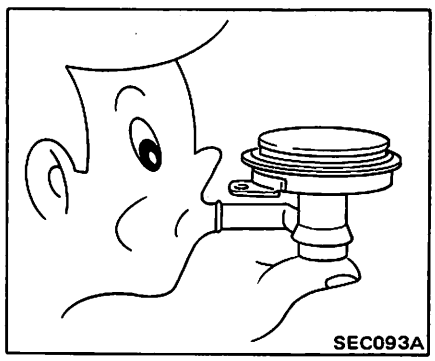
1. Remove crankcase emission control valve.



2. Suck on pipe to make sure that air flows on the intake manifold side.



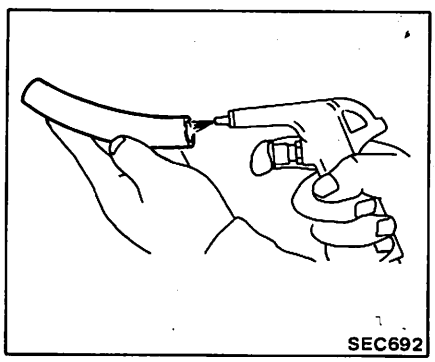
3. Close rocker cover side and suck on pipe to make sure that diaphragm makes clicking sounds.



VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air.

If any hose cannot be free of obstructions, replace.



EXHAUST EMISSION CONTROL SYSTEM

DESCRIPTION

The exhaust emission control system is made up of the following:

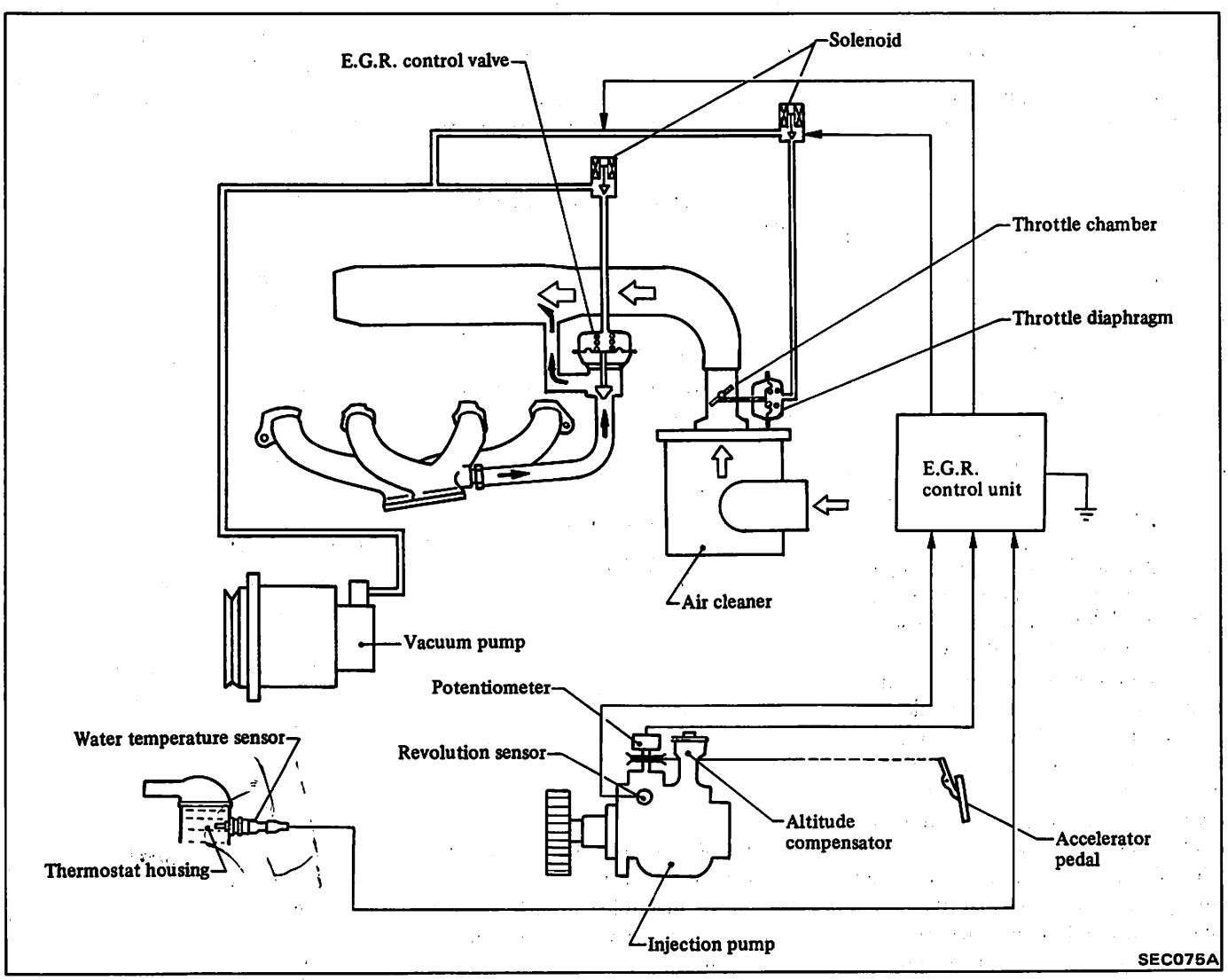
Emission control system	
E.G.R. system	E.G.R. control valve E.G.R. control unit Throttle chamber Potentiometer Revolution sensor Solenoid valve Water temperature sensor
Altitude emission control system	Altitude compensator E.G.R. control unit

EXHAUST GAS RECIRCULATION (E.G.R.) CONTROL SYSTEM

DESCRIPTION

The E.G.R. system is designed to control the formation of NOx emission by recirculating the exhaust gas into the intake manifold passage through the control valve.

The E.G.R. system is composed of the E.G.R. control valve, the throttle chamber, the solenoid valves and the E.G.R. control unit.



OPERATION

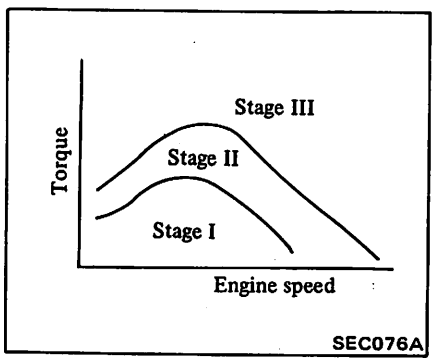
The E.G.R. flow rate is controlled in three stages in accordance with the engine speed, load and altitude. The first stage, "HIGH E.G.R."/"LOW E.G.R.", is obtained in the combination of closed throttle valve/open throttle valve and open E.G.R. valve. The second stage, "LOW E.G.R.", is attained by opening the throttle valve. The third stage is Zero-E.G.R. condition and is attained by closing E.G.R. valve.

Low altitude

Stage	Throttle valve	E.G.R. control valve	E.G.R. rate
I	Closed	Open	High
II	Full Open	Open	Low
III	Full Open	Closed	Zero

High altitude

Stage	Throttle valve	E.G.R. control valve	E.G.R. rate
I	Full Open	Open	Low
II	Full Open	Open	Low
III	Full Open	Closed	Zero

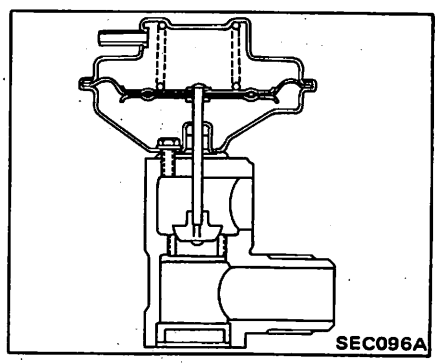


The engine load signal is picked up by the potentiometer installed on the injection pump control lever. The engine speed signal is by the electromagnetic revolution sensor on the injection pump itself. The throttle diaphragm and E.G.R. valve is actuated by the vacuum generated at the vacuum pump. Solenoids are utilized to convert the electric signal from the control unit to the vacuum signal.

The E.G.R. system is deactivated under the conditions that the water temperature is low in order to assure good car drive-ability and to prevent unsafe car driving. The temperature sensor is of a thermistor type and it senses temperatures at engine water inlet.

E.G.R. control valve

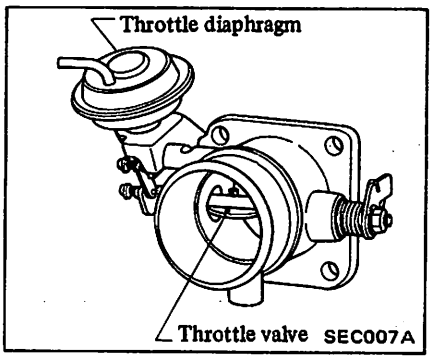
The E.G.R. control valve is operated only of full open and close.



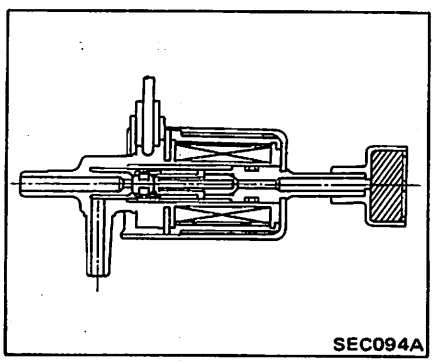
The E.G.R. control valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the valve connected to the diaphragm, to which vacuum is applied in response to the operation of the solenoid valve.

Throttle chamber

The throttle chamber consists of the throttle valve and throttle diaphragm. The throttle valve is controlled by the throttle diaphragm, to which vacuum is applied in response to the operation of the solenoid valve.

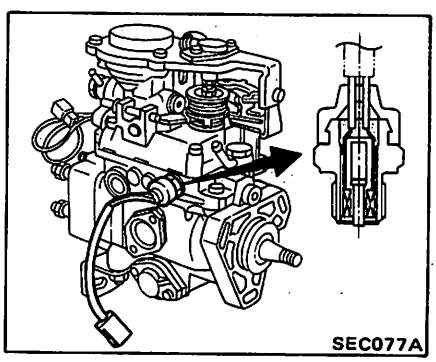


Two solenoid valves are used in the E.G.R. system to lead/cut off the vacuum to the actuators – one is for throttle diaphragm and the other is for E.G.R. control valve.



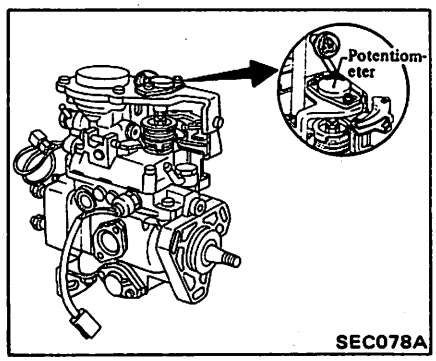
Revolution sensor

The revolution sensor picks up the engine speed to control E.G.R. by counting the number of teeth on the flyweight which is driven by the injection pump drive shaft.



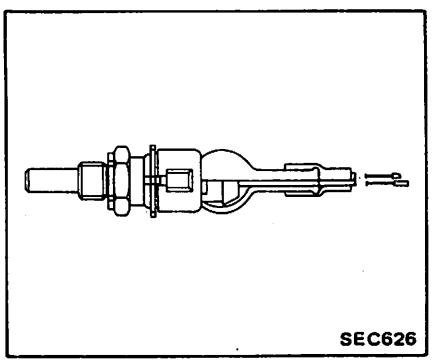
Potentiometer

The potentiometer converts the opening angle of the control lever of the fuel injection pump into a voltage signal. The securing screw of the potentiometer is sealed at the factory and should not be readjusted.



Water temperature sensor

The water temperature sensor is of a thermistor type. It senses coolant temperature at water inlet of the engine to control E.G.R. and glow system.

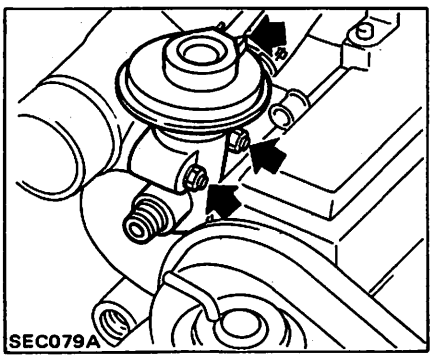


REMOVAL AND INSTALLATION

WARNING:
Be sure to install vacuum hoses in their original positions after removal. Otherwise, it may cause seriously unsafe driving conditions.

E.G.R. control valve

1. Remove nut which secures E.G.R. tube to E.G.R. control valve, and disconnect tube from valve.
2. Disconnect vacuum hose and remove nuts mounting E.G.R. control valve to intake manifold. The E.G.R. control valve can then be taken out.

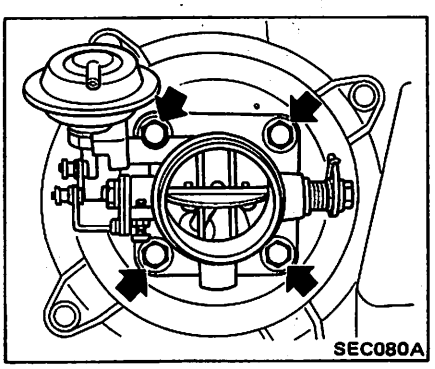


3. Installation is in the reverse sequence of removal.

CAUTION:
Always replace E.G.R. gasket.

Throttle chamber

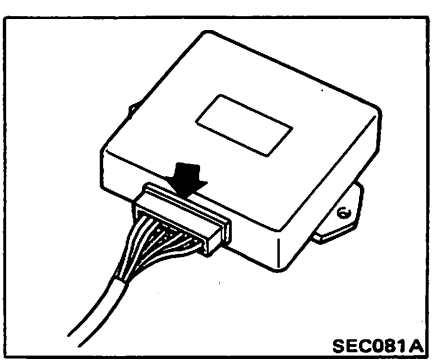
1. Loosen clamp and disconnect air duct hose.
2. Remove throttle chamber.



3. Installation is in the reverse sequence of removal.

E.G.R. control unit

1. Remove left side seat.
2. Disconnect harness connector and remove E.G.R. control unit.



3. Installation is in the reverse sequence of removal.

INSPECTION

Entire system

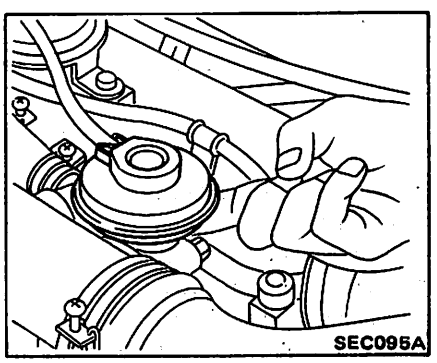
1. Make a thorough visual check of E.G.R. control system. If necessary, wipe away oil to facilitate inspection. If any hoses are cracked or broken, replace them.

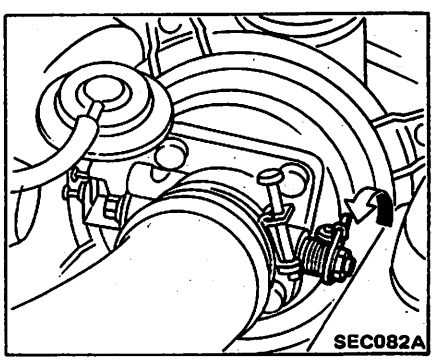
Make sure that all harness connectors are connected securely.

2. With engine stopped, inspect E.G.R. control valve and throttle chamber for any indication of binding or sticking by moving diaphragm/rod upwards with handy vacuum pump.
3. With engine running, inspect E.G.R. control valve and throttle valve for normal operation as described below.

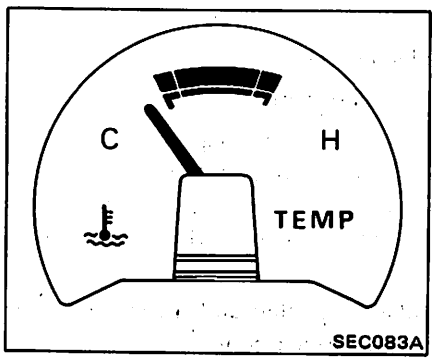
Place your finger on diaphragm of E.G.R. control valve to ensure that the valve functions.

WARNING:
Take care not to let your finger get caught between diaphragm and body of E.G.R. control valve.

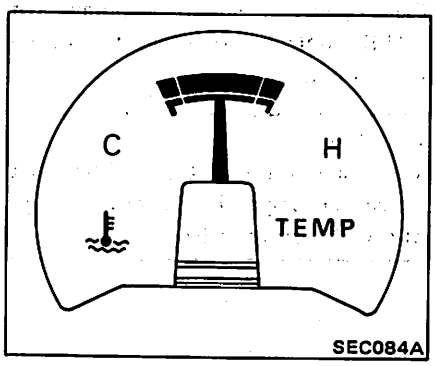




(1) When temperature of the engine coolant is low:
[Below 40°C (104°F)]

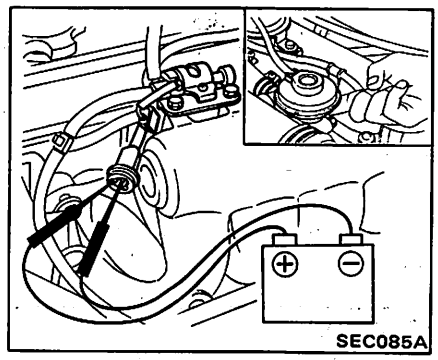


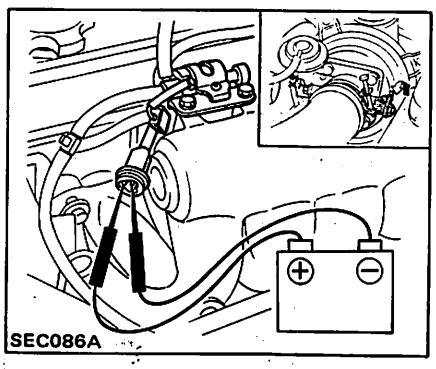
Make sure that E.G.R. control valve does not operate and throttle valve is open when engine is at idling and then revved up.
(2) When temperature of the engine coolant is high:
[Above 40° (104°F)]



- Make sure that E.G.R. control valve operates and throttle valve is closed when engine is at idling.
- Increase engine speed gradually and make sure that throttle valve opens and E.G.R. control valve closes in this order.

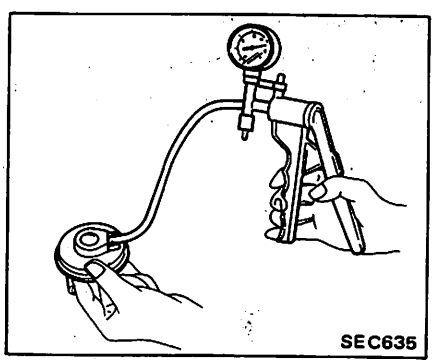
4. If E.G.R. control valve operates and/or throttle valve is closed in step (1) of 3, check water temperature sensor.
And, if the sensor appears normal, replace E.G.R. control unit.
5. If E.G.R. control valve and/or throttle valve do not operate properly in step (2) of 3, check them as follows:
(1) Run engine at idle.
(2) Disconnect harness connector at solenoid valve. Apply battery voltage at harness connector of solenoid valve and check that E.G.R. control valve operate/throttle valve closes normally.





E.G.R. control valve

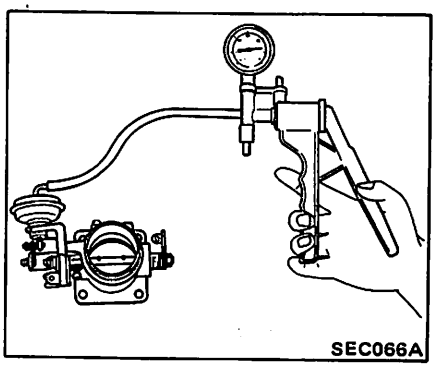
1. Dismount E.G.R. control valve from engine.
2. Apply vacuum to E.G.R. control valve, referring to the following figure. If the valve moves to full position, it is normal.
E.G.R. control valve will remain open, for more than 30 seconds after vacuum has cut off.



3. Visually check E.G.R. control valve for damage, wrinkle or deformation.

Throttle chamber

1. Remove throttle chamber from air cleaner.
2. Apply vacuum to throttle diaphragm, referring to the following figure. If the throttle valve moves to fully-closed position, it is normal.
Throttle valve will remain closed for more than 30 seconds after vacuum has cut off.

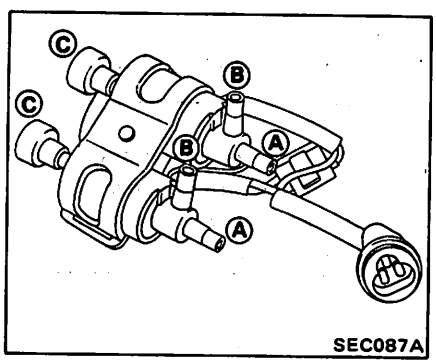


3. Visually check throttle chamber for damage or deformation.

Solenoid valve

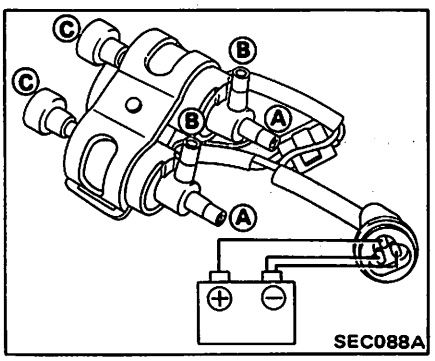
1. Remove solenoid valve from engine.
2. Check solenoid valve.

- Check the continuity of air passage by sucking or blowing on it.



Terminals	Continuity
Ⓐ – Ⓑ	No
Ⓑ – Ⓒ	Yes
Ⓒ – Ⓐ	No

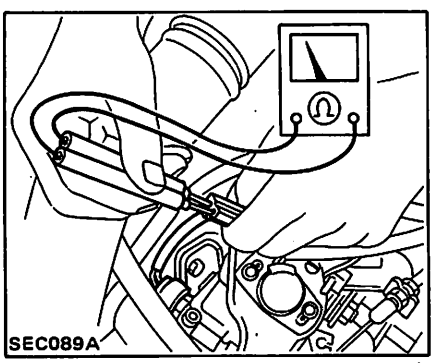
- Apply battery voltage at harness connector, and check the continuity of air passage by sucking or blowing it.



Terminals	Continuity
Ⓐ – Ⓑ	Yes
Ⓑ – Ⓒ	No
Ⓒ – Ⓐ	No

Revolution sensor

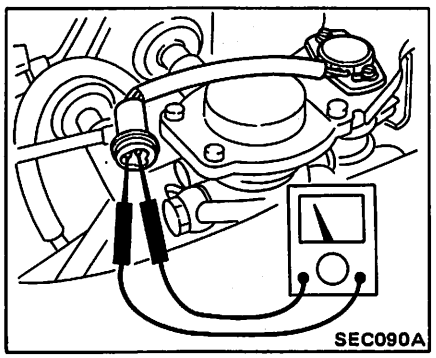
1. Disconnect revolution sensor harness connector and connect ohmmeter as shown below.



2. Make sure that a resistance exists.

Potentiomenter

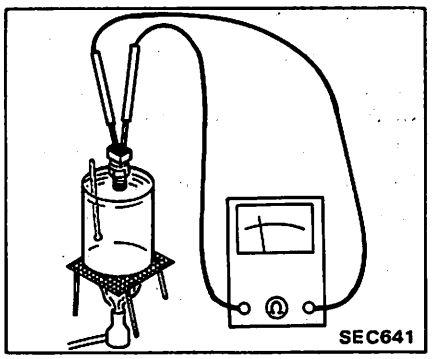
1. Disconnect potentiometer harness connector and connect ohmmeter as shown below.



2. Make sure that the resistance changes when the opening angle of the control lever of the fuel injection pump is changed.

Water temperature sensor

1. Remove water temperature sensor from water outlet.
2. Dip water temperature sensor in a pan of water and connect ohmmeter as shown below.



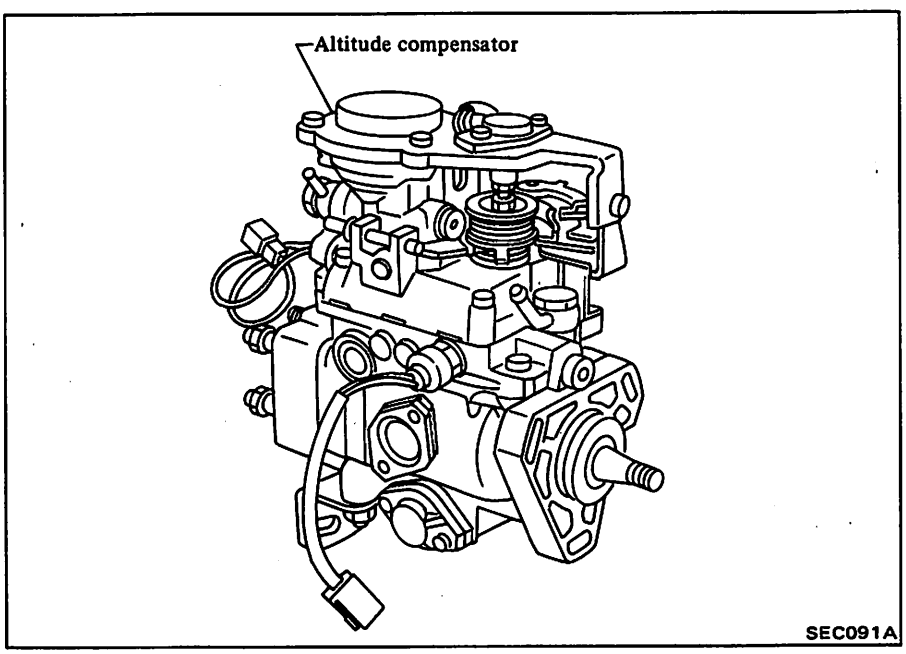
3. Check the resistance at the specified water temperature.

Water temperature °C (°F)	Resistance kΩ
19 - 21 (66 - 70)	2.1 - 2.9

HIGH ALTITUDE EMISSION CONTROL SYSTEM

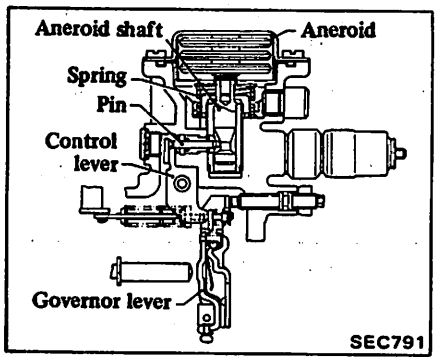
DESCRIPTION

The high altitude emission control system is designed to control the formation of HC and CO emissions and improve driveability in high altitude areas. In order to ensure decreased exhaust emission, the injection timing and E.G.R. control unit have to be changed/replaced.

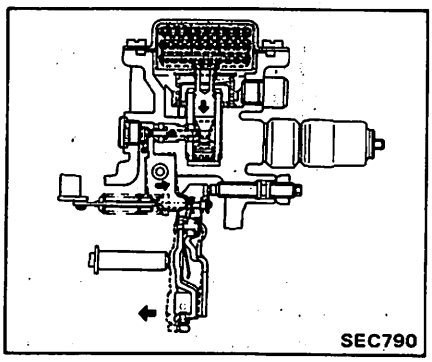


OPERATION

The altitude compensator is located on top of injection pump, and altitude shaft is in contact with the pin.
The pin is connected to the control lever which is in contact with the governor lever.



The higher the altitude, the lower the atmospheric pressure. Due to this fact, the pressure inside the aneroid is higher than the atmospheric pressure at high altitudes, which causes the aneroid to expand like a balloon.
When this happens, the aneroid shaft is lower and the aneroid shaft and pin's contact surface is changed to decrease fuel. Thus, the system controls the amount of fuel supplied in proportion to the altitude.



MODIFICATIONS

Changing injection timing

Refer to Adjusting Injection Timing in section MA for changing injection timing.

Replacing E.G.R. control unit

Replace E.G.R. control unit for high altitudes or low altitudes.
Refer to Removal and Installation.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

E15 & E16

GENERAL SPECIFICATIONS

CARBURETOR

Item \ Destination		California		Non-California		M.P.G.	Canada	
Engine		E16		E16		E15	E16	
Transaxle		M/T	A/T	M/T	A/T	M/T	M/T	A/T
Carburetor model		DFC328-1	DFC328-2	DCZ328-1	DCZ328-2	DFP306-2	DCZ328-11	DCZ328-12
Air outlet diameter mm (in)	P	28 (1.10)		28 (1.10)		26 (1.02)	28 (1.10)	
	S	32 (1.26)		32 (1.26)		30 (1.18)	32 (1.26)	
Venturi diameter mm (in)	P	24 (0.94)		24 (0.94)		23 (0.91)	24 (0.94)	
	S	27 (1.06)		27 (1.06)		27 (1.06)	27 (1.06)	
Main jet	P	#91		#106		#98	#100	
	S	#130		#133		#140	#135	
Main air bleed	P	#105		#100		#60	#110	
	S	#60		#60		#80	#60	
Slow jet	P	#43		#43		#43	#43	
	S	#70		#55		#55	#65	
Slow air bleed	P	#170		#185		#160	#180	
	S	#80		#100		#80	#100	
Power jet		–		#35		–	#35	
Solenoid controlled slow air bleed		#220		–		#220	–	
Solenoid controlled fuel orifice		#70				#70		

P: Primary S: Secondary

INSPECTION AND ADJUSTMENT

A.T.C. AIR CLEANER		
Air control valve partially opens	°C (°F)	38 - 53 (100 - 127)
Air control valve fully opens	°C (°F)	Above 53 (127)
IDLE COMPENSATOR		
Idle compensator partially opens		
Bimetal No. 1	°C (°F)	60 - 70 (140 - 158)
Bimetal No. 2	°C (°F)	70 - 80 (158 - 176)
Idle compensator fully opens		
Bimetal No. 1	°C (°F)	Above 70 (158)
Bimetal No. 2	°C (°F)	Above 80 (176)
FUEL PUMP		
Fuel pressure	kPa (kg/cm², psi)	19.6 - 26.5 (0.20 - 0.27, 2.8 - 3.8)
Fuel pump capacity	mℓ (US fl oz, Imp fl oz)/min. at rpm	More than 1,300 (44.0, 45.8)/600

Item \ Destination / Engine / Transaxle	California		Non-California		M.P.G.	Canada	
	E16		E16		E15	E16	
	M/T	A/T	M/T	A/T	M/T	M/T	A/T
Carburetor model	DFC328-1	DFC328-2	DCZ328-1	DCZ328-2	DFP306-2	DCZ328-11	DCZ328-12
Choke type	Automatic		Automatic			Automatic	
Fuel level adjustment mm (in) Gap between float and carburetor body "H"	12 (0.47)						
Gap between valve stem and float seat "h"	1.3 - 1.7 (0.051 - 0.067)						
Fast idle adjustment Clearance "A" (*4 at 2nd cam step) mm (in)	0.86±0.07 (0.0339± 0.0028)	1.15±0.07 (0.0453± 0.0028)	0.86±0.07 (0.0339± 0.0028)	1.15±0.07 (0.0453± 0.0028)	0.8±0.07 (0.0315± 0.0028)	0.72±0.07 (0.0283± 0.0028)	1.00±0.07 (0.0394± 0.0028)
Fast idle speed rpm	2,600 - 3,400	2,900 - 3,700	2,400 - 3,200	2,700 - 3,500	2,400 - 3,200	1,900 - 2,700	2,400 - 3,200
Vacuum break adjustment [at temperature °C (°F)] Clearance "R" mm (in)	1.53±0.09 (0.0602±0.0035) [13.6 (56)] 2.60±0.09 (0.1024±0.0035) [24.0 (75)]		1.88±0.09 (0.0740±0.0035) [11 (52)] 2.60±0.09 (0.1024±0.0035) [18 (64)]		1.7±0.09 (0.0669± 0.0035) [9 (48)] 3.2±0.09 (0.1260± 0.0035) [25 (77)	1.38±0.09 (0.0543±0.0035) [11.5 (53)] 2.03±0.09 (0.0799±0.0035) [18.5 (65)]	
Choke unloader adjustment Clearance "C" mm (in)	2.96 (0.1165)		2.96 (0.1165)		2.36 (0.0929)	2.96 (0.1165)	
Interlock opening adjustment Clearance "G" mm (in)	6.28±0.60 (0.2472±0.0236)						
Dash pot adjustment Gap between throttle valve and carburetor body mm (in)		0.56 (0.0220)		0.56 (0.0220)		0.72 (0.0283)	0.56 (0.0220)
Throttle opener adjustment Gap between throttle valve and carburetor body mm (in)	Refer to first idle adjustment for air conditioner. (Page HA-27)				–	0.52±0.07 (0.0205±0.0028)	

CD17

INSPECTION AND ADJUSTMENT

INJECTION PUMP

Plunger lift

Unit: mm (in)

For low altitude	
M/T	0.94±0.03 (0.0370±0.0012)
A/T	0.88±0.03 (0.0346±0.0012)
For high altitude	
M/T	1.00±0.03 (0.0394±0.0012)
A/T	0.94±0.03 (0.0370±0.0012)

INJECTION NOZZLE ASSEMBLY

Initial injection pressure		
New	kPa (kg/cm², psi)	13,239 - 14,024 (135 - 143, 1,920 - 2,033)
Used	kPa (kg/cm², psi)	12,259 - 13,239 (125 - 135, 1,778 - 1,920)

Adjusting shim

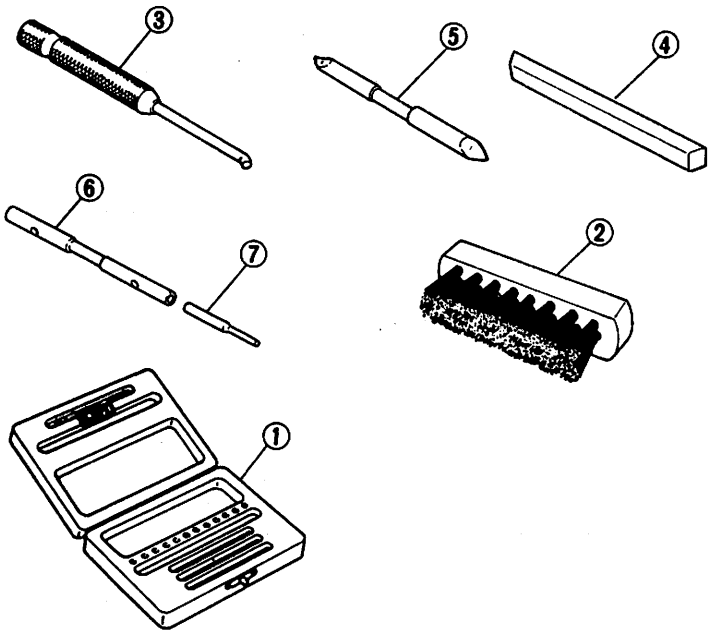
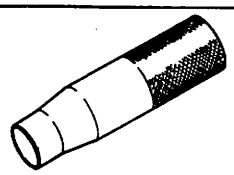
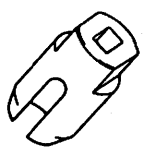
Thickness mm (in)	Parts No.
0.50 (0.0197)	16613-V0700
0.54 (0.0213)	16613-V0702
0.58 (0.0228)	16613-V0704
0.62 (0.0244)	16613-V0706
0.66 (0.0260)	16613-V0708
0.70 (0.0276)	16613-V0710
0.74 (0.0291)	16613-V0712
0.78 (0.0307)	16613-V0714
0.82 (0.0323)	16613-V0716
0.86 (0.0339)	16613-V0718
0.90 (0.0354)	16613-V0720
0.94 (0.0370)	16613-V0722
0.98 (0.0386)	16613-V0724
1.00 (0.0394)	16613-V0760

TIGHTENING TORQUE

	N·m	kg-m	ft-lb
Fuel cut solenoid valve	20 - 25	2.0 - 2.5	14 - 18
Injection pump drive pulley nut	59 - 69	6.0 - 7.0	43 - 51
Injection nozzle to engine	59 - 69	6.0 - 7.0	43 - 51
Injection to tube flare nut	22 - 25	2.2 - 2.5	16 - 18
Injection pump to bracket (nut)	13 - 18	1.3 - 1.8	9 - 13
Injection pump to bracket (bolt)	45 - 60	4.6 - 6.6	33 - 44
Spill tube nut	39 - 49	4.0 - 5.0	29 - 36
Plug bolt	14 - 20	1.4 - 2.0	10 - 14
Nozzle holder to nozzle nut	78 - 98	8.0 - 10.0	58 - 72
Tensioner nut	16 - 21	1.6 - 2.1	12 - 15
Dust cover bolt	3 - 5	0.3 - 0.5	2.2 - 3.6
Crankcase emission control valve mounting bolt	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
E.G.R. control valve mounting nut	18 - 23	1.8 - 2.3	13 - 17
E.G.R. tube securing nut	34 - 44	3.5 - 4.5	25 - 33
Throttle body mounting bolt	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7

SPECIAL SERVICE TOOLS

CD17

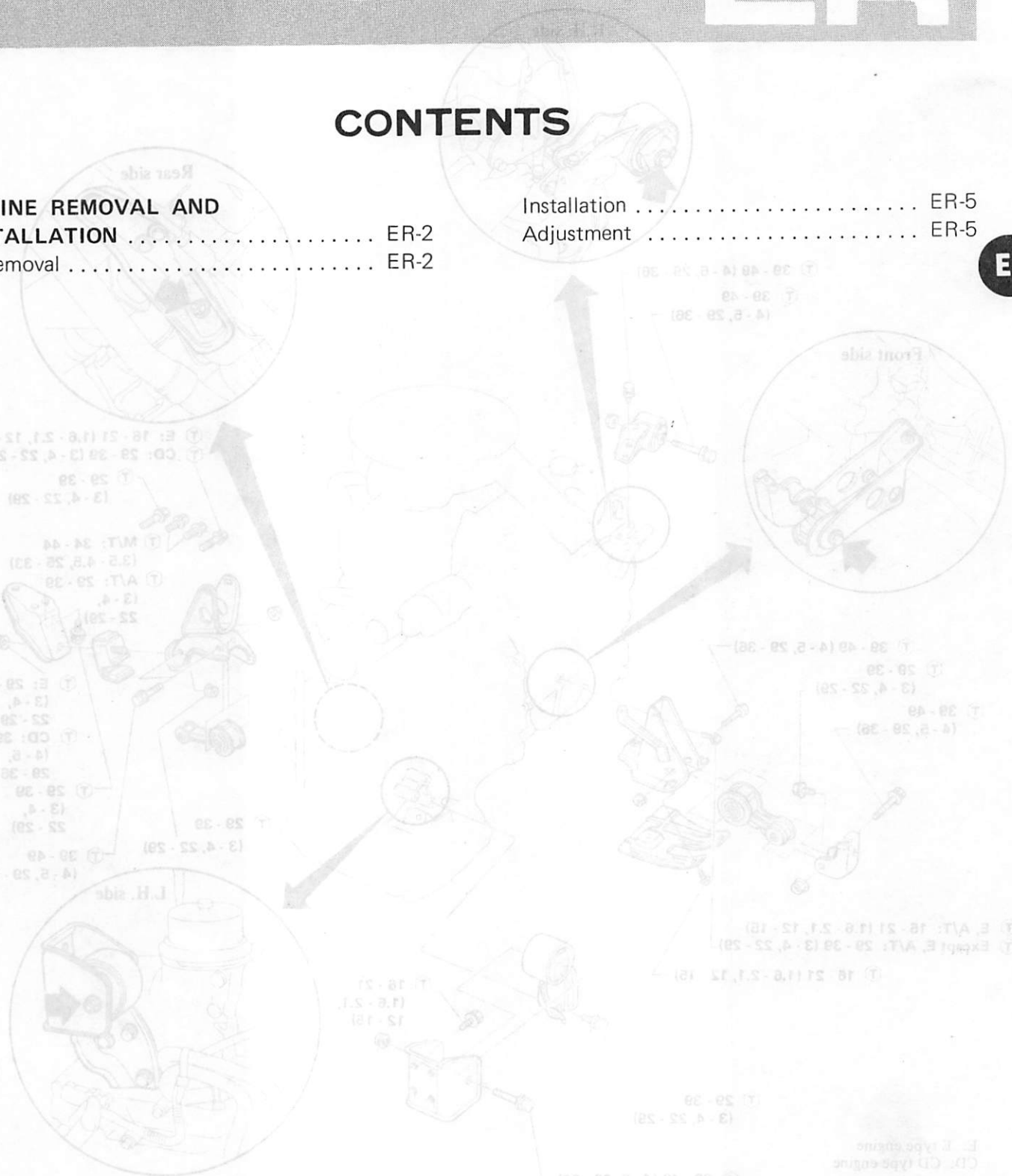
Tool number (Kent-Moore No.)	Tool name	
KV11289004 (J28826) ① KV11290012 (–) ② KV11290110 (–) ③ KV11290122 (–) ④ KV11290140 (–) ⑤ KV11290150 (–) ⑥ KV11290210 (–) ⑦ KV11290220 (–)	Nozzle cleaning kit Box Brush Nozzle oil sump scraper Nozzle needle tip cleaner Nozzle seat scraper Nozzle holder Nozzle hole cleaning needle	
KV11292010 (–)	Nozzle centering device	
KV11100300 (–)	Nozzle holder socket	

ENGINE REMOVAL & INSTALLATION

SECTION ER

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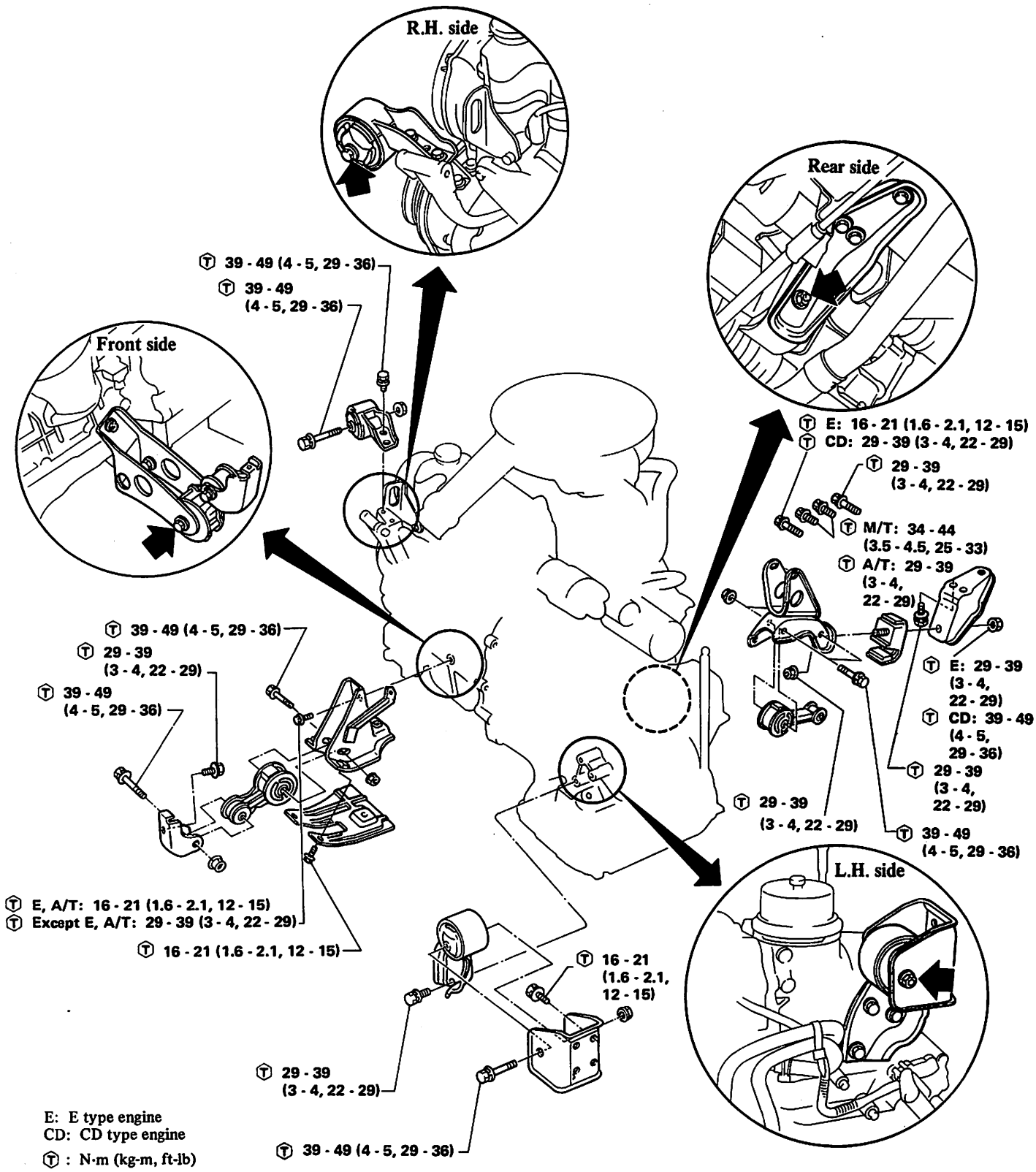
ENGINE REMOVAL AND INSTALLATION ER-2
Removal ER-2
Installation ER-5
Adjustment ER-5



ENGINE REMOVAL AND INSTALLATION

REMOVAL

ENGINE BRACKET FITTING

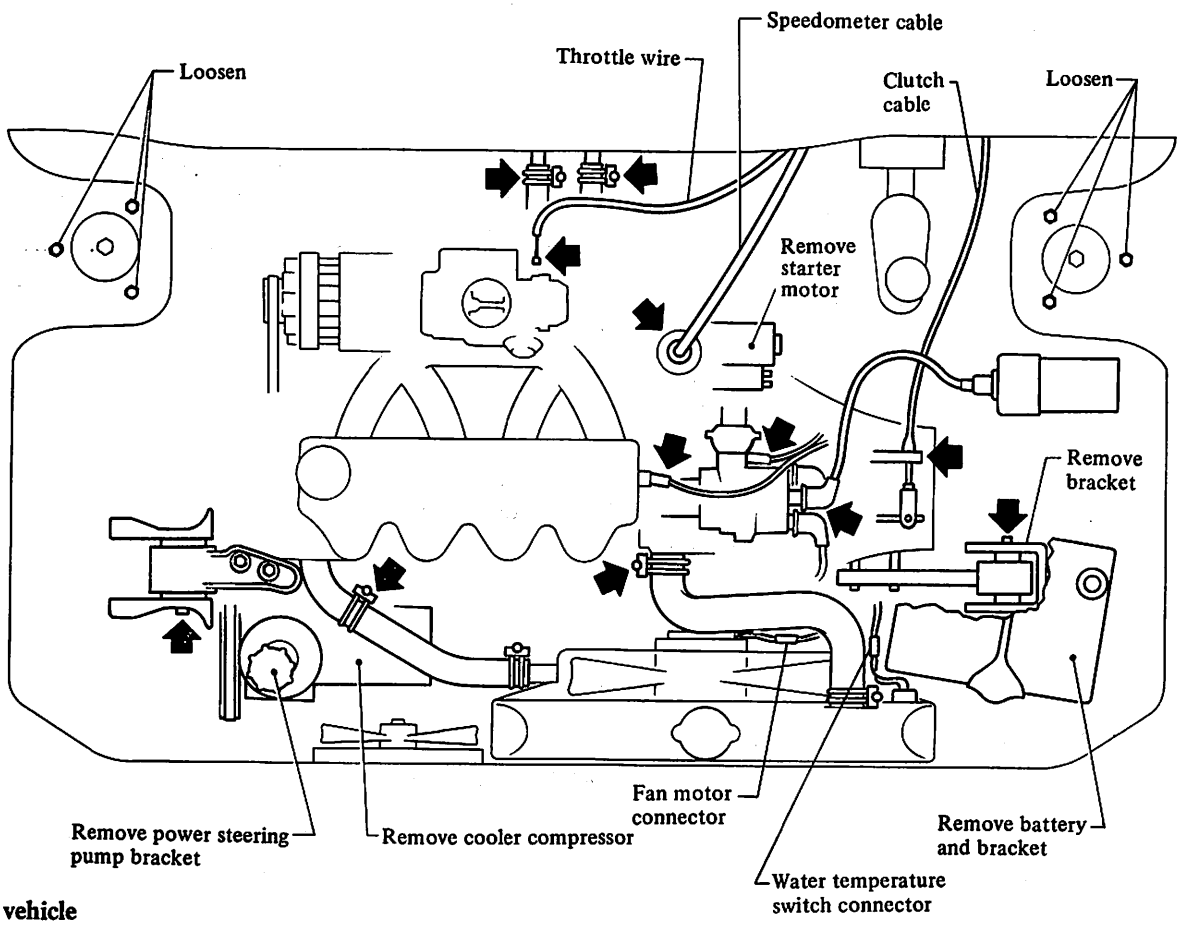


E: E type engine
CD: CD type engine
Ⓣ : N·m (kg-m, ft-lb)

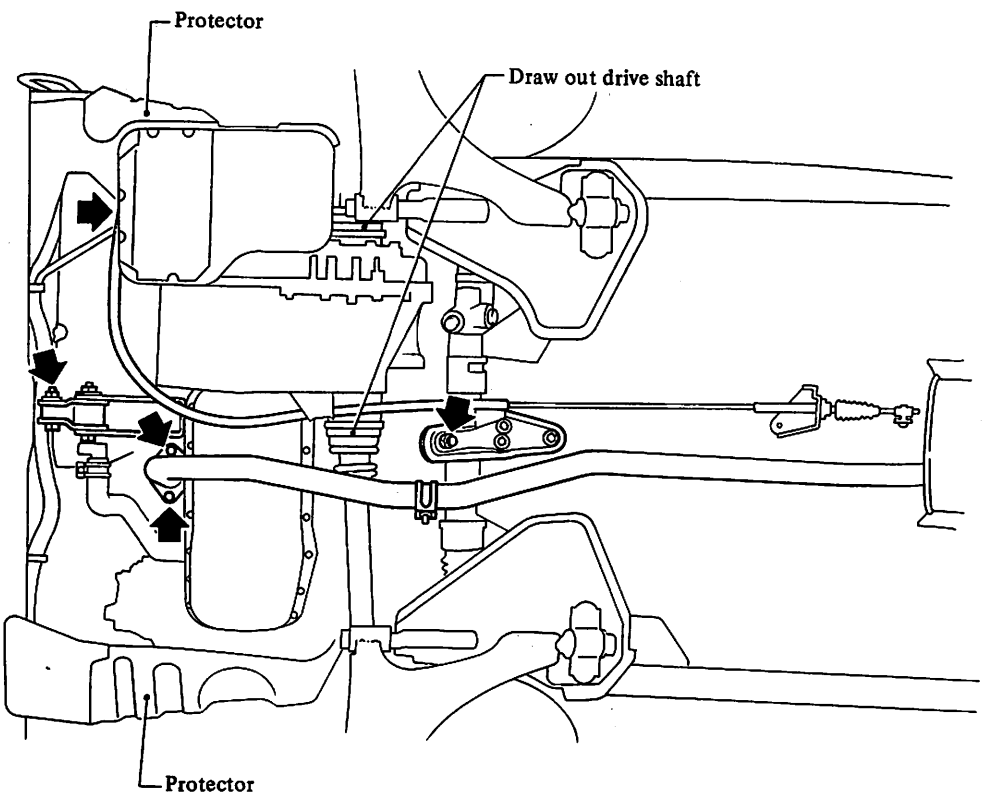
SER270

SEPARATING POSITIONS

Engine room



Under vehicle



SER266

When it is necessary to remove engine from vehicle, engine and transaxle should be dismounted as a unit.

WARNING:

a. Situate vehicle on as flat and solid a surface as possible.
b. Place chocks at front and rear of rear wheels.
c. Before removing front axle from transaxle unit, place safety stands under designated front supporting points. Refer to GI section for lifting points and towing.
d. Be sure to hoist engine and transaxle in a safe manner.
e. You should not remove engine until exhaust system has completely cooled off.
Otherwise, you may burn yourself and/or fire may break out in the fuel line.

1. Remove hood (See BF section).

Make hood hinge locations on hood to facilitate proper reinstallation.

CAUTION:

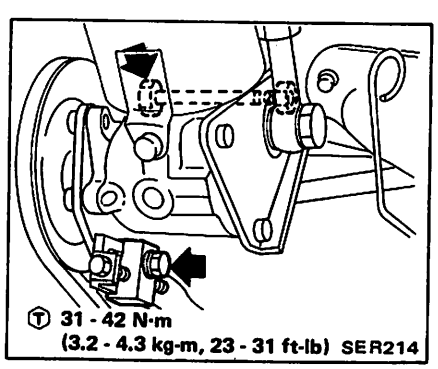
Have an assistant help you so as to prevent damage to the body.

2. Remove battery and battery support bracket.
3. Remove air cleaner.

Plug air horn of carburetor with clean rag to prevent entry of foreign matter.

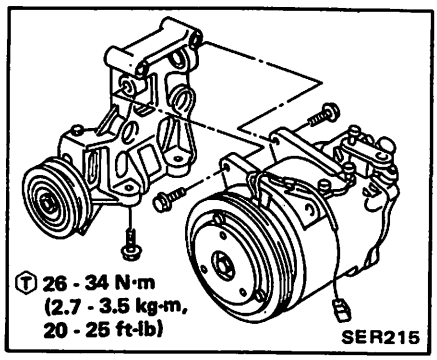
4. Drain engine coolant and remove radiator with radiator cooling fan (See LC section).
5. Remove power steering oil pump (See ST section).

Oil must not be drained from power steering oil circuit.



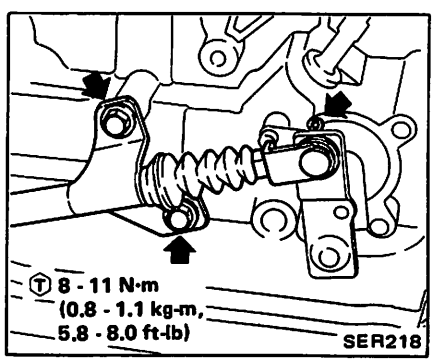
6. Remove cooler compressor and idler pulley (See HA section).

Gas must not be discharged from air conditioner circuit.



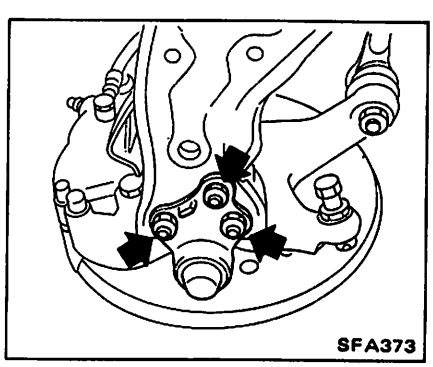
While removing engine, support compressor with a suitable rope to prevent it from dropping.

7. Disconnect exhaust front tube from exhaust manifold (See FE section).
8. Disconnect manual transaxle control rod link support rod from transaxle (See MT section).
9. Disconnect automatic transaxle control wire from transaxle (See AT section).



10. Remove lower ball joint.

Do not reuse nut once it has been removed.

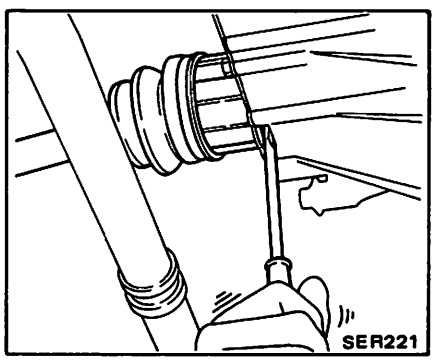


11. Drain gear oil.
12. Disconnect right and left drive shafts from transaxle (See FA section).

When drawing out drive shaft, it is necessary to loosen strut head bolts.

CAUTION:

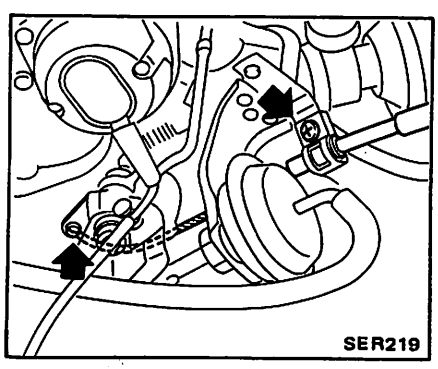
In removing drive shaft, be careful not to damage grease seal of transaxle side.



13. Disconnect clutch wire.
14. Remove speedometer cable with pinion from transaxle.

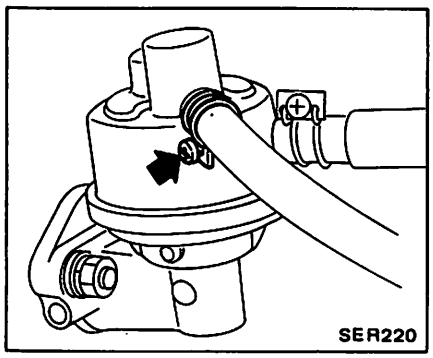
Plug hole from which pinion gear was removed with clean rag to prevent entry of foreign matter.

15. Disconnect accelerator wire.

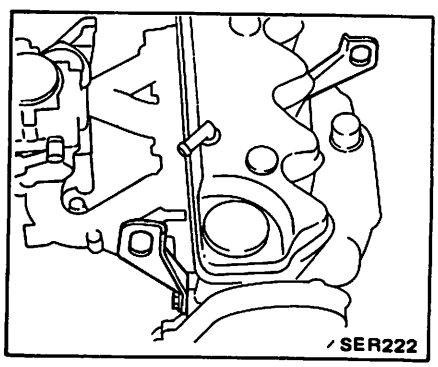


16. Remove vacuum and air hoses between engine and vehicle body.
17. Disconnect completely cables, wires and harness connectors.

18. Disconnect fuel hoses from fuel pump.



19. Attach front engine slinger 10005 01M00 and rear engine slinger 10006 23M00 to cylinder head.

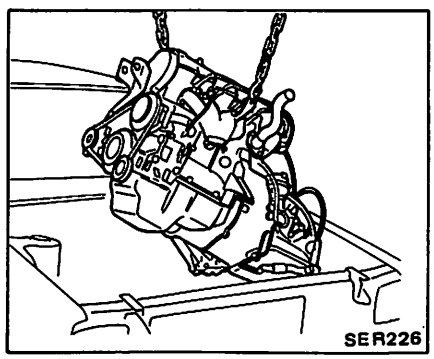


20. Connect suitable wires or chains between overhead hoist and engine slingers.

WARNING:
For safety during subsequent steps, the tension of wires or chains should be slackened against the engine.

21. Disconnect engine mounting insulators (See Engine Bracket Fitting).
22. Lift engine up and away from vehicle.

CAUTION:
In lifting engine, be careful not to hit it against adjacent parts, especially against brake tube and brake master cylinder.



23. Separate engine and transaxle.

INSTALLATION

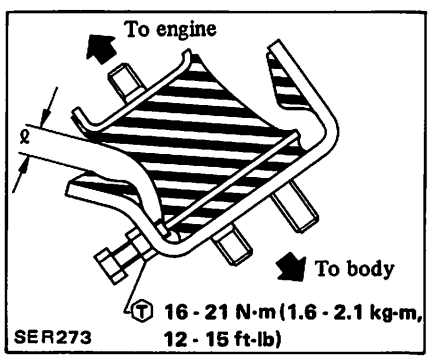
1. Install engine with transaxle on vehicle.

a. **When installing, ensure that brake tubes, brake master cylinder, etc. do not interfere with engine and transaxle.**
b. **Ensure that cooler compressor and power steering oil pump are in their proper positions when lowering engine.**

2. Tighten engine mounting insulator bolts, and ensure rubber insulator clearance.
3. For subsequent steps, refer to instructions under heading "Removal".

ADJUSTMENT

Stopper clearance "ℓ"
(CD17 engine models only):
M/T 10 - 15 mm (0.39 - 0.59 in)
A/T 15 - 20 mm (0.59 - 0.79 in)



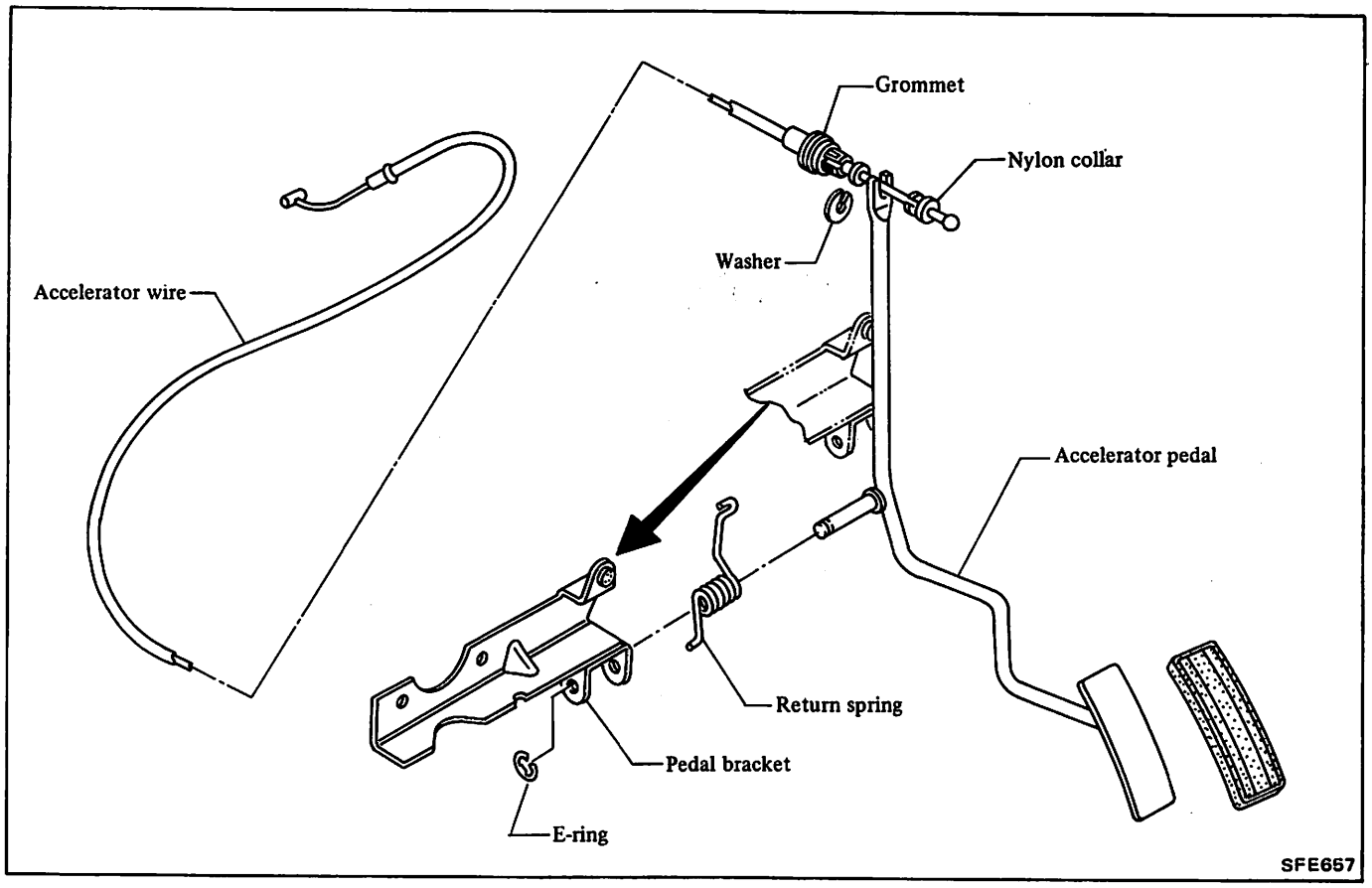
ENGINE CONTROL, FUEL & EXHAUST SYSTEMS

SECTION FE

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ENGINE CONTROL SYSTEM



ACCELERATOR SYSTEM

ACCELERATOR WIRE

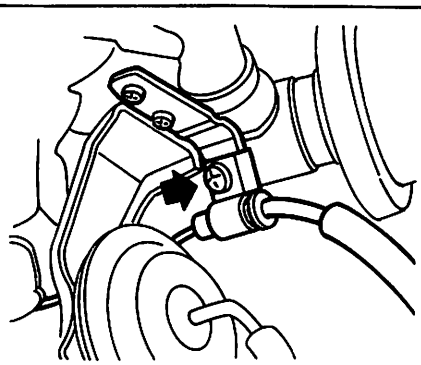
Adjustment

1. Disconnect battery ground cable.
2. Remove air cleaner.
3. Depress accelerator pedal fully.

Before adjusting, open auto-choke valve if it is not already open.

4. Adjust wire length so that the specified pedal free play exists.

Make sure that accelerator operates smoothly and throttle valve fully closes when accelerator is released.





SFE492

Removal and installation

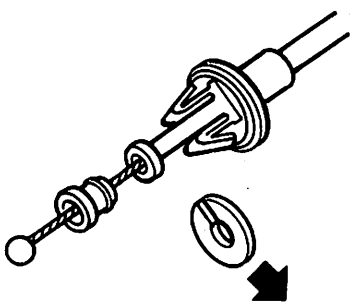
- Remove accelerator wire in the order of 1 to 5.
- Install in the reverse order of removal.

1. Disconnect battery ground cable.
2. Disconnect wire at pedal arm.



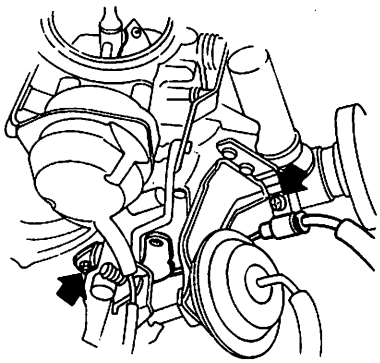
SFE397

3. Remove plastic washer.



SFE435

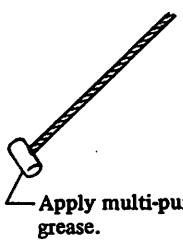
4. Disconnect accelerator wire.



5. Take wire out from engine compartment.

a. Be careful not to damage or bend wire.

b.



Apply multi-purpose grease.

SFE658

Inspection

Check accelerator wire, case and fastening locations for rust, damage or looseness.
If necessary, replace.

ACCELERATOR PEDAL

Removal and installation

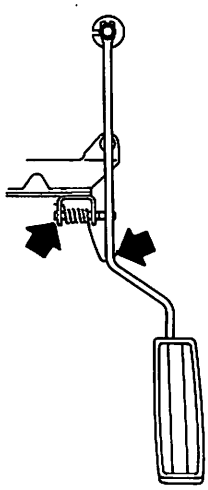
- Remove accelerator pedal in the order of 1 to 2.
- Install in the reverse order of removal.

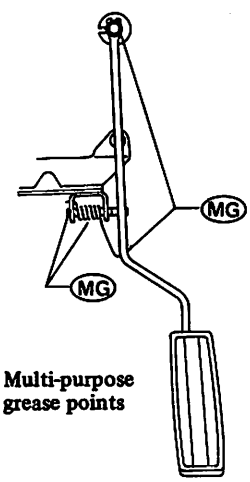
1. Disconnect wire at pedal arm.



SFE397

2. Remove E-ring, disengage return spring, and then remove accelerator pedal.





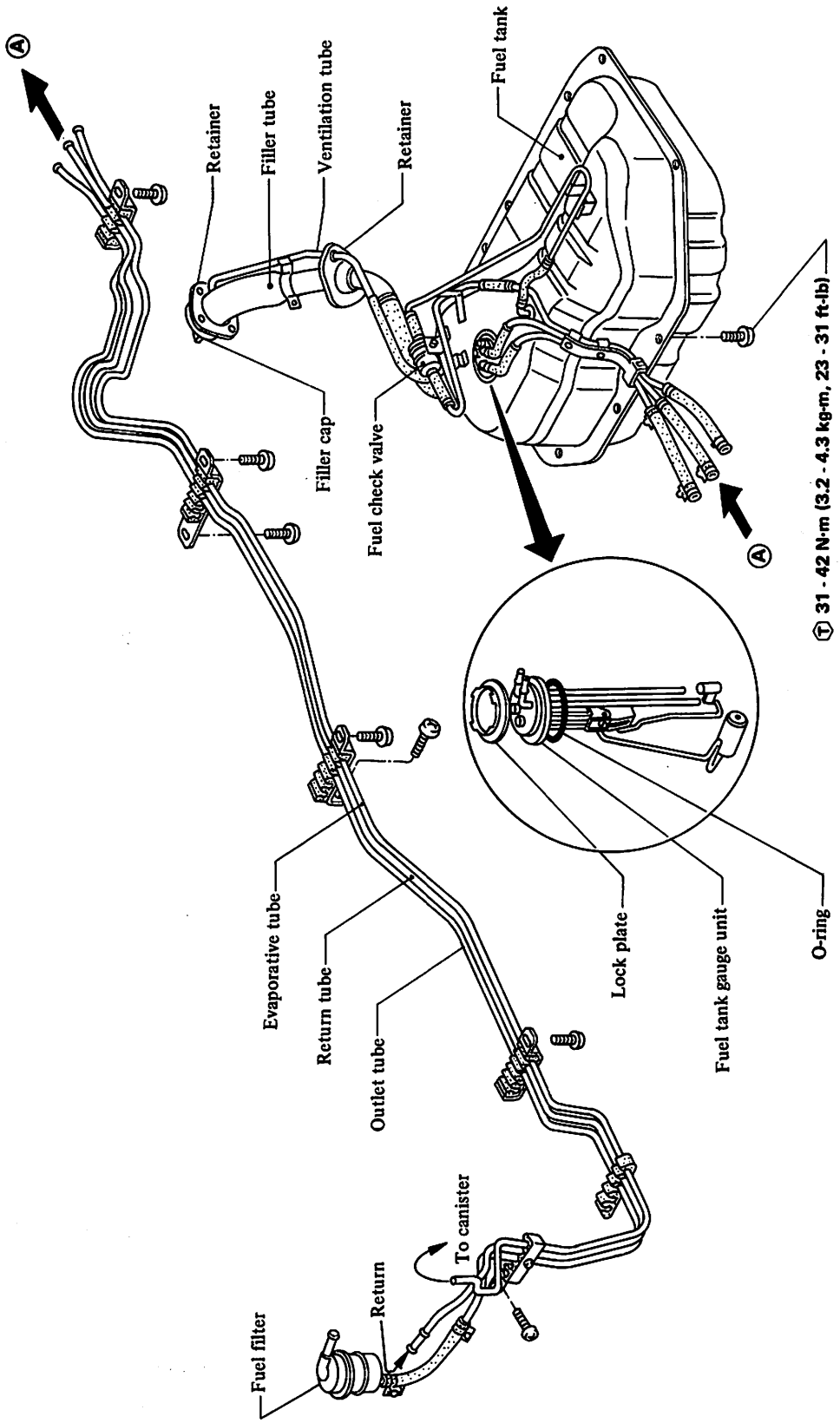
MG: Multi-purpose grease points

SFE659

Inspection

Check accelerator pedal return spring for rust, fatigue or damage.
Replace if necessary.

FUEL SYSTEM



SFE660

PRECAUTIONS

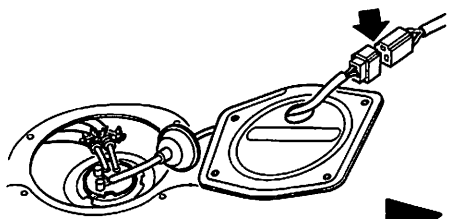
WARNING:
When replacing fuel line parts, be sure to observe the following:
a. Put a "CAUTION: INFLAMMABLE" sign in workshop.
b. Be sure to furnish workshop with an asphyxiator.
c. Be sure to disconnect battery ground cable before starting work.
d. Put drained fuel in an explosionproof container and put on lid securely.

FUEL TANK

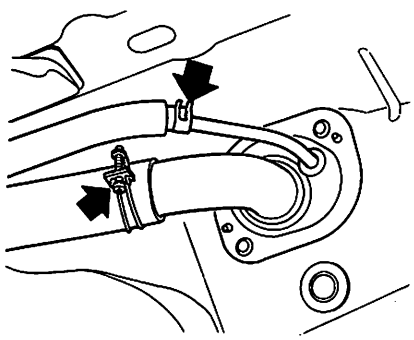
REMOVAL AND INSTALLATION

- Remove fuel tank in the order of 1 to 5.
- Install in the reverse order of removal.

1. Drain fuel.
2. Remove inspection cover and disconnect fuel tank gauge unit harness connector.

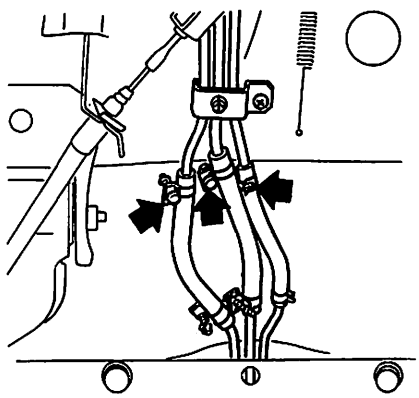


3. Disconnect fuel filler and ventilation tubes.



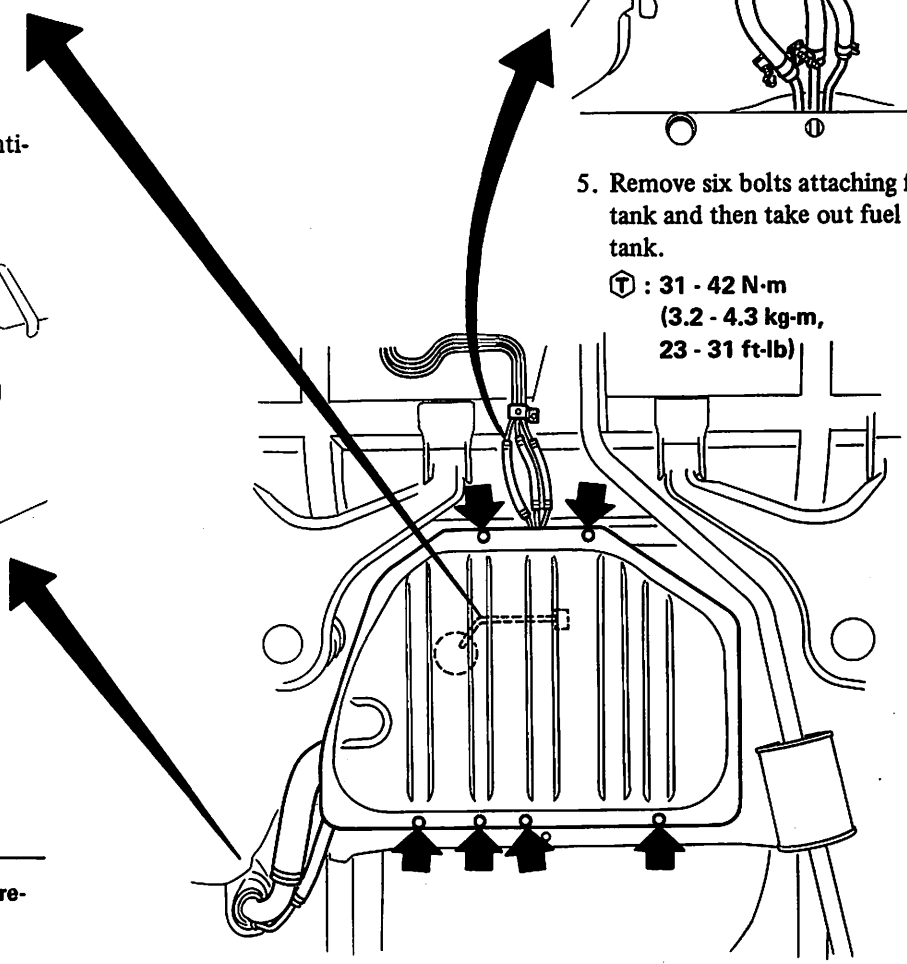
Plug hose and pipe openings to prevent entry of dust or dirt.

4. Disconnect fuel outlet, return and evaporation hoses.



5. Remove six bolts attaching fuel tank and then take out fuel tank.

Ⓣ : 31 - 42 N·m (3.2 - 4.3 kg-m, 23 - 31 ft-lb)



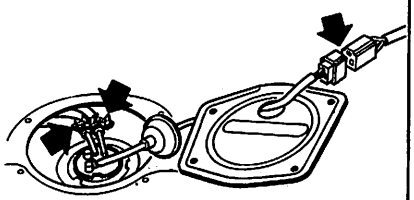
SFE661

FUEL TANK GAUGE UNIT

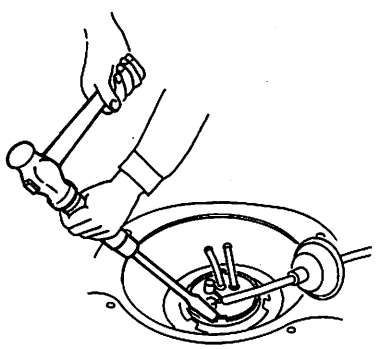
REMOVAL AND INSTALLATION

- Remove fuel tank gauge unit in the order of 1 to 3.
- Install in the reverse order of removal.

1. Remove inspection cover and disconnect fuel tank gauge unit harness connector.
2. Disconnect fuel outlet and return hoses.

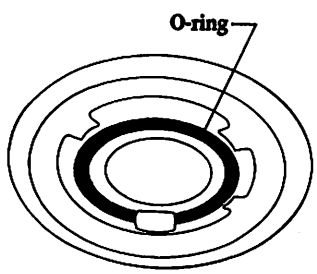


3. Remove lock plate and take out fuel tank gauge unit.



a. When taking out fuel tank gauge unit, be careful not to damage or deform.

b. Install new O-ring.



c. Plug the opening to prevent entry of dust or dirt.

SFE662

INSPECTION

Refer to Fuel Tank Guage Unit for inspection (section EL).

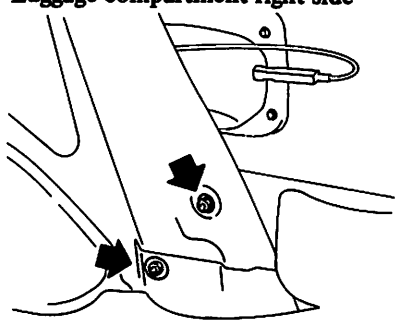
FUEL FILLER HOSE AND TUBE

REMOVAL AND INSTALLATION

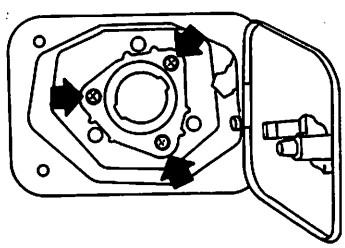
- Remove fuel filler hose and tube in the order of 1 to 5.
- Install in the reverse order of removal.

1. Drain fuel.
2. Remove screws attaching filler tube stay from inside luggage compartment.

Luggage compartment right side

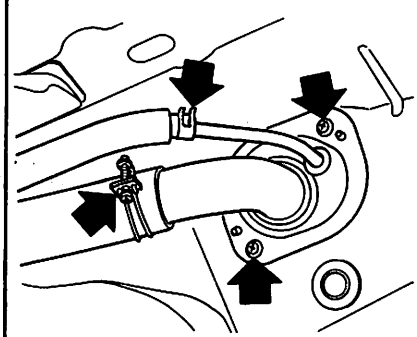


3. Remove filler cap and filler neck retainer.



SFE450

4. Remove filler hose and ventilation hose clamps.
5. Remove lower retainer, and then take out filler tube in a downward direction.



Plug hose and pipe openings to prevent entry of dust or dirt.

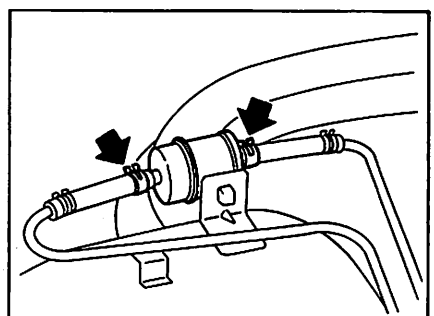
SFE663

INSPECTION

Inspect all hoses and tubes for cracks, fatigue, sweating or deterioration. Replace any hose or tube that is damaged.

FUEL CHECK VALVE

REMOVAL AND INSTALLATION



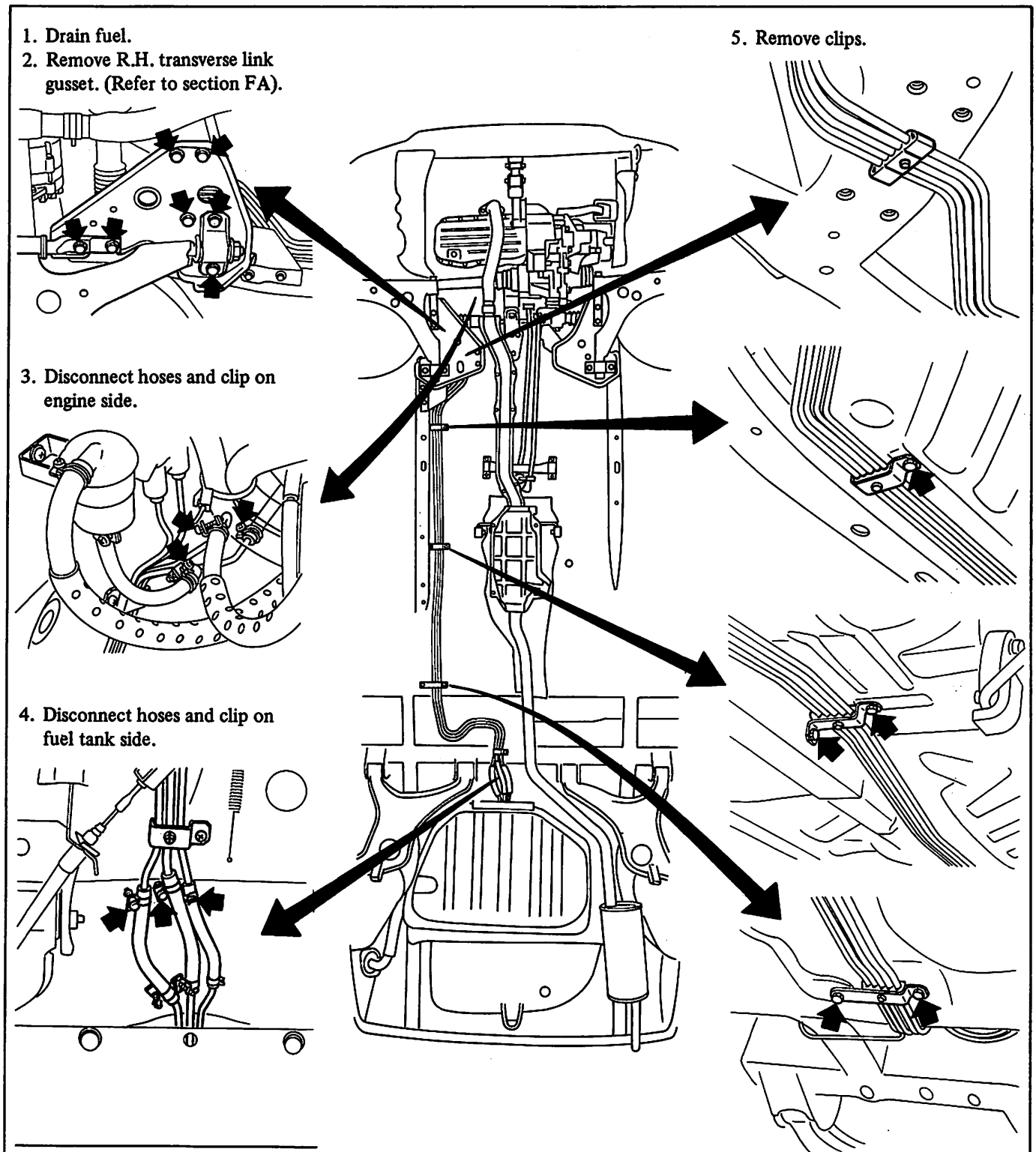
SFE664

FUEL TUBE

REMOVAL AND INSTALLATION

Fuel tubes are serviced as an assembly. Do not disconnect any fuel line unless absolutely necessary.

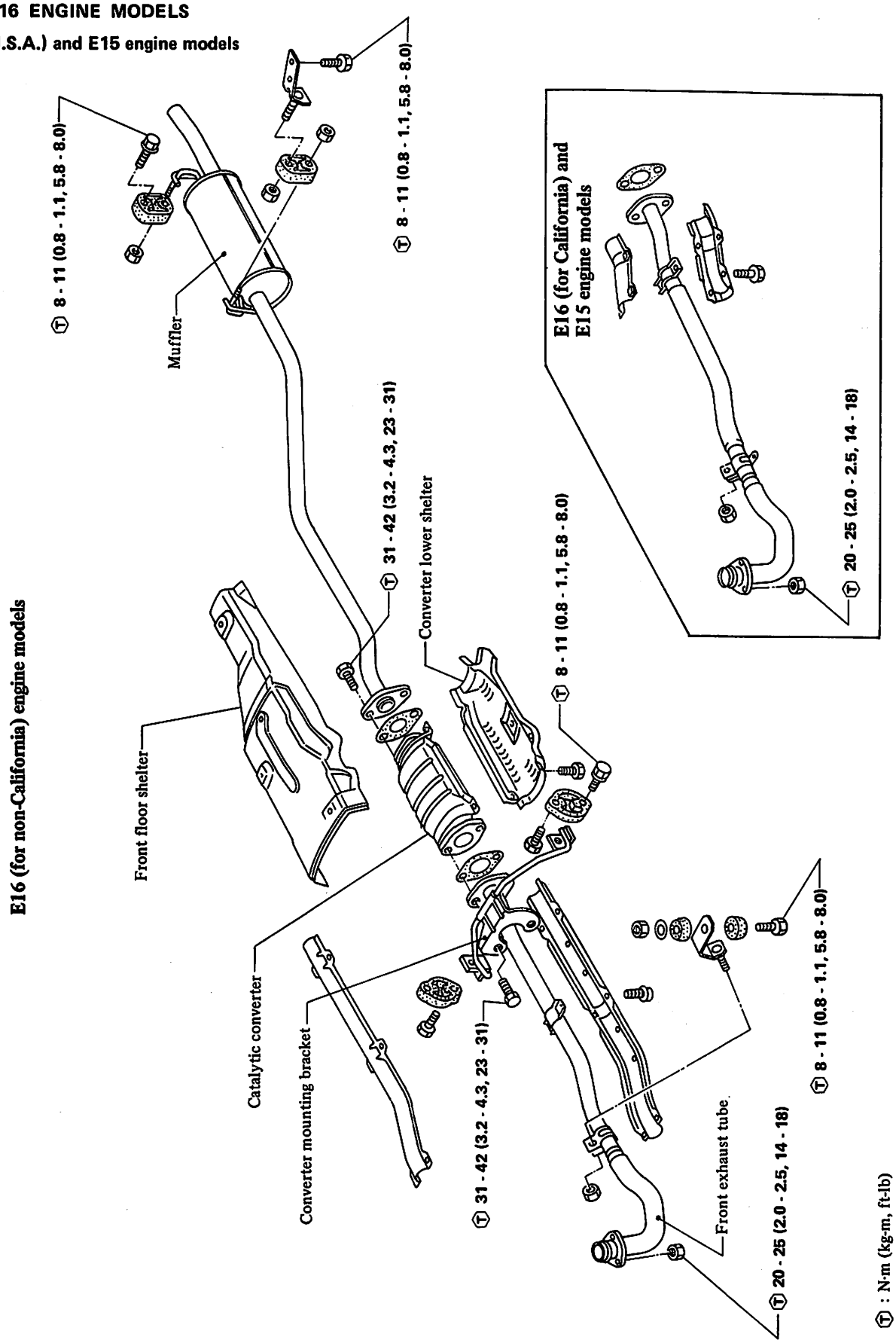
- Remove fuel tube in the order of 1 to 6.
- Install in the reverse order of removal.



EXHAUST SYSTEM

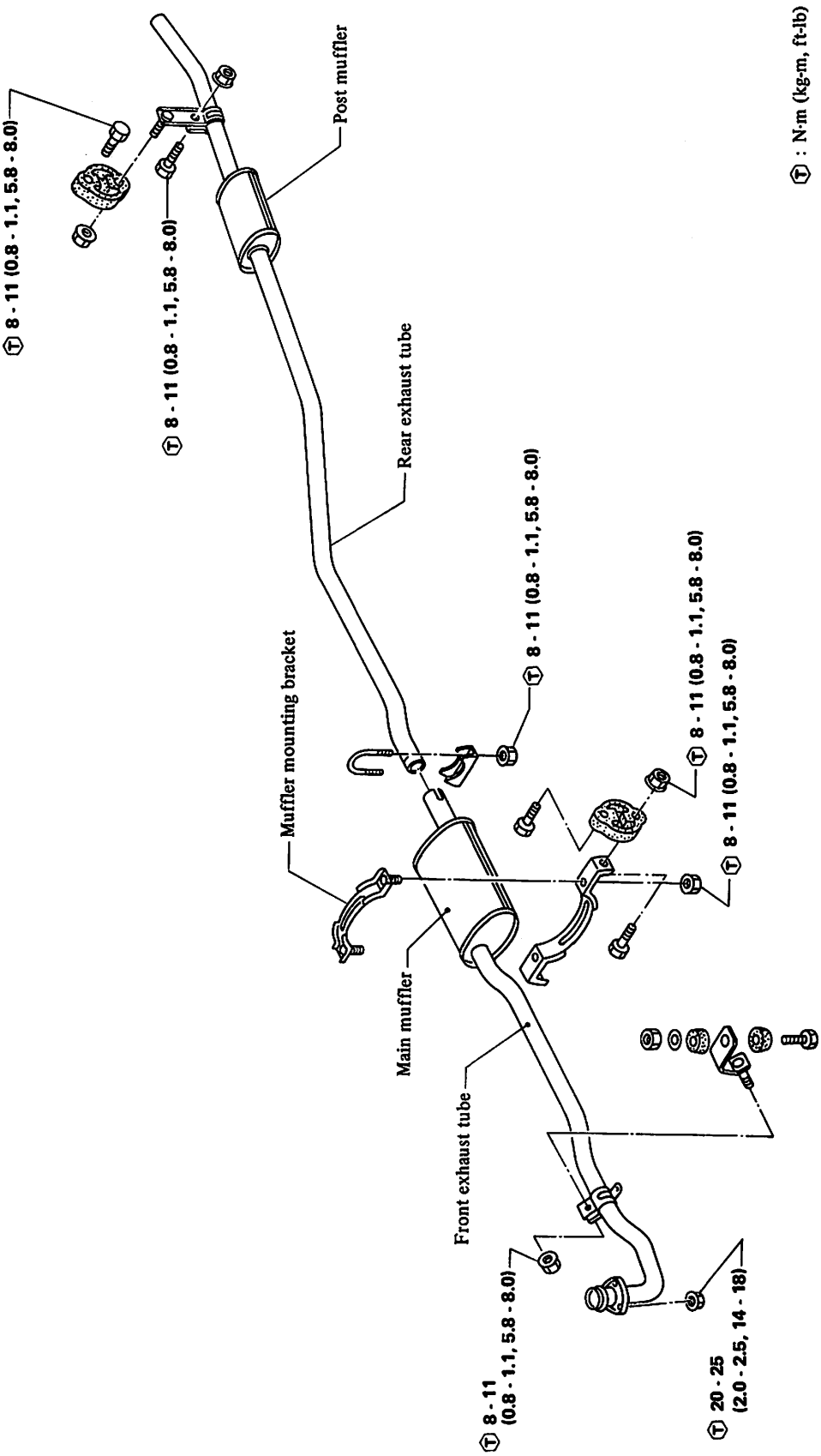
E15, E16 ENGINE MODELS

E16 (U.S.A.) and E15 engine models



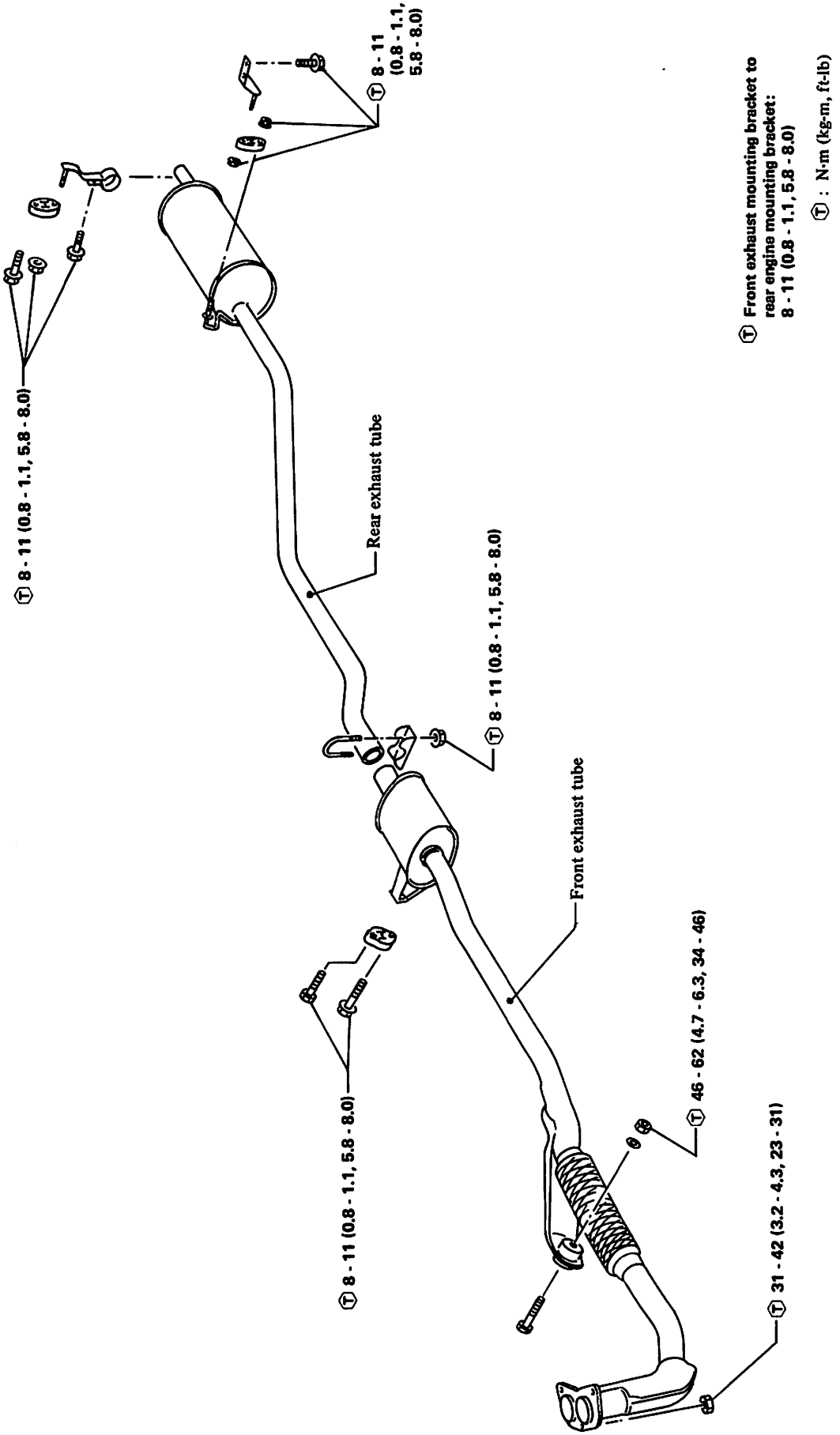
SFE666

E16 (for Canada) engine models



SFE667

CD17 ENGINE MODELS



SFE685

EXHAUST TUBE AND MUFFLER ASSEMBLY

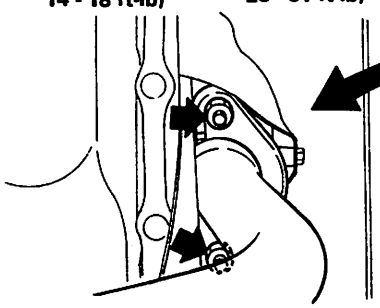
REMOVAL AND INSTALLATION

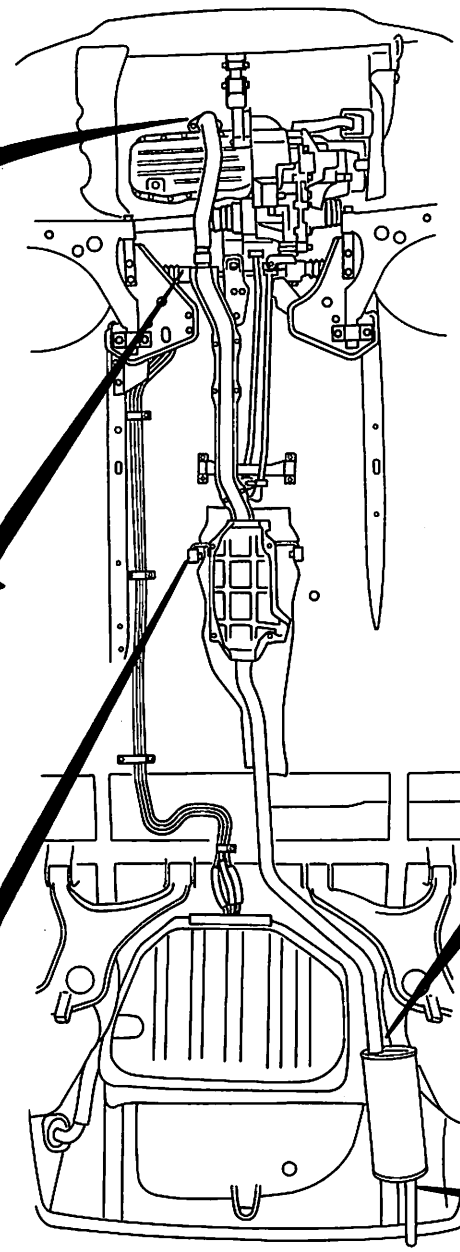
- Remove exhaust tube and muffler assembly in the order of 1 to 5.
- Install in the reverse order of removal.

1. Remove manifold fixing bolts.

E15, E16
Ⓣ 20 - 25 N·m (2.0 - 2.5 kg-m, 14 - 18 ft-lb)

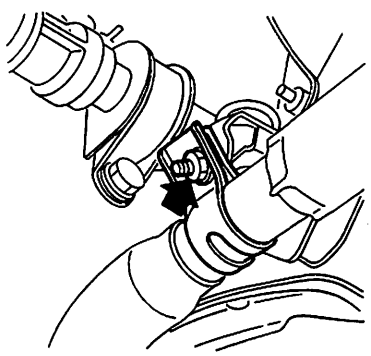
CD17
Ⓣ 31 - 42 N·m (3.2 - 4.3 kg-m, 23 - 31 ft-lb)



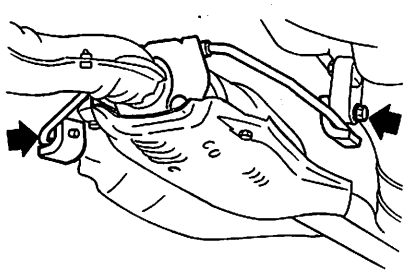


Ⓣ : Mounting bolts and nuts
Front tube of CD17
46 - 62 N·m (4.7 - 6.3 kg-m, 34 - 46 ft-lb)
Except front tube of CD17
8 - 11 N·m (0.8 - 1.1 kg-m, 5.8 - 8.0 ft-lb)

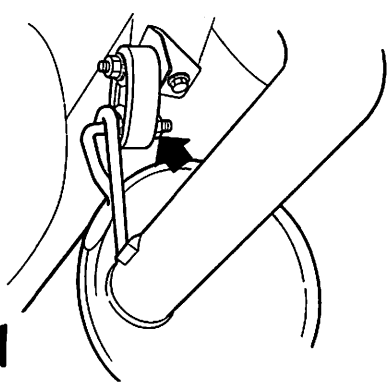
2. Remove front tube mounting nut.



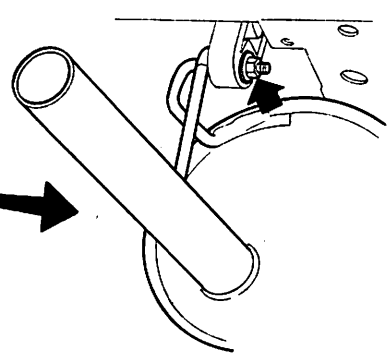
3. Remove converter mounting bolts.



4. Remove muffler mounting (front) nut.



5. Remove muffler mounting (rear) nut.



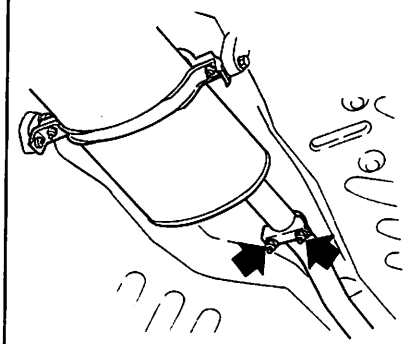
a. Be careful not to deform mounting rubbers.
b. Install new converter gasket.
c. Keep sufficient clearance between exhaust system parts and adjacent parts.

SFE668

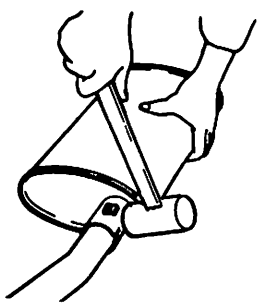
DISASSEMBLY AND ASSEMBLY

E16 (for Canada) and CD17 engine models

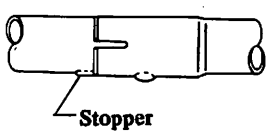
1. Remove U-Bolt nuts.



2. Break sealant and separate front tube and main muffler.

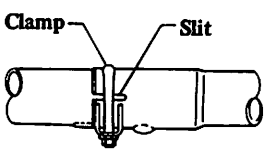


a.



Insert muffler as far as stopper.

b.



Clamp should be centered over slit.

c. When injecting sealant, refer to SEALING.

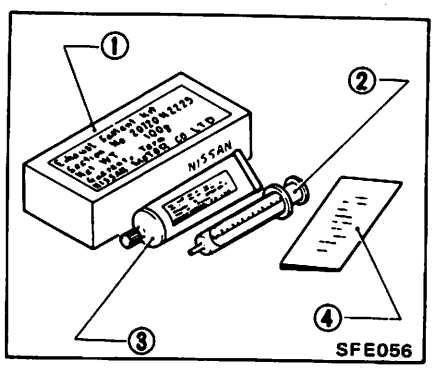
SFE669

INSPECTION

1. Check exhaust tube and muffler for cracks or damage. Replace any part that is damaged beyond repair.
2. Replace any bracket, hanger or rubber part that is cracked, fatigued or sweated.

SEALING

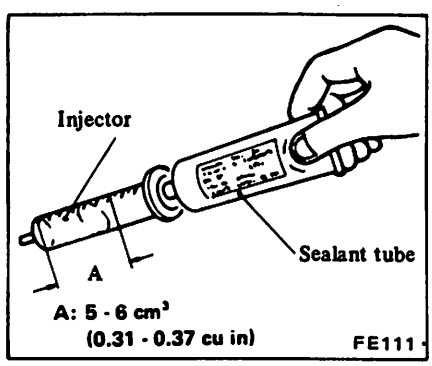
After installing exhaust parts, use the genuine Nissan Sealant "Exhaust Kit 20702-N2225" to eliminate gas leakage at the joint. Be sure to observe the following procedures.



SFE056

1 Case
2 Injector
3 Sealant tube (Polyethylene)
4 Instruction sheet

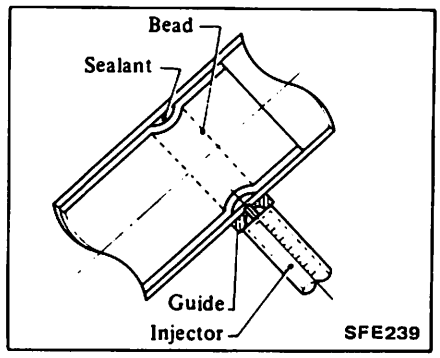
1. Squeeze 5 to 6 cm^3 (0.31 to 0.37 cu in) of sealant into injector from the sealant tube.
Be sure to place the cap back to the sealant tube since sealant will dry.



FE111

2. Position the nozzle of injector to the guide and press it there firmly. Inject sealant slowly until sealant begins to flow out of the slit of the tube. This indicates that the bead requires no further sealant. Excessive sealant can cause a clogged tube.

After injecting, wash injector thoroughly in clean water to remove all traces of sealant.



SFE239

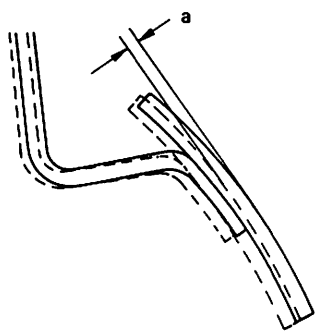
3. Start the engine and let it idle slowly for ten minutes (minimum) to harden sealant with the heat of exhaust gas.
4. Check the condition of sealant before driving the car. It is also essential that the vehicle should no be accelerated sharply for 20 to 30 minutes subsequent to this operation.

a. The sealant should be used within guaranty term indicated on the kit case.
b. Exposure of the skin to sealant may cause a rash. Wash sealant off the skin with water.
c. Do not keep the sealant tube in a place where the ambient temperature is 40°C (104°F) or above. A sealant hardened at 40°C (104°F) or above cannot be used. The most suitable storage temperature is from 15 to 35°C (59 to 95°F). If sealant becomes hardened because of low temperatures, warm the sealant tube with lukewarm water until the sealant is softened. Do not warm the tube at a temperature of over 40°C (104°F) for a long period of time.
d. Thoroughly read the instruction sheet furnished with the kit before using the sealant.
e. Check all tube connections for exhaust gas leaks, and entire system for unusual noise, with engine running.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

INSPECTION AND ADJUSTMENT

ACCELERATOR SYSTEM



SFE431

Free play at pedal pad center, "a"	mm (in)	1 - 2 (0.04 - 0.08)

TIGHTENING TORQUE

FUEL SYSTEM

Unit	N·m	kg-m	ft-lb
Fuel tank mounting bolt	31 - 42	3.2 - 4.3	23 - 31

EXHAUST SYSTEM

Unit		N·m	kg-m	ft-lb
Exhaust front tube fixing nut	E15, E16	20 - 25	2.0 - 2.5	14 - 18
	CD17	31 - 42	3.2 - 4.3	23 - 31
Exhaust mounting insulator and bracket bolt (nut)	Front tube of CD17	46 - 62	4.7 - 6.3	34 - 46
	Except front tube of CD17	8 - 11	0.8 - 1.1	5.8 - 8.0
U-bolt nut		8 - 11	0.8 - 1.1	5.8 - 8.0
Catalytic converter fixing bolt		31 - 42	3.2 - 4.3	23 - 31

SECTION CL

CONTENTS

MECHANICAL CLUTCH CONTROL ..... CL- 2
CLUTCH PEDAL AND CONTROL CABLE .. CL- 2
CLUTCH UNIT ..... CL- 3
CLUTCH DISC AND COVER ..... CL- 3
RELEASE BEARING ..... CL- 5
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ..... CL- 7
GENERAL SPECIFICATIONS ..... CL- 7
INSPECTION AND ADJUSTMENT ..... CL- 7
TIGHTENING TORQUE ..... CL- 7
TROUBLE DIAGNOSES AND CORRECTIONS ..... CL- 8
SPECIAL SERVICE TOOLS CL-10

Refer to Section MA (Clutch) for:

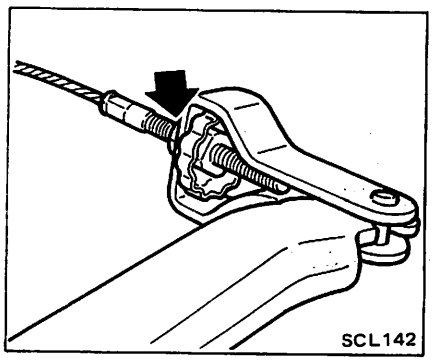
- CHECKING CLUTCH PEDAL HEIGHT AND FREE TRAVEL

MECHANICAL CLUTCH CONTROL

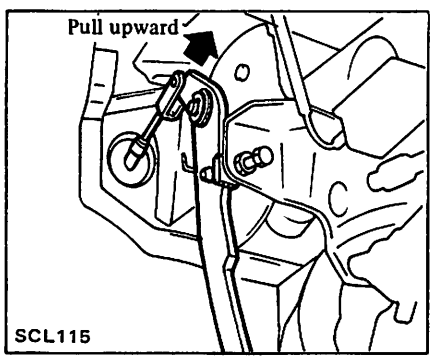
CLUTCH PEDAL AND CONTROL CABLE

REMOVAL

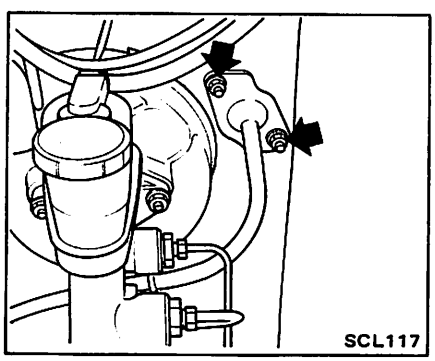
1. Remove instrument lower cover.
2. Loosen double nuts and disconnect control cable from withdrawal lever.



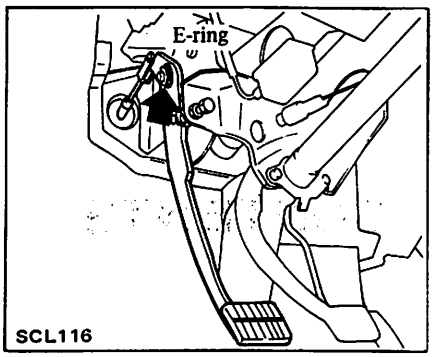
3. Disconnect other end of control cable from clutch pedal.



4. Remove control cable.



5. Remove E-ring retaining fulcrum pin.



6. Take out clutch pedal and return spring.

INSPECTION

Check pedal parts for the following, correcting as necessary.

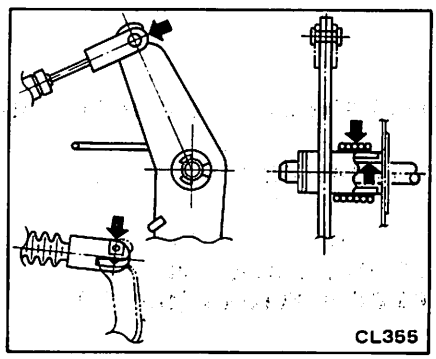
1. Bent pedal.
2. Weakened return spring.
3. Worn or deformed fulcrum bushings.
4. Cracks at welded parts.
5. Worn or damaged control cable ends.
6. Cracked outer case.

CAUTION:
If clutch pedal drags or does not operate smoothly, replace control cable.

INSTALLATION

To install clutch pedal and control cable, reverse the order of removal. Observe the following:

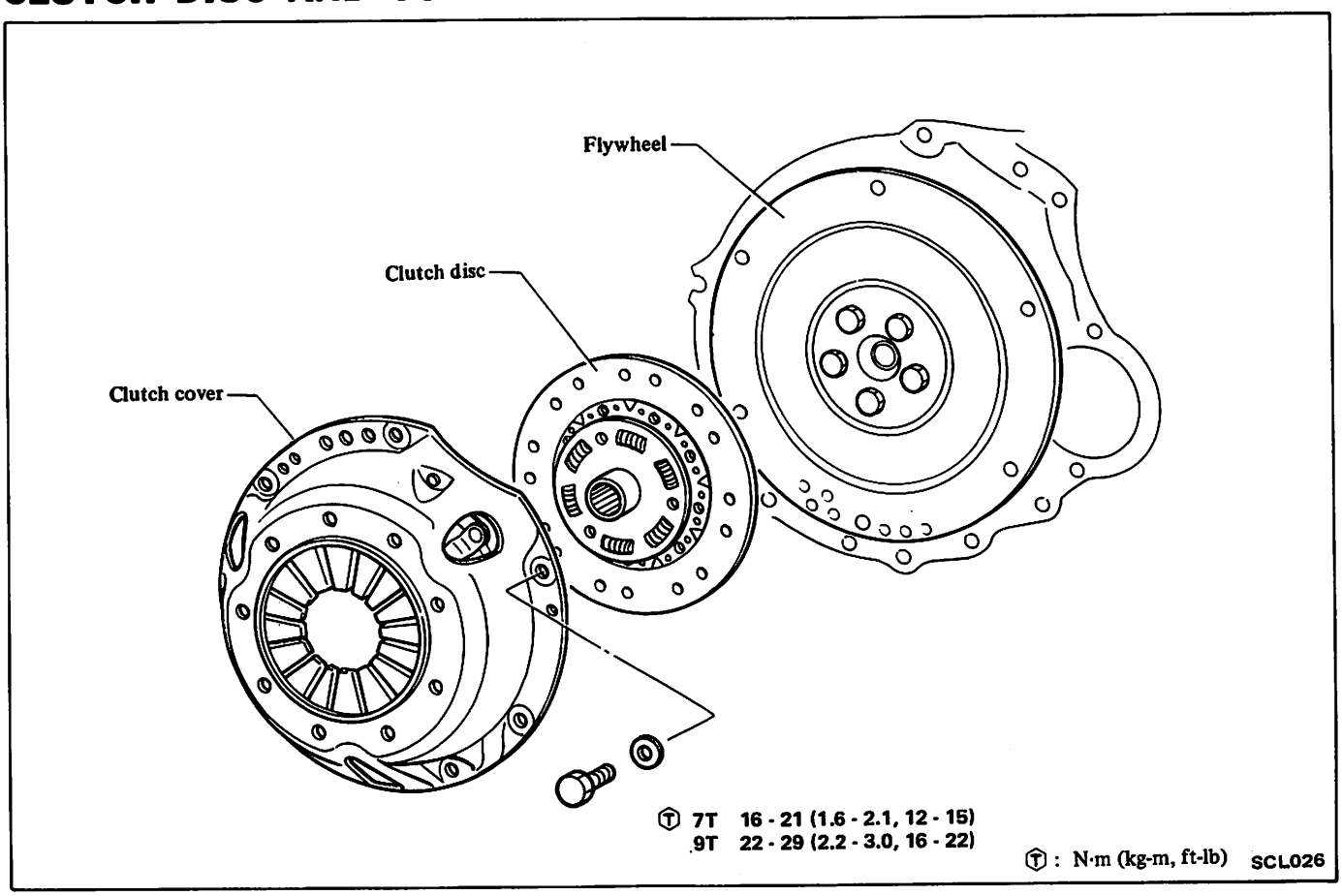
1. Apply coating of recommended multi-purpose grease to sliding portions and return spring.



2. Check the clutch pedal height. Adjust if necessary. Refer to Section MA for Checking Clutch Pedal Height.
3. Adjust the clutch pedal free travel. Refer to Section MA for Clutch Pedal Height and Free Travel.

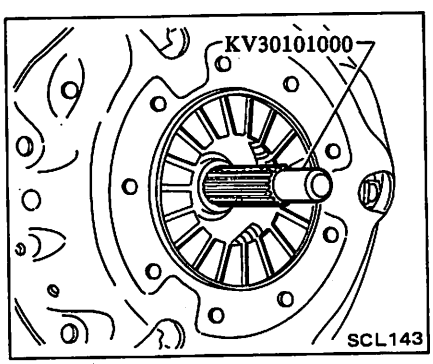
CLUTCH UNIT

CLUTCH DISC AND COVER

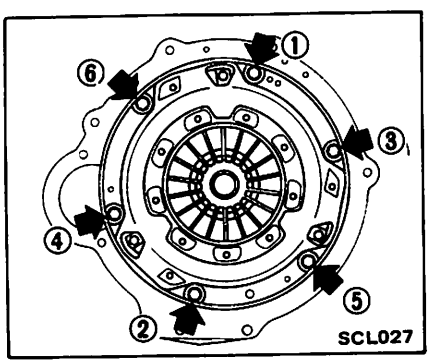


REMOVAL

1. Remove transaxle from engine. Refer to Removal (Section MT).
2. Insert Tool into clutch disc hub.



3. Loosen bolts attaching clutch cover to flywheel, one turn each at a time, until spring pressure is released. Be sure to turn them out in a crisscross fashion.



4. Remove clutch disc and cover assembly.

INSPECTION

Wash all disassembled parts except disc assembly in suitable cleaning solvent to remove dirt and grease before making inspection and adjustment.

Flywheel and pressure plate

Check friction surface of flywheel and pressure plate for scoring or roughness. Slight roughness may be smoothed by using fine emery cloth. If surface is deeply scored or grooved, the part should be replaced.

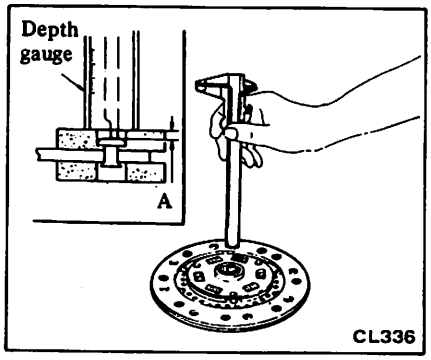
Clutch disc assembly

Inspect clutch disc for worn or oily facings, loose rivets and broken or loose torsional springs.

1. If facings are oily, disc should be replaced. In this case, inspect transaxle input shaft oil seal, engine rear oil seals and other points for oil leakage.

2. The disc should also be replaced when facings are worn locally or worn down to the specified limit.

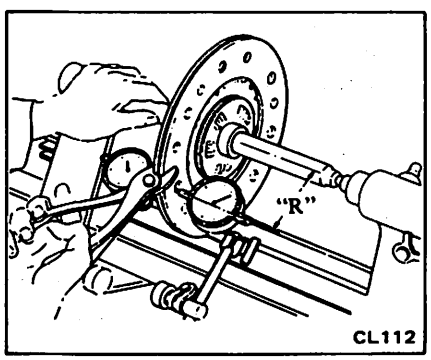
Wear limit of facing "A":
Less than 0.3 mm (0.012 in)



3. Check disc plate for runout whenever the old disc or a new one is installed.
4. If runout exceeds the specified value at outer circumference of facing, replace or repair disc.

Runout limit:
(total indicator reading)
Less than 0.5 mm (0.020 in)
"R" (from hub center):
85 mm (3.35 in)

CAUTION:
When repairing disc plate, never hold it forcibly with pliers or bend it excessively; otherwise facing will be damaged.



5. Check fit of disc hub on transaxle input shaft splines for smooth sliding.

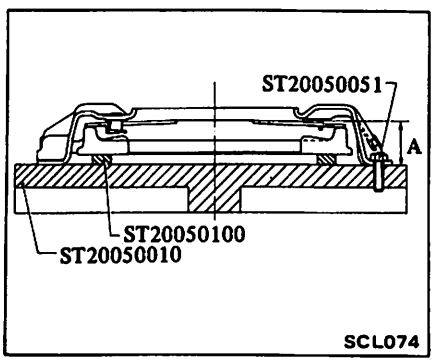
If splines are worn, clutch disc or input shaft should be replaced; that is, backlash exceeds the specified value at outer edge of clutch disc.

Backlash:
Less than 0.4 mm (0.016 in)

Clutch cover assembly

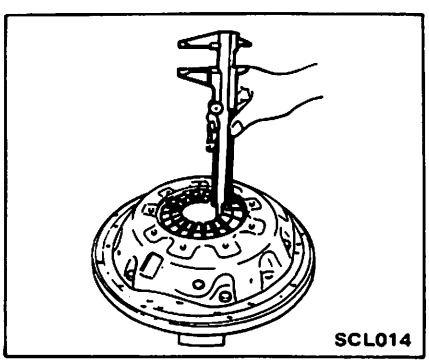
1. Check end surface of diaphragm spring for wear. If excessive wear is found, replace clutch cover assembly.
2. Measure height of diaphragm springs as outlined below:

(1) Place Tool ST20050100 on Tool ST20050010 and then tighten clutch cover assembly on base plate by using Tool ST20050051.

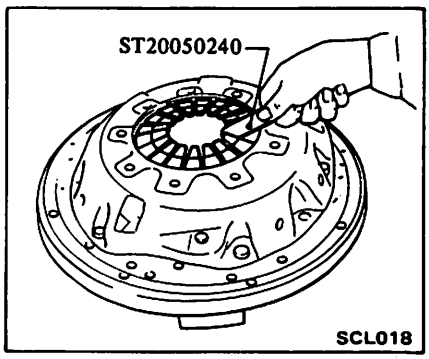


(2) Measure height "A" at several points with a vernier caliper depth gauge.

Diaphragm spring height "A":
29.0 - 31.0 mm
(1.142 - 1.220 in)



If height "A" of spring end is beyond specified value, adjust spring height with Tool ST20050240. If necessary, replace clutch cover assembly.



Also, unevenness of diaphragm spring toe height should be within the specified limit.

Unevenness of diaphragm spring toe height:
Less than 0:5 mm (0.020 in)

If unevenness of diaphragm spring toe height is beyond specified value, adjust spring height with Tool ST20050240.

3. Inspect thrust rings for wear or damage. As these parts are invisible from outside, shake cover assembly up and down to listen for chattering noise, or lightly hammer on rivets for a slightly cracked noise. Any of these noises indicates need of replacement as a complete assembly.

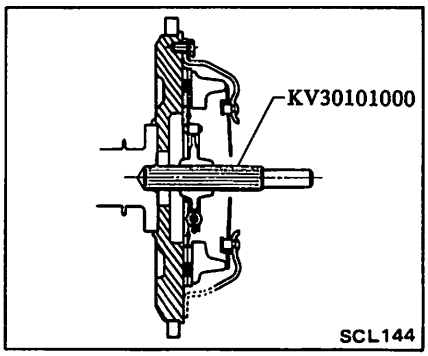
INSTALLATION

1. Apply a light coat of lithium-based grease (including molybdenum disulphide) to transaxle input shaft gear splines. Slide clutch disc on input shaft several times. Remove clutch disc and wipe off excess lubricant pushed off by disc hub.

Take special care to prevent grease or oil from getting on clutch facing.

2. Reinstall clutch disc and clutch cover assembly. Support clutch disc and cover assemblies with Tool KV30101000.

Be sure to keep disc facings, flywheel and pressure plate clean and dry.



3. Install clutch cover assembly. Each bolt should be tightened one turn at a time in a crisscross fashion.

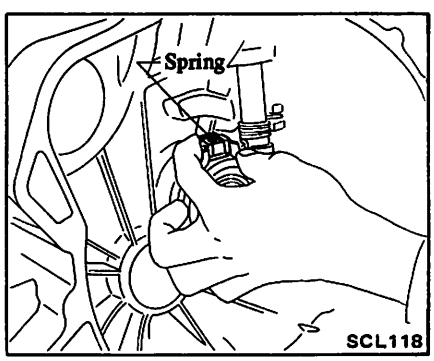
Ⓣ : **Clutch cover bolt**
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

4. Remove clutch aligning bar.
5. Reinstall transaxle. Refer to Installation (Section MT).

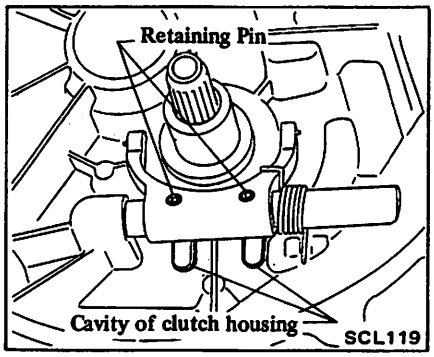
RELEASE BEARING

REMOVAL

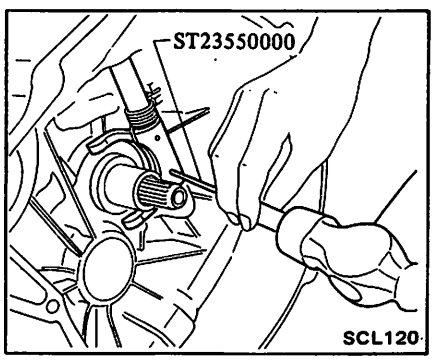
1. Remove transaxle from engine. Refer to Removal (Section MT).
2. Disconnect spring from release bearing.



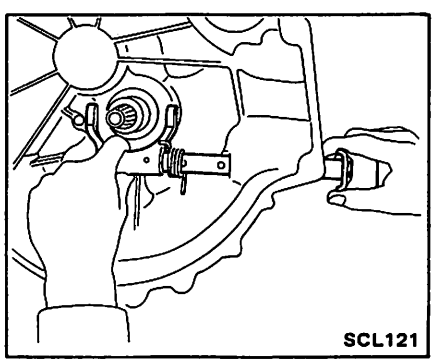
3. Remove release bearing from clutch housing front cover.
4. Align retaining pin with cavity of clutch housing.



5. Drive out retaining pin.



6. Pull out clutch control shaft. Then withdrawal lever and spring can be taken out.



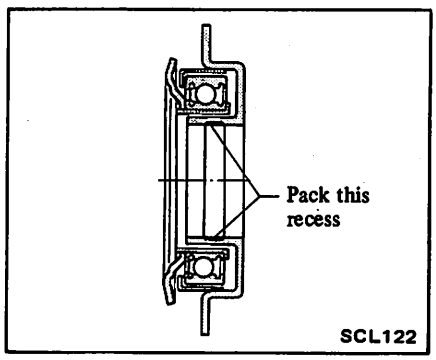
INSPECTION

Check for abnormal wear on contact surface of withdrawal lever, release bearing spring and release bearing.

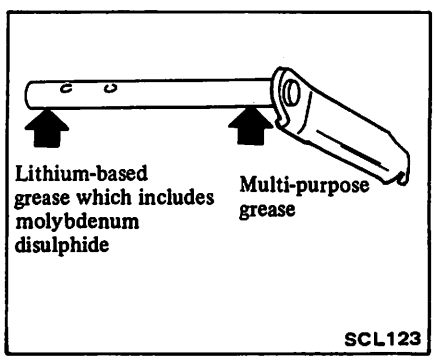
Hold bearing inner race and rotate outer race while applying pressure to it. If the bearing rotation is rough or noisy, replace bearing.

INSTALLATION

1. Lubricate the following points with a light coat of lithium-based grease which includes molybdenum desulphide.
(1) Inner groove of release bearing sleeve.

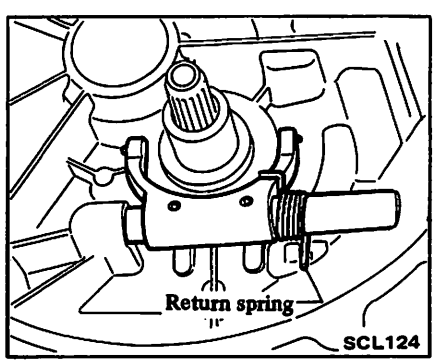


(2) Contact surfaces of withdrawal lever, and release bearing.
2. Apply recommended grease to clutch control shaft.

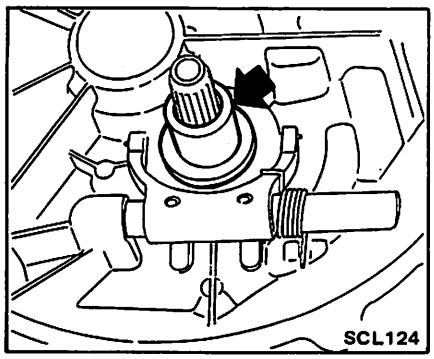


3. Install withdrawal lever, return spring and clutch control shaft on clutch housing.

Be sure to hook return spring as shown below.



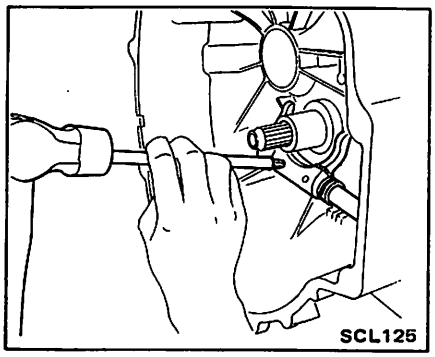
4. Lubricate the following points with lithium-based grease which includes molybdenum disulphide.
(1) Release bearing sliding surface of clutch housing front cover.



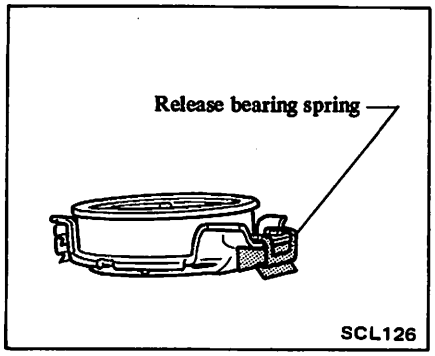
(2) Transaxle splines.

A small amount of grease should be coated to the above points. If too much lubricant is applied, it will run out on the friction plates when hot, resulting in damaged clutch disc facings.

5. Install withdrawal lever retaining pin.



6. Install release bearing springs to release bearing.



7. Install release bearing by pushing release bearing spring and clutch control lever by hand.

Be sure "click" is heard when pushing.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

GENERAL SPECIFICATIONS

CLUTCH CONTROL SYSTEM

Type of clutch control	Mechanical

CLUTCH DISC

Type	180CBL
Facing size Outer dia. x Inner dia. x Thickness mm (in)	180 x 125 x 3.5 (7.09 x 4.92 x 0.138)
Thickness of disc assembly Free mm (in)	8.85 - 9.55 (0.3484 - 0.3760)
At load 3,923 N mm (in) (400 kg, 882 lb)	8.0 - 8.4 (0.315 - 0.331)
Number of torsion springs	6

CLUTCH COVER

Model	C180S
Full load N (kg, lb)	
E15, E16	3,531 (360, 794)
CD17	2,746 (280, 617)

INSPECTION AND ADJUSTMENT

CLUTCH DISC

Unit: mm (in)

Model	180CBL
Wear limit of facing surface to rivet head	0.3 (0.012)
Runout limit	0.5 (0.020)
Distance of runout checking point (from the hub center)	85 (3.35)
Maximum backlash of spline (at outer edge of disc)	0.4 (0.016)

CLUTCH COVER

Unit: mm (in)

Model	C180S
Diaphragm spring height	29.0 - 31.0 (1.142 - 1.220)
Unevenness of diaphragm spring toe height	Less than 0.5 (0.020)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Pedal stopper bolt lock nut	12 - 15	1.2 - 1.5	9 - 11
Clutch cable lock nut (E15, E16)	3 - 4	0.3 - 0.4	2.2 - 2.9
Clutch cable double nut (CD17)	19 - 25	1.9 - 2.6	14 - 19
Clutch cable bracket securing bolt	8 - 11	0.8 - 1.1	5.8 - 8.0
Clutch cover securing bolt			
7T	16 - 21	1.6 - 2.1	12 - 15
9T	22 - 29	2.2 - 3.0	16 - 22

TROUBLE DIAGNOSES AND CORRECTIONS

CLUTCH SLIP

Slipping of clutch may be noticeable when any of the following symptoms is encountered during operation.
(1) Car will not respond to engine speed during acceleration.
(2) Insufficient car speed.
(3) Lack of power during uphill driving.
(4) Increasing of fuel consumption.

Some of the above conditions may also be attributable to engine problem. First determine whether engine or clutch is causing the problem.

If slipping clutch is left unheeded, wear and/or overheating will occur on clutch facing to such an extent that it is no longer serviceable.

TO TEST FOR SLIPPING CLUTCH, proceed as follows:

Inspection

Insure that parking brake is engaged. Disengage clutch and shift transaxle gears into 4th. Gradually increase engine speed while simultaneously engaging clutch. If engine stops while clutch is being engaged, clutch is functioning properly. If car does not move and the engine does not stop, clutch is slipping.

Probable cause	Corrective action
• Clutch facing hardened or wet with oil	Repair or replace
• Clutch facing excessively worn	Replace (Replace if engine/ transaxle oil seal is faulty)
• Diaphragm spring weak or damaged	Replace
• Flywheel or pressure plate warped	Repair or replace

CLUTCH DRAGS

Dragging clutch is particularly noticeable when shifting gears, especially into low gear.
TO TEST FOR DRAGGING CLUTCH, proceed to inspection.

Inspection

The clutch will not disengage properly if the clutch pedal height is not correct. Before inspecting, be sure to correct the clutch pedal height, pedal stroke and extra allowance for disengagement. [There should be sufficient clearance below the pedal stroke (extra allowance for disengagement).]
(1) Clutch pedal height from the floor is outside the specifications. It indicates that the stopper bolt location is not correct.
(2) The adjustment of control cable (withdrawal lever play) is outside the specifications.
(3) Extra disengagement allowance is insufficient because of the interference of floor mats, etc.

Disengage clutch and shift gears into Reverse. Shift gears into Neutral, gradually increasing engine speed. After a short intermission, shift gears into Reverse. If noise is heard while gears are being shifted, clutch is dragging.

Probable cause	Corrective action
• Clutch disc hub splines worn or rusted	Replace (or remove rust) and coat with grease
• Insufficient pedal stroke	Adjust
• Clutch disc runout or warped	Replace
• Diaphragm spring fatigued	Replace
• Clutch facing wet with oil	Replace (Replace if engine/ transaxle oil seal is faulty)

CLUTCH CHATTERS

Clutch chattering is usually noticeable when car is just rolled off with clutch partially engaged.

Probable cause	Corrective action
• Oil on clutch facing	Replace
• Diaphragm spring fatigued	Replace
• Clutch facing hardened	Replace
• Clutch facing warped	Repair or replace
• Pressure plate worn or warped	Replace
• Engine mounting loose or rubber deteriorated	Tighten or replace
• Clutch facing rivets loose	Replace

NOISY CLUTCH

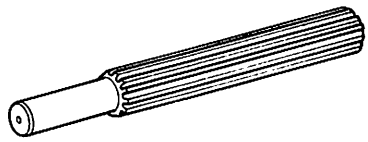
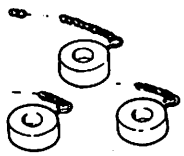
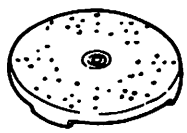
Probable cause	Corrective action
• Release bearing/sleeve damaged or improperly lubricated	Replace
• Pilot bushing worn, jammed or damaged	Replace
• Clutch facing rivets loose	Replace
• Disc plate cracked	Replace
• Clutch disc torsion springs fatigued	Replace

RABBIT-HOPPING CLUTCH

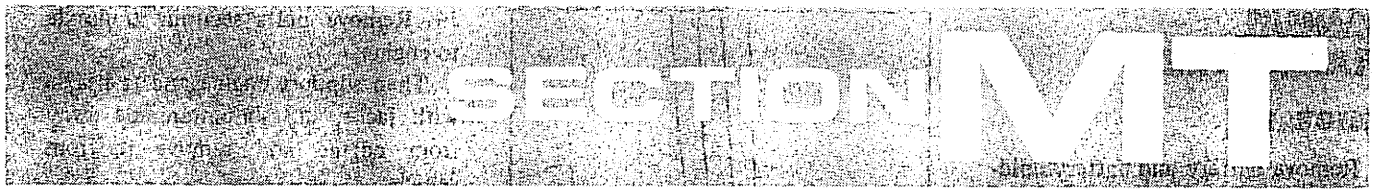
When "rabbit-hopping" of clutch occurs, car will not roll off smoothly from a standing start or clutch will be engaged before clutch pedal is fully depressed.

Probable cause	Corrective action
• Oil on clutch facing	Replace
• Clutch facing worn or rivets loose	Replace
• Flywheel/pressure plate warped or worn	Replace
• Mounting bolts on engine or power train loose	Tighten
• Diaphragm spring fatigued	Replace

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
KV30101000 (–)	Clutch aligning bar 
ST20050100 (–)	Distance piece 
ST20050010 (–)	Base plate 
ST20050051 (–)	Set bolt 
ST20050240 (–)	Diaphragm spring adjusting wrench 

MANUAL TRANSAXLE



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REMOVAL AND INSTALLATION

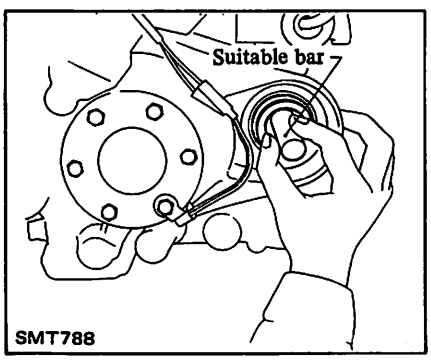
MANUAL TRANSAXLE

REMOVAL

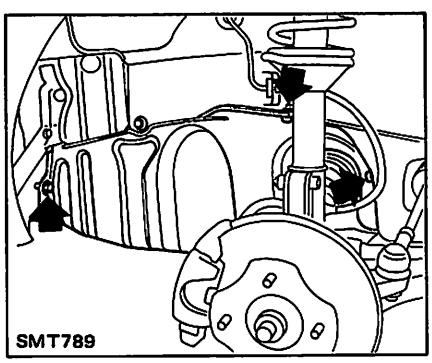
1. Remove battery and battery holding plate.
2. Remove radiator reservoir tank.
3. Drain gear oil.
4. Draw out drive shafts from transaxle.

Refer to Drive Shaft (Section FA) for removal.

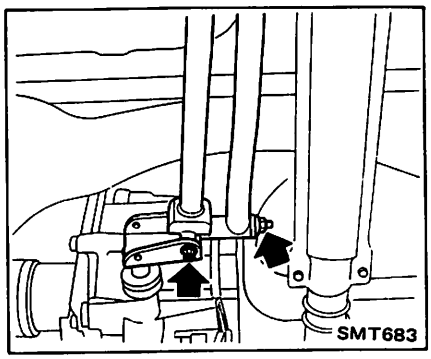
a. When drawing out drive shafts, use care not to damage lip of oil seal.
b. After drawing out drive shafts, insert suitable bar to prevent side gears from rotating and falling into differential case.



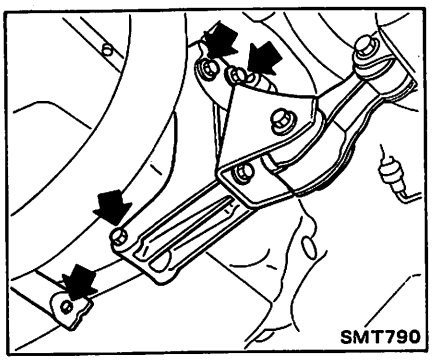
5. Remove wheel house protector.



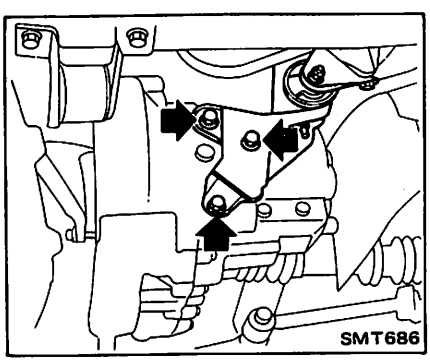
6. Separate control rod and support rod from transaxle.



7. Remove engine gusset securing bolt and engine mounting.

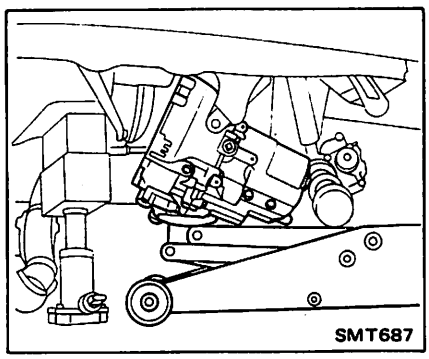


8. Remove clutch control cable from withdrawal lever.
9. Disconnect speedometer cable.
10. Disconnect wires from reverse (back-up) and neutral switches.
11. Support engine by placing a jack under oil pan with a wooden block used between oil pan and jack.
12. Support transaxle with a jack.
13. Remove engine mounting securing bolts.



14. Remove bolts securing transaxle to engine.

Then support engine and transaxle with jacks, and slide transaxle away from engine and remove it from vehicle.



CAUTION:
Take care not to strike any adjacent parts or input shaft when dismounting transaxle.

INSTALLATION

Install transaxle in the reverse order of removal, paying attention to the following points.

1. Before installing, clean mating surfaces of engine rear plate and clutch housing.
2. Before installing, apply a light coat of lithium-based grease which includes molybdenum disulphide to spline parts of clutch disc and input shaft.
3. Remove filler plug and fill transaxle with recommended gear oil up to the level of the plug hole.

Oil capacity:
RN4F30A
2.3 liters (4-7/8 US pt, 4 Imp pt)
FS5F30A
2.7 liters (5-3/4 US pt, 4-3/4 Imp pt)

4. Apply sealant to threads of filler plug, and install filler plug to transmission case.

Ⓣ: **Filler plug**
25 - 34 N·m
(2.5 - 3.5 kg-m,
18 - 25 ft-lb)

5. Tighten bolts securing transaxle to engine.

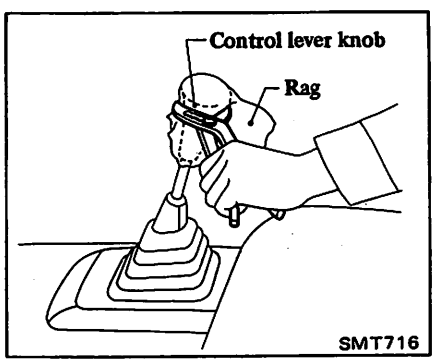
Ⓣ: **16 - 21 N·m**
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

For tightening torques of other related parts, refer to sections ER, FA, BR and CL.

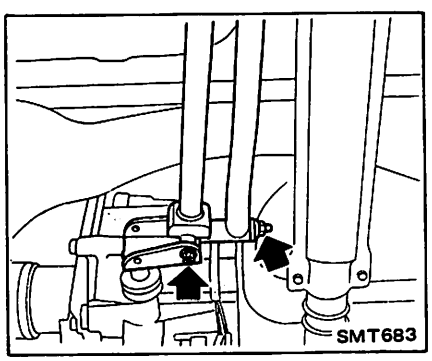
TRANSMISSION GEAR CONTROL

REMOVAL

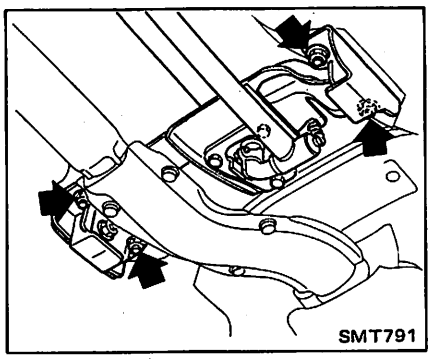
1. Remove control lever knob.



2. Separate control rod and support rod from transaxle.



3. Remove control bracket securing bolts, then remove transmission gear control assembly.



INSTALLATION

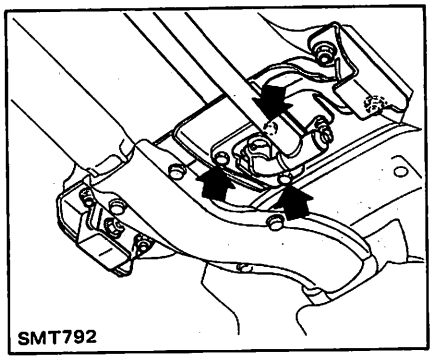
Install transmission gear control in the reverse order of removal.

Apply locking sealer to control lever knob.

Ⓣ : **Rubber holder to body**
8 - 12 N·m
(0.8 - 1.2 kg-m,
5.8 - 8.7 ft-lb)
Control rod to transaxle
6.3 - 8.3 N·m
(0.64 - 0.85 kg-m,
4.6 - 6.1 ft-lb)
Support rod to transaxle
8 - 12 N·m
(0.8 - 1.2 kg-m,
5.8 - 8.7 ft-lb)

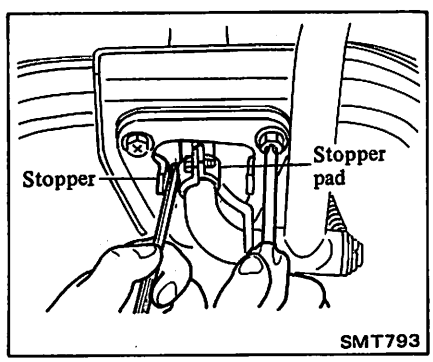
After installing transmission gear control, adjustment for select stopper should be perfomed.

1. Loosen select stopper securing bolts.



2. Shift to 1st gear.
3. Adjust the clearance between control lever and select stopper by sliding the select stopper so that the clearance is the specified value.

Clearance: 1.0 mm (0.039 in)



4. Tighten select stopper securing bolts.

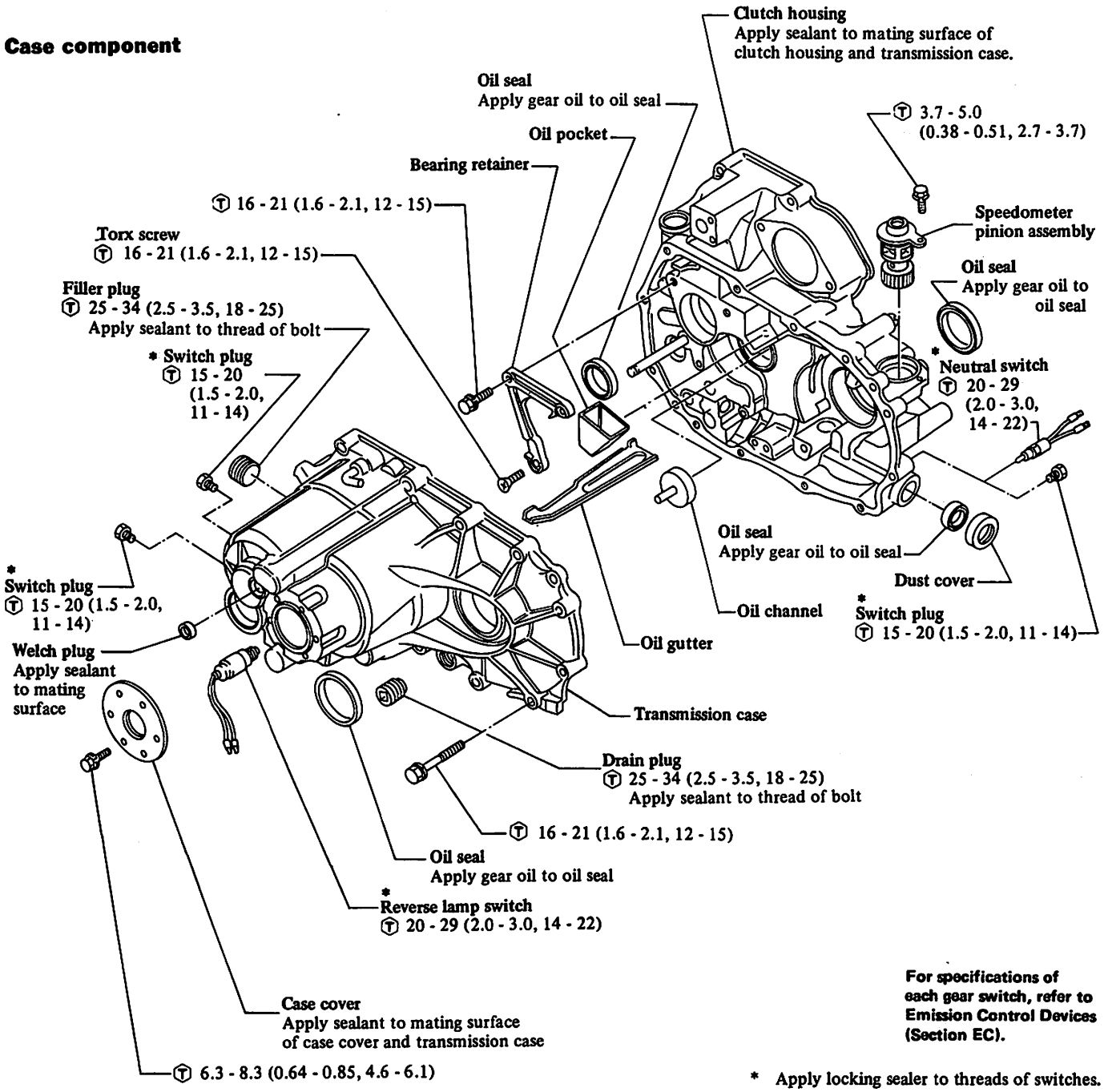
Ⓣ : **Select stopper bolt**
3.1 - 5.0 N·m
(0.32 - 0.51 kg-m,
2.3 - 3.7 ft-lb)

5. After adjustment, be sure to check that control lever can be shifted to all positions without binding or dragging.

MANUAL TRANSAXLES [Models: RS5F30A (5-speed) and RN4F30A (4-speed)]

Service procedures for 4-speed transaxle model RN4F30A are essentially the same as those for 5-speed transaxle model RS5F30A, except for 5th input gear, 5th main gear and synchronized mechanism. Consequently, 4-speed and 5-speed model transaxles are collectively treated in this manual, with major emphasis on the latter.

Case component



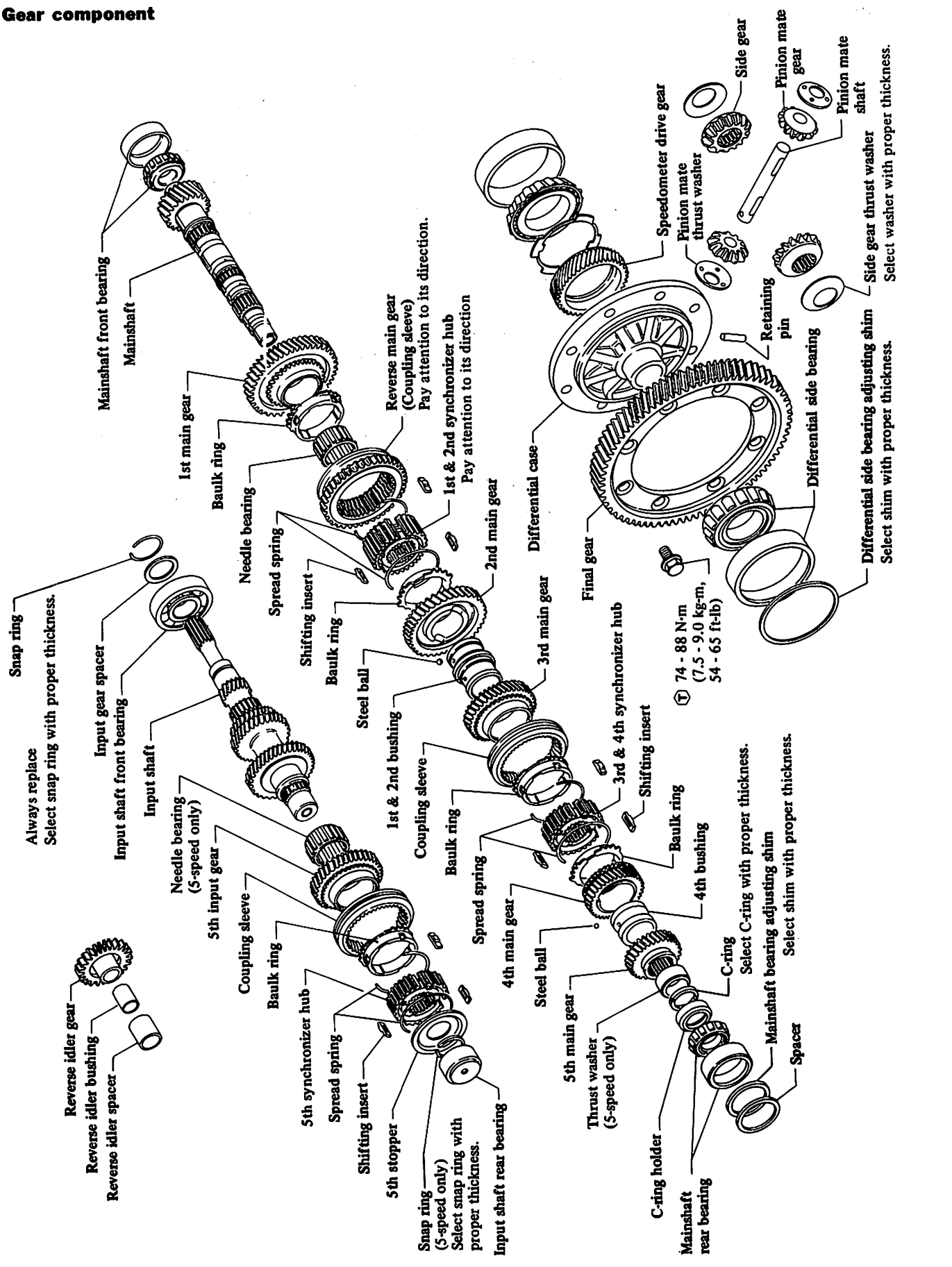
For specifications of each gear switch, refer to Emission Control Devices (Section EC).

* Apply locking sealer to threads of switches.

Ⓣ: N·m (kg-m, ft-lb)

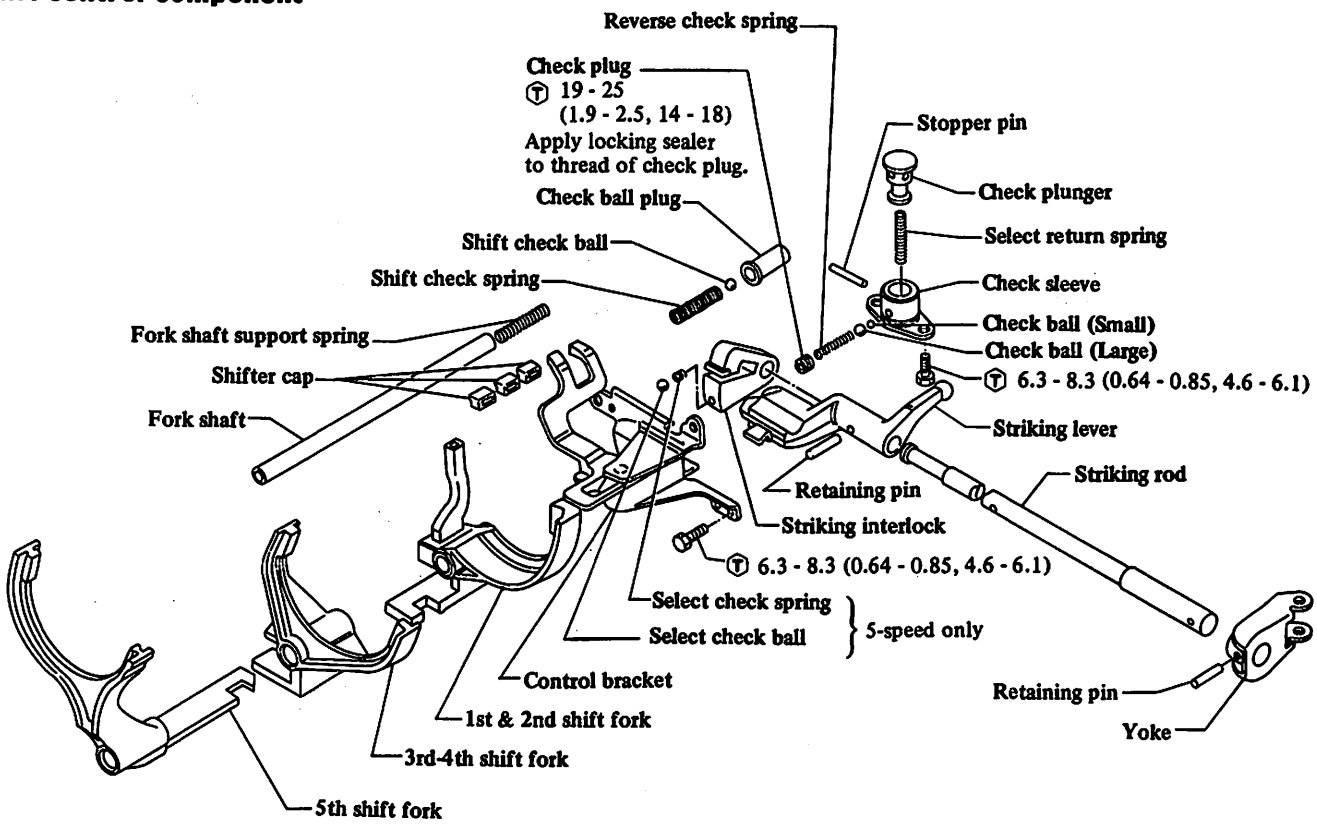
SMT734

Gear component



SMT834

Shift control component



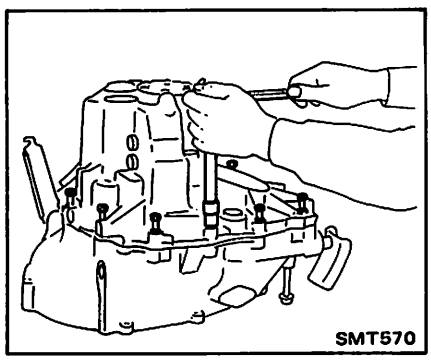
Ⓣ: N·m (kg-m, ft-lb)

SMT803

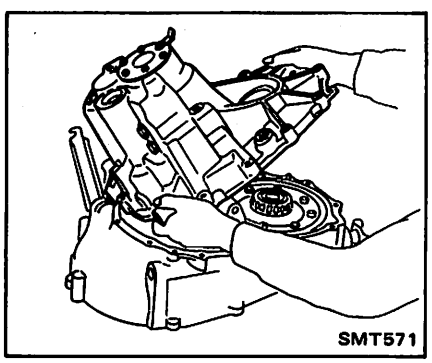
TRANSMISSION CASE

DISASSEMBLY

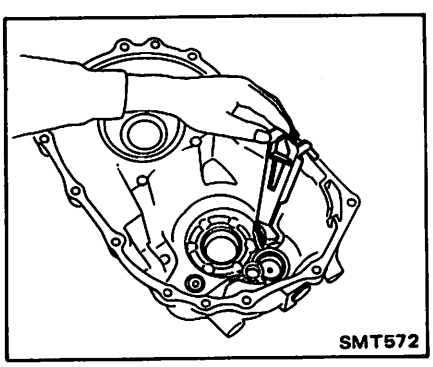
1. Wipe off dirt and grease.
2. Drain oil from transmission case.
3. Remove transmission case fixing bolts.



4. With a plastic hammer, tap the case, then carefully lift transmission case while slightly tilting it (5-speed only) to prevent 5th shift fork from interfering with the case.

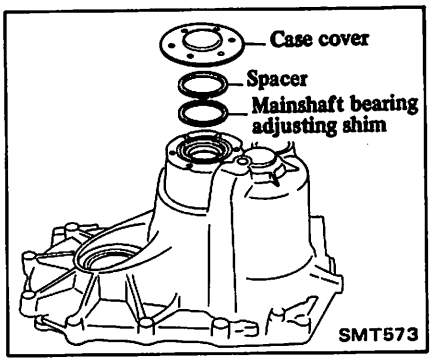


5. Remove reverse lamp (back-up) switch.
6. Remove oil gutter.



7. Remove input shaft rear bearing.
Refer to "Replacement of Bearings".

8. Remove case cover and mainshaft bearing adjusting shim and spacer.



9. Remove mainshaft rear bearing outer race and differential side bearing outer race.
Refer to "Replacement of Bearings".

INSPECTION

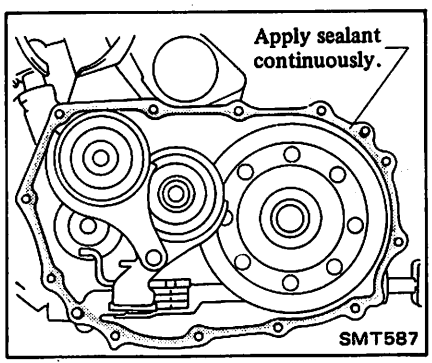
1. Clean with solvent and check for cracks or cavities by means of dyeing test.
2. Check mating surface of transmission case for small nicks, projections or sealant.

ASSEMBLY

1. Press fit differential side bearing outer race and mainshaft bearing outer race.
Refer to "Replacement of Bearings".
2. Install input shaft needle bearing and **apply sealant to welch plug**, then install it on transmission case.
Refer to "Replacement of Bearings".
3. Install oil gutter and apply locking sealer to reverse lamp (back-up) switch, then install them.
4. If transmission case is replaced, adjust differential side bearing and mainshaft rotary frictional force by selecting suitable shims.

Before installing a new transmission case, determine appropriate thickness of differential side bearing adjusting shim with both main and input shafts withdrawn from the case.
For removal of input shaft and mainshaft and for adjustment of bearing rotary frictional force, refer to instructions under "Disassembly of Clutch Housing" and "Adjustment of Gears and Shafts (except final drive)", respectively.
5. Clean mating surface of transmission case and clutch housing, and apply sealant to clutch housing.

Apply an even coat of sealant to mating surfaces of transmission case and clutch housing continuously. Uneven coating could lead to oil leakage.



6. Assemble transmission case on clutch housing.

12 bolts are used to secure transmission case and clutch housing. Only one of these bolts is longer than the others.

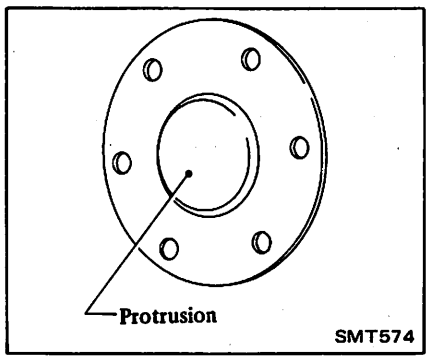
Ⓣ : 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb)

7. After properly adjusting mainshaft bearing, remove transmission case cover.
Clean mating surface of transmission case and case cover, then apply sealant to transmission case.

Ensure that mating surfaces are evenly coated with sealant.

8. Install case cover.

Ensure that convex side of transmission case cover faces outward when installed.

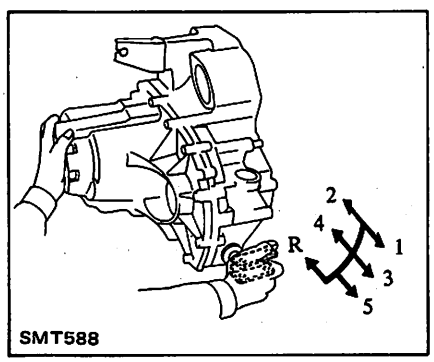


Ⓣ: 6.3 - 8.3 N·m (0.64 - 0.85 kg-m, 4.6 - 6.1 ft-lb)

9. Measure gear rotary frictional force and ensure that gear moves smoothly without binding.

Refer to "Gears and Shafts (Except final drive)" for adjustment.

10. Make sure that gears operate smoothly.



11. **Apply sealant to thread of drain plug,** then install it to transmission case.

Ⓣ: 25 - 34 N·m (2.5 - 3.5 kg-m, 18 - 25 ft-lb)

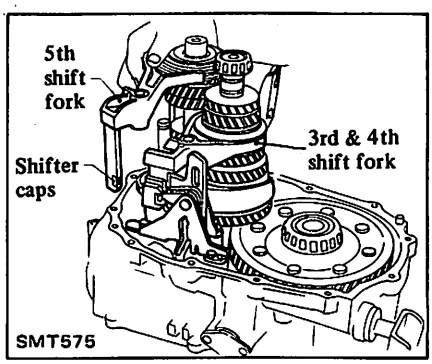
CLUTCH HOUSING

DISASSEMBLY

1. Wipe off dirt and grease.
2. Drain oil.
3. Remove transmission case.

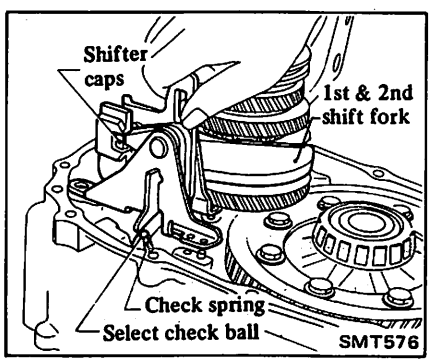
Refer to "Transmission Case" for disassembly.

4. Draw out reverse idler spacer and fork shaft, then remove 5th, 3rd & 4th shift fork. **Be careful not to lose shifter caps.**



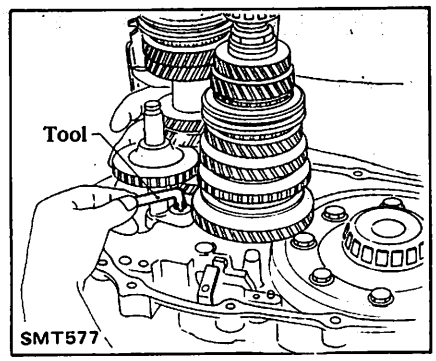
5. Remove control bracket with 1st & 2nd shift fork.

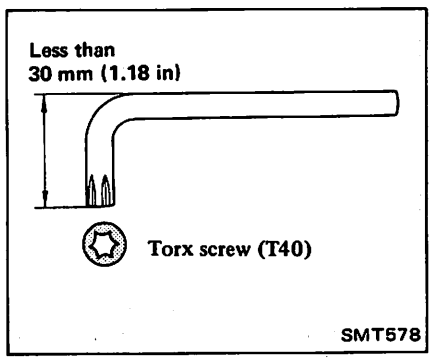
Be careful not to lose select check ball (5-speed only), check spring (5-speed only) and shifter caps.



6. Remove three screws and detach bearing retainer.

One of these three screws is a torx type and should be removed with a special-purpose tool, as shown in figures below; otherwise screw will be difficult to remove because of small clearance between screw and reverse idler gear.

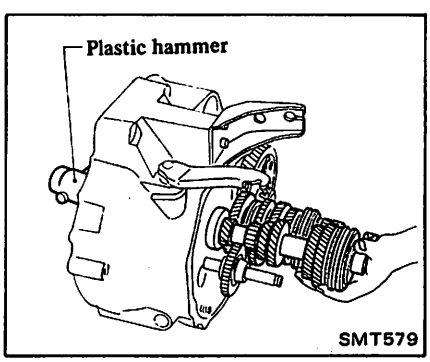




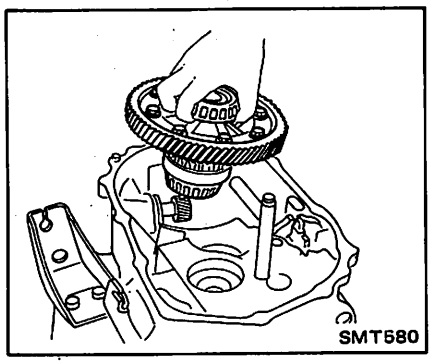
Do not draw out reverse idler shaft from clutch housing because these fittings will be loose.

7. Turn clutch housing so its side faces down. Lightly tap input shaft end (on engine side) with a plastic hammer, then remove input shaft together with mainshaft.

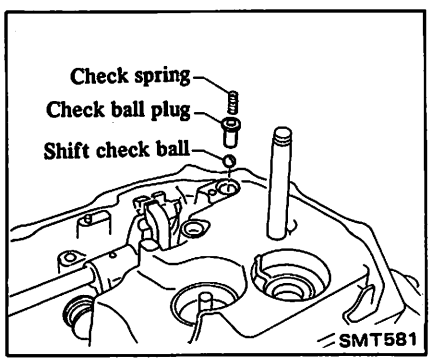
a. **Always withdraw mainshaft straight out. Failure to do so can damage resin oil channel on clutch housing side.**
b. **When removing input shaft, be careful not to scratch oil seal lip with shaft spline.**
c. **While tapping input shaft end, use care not to allow final gear assembly to fall out.**



8. Remove reverse idler gear and final drive assembly.

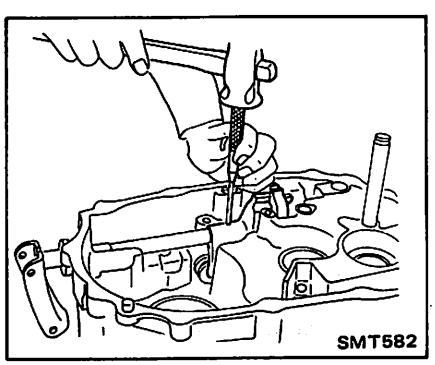


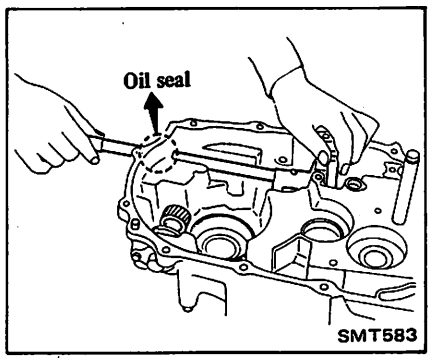
9. Remove oil pocket, shift check ball, check springs and check ball plug.



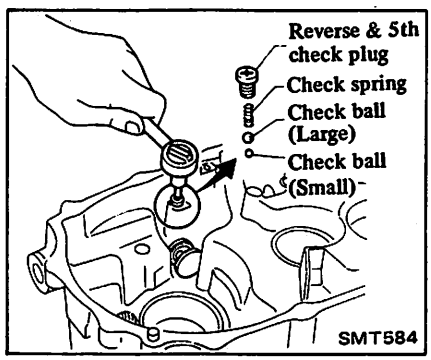
10. Drive retaining pin out of striking lever, then remove striking rod, striking lever and striking interlock.

a. Select a position where retaining pin does not interfere with clutch housing when removing the former.
b. When removing striking rod, use care not to damage oil seal's lip. If necessary, tape edges of striking rod when removing the rod.

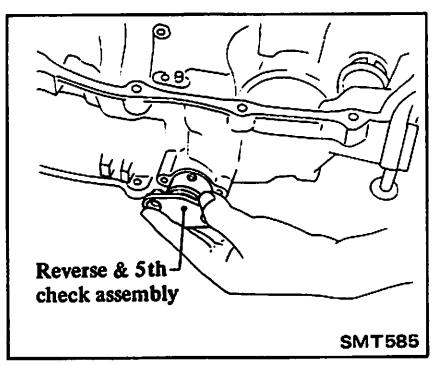




11. Remove reverse & 5th check plug, then detach check spring and check balls.



12. Remove reverse & 5th check assembly.



13. Remove clutch control shaft, clutch release bearing and clutch lever.

Refer to "Release Bearing (Section CL)" for removal.

14. Remove mainshaft bearing outer race and differential side bearing outer race.

Refer to "Replacement of Bearings".

15. Remove oil channel.

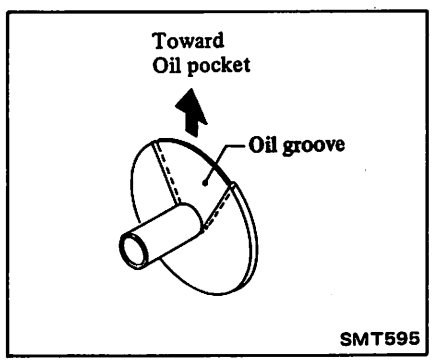
INSPECTION

1. Clean with solvent and check for cracks or cavities by means of dyeing test.
2. Check mating surface of clutch housing for small nicks, projections or sealant.

ASSEMBLY

1. Install a new oil channel.

Ensure that oil groove in oil channel always faces toward oil pocket when installing it on clutch housing.



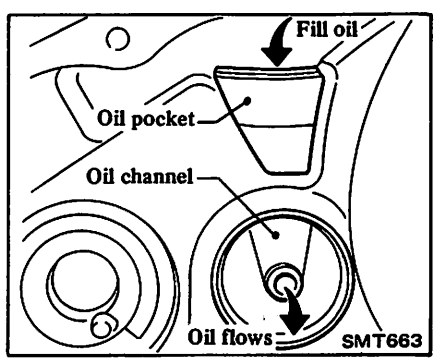
2. Install mainshaft bearing outer race and differential side bearing outer race.

Refer to "Replacement of Bearings".

3. Install clutch control shaft, clutch release bearing and clutch lever.

Refer to "Release Bearing (Section CL)" for installation.

4. Install oil pocket, then **make sure oil flows from oil pocket to oil channel.**

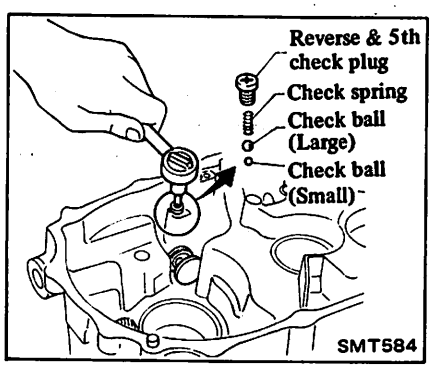


5. Install following parts in reverse order of disassembly.
- Reverse & 5th check assembly
- Reverse & 5th check plug (check spring, check balls)

a. Install smaller check ball first, then larger one.

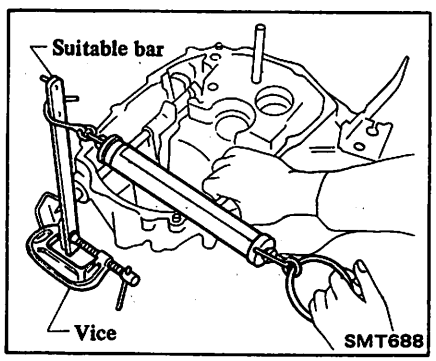
b. When replacing clutch housing, reverse & 5th check assembly, check spring and check plug, it is necessary to adjust reverse check force.

1) First, install used check plug or standard check plug and tighten it to the specified torque.



Ⓣ: Reverse & 5th check plug
19 - 25 N·m
(1.9 - 2.5 kg-m,
14 - 18 ft-lb)

2) Check reverse check force.

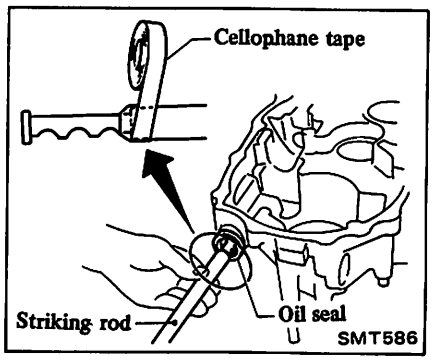


Reverse check force:
4-speed
15.7 - 22.6 N·m
(160 - 230 kg-cm,
139 - 200 in-lb)
5-speed
22.1 - 27.0 N·m
(225 - 275 kg-cm,
195 - 239 in-lb)

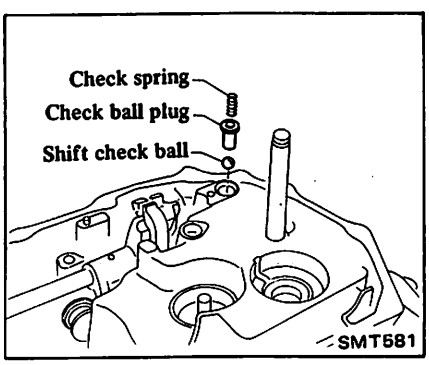
3) If reverse check force is not within the above range, select another check plug having a different length and reinstall it.
Reverse check plug:
Refer to S.D.S.

c. Apply locking sealer to thread of check plug.
- Striking lever
- Striking interlock
- Boot (for shift control oil seal)
- Striking rod

CAUTION:
When inserting striking rod into clutch housing, tape edges of striking rod to avoid damaging oil seal's lip if it hits against oil seal.



- Shift check related parts (check ball plug, shift check ball, check spring)



- Oil pocket
- Differential case assembly
  If clutch housing is replaced with a new one, adjust differential side bearing rotary frictional force by selecting shim. Refer to Transmission Case for assembly and adjustment.
- Reverse idler gear
- Mainshaft

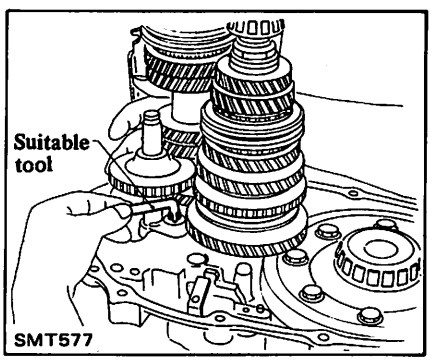
A resin oil channel is used at end of mainshaft on clutch housing side. Use care not to damage oil channel when inserting mainshaft into clutch housing.

- Input shaft

Use care not to damage oil seal's lip by splines of input shaft while shaft is being inserted into clutch housing.

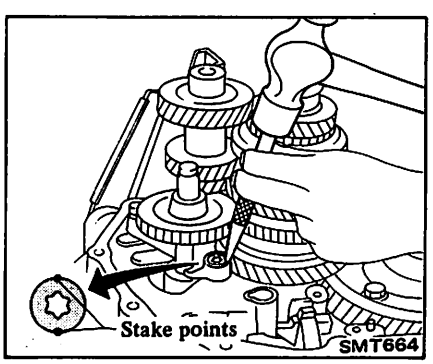
- Bearing retainer
  One of three screws is a torx design and should be installed with a special-purpose tool referred to in "Disassembly". A conventional tool will not do, as clearance between reverse idler gear and screw location is not wide enough for screw to be inserted.

a. Apply locking sealer to thread of torx screw.

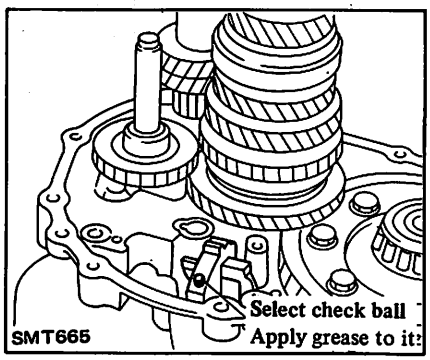


Ⓣ: Torx screw
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)
Bearing retainer bolt
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

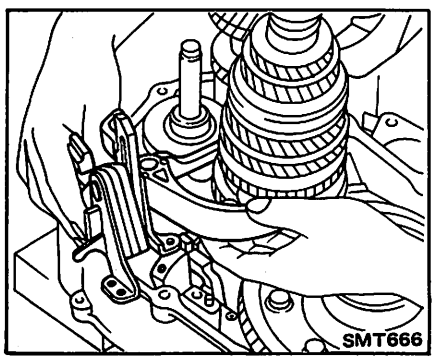
b. After installing torx screw, stake it at two points.



6. Apply grease to select check ball, then install it and check spring into striking interlock hole (5-speed only).



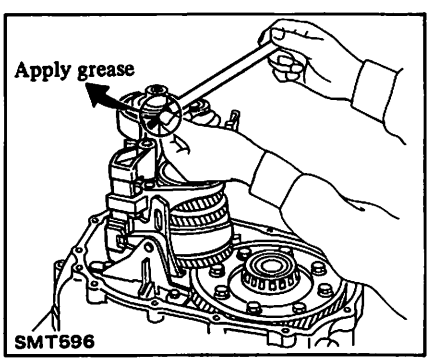
7. Apply grease to shifter caps, then install it to control bracket. Install control bracket with 1st & 2nd shift fork.



Ⓣ : **Control bracket bolt**
6.3 - 8.3 N·m
(0.64 - 0.85 kg-m, 4.6 - 6.1 ft-lb)

8. Install 3rd & 4th and 5th shift fork.
9. Insert fork shaft.

Apply grease to support spring before installing, in order to prevent spring from falling into hole for fork shaft on clutch housing.



10. Install reverse idler spacer.
11. Install transmission case.
Refer to "Transmission Case" for assembly.
12. Measure gear rotary frictional force and ensure that gear moves smoothly without binding. Refer to "Transmission Case" for assembly.
13. **Apply sealant to thread of drain plug,** then install it to transmission case.

Ⓣ : **25 - 34 N·m**
(2.5 - 3.5 kg-m, 18 - 25 ft-lb)

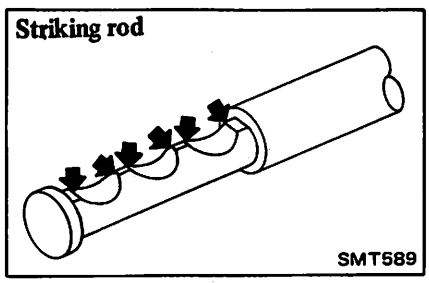
SHIFT CONTROL MECHANISM (Inside transaxle)

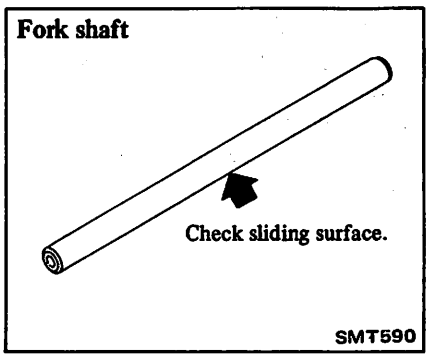
DISASSEMBLY

Disassemble shift control mechanism, following steps 1 through 12 described under "Disassembly of Clutch Housing".

INSPECTION

Clean with solvent and check for wear, scratches, projections, damage or other faulty conditions. Replace any part which is worn or damaged.





ASSEMBLY

Assemble shift control mechanism, following steps 5 through 13 described under "Assembly of Clutch Housing".

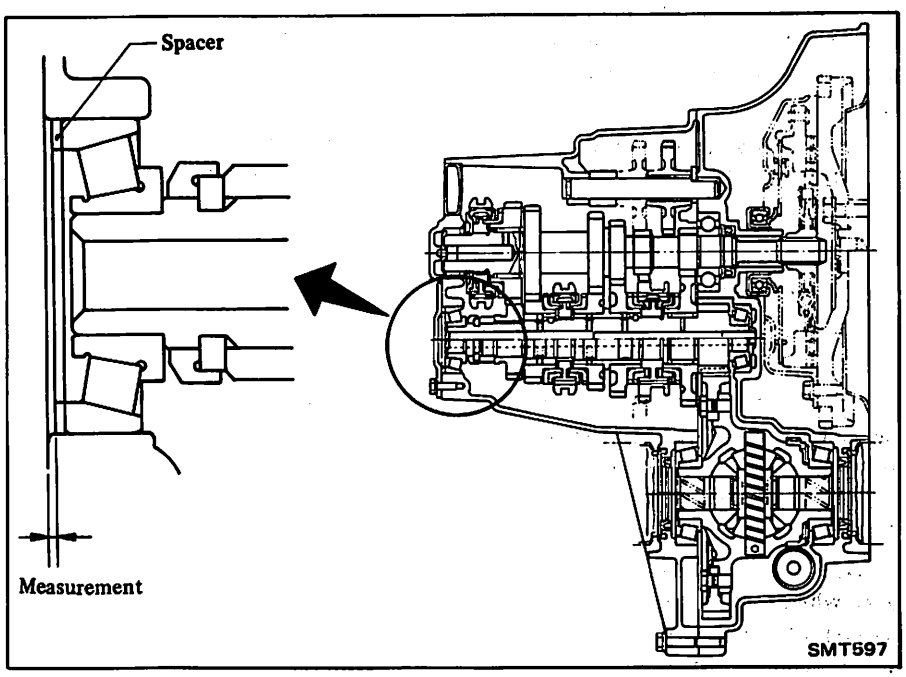
GEARS AND SHAFTS (Except final drive)

ADJUSTMENT

If any of following parts is replaced, mainshaft bearing rotary frictional force should be adjusted.

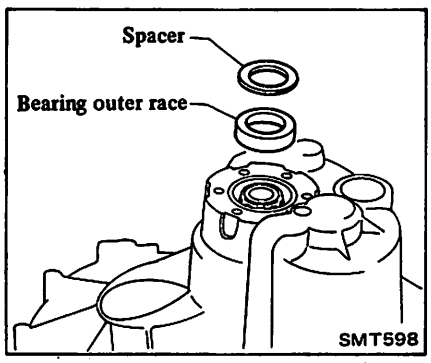
- Mainshaft
- Mainshaft bearings (front and rear)
- Clutch housing
- Transmission case

To properly adjust mainshaft bearing rotary frictional force, measure distance from rear of transmission case to spacer, then select proper thickness of shim equivalent to measured distance plus 0.2 mm (0.008 in).

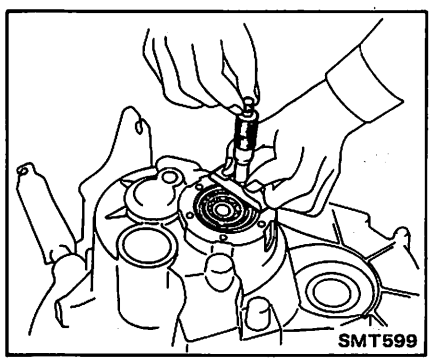


To properly adjust mainshaft bearing rotary frictional force, proceed as follows:

1. Apply gear oil to mainshaft rear bearing outer race, then install bearing outer race and spacer.



2. Measure distance from transmission case to spacer.



3. Select proper thickness of shim so that total thickness of shim is closest to measured distance plus 0.2 mm (0.008 in). Then **position this shim in place between bearing outer race and spacer.**

Main shaft adjusting shim:
Refer to S.D.S.

4. Install case cover.

Ⓣ : **6.3 - 8.3 N·m**
(0.64 - 0.85 kg-m,
4.6 - 6.1 ft-lb)

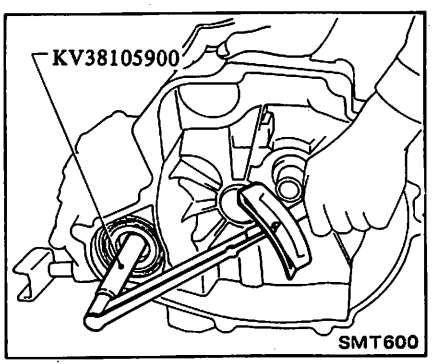
5. Ensure that differential side bearing rotary frictional force is within specified range. Then, check all gear rotary frictional force to see if it is within specified range without binding.

This check should be performed only when using a new bearing. When reusing a bearing, check to see if final drive assembly revolves smoothly.

To do this proceed as follows:

(1) Shift to 4th gear, then turn input shaft at least ten times until bearing is properly seated and gears are properly broken in.

(2) Insert special tool KV38105900 into final drive assembly at drive shaft location. With tool held in position, measure gear's rotary frictional force to ensure that it is within specified range.



Rotary frictional force:
7.4 - 10.8 N·m
(75 - 110 kg-cm, 65 - 95 in-lb)

Changes in rotary frictional force of final drive per revolution should be within 1.0 N·m (10 kg-cm, 8.7 in-lb) without binding.

(3) If any abnormality is noted while checking rotary frictional force, disassemble final drive assembly and readjust it.

(4) After properly adjusting mainshaft bearing rotary frictional force, remove case cover and apply sealant to it, then install it to transmission case.

Ⓣ : **Case cover bolt**
6.3 - 8.3 N·m
(0.64 - 0.85 kg-m,
4.6 - 6.1 ft-lb)

DISASSEMBLY

Input gears and input shaft

1. Remove transmission case, fork rod, shift forks, control bracket and bearing retainer.

Refer to "Clutch Housing" for disassembly.

2. Remove input shaft assembly.

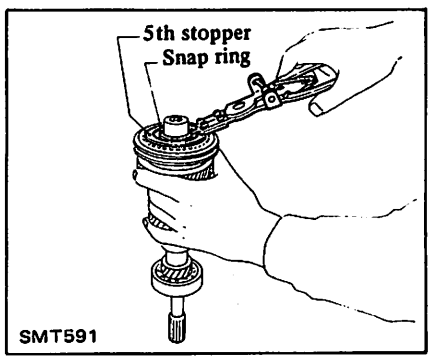
Refer to "Clutch Housing" for disassembly.

3. Remove input shaft front bearing.

Refer to "Replacement of Bearings".

4. Measure 5th input gear end play. Refer to "Gears and Shafts" for inspection.

5. Remove snap ring and 5th stopper.



6. Draw out 5th synchronizer and 5th gear.

Main gears and mainshaft

1. Remove transmission case, fork rod, shift forks, control bracket and bearing retainer.

Refer to "Clutch Housing" for disassembly.

2. Remove main gears and shaft assembly.

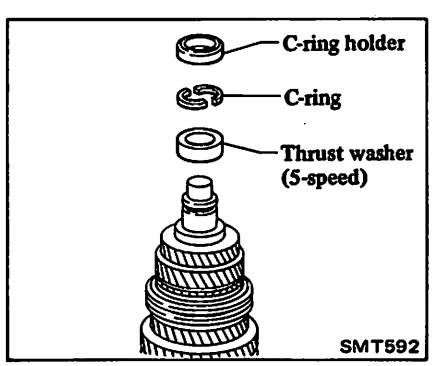
Refer to "Clutch Housing " for disassembly.

3. Measure gear end play. Refer to "Gears and Shafts" for inspection.

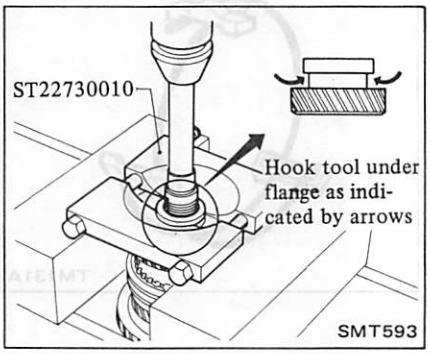
4. Remove mainshaft front and rear bearing inner race.

Refer to "Replacement of Bearing".

5. Remove C-rings, C-ring holder and thrust washer (5-speed only).

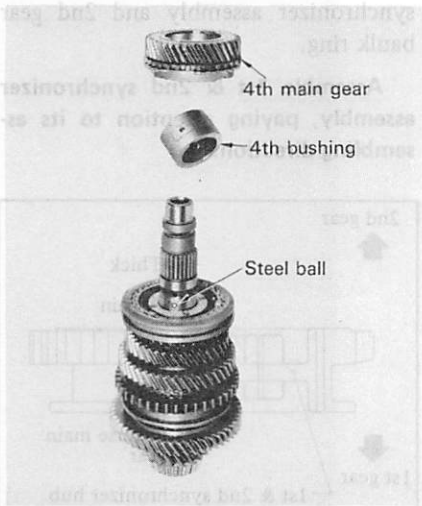


6. Remove 5th main gear.



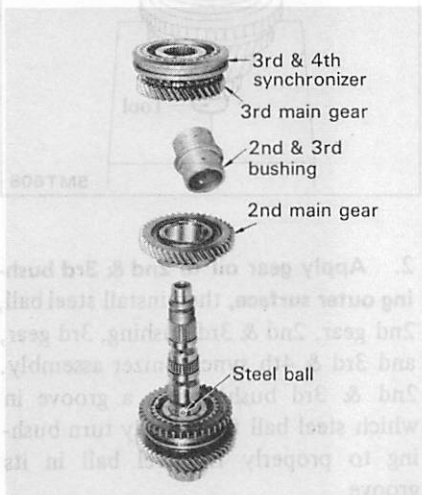
7. Remove 4th main gear, 4th bushing and steel ball.

Be careful not to lose steel ball.

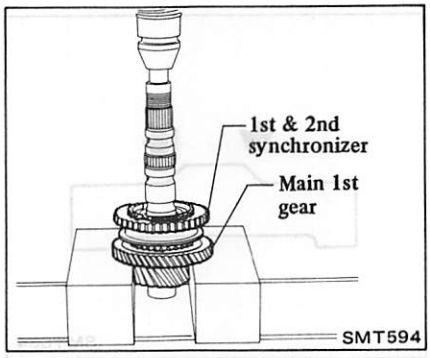


8. Draw out 3rd & 4th synchronizer, main 3rd gear, 2nd & 3rd bushing, steel ball and main 2nd gear.

Be careful not to lose steel ball.



9. Remove 1st & 2nd synchronizer and main 1st gear **as an assembly,** then remove 1st needle bearing.

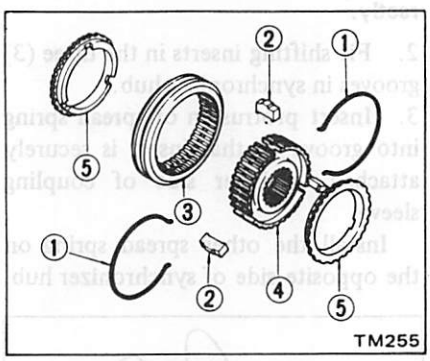


Reverse idler gear

Follow steps 1 throuth 8 described under "Disassembly of Clutch Housing" to disassemble reverse idler gear.

Synchronizer (1st & 2nd, 3rd & 4th and 5th)

1. Remove spread springs ①, and take out shifting inserts ②.
2. Separate coupling sleeve ③ from synchro-hub ④.



1 Spread spring
2 Shifting insert
3 Coupling sleeve
4 Synchro hub
5 Baulk ring

INSPECTION

Bearings

Thoroughly clean bearings and dry with compressed air.

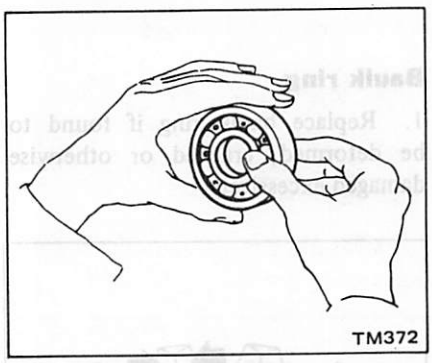
Tapered roller bearings

Check bearings for wear, scratches, pitching or flaking.

Ball bearing

When race and ball surfaces are worn or rough, or when balls are out-of-round or rough, replace bearing with a new one.

CAUTION:
Do not allow the bearings to spin when using compressed air because it will damage the race and balls. Turn them slowly by hand.



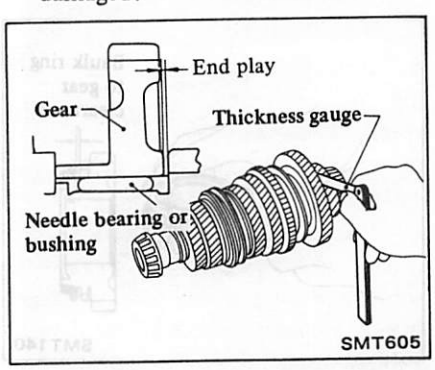
Needle bearing

Replace needle bearing if worn or damaged.

Gears and shafts

1. Check all gears for excessive wear, chips or cracks; replace as required.
2. Check shaft for bending, crack, wear or worn spline; if necessary, replace.
3. **Measure gear end play:**

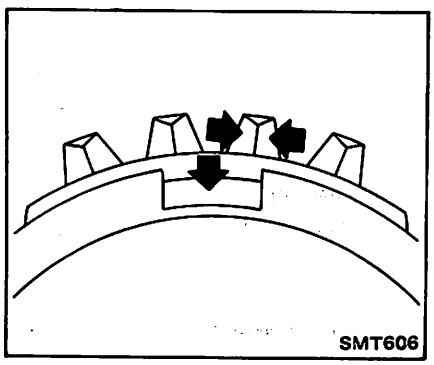
- It is necessary to measure end play before disassembling shafts and after reassembling shafts.
- Measure end play to insure that it is within the specified limit.
- If end play is not within the specified limit, disassemble and check the parts.
- Replace any part which is worn or damaged.



Standard end play:
Main 1st gear
0.18 - 0.31 mm
(0.0071 - 0.0122 in)
Main 2nd, 3rd, 4th gear
0.20 - 0.40 mm
(0.0079 - 0.0157 in)
Input 5th gear
0.18 - 0.41 mm
(0.0071 - 0.0161 in)

Baulk ring

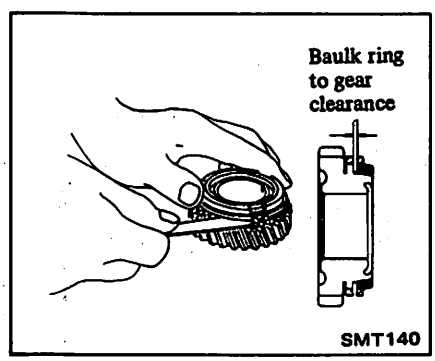
1. Replace baulk ring if found to be deformed, cracked or otherwise damaged excessively.


SMT606

2. Place baulk ring in position on gauge cone. While holding baulk ring against gear as far as it will go, measure gap between baulk ring and outer gear.

If the clearance is smaller than the wear limit, discard baulk ring.

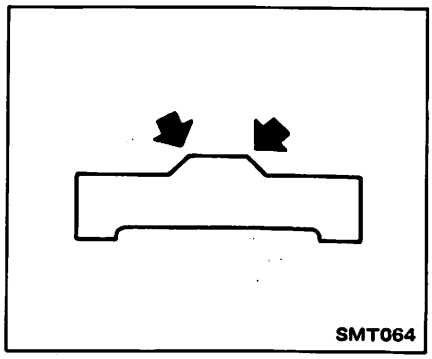
Baulk ring to gear clearance:
Standard
1.0 - 1.35 mm
(0.039 - 0.0531 in)
Wear limit
Less than 0.7 mm
(0.028 in)



SMT140

Shifting insert

Replace, if worn excessively or unevenly, deformed, or damaged.


SMT064

ASSEMBLY

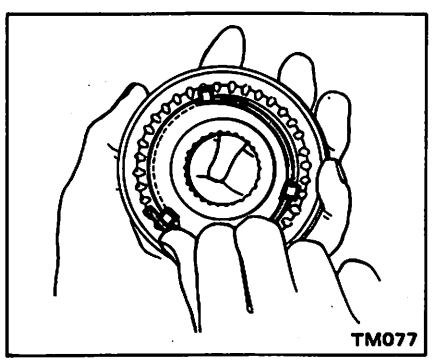
Synchronizer

1. Place synchronizer hub into coupling sleeve.

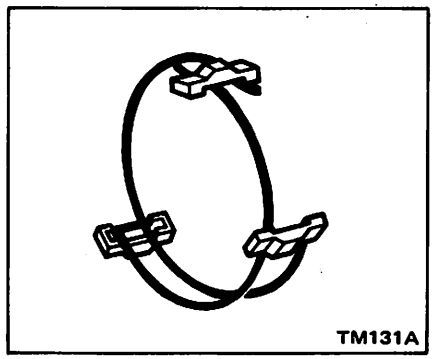
Turn hub and sleeve by hand to be sure they operate smoothly and correctly.

2. Fit shifting inserts in the three (3) grooves in synchronizer hub.
3. Insert protrusion of spread spring into groove so that insert is securely attached to inner side of coupling sleeve.

Install the other spread spring on the opposite side of synchronizer hub.


TM077

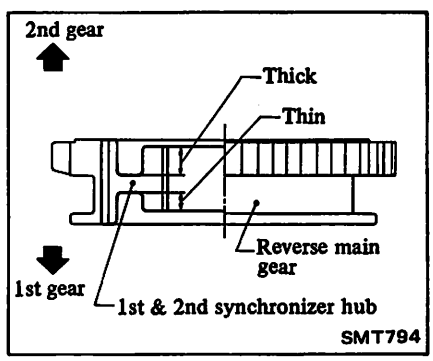
Be careful not to hook front and rear ends of spread spring to the same insert.


TM131A

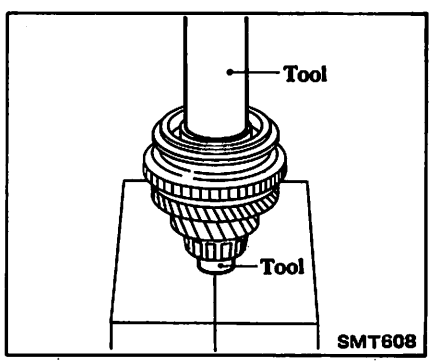
Main gears and mainshaft

1. **Apply gear oil to 1st needle bearing,** then assemble needle bearing, 1st gear, 1st gear baulk ring, 1st & 2nd synchronizer assembly and 2nd gear baulk ring.

Assemble 1st & 2nd synchronizer assembly, paying attention to its assembling direction.



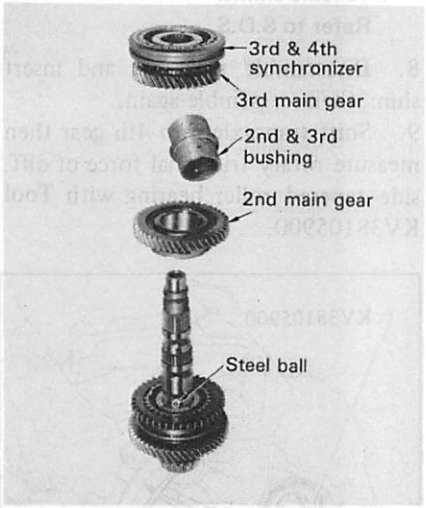
SMT794

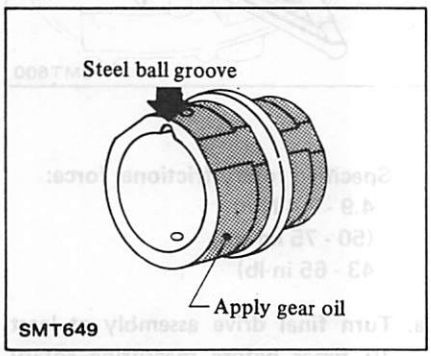


SMT608

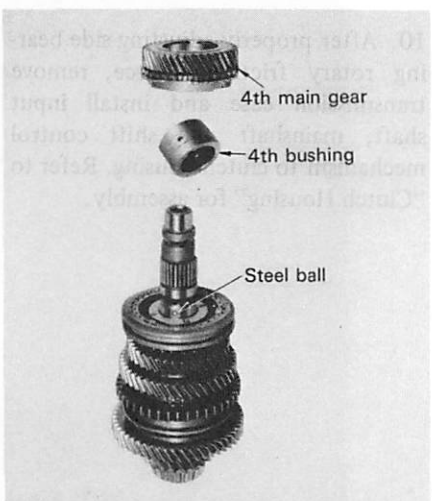
2. **Apply gear oil to 2nd & 3rd bushing outer surface,** then install steel ball, 2nd gear, 2nd & 3rd bushing, 3rd gear, and 3rd & 4th synchronizer assembly. 2nd & 3rd bushing has a groove in which steel ball fits. Slowly turn bushing to properly fit steel ball in its groove.

Before installing steel ball, apply grease to it.

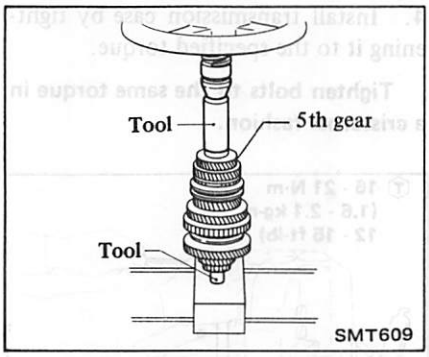




3. Apply grease to steel ball, then install it to mainshaft. **Apply gear oil to 4th bushing outer surface.** 4th bushing also has a groove in which steel ball fits. Ensure that steel ball fits properly in its groove when installing 4th bushing.

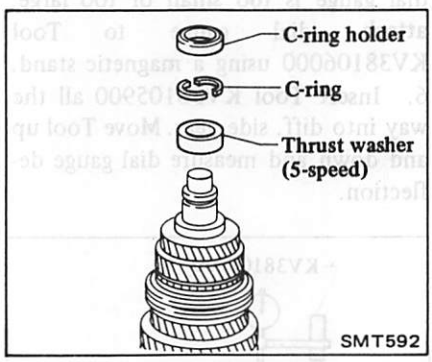


4. Install 5th gear.



5. Install thrust washer (5-speed only). Select C-ring that will minimize clearance of groove in mainshaft, then install C-ring and C-ring holder.

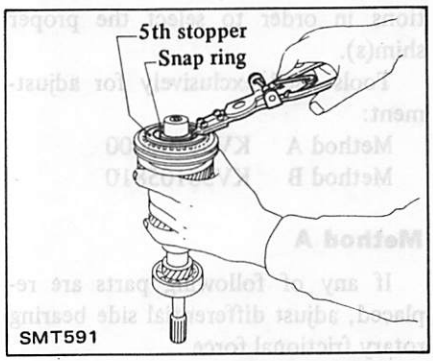
Allowable clearance of groove:
0 - 0.1 mm
(0 - 0.004 in)
C-ring:
Refer to S.D.S.



6. Install mainshaft front and rear bearing inner race. Refer to "Replacement of Bearings".
7. **Measure gear end play.** Refer to "Gears and Shafts" for inspection.
8. Install mainshaft assembly, input shaft assembly, bearing retainer, control bracket, shift forks, fork rod and transmission case. Refer to "Clutch Housing" for assembly.

Input gears and input shaft

1. Install 5th gear and 5th synchronizer.
2. Install 5th stopper on 5th synchronizer and secure it with snap ring of proper thickness that will minimize clearance of groove in input shaft.



Allowable clearance of groove:
0 - 0.1 mm
(0 - 0.004 in)
Input shaft gear snap ring:
Refer to S.D.S.

3. Measure 5th input gear end play. Refer to "Gears and Shafts" for inspection.
4. Install input shaft front bearing. Refer to "Replacement of Bearings".
5. Install input shaft assembly, mainshaft assembly, bearing retainer, control bracket, shift forks, fork rod and transmission case. Refer to "Clutch Housing" for assembly.

Reverse idler gear

Follow steps 5 through 13 described under "Assembly of Clutch Housing" to assemble reverse idler gear.

FINAL DRIVE

ADJUSTMENT

The two adjusting procedures are as follows.

Compared with the method B, the method A takes longer, but it is not necessary to make calculations in order to select the proper shim(s).

Tools used exclusively for adjustment:

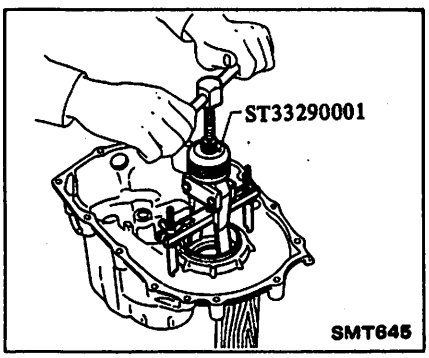
Method A KV38106000
Method B KV38105810

Method A

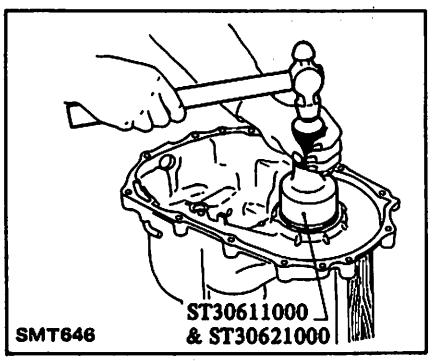
If any of following parts are replaced, adjust differential side bearing rotary frictional force.

- Differential case
- Differential side bearing
- Clutch housing
- Transmission case

1. Remove bearing outer race on shim side only and take out shim.

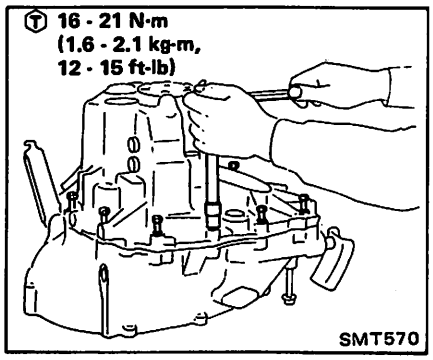


2. Press fit bearing outer race into place **without shim.**

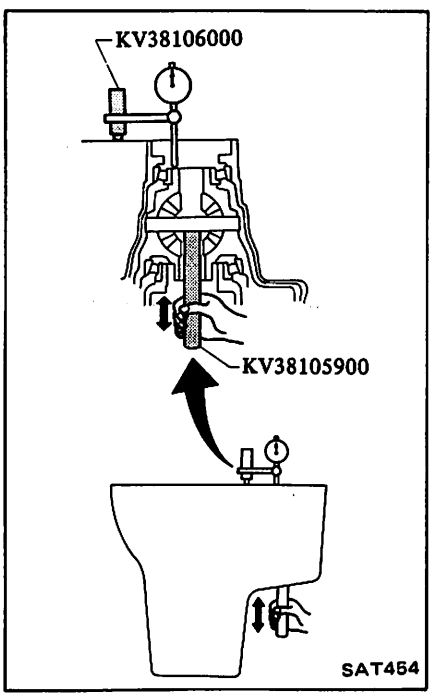


3. Install final drive assembly on clutch housing.
4. Install transmission case by tightening it to the specified torque.

Tighten bolts to the same torque in a crisscross fashion.



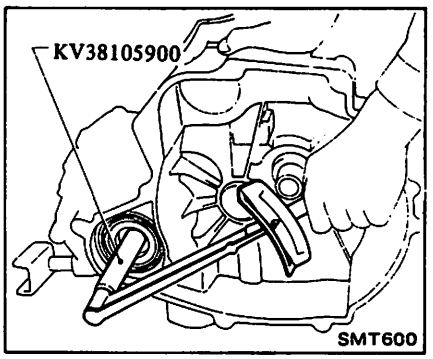
5. Attach dial gauge, using Tool KV38106000. If clamp diameter of dial gauge is too small or too large, attach dial gauge to Tool KV38106000 using a magnetic stand.
6. Insert Tool KV38105900 all the way into diff. side gear. Move Tool up and down and measure dial gauge deflection.



7. Select shim with appropriate thickness, using S.D.S. as a guide.

Available shims:
Refer to S.D.S.

8. Disassemble transaxle and insert shim, then reassemble again.
9. Shift transaxle into 4th gear then measure rotary frictional force of diff. side tapered roller bearing with Tool KV38105900.



Specified rotary frictional force:
4.9 - 7.4 N·m
(50 - 75 kg-cm,
43 - 65 in-lb)

a. Turn final drive assembly at least 10 times before measuring rotary frictional force.
b. Changes in rotary frictional force of final drive assembly per revolution should be within 1.0 N·m (10 kg-cm, 8.7 in-lb) without binding.
c. If any abnormalities are noted in b. above, or rotary frictional force is outside the specified range, disassemble and reassemble again.

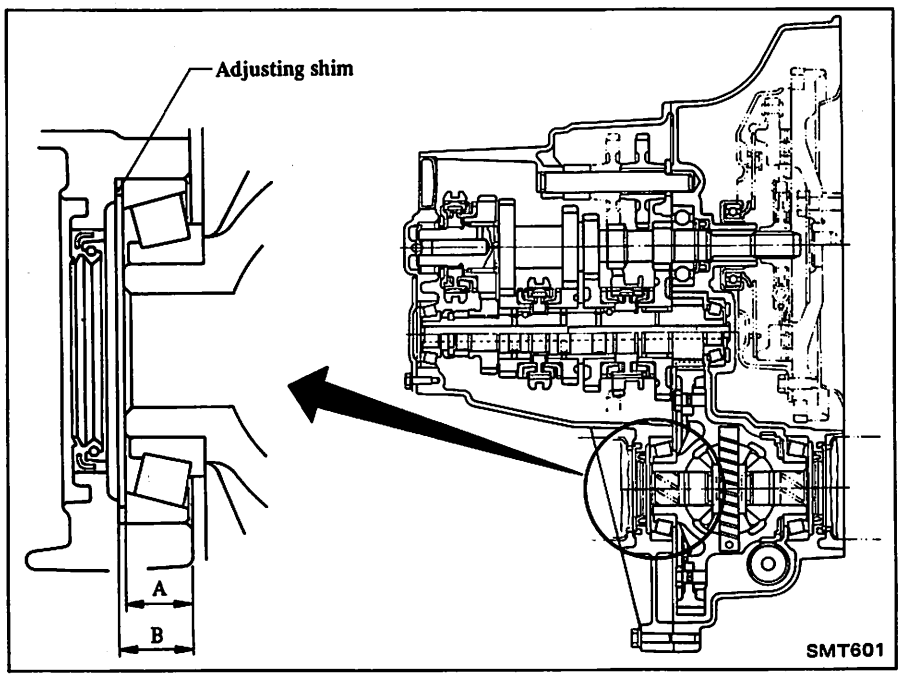
10. After properly adjusting side bearing rotary frictional force, remove transmission case and install input shaft, mainshaft and shift control mechanism to clutch housing. Refer to "Clutch Housing" for assembly.

Method B

If any of following parts are replaced, adjust differential side bearing rotary frictional force.

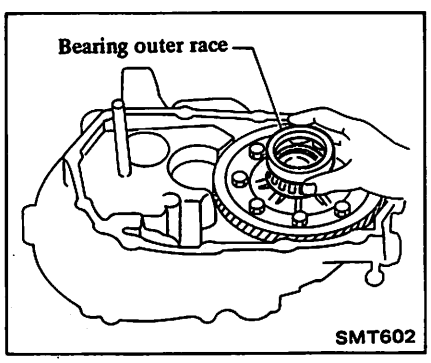
- Differential case
- Differential side bearing
- Clutch housing
- Transmission case

To properly adjust side bearing rotary frictional force, measure distances A and B from mating surfaces of clutch housing and transmission case, determine difference between the two distances, and add shim with a thickness equal to the difference plus 0.3 mm (0.012 in).

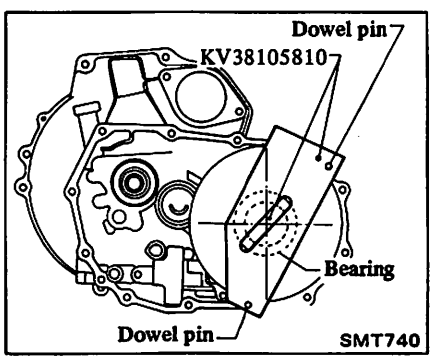


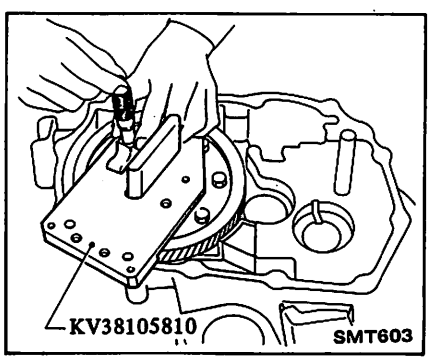
Adjustment procedures are described below.

1. Clean mating surfaces of clutch housing and transmission case with solvent.
2. Install final drive assembly and side bearing outer race on clutch housing. Turn final drive assembly while holding bearing outer race so that bearing outer race is properly broken in.



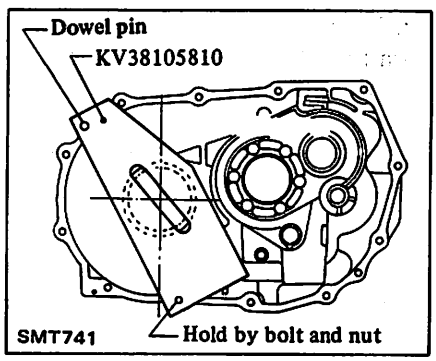
3. Properly attach Tool KV38105810 to clutch housing and bearing outer race, and measure the distance from upper surface of side bearing outer race to surface of the tool using a depth micrometer.

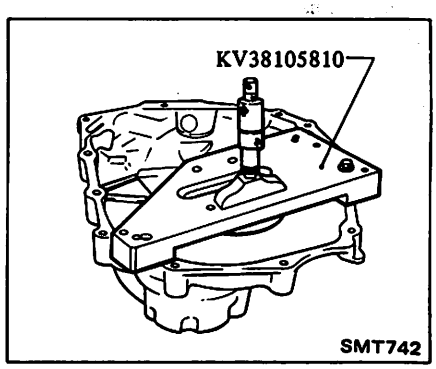




Dimension A =
Thickness of Tool [approx. 24 mm (0.9449 in)] – Measured distance

4. Properly attach Tool KV38105810 to transmission case and, using a depth micrometer, measure the distance from upper surface of Tool to portion with which side bearing adjusting shim is to be mated.





Dimension B =
Measured distance – Thickness of Tool

5. Determine thickness of shim to be used by the following equation.

Shim thickness =
(B – A) + 0.3 mm (0.012 in)

Select a shim whose thickness is nearest to the value determined by above equation.

Side bearing adjusting shim:
Refer to S.D.S.

6. Check preload to determine if final drive assembly turns smoothly without binding.

To do this, proceed as follows:

(1) Install final drive assembly and side bearing outer race on clutch housing.

(2) Assemble transmission case on clutch housing.

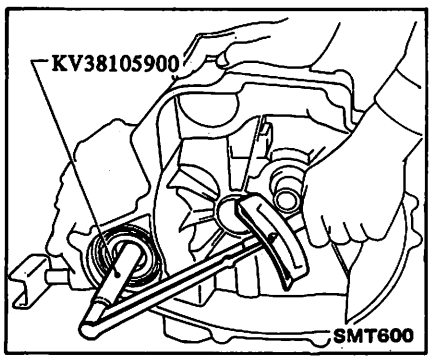
A total of twelve bolts are used to secure transmission case and clutch housing. Note that only one is longer than the remaining eleven bolts.

Ⓣ : 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb)

(3) Insert Tool KV38105900 into final drive at drive shaft location, and turn final drive at least 10 revolutions so that final drive is properly broken in.

Measure the turning torque of final drive assembly to determine if it is within specified range.

This check should be performed only when using a new bearing. When reusing a bearing, the turning torque will decrease depending on distance driven.



Rotary frictional force:
4.9 - 7.4 N·m (50 - 75 kg-cm, 43 - 65 in-lb)

Changes in turning torque of final drive assembly per revolution should be within 1.0 N·m (10 kg-cm, 8.7 in-lb) without binding.

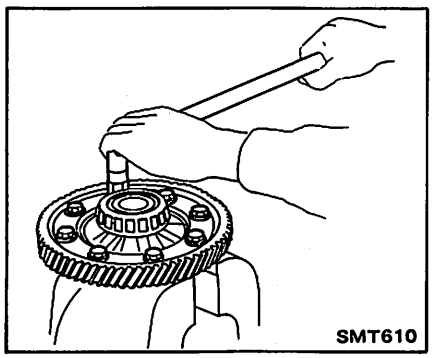
(4) If any abnormality is noted while checking rotary frictional force, disassemble final drive assembly and readjust it.

(5) After properly adjusting side bearing rotary frictional force, remove transmission case and install input shaft, mainshaft and shift control mechanism to clutch housing. Refer to "Clutch Housing" for assembly.

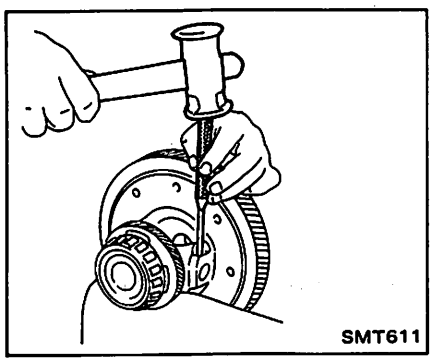
DISASSEMBLY

To remove final drive assembly from transaxle, follow steps 1 through 8 under "Disassembly of Clutch Housing".

1. Remove final gear.



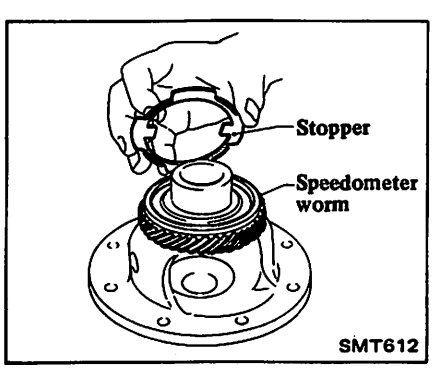
2. Drive out pinion mate shaft lock pin and draw out pinion mate shaft.



3. Remove pinion mate gears and side gears.
4. Drive out differential side bearing inner races. Refer to "Replacement of Bearings".

Be careful not to confuse the right- and left-hand bearings.

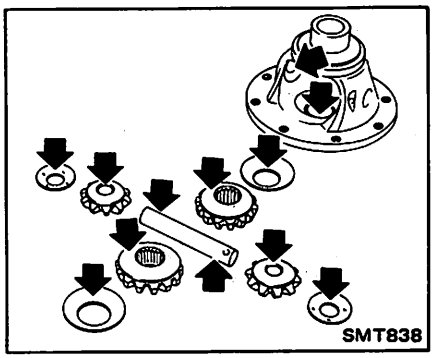
5. Remove speedometer worm and stopper.



INSPECTION

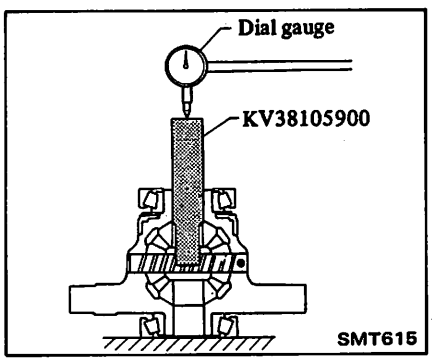
1. Thoroughly clean all disassembled parts, and check mating surfaces of differential case, side gears and pinion mate gears.

Replace as required.

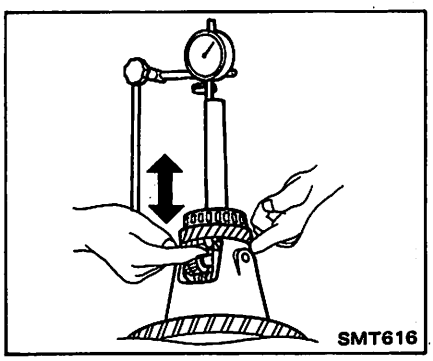


2. Check clearance between side gear and pinion mate gear following the procedure below.

(1) Set Tool and dial gauge on side gear.



(2) Move side gear up and down to measure dial gauge deflection. Always measure gauge deflection on both side gears.



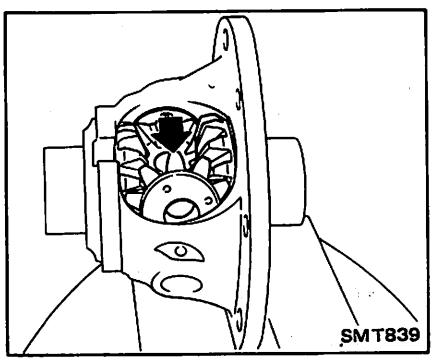
Side gear to pinion mate clearance:
0 - 0.3 mm (0 - 0.012 in)

(3) If clearance exceeds the specified value, check for wear and replace necessary parts.

3. Check tapered roller bearings for wear, scratches, pitching or flaking.

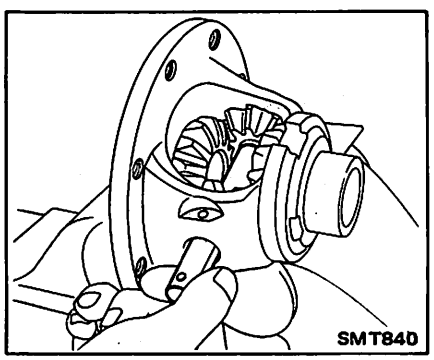
ASSEMBLY

1. Fit side gear thrust washers and side gears, then install pinion mate washers and pinion mate gears in place.



2. Insert pinion mate shaft.

When inserting, be careful not to damage pinion mate washers.



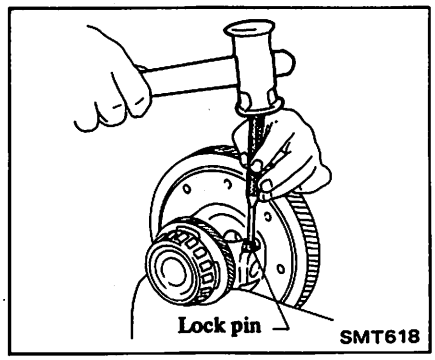
3. Measure clearance between side gear and pinion mate gear, referring to "Inspection". If necessary, adjust.

Side gear to pinion mate clearance:
0 - 0.3 mm
(0 - 0.012 in)

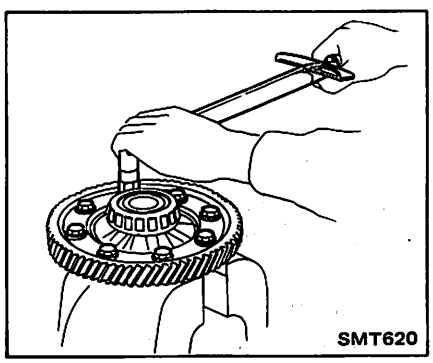
Side gear thrust washer:
Refer to S.D.S.

4. Install pinion mate shaft lock pin using a punch.

Make sure that lock pin is flush with case.



5. Install speedometer worm and stopper.
6. Press on differential side bearing inner races. Refer to "Replacement of Bearings".
7. Apply locking sealer to final gear bolts, then install final gear.



Ⓣ: 74 - 88 N·m
(7.5 - 9.0 kg-m,
54 - 65 ft-lb)

8. Assemble transaxle. Follow steps 5 through 13 under "Assembly of Clutch Housing".

REPLACEMENT OF OIL SEALS

DIFFERENTIAL SIDE OIL SEAL

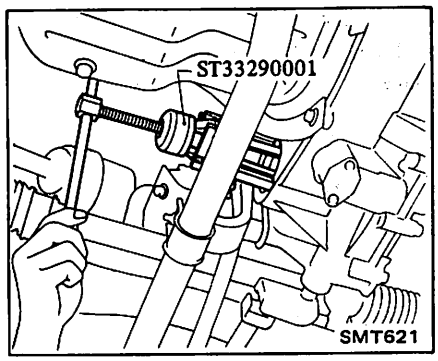
Differential side oil seals can be replaced without removing transaxle unit.

Replace oil seal as follows:

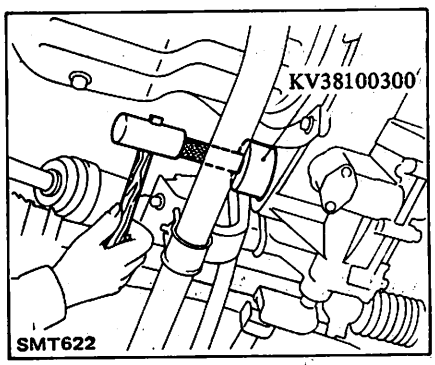
1. Drain oil.
2. Remove drive shaft.

Refer to "Drive Shaft (Section FA)" for removal.

3. Pull out oil seal.



4. Apply coat of gear oil to oil seal surface, then drive new oil seal into place.



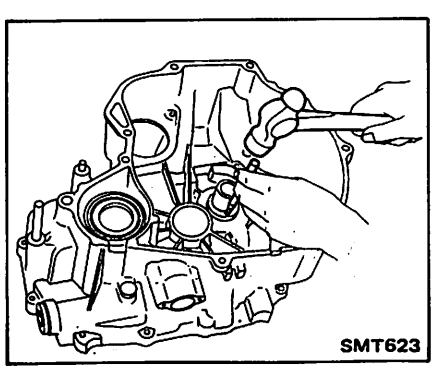
5. Lubricate seal lip and drive shafts with gear oil, then install drive shafts. Refer to "Drive Shaft (Section FA)" for installation.
6. Refill oil.

INPUT SHAFT OIL SEAL

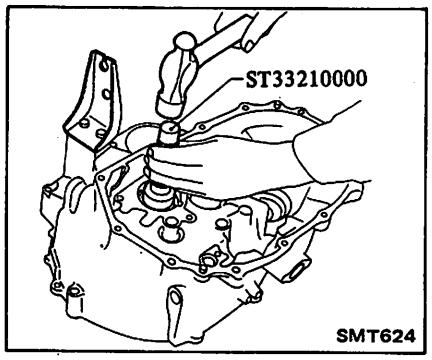
It is necessary to remove transaxle unit from vehicle.

Replace oil seal as follows:

1. Remove transaxle. Refer to "Removal".
2. Remove input shaft assembly from transaxle. Follow steps 1 through 7 under "Disassembly of Clutch Housing" for removal of required parts prior to removal of input shaft.
3. Remove oil seal.



4. Apply coat of gear oil to oil seal surface, then drive new oil seal into place.



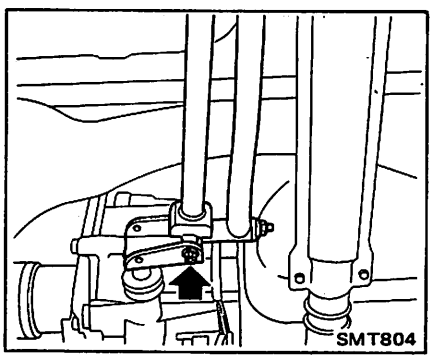
5. Lubricate seal lip and input shaft with gear oil.
6. Assemble transaxle. Follow steps 5 through 13 under "Assembly of Clutch Housing".

SHIFT CONTROL OIL SEAL

It can be replaced without removing transaxle unit.

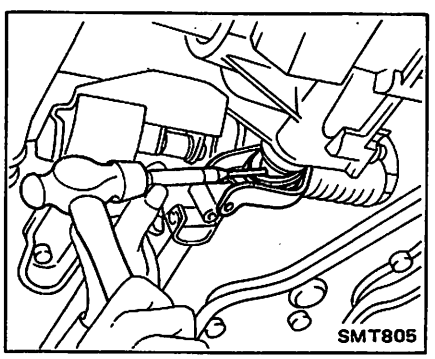
Replace oil seal as follows.

1. Separate control rod from transaxle.

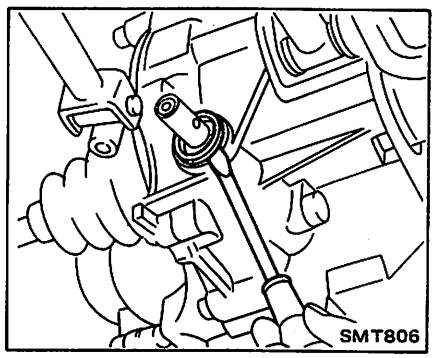


2. Remove yoke.

Be careful not to damage boot.



3. Remove oil seal.



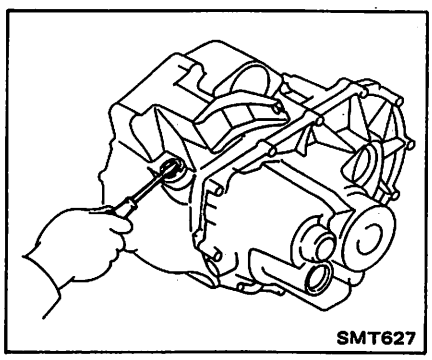
4. Apply coat of gear oil to oil seal surface, then drive new oil seal into place using suitable tool.
5. Install yoke.
6. Connect control rod to transaxle.

CLUTCH CONTROL SHAFT OIL SEAL

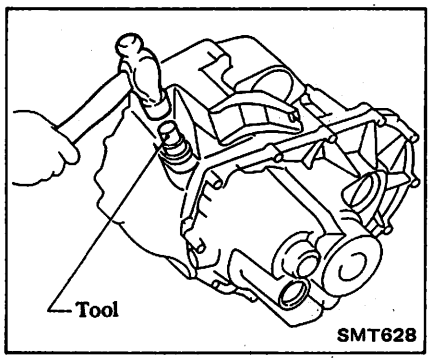
It is necessary to remove transaxle unit from vehicle.

Replace oil seal as follows:

1. Remove transaxle. Refer to "Removal".
2. Draw out clutch control shaft. Refer to "Release Bearing (Section CL)" for disassembly.
3. Remove oil seal.



4. Apply coat of gear oil to oil seal surface, then drive new oil seal into place.



5. Lubricate seal lip and clutch control shaft with gear oil.
6. Install clutch control shaft.

Refer to "Release Bearing (Section CL)" for assembly.

7. Install transaxle. Refer to "Installation".

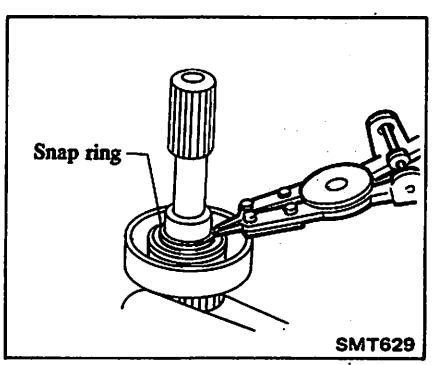
REPLACEMENT OF BEARINGS

CAUTION:
When replacing tapered roller bearing, replace inner and outer bearings at the same time to prevent mixed use of bearings of different brands.

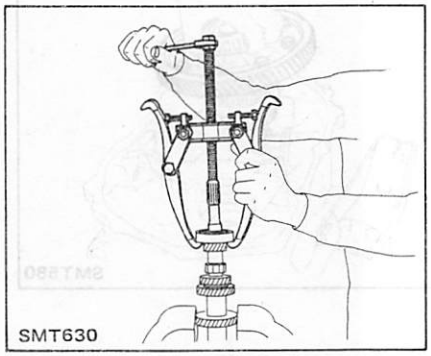
INPUT SHAFT FRONT BEARING

1. Remove input shaft assembly from transaxle. Before removing it, follow steps 1 through 7 under "Disassembly of Clutch Housing" so that input shaft can then be removed.
2. Remove snap ring from front bearing, and withdraw input gear spacer.

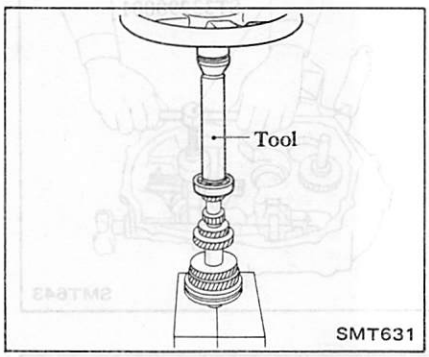
Snap ring must not be reused.



3. Pull out input shaft front bearing.



4. Press fit new ball bearing.



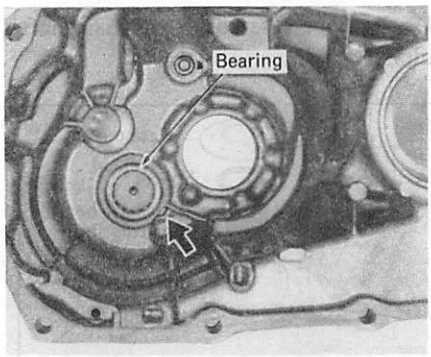
5. Install input gear spacer on front bearing and secure it with snap ring of proper thickness that will minimize clearance of groove in input shaft.

Allowable clearance of groove:
0 - 0.1 mm
(0 - 0.004 in)
Input shaft front snap ring:
Refer to S.D.S.

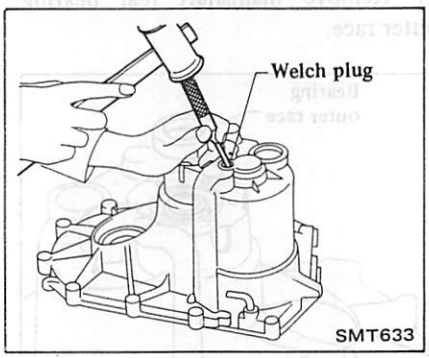
6. Assemble transaxle. Follow steps 5 through 13 under "Assembly of Clutch Housing".

INPUT SHAFT REAR BEARING

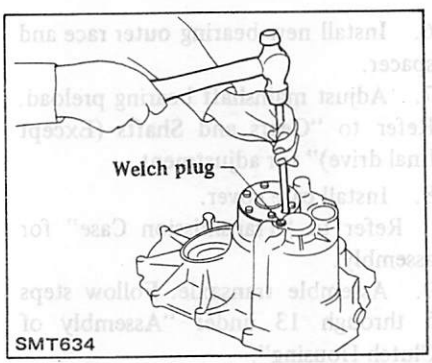
1. Remove transmission case.
Refer to "Transmission Case" for disassembly.
2. Remove welch plug from transmission case using a punch.



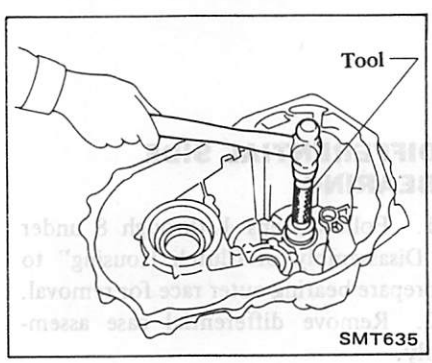
3. Using a punch, drive rear bearing of input shaft out of hole from which welch plug was removed.



4. **Apply sealant to welch plug** and punch it on transmission case.



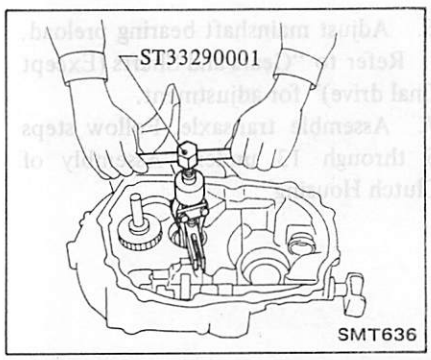
5. Press fit new bearing.



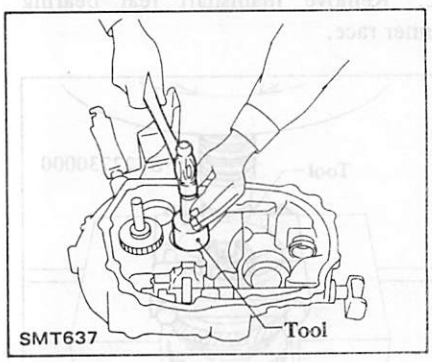
6. Install transmission case.
Refer to "Transmission Case" for assembly.

MAINSHAFT FRONT BEARING

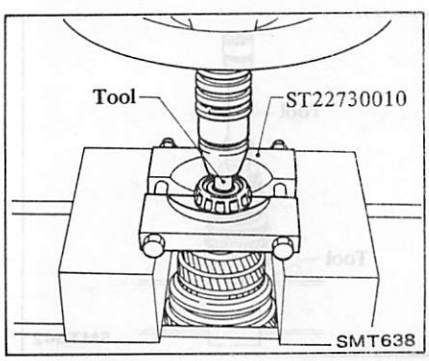
1. Follow steps 1 through 8 under "Disassembly of Clutch Housing" to prepare mainshaft front bearing outer race for removal.
2. Pull out mainshaft front bearing outer race.



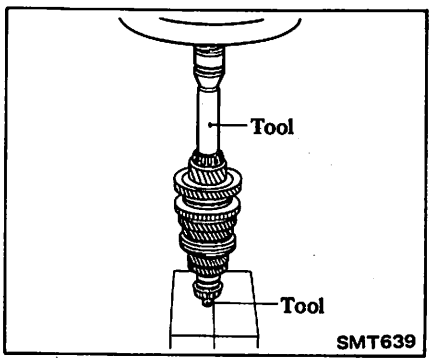
3. Press fit new bearing outer race.



4. Remove mainshaft front bearing inner race.



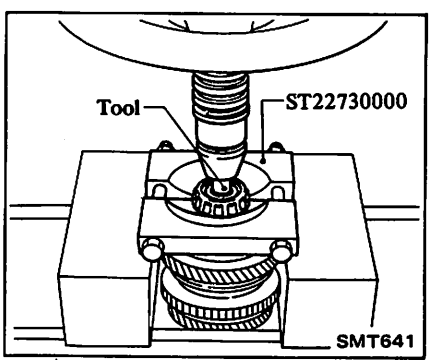
5. Install new bearing inner race.



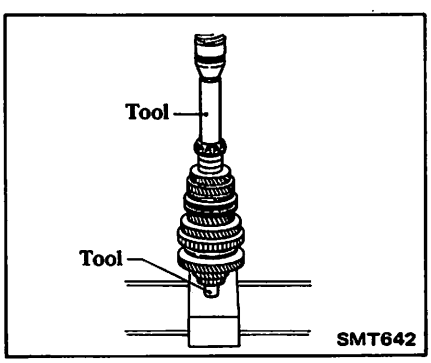
6. Adjust mainshaft bearing preload.
Refer to "Gears and Shafts (Except final drive)" for adjustment.
7. Assemble transaxle. Follow steps 5 through 13 under "Assembly of Clutch Housing".

MAINSHAFT REAR BEARING

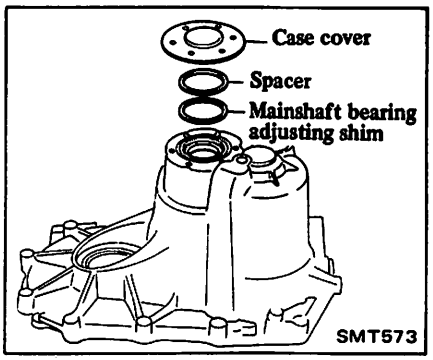
1. Remove mainshaft from transaxle. Follow steps 1 through 5 under "Disassembly of Clutch Housing".
2. Remove mainshaft rear bearing inner race.



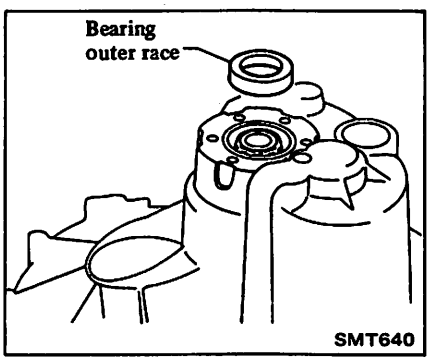
3. Install new bearing inner race.



4. Remove case cover and mainshaft adjusting shim.



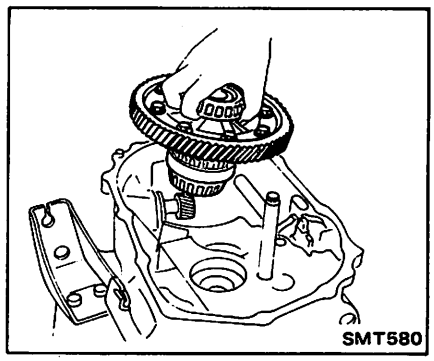
5. Remove mainshaft rear bearing outer race.



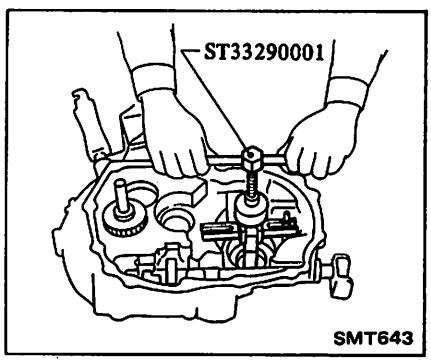
6. Install new bearing outer race and spacer.
7. Adjust mainshaft bearing preload. Refer to "Gears and Shafts (Except final drive)" for adjustment.
8. Install case cover.
Refer to "Transmission Case" for assembly.
9. Assemble transaxle. Follow steps 5 through 13 under "Assembly of Clutch Housing".

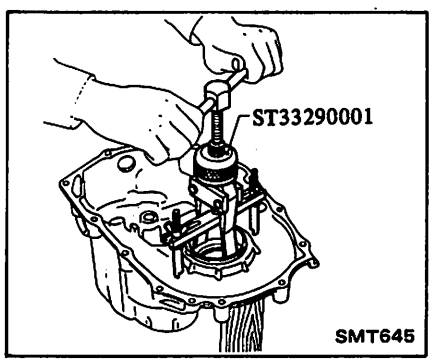
DIFFERENTIAL SIDE BEARING

1. Follow steps 1 through 8 under "Disassembly of Clutch Housing" to prepare bearing outer race for removal.
2. Remove differential case assembly.

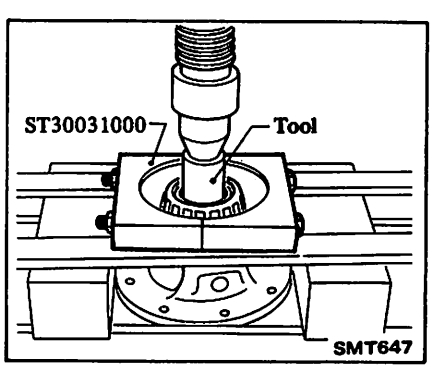


3. Pull out differential side bearing outer race.

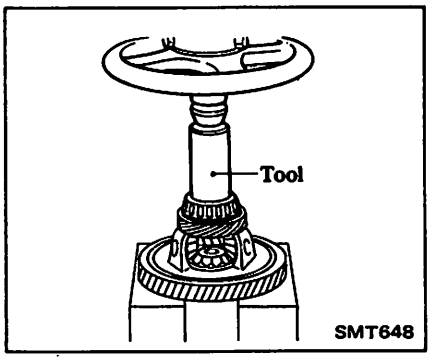




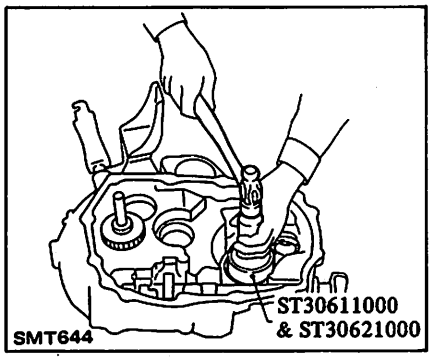
4. Remove differential side bearing inner race.

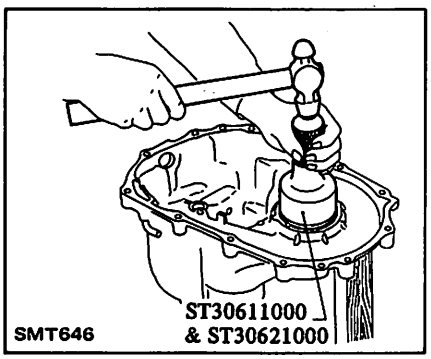


5. Install **new** bearing inner race.



6. Press fit **new** bearing outer race.



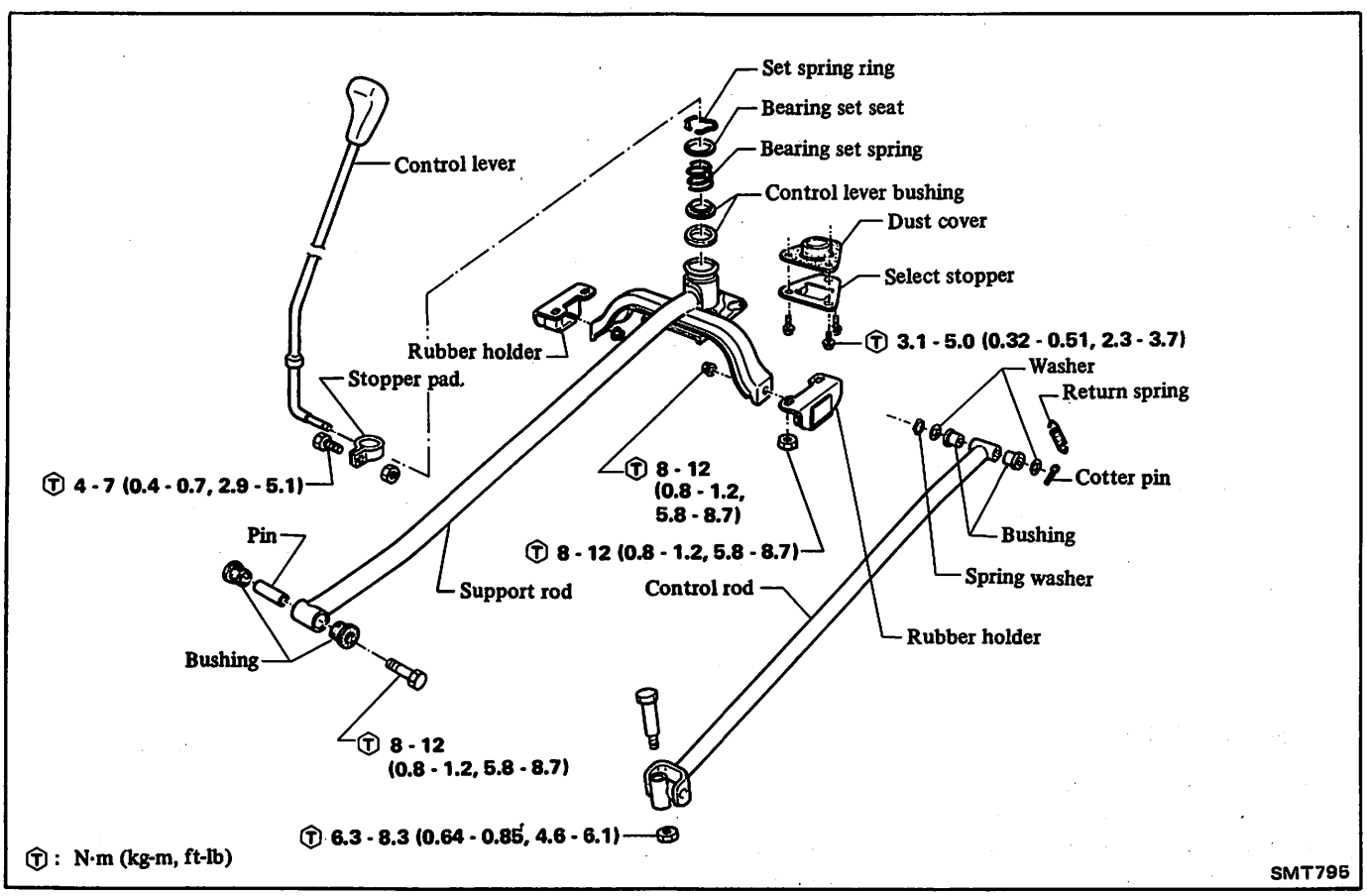


7. Install differential case assembly.
8. Adjust differential side bearing preload.

   Refer to "Final Drive" for adjustment.
9. Install transmission case.

   Refer to "Transmission Case" for assembly.

TRANSMISSION GEAR CONTROL

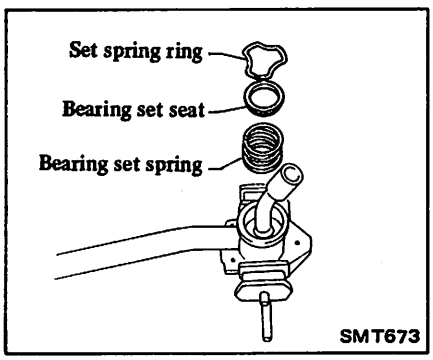


DISASSEMBLY

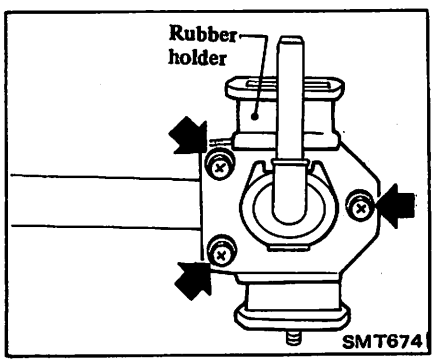
1. Remove control rod.

Cotter pin must not be reused.

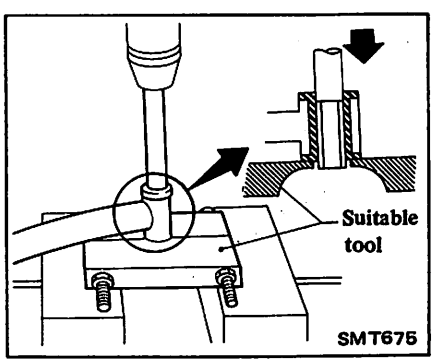
2. Remove control lever bracket, set spring ring, bearing set seat and bearing set spring.



3. Remove rubber holder, dust cover and control lever bearing.



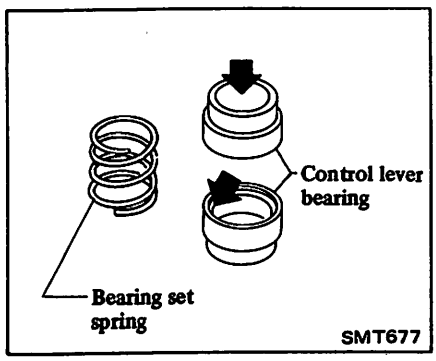
4. Draw out rubber bushing from control rod and support rod if necessary.



INSPECTION

Check for wear, cracks or other damage on sliding contact surfaces of parts. If any of the above conditions is apparent, replace faulty part.

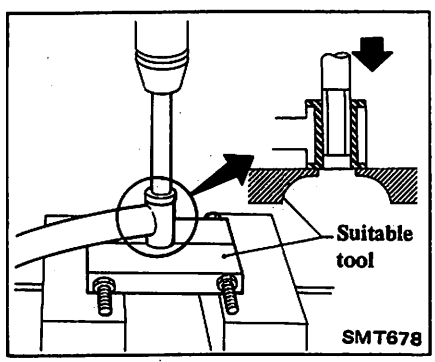
- Check bushings and rubbers for deformation or cracks, and replace with a new one if necessary.
- Check bearing set spring, set spring ring and control lever bearing for deformation, cracks, wear or other damage, and replace with a new one if necessary.



ASSEMBLY

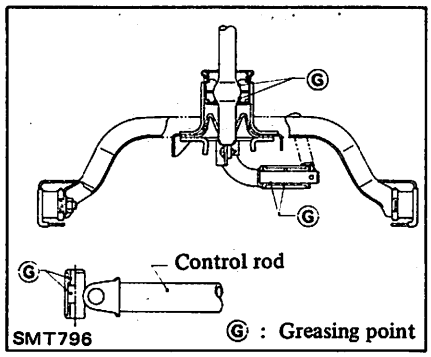
Assemble transmission gear control in the reverse order of disassembly, noting the following points.

- When installing rubber bushing to control rod and support rod, be sure to install in its proper place.

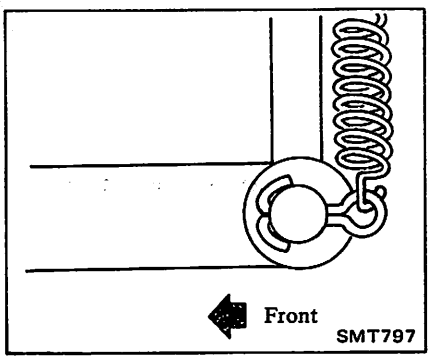


Ⓣ : **Rubber holder nut**
8 - 12 N·m
(0.8 - 1.2 kg-m,
5.8 - 8.7 ft-lb)

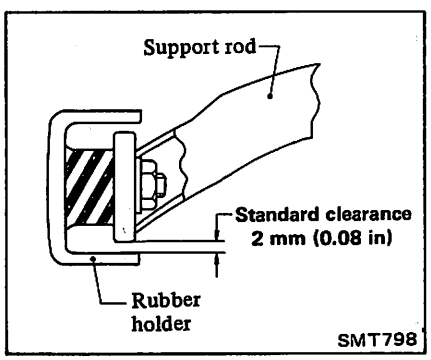
- **When assembling transaxle gear control, apply grease to the following positions.**



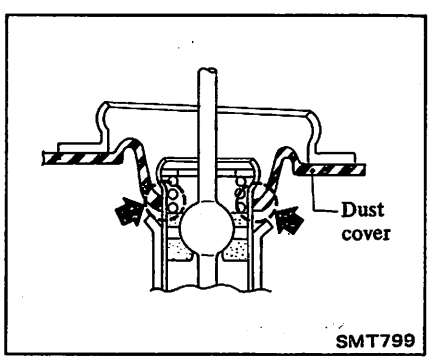
- **When installing cotter pin, pay attention to its direction and bend it securely.**



- **Adjust standard clearance with support rod exerting no weight.**



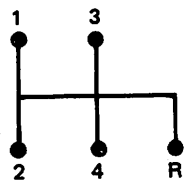
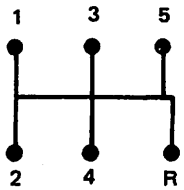
- **Install dust cover securely.**



SERVICE DATA AND SPECIFICATIONS (S.D.S.)

GENERAL SPECIFICATIONS

TRANSAXLE

Engine		E15	E16	CD17	E15	E16, CD17
Transaxle model		RN4F30A			RS5F30A	
No. of speeds		4			5	
Synchromesh type		Warner				
Shift pattern						
Gear ratio	1st	3.063	3.333	3.333	3.063	3.333
	2nd	1.708	1.955	1.708	1.708	1.955
	3rd	1.133	1.286	1.027	1.133	1.286
	4th	0.814	0.902	0.733	0.814	0.902
	5th	–	–	–	0.681	0.733
	Rev.	3.417	3.417	3.417	3.417	3.417
Number of teeth						
Input gear	1st	16	15	15	16	15
	2nd	24	22	24	24	22
	3rd	30	28	37	30	28
	4th	43	41	45	43	41
	5th	–	–	–	47	45
	Rev.	12	12	12	12	12
Main gear	1st	49	50	50	49	50
	2nd	41	43	41	41	43
	3rd	34	36	38	34	36
	4th	35	37	33	35	37
	5th	–	–	–	32	33
	Rev.	41	41	41	41	41
Reverse idler gear		30				
Speedometer gear ratio (Worm/pinion)		41/36				
Oil capacity liters (US pt, Imp pt)		2.3 (4-7/8, 4)			2.7 (5-3/4, 4-3/4)	

FINAL GEAR

Engine	E15, E16	CD17
Final gear ratio	3.550	3.789
Number of teeth Final gear/Pinion gear	71/20	72/19
Side gear/Pinion mate gear	14/10	

INSPECTION AND ADJUSTMENT

GEAR END PLAY

Unit: mm (in)

Position \ Model	RN4F30A	RS5F30A
Main 1st gear	0.18 - 0.31 (0.0071 - 0.0122)	
Main 2nd ~ 4th gear	0.20 - 0.40 (0.0079 - 0.0157)	
Input 5th gear	–	0.18 - 0.41 (0.0071 - 0.0161)

CLEARANCE BETWEEN BAULK RING AND GEAR

Unit: mm (in)

	All models
Standard Wear limit	1.0 - 1.35 (0.039 - 0.0531) 0.7 (0.028)

MAINSHAFT C-RING

Model RN4F30A

Unit: mm (in)

Part No.	Thickness	Part No.	Thickness
32348-M8000	3.63 (0.1429)	32348-M8006	4.05 (0.1594)
M8001	3.70 (0.1457)	M8007	4.12 (0.1622)
M8002	3.77 (0.1484)	M8008	4.19 (0.1650)
M8003	3.84 (0.1512)	M8009	4.26 (0.1677)
M8004	3.91 (0.1539)	M8010	4.33 (0.1705)
M8005	3.98 (0.1567)	M8011	4.40 (0.1732)

Model RS5F30A

Unit: mm (in)

Part No.	Thickness	Part No.	Thickness
32348-M8800	3.67 (0.1445)	32348-M8807	4.16 (0.1638)
M8801	3.74 (0.1472)	M8808	4.23 (0.1665)
M8802	3.81 (0.1500)	M8809	4.30 (0.1693)
M8803	3.88 (0.1528)	M8810	4.37 (0.1720)
M8804	3.95 (0.1555)	M8811	4.44 (0.1748)
M8805	4.02 (0.1583)	M8812	4.51 (0.1776)
M8806	4.09 (0.1610)		

AVAILABLE SNAP RING

Input shaft front bearing snap ring

Unit: mm (in)

Part No.	Thickness
32204-M8004	1.27 (0.0500)
M8005	1.33 (0.0524)
M8006	1.39 (0.0547)
M8007	1.45 (0.0571)

Input shaft 5th synchronizer snap ring

Unit: mm (in)

Part No.	Thickness
32311-M8812	2.00 (0.0787)
M8813	2.05 (0.0807)
M8814	2.10 (0.0827)
M8815	2.15 (0.0846)
M8816	2.20 (0.0866)
M8817	2.25 (0.0886)
M8818	2.30 (0.0906)

REVERSE CHECK TURNING TORQUE (At striking rod)

Unit: N·m (kg-cm, in-lb)

RN4F30A	RS5F30A
15.7 - 22.6 (160 - 230, 139 - 200)	22.1 - 27.0 (225 - 275, 195 - 239)

REVERSE CHECK PLUG

Unit: mm (in)

Part No.	Thickness
32188-M8001*	8.3 (0.327)
32188-M8002	7.1 (0.280)
32188-M8003	7.7 (0.303)
32188-M8004	8.9 (0.350)

*Standard check plug

CLEARANCE BETWEEN SIDE GEAR AND PINION MATE GEAR

0 - 0.3 mm (0 - 0.012 in)

Side gear thrust washer

Unit: mm (in)

Part number	Thickness
38424 01M00	0.76 - 0.81 (0.0299 - 0.0319)
01M01	0.81 - 0.86 (0.0319 - 0.0339)
01M02	0.86 - 0.91 (0.0339 - 0.0358)
01M03	0.91 - 0.96 (0.0358 - 0.0378)

ROTARY FRICTIONAL FORCE

Unit: N·m (kg-cm, in-lb)

Final drive only	4.9 - 7.4 (50 - 75, 43 - 65)
Total	7.4 - 10.8 (75 - 110, 65 - 95)

AVAILABLE SHIM

Mainshaft bearing adjusting shim

Unit: mm (in)

Part No.	Thickness	Part No.	Thickness
32137-M8000	0.10 (0.0039)	32137-M8010	0.60 (0.0236)
M8001	0.15 (0.0059)	M8011	0.65 (0.0256)
M8002	0.20 (0.0079)	M8012	0.70 (0.0276)
M8003	0.25 (0.0098)	M8013	0.75 (0.0295)
M8004	0.30 (0.0118)	M8014	0.80 (0.0315)
M8005	0.35 (0.0138)	M8015	0.85 (0.0335)
M8006	0.40 (0.0157)	M8016	0.90 (0.0354)
M8007	0.45 (0.0177)	M8017	0.95 (0.0374)
M8008	0.50 (0.0197)	M8018	1.00 (0.0394)
M8009	0.55 (0.0217)		

Differential side bearing adjusting shim

Unit: mm (in)

Part No.	Thickness	Part No.	Thickness
38454-M8000	0.44 (0.0173)	38454-M8008	0.76 (0.0299)
M8001	0.48 (0.0189)	M8009	0.80 (0.0315)
M8003	0.56 (0.0220)	M8010	0.84 (0.0331)
M8004	0.60 (0.0236)	M8011	0.88 (0.0346)
M8005	0.64 (0.0252)		
M8006	0.68 (0.0268)		
M8007	0.72 (0.0283)		

Table for method A

Unit: mm (in)

Dial gauge deflection	Suitable shim thickness	Appropriate shim(s)
0.30 - 0.34 (0.0118 - 0.0134)	0.60 (0.0236)	0.60 (0.0236)
0.34 - 0.38 (0.0134 - 0.0150)	0.64 (0.0252)	0.64 (0.0252)
0.38 - 0.42 (0.0150 - 0.0165)	0.68 (0.0268)	0.68 (0.0268)
0.42 - 0.46 (0.0165 - 0.0181)	0.72 (0.0283)	0.72 (0.0283)
0.46 - 0.50 (0.0181 - 0.0197)	0.76 (0.0299)	0.76 (0.0299)
0.50 - 0.54 (0.0197 - 0.0213)	0.80 (0.0315)	0.80 (0.0315)
0.54 - 0.58 (0.0213 - 0.0228)	0.84 (0.0331)	0.84 (0.0331)
0.58 - 0.62 (0.0228 - 0.0244)	0.88 (0.0346)	0.88 (0.0346)
0.62 - 0.66 (0.0244 - 0.0260)	0.92 (0.0362)	0.44 (0.0173) + 0.48 (0.0189)
0.66 - 0.70 (0.0260 - 0.0276)	0.96 (0.0378)	0.48 (0.0189) + 0.48 (0.0189)
0.70 - 0.74 (0.0276 - 0.0291)	1.00 (0.0394)	0.44 (0.0173) + 0.56 (0.0220)
0.74 - 0.78 (0.0291 - 0.0307)	1.04 (0.0409)	0.44 (0.0173) + 0.60 (0.0236)
0.78 - 0.82 (0.0307 - 0.0323)	1.08 (0.0425)	0.44 (0.0173) + 0.64 (0.0252)
0.82 - 0.86 (0.0323 - 0.0339)	1.12 (0.0441)	0.44 (0.0173) + 0.68 (0.0268)
0.86 - 0.90 (0.0339 - 0.0354)	1.16 (0.0457)	0.44 (0.0173) + 0.72 (0.0283)
0.90 - 0.94 (0.0354 - 0.0370)	1.20 (0.0472)	0.44 (0.0173) + 0.76 (0.0299)
0.94 - 0.98 (0.0370 - 0.0386)	1.24 (0.0488)	0.44 (0.0173) + 0.80 (0.0315)
0.98 - 1.02 (0.0386 - 0.0402)	1.28 (0.0504)	0.44 (0.0173) + 0.84 (0.0331)
1.02 - 1.06 (0.0402 - 0.0417)	1.32 (0.0520)	0.44 (0.0173) + 0.88 (0.0346)
1.06 - 1.10 (0.0417 - 0.0433)	1.36 (0.0535)	0.88 (0.0346) + 0.48 (0.0189)
1.10 - 1.14 (0.0433 - 0.0449)	1.40 (0.0551)	0.68 (0.0268) + 0.72 (0.0283)
1.14 - 1.18 (0.0449 - 0.0465)	1.44 (0.0567)	0.88 (0.0346) + 0.56 (0.0220)
1.18 - 1.22 (0.0465 - 0.0480)	1.48 (0.0583)	0.88 (0.0346) + 0.60 (0.0236)
1.22 - 1.26 (0.0480 - 0.0496)	1.52 (0.0598)	0.88 (0.0346) + 0.64 (0.0252)
1.26 - 1.30 (0.0496 - 0.0512)	1.56 (0.0614)	0.88 (0.0346) + 0.68 (0.0268)
1.30 - 1.34 (0.0512 - 0.0528)	1.60 (0.0630)	0.88 (0.0346) + 0.72 (0.0283)
1.34 - 1.38 (0.0528 - 0.0543)	1.64 (0.0646)	0.88 (0.0346) + 0.76 (0.0299)
1.38 - 1.42 (0.0543 - 0.0559)	1.68 (0.0661)	0.88 (0.0346) + 0.80 (0.0315)
1.42 - 1.46 (0.0559 - 0.0575)	1.72 (0.0677)	0.88 (0.0346) + 0.84 (0.0331)
1.46 - 1.50 (0.0575 - 0.0591)	1.76 (0.0693)	0.88 (0.0346) + 0.88 (0.0346)

Table for method B

Suitable shim thickness can be achieved by selecting one or two shims among the above eleven types.

For example:

Unit: mm (in)

Suitable shim thickness	Appropriate shim(s)	Suitable shim thickness	Appropriate shim(s)
0.56 (0.0220)	0.56 (0.0220)	1.16 (0.0457)	0.44 (0.0173) + 0.72 (0.0283)
0.60 (0.0236)	0.60 (0.0236)	1.20 (0.0472)	0.44 (0.0173) + 0.76 (0.0299)
0.64 (0.0252)	0.64 (0.0252)	1.24 (0.0488)	0.44 (0.0173) + 0.80 (0.0315)
0.68 (0.0268)	0.68 (0.0268)	1.28 (0.0504)	0.44 (0.0173) + 0.84 (0.0331)
0.72 (0.0283)	0.72 (0.0283)	1.32 (0.0520)	0.44 (0.0173) + 0.88 (0.0346)
0.76 (0.0299)	0.76 (0.0299)	1.36 (0.0535)	0.88 (0.0346) + 0.48 (0.0189)
0.80 (0.0315)	0.80 (0.0315)	1.40 (0.0551)	0.68 (0.0268) + 0.72 (0.0283)
0.84 (0.0331)	0.84 (0.0331)	1.44 (0.0567)	0.88 (0.0346) + 0.56 (0.0220)
0.88 (0.0346)	0.88 (0.0346)	1.48 (0.0583)	0.88 (0.0346) + 0.60 (0.0236)
0.92 (0.0362)	0.44 (0.0173) + 0.48 (0.0189)	1.52 (0.0598)	0.88 (0.0346) + 0.64 (0.0252)
0.96 (0.0378)	0.48 (0.0189) + 0.48 (0.0189)	1.56 (0.0614)	0.88 (0.0346) + 0.68 (0.0268)
1.00 (0.0394)	0.44 (0.0173) + 0.56 (0.0220)	1.60 (0.0630)	0.88 (0.0346) + 0.72 (0.0283)
1.04 (0.0409)	0.44 (0.0173) + 0.60 (0.0236)	1.64 (0.0646)	0.88 (0.0346) + 0.76 (0.0299)
1.08 (0.0425)	0.44 (0.0173) + 0.64 (0.0252)	1.68 (0.0661)	0.88 (0.0346) + 0.80 (0.0315)
1.12 (0.0441)	0.44 (0.0173) + 0.68 (0.0268)	1.72 (0.0677)	0.88 (0.0346) + 0.84 (0.0331)

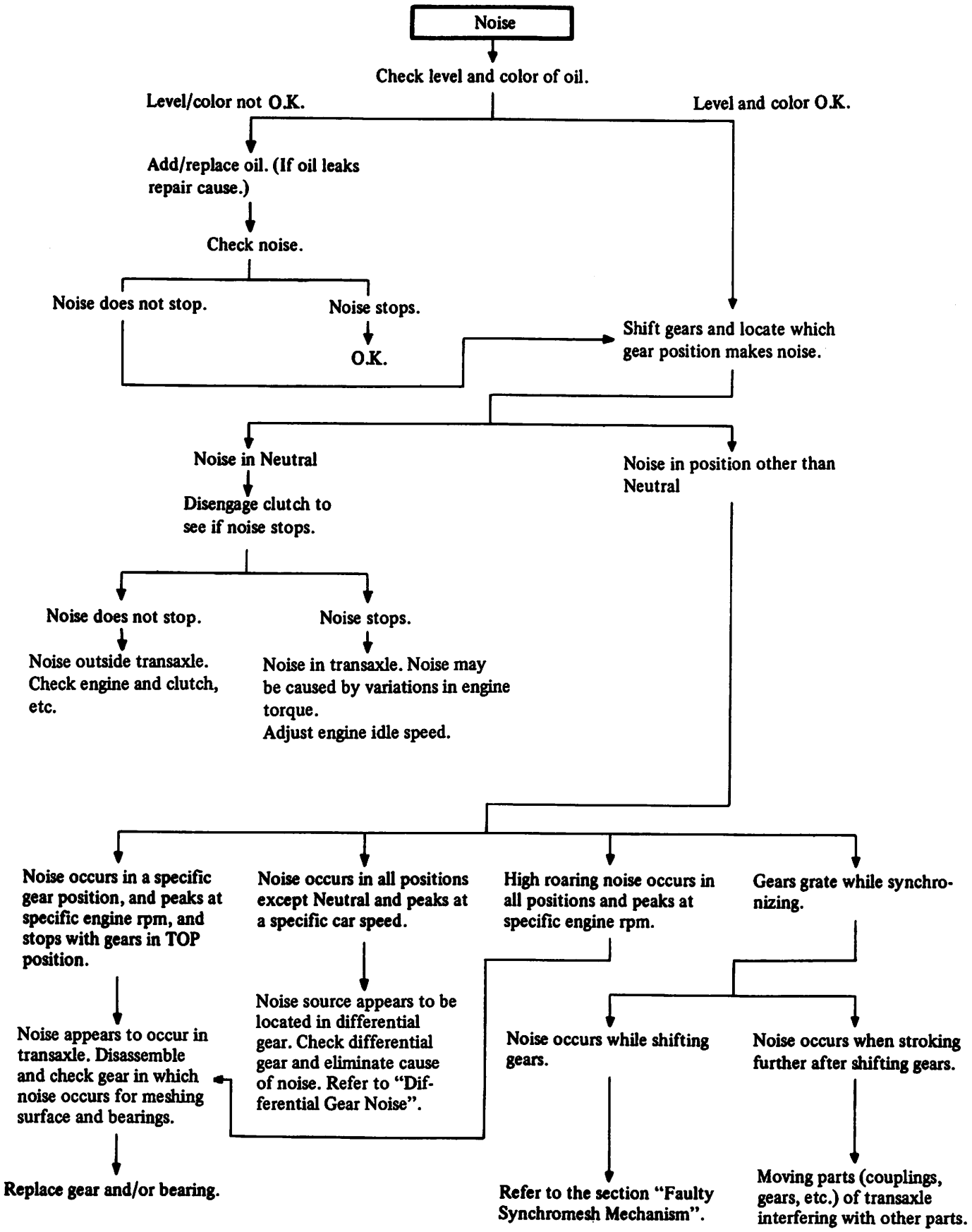
TIGHTENING TORQUE

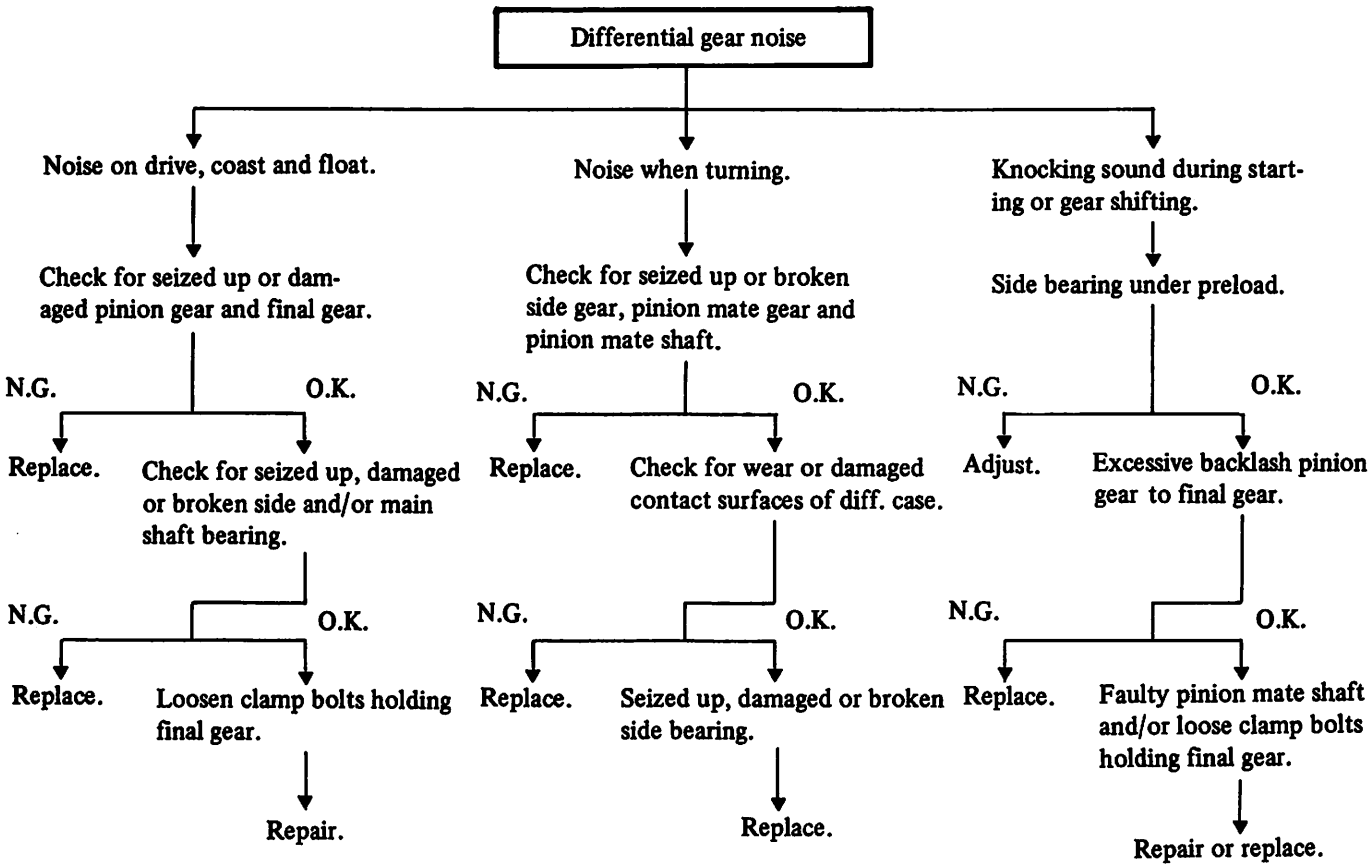
Item \ Unit	N·m	kg-m	ft-lb
Transaxle installation			
Clutch control cable lock nut	3 - 4	0.3 - 0.4	2.2 - 2.9
Front buffer rod bracket			
To engine	29 - 39	3 - 4	22 - 29
To transaxle	16 - 21	1.6 - 2.1	12 - 15
Left engine mounting to transaxle	29 - 39	3 - 4	22 - 29
Rear engine mounting			
To body	29 - 39	3 - 4	22 - 29
To transaxle *	16 - 21 29 - 39 34 - 39	1.6 - 2.1 3 - 4 3.5 - 4.0	12 - 15 22 - 29 25 - 29
Buffer rod	39 - 49	4 - 5	29 - 36
Speedometer pinion gear	3.7 - 5.0	0.38 - 0.51	2.7 - 3.7
Transmission gear control installation			
Control rod to transaxle	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Support rod to transaxle	8 - 12	0.8 - 1.2	5.8 - 8.7
Select stopper bolt	3.1 - 5.0	0.32 - 0.51	2.3 - 3.7
Rubber holder to body	8 - 12	0.8 - 1.2	5.8 - 8.7

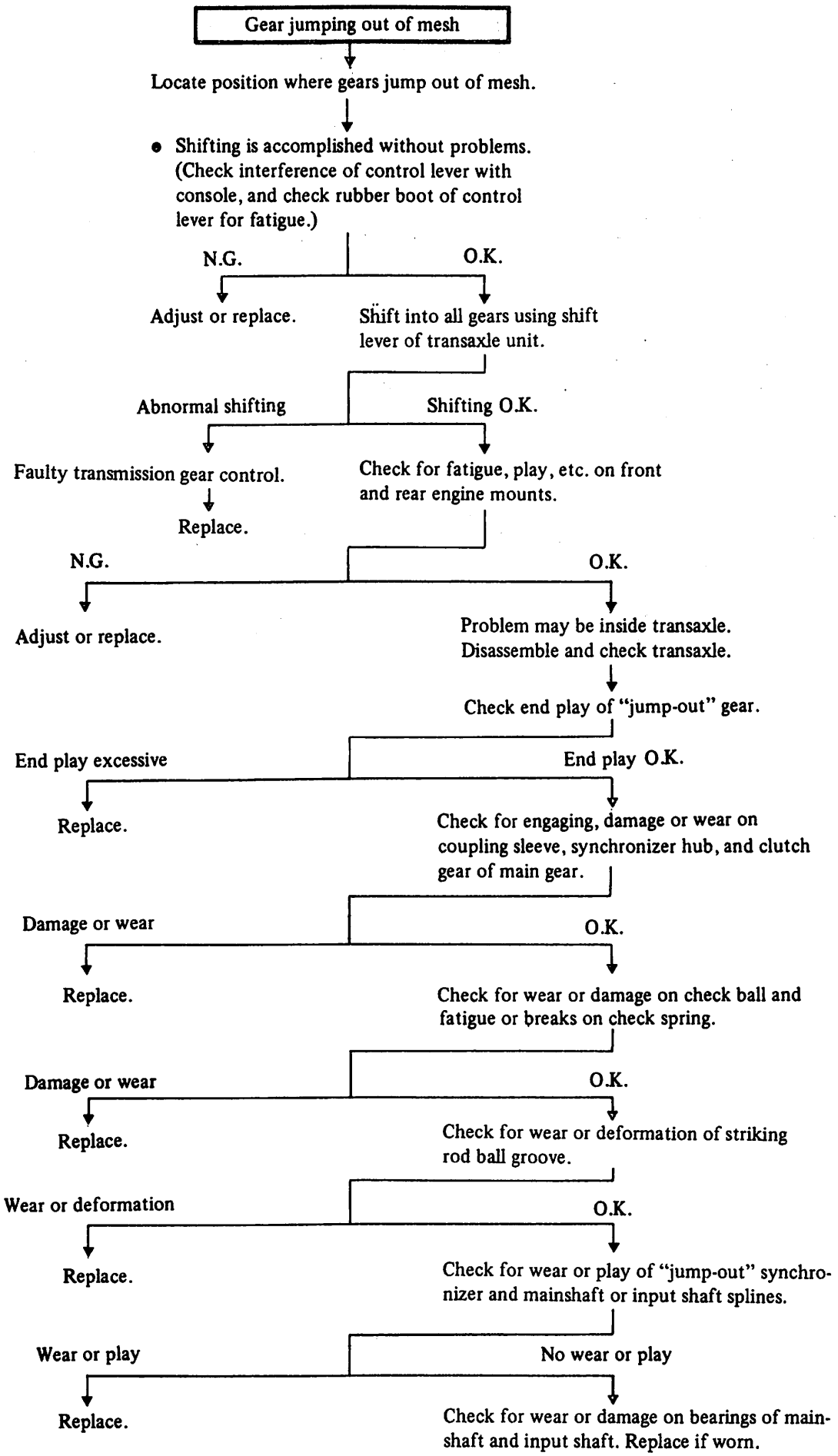
Item \ Unit	N·m	kg-m	ft-lb
Gear assembly			
Clutch housing to transmission case	16 - 21	1.6 - 2.1	12 - 15
Case cover to transmission case	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Bearing retainer to clutch housing	16 - 21	1.6 - 2.1	12 - 15
Control bracket to clutch housing	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
5th & Rev. check plug	19 - 25	1.9 - 2.5	14 - 18
5th & Rev. check assembly to clutch housing	6.3 - 8.3	0.64 - 0.85	4.6 - 6.1
Final gear to differential case	74 - 88	7.5 - 9.0	54 - 65
Filler plug	25 - 34	2.5 - 3.5	18 - 25
Drain plug	25 - 34	2.5 - 3.5	18 - 25
Back-up switch	20 - 29	2.0 - 3.0	14 - 22
Neutral switch	20 - 29	2.0 - 3.0	14 - 22
Switch plug	15 - 20	1.5 - 2.0	11 - 14
Transmission gear control			
Stopper pad bolt	4 - 7	0.4 - 0.7	2.9 - 5.1
Rubber holder nut	8 - 12	0.8 - 1.2	5.8 - 8.7

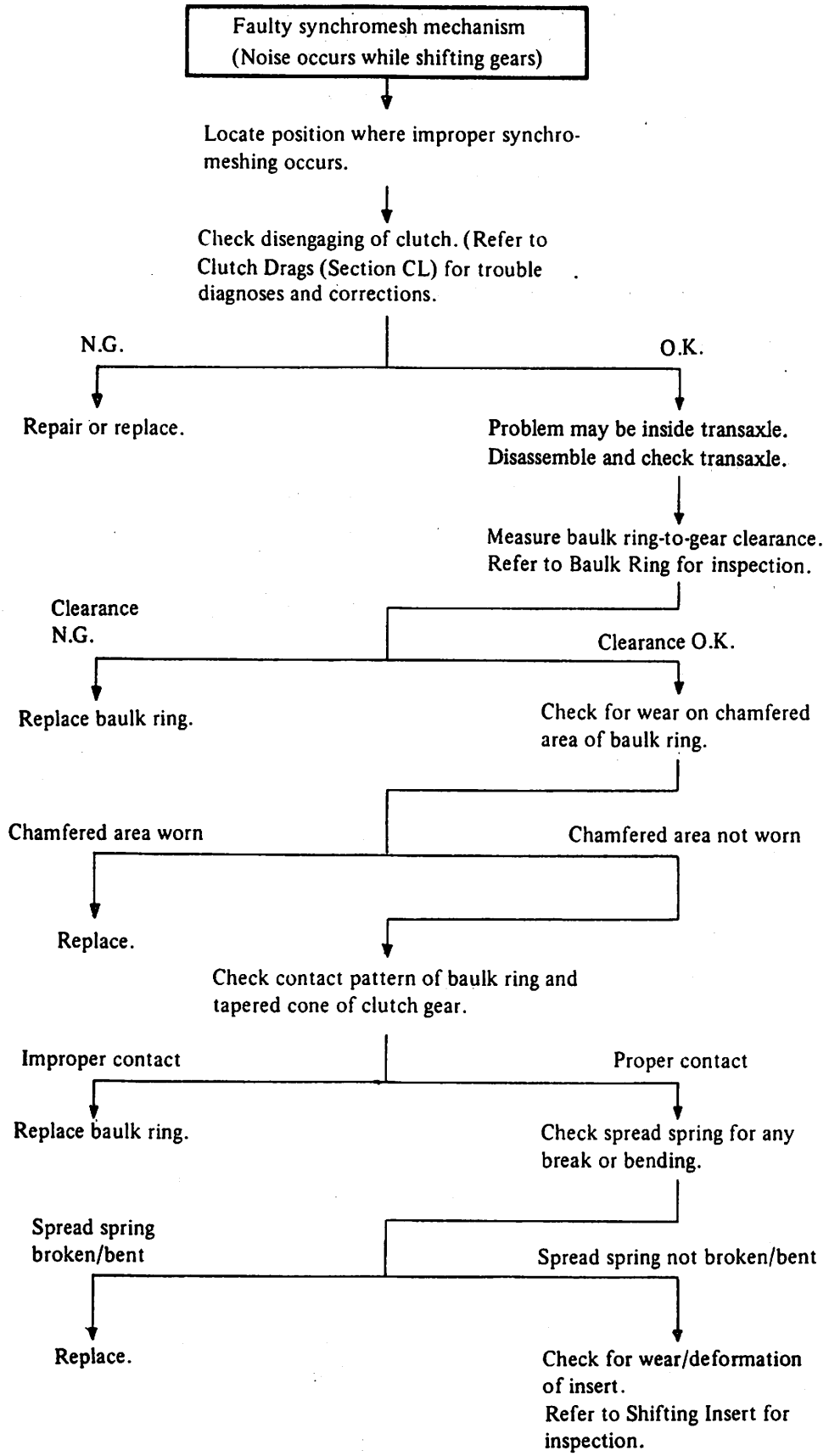
*For details, refer to ER section.

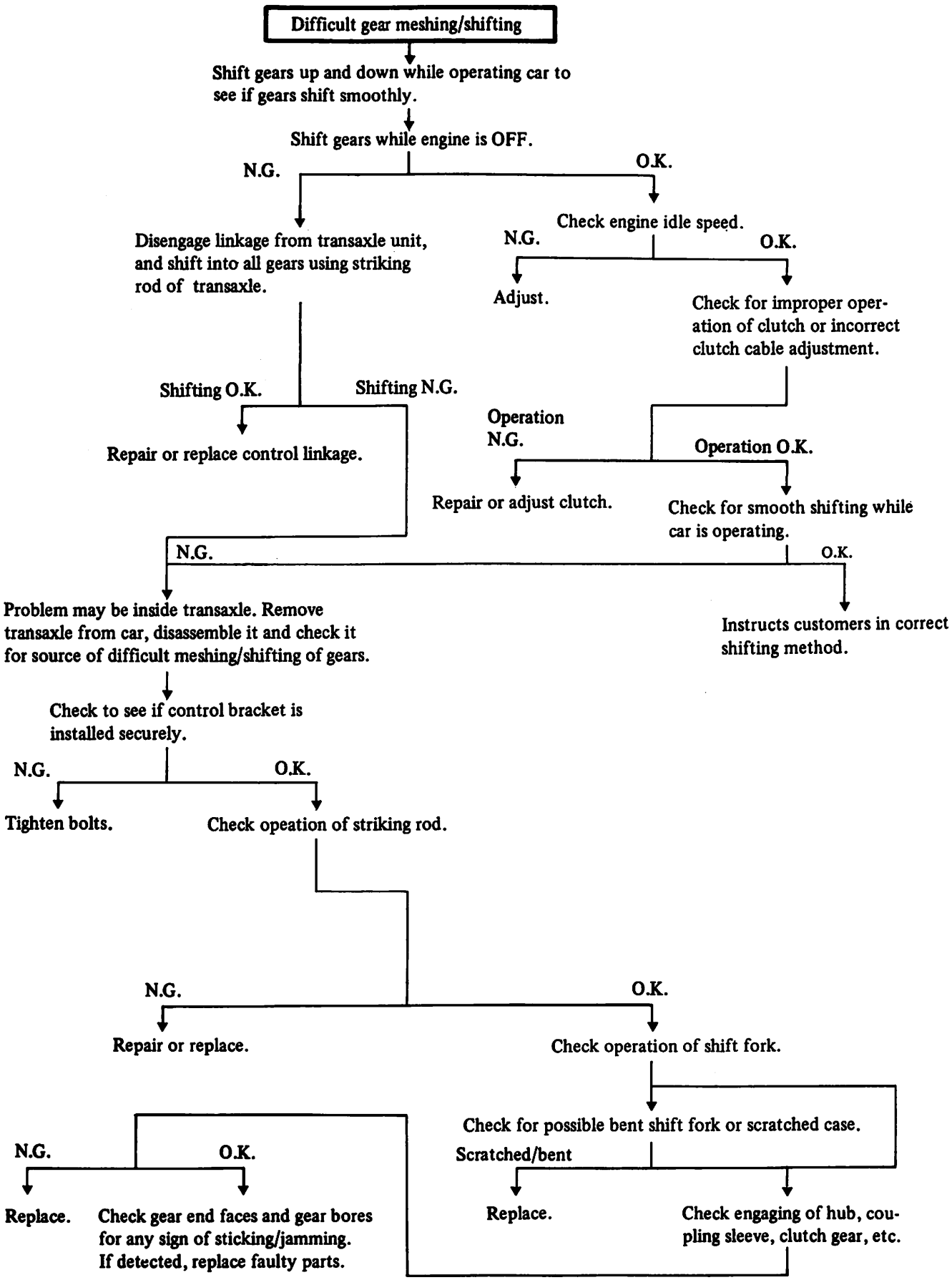
TROUBLE DIAGNOSES AND CORRECTIONS



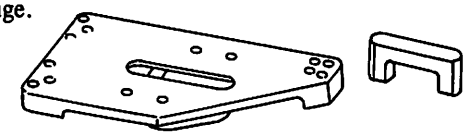
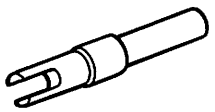
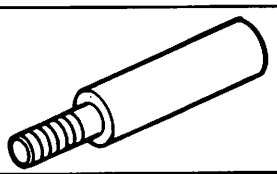
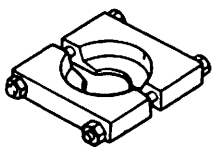
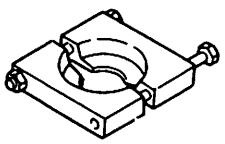
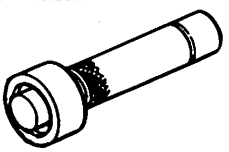
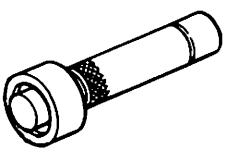
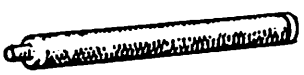

Differential gear noise
Noise on drive, coast and float.
Noise when turning.
Knocking sound during starting or gear shifting.
Check for seized up or damaged pinion gear and final gear.
Check for seized up or broken side gear, pinion mate gear and pinion mate shaft.
Side bearing under preload.
N.G.
O.K.
N.G.
O.K.
N.G.
O.K.
Replace.
Check for seized up, damaged or broken side and/or main shaft bearing.
Replace.
Check for wear or damaged contact surfaces of diff. case.
Adjust.
Excessive backlash pinion gear to final gear.
N.G.
O.K.
N.G.
O.K.
N.G.
O.K.
Replace.
Loosen clamp bolts holding final gear.
Replace.
Seized up, damaged or broken side bearing.
Replace.
Faulty pinion mate shaft and/or loose clamp bolts holding final gear.
Repair.
Replace.
Repair or replace.


Gear jumping out of mesh
Locate position where gears jump out of mesh.
• Shifting is accomplished without problems. (Check interference of control lever with console, and check rubber boot of control lever for fatigue.)
N.G.
O.K.
Adjust or replace.
Shift into all gears using shift lever of transaxle unit.
Abnormal shifting
Shifting O.K.
Faulty transmission gear control.
Replace.
Check for fatigue, play, etc. on front and rear engine mounts.
N.G.
O.K.
Adjust or replace.
Problem may be inside transaxle. Disassemble and check transaxle.
Check end play of "jump-out" gear.
End play excessive
End play O.K.
Replace.
Check for engaging, damage or wear on coupling sleeve, synchronizer hub, and clutch gear of main gear.
Damage or wear
O.K.
Replace.
Check for wear or damage on check ball and fatigue or breaks on check spring.
Damage or wear
O.K.
Replace.
Check for wear or deformation of striking rod ball groove.
Wear or deformation
O.K.
Replace.
Check for wear or play of "jump-out" synchronizer and mainshaft or input shaft splines.
Wear or play
No wear or play
Replace.
Check for wear or damage on bearings of mainshaft and input shaft. Replace if worn.


Faulty synchromesh mechanism
(Noise occurs while shifting gears)
Locate position where improper synchro-meshing occurs.
Check disengaging of clutch. (Refer to Clutch Drags (Section CL) for trouble diagnoses and corrections.
N.G.
O.K.
Repair or replace.
Problem may be inside transaxle. Disassemble and check transaxle.
Measure baulk ring-to-gear clearance. Refer to Baulk Ring for inspection.
Clearance N.G.
Clearance O.K.
Replace baulk ring.
Check for wear on chamfered area of baulk ring.
Chamfered area worn
Chamfered area not worn
Replace.
Check contact pattern of baulk ring and tapered cone of clutch gear.
Improper contact
Proper contact
Replace baulk ring.
Check spread spring for any break or bending.
Spread spring broken/bent
Spread spring not broken/bent
Replace.
Check for wear/deformation of insert.
Refer to Shifting Insert for inspection.


Difficult gear meshing/shifting
Shift gears up and down while operating car to see if gears shift smoothly.
Shift gears while engine is OFF.
N.G.
O.K.
Disengage linkage from transaxle unit, and shift into all gears using striking rod of transaxle.
Check engine idle speed.
N.G.
O.K.
Adjust.
Check for improper operation of clutch or incorrect clutch cable adjustment.
Shifting O.K.
Shifting N.G.
Repair or replace control linkage.
Operation N.G.
Operation O.K.
Repair or adjust clutch.
Check for smooth shifting while car is operating.
N.G.
O.K.
Problem may be inside transaxle. Remove transaxle from car, disassemble it and check it for source of difficult meshing/shifting of gears.
Instructs customers in correct shifting method.
Check to see if control bracket is installed securely.
N.G.
O.K.
Tighten bolts.
Check opeation of striking rod.
N.G.
O.K.
Repair or replace.
Check operation of shift fork.
Check for possible bent shift fork or scratched case.
N.G.
O.K.
Scratched/bent
Replace.
Check gear end faces and gear bores for any sign of sticking/jamming. If detected, replace faulty parts.
Replace.
Check engaging of hub, coupling sleeve, clutch gear, etc.

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
KV38105810 (–)	Differential side bearing height gauge. 
KV38105900 (–)	Preload adapter 
KV38106000 (–)	Height gauge adapter (diff. side bearing) 
ST30031000 (J25733-1)	Bearing puller 
ST22730000 (–)	Bearing puller 
ST33290001 (J25810)	Side bearing outer race puller 
KV38100300 (–)	Drift 
ST33210000 (J25803)	Drift 
ST30611000 (J25742-1)	Drift bar 
ST30621000 (–)	Drift 

AUTOMATIC TRANSAXLE

SECTION AT

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SPECIAL SERVICE TOOLS AT-58

This section describes both RN3F01A (without lock-up) and RL3F01A (with lock-up) transaxles but it mainly describes RL3F01A. Portions different from RN3F01A are noted with (L/U) marks.

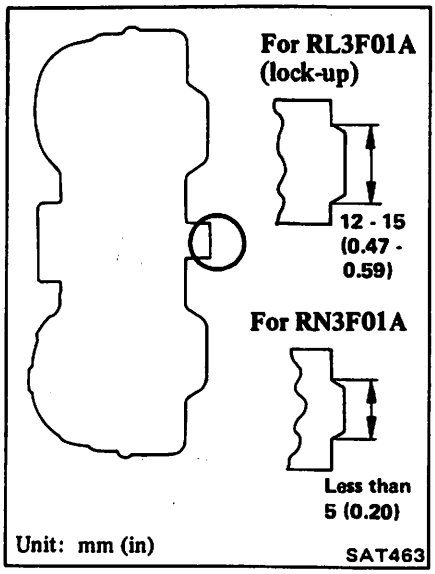
DESCRIPTION

The RL3F01A transaxle is a fully automatic unit consisting primary of a 3 element hydraulic lock-up torque converter (L/U) , two planetary gear sets and final gear. Two multiple-disc clutches, a multiple-disc brake, brake band, and one-way clutch provide the friction elements necessary to obtain the desired function of the two planetary gear-sets.
A hydraulic control system is used to operate the friction elements and automatic shift controls.

TORQUE CONVERTER

The lock-up torque converter (L/U) is attached to the crankshaft through a flexible drive plate and serves to directly couple the turbine runner and pump impeller through the lock-up piston (L/U) which is controlled by the speed cut valve and lock-up control valve (L/U) . Heat generated in the torque converter is dissipated by circulating the transaxle fluid through an oil-to-water type cooler in the radiator lower tank.
The welded construction of the torque converter prohibits disassembly or service unless highly specialized equipment is available.

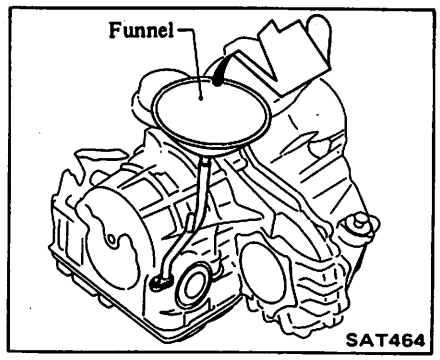
Discrimination



FLUID RECOMMENDATION

Use "DEXRON" type automatic transaxle fluid only.

FLUID REFILLING POSITION



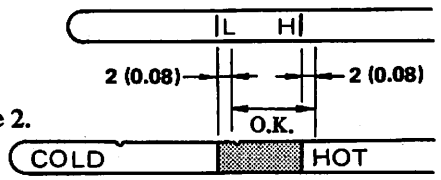
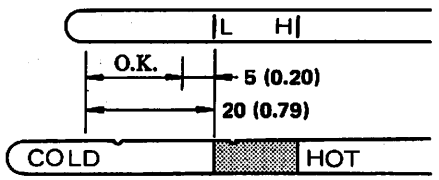
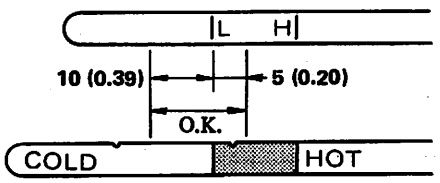
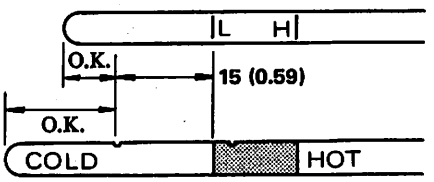
FLUID LEVEL

The transaxle has the proper amount of fluid if, 10 minutes after engine start and with the engine idling, the level is within the values described in the following table.
Proceed with fluid level check as follows:
1. Park the vehicle on a level surface and set the parking brake.
2. Start the engine and idle it for about 10 minutes and then move the selector lever through each gear range, ending in "P".
3. Check the fluid level with the engine idling.
4. Remove the dipstick and clean it with lint-free paper. Reinsert it into the charging pipe as far as it will go.
5. Remove the dipstick and note the reading.

Keep the fluid at the proper level.

- **Overfilling may blow off the fluid during high speed driving.**
- **Underfilling may cause the clutches to slip, and finally break them.**

Unit: mm (in)

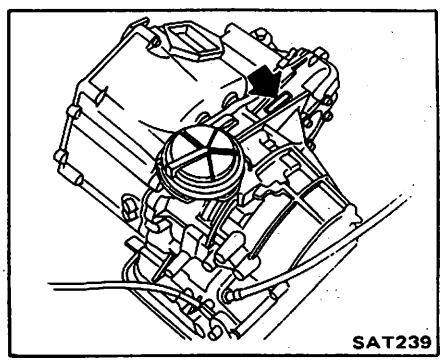
Ambient temperature	Fluid level	Ambient temperature	Fluid level
30 - 50°C (86 - 122°F)	Type 1. / Type 2. 	–10 - 10°C (14 - 50°F)	
10 - 30°C (50 - 86°F)		–30 - –10°C (–22 - 14°F)	

SAT611

IDENTIFICATION NUMBER LABEL

Location

The label is pasted on right upper face of transmission case.

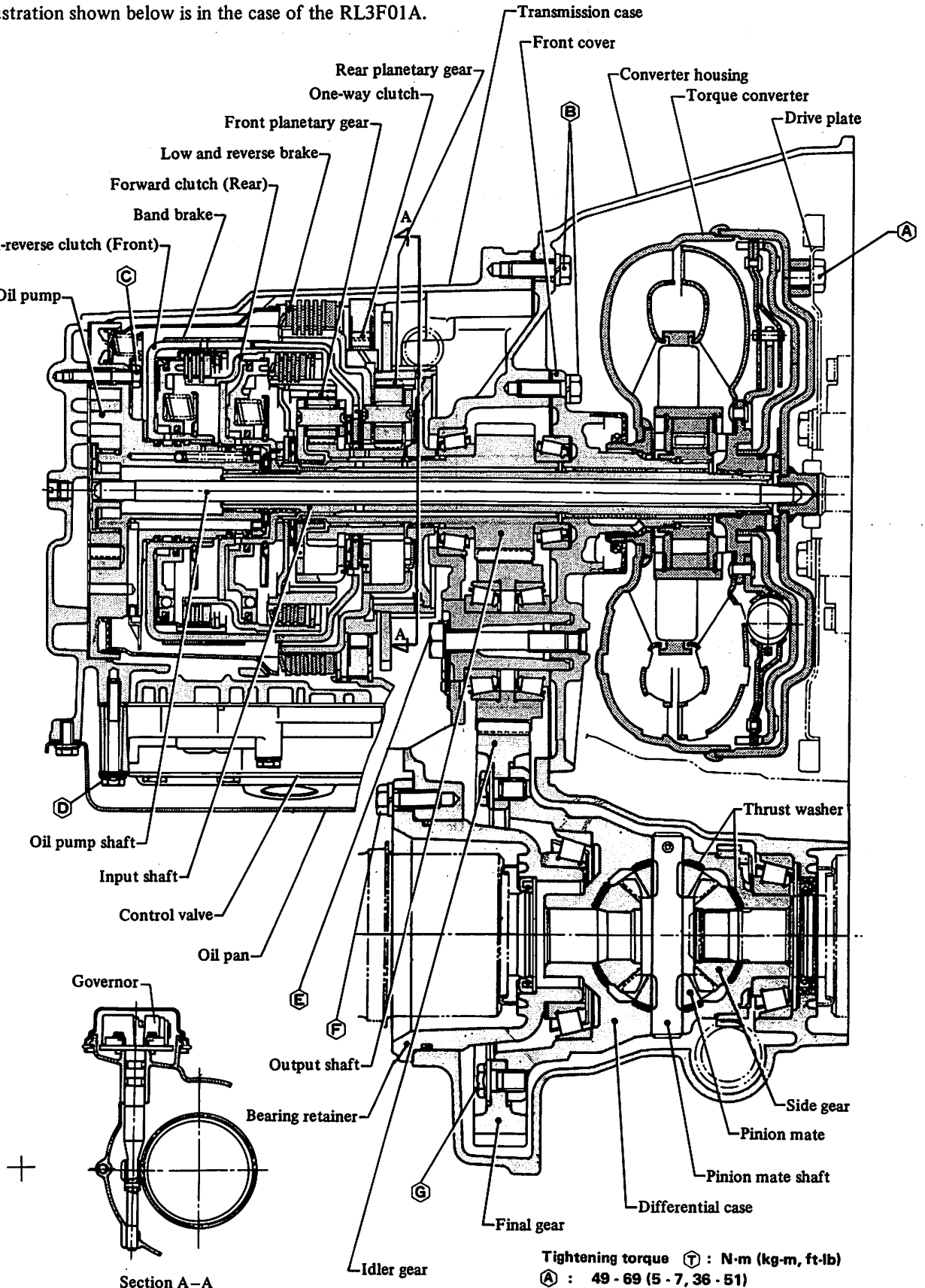


Number designation

0 6 0 1 2 3 4

- Serial production number for the month
- Month of production
  1: Jan., 2: Feb., ...
  X: Oct., Y: Nov., Z: Dec.
- This figure denoting the transaxle model
  0: Automatic transaxle
  1.2, and 9: Manual transaxle

The illustration shown below is in the case of the RL3F01A.



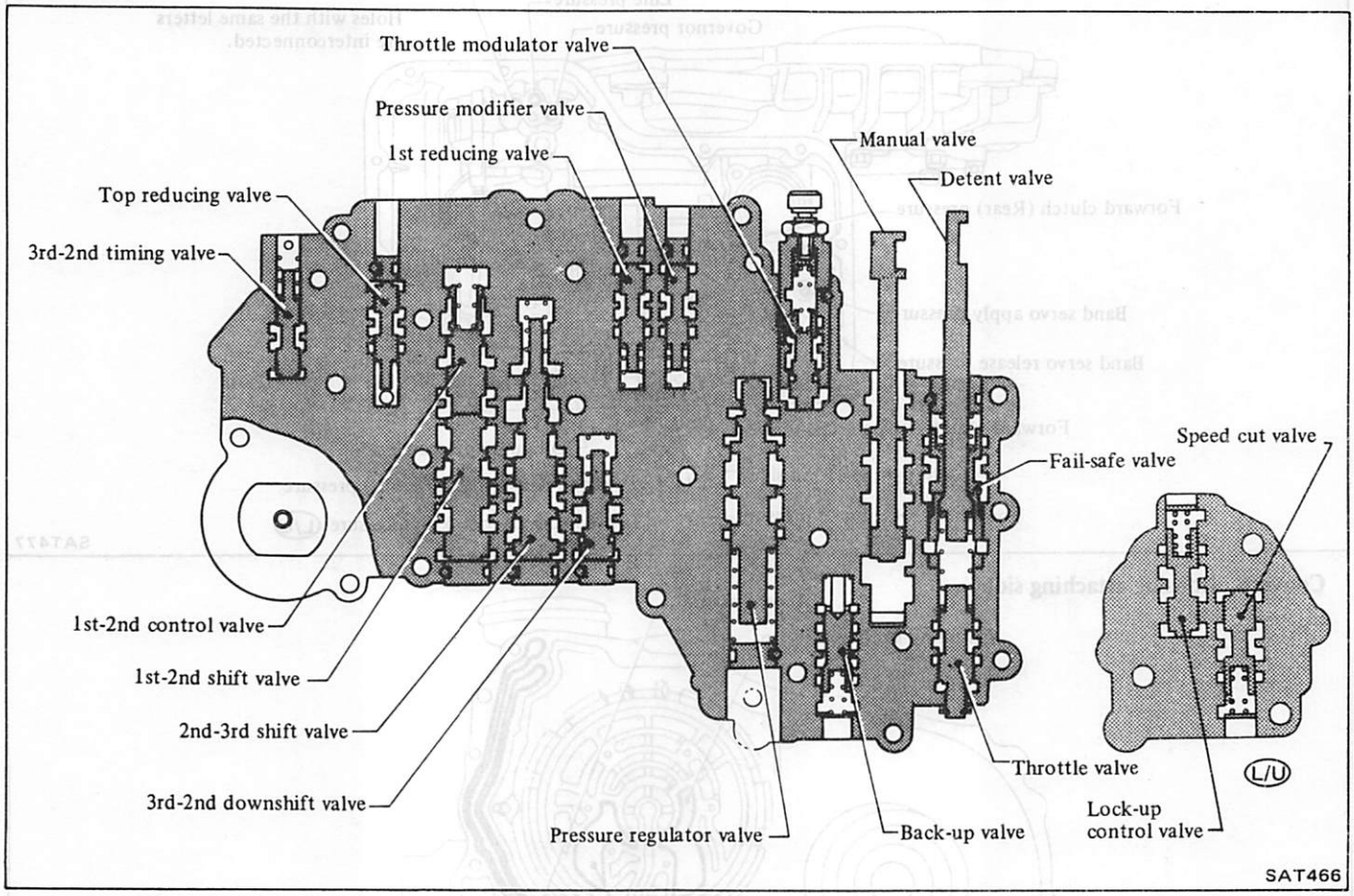
Tightening torque Ⓣ : **N·m (kg-m, ft-lb)**

- Ⓐ : 49 - 69 (5 - 7, 36 - 51)
- Ⓑ : 14 - 18 (1.4 - 1.8, 10 - 13)
- Ⓒ : 7 - 9 (0.7 - 0.9, 5.1 - 6.5)
- Ⓓ : 7 - 9 (0.7 - 0.9, 5.1 - 6.5)
- Ⓔ : 3 - 4 (0.3 - 0.4, 2.2 - 2.9)
- Ⓕ : 19 - 25 (1.9 - 2.5, 14 - 18)
- Ⓖ : 69 - 78 (7.0 - 8.0, 51 - 58)

SAT612

HYDRAULIC CONTROL UNIT AND VALVES

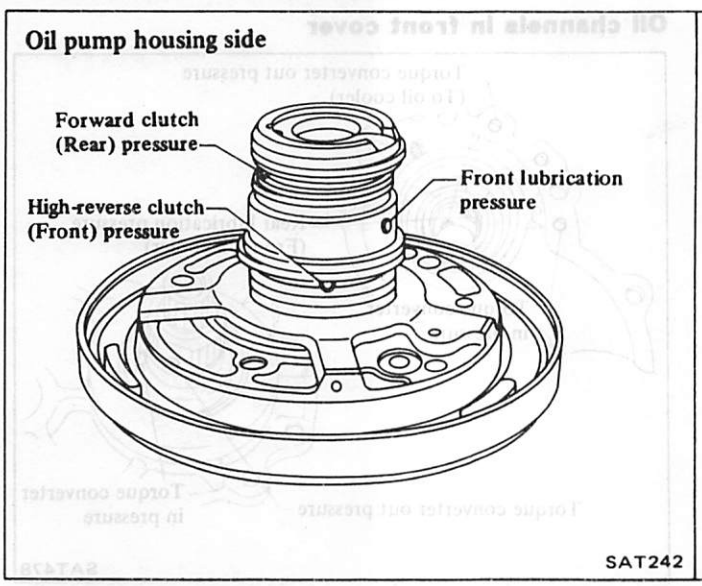
Control valve

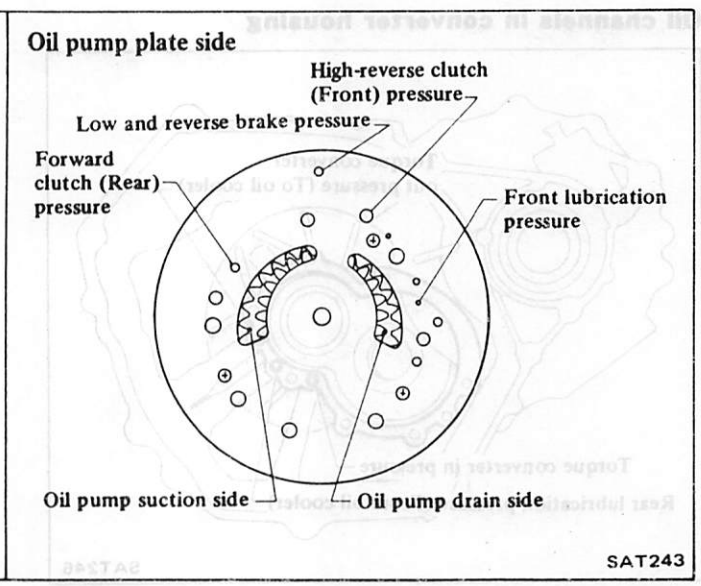


OIL CHANNEL

Oil channels which connect components are located in areas shown below.

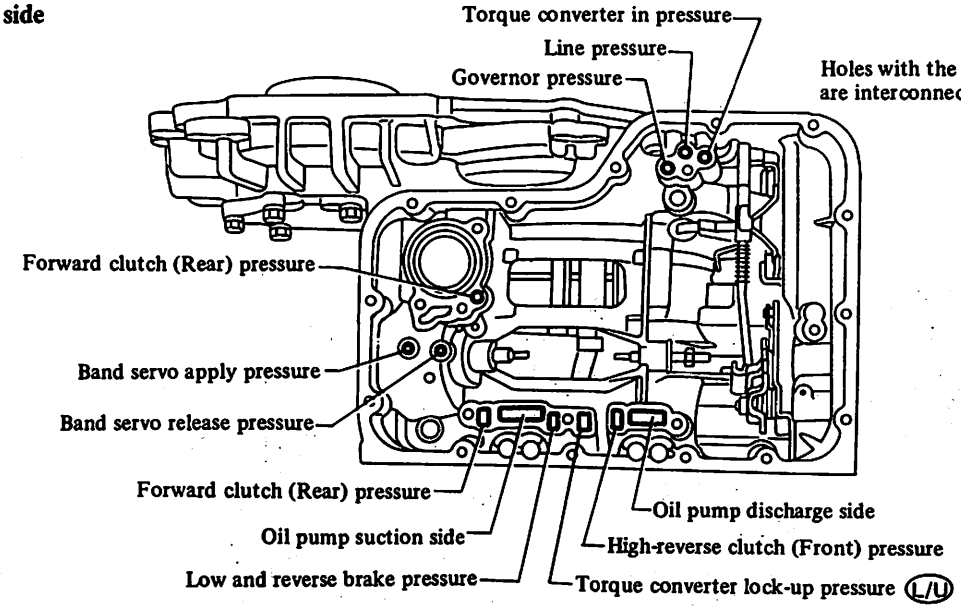
Oil channels in oil pump housing





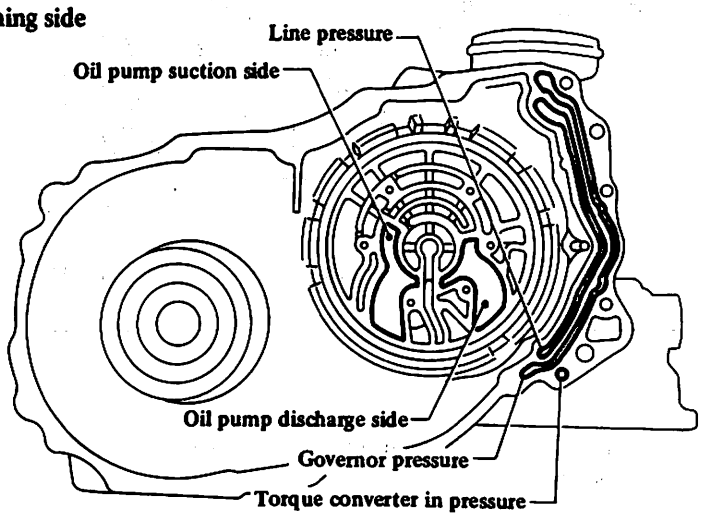
Oil channels in transmission case

Lower face side



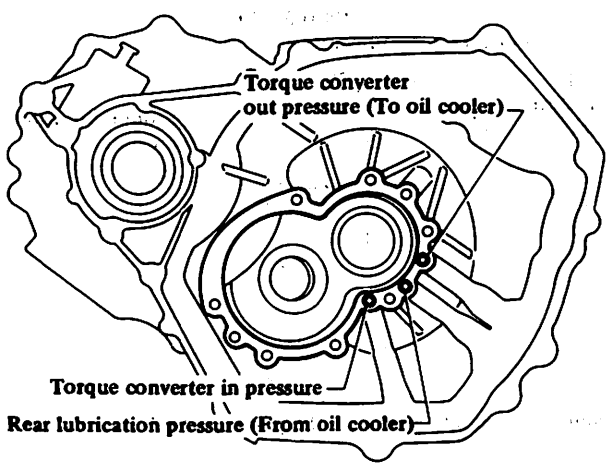
SAT477

Converter housing attaching side



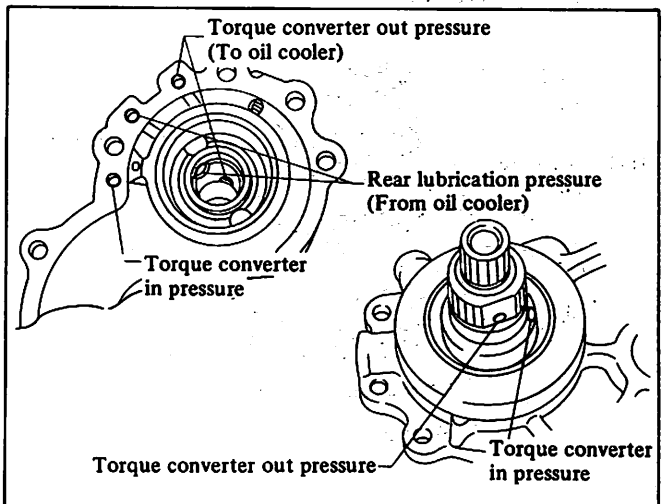
SAT245

Oil channels in converter housing



SAT246

Oil channels in front cover



SAT478

MECHANICAL OPERATION

In the RL3F01A automatic transaxle, each part operates as shown in the following table at each gear select position.

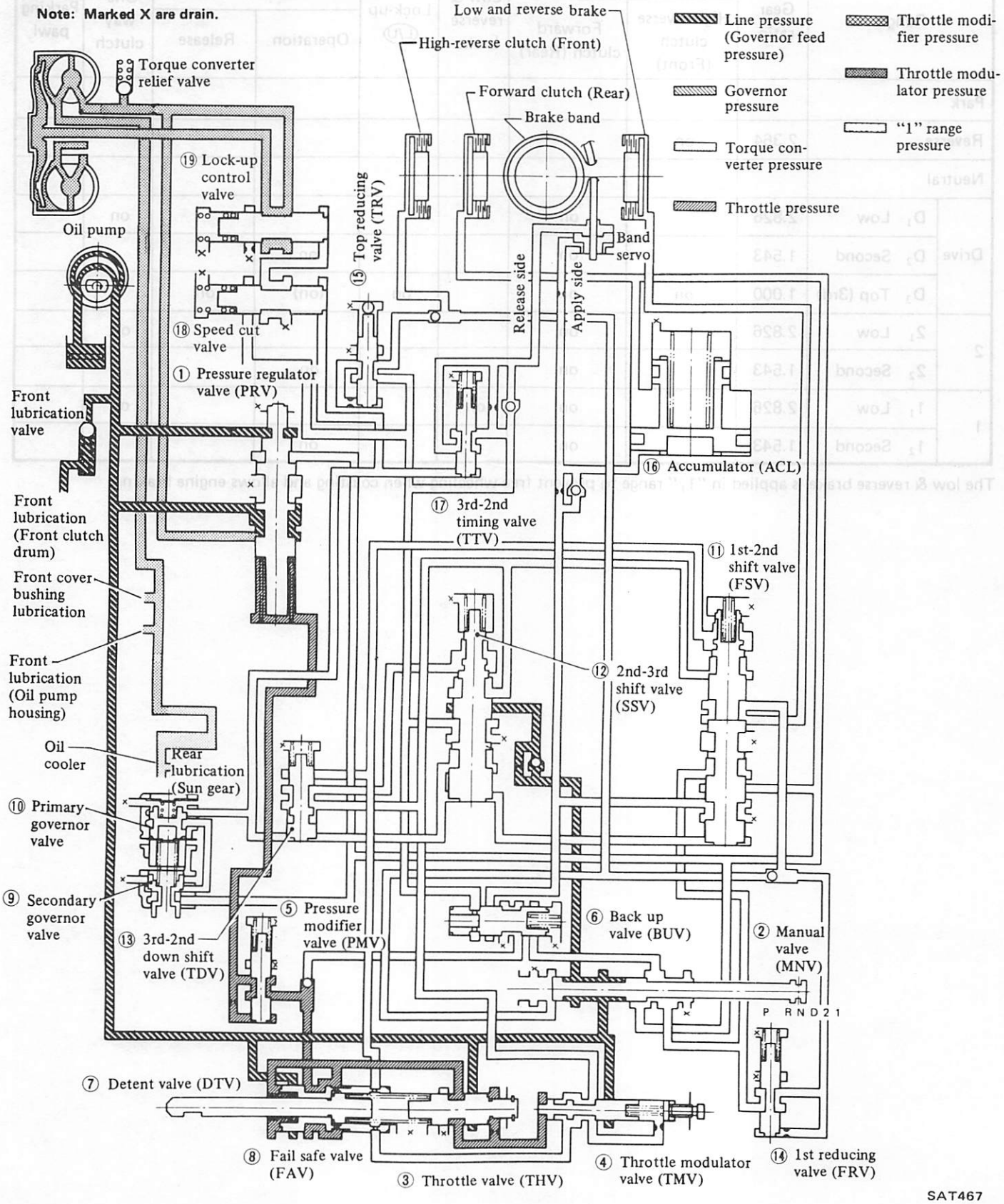
Range		Gear ratio	Clutch		Low & reverse brake	Lock-up (L/U)	Band servo		One-way clutch	Parking pawl
			High-reverse clutch (Front)	Forward clutch (Rear)			Operation	Release		
Park										on
Reverse		2.364	on		on					
Neutral										
Drive	D_1 Low	2.826		on					on	
	D_2 Second	1.543		on			on			
	D_3 Top (3rd)	1.000	on	on		on	(on)	on		
2	2_1 Low	2.826		on					on	
	2_2 Second	1.543		on			on			
1	1_1 Low	2.826		on	on				on	
	1_2 Second	1.543		on			on			

The low & reverse brake is applied in "1_1" range to prevent free wheeling when coasting and allows engine braking.

HYDRAULIC CONTROL CIRCUITS

The illustration shown below is in the case of the RL3F01A.

Oil Pressure Circuit Diagram - "N" range (Neutral)



SAT467

ON-VEHICLE SERVICE

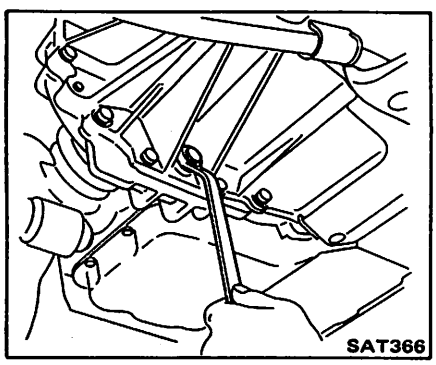
The following parts can be serviced with the transaxle on the vehicle.

1. Control valve assembly
2. Throttle wire
3. Governor shaft assembly
4. Inhibitor switch
5. Bearing retainer oil seal
6. Converter housing oil seal

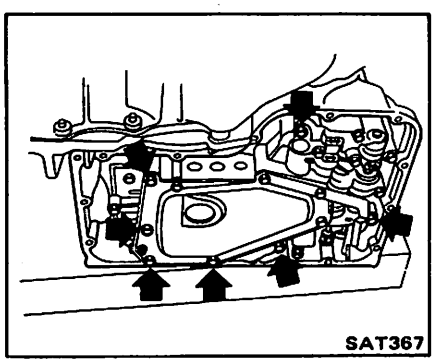
Check and/or replace faulty parts as follows:

CONTROL VALVE ASSEMBLY

1. Remove hexagon plug and drain oil completely.



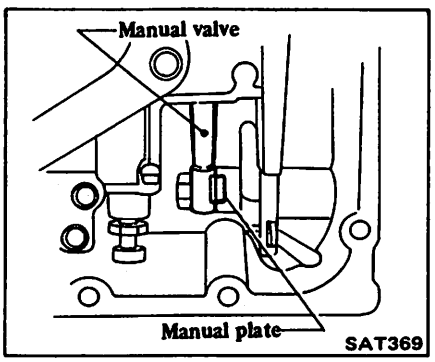
2. Remove oil pan guard, oil pan and gasket.
3. Remove control valve assembly.



4. Disassemble, inspect and assemble control valve assembly. Refer to page AT-24 for Control Valve Body.
5. Install control valve assembly.

Ⓣ : 7 - 9 N·m
(0.7 - 0.9 kg-m, 5.1 - 6.5 ft-lb)

a. Set manual shaft at Neutral, then align manual plate with groove in manual valve of control valve assembly.



b. Install detent valve with its groove facing forward.

c. After installing control valve to transmission case, make sure that control lever can be moved to all positions.

6. Install gasket, oil pan and oil pan guard.

Ⓣ : 5 - 7 N·m
(0.5 - 0.7 kg-m, 3.6 - 5.1 ft-lb)

7. Apply sealant to threads of hexagon plug, and install it in place.

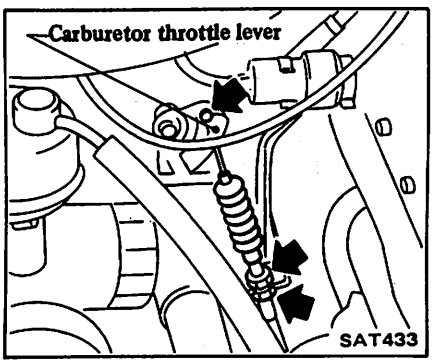
Ⓣ : 7 - 13 N·m
(0.7 - 1.3 kg-m, 5.1 - 9.4 ft-lb)

8. Refill automatic transaxle fluid.

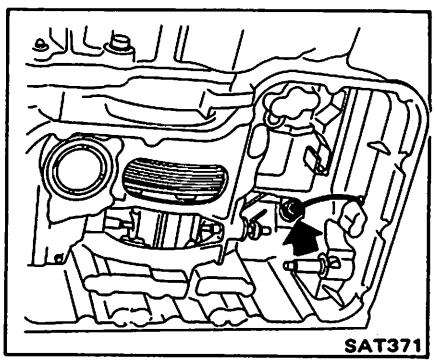
Oil capacity:
Refer to S.D.S.

THROTTLE WIRE

1. Remove control valve assembly. Refer to Control Valve Assembly.
2. Disconnect throttle wire from carburetor throttle valve.



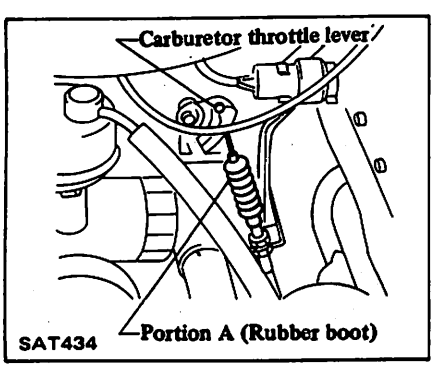
3. Disconnect the other end of throttle wire from throttle lever.
4. Remove throttle wire from transmission case.



5. Install throttle wire in the reverse order of removal. After tightening nut, bend the lock plate securely.

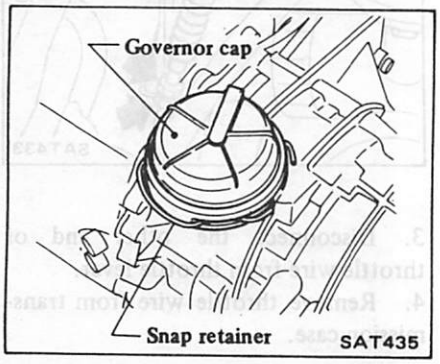
Ⓣ : Throttle wire securing nut
2 - 3 N·m
(0.2 - 0.3 kg-m, 1.4 - 2.2 ft-lb)

6. Adjust throttle wire. Refer to Minor Adjustments.
7. After properly adjusting throttle wire, turn portion (A) to correct any twisting of rubber boot. Ensure the parting line is as straight as possible.

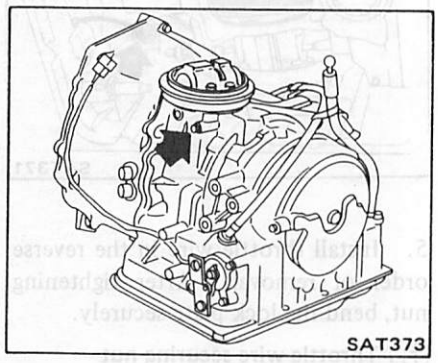


GOVERNOR SHAFT ASSEMBLY

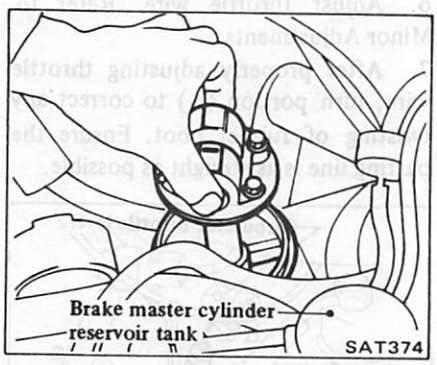
1. Disconnect battery terminal.
2. Remove radiator reservoir tank.
3. Remove battery.
4. Remove battery support bracket.
5. Remove snap retainer, governor cap with breather hose, and seal ring.



6. Remove governor shaft securing bolt.

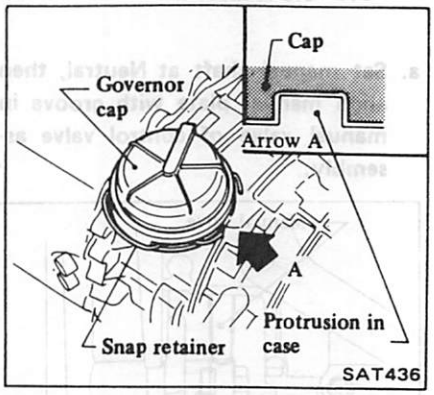


7. Remove governor shaft assembly.



8. Disassemble, check and reassemble governor shaft assembly. Refer to page AT-33 for Governor.
9. Install governor shaft assembly.
10. Install O-ring, governor cap with breather hose, then secure it with snap retainer.

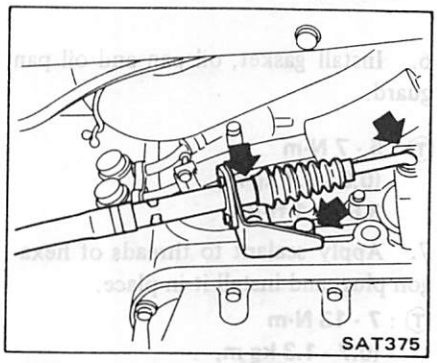
When installing governor cap, pay attention to its direction.



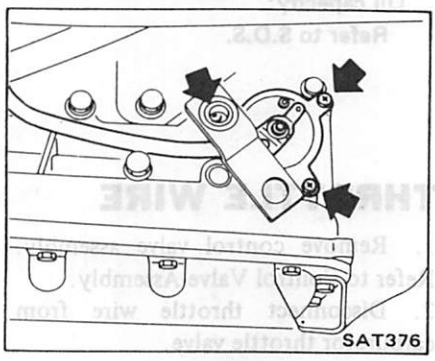
11. Install battery support bracket, battery and radiator reservoir tank.
12. Connect battery terminal.

INHIBITOR SWITCH

1. Remove undercover.
2. Remove control cable end from unit.



3. Disconnect harness at connector, then remove inhibitor switch.



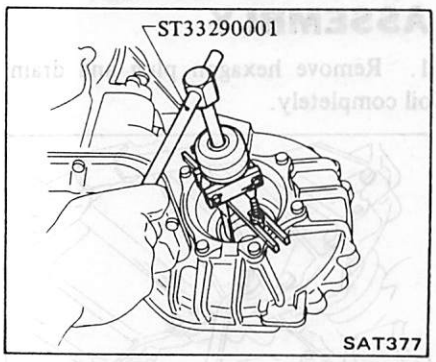
4. Install inhibitor switch in the reverse order of removal.

Ⓣ : **2.0 - 2.5 N·m (0.20 - 0.25 kg-m, 1.4 - 1.8 ft-lb)**

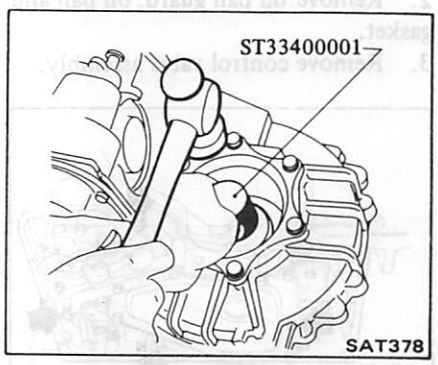
5. Adjust inhibitor switch. Refer to Minor Adjustments.

BEARING RETAINER OIL SEAL

1. Remove left drive shaft assembly. Refer to Drive Shaft for removal.
2. Remove oil seal.



3. Apply coat of automatic transaxle fluid to oil seal surface, then drive new seal into place.

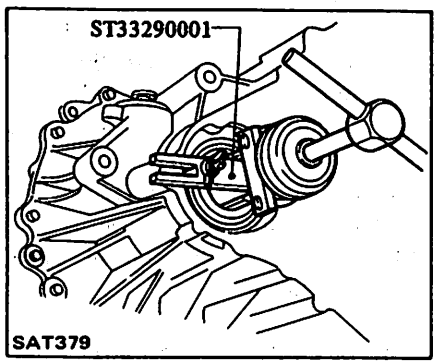


4. Install left drive shaft assembly. Refer to Drive Shaft for installation.

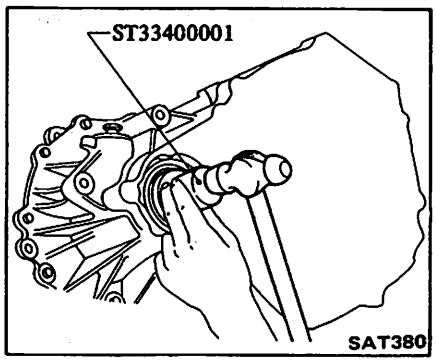
Be extremely careful not to scratch oil seal when inserting drive shaft.

CONVERTER HOUSING OIL SEAL

1. Remove right drive shaft assembly. Refer to Drive Shaft for removal.
2. Remove oil seal.



3. Apply coat of automatic transaxle fluid to oil seal surface, then drive new seal into place.



4. Install right drive shaft assembly. Refer to Drive Shaft for installation.

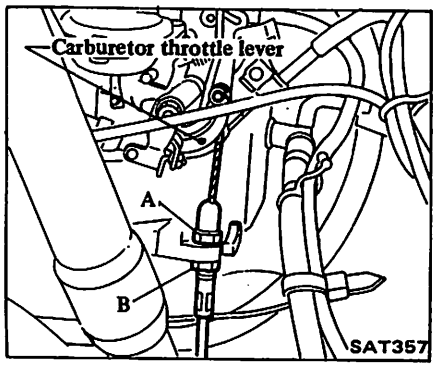
Be extremely careful not to scratch oil seal when inserting drive shaft.

MINOR ADJUSTMENTS

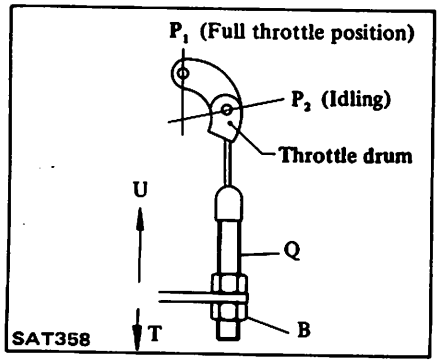
THROTTLE WIRE ADJUSTMENT

Throttle wire is adjusted by means of double nuts on carburetor side.

1. Loosen throttle wire double nuts A and B on carburetor side.



2. With throttle drum set at "P_1" (fully-open), move fitting Q fully in direction T and tighten nut B in direction U.

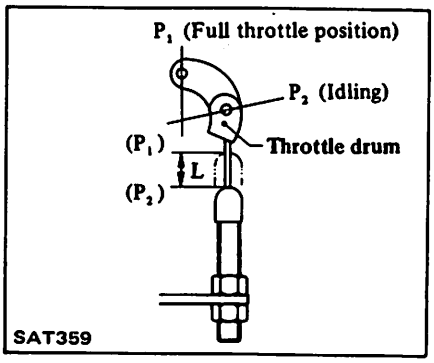


3. Reverse nut B 1.0 to 1.5 revolutions in direction T, then tighten nut A securely. Throttle drum should be held at "P_1".

Ⓣ : **Double nuts**
8 - 10 N-m
(0.8 - 1.0 kg-m,
5.8 - 7.2 ft-lb)

4. Ensure that throttle wire stroke L is within specified range between full throttle and idle.

Throttle wire stroke:
27.4 - 31.4 mm
(1.079 - 1.236 in)

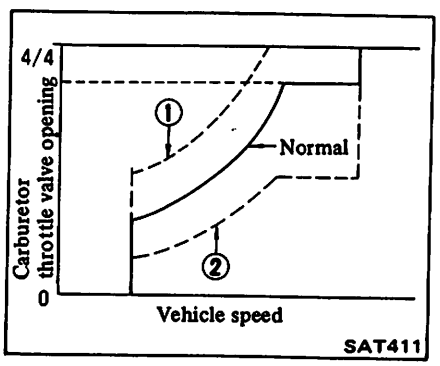


a. Adjust throttle wire stroke when throttle wire/accelerator wire is installed or after carburetor has been adjusted.
b. Put marks on throttle wire to facilitate measuring wire stroke.

Problems arising from improper adjustment of throttle wire

If throttle wire stroke is improperly adjusted, the following problems may arise.

- When full-open position "P_1" of throttle drum is closer to direction T, shift schedule will be as shown by ② in figure below, and kick-down range will greatly increase.



- When full-open position "P_1" of throttle drum is closer to direction U, shift schedule will be as shown by ① in figure above, and kick-down range will not occur.

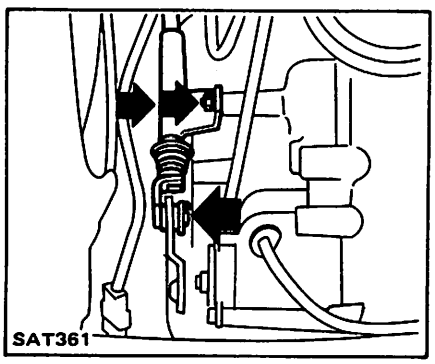
CONTROL CABLE ADJUSTMENT

Adjustment of the control cable is an important adjustment of the automatic transaxle. Move the shift lever from the "P" range to "1" range. You should be able to feel the detents in each range.

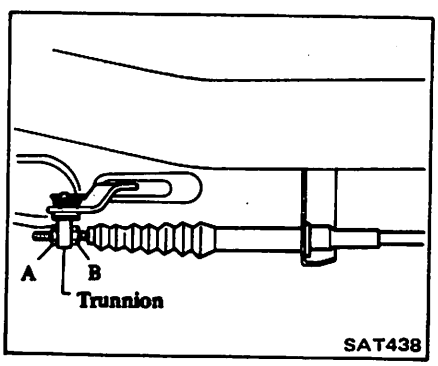
If the detents cannot be felt or the pointer indicating the range is improperly aligned, the control cable needs adjustment.

Control cable adjustment

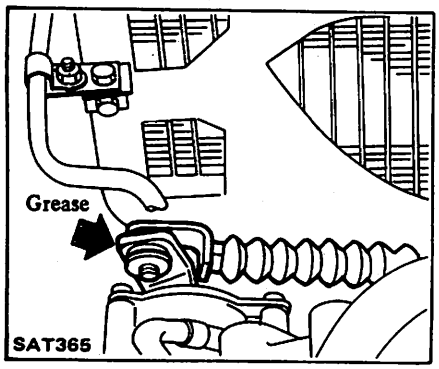
1. Place control lever at "P" range.
2. Connect control cable end to manual lever in transaxle unit, and tighten control cable securing bolts.



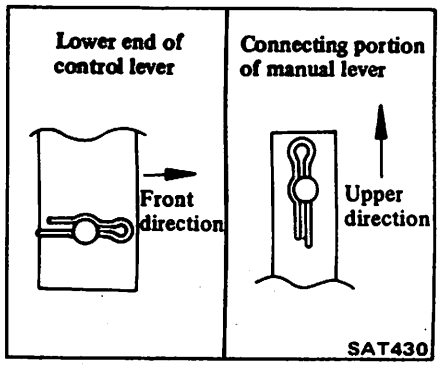
3. Move control lever from "P" range to "1" range. Make sure that control lever can move smoothly and without any sliding noise.
4. Place control lever at "P" range again.
5. Make sure that control lever locks at "P" range.
6. Remove control cable adjusting nut A and loosen nut B, then connect control cable to trunnion. Install nut A and B, then tighten them.



7. Move control lever from "P" range to "1" range again. Make sure that control lever can move smoothly and without any sliding noise.
8. Apply grease to spring washer.



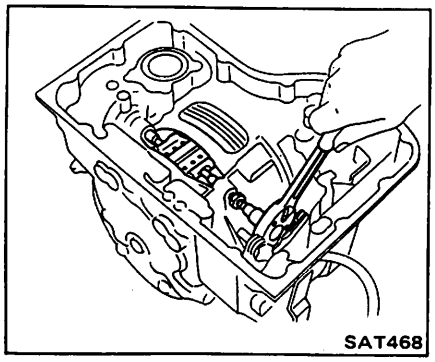
9. After properly adjusting control cable, check spring pin to see if it is assembled as shown in figure below. If not, adjust spring pin.



BRAKE BAND ADJUSTMENT

Proper brake band adjustment results in smooth shifting between 1st & 2nd and 2nd & 3rd. Although the adjustment is very simple, it is important to use an accurate torque wrench.

1. Loosen locknut.



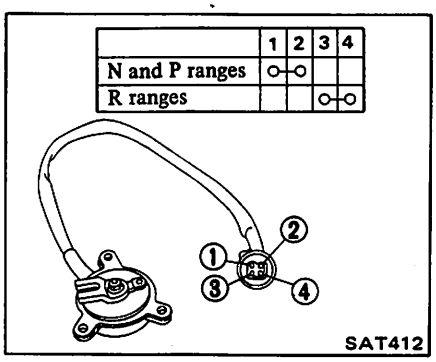
2. Torque anchor end pin lock nut to 4 to 6 N·m (0.4 to 0.6 kg-m, 2.9 to 4.3 ft-lb).
3. Back off anchor end pin lock nut 2.5 complete turns.
4. Tighten locknut to 16 to 22 N·m (1.6 to 2.2 kg-m, 12 to 16 ft-lb) while holding anchor end pin lock nut stationary.

INHIBITOR SWITCH ADJUSTMENT

The inhibitor switch has two major functions. It allows the back-up lights to illuminate when the shift lever is placed in the reverse range. It also acts as a neutral safety switch allowing current to pass from the starter only when the lever is placed in the "P" or "N" range.

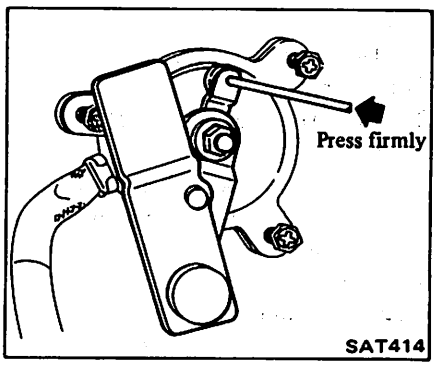
A continuity tester may be used to check the inhibitor switch for proper operation.

- Check continuity at "N", "P" and "R" ranges.



- With control lever held in Neutral, turn manual lever an equal amount in both directions to see if current flow ranges are nearly the same. (Current normally begins to flow before manual lever reaches a angle of 1.5° in either direction.)
  If current flows outside normal range, or if normal flow range is out of specifications, properly adjust inhibitor switch.

Adjust inhibitor switch as follows:
This adjustment can be done on the vehicle.
1. Loosen attaching screws.
2. Set select lever (manual shaft) at "N" position.
3. Insert a 2.5 mm (0.098 in) dia. pin into adjustment holes in both inhibitor switch and switch lever as near vertical as possible.



4. Tighten screws.

Ⓣ : **2.0 - 2.5 N·m (0.20 - 0.26 kg-m, 1.4 - 1.9 ft-lb)**

5. Recheck for continuity. If faulty, replace the switch.

REMOVAL AND INSTALLATION

TRANSAXLE ASSEMBLY

When dismounting the automatic transaxle from a vehicle, pay attention to the following points:

1. Before dismounting the transaxle, rigidly inspect it by using the "Trouble-shooting Chart", and dismount it only when it is necessary.
2. Dismount the transaxle with utmost care; and when mounting, observing the tightening torque indicated on another table, do not exert excessive force.

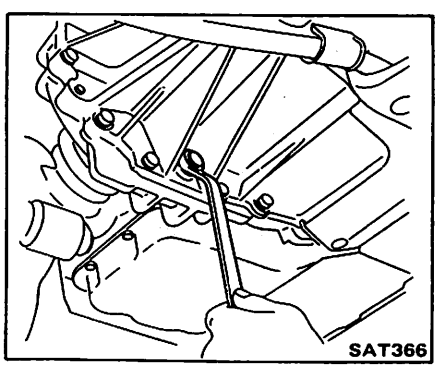
REMOVAL

In dismounting the automatic transaxle from a vehicle, proceed as follows:

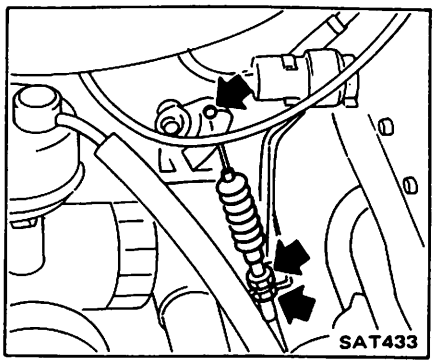
1. Disconnect battery ground cable from terminal.
2. Remove air cleaner (CD17 engine model).
3. Jack up vehicle and support it on safety stands. We recommend a hydraulic hoist or open pit be utilized, if available.

Observe all safety regulations.

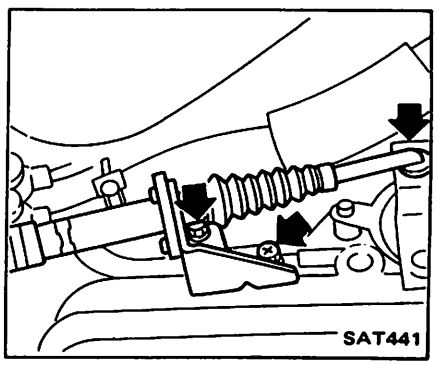
4. Remove front L.H. tire.
5. Drain oil.



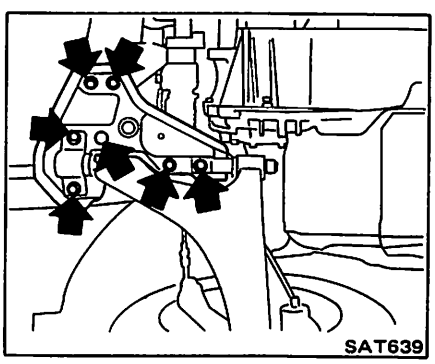
6. Remove left side fender protector.
7. Disconnect drive shafts. Refer to Drive shaft (Section FA) for removal.
8. Disconnect speedometer cable.
9. Disconnect throttle wire from throttle lever.



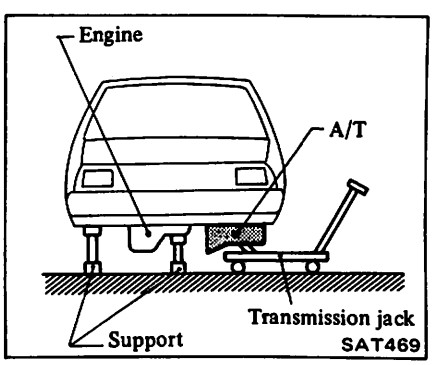
10. Remove control cable rear end from unit.



11. Remove oil level gauge tube.
12. Remove left-hand transverse link and gusset (CD17 engine model).

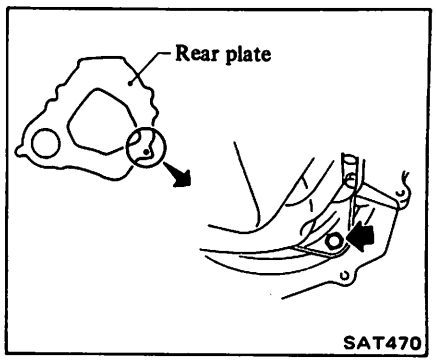


13. Place jack under transaxle and engine.



CAUTION:
Do not place the jack under the oil pan drain plug.

14. Disconnect oil cooler hoses from tubes.
15. Remove engine gusset (CD17 engine model).
16. Remove bolts securing torque converter to drive plate.



a. Remove those bolts turning crank shaft.
b. Before removing torque converter, inscribe chalk marks on two parts so that they may be replaced in their original positions during assembly.

17. Remove engine mount securing bolts.
18. Remove starter motor.
19. Remove bolts securing transaxle to engine. After removing these bolts, move the jack gradually until transaxle can be removed and take out transaxle from left side wheel house.

Plug up openings such as oil charging pipe, oil cooler tubes, etc.

CAUTION:
Take care when dismounting transaxle not to strike any adjacent parts.

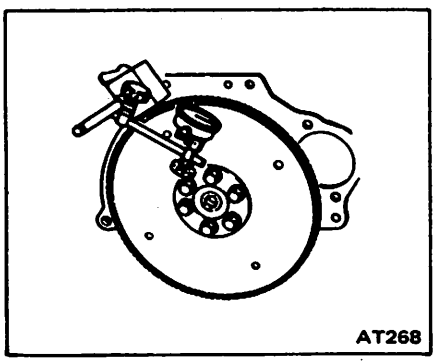
INSTALLATION

Installation of automatic transaxle on vehicle is in reverse order of removal. However, observe the following installation notes.

1. Drive plate runout

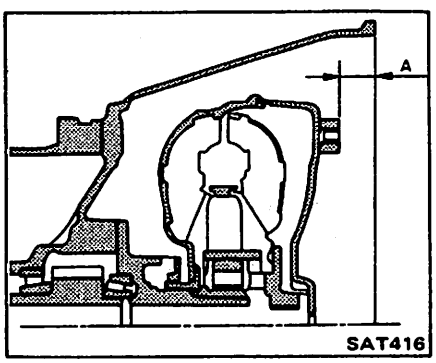
Turn crankshaft one full turn and measure drive plate runout with indicating finger of a dial gauge rested against plate.

Maximum allowable runout:
0.5 mm (0.020 in)



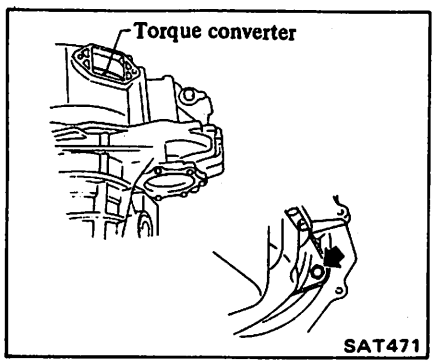
2. When connecting torque converter to transaxle, measure distance "A" to be certain that they are correctly assembled.

Distance "A":
More than 21.1 mm (0.831 in)



3. Bolt converter to drive plate.

When installing the first bolt, turn torque converter by reaching for it through hole in starter motor mounting portion on converter housing. Then align hole in drive plate with that in torque converter.



a. Align chalk marks painted across both parts during disassembly.
b. Before installing torque converter securing bolts, apply locking sealer to threads of bolts.

4. After converter is installed, rotate crankshaft several turns and check to be sure that transaxle rotates freely without binding.
5. Pour recommended automatic transaxle fluid up to correct level through oil charge pipe.
6. Connect control cable to manual shaft. Adjust control cable. Refer to Minor Adjustments.
7. Connect inhibitor switch wires.

a. Refer to page AT-13 for Inhibitor Switch Adjustment.
b. Inspect and adjust switch as above whenever it has to be removed for service.

8. Check inhibitor switch for operation:

Starter should be brought into operation only when selector lever is in "P" and "N" positions (it should not be started when lever is in "D", "2", "1" and "R" positions).

Back-up lamp should also light when selector lever is placed in "R" position.

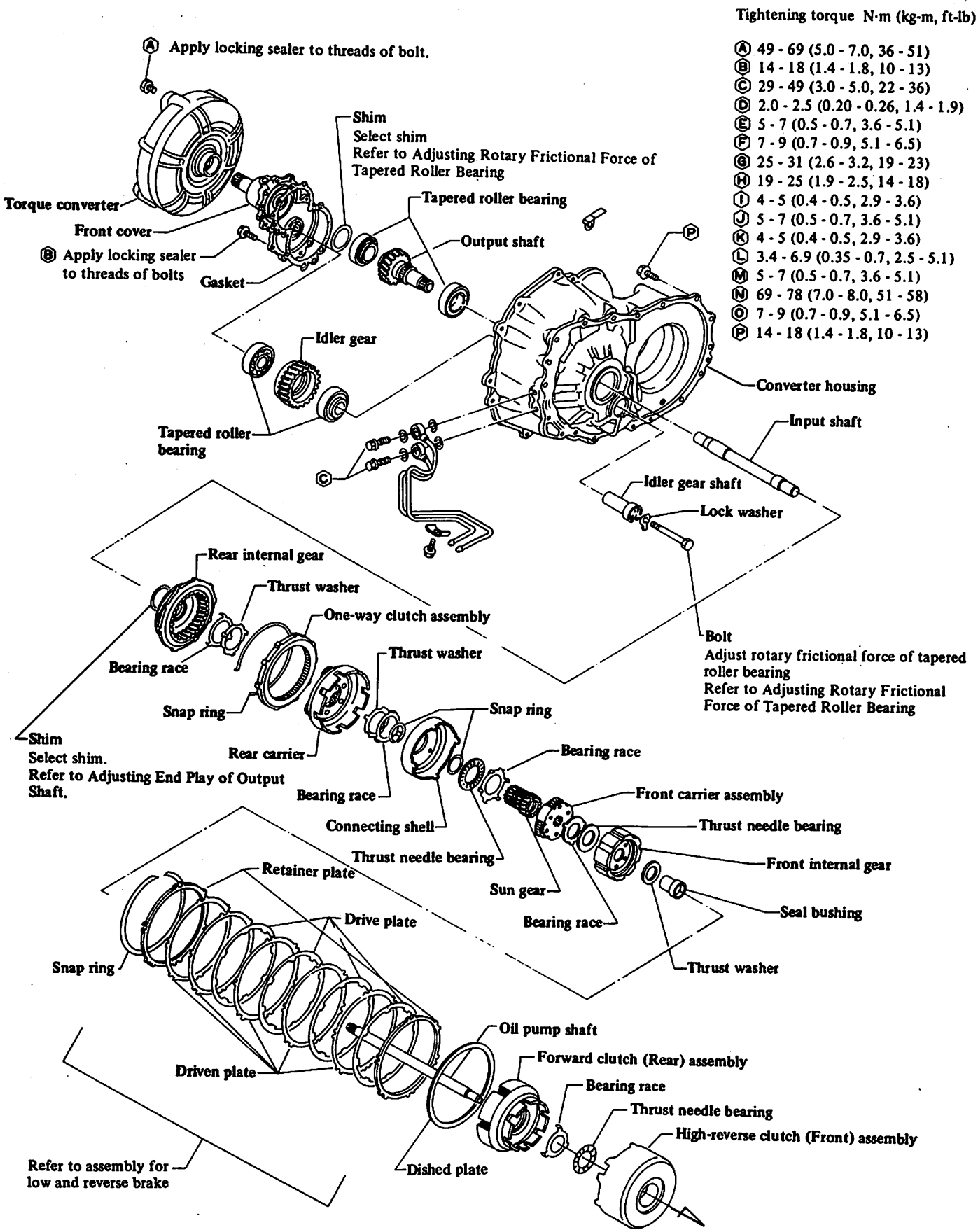
9. Check fluid level in transaxle. For detailed procedure, see page AT-2.
10. Move hand lever through all positions to be sure that transaxle operates correctly.

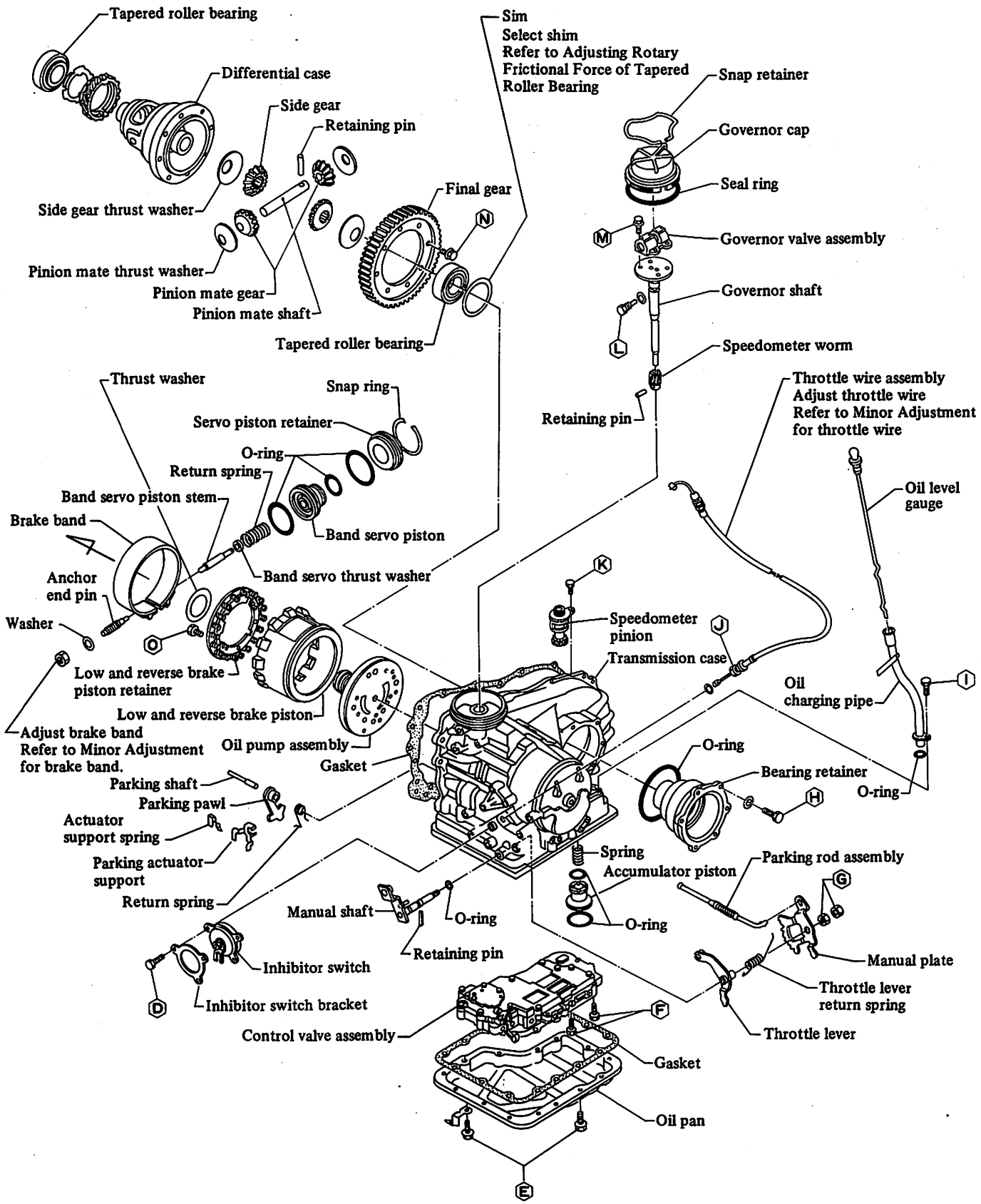
With hand brake applied, rotate engine at idling. Without disturbing the above setting, move selector lever through "N" to "D", to "2", to "1" and to "R". A slight shock should be felt by hand gripping hand lever each time transaxle is shifted.

Refer to MA section.

11. Check to be sure that line pressure is correct. To do this, refer to page AT-46 for Line Pressure Test.
12. Perform stall test as described on Page AT-47.

MAJOR OVERHAUL OPERATIONS




Tapered roller bearing
Differential case
Side gear
Retaining pin
Side gear thrust washer
Pinion mate thrust washer
Pinion mate gear
Pinion mate shaft
Final gear
N
Tapered roller bearing
Sim
Select shim
Refer to Adjusting Rotary Frictional Force of Tapered Roller Bearing
Snap retainer
Governor cap
Seal ring
M
Governor valve assembly
Governor shaft
L
Speedometer worm
Retaining pin
Throttle wire assembly
Adjust throttle wire
Refer to Minor Adjustment for throttle wire
Oil level gauge
Thrust washer
Snap ring
Servo piston retainer
O-ring
Return spring
Band servo piston stem
Brake band
Band servo piston
Band servo thrust washer
Anchor end pin
Washer
O
Low and reverse brake piston retainer
Low and reverse brake piston
Adjust brake band
Refer to Minor Adjustment for brake band.
Oil pump assembly
Gasket
K
Speedometer pinion
J
Transmission case
Oil charging pipe
I
O-ring
Bearing retainer
H
O-ring
Parking shaft
Parking pawl
Actuator support spring
Parking actuator support
Return spring
Spring
Accumulator piston
O-ring
Parking rod assembly
G
Manual shaft
O-ring
Retaining pin
Inhibitor switch
D
Inhibitor switch bracket
Control valve assembly
F
Gasket
Oil pan
E
Manual plate
Throttle lever return spring
Throttle lever

SAT613

SERVICE NOTES FOR DISASSEMBLY

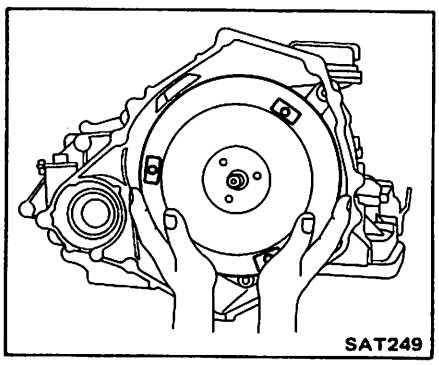
Before proceeding with disassembly, thoroughly clean the outside of the transaxle. It is important to prevent the internal parts of the transaxle from becoming contaminated by dirt or other foreign matter.

Disassembly should be done in a clean work area.

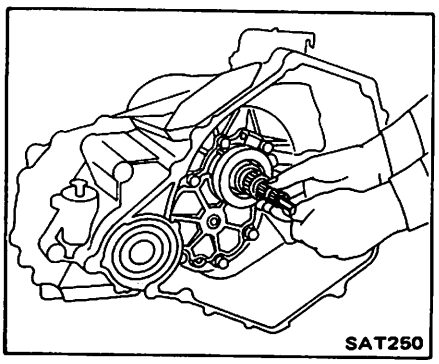
Use a nylon cloth or paper towel for wiping parts clean. Common shop rags can leave lint that might interfere with the transaxle's operation.

DISASSEMBLY

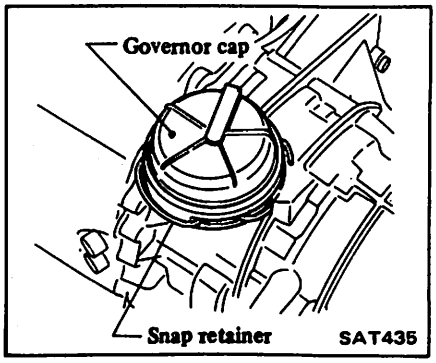
1. Remove hexagon plug, then drain transaxle fluid from plug hole.
2. Remove torque converter.



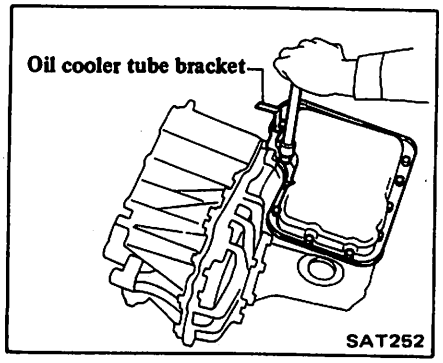
3. Remove oil pump shaft and input shaft.



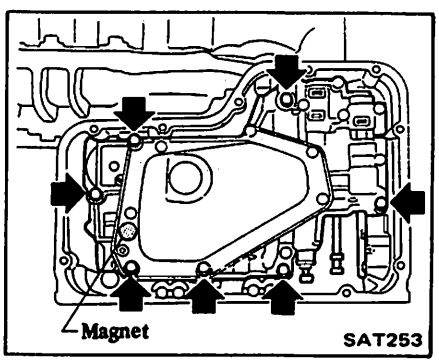
4. Remove snap retainer, governor cap with breather hose and O-ring.



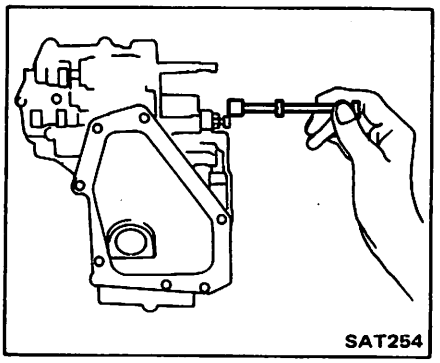
5. Remove oil pan guard and oil pan and inspect its contents. An analysis of any foreign matter can indicate the types of problems to look for. If the fluid is very dark, smells burned, or contains foreign particles, the frictional material (clutches, band.) may need replacement. A tacky film that will not wipe clean indicates varnish build up which can cause valves, servo, and clutches to stick and may inhibit pump pressure.



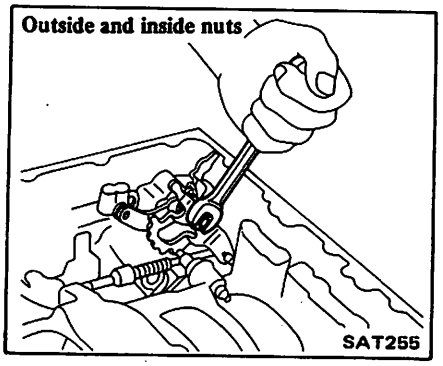
6. Remove control valve body and magnet.



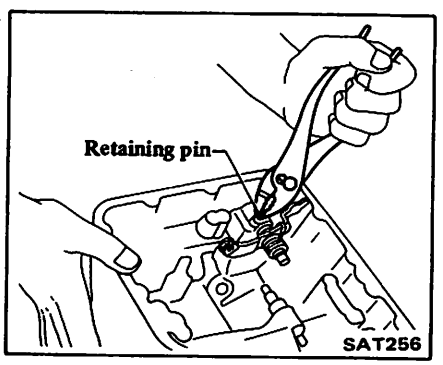
Remove manual valve from valve body as a precaution, to prevent valve from dropping out accidentally.



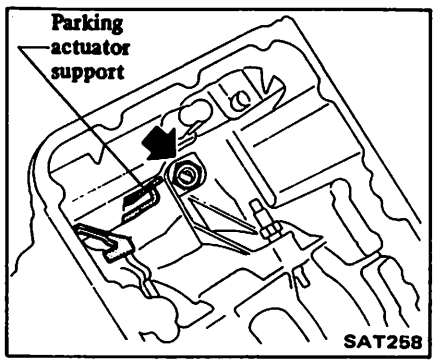
7. Remove manual shaft securing nuts.



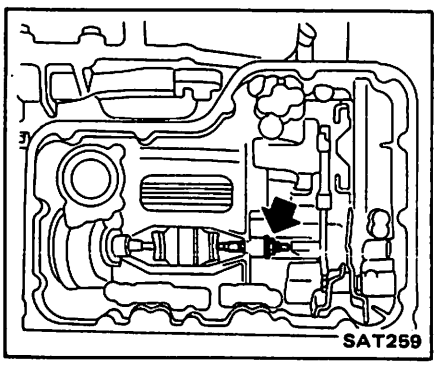
8. Pull out retaining pin, then remove throttle lever, manual plate, manual shaft, selector range lever and parking rod assembly.



9. Disconnect throttle wire from throttle lever, then remove throttle wire. Remove parking actuator support from transmission case.

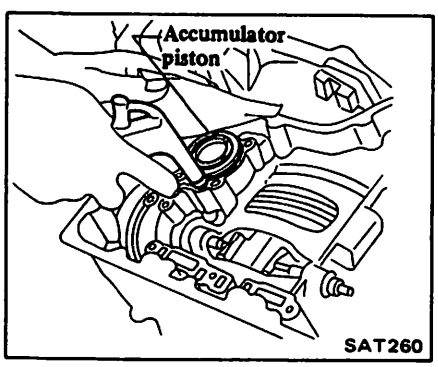


10. Loosen band brake piston stem lock nut, then back off piston stem.

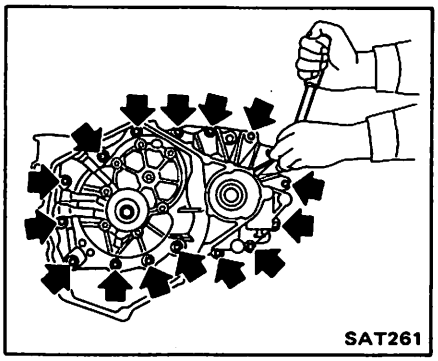


11. Remove accumlator piston with compressed air.

Be careful that accumulator piston does not jump out.

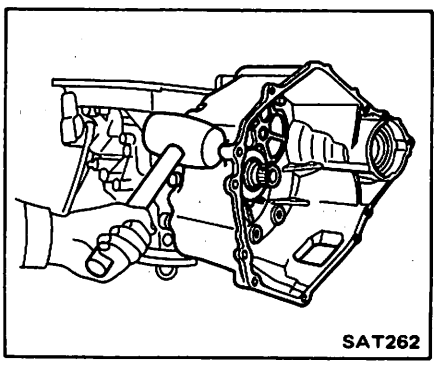


12. Remove converter housing securing bolts.

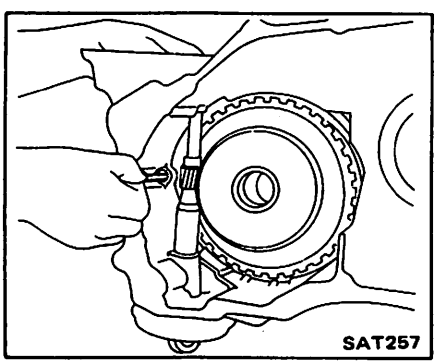


13. Separate converter housing from transmission case by tapping it.

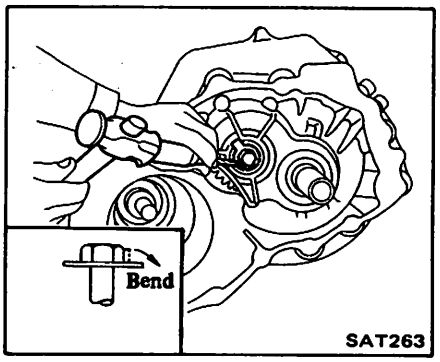
Be careful not to drop final drive assembly.



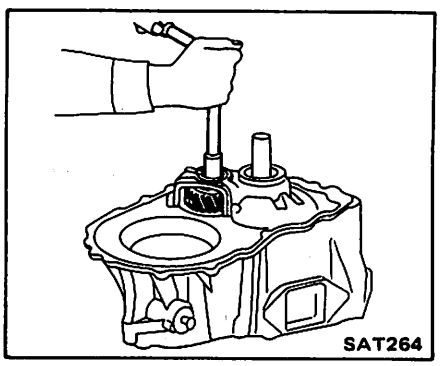
14. Remove final drive assembly.
15. Pull out parking pawl shaft, then remove parking pawl and return spring.



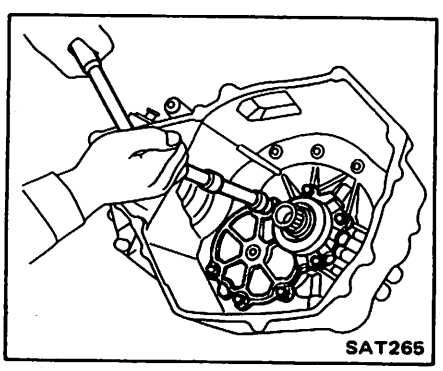
16. Straighten lock washer.



17. Remove idler gear bolt and lock washer.

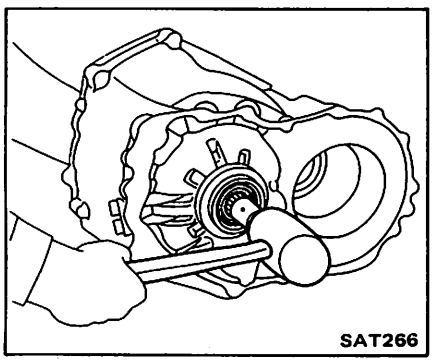


18. Remove front cover retaining bolts.

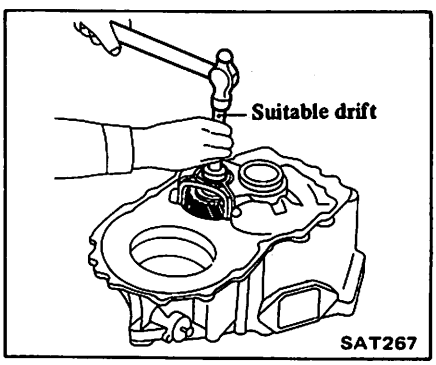


19. Tap output shaft, then remove it together with front cover.

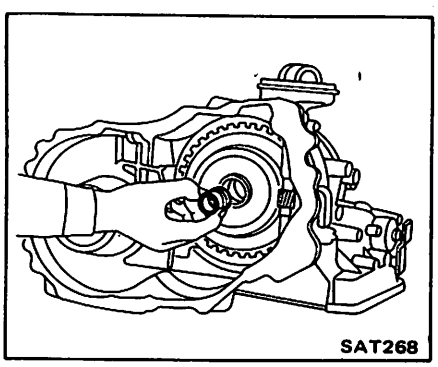
a. When tapping output shaft, be sure to hold front cover so that it does not fall.
b. Adjusting shim is attached to rear internal gear side of output shaft so be careful not to lose it.



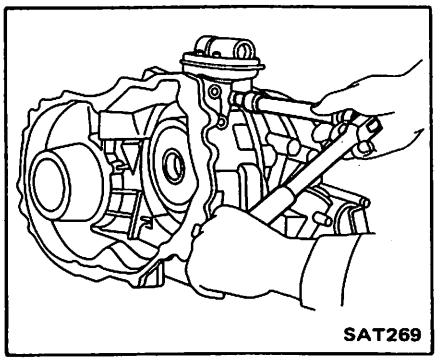
20. Remove front cover gasket.
21. Remove idler gear, idler gear shaft and taper roller bearings by tapping idler gear shaft.



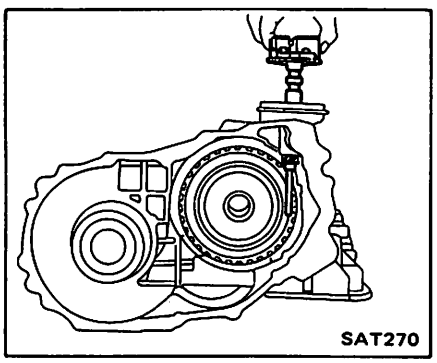
22. Remove seal bushing.



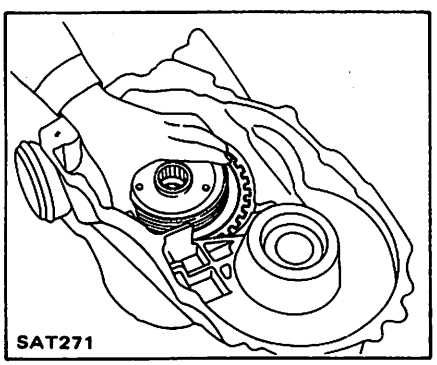
23. Remove governor shaft retaining bolt.



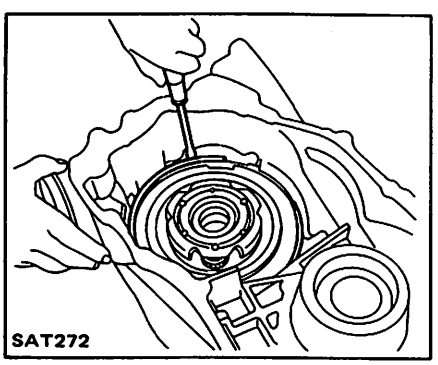
24. Pull out governor shaft.



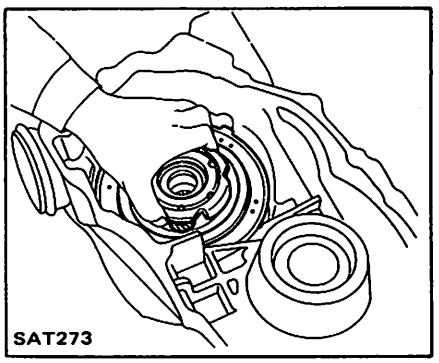
25. Remove rear internal gear, bearing race and thrust washer.



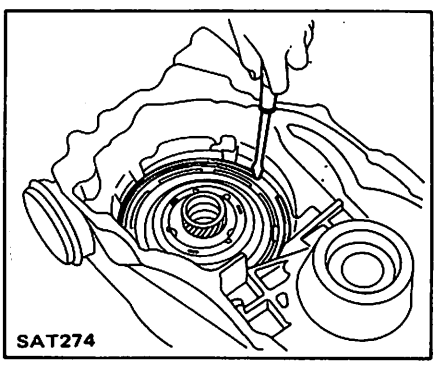
26. Remove one-way clutch snap ring.



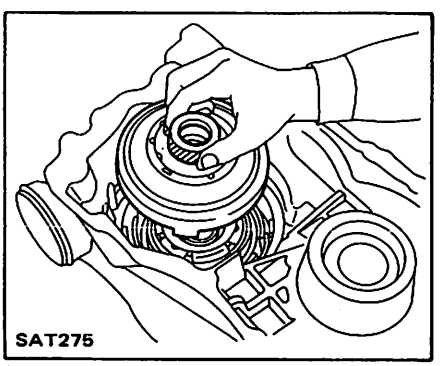
27. Remove one-way clutch assembly together with rear carrier assembly.



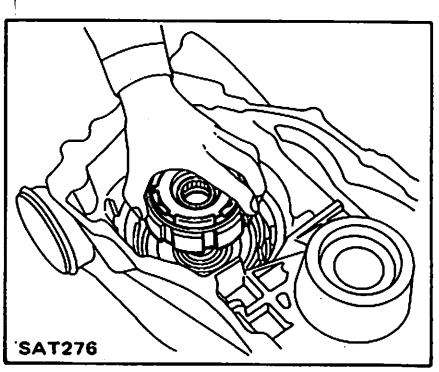
28. Remove bearing race and thrust washer.
29. Remove low and reverse brake snap ring.



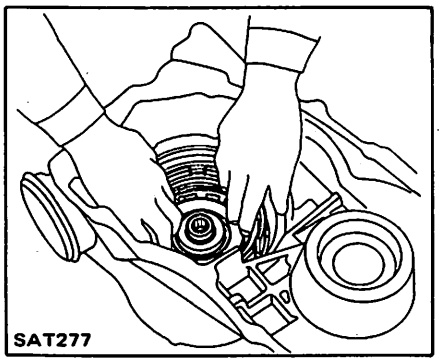
30. Remove shell & sun gear assembly, thrust needle bearing and bearing race.



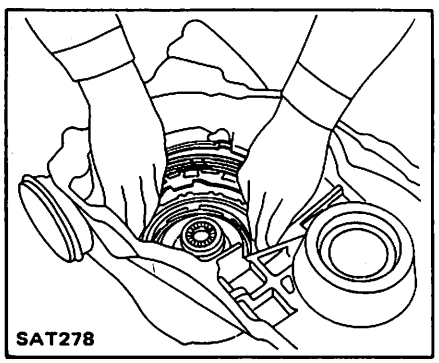
31. Remove front carrier assembly together with front internal gear.



32. Remove forward clutch (Rear) assembly and plastic thrust washer.

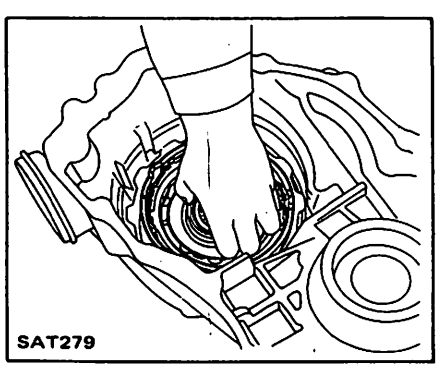


33. Remove low and reverse brake retaining plate, driven plates and drive plates at the same time.

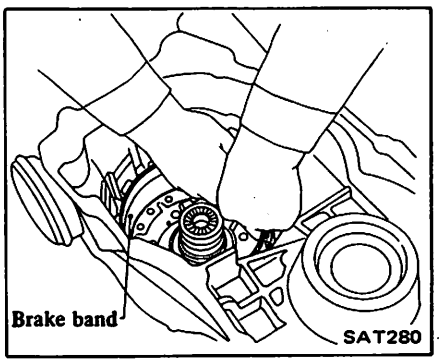


34. Remove high-reverse clutch (Front) assembly by turning it.

Check seal rings to ensure that they have not expanded. If they have, high-reverse clutch (Front) assembly will be hard to remove. If it is forcibly removed, seal rings may be damaged.

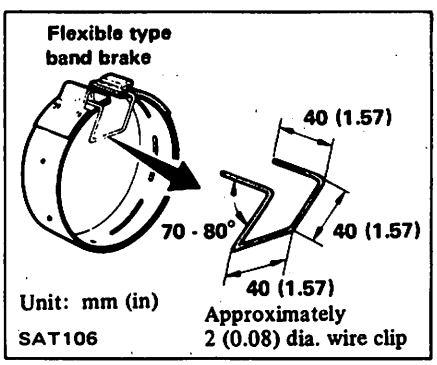


35. Remove brake band.

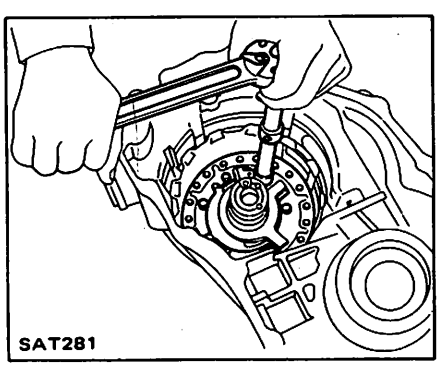


To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. Before removing the brake band, always secure it with a clip as shown in the figure below.

Leave the clip in position after removing the brake band.

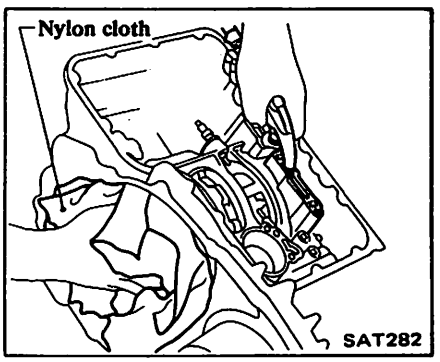


36. Remove low and reverse brake retainer.

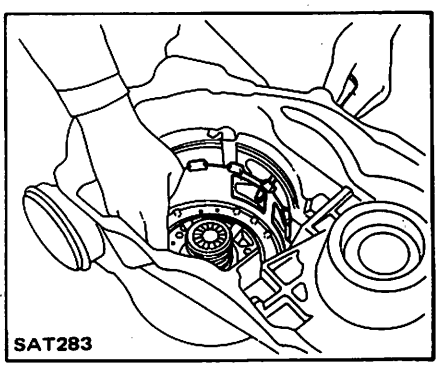


37. Remove low and reverse brake piston with compressed air.

Be sure to hold low and reverse brake piston with nylon cloth so that they do not jump out.

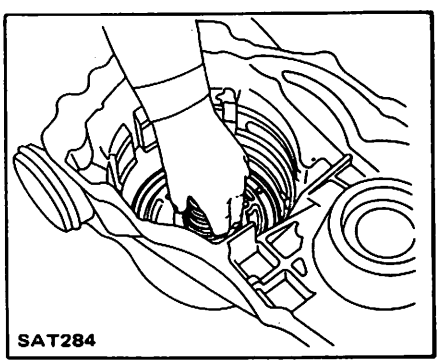


If compressed air is not available, remove it with a screwdriver.

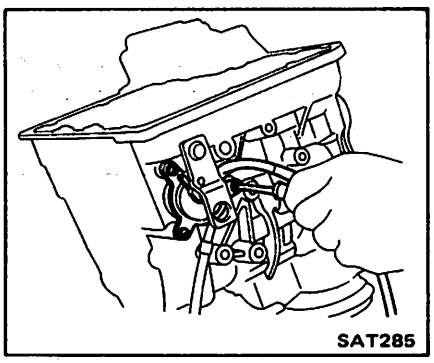


38. Remove oil pump assembly, thrust washer and thrust needle bearing.

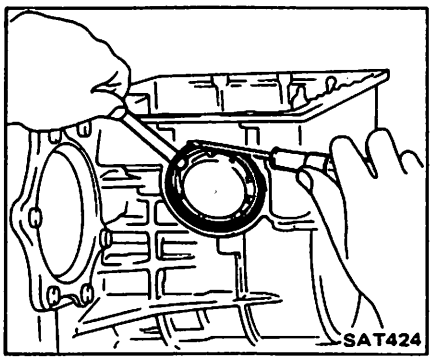
The oil pump and transmission case fit loosely, but the clearance is very small. So always lift it straight out of transmission case.



39. Remove inhibitor switch.



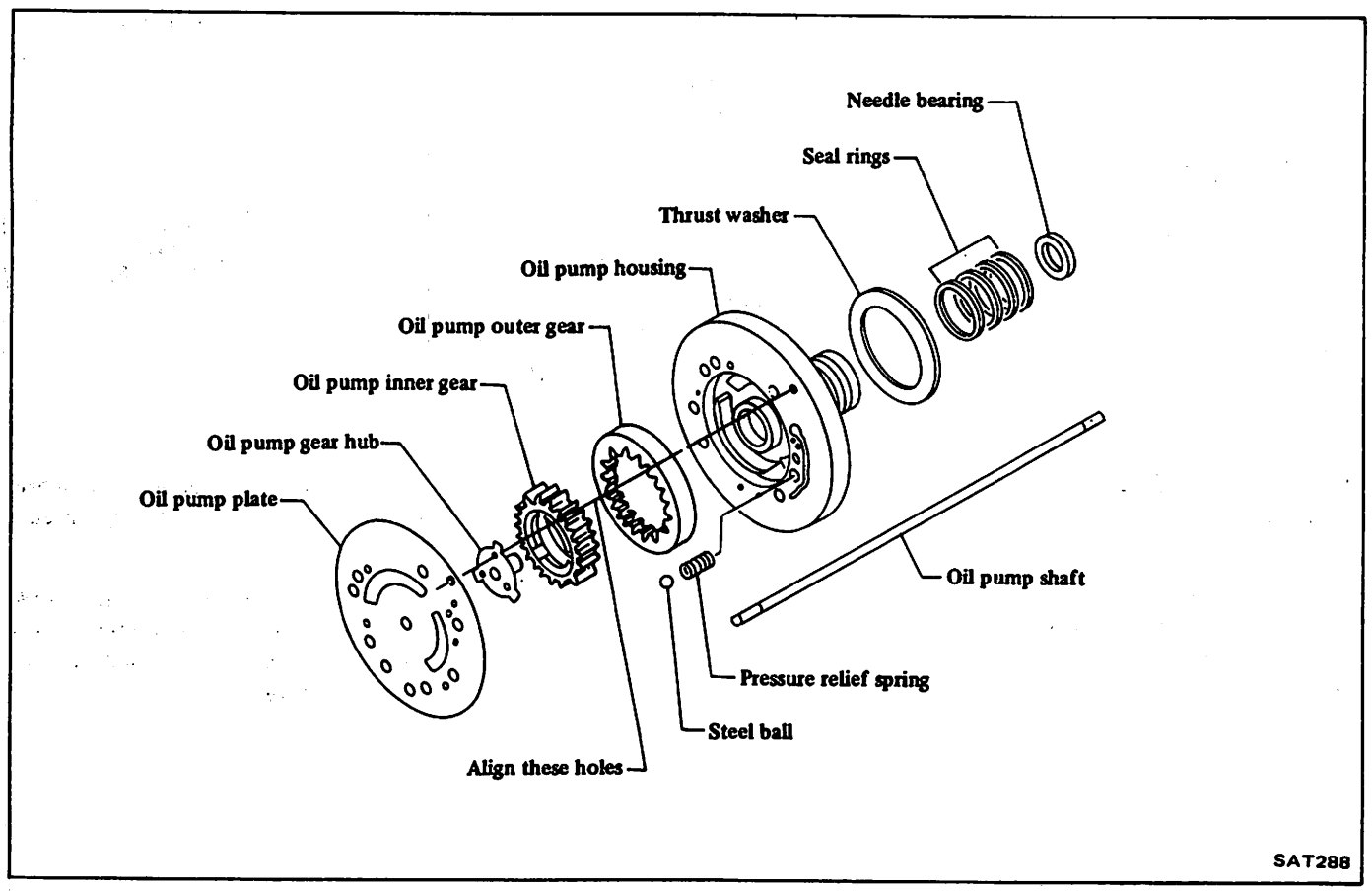
40. Remove band servo piston and return spring. Then, transmission case can be removed.



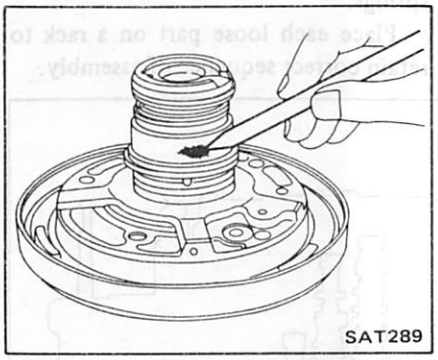
COMPONENT PARTS

The transaxle consists of many small parts that are quite alike in construction yet machined to very close tolerances. When disassembling parts, be sure to place them in order in parts rack so they can be put back in the unit in their proper positions. All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspeciton or reassembly. Gaskets, seals, and similar parts should be replaced. It is also very important to perform functional tests whenever it is designated.

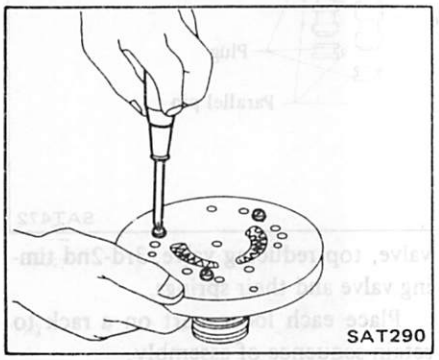
OIL PUMP



1. Inspect oil pump body, oil pump shaft and ring groove areas for wear.



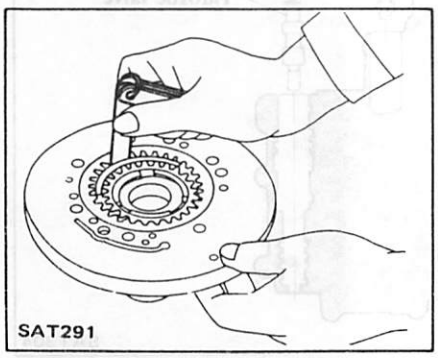
2. Remove oil pump plate.



3. Inspect gears and all internal surfaces for faults and visible wear.
4. Measure clearance between outer gear and crescent.

Standard clearance:
0.20 - 0.30 mm
(0.0079 - 0.0118 in)

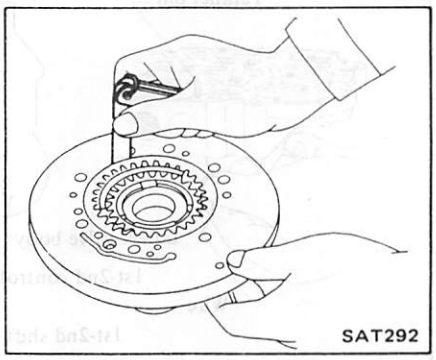
Repalce if the clearance exceeds **0.35 mm (0.0138 in).**



5. Measure clearance between outer gear and pump housing.

Standard clearance:
0.20 - 0.30 mm
(0.0079 - 0.0118 in)

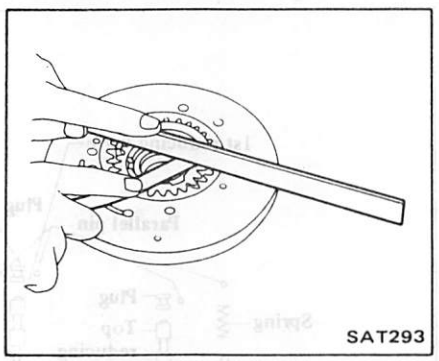
Replace if the clearance exceeds **0.35 mm (0.0138 in).**



6. Using a feeler gauge and straight edge, measure clearance between gears and pump plate.

Standard clearance:
0.02 - 0.04 mm
(0.0008 - 0.0016 in)

Replace if the clearance exceeds **0.08 mm (0.0031 in).**

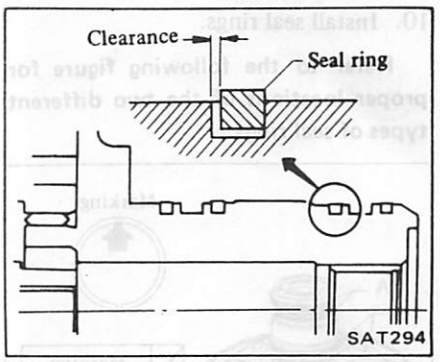


7. Measure clearance between seal ring and ring groove.

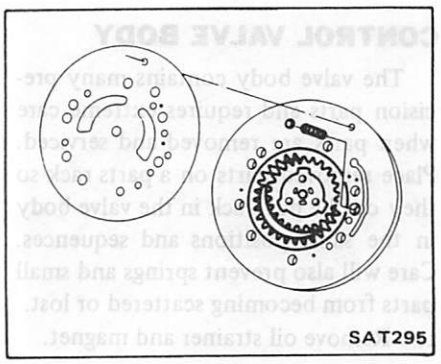
Standard clearance:
0.10 - 0.25 mm
(0.0039 - 0.0098 in)

Replace if the clearance exceeds **0.25 mm (0.0098 in).**

Of course, it is good practice to replace all seal rings during an overhaul.

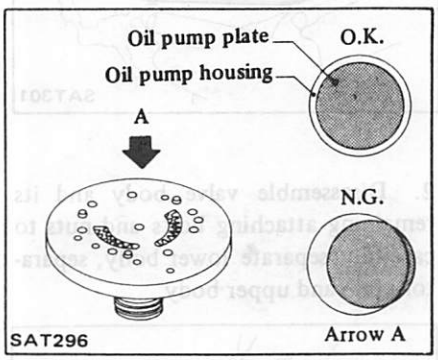


8. Install oil pump gear hub, pressure relief spring and steel ball onto oil pump housing.



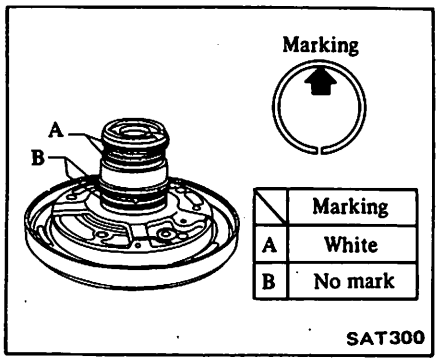
9. Install oil pump plate.

Do not allow periphery of oil pump plate to protrude beyond periphery of oil pump housing.



10. Install seal rings.

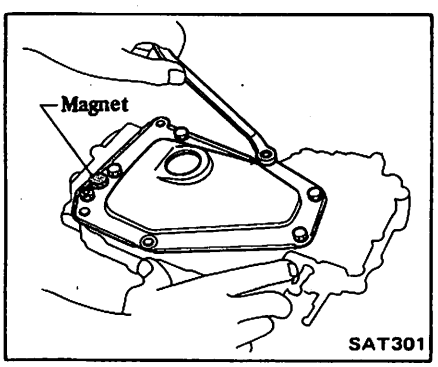
Refer to the following figure for proper locations of the two different types of seal rings.



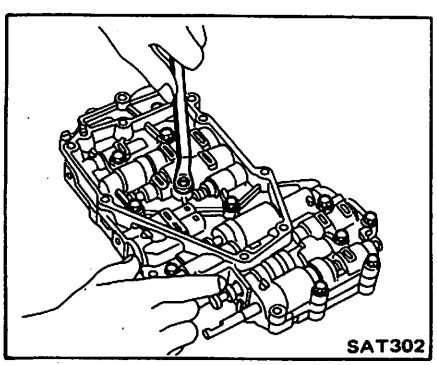
CONTROL VALVE BODY

The valve body contains many precision parts and requires extreme care when parts are removed and serviced. Place removed parts on a parts rack so they can be put back in the valve body in the same positions and sequences. Care will also prevent springs and small parts from becoming scattered or lost.

1. Remove oil strainer and magnet.

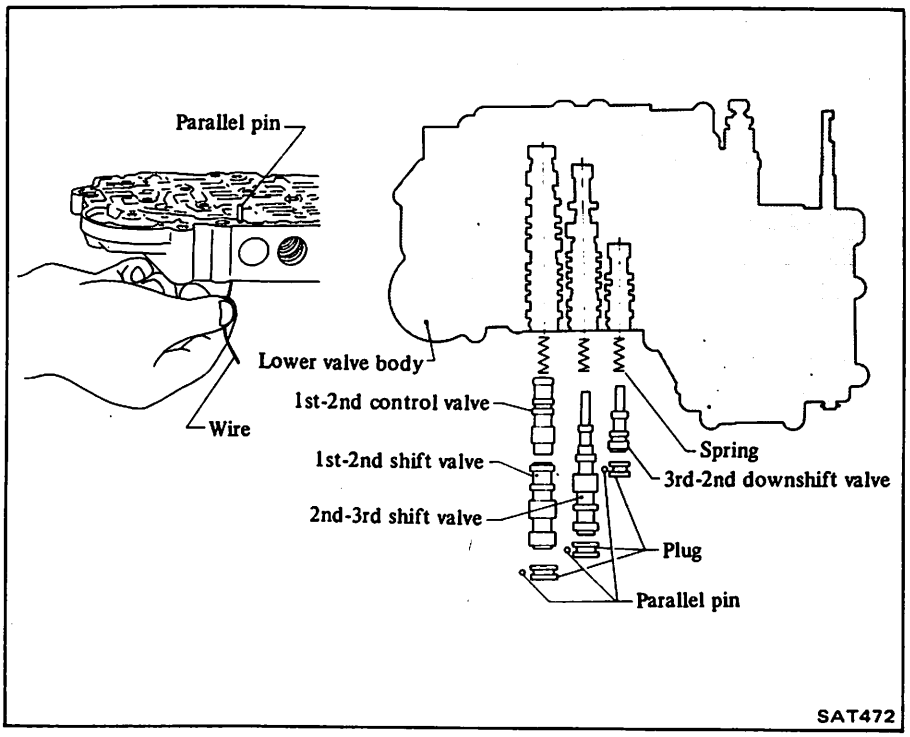


2. Disassemble valve body and its remaining attaching bolts and nuts to carefully separate lower body, separator plate and upper body.



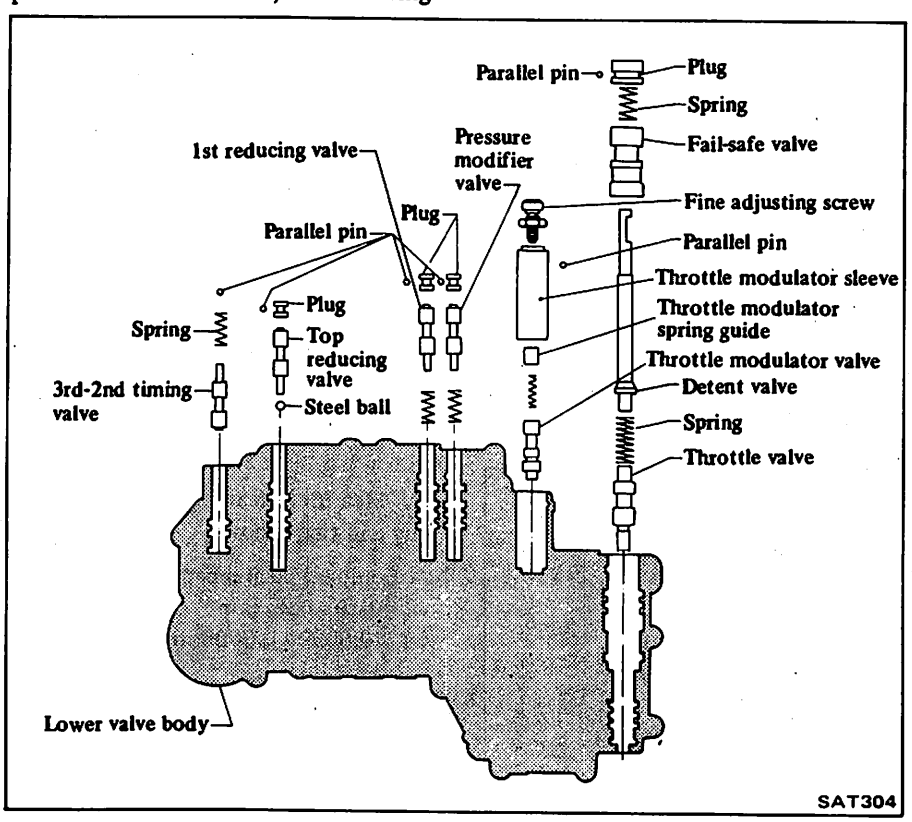
3. During valve body separation, do not lose the 6 steel balls on valve upper body.
4. Remove parallel pins with wire, then remove plugs, 3rd-2nd downshift valve, 2nd-3rd shift valve, 1st-2nd shift valve, 1st-2nd control valve and their springs.

Place each loose part on a rack to retain correct sequence of assembly.



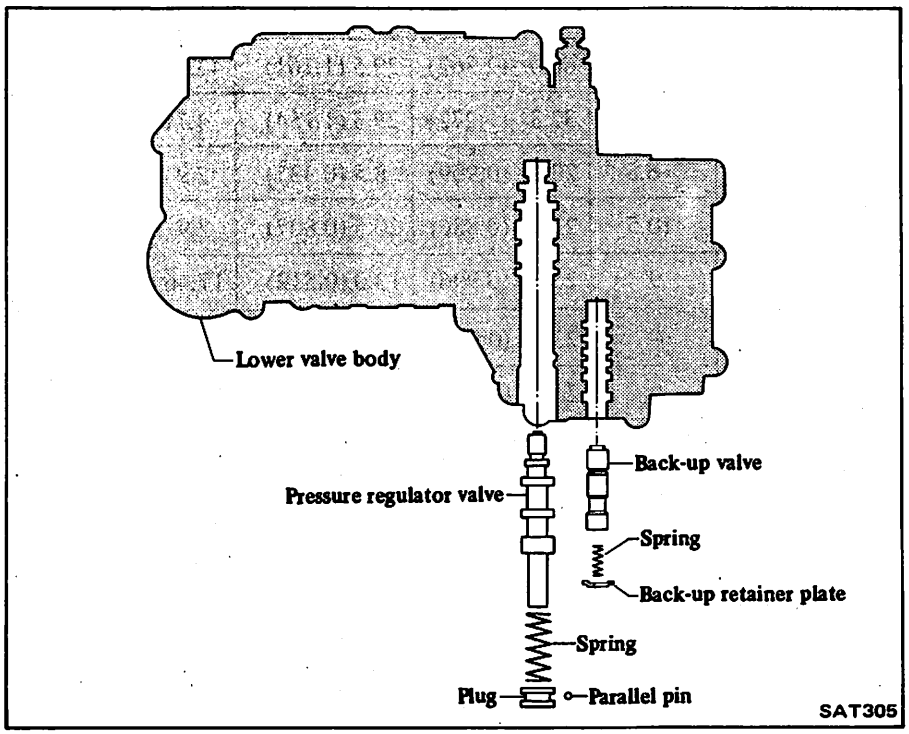
5. Remove parallel pins with wire, then remove plugs, fail-safe valve, throttle valve, detent valve, throttle modulator valve with spring guide, pressure modifier valve, 1st reducing valve, top reducing valve, 3rd-2nd timing valve and their springs.

Place each loose part on a rack to retain sequence of assembly.



6. Remove back up valve retaining plate by pressing its spring with small screwdriver. Remove parallel pin, then remove plug, pressure regulator valve and its spring.

Place each loose part on a rack to retain sequence of assembly.



Manual valve was removed when valve body was removed from transaxle. Include valve in subsequent inspection and service sequence.

Precaution for inspection

A newly manufactured valve body represents precision manufactured valves assembled with close tolerances into precision bores of the valve body. If inspection reveals excessive clearances, 0.03 mm (0.0012 in) or more, between the valves and the valve body bores, replace the entire valve body rather than attempt rework.

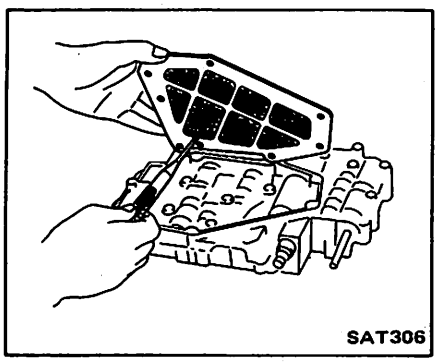
If one or more valves are sticking from varnish deposits or burns resulting from deteriorated oil or overheating, you may be able to clean the valves and valve bodies. **Always use crocus cloth,** which is a very fine type of cutting material. **Never use emery cloth,** as it is too coarse and can scratch the valves or valve bores. Scratches can lead to future deposits of varnish or foreign matter.

During cleaning, do not remove the sharp edges of the valve. When edges are rounded or scratched, entry is provided for dirt or foreign matter to work into the sides of the valves and hinder valve movement.

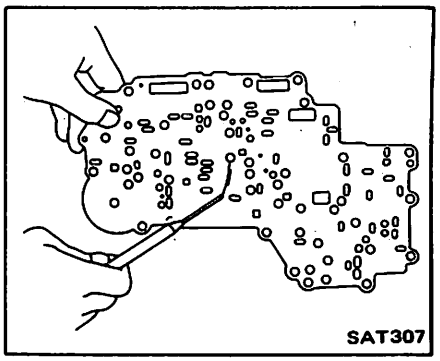
The valves may be cleaned using alcohol or lacquer thinner. The valve bodies can be dip cleaned with a good carburetor cleaner or lacquer thinner. **Do not leave valve bodies submerged in carburetor cleaner longer than five minutes. Rinse parts thoroughly and dry.**

Lubricate all parts in clean automatic transaxle fluid before reassembly.

7. Check valves for signs of burning. Replace if beyond clean-up.
8. Check oil strainer for general condition. Replace if necessary.

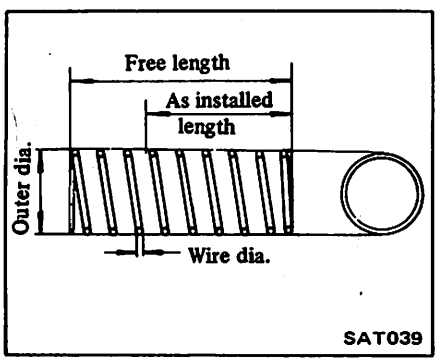


9. Check separator plate for scratches or damage. Replace if necessary. Scratches or score marks can cause oil to bypass correct oil passages and result in system malfunction.



10. Check oil passages in upper and lower valve bodies for varnish deposits, scratches or other damage that would impair valve movement. Check threaded holes and related bolts and screws for stripped threads; replace as needed.
11. Test valve springs for weakened load condition. Refer to Valve Body Spring Chart for spring specifications.

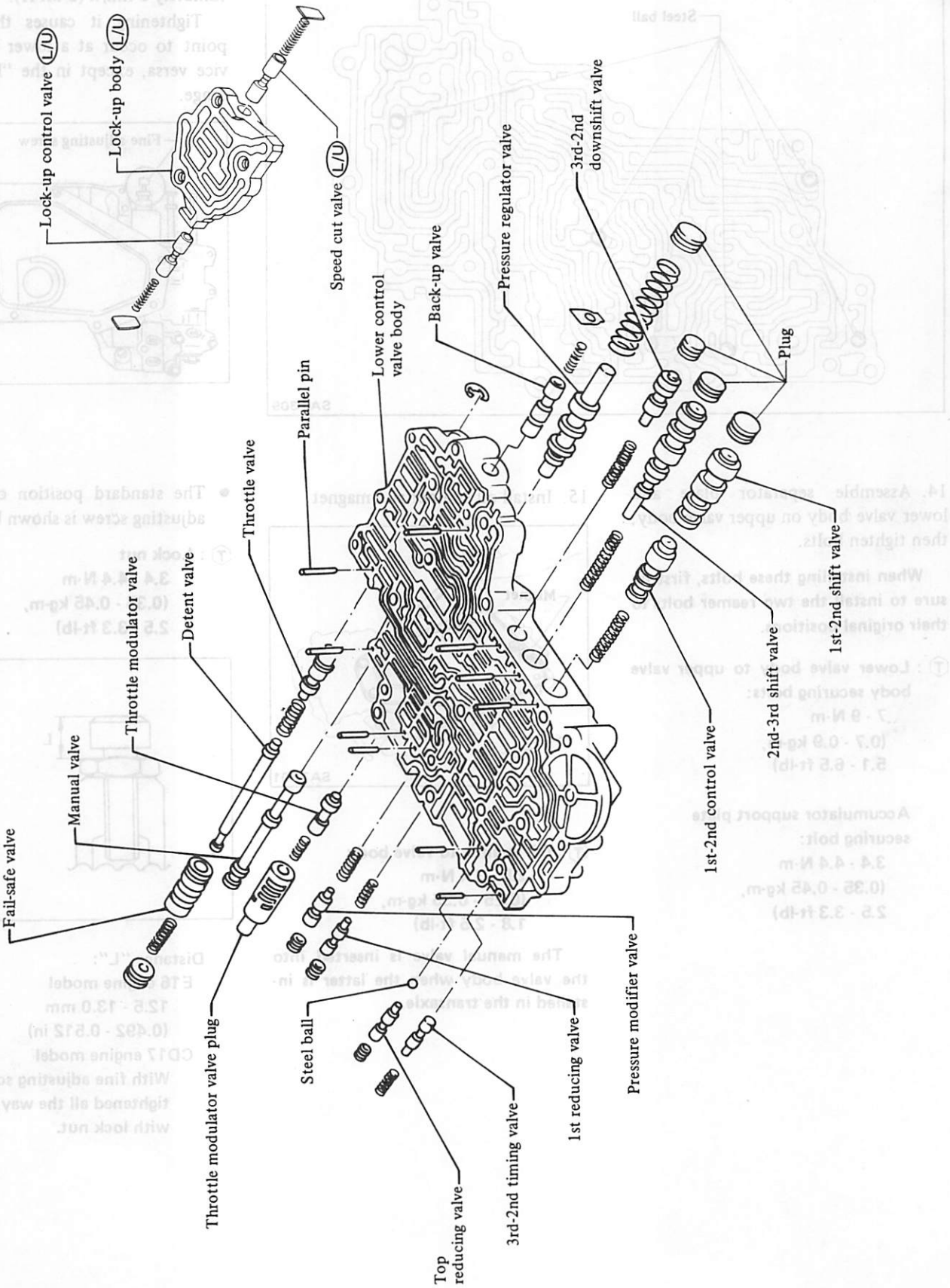
Valve body spring chart



Valve spring	Wire dia. mm (in)	Outer coil dia. mm (in)	No. of active coils	Free length mm (in)	Installed	
					Length mm (in)	Load N (kg, lb)
Manual detent	1.2 (0.047)	7.2 (0.283)	16	31.9 (1.256)	25 (0.98)	37.76 (3.85, 8.49)
Pressure regulator valve	1.4 (0.055)	15.4 (0.606)	10	60.0 (2.362)	29.5 (1.161)	43.35 (4.42, 9.75)
Throttle valve	1.0 (0.039)	10.0 (0.394)	9.4	32.3 (1.272)	29.3 (1.154)	4.71 (0.48, 1.06)
Fail-safe valve	0.6 (0.024)	10.6 (0.417)	6.5	23.1 (0.909)	8.5 (0.335)	2.9 (0.3, 0.7)
Throttle modulator valve	0.6 (0.024)	5.1 (0.201)	10.5	22.5 (0.886)	20.5 (0.807)	2.9 (0.3, 0.7)
Pressure modifier valve*	0.8 (0.031)	7.8 (0.307)	9	25.3 (0.996)	13.0 (0.512)	17.46 (1.78, 3.92)
	0.8 (0.031)	7.8 (0.307)	9	23.6 (0.929)	13.0 (0.512)	15.00 (1.53, 3.37)
	0.8 (0.031)	7.8 (0.307)	9	21.8 (0.858)	13.0 (0.512)	12.55 (1.28, 2.82)
1st reducing valve	0.75 (0.0295)	6.75 (0.2657)	9	21.4 (0.843)	13.0 (0.512)	14.81 (1.51, 3.33)
3rd-2nd timing valve	0.75 (0.0295)	6.75 (0.2657)	9	20.6 (0.811)	13.0 (0.512)	12.36 (1.26, 2.78)
Back up valve	0.5 (0.020)	5.5 (0.217)	7	18.8 (0.740)	12.0 (0.472)	4.9 (0.5, 1.1)
1st-2nd shift valve	0.65 (0.0256)	6.65 (0.2618)	16	37.3 (1.469)	18.0 (0.709)	10.8 (1.1, 2.4)
2nd-3rd shift valve	0.8 (0.031)	7.8 (0.307)	17	45.4 (1.787)	22.5 (0.886)	17.26 (1.76, 3.88)
3rd-2nd downshift valve	0.55 (0.0217)	7.55 (0.2972)	12	38.9 (1.531)	18.0 (0.709)	4.71 (0.48, 1.06)
Speed cut valve (L/U)	0.65 (0.0256)	5.65 (0.2224)	11	19.9 (0.783)	12.0 (0.472)	11.18 (1.14, 2.51)
Lock-up control valve (L/U)	0.6 (0.024)	5.6 (0.220)	11	21.6 (0.850)	12.0 (0.472)	9.12 (0.93, 2.05)

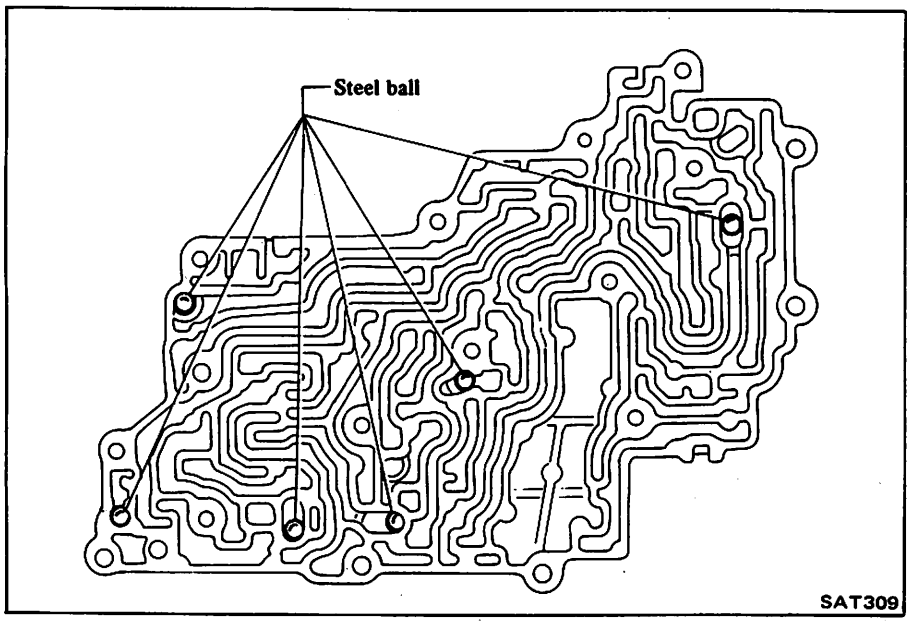
*** Ensure that the new pressure modifier valve spring is the same type as the one which was removed.**

12. Assemble all parts into lower valve body in the reverse order of disassembly.



SAT473

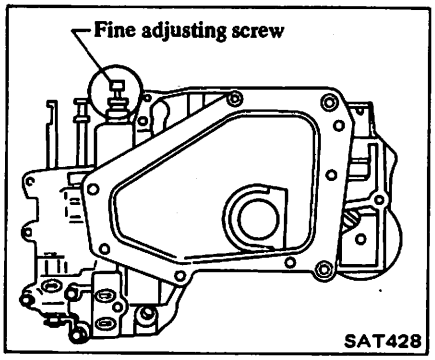
13. Reinstall the six steel balls in upper valve body.



Fine adjusting screw

The fine adjusting screw provides a maximum fine adjustment of approximately 5 km/h (3 MPH).

Tightening it causes the shifting point to occur at a lower point, and vice versa, except in the "kickdown" range.



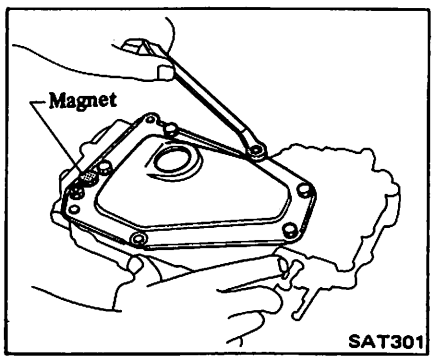
14. Assemble separator plate and lower valve body on upper valve body, then tighten bolts.

When installing these bolts, first be sure to install the two reamer bolts to their original positions.

Ⓣ : Lower valve body to upper valve body securing bolts:
7 - 9 N·m
(0.7 - 0.9 kg-m,
5.1 - 6.5 ft-lb)

Accumulator support plate securing bolt:
3.4 - 4.4 N·m
(0.35 - 0.45 kg-m,
2.5 - 3.3 ft-lb)

15. Install oil strainer and magnet.

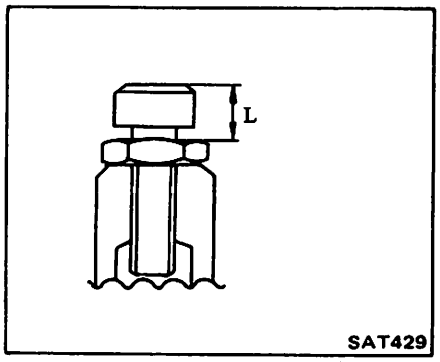


Ⓣ : Oil strainer to valve body
2.5 - 3.4 N·m
(0.25 - 0.35 kg-m,
1.8 - 2.5 ft-lb)

The manual valve is inserted into the valve body when the latter is installed in the transaxle.

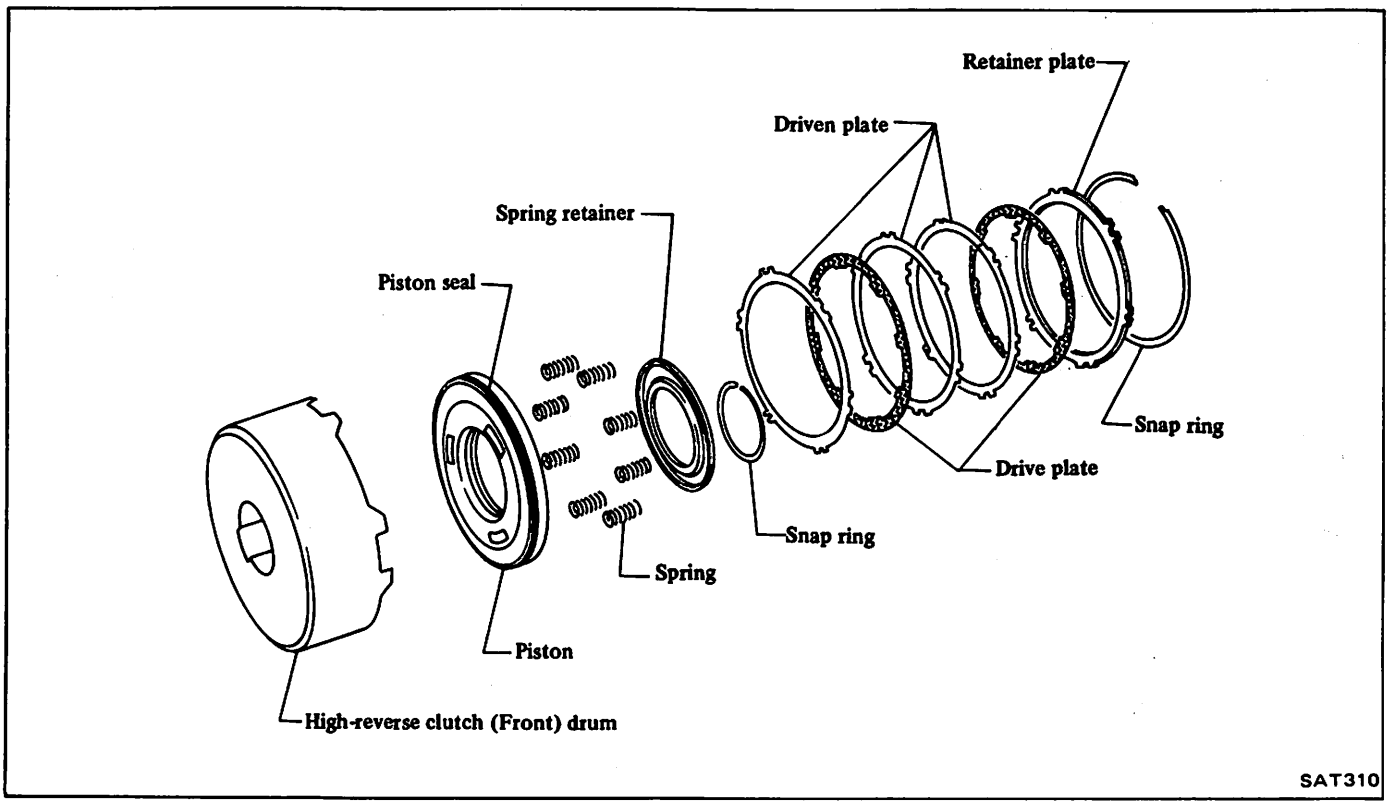
- The standard position of the fine adjusting screw is shown below.

Ⓣ : Lock nut
3.4 - 4.4 N·m
(0.35 - 0.45 kg-m,
2.5 - 3.3 ft-lb)

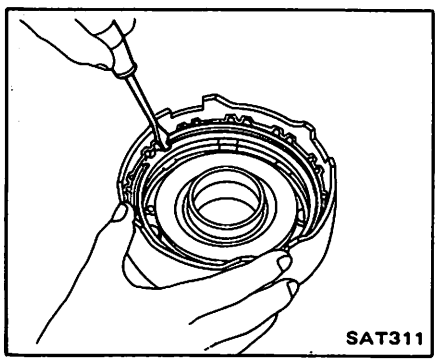


Distance "L":
E16 engine model
12.5 - 13.0 mm
(0.492 - 0.512 in)
CD17 engine model
With fine adjusting screw tightened all the way, secure with lock nut.

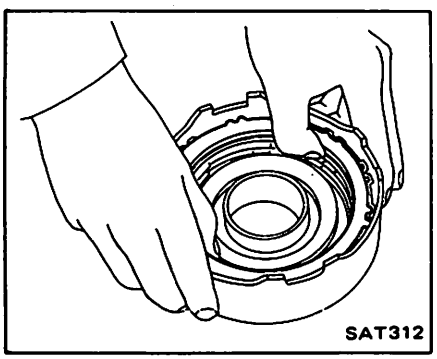
HIGH-REVERSE CLUTCH (Front)



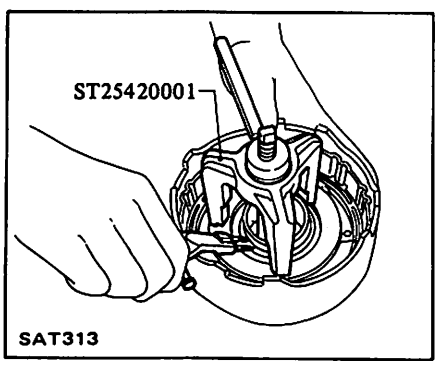
1. Using a screwdriver, remove large clutch retaining plate snap ring.



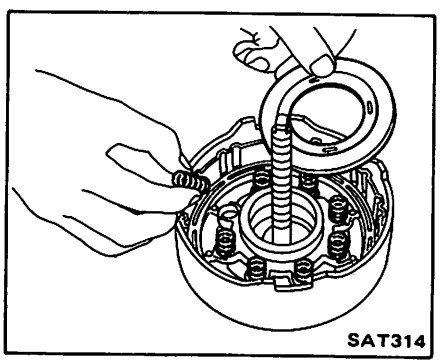
2. Remove clutch plates assembly.



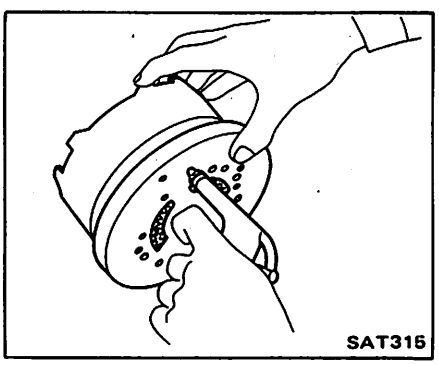
3. Compress clutch springs and remove snap ring from spring retainer.



4. Remove spring retainer and springs.



5. For easy removal of piston from drum, use an air gun with a tapered rubber tip to carefully apply air pressure to loosen piston from drum.



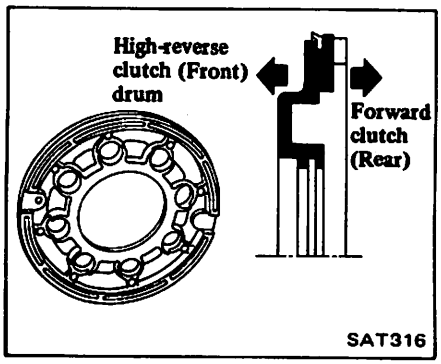
6. Check clutch drive plate facing for wear or damage. Drive plate thickness must not be less than **1.4 mm (0.055 in)**.

Standard drive plate thickness:
1.50 - 1.65 mm
(0.0591 - 0.0650 in)

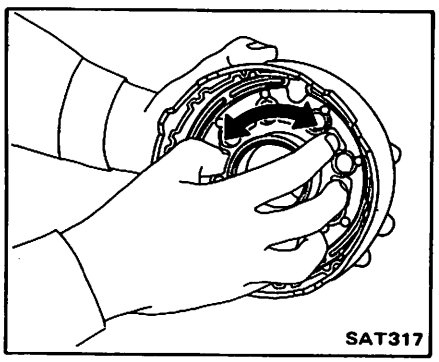
7. Check for wear on snap ring, weak or broken coil springs, and warped spring retainer.

8. Lubricate clutch drum bushing, and install inner seal and piston seal as illustrated. *Be careful not to stretch seals during installation.*

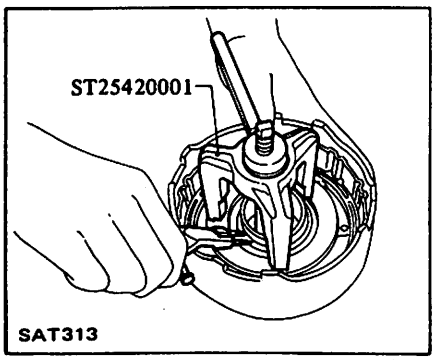
a. Never assemble clutch dry; always lubricate its components thoroughly.
b. Always install piston seal in direction shown in figure below.



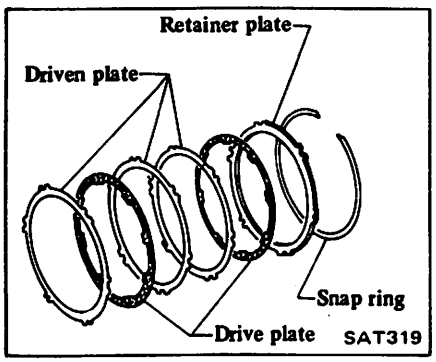
9. Assemble piston, being careful not to allow seal to kink or become damaged during installation. After installing, turn piston by hand to ensure that there is no binding.



10. Reassemble springs and retainer. Reinstall snap ring. Be sure snap ring is properly seated.



11. Now install driven plates (steel plate) and drive plates (friction plate) in the order shown below. Now install retainer plate and snap ring.



12. Measure clearance between retainer plate and snap ring.

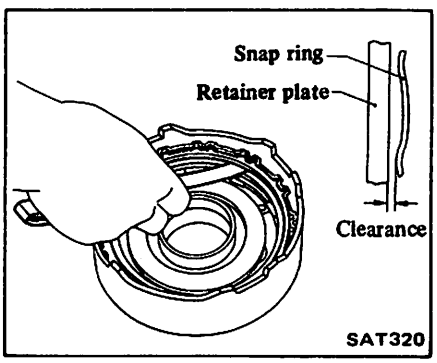
Always measure the existing minimum clearance, since snap ring is a wave type.

Specified clearance:
Standard
1.0 - 1.4 mm (0.039 - 0.055 in)
Allowable limit
2.2 mm (0.087 in)

If necessary, try other retaining plates having different thicknesses until correct clearance is obtained.

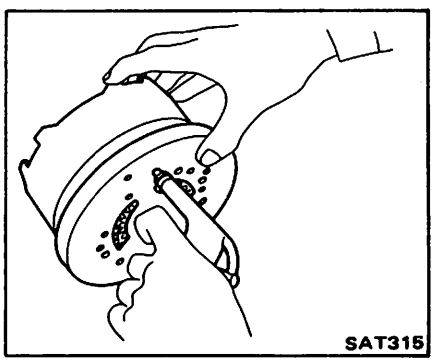
Available retainer plate

Thickness mm (in)	Part number
3.4 (0.134)	31537-01X05
3.6 (0.142)	31537-01X00
3.8 (0.150)	31537-01X01
4.0 (0.157)	31537-01X02
4.2 (0.165)	31537-01X03
4.4 (0.173)	31537-01X04

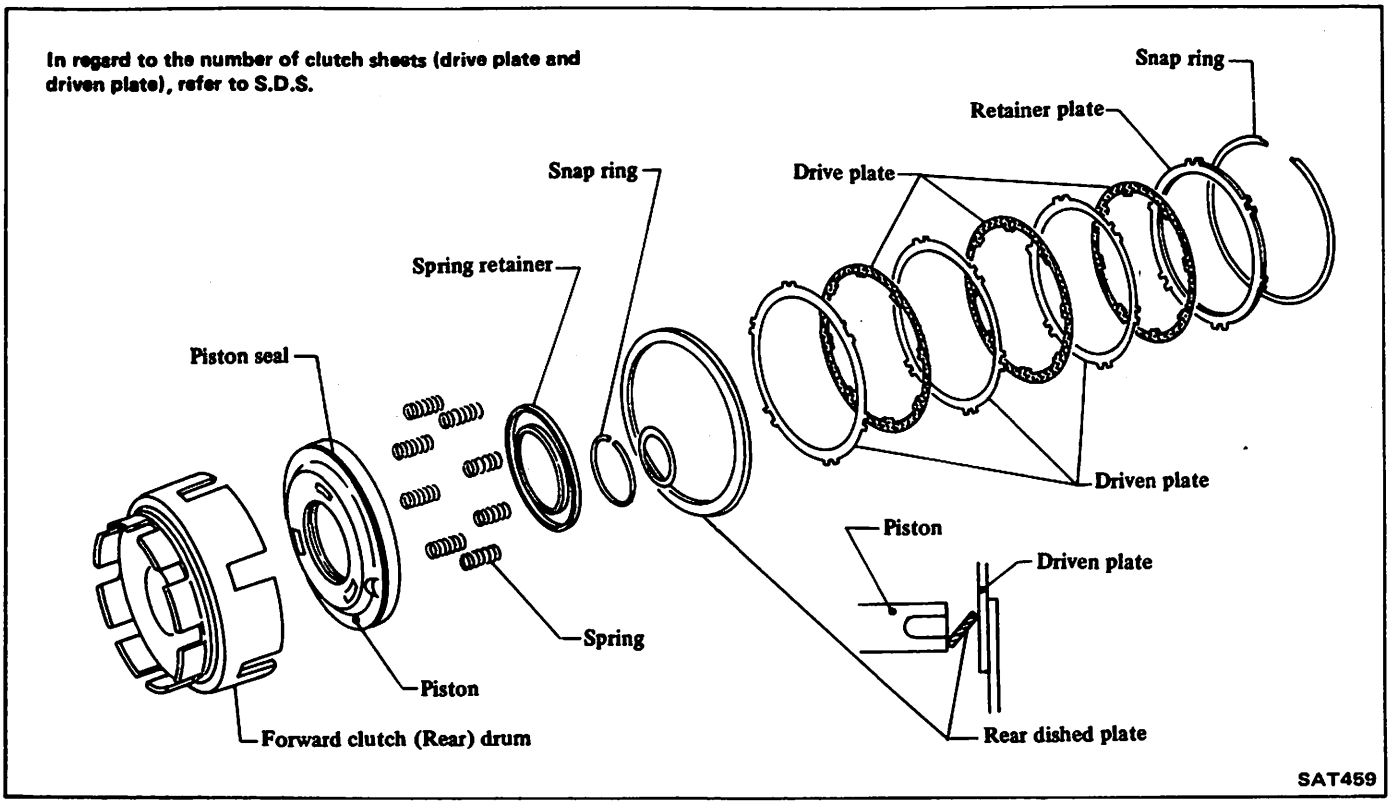


13. Testing high-reverse clutch (Front)

With high-reverse clutch (Front) assembled on oil pump housing, direct a jet of air into hole in clutch drum for definite clutch operation.

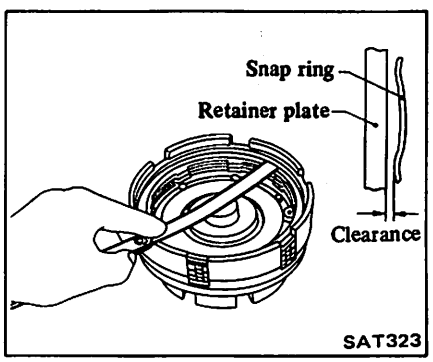


FORWARD CLUTCH (Rear)

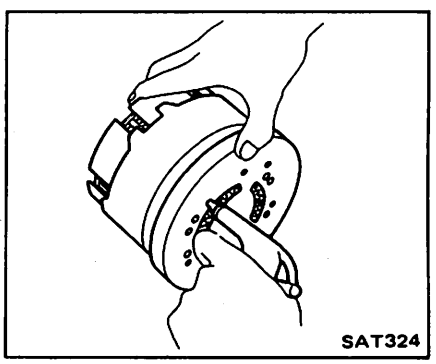


Service procedures for forward clutch (Rear) are essentially the same as those for high-reverse clutch (Front), with the following exception:

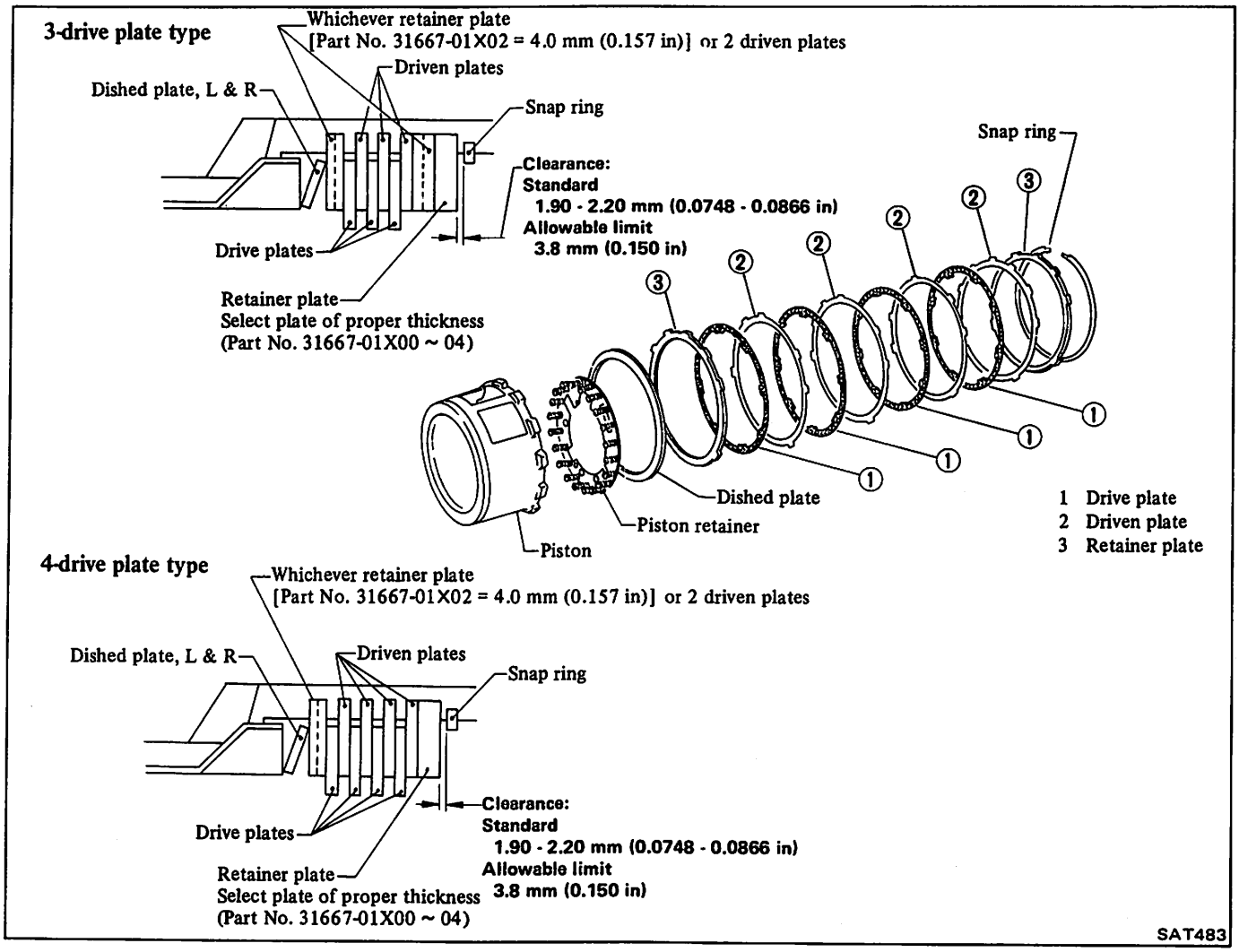
Specified clearance between retainer plate and snap ring:
Standard
0.8 - 1.2 mm
(0.031 - 0.047 in)
Allowable limit
2.8 mm (0.110 in)



Test forward clutch (Rear)



LOW & REVERSE BRAKE

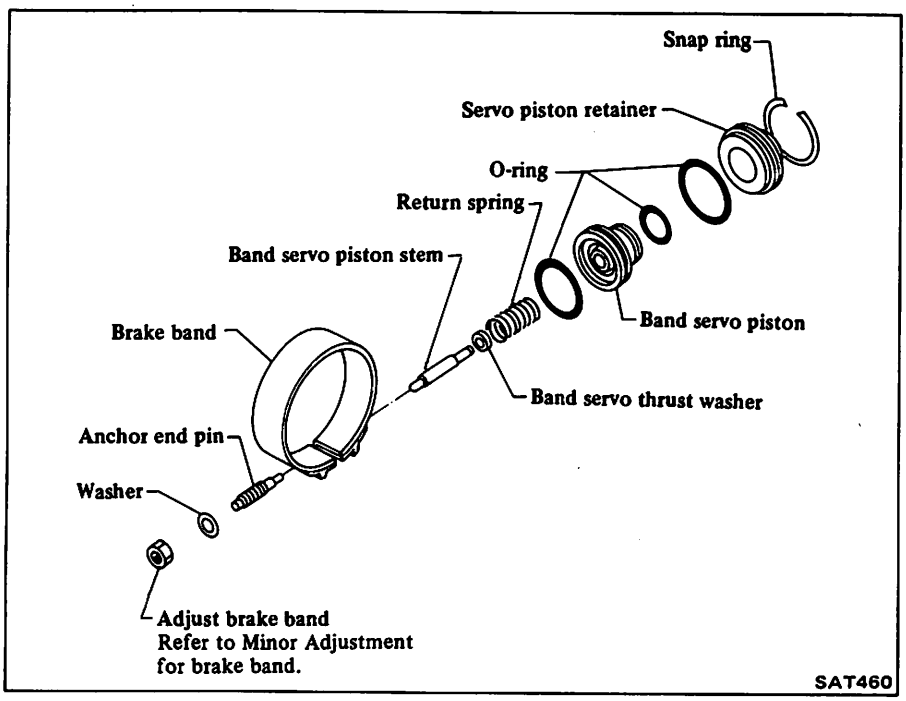


- Examine low and reverse brake for damaged clutch drive plate facing and worn snap ring.
- Check drive plate facing for wear or damage; if necessary, replace.

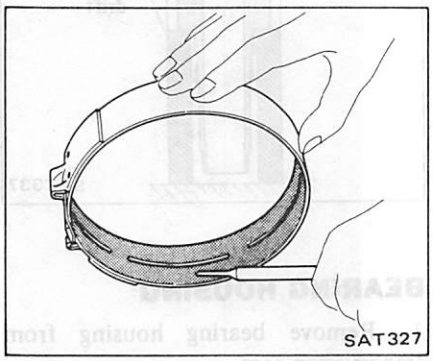
Drive plate thickness:
Standard
1.90 - 2.05 mm
(0.0748 - 0.0807 in)
Allowable limit
1.8 mm (0.071 in)

- Test piston return spring for weakness. Discard if it is too weak.

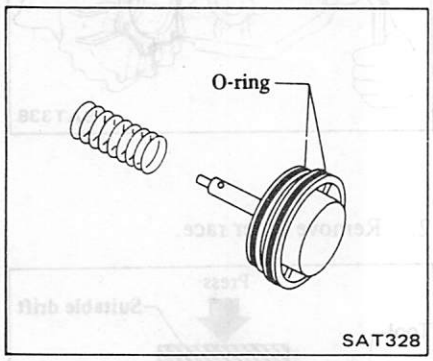
BRAKE BAND AND BAND SERVO



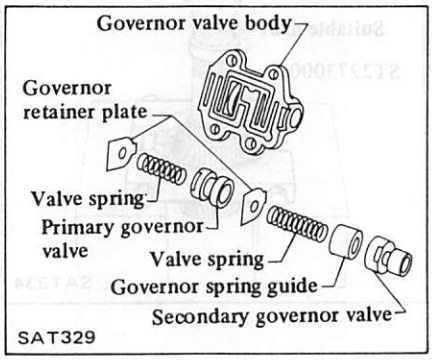
- Inspect band friction material for wear. If cracked, chipped or burnt spots are apparent, replace the band.



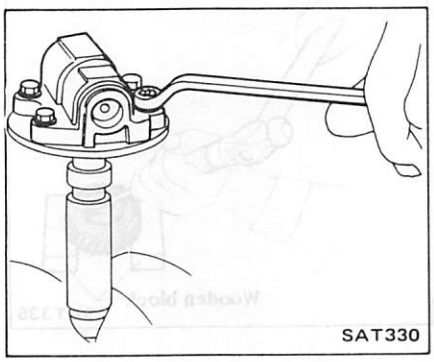
- Check band servo components for wear and scoring. Replace piston O-rings and all other components as necessary.



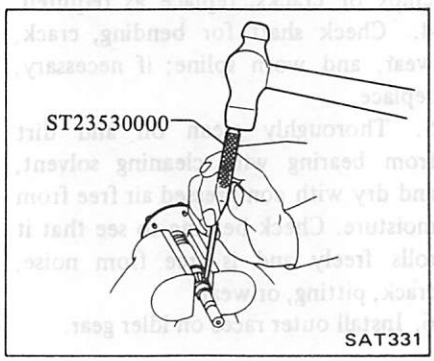
GOVERNOR



- Remove governor body from governor shaft.



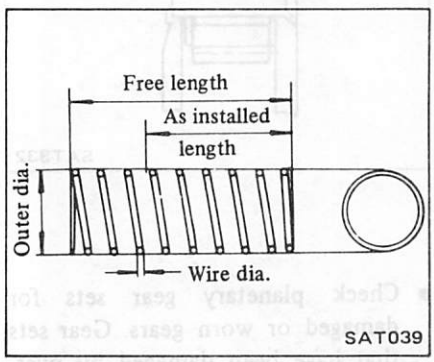
- Remove governor worm.



- Disassemble governor and check valves for indication of burning or scratches. Inspect springs for weakness or burning. Replace parts as necessary and reassemble.

Do not interchange components of primary and secondary governor valves.

Governor valve spring chart



- Assemble governor on governor shaft.

Ⓣ: **Governor valve body to governor shaft**
5 - 7 N·m
(0.5 - 0.7 kg-m, 3.6 - 5.1 ft-lb)

Valve spring	Wire dia. mm (in)	Outer coil dia. mm (in)	No. of active coils	Free length mm (in)	Installed	
					Length mm (in)	Load N (kg, lb)
Primary governor	0.45 (0.0177)	10.45 (0.4114)	7	31.7 (1.248)	9.3 (0.366)	1.47 (0.15, 0.33)
Secondary governor	0.8 (0.031)	10.8 (0.425)	7	38.2 (1.504)	26.0 (1.024)	7.75 (0.79, 1.74)

PLANETARY CARRIER

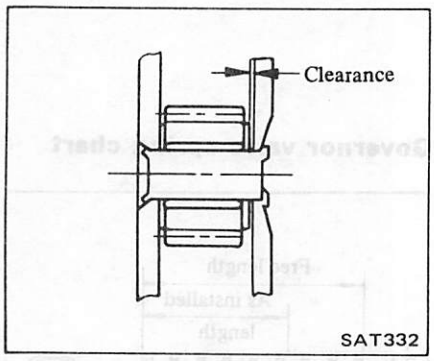
The planetary carrier cannot be divided into its individual components.

If any part of the component is faulty, replace the carrier as a unit.

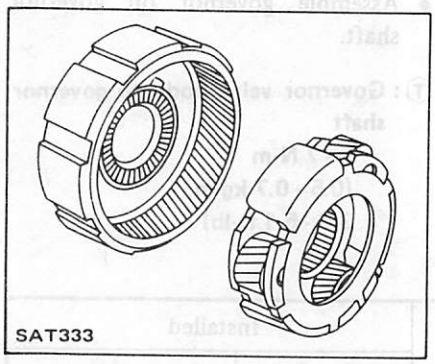
- Check clearance between pinion washer and planetary carrier with a feeler.

Standard clearance:
0.20 - 0.70 mm
(0.0079 - 0.0276 in)

Replace if the clearance exceeds **0.80 mm (0.0315 in).**

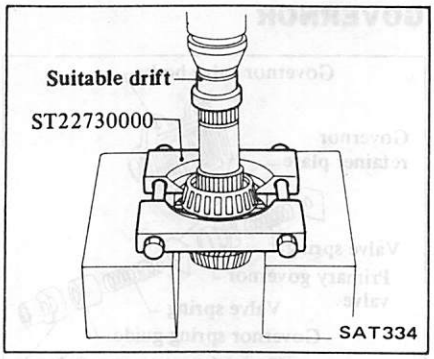


- Check planetary gear sets for damaged or worn gears. Gear sets that have been damaged by overheating will have a blue discoloration.

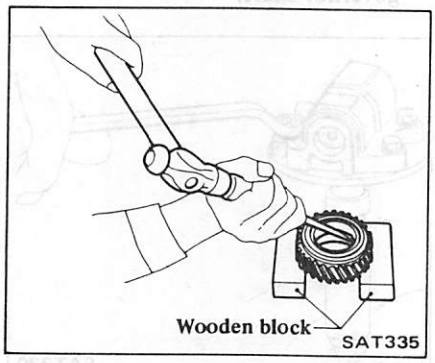


OUTPUT SHAFT AND IDLER SHAFT

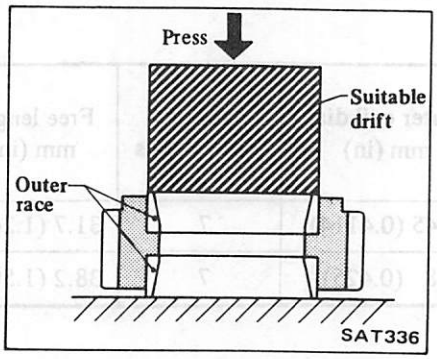
1. Remove inner races from output shaft.



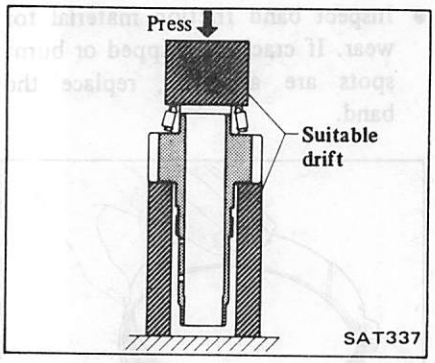
2. Remove outer races from ilder gear.



3. Check all gears for excessive wear, chips or cracks; replace as required.
4. Check shaft for bending, crack, wear, and worn spline; if necessary, replace.
5. Thoroughly clean oil and dirt from bearing with cleaning solvent, and dry with compressed air free from moisture. Check bearing to see that it rolls freely and is free from noise, crack, pitting, or wear.
6. Install outer races on idler gear.

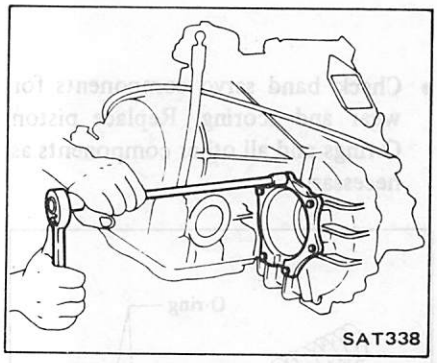


7. Install inner races on output shaft.

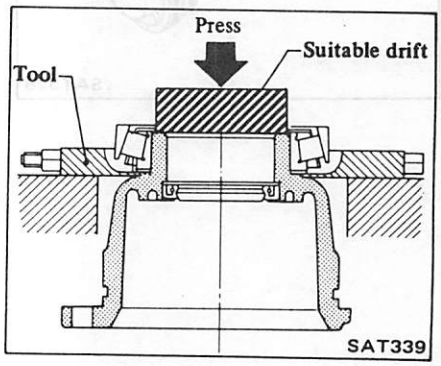


BEARING HOUSING

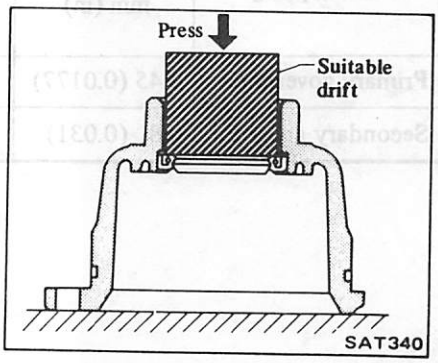
1. Remove bearing housing from transmission case.



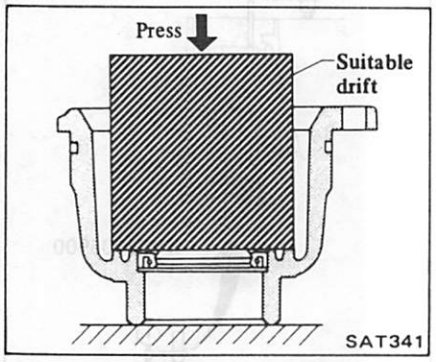
2. Remove inner race.



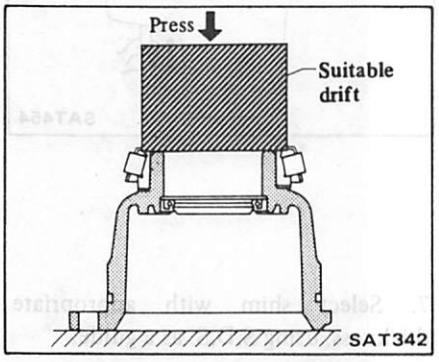
3. Remove oil seal and O-ring.



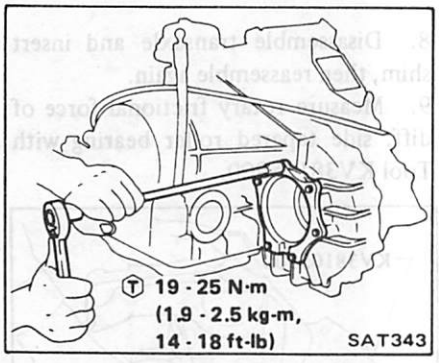
4. Apply coat of gear oil to seal surface and O-ring, then drive new seal and O-ring into place.



5. Install inner race.



6. Install bearing housing.



ADJUSTING ROTARY FRICTIONAL FORCE OF TAPERED ROLLER BEARING

Before assembling automatic transaxle, be sure to adjust rotary frictional force of each tapered roller bearing first.

FINAL DRIVE

If transmission case, bearing housing, tapered roller bearing, differential case or converter housing is replaced, final drive should be adjusted. Adjusting procedures are basically the same as those for final drive of manual transaxle. Rotary frictional force is adjusted by selecting shims of appropriate thickness.

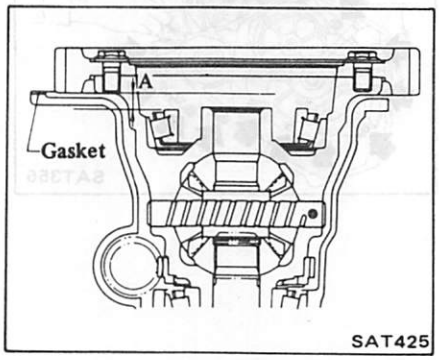
Adjusting procedures

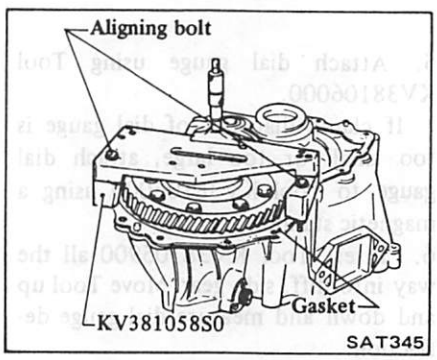
Two types of adjusting procedures have been established.

Type A

1. Press bearing outer race into bore in converter housing.
2. Install final drive assembly on converter housing.
3. Install tapered roller bearing on differential case.
4. Measure depth "A" with micrometer.

a. "A" is depth from upper surface of gasket to inner race upper surface.
b. Secure Tool to transmission case with aligning bolts and tighten it to the specified torque.
c. When measuring depth "A", be sure to use counterweight that is included in the Tool.
d. Before measuring depth "A", ensure that bearing is seated properly. To seat it, turn final gear.

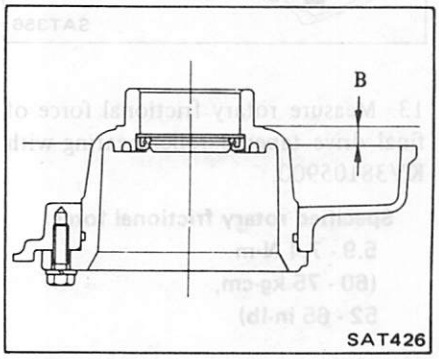


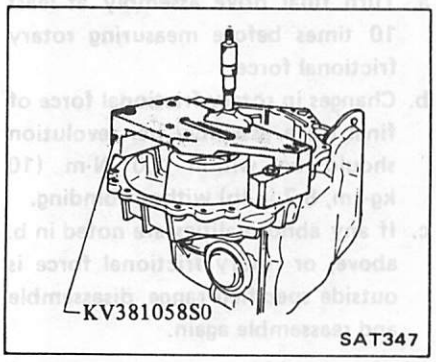


A = Measured value
– Thickness of special tool

5. Install bearing housing to transmission case.
6. Measure height "B" with micrometer.

Before measuring height "B", ensure that bearing is seated properly. To seat it, turn outer race while pushing it.





B = Thickness of special tool
– Measured value

7. Determine height "H" using following equation:

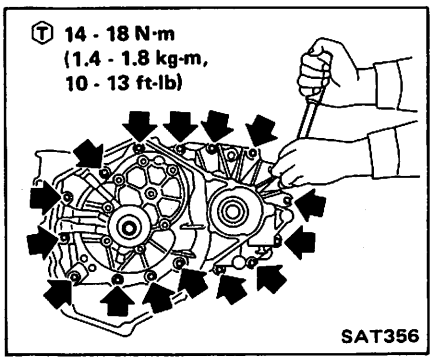
H = A – B

Select shim(s) of appropriate thickness, using S.D.S. as a guide.

Available shims
Refer to S.D.S.

8. Remove bearing retainer from transmission case.
9. Install shim selected in step 7 on bearing housing, and seat bearing inner race.
10. Apply vaseline to O-ring and install it on bearing housing.
11. Install bearing housing to transmission case.

12. Attach converter housing and gasket to transmission case.



13. Measure rotary frictional force of final drive tapered roller bearing with KV38105900.

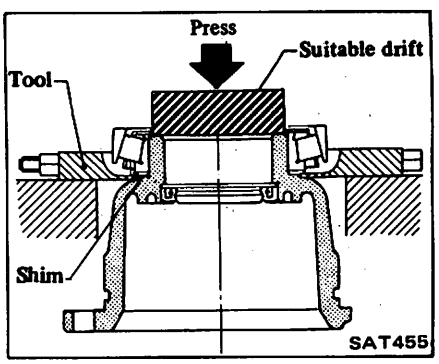
Specified rotary frictional force:
5.9 - 7.4 N·m
(60 - 75 kg-cm,
52 - 65 in-lb)

- **a. Turn final drive assembly at least 10 times before measuring rotary frictional force.**
- **b. Changes in rotary frictional force of final drive assembly per revolution should be within 1.0 N·m (10 kg-cm, 8.7 in-lb) without binding.**
- **c. If any abnormalities are noted in b. above, or rotary frictional force is outside specified range, disassemble and reassemble again.**

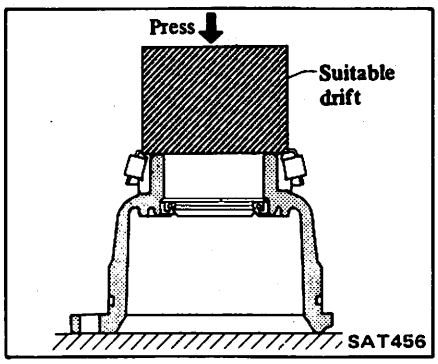
14. Disassemble transmission case and remove final drive assembly.

Type B

1. Remove bearing inner race on shim side only and take out shim.

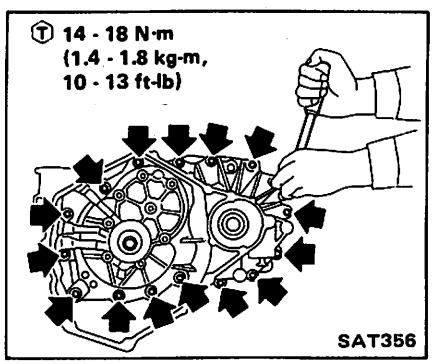


2. Press fit bearing inner race into place **without shim.**

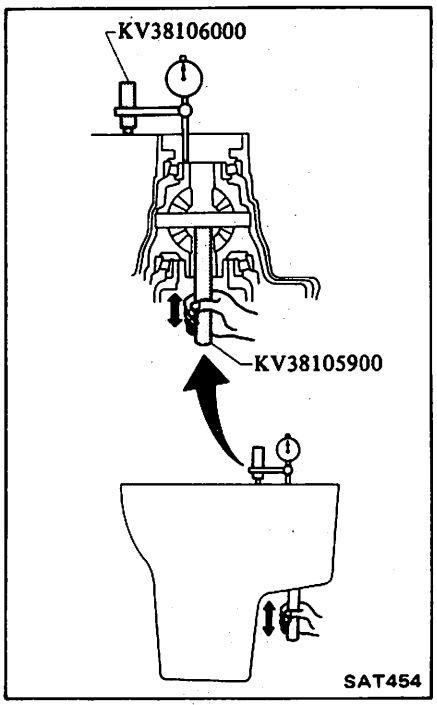


3. Install final drive assembly on transmission case.
4. Place gasket on transmission case, then install converter housing by tightening it to the specified torque.

Tighten bolts to the same torque in a crisscross fashion.



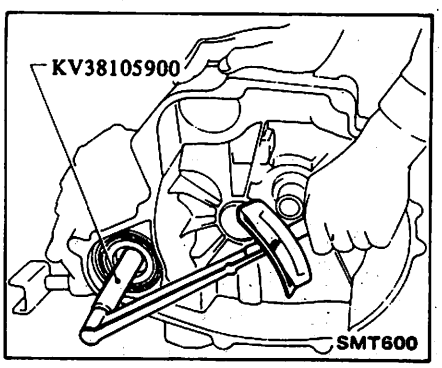
5. Attach dial gauge using Tool KV38106000.
If clamp diameter of dial gauge is too small or too large, attach dial gauge to Tool KV38106000 using a magnetic stand.
6. Insert Tool KV38105900 all the way into diff. side gear. Move Tool up and down and measure dial gauge deflection.



7. Select shim with appropriate thickness, using S.D.S. as a guide.

Available shims:
Refer to S.D.S.

8. Disassemble transaxle and insert shim, then reassemble again.
9. Measure rotary frictional force of diff. side tapered roller bearing with Tool KV38105900.



Specified rotary frictional force:
5.9 - 7.4 N·m
(60 - 75 kg-cm,
52 - 65 in-lb)

- **a. Turn final drive assembly at least 10 times before measuring rotary frictional force.**

b. Changes in rotary frictional force of final drive assembly per revolution should be within 1.0 N·m (10 kg-cm, 8.7 in-lb) without binding.
c. If any abnormalities are noted in b. above, or rotary frictional force is outside the specified range, disassemble and reassemble again.

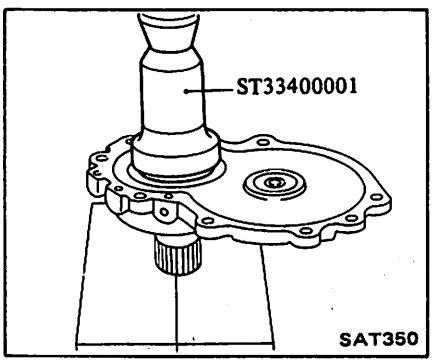
Disassembly and assembly procedures

Refer to Section MT.

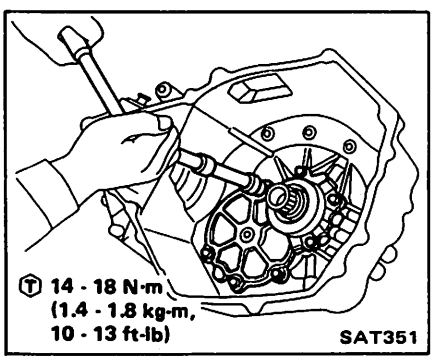
OUTPUT SHAFT

If transmission case, output shaft, tapered roller bearing or front cover is replaced, output shaft should be adjusted by means of shims.

1. Apply automatic transaxle fluid to bearing outer race.
2. Press bearing outer race into bore in transmission case.
3. Install two or three shims on front cover, and press bearing outer race into bore in front cover.



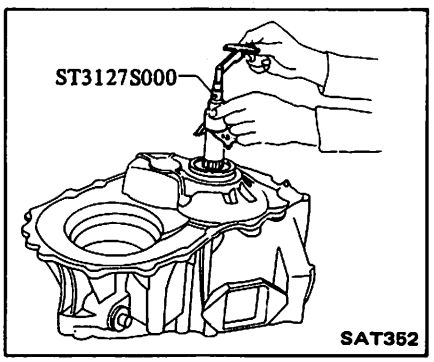
4. Install gasket and front cover on converter housing.



5. Measure rotary frictional force of output shaft.

Specified rotary frictional force:
0.35 - 0.47 N·m
(3.6 - 4.8 kg-cm,
3.1 - 4.2 in-lb)

a. Turn output shaft at least 10 times before measuring rotary frictional force.
b. Ensure that output shaft turns smoothly without binding.
c. If any abnormalities are noted in b. above, or rotary frictional force is outside specified range, disassemble and reassemble again.



Available shims:
Refer to S.D.S.

6. Remove front cover and withdraw output shaft.

IDLER GEAR

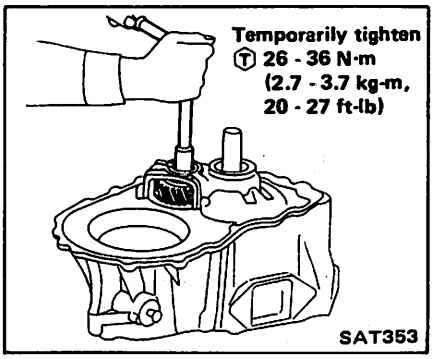
1. Press bearing outer races onto idler gear.
2. Assemble bearing inner races and idler shaft to idler gear.
3. Attach idler gear assembly and output shaft assembly to converter housing.
4. Install gasket and front cover on converter housing as follows:
(1) Clean threads of bolts and converter housing with solvent.
(2) Apply locking sealer to threads of bolts and install them into place.

Ⓣ : 14 - 18 N·m
(1.4 - 1.8 kg-m,
10 - 13 ft-lb)

5. Install lock washer and idler gear bolt, and tighten bolt to specified torque.

Be sure to align lock washer with groove on converter housing.

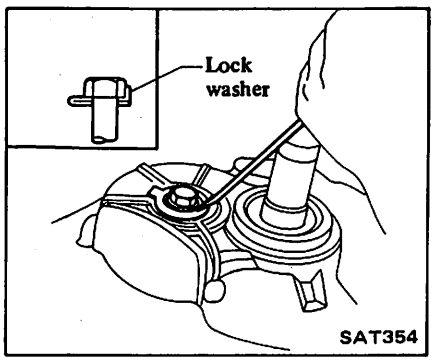
Ⓣ : 26 - 36 N·m
(2.7 - 3.7 kg-m,
20 - 27 ft-lb)



6. After tightening bolt, turn output shaft five complete rotations. Loosen idler gear bolt, then tighten it to specified torque.

Ⓣ : 3 - 4 N·m
(0.3 - 0.4 kg-m,
2.2 - 2.9 ft-lb)

7. Bend lock washer.

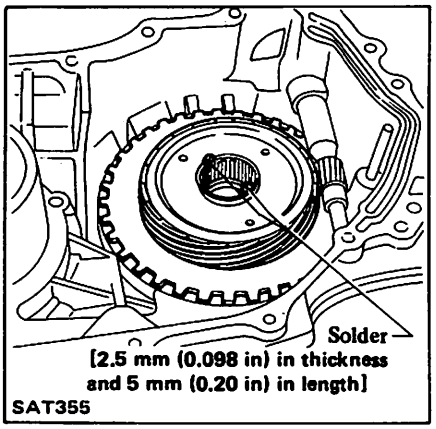


ADJUSTING END PLAY OF OUTPUT SHAFT

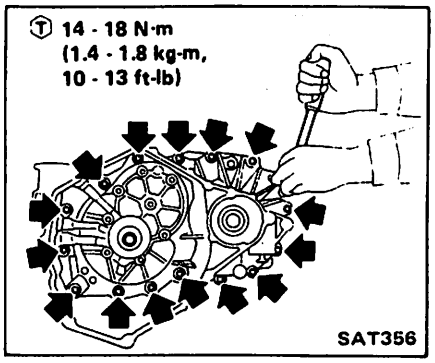
1. After adjusting rotary frictional force of tapered roller bearing used with output shaft, put solder on rear internal gear.

a. Be sure to use fuse of 2.5 mm (0.098 in) in diameter or soldering plate of 2.5 mm (0.098 in) in thickness and 5 mm (0.20 in) in length, as maximum gear clearance is 2.3 mm (0.091 in). [If diameter or thickness is smaller than 2.5 mm (0.098 in), also use shim(s).]

b. Always install two fuses or soldering plates symmetrically over the periphery of internal gear.



2. Install converter housing and output shaft assembly as a unit on transmission case.



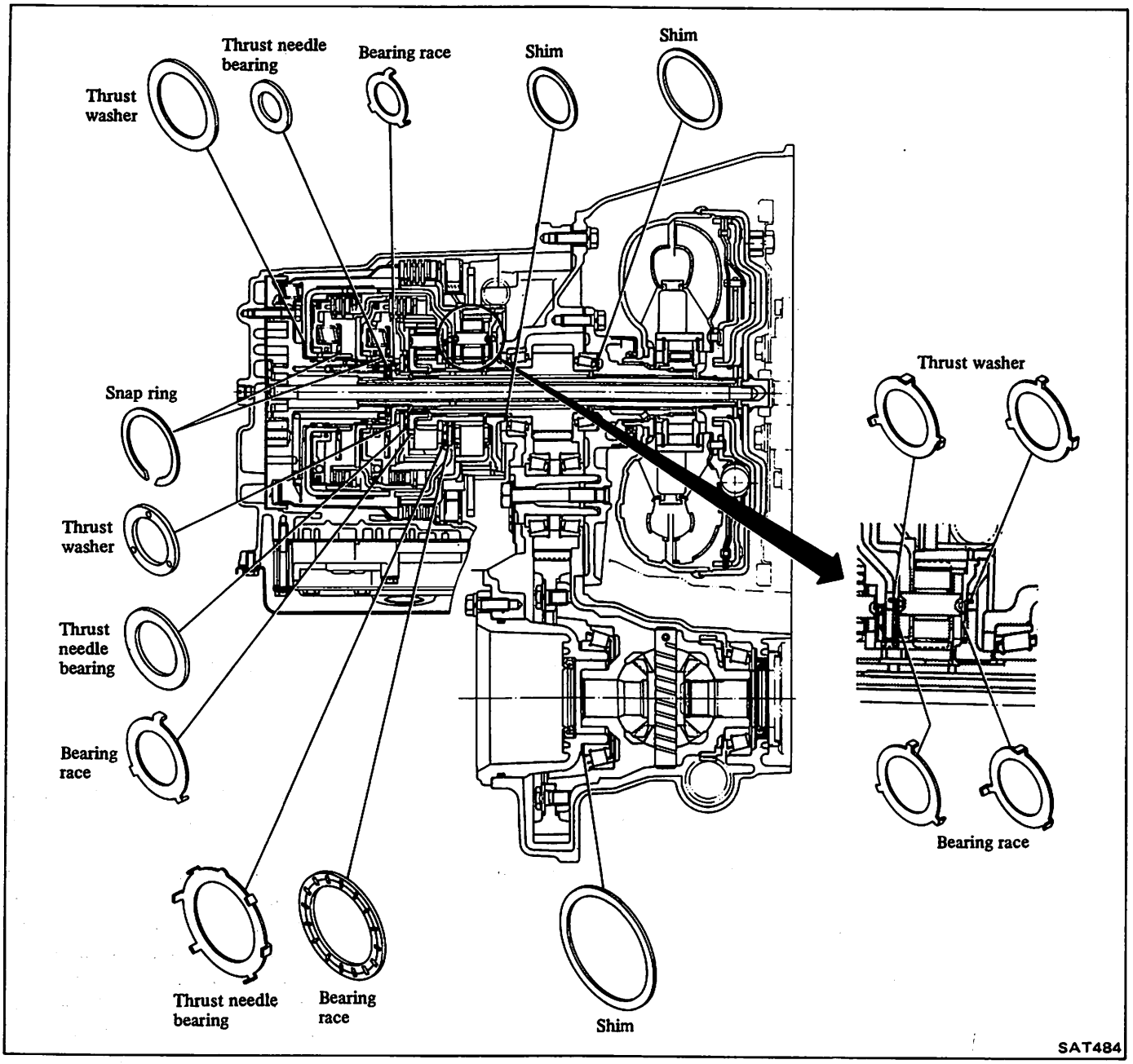
3. Disassemble output shaft assembly and remove soldering plate.

4. Measure thickness of soldering plate and, if necessary, select shim(s) of appropriate thickness so that end play of output shaft is within specified range.

End play:
0.25 - 0.55 mm
(0.0098 - 0.0217 in)
Available shims:
Refer to S.D.S.

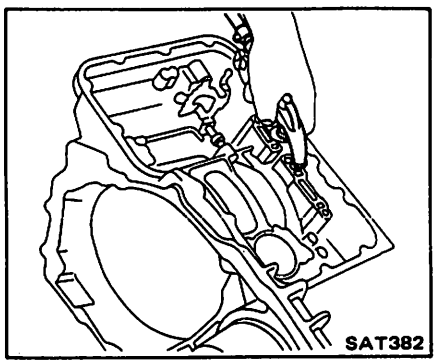
FINAL ASSEMBLY

When installing/assembling needle bearing, bearing race, snap ring and seal ring, use the following illustration as a guide to installation procedures and locations.



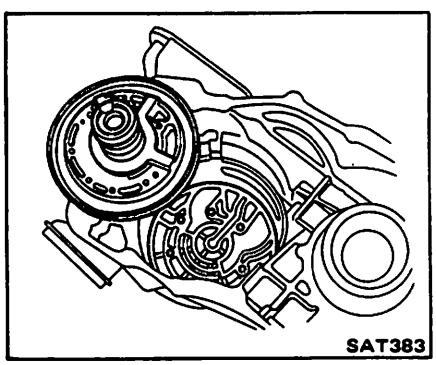
1. Before proceeding with the final assembly of all components, it is important to verify that the case, housing and parts are clean and free from dust, dirt and foreign matter (use air gun). Have a tray available with clean transaxle fluid for lubricating parts.

Petroleum jelly can be used to secure washers during installation. All new seals and rings should have been installed before beginning final assembly.

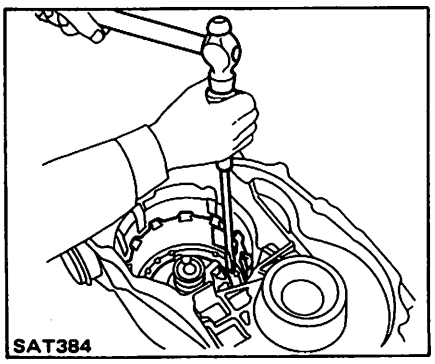

SAT382

2. Apply automatic transaxle fluid or vaseline to outer diameter part of oil pump assembly. Install oil pump assembly, nylon washer and thrust bearing.

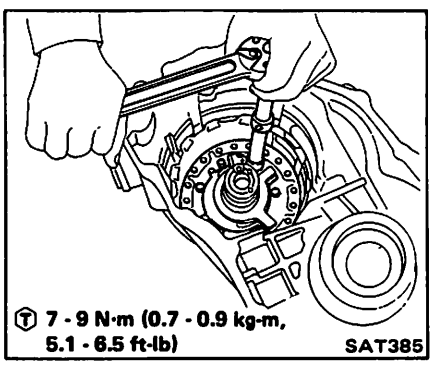
Align five bolt holes on oil pump assembly and transmission case and install oil pump.


SAT383

3. Apply automatic transaxle fluid or vaseline to low and reverse brake piston seal then install piston by tapping it evenly.

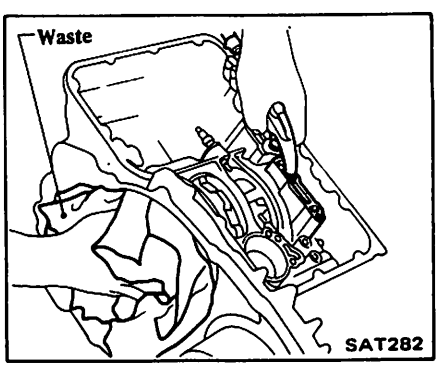

SAT384

4. Install low and reverse brake piston retainer.



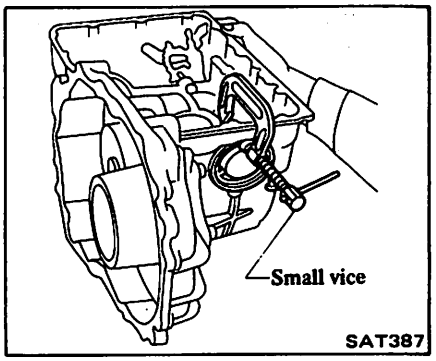
SAT385

After installing piston retainer, make sure that its piston seal is not turned over by the application of air pressure to low and reverse brake circuit. The piston is installed properly if it move smoothly.



SAT282

5. Install brake band. Apply automatic transaxle fluid or vaseline to band servo piston O-ring and install band servo piston, return spring and snap ring holding piston with a small vice.



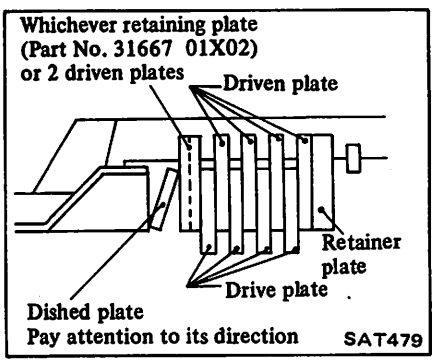
SAT387

6. Apply automatic transaxle fluid or vaseline to seals in oil pump housing, then install high-reverse clutch (Front).

7. Install forward clutch (Rear), front internal gear, thrust bearing, bearing race, front carrier, bearing race, thrust bearing and sun gear assembly in the reverse order of removal. Prior to assembly, apply automatic transaxle fluid or grease to thrust bearings and bearing races.

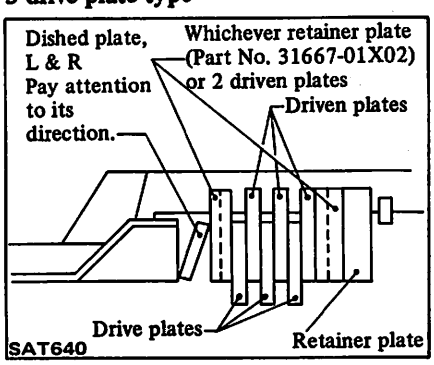
8. Install low and reverse brake retainer plate, drive and driven plates, retainer plate and snap ring.

4-drive plate type



SAT479

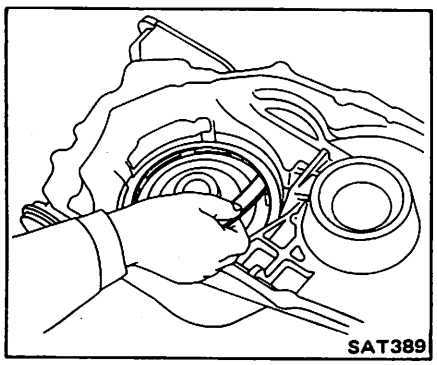
3-drive plate type



SAT640

9. After low and reverse brake has been completely assembled, measure clearance between snap ring and retainer plate. If measurement exceeds specifications it can be adjusted by replacing retainer plate with one of a different thickness.

Low and reverse brake clearance:
Standard
1.90 - 2.20 mm
(0.0748 - 0.0866 in)
Allowable limit
3.8 mm (0.150 in)



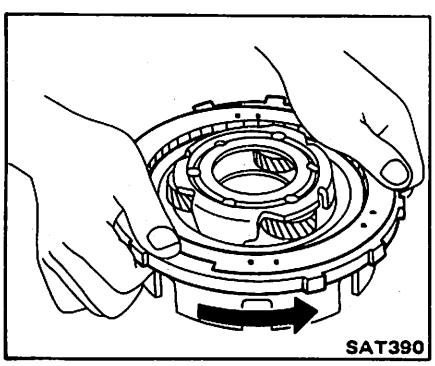
Available retainer plate (Piston side)

Thickness mm (in)	Part Number
3.6 (0.142)	31667-01X00
3.8 (0.150)	31667-01X01

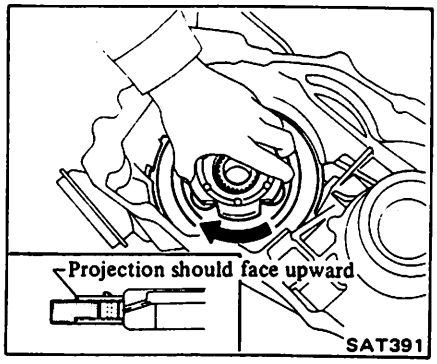
Available retainer plate (O.W.C. side)

Thickness mm (in)	Part Number
3.6 (0.142)	31667-01X00
3.8 (0.150)	31667-01X01
4.0 (0.157)	31667-01X02
4.2 (0.165)	31667-01X03
4.4 (0.173)	31667-01X04

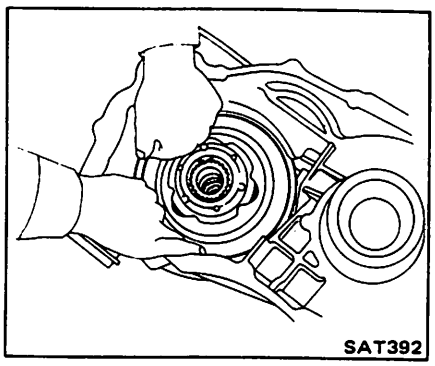
10. Install bearing race on connecting shell.
11. Apply vaseline to thrust washer, then attach it to rear carrier.
12. Install one-way clutch assembly to rear carrier by turning it counterclockwise.



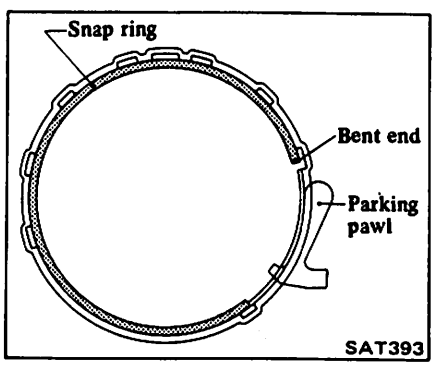
13. Apply vaseline to thrust washer and install it on rear carrier.
14. Install one-way clutch together with rear carrier by turning rear carrier clockwise.



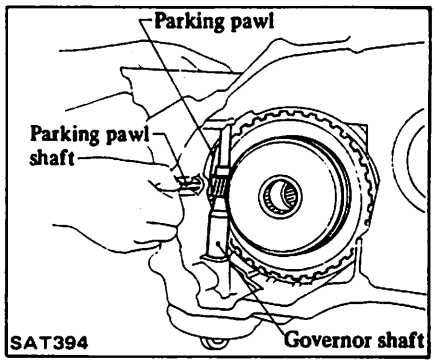
15. Install snap ring



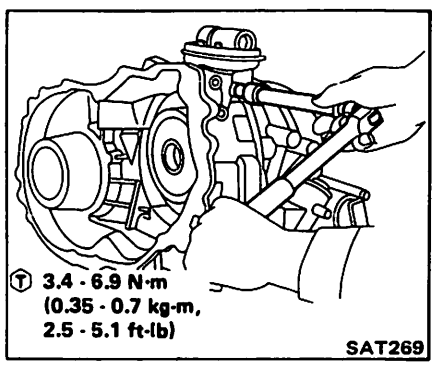
Install snap ring. Ensure that its bent end is positioned so that it does not interfere with parking pawl.



16. Apply vaseline to bearing race, then attach it to rear internal gear.
17. Install rear internal gear, then assemble governor shaft assembly, parking pawl, return spring and parking pawl shaft.

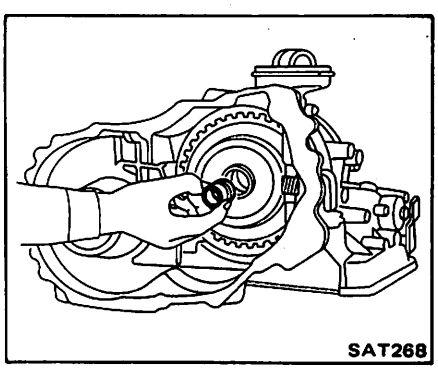


18. Install governor shaft retaining bolt.



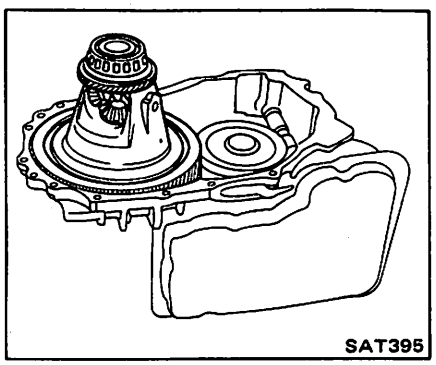
19. Install seal bushing.

CAUTION:
Always install seal bushing to prevent sun gear and output shaft from becoming jammed.

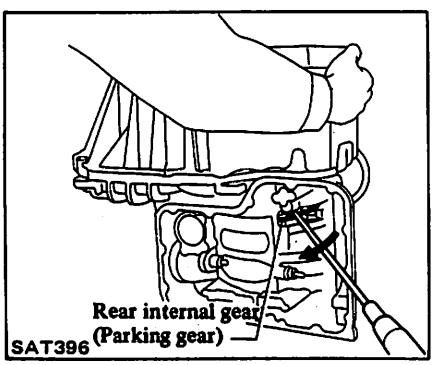


20. **Adjust end play of output shaft.** Refer to Adjusting End Play of Output Shaft.
21. **Adjust rotary frictional force of output shaft and idler gear tapered roller bearing.** Refer to Adjusting Rotary Frictional Force of Tapered Roller Bearing.

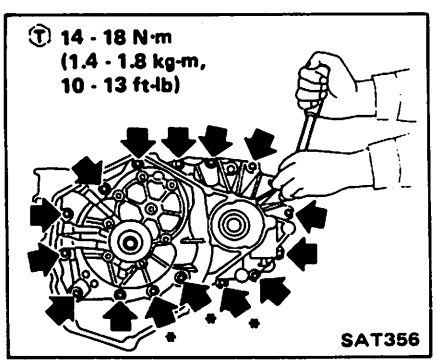
22. **Adjust rotary frictional force of final drive tapered roller bearing.** Refer to Adjusting Rotary Frictional Force of Tapered Roller Bearing.
23. Install final drive assembly on transmission case.



24. Apply vaseline to output shaft shim selected, then attach it to output shaft.
25. Put gasket on transmission case.
26. Install converter housing assembly on transmission case.
27. Turn parking gear (rear internal gear) clockwise with screwdriver while supporting converter housing assembly by hand, until output shaft splines, front carrier, and rear internal gear are engaged properly.

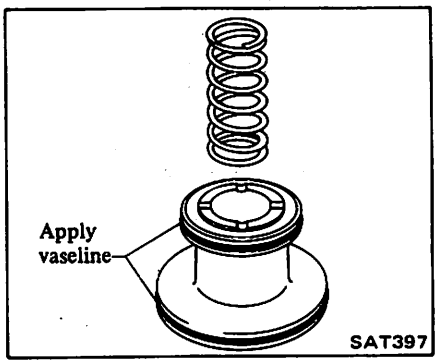


28. Tighten converter housing securing bolts to the specified torque.

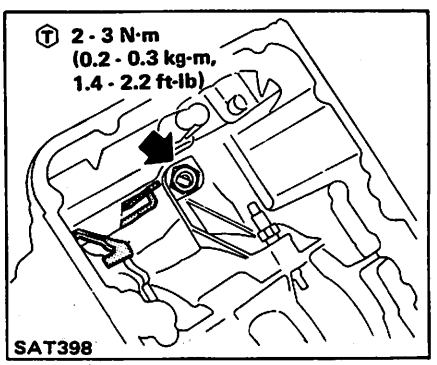


Before installing bolts marked "*" in figure below, ensure that bolt threads are clean and that locking sealer has been applied. Also ensure that the transmission case has been cleaned with solvent.

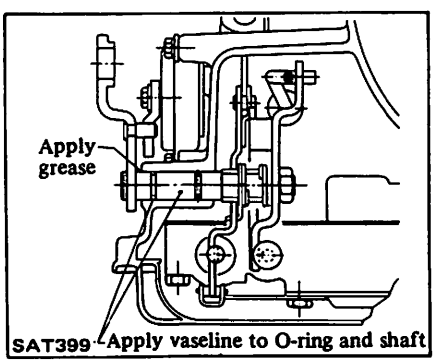
29. Apply vaseline to lathe cut ring, then install return spring and accumulator piston on transmission case.



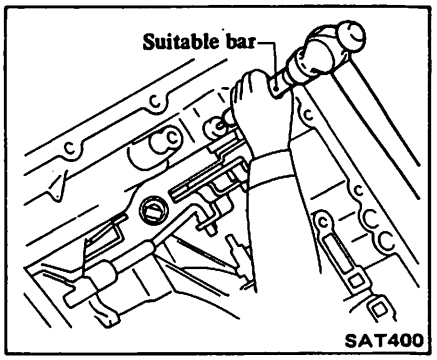
30. **Adjust brake band.** Refer to Brake Band Adjustment.
31. Assemble parking actuator support and throttle wire to transmission case. After tightening nut, bend the lock-plate securely.



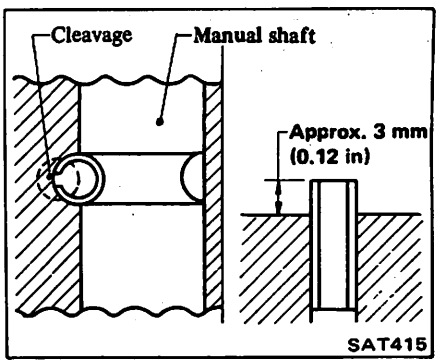
32. Apply grease and vaseline to manual shaft.



33. Install throttle lever, manual plate, manual shaft, selector range lever and parking rod assembly, then secure them with retaining pin.



Install retaining pin as shown in figures below.

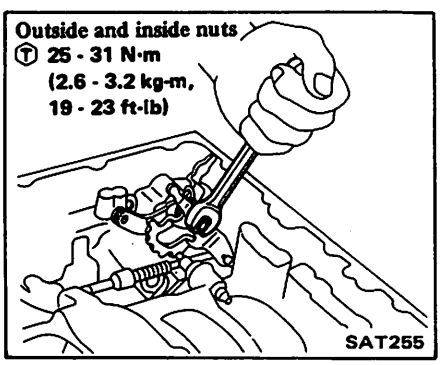


34. Tighten manual shaft securing nuts as follows:
(1) Tighten inside nut to the specified torque.

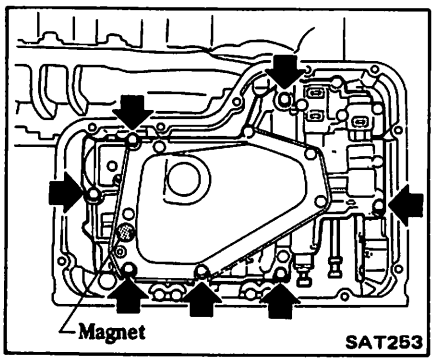
Ⓣ: **Inside nut**
25 - 31 N·m
(2.6 - 3.2 kg-m,
19 - 23 ft-lb)

(2) Tighten outside nut to the specified torque.

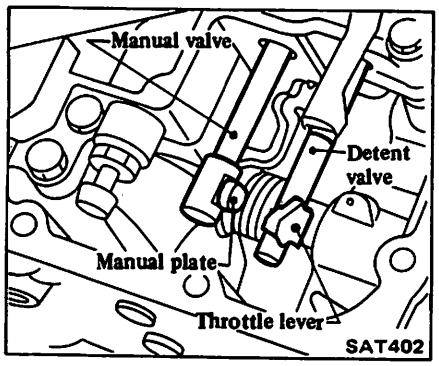
Ⓣ: **Outside nut**
25 - 31 N·m
(2.6 - 3.2 kg-m,
19 - 23 ft-lb)



35. Insert manual valve to control valve body, then assemble them to transmission case. Then install magnet in place.

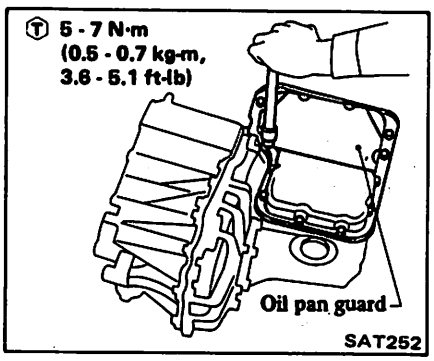


Install manual valve, manual plate, detent valve and throttle lever securely, as shown in figure below.



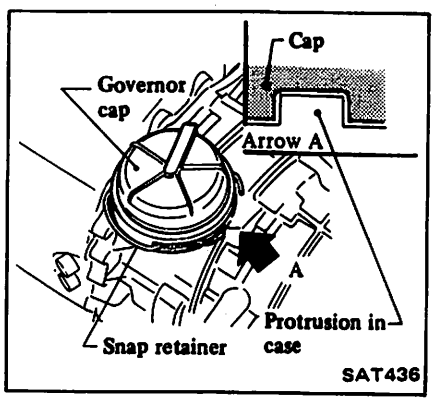
36. Before installing oil pan, check alignment and operation of manual lever and parking pawl engagement. Blow mechanism with air to clean. Make final check to be sure all bolts are installed in valve body.

37. Install oil pan with new gasket and oil pan guard.



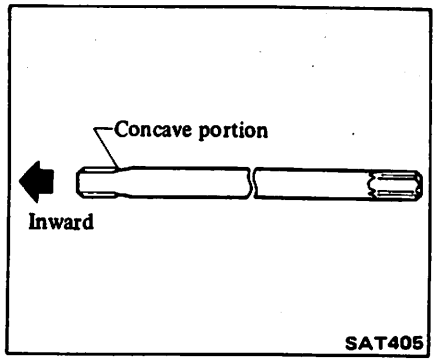
38. Install seal ring and governor cap, then secure it with snap retainer.

When installing snap retainer, pay attention to its direction.



39. Install oil pump shaft and input shaft.

Ensure that concave portion of oil pump shaft faces inward.



40. Carefully inspect torque converter for damage. Check converter hub for grooves caused by hardened seals. Also check bushing contact area.

41. Lubricate oil pump lip seal and converter neck before installing converter.

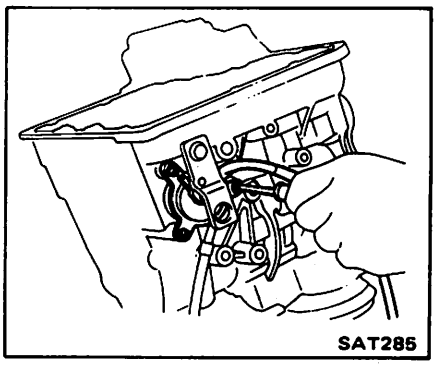
42. Install torque converter to converter housing.

Be careful not to scratch front cover oil seal.

43. Apply sealant to threads of hexagon plug and install it in place.

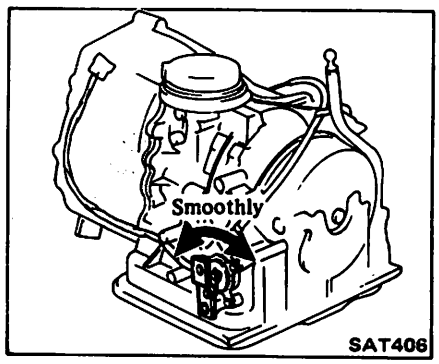
Ⓣ : **Hexagon plug**
7 - 13 N·m
(0.7 - 1.3 kg-m,
5.1 - 9.4 ft-lb)

44. Install inhibitor switch to transaxle case.



45. Adjust inhibitor switch. Refer to Minor Adjustments.

46. Make sure that manual lever operates smoothly.



TROUBLE-SHOOTING AND DIAGNOSES

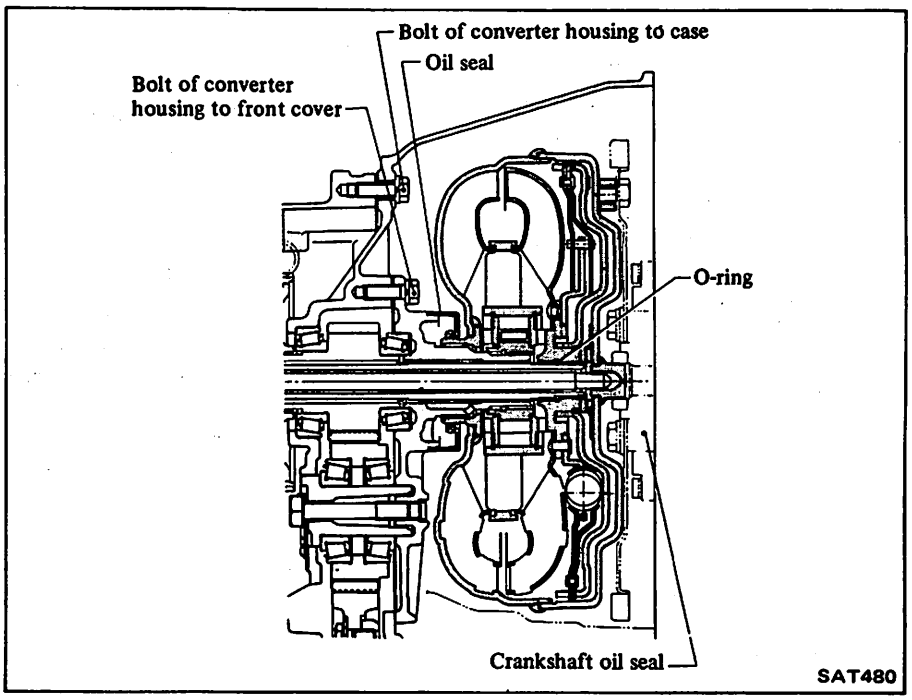
PRELIMINARY CHECKS (Prior to road testing)

Verify customer complaint

The customer should supply as much information as possible, including any unusual characteristics that accompany the complaint.

Fluid level

Refer to Description (on the first page).



Fluid leakage

To detect a fluid leak:

1) Raise vehicle.
2) Clean area suspected of leaking.
3) Start engine, apply foot brake, place control lever in drive, and wait a few minutes.
4) Stop engine.
5) Check for fresh leakage.

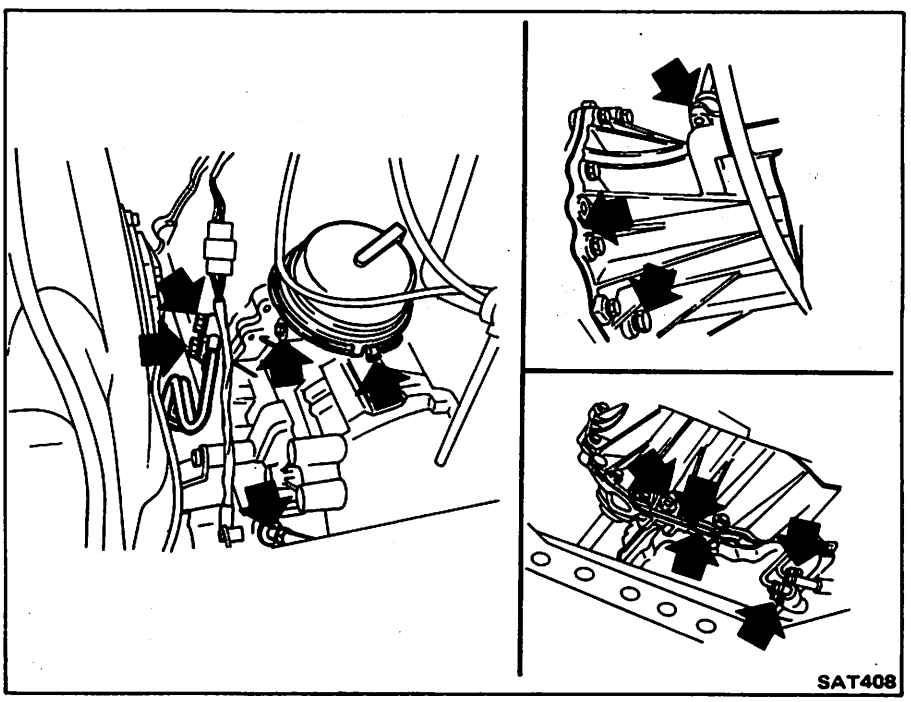
If the governor cap is suspected:

1) Open hood.
2) Remove snap retainer, governor cap and seal ring, then reinstall them. Refer to ON-VEHICLE SERVICE.
3) Clean the area around the governor cap.
4) Run the car at highway speeds.
5) Check the governor cap for fresh leakage.

To aid in locating leaks, use the following list of seals and gaskets.

1) Converter housing
- Front cover oil seal (transaxle front seal).
- Crankshaft oil seal.
- Bolts of converter housing to case and converter housing to front cover.
- Input shaft O-ring.

2) Transaxle and bearing housing.
- Junction of transmission case and converter housing.
- Junction of transmission case and bearing housing.
- Oil cooler inlet and outlet tube connectors.
- Oil pressure inspection ports.
- O-ring of manual shaft.
- O-ring of throttle wire.
- Speedometer pinion sleeve.
- Drive shaft oil seals.
- Governor cap seal ring.



Fluid condition

Transaxle fluid color and texture can aid greatly in transaxle trouble-shooting. When checking fluid level, examine the transaxle fluid and note its color, texture, and odor. Some common forms of contamination are listed below:

1) Dark of Black Fluid:
   With a burned odor
   – Worn friction material.
   Without an odor
   – Slight engine coolant leak (in radiator).
2) Milky Pink Fluid: Water Contamination
   – Coolant leak.
   – Road water entering through filler tube or breather.
3) Varnished Fluid, light to dark brown and tacky: Oxidation
   – Over or Underfilling.
   – Overheating.

Engine idle

Check and adjust idle to specifications.

Idling speed:

Refer to MA section.

Engine oil and coolant levels

Prior to road testing, check engine oil and coolant levels, and fill as necessary.

Control cable

Start in park position, depress detent button and slowly move the gear selector through all ranges. The detent "clicks" should correspond with the range indicator.

DIAGNOSTIC ROAD TEST

Prior to road testing, perform the preliminary inspections outlined earlier. If the car is not equipped with a tachometer, install a portable tachometer in the car. And also install a suitable pressure gauge. If the customer has a specific complaint, select road conditions similar to those described. (e.g. steep hills, freeways, etc.)

Follow the test sequence as outlined in this section and mark the results on the Symptom Chart on page AT-55. It may be necessary to repeat sections of the test under different throttle conditions. (e.g. light, medium of full throttle.) After completing the road test, compare the test results to the Trouble-shooting Chart on page AT-51.

ROAD TESTING

1. Park Range

Place the control lever in "P" range and start the engine. Stop the engine and repeat the procedure in all other ranges and neutral. In Park, the car should be locked in position, unable to roll or move. Make all results on the Symptom Chart.

2. Reverse

Manually shift the control lever from "P" to "R", and note shift quality. Drive the car in reverse long enough to detect slippage or other abnormalities. Note results.

3. Neutral

Manually shift the control lever from "P" to "N" and note quality. In neutral no clutches or bands are applied, and there should be no movement. Note results.

4. Drive Range

Manually shift the control lever to range "D", and note shift quality. Drive the car through all automatic shifts and in all gear ranges. Note shift quality and timing [km/h (MPH)], check for slippage, noise, or other abnormal conditions. If necessary, drive the test sequence under different throttle openings (e.g. light, medium or full throttle).

5. Range "2"

Manually shift the control lever to range "2". Check for slippage, hesitation or abnormal condition. When the lever is set at this position, the transaxle will be automatically shifted between 1st and 2nd gears in response to the depression of the accelerator pedal. However, the transaxle is not shifted to 3rd gear. When the car is slowing down, the transaxle will automatically down-shift.

6. Range "1"

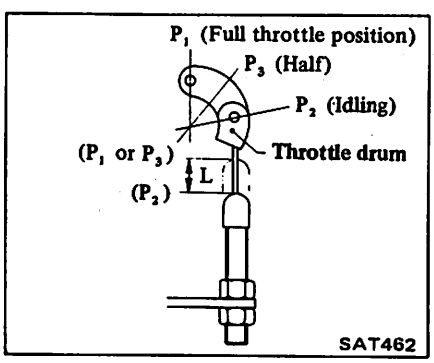
Manually shift the control lever to range "1". Note shift quality. It should, however, downshift immediately to 2nd gear and downshift again to 1st gear as road speed decreases. Accelerate and decelerate in 1st gear to determine engine braking Note results.

The transaxle should not sift into 1st gear from "D" range if the car road speed is above approximately 65 km/h (40 MPH).

7. Record line pressure and governor pressure at each range and at each throttle valve opening in accordance with the pressure testing described below.

CAR SPEED AND LINE PRESSURE WHEN SHIFTING GEARS

This check should be carried out when oil temperature is between 43 to 57°C (109 to 135°F). Throttle position is determined by wire length.



E16 engine model (11X03)

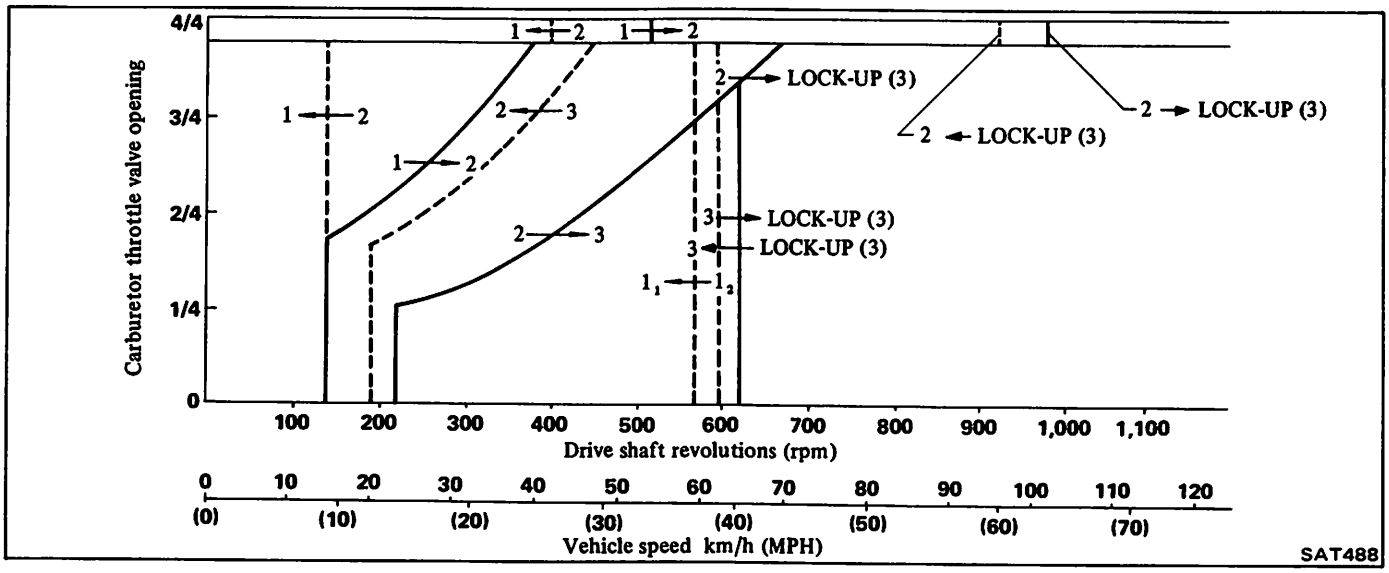
Throttle position	Throttle Wire length L mm (in)	Gear shift	Vehicle speed km/h (MPH)	Drive shaft revolutions rpm	Line pressure kPa (kg/cm², psi)
Full throttle	29.4 (1.157)	$D_1 \rightarrow D_2$ $(2_1 \rightarrow 2_2)$	48 - 56 (30 - 35)	467 - 540	549 - 696 (5.6 - 7.1, 80 - 101)
		$D_2 \rightarrow D_3$	95 - 104 (59 - 65)	915 - 992	
		$D_3 \rightarrow D_2$	93 - 99 (58 - 62)	889 - 947	
		$D_2 \rightarrow D_1$ $(2_2 \rightarrow 2_1)$	29 - 44 (18 - 27)	275 - 419	
		$D_3 \rightarrow 2_2$	–	–	
		$1_2 \rightarrow 1_1$	–	–	
Half throttle (4/8 open)	14.6 (0.575)	$D_1 \rightarrow D_2$ $(2_1 \rightarrow 2_2)$	18 - 27 (11 - 17)	175 - 261	500 - 647 (5.1 - 6.6, 73 - 94)
		$D_2 \rightarrow D_3$	46 - 55 (29 - 34)	447 - 534	
		$D_3 \rightarrow D_2$	25 - 32 (16 - 20)	238 - 310	
		$D_2 \rightarrow D_1$ $(2_2 \rightarrow 2_1)$	11 - 19 (7 - 12)	101 - 188	
		$D_3 \rightarrow 2_2$ $(D_3 \rightarrow 1_2)$	–	–	549 - 696 (5.6 - 7.1, 80 - 101)
		$1_2 \rightarrow 1_1$	50 - 66 (31 - 41)	487 - 632	500 - 647 (5.1 - 6.6, 73 - 94)
Light throttle (1/8 open)	3.7 (0.146)	$D_1 \rightarrow D_2$ $(2_1 \rightarrow 2_2)$	12 - 21 (7 - 13)	115 - 201	245 - 343 (2.5 - 3.5, 36 - 50)
		$D_2 \rightarrow D_3$	23 - 32 (14 - 20)	219 - 306	
		$D_3 \rightarrow D_2$	19 - 27 (12 - 17)	187 - 259	
		$D_2 \rightarrow D_1$ $(2_2 \rightarrow 2_1)$	11 - 19 (7 - 12)	101 - 188	
		$D_3 \rightarrow 2_2$ $(D_3 \rightarrow 1_2)$	–	–	549 - 696 (5.6 - 7.1, 80 - 101)
		$1_2 \rightarrow 1_1$	50 - 66 (31 - 41)	487 - 632	245 - 343 (2.5 - 3.5, 36 - 50)
Lock-up shift	0 - 22.5 (0 - 0.886)	$D_3 \rightarrow D_3$ L/U	61 - 72 (38 - 45)	586 - 688	–
		D_3 L/U $\rightarrow D_3$	58 - 69 (36 - 43)	558 - 660	–

CD17 engine model (03X17)

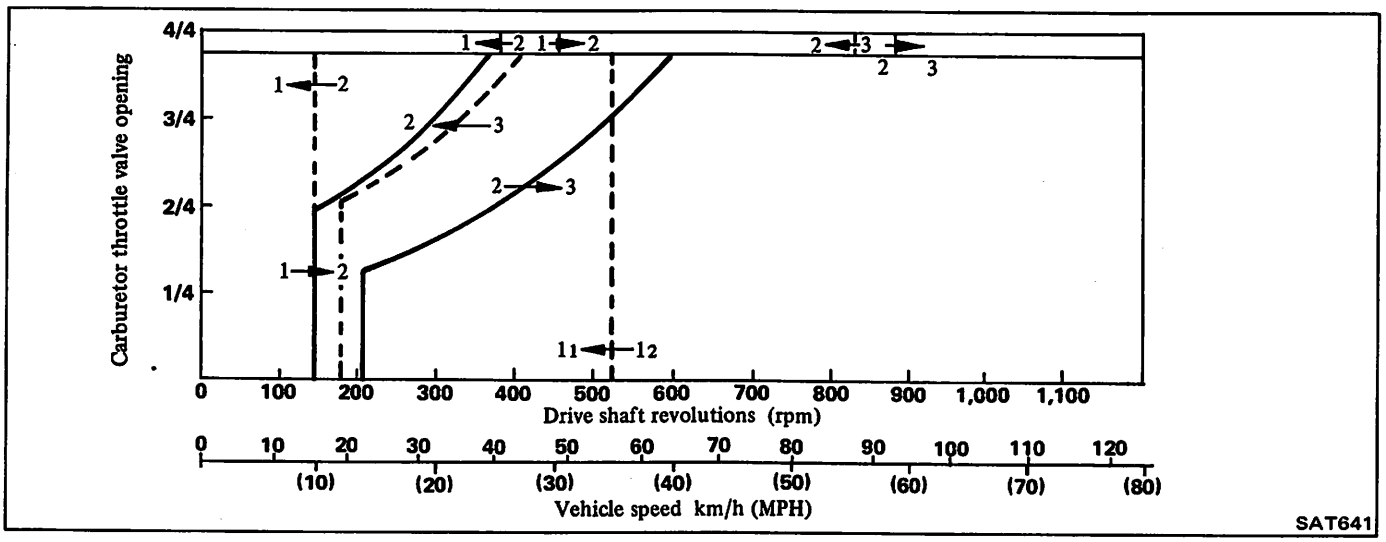
Throttle position	Throttle Wire length L mm (in)	Gear shift	Vehicle speed km/h (MPH)	Drive shaft revolutions rpm	Line pressure kPa (kg/cm², psi)
Full throttle	29.4 (1.157)	$D_1 \rightarrow D_2$ $(2_1 \rightarrow 2_2)$	44 - 52 (27 - 32)	421 - 496	549 - 696 (5.6 - 7.1, 80 - 101)
		$D_2 \rightarrow D_3$	87 - 96 (54 - 60)	829 - 909	
		$D_3 \rightarrow D_2$	85 - 92 (53 - 57)	810 - 871	
		$D_2 \rightarrow D_1$ $(2_2 \rightarrow 2_1)$	28 - 44 (17 - 27)	268 - 416	
		$D_3 \rightarrow 2_2$ $(D_3 \rightarrow 1_1)$	–	–	
		$1_2 \rightarrow 1_1$	–	–	
Half throttle (4/8 open)	14.6 (0.575)	$D_1 \rightarrow D_2$ $(2_1 \rightarrow 2_2)$	14 - 23 (9 - 14)	132 - 221	500 - 647 (5.1 - 6.6, 73 - 94)
		$D_2 \rightarrow D_3$	38 - 48 (24 - 30)	365 - 455	
		$D_3 \rightarrow D_2$	18 - 26 (11 - 16)	170 - 245	
		$D_2 \rightarrow D_1$ $(2_2 \rightarrow 2_1)$	11 - 20 (7 - 12)	104 - 194	
		$D_3 \rightarrow 2_2$ $(D_3 \rightarrow 1_2)$	–	–	549 - 696 (5.6 - 7.1, 80 - 101)
		$1_2 \rightarrow 1_1$	46 - 62 (29 - 39)	435 - 585	500 - 647 (5.1 - 6.6, 73 - 94)
Light throttle (1/8 open)	3.7 (0.146)	$D_1 \rightarrow D_2$ $(2_1 \rightarrow 2_2)$	13 - 22 (8 - 14)	119 - 208	245 - 343 (2.5 - 3.5, 36 - 50)
		$D_2 \rightarrow D_3$	21 - 30 (13 - 19)	198 - 288	
		$D_3 \rightarrow D_2$	18 - 26 (11 - 16)	170 - 245	
		$D_2 \rightarrow D_1$ $(2_2 \rightarrow 2_1)$	11 - 21 (7 - 13)	104 - 194	
		$D_3 \rightarrow 2_2$ $(D_3 \rightarrow 1_2)$	–	–	549 - 696 (5.6 - 7.1, 80 - 101)
		$1_2 \rightarrow 1_1$	46 - 62 (29 - 39)	435 - 585	245 - 343 (2.5 - 3.5, 36 - 50)

SHIFT SCHEDULE —— Upshift line ------- Downshift line

E16 engine model

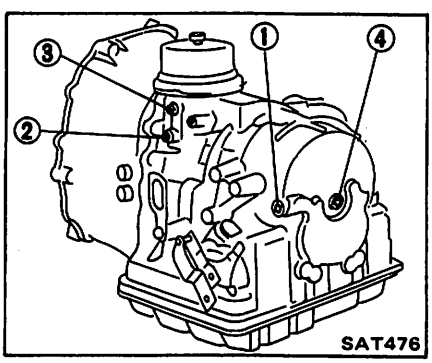


CD17 engine model (03X17)



PRESSURE TESTING

The RL3F01A transaxle is provided with three pressure test ports. All are useful for transaxle trouble-shooting, Line Pressure [To high-reverse clutch (Front)], Line Pressure [To forward clutch (Rear)] and Governor Pressure.



1 Line pressure [To high-reverse clutch (Front)]
2 Line pressure [To forward clutch (Rear)]
3 Governor pressure
4 Torque converter lock-up pressure

LINE PRESSURE

1. Install pressure gauge to line pressure port. (When shift lever is in "D", "2" or "1" range, install pressure gauge to port ② and when in "R" range, install pressure gauge to port ① shown above.) Locate the gauge so it can be seen by driver. Measure line pressure at idling and at stall test.
2. Road test car and note pressure under different throttle conditions.

At idling

E16 engine model

Range	Line pressure kPa (kg/cm², psi)
R	628 - 775 (6.4 - 7.9, 91 - 112)
D	245 - 343 (2.5 - 3.5, 36 - 50)
2	245 - 343 (2.5 - 3.5, 36 - 50)
1	245 - 343 (2.5 - 3.5, 36 - 50)

CD17 engine model

Range	Line pressure kPa (kg/cm², psi)
R	628 - 775 (6.4 - 7.9, 91 - 112)
D	245 - 343 (2.5 - 3.5, 36 - 50)
2	245 - 343 (2.5 - 3.5, 36 - 50)
1	245 - 343 (2.5 - 3.5, 36 - 50)

At stall test

E16 engine model

Range	Line pressure kPa (kg/cm², psi)
R	1,275 - 1,471 (13.0 - 15.0, 185 - 213)
D	549 - 696 (5.6 - 7.1, 80 - 101)
2	549 - 696 (5.6 - 7.1, 80 - 101)
1	549 - 696 (5.6 - 7.1, 80 - 101)

CD17 engine model

Range	Line pressure kPa (kg/cm², psi)
R	1,275 - 1,471 (13.0 - 15.0, 185 - 213)
D	549 - 696 (5.6 - 7.1, 80 - 101)
2	549 - 696 (5.6 - 7.1, 80 - 101)
1	549 - 696 (5.6 - 7.1, 80 - 101)

a. Line pressure can be measured by gradually opening throttle, starting with engine idle.

b. Line pressure should be measured while fluid temperature is within the 43 to 57°C (109 to 135°F) range.

Lock-up test

Install pressure gauge to port ④. Shift selector lever in "D" range.

Condition	Torque converter lock-up pressure kPa (kg/cm², psi)
Lock-up "ON"	Less than 49 (0.5, 7)
Lock-up "OFF"	More than 196 (2.0, 28)

Key points of pressure testing are:

a. Pressure at idle: Look for a steady rise in pressure as car speed increases under light load.

b. Pressure drop between shift points should not exceed 98 kPa (1.0 kg/cm², 14 psi). Excessive pressure drop may indicate an internal leak at a servo or clutch seal.

GOVERNOR PRESSURE

1. Install pressure gauge to governor pressure port. Locate the gauge so it can be seen by driver.
2. Road test car and note pressure at different road speeds. Governor pressure increases directly with road speed, and should always be less than line pressure.

STALL TESTING

The stall test is an effective method of testing clutch and band holding ability, torque converter one-way clutch operation, and engine performance. A stall test should only be performed as a last resort because of the high fluid temperature it generates and the excessive load it places on the engine and transaxle.

CAUTION:

a. Transaxle and engine fluid levels should always be checked and fluid added as needed.

b. Run engine at 1,200 rpm to attain proper warm-up.

c. During test, never hold throttle wide-open for more than 5 seconds.

d. Do not test more than two gear ranges without driving car to cool off engine and transaxle.

STALL TEST PROCEDURE

1. Install a tachometer where it can be seen by driver during test.
2. Set hand brake and block wheels.
3. Start engine and place shift lever in "D" range.
4. Apply foot brake and accelerate to wide-open throttle. Do **not** hold throttle open longer than five seconds.
5. Quickly note the engine stall speed and immediately release throttle.

Stall revolution:
E16 engine
1,800 - 2,100 rpm
CD17 engine
1,500 - 1,800 rpm

6. Place control lever in "R" range and repeat above test (same as in "D" range).

If stall test indicates proper stall revolution in "D" range, no further testing is necessary.

STALL TEST ANALYSIS

1. Satisfactory results in "D" range indicates forward clutch (Rear), one-way clutch of transaxle, and sprag clutch of torque converter, are functioning properly.

2. **Stall revolution in "D" range, 1st gear, is above the vehicle's specified revolution:**
The forward clutch (Rear) is faulty.

3. **Stall revolution in "R" range is above specified revolution (for "D" range):**
Low and Reverse Brakes are faulty.

4. **Stall revolution in "D" range, 1st gear is below specified revolution:**
Converter one-way clutch is faulty (slipping), or engine is not performing properly.

If converter one-way clutch is frozen, vehicle will have poor high speed performance. If converter one-way clutch is slipping, vehicle will be sluggish up to 50 or 60 km/h (30 or 40 MPH).

TROUBLE-SHOOTING CHART

Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transaxle must be removed from the vehicle.

	ON CAR								OFF CAR									
	Oil level	Control cable	Inhibitor switch and wiring	Throttle wire	Detent valve	Engine idling rpm	Line pressure	Manual valve	Governor	Band servo	Transaxle air check	Oil quality	Ignition switch and starter motor	Engine adjustment, brake inspection	Forward clutch (Rear)	High-reverse clutch (Front)	Band brake	Low and reverse brake	Oil pump	Oil passage leak	Transaxle on-way clutch	High-reverse clutch (Front) check ball	Park linkage
Engine does not start in "N", "P" ranges.		2	3										1										
Engine starts in range other than "N" and "P".		1	2																				
Transaxle noise in "P" and "N" ranges.	1						2												③				
Car moves when changing into "P" range or parking gear does not disengage when shifted out of "P" range		1																					②
Car runs in "N" range.		1						3				2			④								
Car will not run in "R" range (but runs in "D", "2" and "1" ranges.) Clutch slips. Very poor acceleration.	1	2					3	5			6	4			⑨	⑧		⑦		⑩		⑪	
Car braked when shifting into "R" range.										3	2	1			④	⑤							⑥
Sharp shock in shifting from "N" to "D" range.				2		1	3	4							⑤								
Car will not run in "D" range (but runs in "2", "1" and "R" ranges).		1					2	3													④		
Car will not run in "D", "1", "2" ranges (but runs in "R" range). Clutch slips. Very poor acceleration.	1	2					4	5			6	3		7	⑧	⑩				⑨			
Clutches or brakes slip somewhat in starting.	1	2		6			3	5			7	4							⑧	⑨			
Excessive creep.						1																	
No creep at all.	1	2				3		5				4			⑧	⑨			⑥	⑦			
Failure to change gear from "1st" to "2nd".		1		2	3			5	6	8	7	4				⑨			⑩				
Failure to change gear from "2nd" to "3rd".		1		2	3			5	6	8	7	4				⑨			⑩			⑪	
Too high a gear change point from "1st" to "2nd", from "2nd" to "3rd".				1	2		3	5	6			4							⑦				
Gear change directly from "1st" to "3rd" occurs.								2	4		3	1				⑤			⑥				
Engine stops when shifting lever into "D" range.													1										
	ON CAR														OFF CAR								

Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transaxle must be removed from the vehicle.

	ON CAR							OFF CAR				
	Oil level	Control cable	Throttle wire	Detent valve	Line pressure	Engine stall rpm	Manual valve	Governor	Band servo	Transaxle air check	Oil quality	Engine adjustment, brake inspection	Forward clutch (Rear)	High-reverse clutch (Front)	Band brake	Low and reverse brake	Oil pump	Oil passage leak	Transaxle one-way clutch	High-reverse clutch (Front) check ball
Too sharp a shock in change from "1st" to "2nd".			1			2	4		5		3				⑥					
Too sharp a shock in change from "2nd" to "3rd".			1		2		3		5	4				⑥						
Almost no shock or clutches slipping in change from "1st" to "2nd".	1	2	3		4		6		8	7	5				⑨			⑩		
Almost no shock or slipping in change from "2nd" to "3rd". Engine races extremely fast.	1	2	3		4		6		8	7	5			⑨				⑩		⑪
Car braked by gear change from "1st" to "2nd".							2				1			④		③			⑤	
Car braked by gear change from "2nd" to "3rd".							3		2		1				④					
Maximum speed not attained. Acceleration poor.	1	2			4	5	7		6		3	8	⑪	⑫	⑨	⑩	⑬			
Failure to change gear from "3rd" to "2nd".			1				3	4	6	5	2			⑦	⑧			⑨		
Failure to change gear from "2nd" to "1st" or from "3rd" to "1st".			1				3	4	6	5	2				⑦				⑧	
Gear change shock felt during deceleration by releasing accelerator pedal.		1	2	3	4		5	6										⑦		
Too high a change point from "3rd" to "2nd", from "2nd" to "1st".		1	2	3	4		5	6										⑦		
Kickdown does not operate when depressing pedal in "3rd" within kickdown car speed.			2	1			4	5		3					⑥			⑦		
Kickdown operates or engine overruns when depressing pedal in "3rd" beyond kickdown car speed limit.		1	2		3		5	6		7	4			⑧				⑨		
Races extremely fast or slips in changing from "3rd" to "2nd" when depressing pedal.			1		2		4		6	5	3			⑦	⑧			⑨		⑩
	ON CAR												OFF CAR							

Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transaxle must be removed from the vehicle.

	ON CAR									OFF CAR												
	Oil level	Control cable	Throttle wire	Engine idling rpm	Line pressure	Engine stall rpm	Lubrication	Manual valve	Governor	Band servo	Transaxle air check	Oil quality	Forward clutch (Rear)	High-reverse clutch (Front)	Band brake	Low and reverse brake	Oil pump	Oil passage leak	Torque converter, one-way clutch	Transaxle one-way clutch	Park linkage	Planetary gear
Car will not run in any range.	1	2	.	.	3	.	.	5	.	.	6	4	.	.	.	.	⑦	⑧	.	.	⑨	.
Transmission noise in "D", "2", "1" and "R" ranges.	1	.	.	.	2	.	.	.	.	.	.	.	③	.	.	.	④	.	.	⑤	.	⑥
Failure to change from "3rd" to "2nd" when changing lever into "2" range.	.	1	.	.	2	.	.	4	.	5	.	3	.	.	⑥	.	.	⑦	.	.	.	.
Gear change from "2nd" to "3rd" in "2" range.	.	1	.	.	2	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
No shock at change from "1" to "2" range or engine races extremely fast.	1	2	3	4	.	5	.	7	.	.	8	6	.	.	⑨	.	⑩	.	.	.	.	.
Failure to change from "3rd" to "2nd" when shifting lever into "1" range.	.	1	.	.	2	.	.	4	5	7	6	3	.	⑧	⑨	.	.	⑩	.	.	.	.
Engine brake does not operate in "1" range.	.	1	.	.	2	.	.	4	.	.	5	3	.	.	.	⑥	.	⑦	.	.	.	.
Gear change from "1st" to "2nd" or from "2nd" to "3rd" in "1" range.	.	1	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	③	.	.	.	.
Does not change from "2nd" to "1st" in "1" range.	1	2	.	.	.	.	.	4	5	6	7	3	.	.	.	⑧	.	⑨	.	.	.	.
Large shock changing from "2nd" to "1st" in "1" range.	.	.	1	.	.	2	.	4	.	.	.	3	.	.	.	⑤	.	.	.	.	.	.
Transaxle overheats.	1	.	.	.	3	4	2	6	.	8	7	5	.	⑨	⑩	⑪	⑫	⑬	⑭	.	.	⑮
Oil shoots out during operation. White smoke emitted from exhaust pipe during operation.	1	.	3	.	5	6	2	7	.	.	8	4	.	⑨	⑩	⑪	⑫	⑬	⑭	.	.	⑮
Offensive smell at oil charging pipe.	1	.	.	.	.	.	.	.	.	.	.	2	③	④	⑤	⑥	⑦	⑧	⑨	.	.	⑩
	ON CAR									OFF CAR												

Exclusively for RL3F01A (L/U)

Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transaxle must be removed from the vehicle.

	ON CAR		OFF CAR				
	Governor	*Line pressure*	*O-ring in input shaft*	*Torque converter*	*Speed cut valve*	*Lock-up control valve*	*Oil pump*
Torque converter is not locked up	1	2	③	⑦	⑤	⑥	④
Lock-up piston slip		1	②	④			③
Lock-up point is extremely high or low	1				②	③	
Engine is stopped at R.D. 2 and 1 ranges				②		①	
Transmission overheats		1	②	④			③

ROAD TEST SYMPTOM CHART

		SHIFT QUALITY				CAR WON'T MOVE	CRUISE SLIPPAGE	POOR POWER/ ACCELERATION	NOISY	OK	COMMENTS
		ROUGH	SHIFT TIMING [Mark km/h (MPH)]	NO SHIFT	SHIFT SLIPPAGE						
PARK RANGE	ENG. START										
	HOLDING										
"R" RANGE	Man. shift P-R										
	REVERSE										
"N" RANGE	Man. shift R-N										
	ENG. START										
	N										
"D" RANGE	Man. shift N-D										
	1st										
	Auto shift 1-2										
	2nd										
	Auto shift 2-3										
	3rd in lock-up "OFF"										
	Auto shift Lock-up "OFF" (3) → Lock-up "ON" (3) (L/U)										
	3rd in Lock-up "ON" (L/U)										
	Auto shift Lock-up "ON" (3) → Lock-up "OFF" (3) (L/U)										
	Decel. 3-2										
	Kickdown 3-2										
	Decel. 2-1										
	Kickdown 2-1										
"2" RANGE	Man. shift D-2										
	1st										
	Auto shift 1-2										
	2nd										
	Decel. 2-1										
	Kickdown 2-1										
"1" RANGE	Man. shift 2-1										
	Man. shift D-1										
	Acceleration										
	"1" Engine Braking										

TROUBLE-SHOOTING GUIDE

Order	Test item	Procedure
Checking	1. Oil level gauge	Check gauge for oil level and leakage before and after each test.
	2. Control cable	Check by shifting into "P", "R", "N", "D", "2" and "1" ranges with selector lever.
	3. Inhibitor switch	Check whether starter operates in "N" and "P" ranges only and whether reverse lamp operates in "R" range only.
	4. Engine idling rpm.	Check whether idling rpm meet standard.
	5. Throttle wire	Check whether the throttle wire is adjusted properly.
	6. Operation in each range.	Check whether transmission engages positively by shifting "N" → "D", "N" → "2", "N" → "1" and "N" → "R" range while idling with brake applied.
	7. Creep of car.	Check whether there is any creep in "D", "2", "1" and "R" ranges.
Stall test	1. Oil pressure before testing.	Measure line pressures in "D", "2", "1" and "R" range while idling.
	2. Stall test.	Measure engine rpm and line pressure in "D", "2", "1" and "R" ranges during full throttle operation. **Temperature of torque converter oil used in test should be from 60 to 100°C (140 to 212°F) i.e., sufficiently warmed up but not overheated.** **CAUTION:** **To cool oil between each stall test for "D", "2", "1" and "R" ranges, idle engine, i.e., rpm at about 1,200 rpm for more than 1 minute in "P" range. Measurement time must not be more than 5 seconds.**
	3. Oil pressure after testing	Same as item 1.
Road test	1. Slow acceleration, 1st → 2nd 2nd → 3rd	Check car speeds and engine rpm in shifting up 1st → 2nd range and 2nd → 3rd range while running with lever in "D" range and accelerator pedal half-way down.
	2. Quick acceleration, 1st → 2nd 2nd → 3rd	Same as item 1 above except with accelerator pedal more than 15/16 down (i.e., in the position just before kick-down).
	3. Lock-up operation, Lock-up "OFF" ⟷ "ON" (L/U)	Check whether the lock-up operates and measure the operating vehicle speeds.
	4. Kickdown operation, 3rd → 2nd or 2nd → 1st	Check whether the kickdown operates and measure the time delays while running at 30, 40, 50, 60, 70 km/h (19, 25, 31, 37, 43 MPH) in "D_3" range.
	5. Shift down, $D_3 \rightarrow D_2 \rightarrow D_1$	Check car speeds and engine rpm in shifting down from 3rd → 2nd → 1st (sequentially) while coasting with accelerator pedal released and in "D_3" range with accelerator pedal half-way down.

Order	Test item	Procedure
Road test	6. Shift down, $D_3 \rightarrow 1_2 \rightarrow 1_1$	Check for shifting down $D_3 \rightarrow 1_2$ and engine braking, and further for shifting down $1_2 \rightarrow 1_1$ and engine braking after shifting the lever into "1" range with the accelerator pedal released and while driving at about 60 km/h (37 MPH) in "D_3" range.
	7. Shift down, $D_3 \rightarrow 2$	Check for quick shifting down $D_3 \rightarrow 2$ and engine braking, after shifting the lever into "2" range while driving at about 50 km/h (31 MPH) in "D_3" range.
	8. Shift up and down $2_2 \rightarrow 2_1 \rightarrow 2_2$	Check for shifting up and down between 2_2 and 2_1 in response to car speed.
	9. Shift up, $1_1 \rightarrow 1_2$	Check for failure of the transaxle to shift up during acceleration, when starting in "1" range.
	10. Parking	Confirm that car will not move on grade when shifting to "P" range.
Others	Abnormal shock, oil leakage.	Enter into record conditions observed during these tests such as gear noise, abnormal clutch noise and acceleration performance.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

GENERAL SPECIFICATIONS

Vehicle model		E16 engine	CD17 engine
Automatic transaxle model		RL3F01A	RN3F01A
Stall torque ratio		1.9 : 1	1.9 : 1
Transaxle gear ratio	1st	2.826	
	2nd	1.543	
	Top	1.000	
	Reverse	2.364	
	Final drive	3.476	3.364
Number of teeth	Output shaft	21	22
	Idler gear	31	30
	Final gear	73	74
Oil		Automatic transmission fluid "Dexron" type	
Oil capacity		6.0 liters (6-3/8 US qt, 5-1/4 Imp qt)	

SPECIFICATIONS AND ADJUSTMENT

Vehicle model			E16 engine	CD17 engine
Automatic transaxle assembly Model code number			11X03	03X17
High-reverse clutch (Front)	Number of drive plates		2	2
	Number of driven plates		3	3
	Clearance mm (in)	Standard	1.0 - 1.4 (0.039 - 0.055)	
		Allowable limit	2.2 (0.087)	
	Drive plate thickness mm (in)	Standard	1.80 (0.0709)	
		Allowable limit	1.6 (0.063)	
	Thickness of retaining plate		Thickness mm (in)	Part number
			3.4 (0.134)	31537-01X05
			3.6 (0.142)	31537-01X00
			3.8 (0.150)	31537-01X01
			4.0 (0.157)	31537-01X02
			4.2 (0.165)	31537-01X03
			4.4 (0.173)	31537-01X04
Forward clutch (Rear)	Number of drive plates		3	3
	Number of driven plates		3	3
	Clearance mm (in)	Standard	0.8 - 1.2 (0.031 - 0.047)	
		Allowable limit	2.8 (0.110)	
	Drive plate thickness mm (in)	Standard	1.80 (0.0709)	
		Allowable limit	1.6 (0.063)	
	Thickness of retaining plate		Thickness mm (in)	Part number
			3.4 (0.134)	31537-01X05
			3.6 (0.142)	31537-01X00
			3.8 (0.150)	31537-01X01
			4.0 (0.157)	31537-01X02
			4.2 (0.165)	31537-01X03
			4.4 (0.173)	31537-01X04
Low & reverse brake	Number of drive plates		4	3
	Number of driven plates		4 (6)*	3 (7)*
	Clearance mm (in)	Standard	1.90 - 2.20 (0.0748 - 0.0866)	
		Allowable limit	3.8 (0.150)	
	Drive plate thickness mm (in)	Standard	2.00 (0.0787)	
		Allowable limit	1.8 (0.071)	
	Thickness of retaining plate		Thickness mm (in)	Part number
			3.6 (0.142)	31667-01X00
			3.8 (0.150)	31667-01X01
			4.0 (0.157)	31667-01X02
			4.2 (0.165)	31667-01X03
			4.4 (0.173)	31667-01X04
Brake band Piston size mm (in)		Big dia.	68 (2.68)	
		Small dia.	40 (1.57)	
Identification mark on separator plate (Punch mark on separator plate)			W	R

*: In the case where two driven plates are used instead of the retaining plate (Part No. 31667-01X02).

Oil pump clearance mm (in)	Outer gear-pump housing	Standard	0.20 - 0.30 (0.0079 - 0.0118)
		Allowable limit	0.35 (0.0138)
	Outer gear-crescent	Standard	0.20 - 0.30 (0.0079 - 0.0118)
		Allowable limit	0.35 (0.0138)
	Gears-pump plate	Standard	0.02 - 0.04 (0.0008 - 0.0016)
		Allowable limit	0.08 (0.0031)
	Seal ring-ring groove	Standard	0.10 - 0.25 (0.0039 - 0.0098)
		Allowable limit	0.25 (0.0098)
Planetary carrier mm (in)	Clearance between pinion washer and planetary carrier	Standard	0.20 - 0.70 (0.0079 - 0.0276)
		Allowable limit	0.80 (0.0315)

ROTARY FRICTIONAL FORCE

Unit: N·m (kg-cm, in-lb)

Output shaft	0.35 - 0.47 (3.6 - 4.8, 3.1 - 4.2)
Final drive	5.9 - 7.4 (60 - 75, 52 - 65)

OUTPUT SHAFT END PLAY

0.25 - 0.55 mm (0.0098 - 0.0217 in)

AVAILABLE SHIMS

Output shaft tapered roller bearing

Thickness mm (in)	Part number
0.11 (0.0043)	31499-01X00
0.13 (0.0051)	31499-01X01
0.15 (0.0059)	31499-01X02
0.17 (0.0067)	31499-01X03
0.19 (0.0075)	31499-01X04
0.30 (0.0118)	31499-01X05
0.40 (0.0157)	31499-01X06
0.50 (0.0197)	31499-01X07
0.60 (0.0236)	31499-01X08
0.70 (0.0276)	31499-01X09
0.80 (0.0315)	31499-01X10
0.90 (0.0354)	31499-01X11
1.00 (0.0394)	31499-01X12

Output shaft end play

Thickness of soldering plate –0.05 mm (0.0020 in)* mm (in)	Thickness mm (in)	Part number
0.55 - 0.85 (0.0217 - 0.0335)	0.3 (0.012)	31484-01X00
0.75 - 1.05 (0.0295 - 0.0413)	0.5 (0.020)	31484-01X01
0.95 - 1.25 (0.0374 - 0.0492)	0.7 (0.028)	31484-01X02
1.15 - 1.45 (0.0453 - 0.0571)	0.9 (0.035)	31484-01X03
1.35 - 1.65 (0.0531 - 0.0650)	1.1 (0.043)	31484-01X04
1.55 - 1.85 (0.0610 - 0.0728)	1.3 (0.051)	31484-01X05
1.75 - 2.05 (0.0689 - 0.0807)	1.5 (0.059)	31484-01X06
1.95 - 2.25 (0.0768 - 0.0886)	1.7 (0.067)	31484-01X07

* 0.05 mm (0.0020 in) is the amount the soldering plate recovers due to its elasticity, and it must be subtracted from the thickness of soldering plate.

Final drive

H = A – B mm (in)	Thickness mm (in)	Part number
0 - 0.07 (0 - 0.0028)	0.38 (0.0150)	38453-01X00
0.07 - 0.15 (0.0028 - 0.0059)	0.46 (0.0181)	38453-01X01
0.15 - 0.23 (0.0059 - 0.0091)	0.54 (0.0213)	38453-01X02
0.23 - 0.31 (0.0091 - 0.0122)	0.62 (0.0244)	38453-01X03
0.31 - 0.39 (0.0122 - 0.0154)	0.70 (0.0276)	38453-01X04
0.39 - 0.47 (0.0154 - 0.0185)	0.78 (0.0307)	38453-01X05
0.47 - 0.55 (0.0185 - 0.0217)	0.86 (0.0339)	38453-01X06
0.55 - 0.63 (0.0217 - 0.0248)	0.94 (0.0370)	38453-01X07
0.63 - 0.71 (0.0248 - 0.0280)	1.02 (0.0402)	38453-01X08
0.71 - 0.79 (0.0280 - 0.0311)	1.10 (0.0433)	38453-01X09
0.79 - 0.87 (0.0311 - 0.0343)	1.18 (0.0465)	38453-01X10
0.87 - 0.95 (0.0343 - 0.0374)	1.26 (0.0496)	38453-01X11
0.95 - 1.03 (0.0374 - 0.0406)	1.34 (0.0528)	38453-01X12
1.03 - 1.11 (0.0406 - 0.0437)	1.42 (0.0559)	38453-01X13
1.11 - 1.19 (0.0437 - 0.0469)	1.50 (0.0591)	38453-01X14
1.19 - 1.27 (0.0469 - 0.0500)	1.58 (0.0622)	38453-01X15
1.27 - 1.35 (0.0500 - 0.0531)	1.66 (0.0654)	38453-01X16

STALL REVOLUTION

Stall revolution rpm	E16 engine	1,800 - 2,100
	CD17 engine	1,500 - 1,800

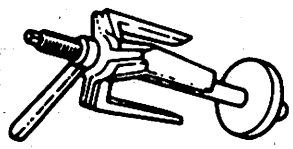
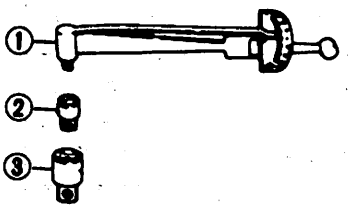
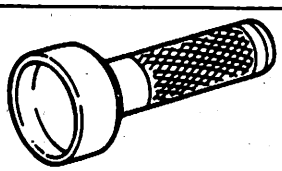
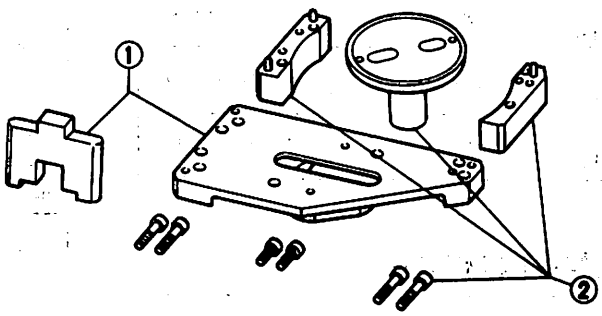
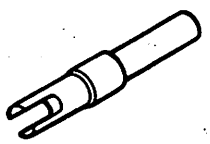
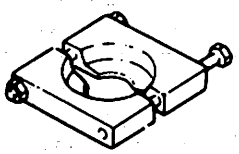
TIGHTENING TORQUE

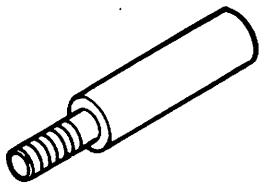
Unit		N·m	kg-m	ft-lb
Drive plate to torque converter		49 - 69	5.0 - 7.0	36 - 51
Converter housing to engine	M8	16 - 22	1.6 - 2.2	12 - 16
	M10	39 - 49	4.0 - 5.0	29 - 36
Engine gusset to cylinder block (CD17 engine model)		30 - 40	3.1 - 4.1	22 - 30

Unit	N·m	kg-m	ft-lb
Transaxle case to converter housing	14 - 18	1.4 - 1.8	10 - 13
Transaxle case to front cover	14 - 18	1.4 - 1.8	10 - 13
Oil pan to transaxle case	5 - 7	0.5 - 0.7	3.6 - 5.1
Bearing retainer to transaxle case	19 - 25	1.9 - 2.5	14 - 18
Piston stem (when adjusting band brake)	*4 - 5	*0.4 - 0.5	*2.9 - 3.6
Piston stem lock nut	16 - 22	1.6 - 2.2	12 - 16
Low and reverse brake piston retainer	7 - 9	0.7 - 0.9	5.1 - 6.5
Control valve body to transaxle case	7 - 9	0.7 - 0.9	5.1 - 6.5
Lower valve body to upper valve body	7 - 9	0.7 - 0.9	5.1 - 6.5
Final gear bolt	69 - 78	7.0 - 8.0	51 - 58
Oil strainer to lower valve body	5 - 7	0.5 - 0.7	3.6 - 5.1
Governor valve body to governor shaft	5 - 7	0.5 - 0.7	3.6 - 5.1
Governor shaft securing nut	3.4 - 6.9	0.35 - 0.7	2.5 - 5.1
Idler gear when adjusting turning frictional force)	26 - 36	2.7 - 3.7	20 - 27
Idler gear lock nut	**		
Throttle wire securing nut	5 - 7	0.5 - 0.7	3.6 - 5.1
Control cable securing nut	8 - 11	0.8 - 1.1	5.8 - 8.0
Inhibitor switch to transaxle case	2.0 - 2.5	0.20 - 0.26	1.4 - 1.9
Manual shaft lock nut	31 - 42	3.2 - 4.3	23 - 31
Oil cooler pipe to transaxle case	29 - 49	3.0 - 5.0	22 - 36
Test plug (oil pressure inspection hole	5 - 10	0.5 - 1.0	3.6 - 7.2
Support actuator (parking rod inserting position) to rear extension	8 - 11	0.8 - 1.1	5.8 - 8.0
Engine to gusset	30 - 40	3.1 - 4.1	22 - 30
Gusset to converter housing	16 - 21	1.6 - 2.1	12 - 15

* Turn back 2.5 turns after tightening.
** Refer to Adjusting Turning Frictional Force of Tapered Roller Bearing.

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	
ST25420001 (ST25420000) (J26063)	Clutch spring compressor	
ST33290001 (J25810)	Side bearing outer race puller	
ST3127S000 ① GG91030000 (J25765) ② HT62940000 (——) ③ HT62900000 (——)	Preload gauge Torque wrench Socket adapter Socket adapter	
ST33400001 (J26082)	Oil seal drift	
KV381058S0 (——) ① KV38105810 (——) ② KV38105820 (——)	Differential side bearing height gauge Differential side bearing height gauge Spacer and bolts	
KV38105900 (——)	Preload adapter	
ST22730000 (J25681)	Bearing puller	
ST2505S001 (——)	Oil pressure gauge set	

Tool number (Kent-Moore No.)	Tool name
KV38106000 (——)	Height gauge adapter (diff. side bearing) 

FRONT AXLE & FRONT SUSPENSION

SECTION FA

CONTENTS

FRONT AXLE AND FRONT SUSPENSION ..... FA- 2
FRONT AXLE ..... FA- 3
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Drive shaft ..... FA- 7
FRONT SUSPENSION FA-11
Spring and strut assembly FA-11
Transverse link FA-13
Lower ball joint FA-13
SERVICE DATA AND SPECIFICATIONS (S.D.S.) FA-15
General specifications FA-15
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Tightening torque FA-15
TROUBLE DIAGNOSES AND CORRECTIONS FA-16
SPECIAL SERVICE TOOLS FA-18

Refer to section MA (Front Axle and Front Suspension) for:

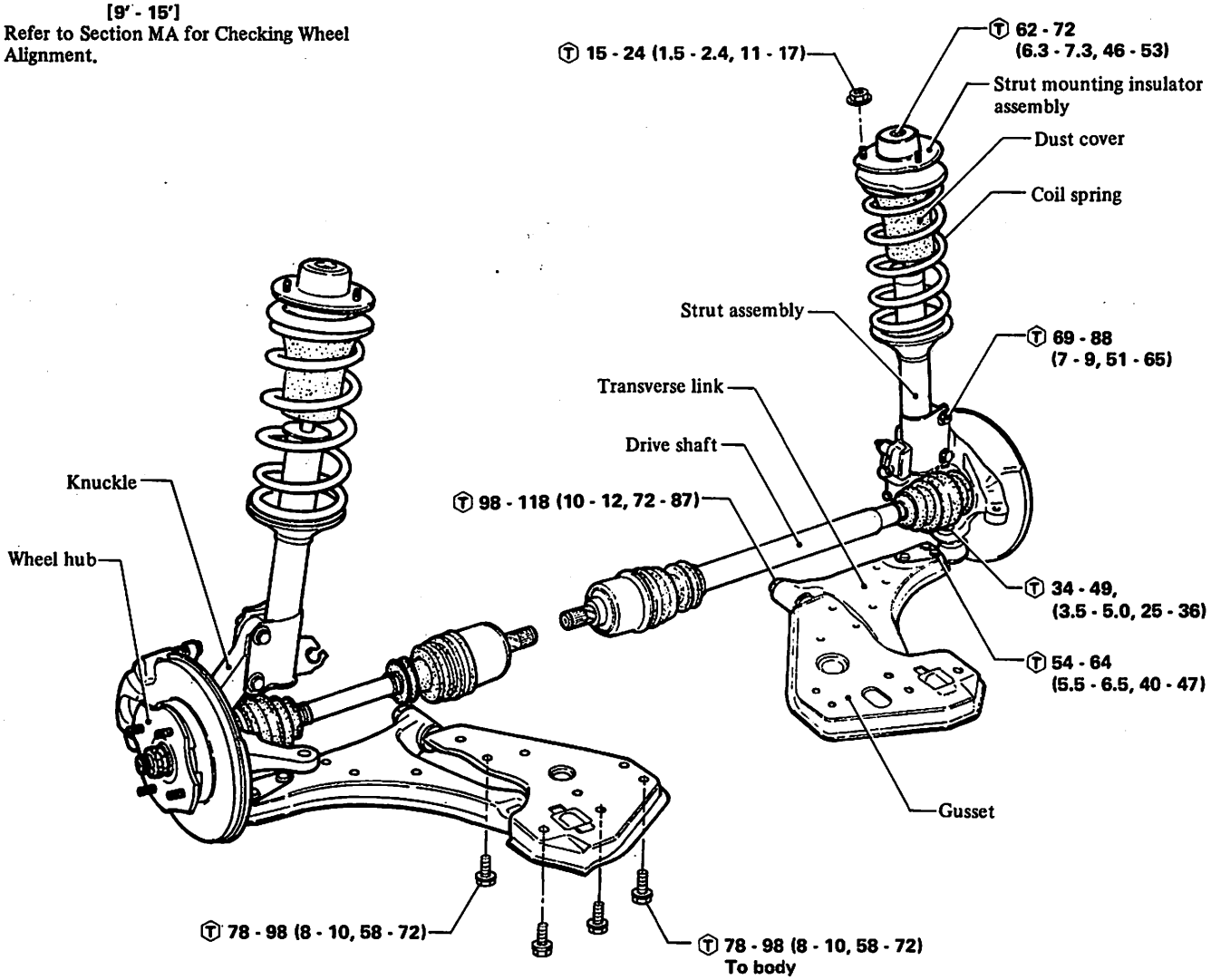
- CHECKING FRONT AXLE AND SUSPENSION PARTS
- CHECKING WHEEL ALIGNMENT

FRONT AXLE AND FRONT SUSPENSION

Wheel alignment
- Camber, caster and kingpin are preset at factory and cannot be adjusted.
- The vehicle requires only toe-in adjustments.

  Toe-in 3 - 5 mm (0.12 - 0.20 in)
  [9' - 15']

  Refer to Section MA for Checking Wheel Alignment.

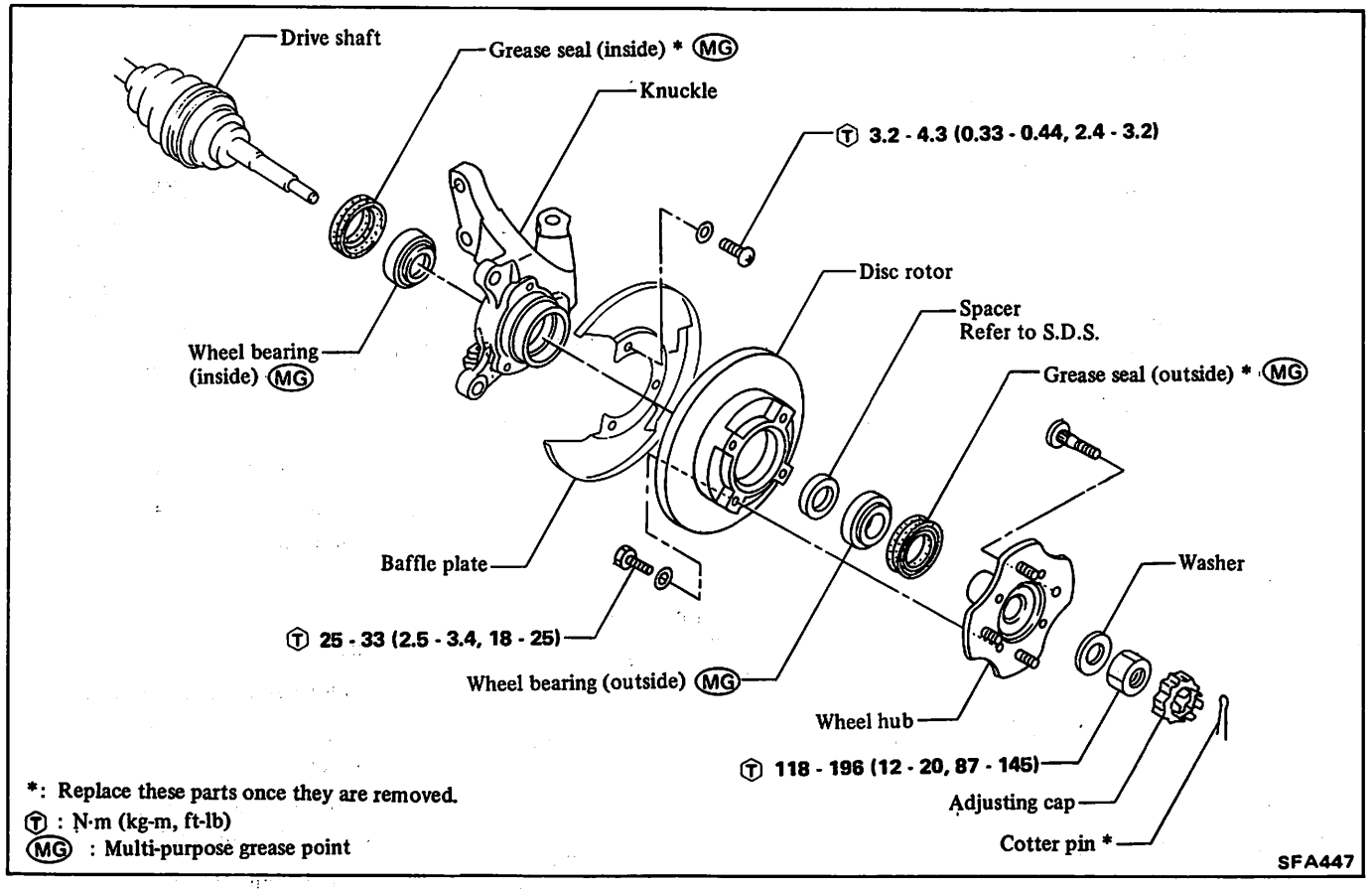


Wheel bearing
- Do not overtighten wheel bearing nuts, as this can cause wheel bearing seizure.
- **Axial play: 0 mm (0 in)**
- **Ⓣ 118 - 196 N·m (12 - 20 kg-m, 87 - 145 ft-lb)**
- **Rotation starting torque (with grease seal)**
  0.8 - 2.7 N·m (8 - 28 kg-cm, 6.9 - 24.3 in-lb)
  As measured at wheel hub bolt
  13.7 - 48.1 N (1.4 - 4.9 kg, 3.1 - 10.8 lb)
- When measuring starting torque, do not include "dragging" resistance with brake pads.
- Adjust shim thickness. Refer to S.D.S.

Ⓣ: N·m (kg-m, ft-lb)

SFA446

FRONT AXLE



WHEEL HUB AND KNUCKLE

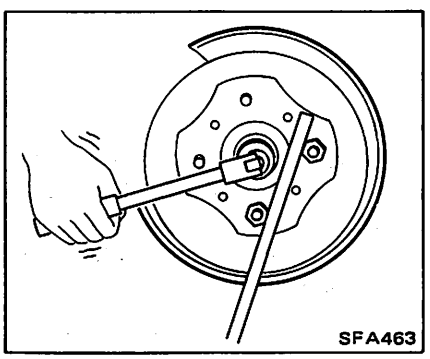
REMOVAL

1. Jack up vehicle and support it with safety stands.
2. Remove wheel and tire.
3. Remove caliper assembly.

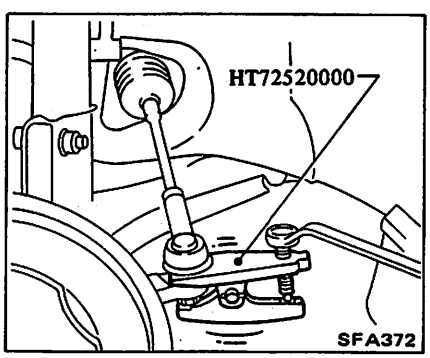
Refer to section BR.

4. Pry off cotter pin.
5. Loosen (not remove) wheel hub nut from drive shaft while holding wheel hub with suitable tool.

CAUTION:
Install wheel nuts so as not to damage wheel bolts during above operation.

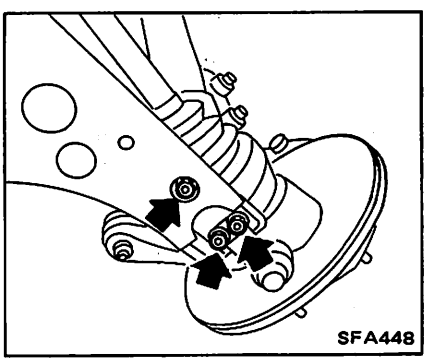


6. Remove tie-rod ball joint.



7. Remove lower ball joint.

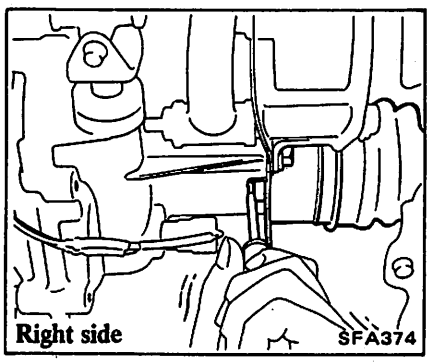
Do not reuse nut once it has been removed.

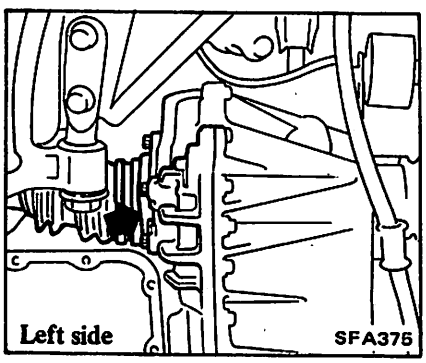


8. Drain gear oil.
9. Remove drive shaft.

Circlip that was installed on shaft should not be used again after drive shaft has been removed.

CAUTION:
To prevent possible damage, do not attempt to pull out drive shaft.

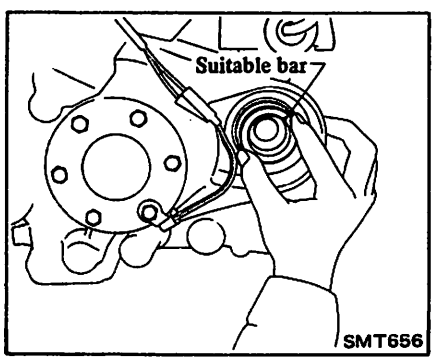




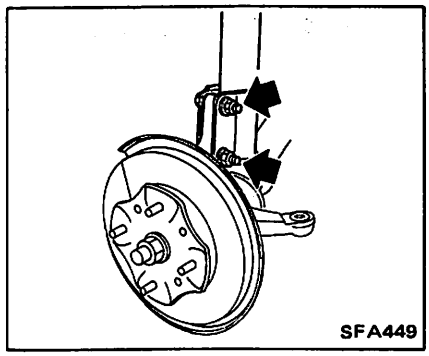
10. Remove oil seal on transaxle side. Refer to section MT or AT.

When removing drive shaft, replace oil seal.

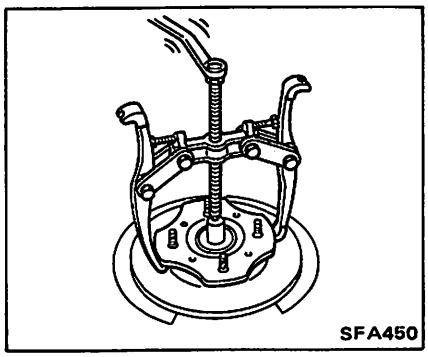
11. Insert a suitable bar or similar tool to prevent side gear from dropping.



12. Remove bolts, then remove wheel hub, knuckle, and drive shaft as a unit.



13. Remove hub nut and then separate drive shaft.

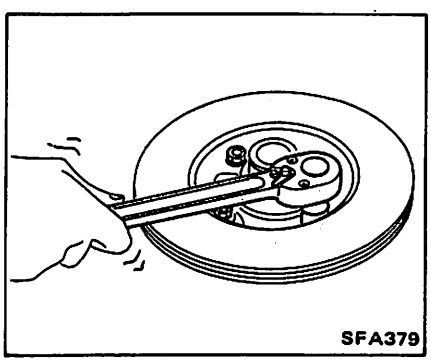


14. If necessary, separate lower ball joint from knuckle, using Ball Joint Remover HT72520000.

DISASSEMBLY

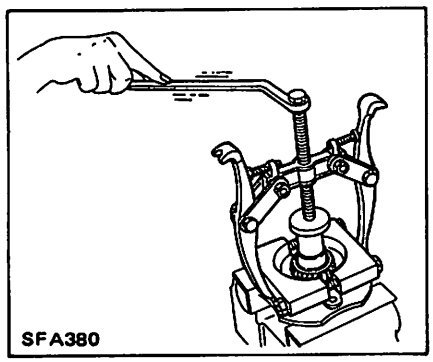
Wheel hub

1. Separate wheel hub and knuckle using tools KV40101000 and ST36230000.
2. Remove bolts securing wheel hub to disc rotor.



3. Remove outer wheel bearing with suitable bearing replacer.

When replacing wheel bearing, replace as a set of outer and inner wheel bearing assembly.



4. Remove grease seal (outside).

Do not reuse grease seal once it has been removed.

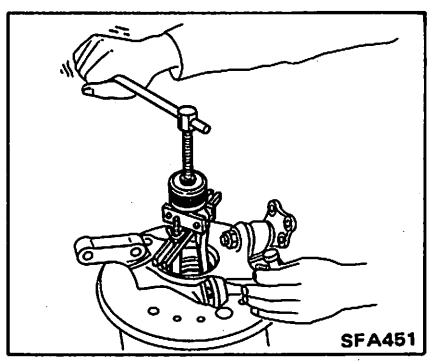
Knuckle

1. Remove grease seal (inside).

Do not reuse grease seal once it has been removed.

2. Remove wheel bearing outer race with suitable bearing puller.

When replacing wheel bearing, replace as a set of outer and inner wheel bearing assembly.



INSPECTION

Wheel bearing

Thoroughly clean grease and dirt from wheel bearing with cleaning solvent, and dry with compressed air free from moisture. Check wheel bearing to see that it rolls freely and is free from noise, crack, pitting, or wear.

Wheel hub and knuckle

Check wheel hub for crack by means of a magnetic exploration or dyeing test, and replace if cracked.

Grease seal

If grease leakage is detected during removal, replace grease seal. Replace grease seal at every disassembly even if it appears good.

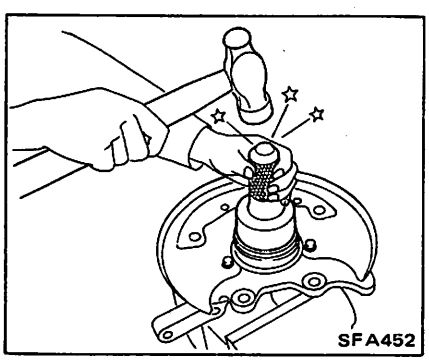
ASSEMBLY

1. Coat each bearing with recommended multi-purpose grease.



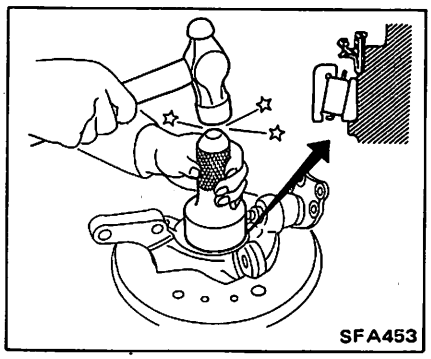
2. Install bearing outer race into each side of knuckle using suitable drift or brass bar.

CAUTION:
When replacing wheel bearing, replace inner and outer wheel bearings at the same time to prevent mix use of bearings of different brands.



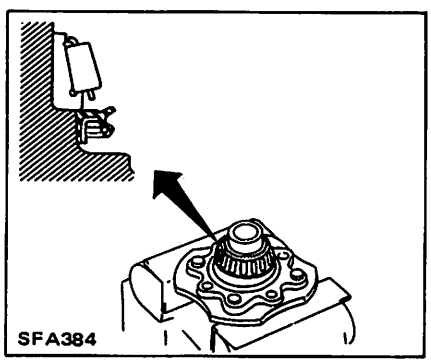
3. Install inside bearing inner race and grease seal using suitable drift.

a. **Pack seal lip with recommended multi-purpose grease.**
b. **Be sure that grease seal is facing in proper direction.**



4. Install outside grease seal and bearing into wheel hub with suitable drift.

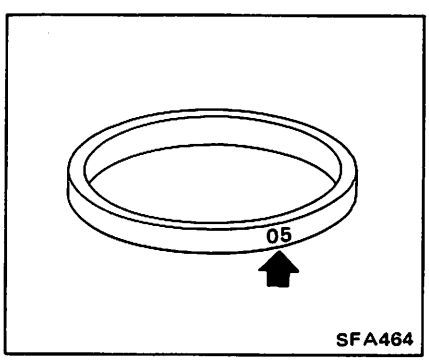
a. **Pack seal lip with recommended multi-purpose grease.**
b. **Be sure that grease seal is facing in proper direction.**
c. **Press bearing inner race to install, never force to the roller or cage.**



5. Install spacer.

Select suitable spacer as follows:

a. **When grease seal, bearing, or spacer is replaced, select a spacer having same mark as old one. The old spacer can be used if it is still serviceable.**

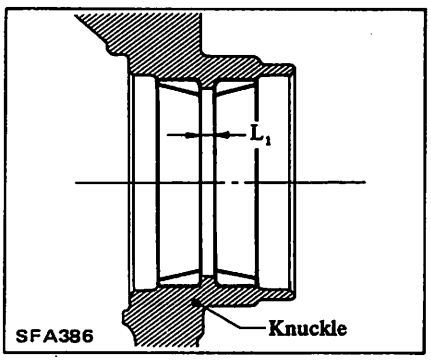


b. **When knuckle is replaced, use a spacer determined by the following equation:**

$L = L_1 - L_2$

L: Spacer thickness, mm (in)
L_1: Distance between outer races of bearing, mm (in)
L_2: 0.16 mm (0.0063 in)

For relationship between spacer's mark and its thickness, refer to S.D.S.



6. Tighten bolts securing hub to disc rotor.

Ⓣ: **25 - 33 N·m (2.5 - 3.4 kg-m, 18 - 25 ft-lb)**

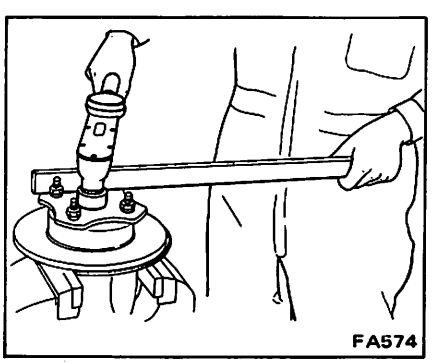
7. Put drive shaft into knuckle, and fit drive shaft serration to wheel hub.
(1) Clamp drive shaft in vise and install knuckle with bearings, spacer and hub nut.

CAUTION:
Do not tap drive shaft.

(2) Tighten hub nut.

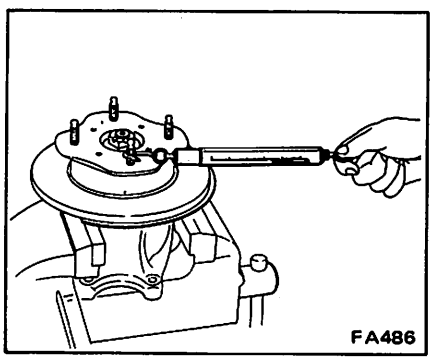
Ⓣ: **118 - 196 N·m (12 - 20 kg-m, 87 - 145 ft-lb)**

CAUTION:
Install wheel nuts so as not to damage wheel bolts during above operation.



8. Spin wheel hub several turns in both directions.
9. Measure bearing preload.

Rotation starting torque of wheel bearing:
0.8 - 2.7 N·m
(8 - 28 kg-cm,
6.9 - 24.3 in-lb)
As measured at wheel hub bolt:
13.7 - 48.1 N
(1.4 - 4.9 kg,
3.1 - 10.8 lb)



If bearing preload does not accord with the specification, reselect spacer as follows:

a. When any axial end-play is present in wheel bearing, or bearing preload is lower than the specification, replace spacer with a smaller one.
b. When bearing preload is greater than the specification, replace spacer with a larger one.

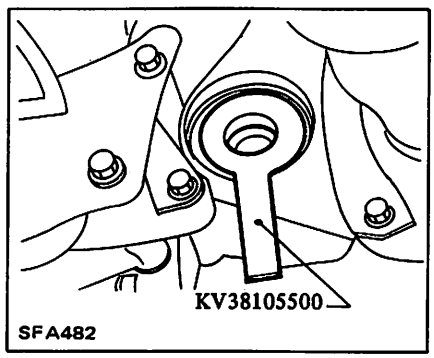
10. Repeat steps 7 and 9 until specified preload is obtained.
11. Insert a new cotter pin, and bend up.

INSTALLATION

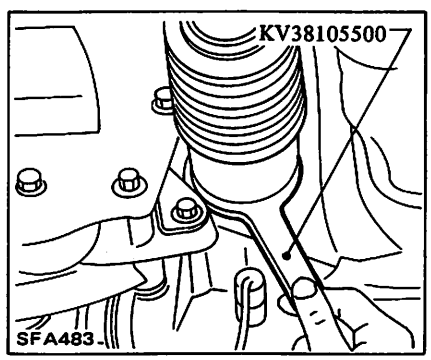
Install hub and knuckle in reverse order of removal, noting the following.

- When installing drive shaft in transaxle;

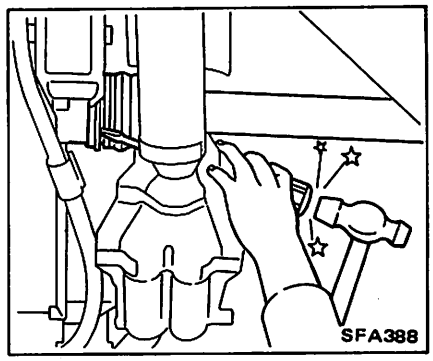
1. Install new oil seal on transaxle side.
2. Install new circlip to drive shaft. When removing drive shaft, replace the circlip.
3. Set Tool along the inner circumference of oil seal (transaxle side).



4. Insert drive shaft into transaxle, be sure to properly align the serrations and then withdraw Tool.



5. Push drive shaft or hammer the flange of slide joint cover, and then press-fit circlip on the drive shaft into circlip groove of side gear.

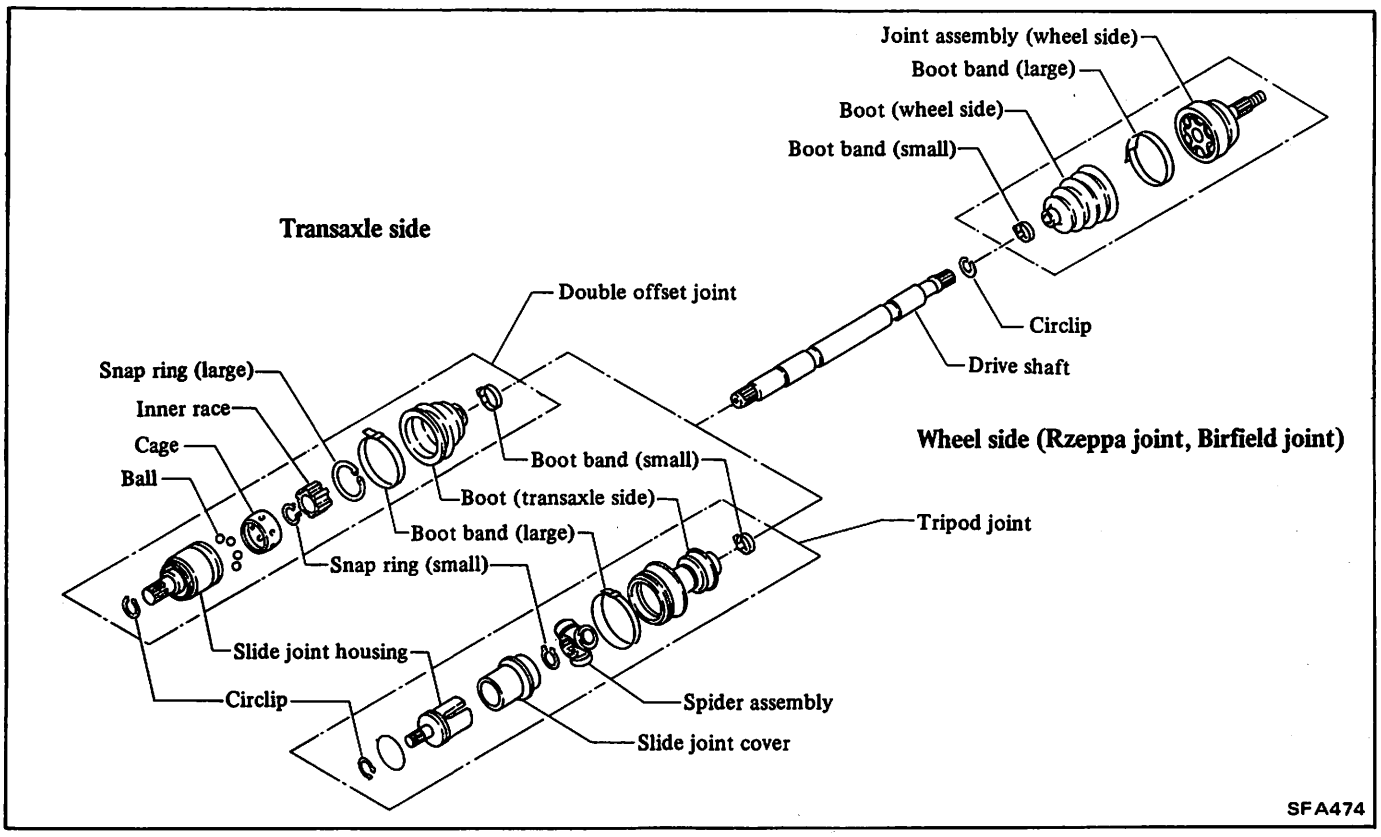


- **After it is inserted, try to pull flange out of slide joint by hand to make sure circlip is properly meshed with side gear and will not come out.**
- Always use new cotter pins and lower ball joint fixing nuts.
- After installation, pour gear oil into transaxle.

Refer to instllation (section MT or AT) of Transaxle in Removal and Installation.

Ⓣ : Strut to knuckle
69 - 88 N·m
(7 - 9 kg-m,
51 - 65 ft-lb)
Transverse link to ball joint
54 - 64 N·m
(5.5 - 6.5 kg-m,
40 - 47 ft-lb)
Lower ball joint stud nut
34 - 49 N·m
(3.5 - 5.0 kg-m,
25 - 36 ft-lb)
Tie-rod stud nut
29 - 49 N·m
(3.0 - 5.0 kg-m,
22 - 36 ft-lb)

DRIVE SHAFT



REMOVAL

Refer to Hub and Knuckle for removal.

DISASSEMBLY

CAUTION:

a. The joint on the wheel side employs a non-disassembling design. It should not be disassembled except as designated in this Service Manual.

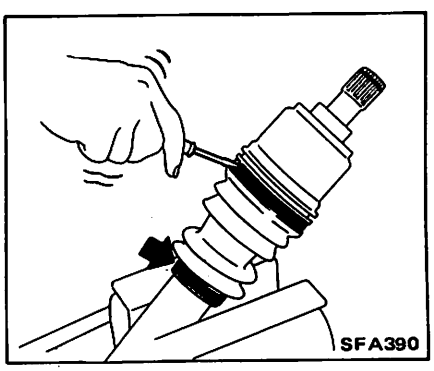
b. Tripod joint:
The spider assembly on the transaxle side is also a non-disassembling type, consisting of a tripod, rollers, needle bearing and washer.

Transaxle side

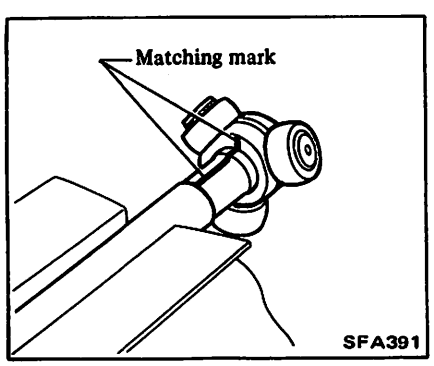
Tripod joint

1. Place "soft" jaws over steel jaws of bench vise, and place drive shaft securely in vise.
2. Remove boot bands.

Do not reuse boot bands once they have been removed.

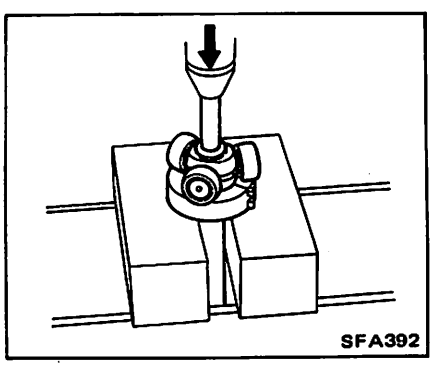


3. Separate slide joint housing (with slide joint cover) and drive shaft (with spider assembly).
4. Make matching mark.



5. Remove snap ring, then detach spider assembly, using press.

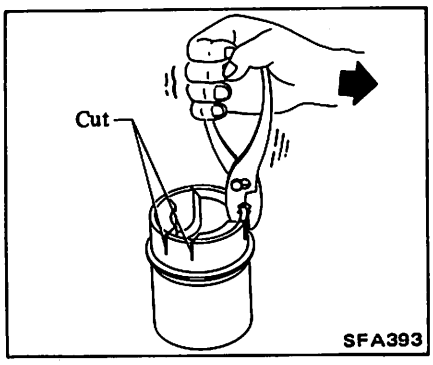
- **Do not reuse snap ring once it has been removed.**
- **To prevent drive shaft from dropping, always support drive shaft by hand when removing spider assembly.**



6. Remove boot.
7. Cut off the edge of slide joint cover with a saw blade; remove slide joint cover by bending it.

- **Do not reuse slide joint cover once it has been removed.**

- **Be careful not to damage slide joint housing.**



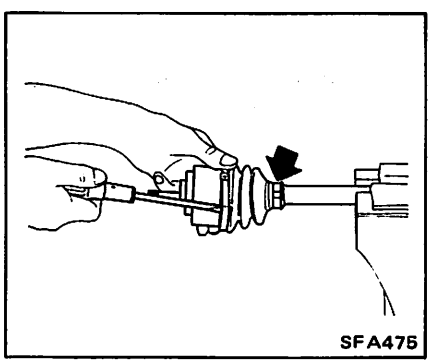
8. Remove O-ring.

Do not reuse O-ring once it has been removed.

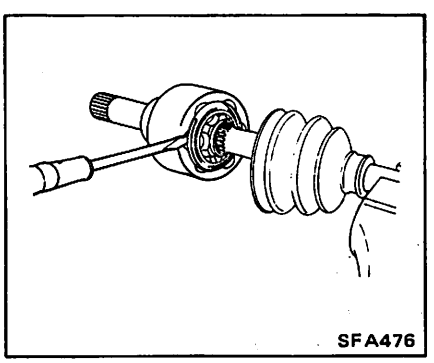
Double offset joint

1. Place "soft" jaws over steel jaws of bench vise, and place drive shaft securely in vise.
2. Remove boot bands.

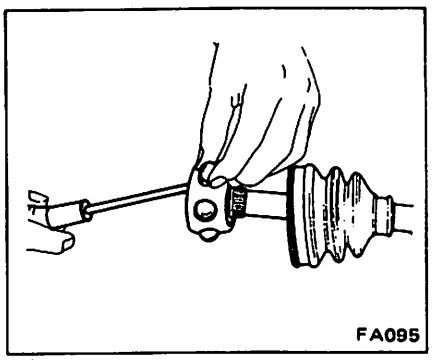
Do not reuse boot bands once they have been removed.



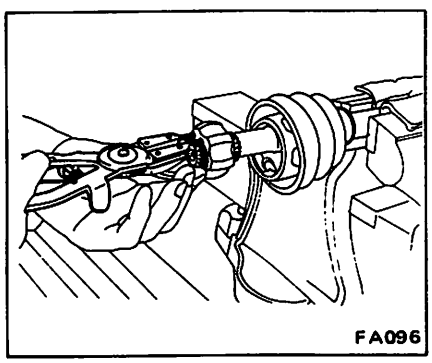
3. To disassemble double offset joint, pry off snap ring with a screwdriver, and pull out slide joint housing.



4. Wipe grease off ball cage, and drive out balls. Turn cage approximately a half turn, and detach from inner race.



5. Pry off snap ring, and withdraw inner race. This inner race is removed easily by lightly tapping on it with a mallet.



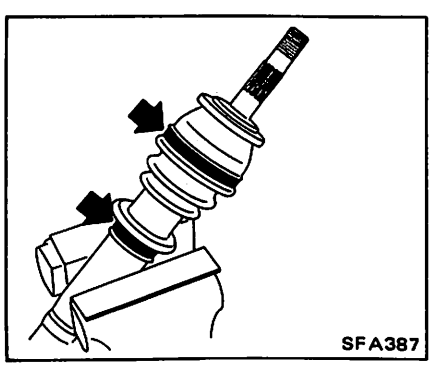
Do not reuse snap ring once it has been removed.

6. Draw out boot.

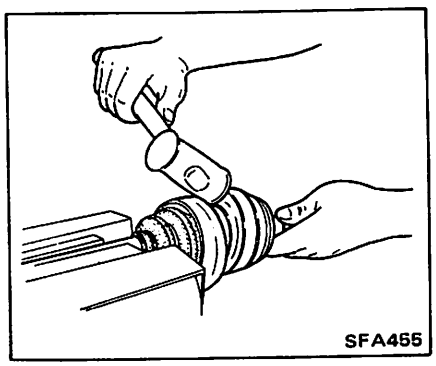
Wheel side

1. Remove boot bands.

Do not reuse boot bands once they have been removed.



2. Put matching marks on drive shaft and joint assembly.
3. Separate joint assembly by lightly tapping it.



Do not disassemble joint assembly.
Do not reuse circlip once it has been separated.

4. Draw out boot.

INSPECTION

Thoroughly clean all parts in cleaning solvent, and dry with compressed air. Check parts for evidence of deformation or other damage.

Drive shaft

Replace drive shaft if it is twisted or cracked.

Joint assembly (Wheel side)

Replace joint assembly if it is deformed or damaged.

Spider assembly (Transaxle side)

1. Replace spider assembly if needle bearing and washer are damaged.
2. Check to see if serrated portions are deformed; also check serrated portions on the drive shaft side. If necessary, replace.
3. Check to see if roller surfaces are scratched, worn or damaged; also check slide joint housing for abnormalities. If necessary, replace.

Double offset joint (Transaxle side)

Replace any parts of double offset joint which show sign of burn, rust, wear, or excessive play.
Check groove of slide joint housing for cracks, wear or deformation. Replace if necessary.

Boot

Replace fatigued, cracked, or worn boot.

ASSEMBLY

- **After drive shaft has been assembled, ensure that it moves smoothly over its entire range without binding.**
- **Use NISSAN GENUINE GREASE or equivalent after every overhaul.**

Rzeppa joint - Tripod joint:

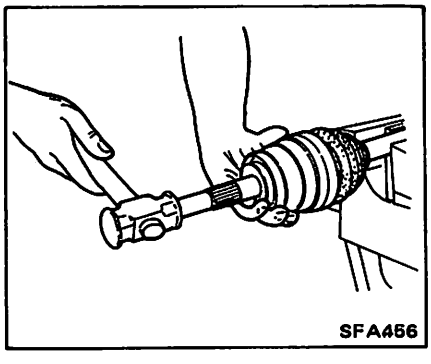
Be careful when applying grease to transaxle side and wheel side as different types are used for each.

Wheel side

1. Install boot and new small boot band to drive shaft.

- **Be careful not to damage boot on the edge of drive shaft.**

2. Set joint assembly onto drive shaft (with new circlip) by lightly tapping it.

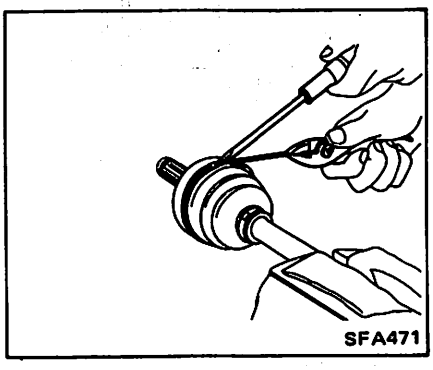

SFA456

- **Do not reuse circlip once it has been separated.**
- **Install joint assembly securely, ensuring marks are properly aligned.**
- **If there is not mark, position both spider assemblies (one on the wheel side and the other on the transaxle side) so that their phases are nearly zero.**

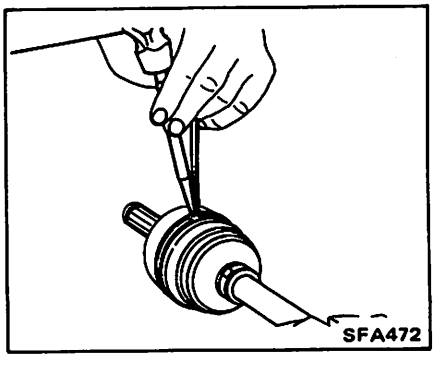
3. Pack drive shaft with specified amount of grease.

Specified amount:
Rzeppa joint
Approx. 110 g (3.88 oz)
Birfield joint
Approx. 100 g (3.53 oz)

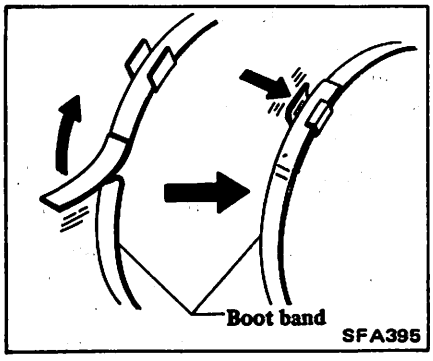
4. Install new larger diameter boot band.
(1) Tie band two turns around boot, tighten it with a screwdriver and pliers or suitable tool, and bend approximately 90 degrees.


SFA471

(2) Lock band securely with a punch, leaving the length the same as its width. Secure band by bending back over itself.

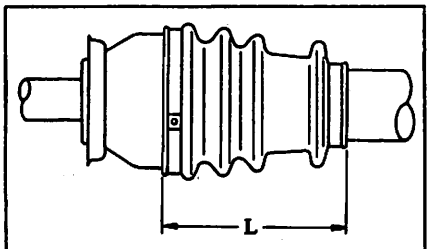

SFA472

In securing band, be careful not to scratch boot.



SFA395

5. Set boot so that it does not swell and deform when its length is "L".



Length "L":
Rzeppa joint
100 mm (3.94 in)
Birfield joint
90 mm (3.54 in)
SFA394

6. Install new smaller diameter boot band.

Transaxle side

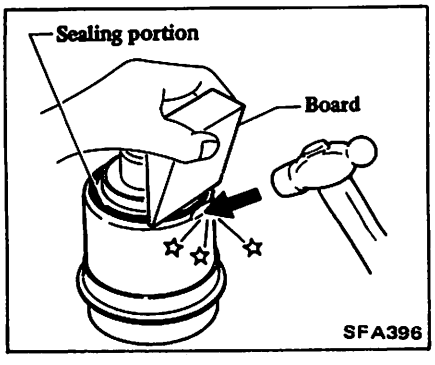
Tripod type

1. Install new O-ring.

Apply a coat of grease to O-ring.

2. Install new slide joint cover and bend the edge over on entire circumference.

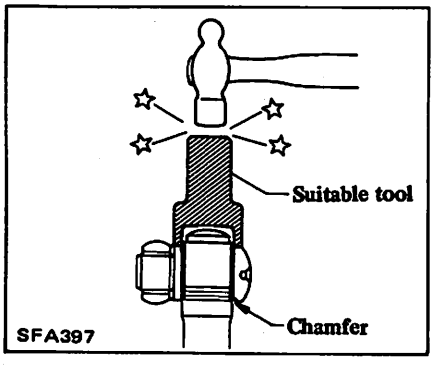
- **Bend the edge at two positions (180° apart) and ensure that housing cover does not rattle.**
- **Place a board on slide joint cover to prevent it from being scratched.**



SFA396

3. Apply sealant.
4. Install boot and new small boot band onto drive shaft.
5. Place drive shaft in a vise, using soft cushioning pads.
6. Install spider assembly securely, ensuring marks are properly aligned.

- **If there is not mark, position both spider assemblies (one on the wheel side and the other on the transaxle side) so that their phases are nearly zero.**
- **Press-fit with spider assembly serration chamfer facing shaft.**



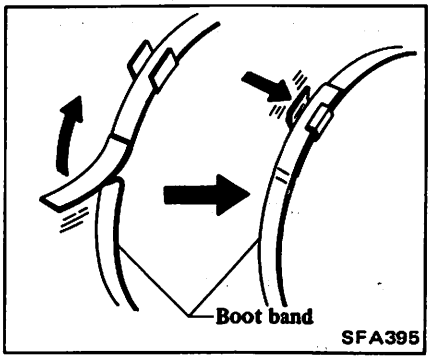
7. Install new snap ring.

Ensure that round surface faces toward spider assembly.

8. Pack with grease.

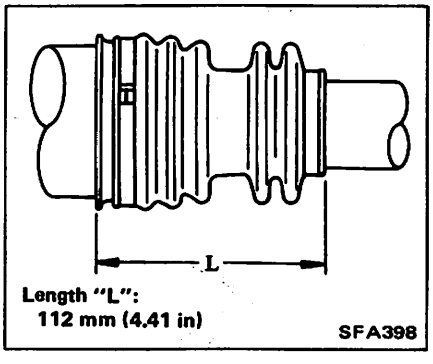
Specified amount of grease:
Approx. 180 g (6.35 oz)

9. Fasten new large diameter boot band.



In securing boot bands, be careful not to scratch boot.

10. Set boot so that it does not swell of deform when its length is "L".



11. Fasten new smaller diameter boot band.

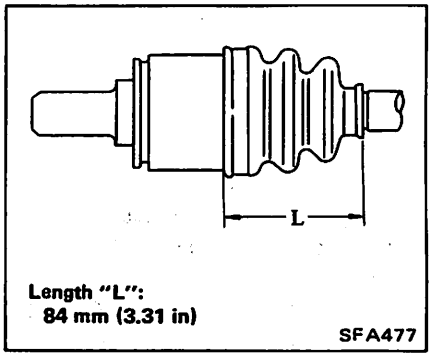
Double offset joint

To assemble drive shaft assembly, reverse the order of disassembly, noting the following.

- Pack with grease.

Specified amount of grease:
Approx. 100 g (3.53 oz)

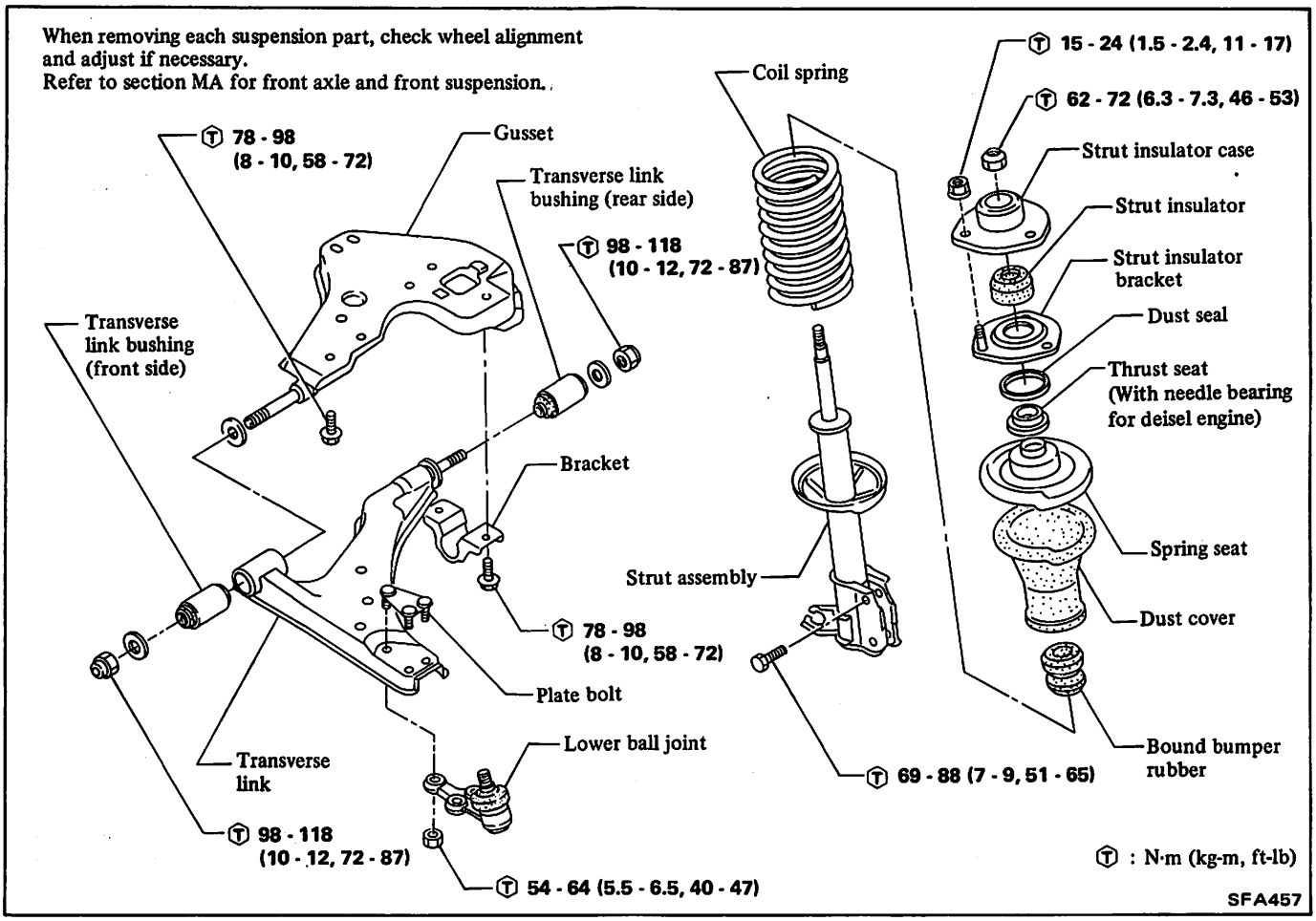
- Fasten boot bands.
  Refer to Tripod type.



INSTALLATION

Refer to Wheel Hub and Knuckle for installation.

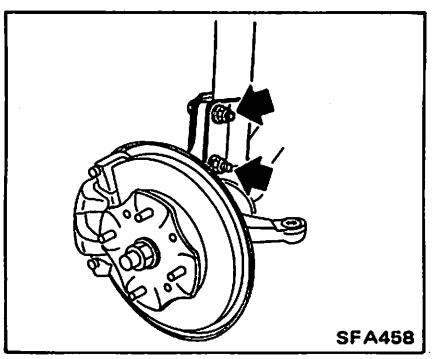
FRONT SUSPENSION



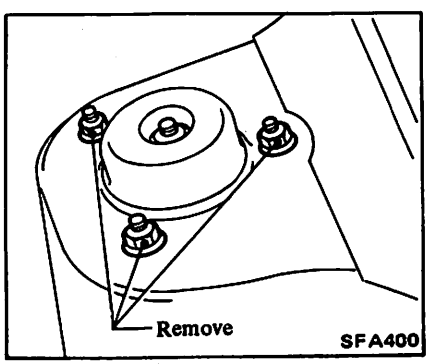
SPRING AND STRUT ASSEMBLY

REMOVAL AND INSTALLATION

1. Jack up vehicle and support it with safety stands.
2. Remove wheel and tire.
3. Detach brake tube from strut.
4. Support transverse link with safety stand.
5. Detach strut from knuckle.



6. Supporting strut assembly, remove strut attaching nut, and then withdraw strut assembly.



7. Install spring and strut assembly in reverse order of removal.

Ⓣ : Strut to body
15 - 24 N·m
(1.5 - 2.4 kg-m,
11 - 17 ft-lb)

Piston rod self-locking nut
62 - 72 N·m
(6.3 - 7.3 kg-m,
46 - 53 ft-lb)

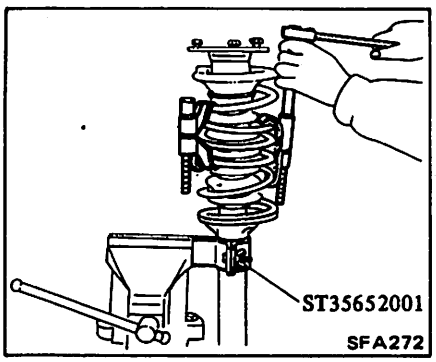
Strut to knuckle
69 - 88 N·m
(7 - 9 kg-m,
51 - 65 ft-lb)

DISASSEMBLY

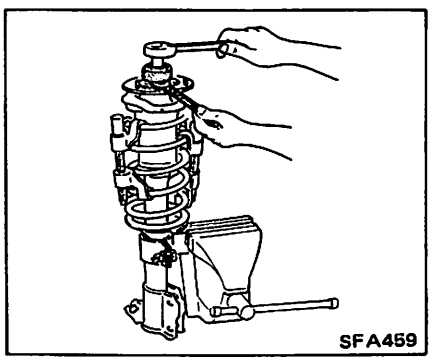
When disassembling strut assembly, extra caution should be exercised to prevent dirt and dust from entering strut.

1. Set up Tool on strut assembly.

Compress spring with coil spring compressor just for enough to permit turning of strut mounting insulator by hand.



2. Remove self-locking nut from top of piston rod.



Separate following parts:
- Strut mounting insulator
- Thrust seat
- Dust seal
- Spring upper seat
- Bound bumper rubber
- Coil spring
- Dust cover

CAUTION:
Pay attention not to damage piston rod.

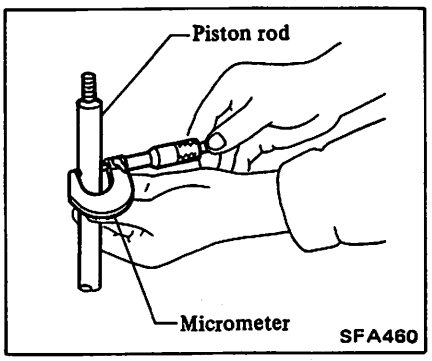
INSPECTION

- Wash all parts, except for nonmetallic parts, clean with suitable solvent and dry with compressed air.
- Blow dirt and dust off of nonmetallic parts using compressed air.
- **If oil leakage occurs on welded and gland packing portion of outer strut casing, replace strut assembly.**

Piston rod

- Inspect piston rod for cracks, deformation or other damage. Replace strut assembly.
- Inspect threads for cracks or other damage. Replace strut assembly.

Rod diameter:
17.940 - 17.975 mm
(0.7063 - 0.7077 in)
Maximum runout:
Less than 0.1 mm (0.004 in)



Strut mounting insulator

Inspect rubber bushing for damage, cracks and deformation. Replace part if necessary.

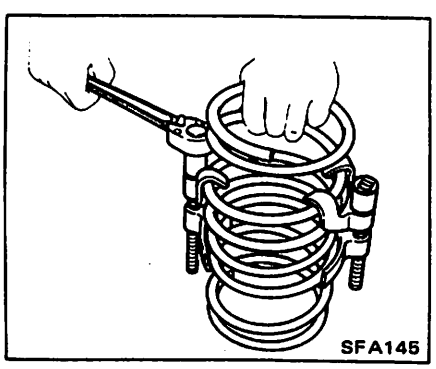
Thrust seat

Replace if inspection reveals abnormal noise or excessive rattle in axial direction.

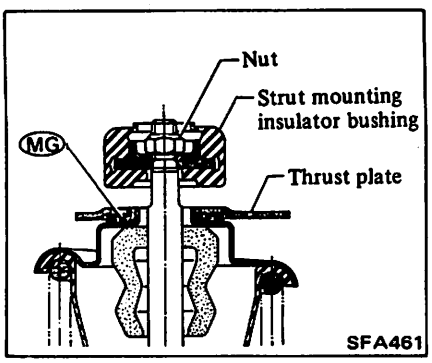
ASSEMBLY

Before assembly, clean away all dirt to prevent any possible entry of dirt into strut assembly.

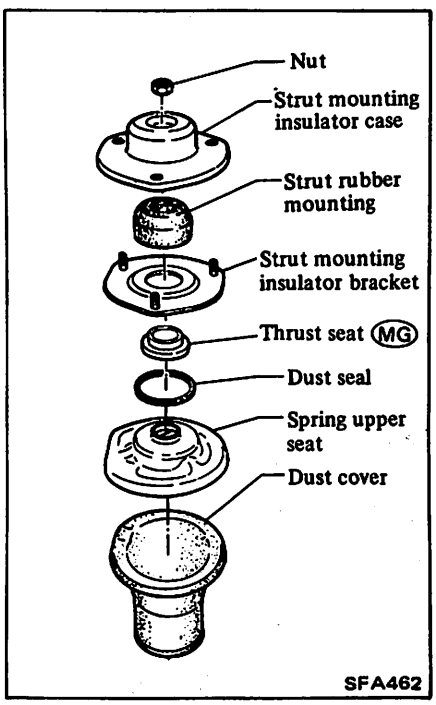
1. Install strut assembly on Tool ST35652001.
2. Compress coil spring using coil spring compressor.



3. Set up coil spring with coil spring compressor on spring lower seat of strut.
4. Lubricate parts indicated in figure.

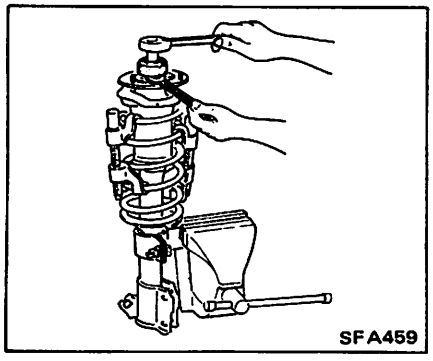


5. Mount following part as shown in figure.



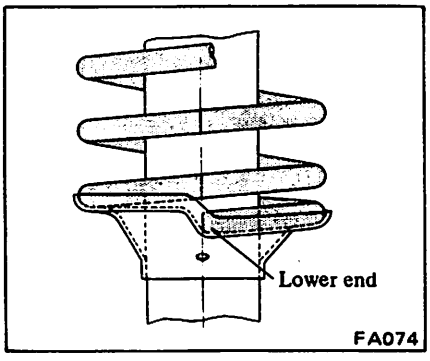
- Install bound bumper rubber in place to prevent piston rod from falling by its own weight.
- Install thrust seat so that it points in correct direction.

6. Tighten new piston rod self-locking nut.



7. Remove coil spring compressor on strut assembly.

After placing spring in position between upper and lower spring seats, release compressor gradually.

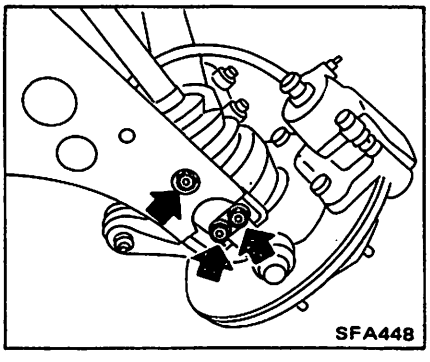


TRANSVERSE LINK

REMOVAL AND INSTALLATION

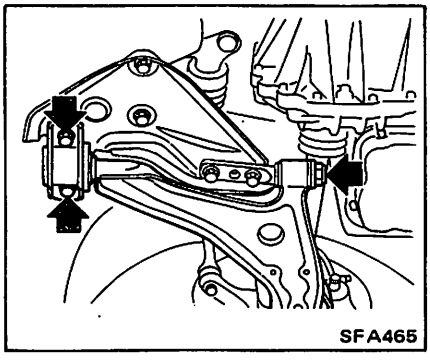
1. Jack up vehicle and support it with safety stands.
2. Remove wheel and tire.
3. Remove stabilizer bar.
4. Remove lower ball joint.

Do not reuse nuts once they have been removed.

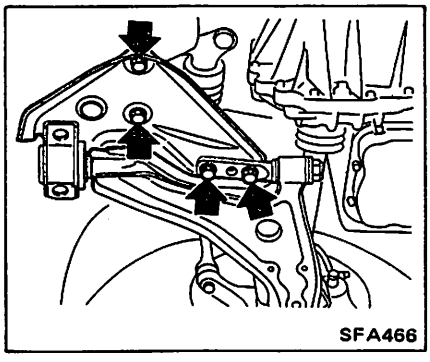


5. Remove transverse link.

Do not reuse nut once it has been removed.



6. Remove gusset.



7. Install transverse link in reverse order of removal, noting the following.

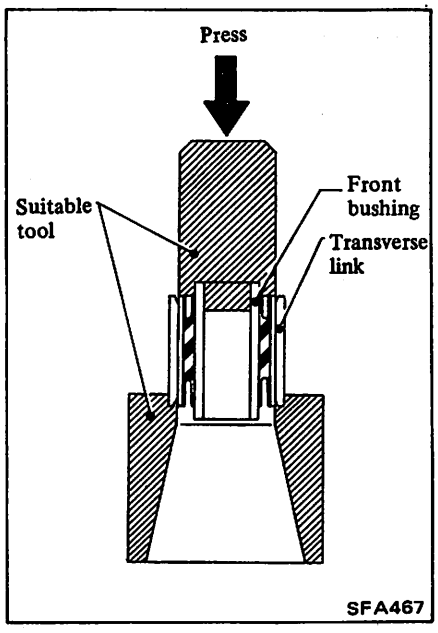
- **To install transverse link, tighten nut securing transverse link spindle which connects transverse link to gusset.**
- **Final tightening should be carried out at curb weight with tires on ground.**

Ⓣ: Gusset to body
78 - 98 N·m
(8 - 10 kg-m,
58 - 72 ft-lb)
Transverse link securing nut
98 - 118 N·m
(10 - 12 kg-m,
72 - 87 ft-lb)
Transverse link securing bolts
78 - 98 N·m
(8 - 10 kg-m,
58 - 72 ft-lb)
Lower ball joint fixing nuts
54 - 64 N·m
(5.5 - 6.5 kg-m,
40 - 47 ft-lb)

DISASSEMBLY

Front bushing

Press out front bushing with suitable bushing replacer.



ASSEMBLY

Front and rear bushing

- **Exercise care not to allow oil or grease to come into contact with it.**
- **Make sure that bushing is exposed evenly on the transverse link side.**

LOWER BALL JOINT

REMOVAL AND INSTALLATION

1. Remove drive shaft.
Refer to Hub and Knuckle for removal.
2. Remove lower ball joint using Ball Joint Remover HT72520000.
3. Install ball joint in reverse order of removal.

INSPECTION

Ball joint is assembled at factory and cannot be disassembled.

1. Check ball joint for play. If ball stud is worn and play in axial direction is excessive or joint is hard to swing, replace as a complete unit.

Turning torque:
New parts
2.9 - 9.8 N·m
(30 - 100 kg-cm,
26 - 87 in-lb)
Used parts
More than 1.0 N·m
(10 kg-cm, 8.7 in-lb)

2. Check condition of dust cover. If it is cracked excessively, replace ball joint.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

GENERAL SPECIFICATIONS

COIL SPRING

		A/T model		M/T model	
		R.H.	L.H.	R.H.	L.H.
Dimension					
Wire diameter	mm (in)	11.2 (0.441)	11.3 (0.445)	11.1 (0.437)	11.2 (0.441)
Coil diameter (inside)	mm (in)	110.0 (4.33)			
Free length	mm (in)	375 (14.76)	384 (15.12)	366 (14.41)	375 (14.76)
Spring constant N/mm (kg/mm, lb/in)		16.77 (1.71, 95.8)			

STRUT ASSEMBLY

Shock absorber type		Double acting hydraulic
Piston rod diameter	mm (in)	18 (0.71)
Piston diameter	mm (in)	25 (0.98)
Stroke	mm (in)	162 (6.38)
Damping force [at 0.3 m (1.0 ft)/sec.]		
Expansion	N (kg, lb)	392 - 588 (40 - 60, 88 - 132)
Compression	N (kg, lb)	127 - 226 (13 - 23, 29 - 51)

INSPECTION AND ADJUSTMENT

WHEEL ALIGNMENT

Refer to section MA.

LOWER BALL JOINT

Turning torque N·m (kg-cm, in-lb) New parts	2.9 - 9.8 (30 - 100, 26 - 87)
Used parts	More than 1.0 (10, 8.7)
Axial end play mm (in)	0.1 - 1.5 (0.004 - 0.059)

WHEEL BEARING ADJUSTMENT

Rotation starting torque N·m (kg-cm, in-lb)	0.8 - 2.7 (8 - 28, 6.9 - 24.3)
As measured at wheel hub bolt N (kg, lb)	13.7 - 48.1 (1.4 - 4.9, 3.1 - 10.8)

Spacer thichness

Mark	H mm (in)
05	7.381 - 7.440 (0.2906 - 0.2929)
06	7.441 - 7.500 (0.2930 - 0.2953)
07	7.501 - 7.560 (0.2953 - 0.2976)
08	7.561 - 7.620 (0.2977 - 0.3000)
09	7.621 - 7.680 (0.3000 - 0.3024)
10	7.681 - 7.740 (0.3024 - 0.3047)
11	7.741 - 7.800 (0.3048 - 0.3071)
12	7.801 - 7.860 (0.3071 - 0.3094)
13	7.861 - 7.920 (0.3095 - 0.3118)
14	7.921 - 7.980 (0.3118 - 0.3142)
15	7.981 - 8.040 (0.3142 - 0.3165)
16	8.041 - 8.100 (0.3166 - 0.3189)
17	8.101 - 8.160 (0.3189 - 0.3213)
18	8.161 - 8.220 (0.3213 - 0.3236)
19	8.221 - 8.280 (0.3237 - 0.3260)
20	8.281 - 8.340 (0.3260 - 0.3283)
21	8.341 - 8.400 (0.3284 - 0.3307)
22	8.401 - 8.460 (0.3307 - 0.3331)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Strut assembly Piston rod self-lock nut	62 - 72	6.3 - 7.3	46 - 53
Strut to body	15 - 24	1.5 - 2.4	11 - 17
Strut to knuckle	69 - 88	7 - 9	51 - 65
Lower ball joint Transverse link to ball joint	54 - 64	5.5 - 6.5	40 - 47
Stud nut	34 - 49	3.5 - 5.0	25 - 36
Tie-rod Lock nut	37 - 46	3.8 - 4.7	27 - 34
Stud nut	29 - 49	3.0 - 5.0	22 - 36
Transverse link Securing bolt	78 - 98	8 - 10	58 - 72
Securing nut	98 - 118	10 - 12	72 - 87
Gusset to body	78 - 98	8 - 10	58 - 72
Axle Drive shaft to hub	118 - 196	12 - 20	87 - 145
Hub to disc rotor	25 - 33	2.5 - 3.4	18 - 25
Baffle plate	3.2 - 4.3	0.33 - 0.44	2.4 - 3.2
Caliper	54 - 64	5.5 - 6.5	40 - 47

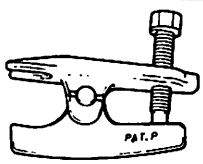
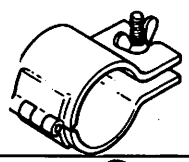
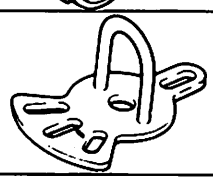
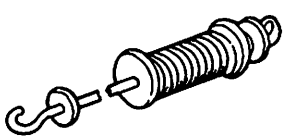
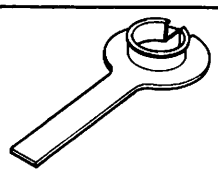
TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Steering wheel shock, vibration or shimmying	• Steering wheel oscillation is often experienced when there is an excessive free play in steering linkage, improper backlash in steering gear, or oscillation of front wheels. • Steering shock or kickback is sharply felt on steering wheel when front wheels encounter obstructions on road. This condition may be due to improper backlash in steering gear or other associated units. • Shimmy is rapid oscillation of front suspension system and related parts and is often experienced when vehicle reaches a certain speed.	
	Improper tire air pressure.	Adjust.
	Wheel out of balance or deformed.	Correct or replace.
	Worn or loose tire.	Replace or retighten.
	Worn suspension ball joint or lack of preload.	Replace ball joint.
	Steering gear out of adjustment.	Readjust.
	Improper wheel alignment.	Readjust.
	Worn rubber bushing in transverse link.	Replace.
	Excessive free play in steering linkage.	Check and correct.
	Excessive play or wear on front wheel bearing.	Replace bearing.
	Loose steering gear box.	Retighten.
	Loose or inoperative shock absorber (in strut assembly).	Retighten or replace.
	Unbalanced vehicle posture.	Adjust.
Vehicle drifts.	This condition becomes evident when vehicle is running on a flat surface with your hands off steering wheel. **Also refer to Trouble diagnoses and corrections under the Rear suspension section.**	
	Improper tire air pressure, or loose wheel nuts.	Replace tires.
	Difference in height between right and left tire treads.	Replace.
	Worn front wheel bearing.	Replace.
	Fatigued front spring, or use of improper spring.	Replace.
	Improper wheel alignment.	Readjust.
	Brake drag.	Check and correct.
	Worn rubber bushing in transverse link.	Replace.
	Deformed steering linkage or suspension link.	Replace.
	Unbalanced vehicle posture.	Adjust.
	Worn radial tire.	Replace.
Vehicle wanders.	Improper tire air pressure.	Adjust.
	Improper wheel alignment.	Readjust.

Condition	Probable cause	Corrective action
	Excessive free play or wear on steering linkage or suspension link.	Replace.
	Steering gear out of adjustment.	Readjust.
	Wheel deformed or out of balance.	Check and correct.
	Worn bushing in transverse link.	Replace.
Stiff steering wheel	• Check and correct in the following manner: Jack up front of vehicle and support it with safety stands. Separate knuckle arm from tie rod and manipulate steering wheel. a) When steering wheel operation is light, check and locate cause of problem in steering linkage, suspension system, or front axle. b) When steering wheel operation is heavy, check and locate cause of problem in steering gear or steering column.	
	Improper tire air pressure.	Adjust.
	Improper lubrication in steering gear housing or dirt in oil.(b)	Lubricate, service, or replace.
	Improper lubrication in steering linkage, dirt in grease, or abnormal wear on steering linkage.(a)	Lubricate or replace.
	Seized or damaged suspension ball joint. Lack of lubrication in ball joint.(a)	Replace.
	Worn or seized wheel bearing.(a)	Replace.
	Steering gear out of adjustment.(b)	Readjust.
	Deformed steering linkage.(a)	Replace.
	Improper wheel alignment.(a)	Readjust.
	Damaged thrust seal on upper end of strut.(a)	Replace.
	Seized or damaged piston or piston rod in shock absorber (in strut).(a)	Replace.
Excessive play in steering wheel.	Steering gear out of adjustment.	Readjust.
	Worn steering linkage.	Replace.
	Loose steering gear box.	Retighten.
	Worn wheel bearing.	Replace.
	Worn bushing in transverse link.	Replace.
Noise	Improper tire air pressure.	Adjust.
	Damaged or worn suspension ball joint or steering linkage, or lack of lubrication.	Replace or lubricate.
	Loose steering gear linkage or suspension system.	Retighten.
	Faulty shock absorber (in strut).	Replace.
	Worn wheel bearing.	Replace.
	Worn steering linkage or steering gear.	Replace.
	Worn bushing in transverse link.	Replace.
	Broken or fatigued coil spring.	Replace.

Condition	Probable cause	Corrective action
	Loose mounting nut on strut mounting insulator.	Retighten.
	Improper tightening of strut and gland packing.	Retighten.
	Loose bolt on gusset.	Retighten.
	Deformed wheel.	Replace.
Tires squeal.	Improper tire air pressure.	Adjust.
	Improper wheel alignment.	Readjust.
	Deformed knuckle, spindle or suspension.	Replace.
	Rough driving.	Avoid rough driving.
Abnormal (or uneven) tire wear.	Improper tire air pressure.	Adjust.
	Improper wheel alignment.	Readjust.
	Worn wheel bearing.	Replace.
	Brake out of adjustment.	Readjust.
	Improper tire rotation.	Rotate tires properly.
	Rough or hard driving.	Avoid rough or hard driving.

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	
HT72520000 (J25730-A)	Ball joint remover	
ST35652001 (–)	Clamp	
KV40101000 (J25604-01)	Rear axle stand	
ST36230000 (J25840-A)	Sliding hammer	
KV38105500 (–)	Differential side oil seal protector	

REAR AXLE & REAR SUSPENSION

SECTION RA

CONTENTS

REAR AXLE RA-2
- Removal RA-2
- Inspection RA-3
- Installation RA-3

REAR SUSPENSION RA-4
- Shock absorber RA-4
- Coil spring RA-4
- Rear arm RA-5

SERVICE DATA AND SPECIFICATIONS (S.D.S.) RA-6
- General specifications RA-6
- Inspection and adjustment RA-6
- Tightening torque RA-6

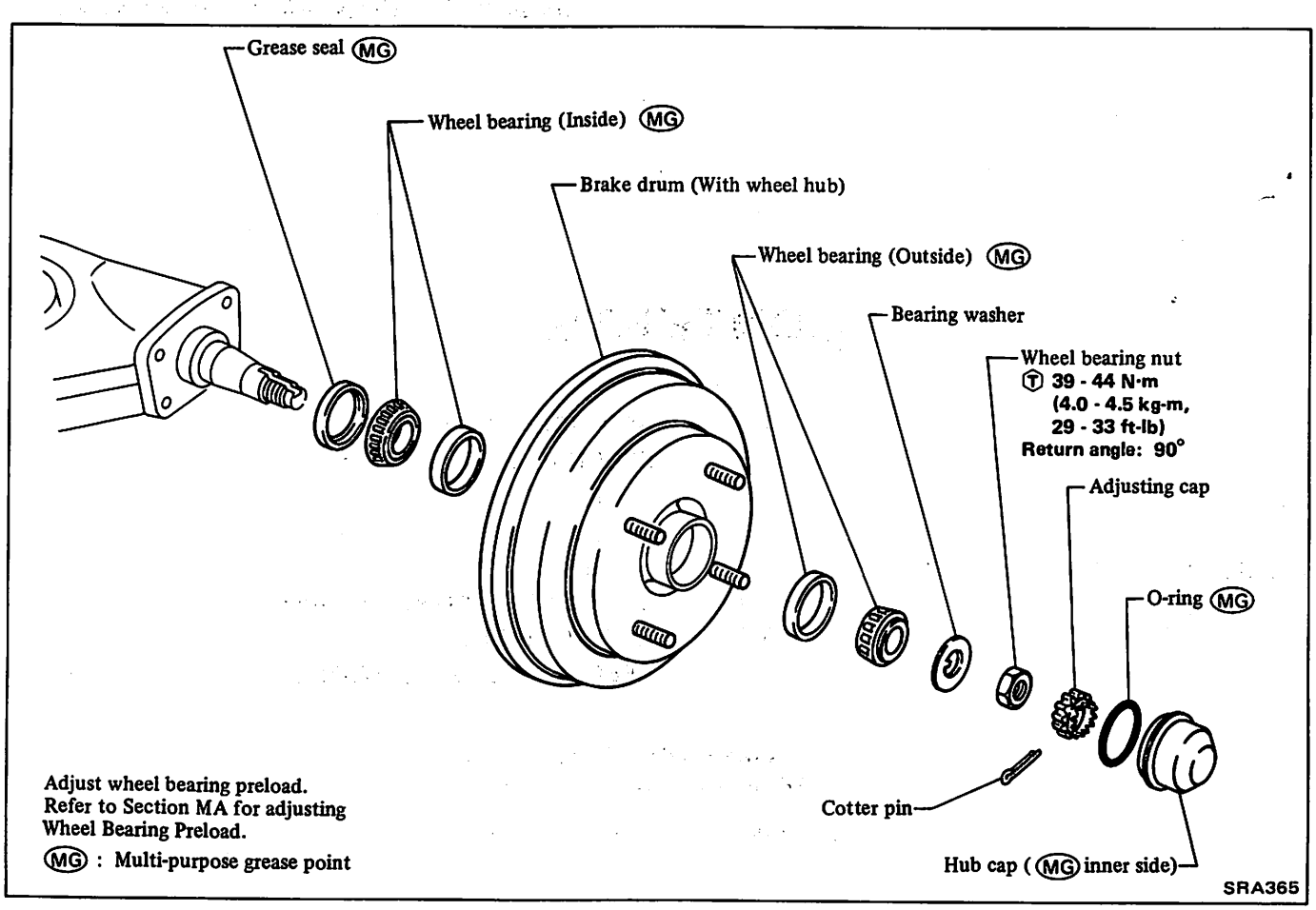
TROUBLE DIAGNOSES AND CORRECTIONS RA-7

SPECIAL SERVICE TOOLS RA-7

Refer to Section MA (Rear Axle & Rear Suspension) for:

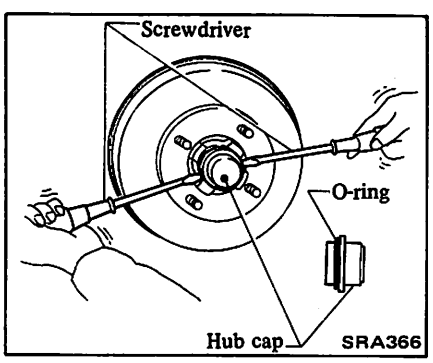
- CHECKING REAR AXLE AND SUSPENSION PARTS
- ADJUSTING WHEEL BEARING PRELOAD

REAR AXLE



REMOVAL

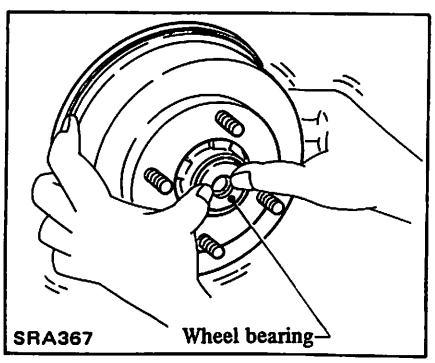
1. Block front wheels and raise rear of vehicle, and then support it with safety stands. Refer to Section GI for Lifting Points and Towing.
2. Remove rear wheel one side to be worked on.
3. Release parking brake.
4. Work off hub cap.



5. Pry off cotter pin; take out adjusting cap and wheel bearing nut.

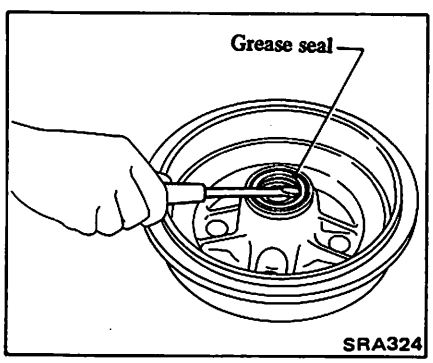
Cotter pin must not be reused.

6. Remove rear brake drum with outer bearing and washer.

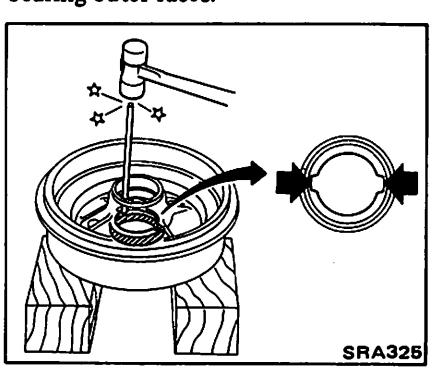


CAUTION:
Be careful not to drop wheel bearing.

7. Remove grease seal and inside wheel bearing inner race. Grease seal must not be reused.



8. Remove inside and outside wheel bearing outer races.



INSPECTION

Thoroughly clean bearing and each part, and dry with compressed air.

WHEEL BEARING

When race, cage or roller surfaces make a noise, or are cracked, pitted, worn, rough, or out-of-round, replace bearing assembly.

CAUTION:
When replacing wheel bearing, replace inner and outer wheel bearings at the same time to prevent mix use of bearings of different brands.

BRAKE DRUM

Check drum for cracks using magnetic exploration or dyeing test; replace if necessary. Refer to Section BR for inspection or sliding portion.

KNUCKLE SPINDLE

Also check brake drum; replace if cracked or damaged. When thread is damaged, replace rear arm.

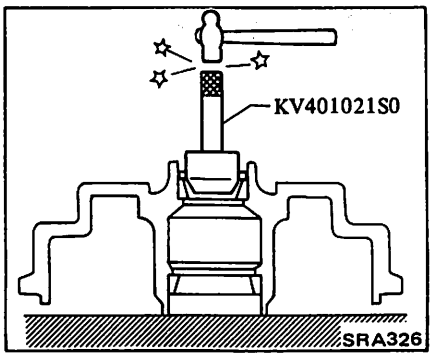
GREASE SEAL

If grease leakage is detected during removal, replace grease seal. Replace grease seal at every disassembly even if it appears good.

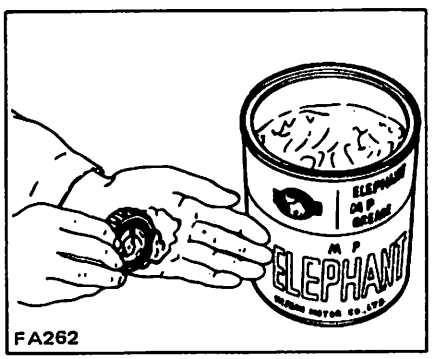
INSTALLATION

Install rear axle in the reverse order of removal as follows:

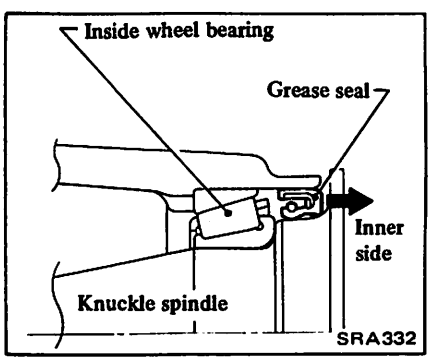
1. Install bearing outer race with Tool until it seats in hub.



2. Coat each bearing with recommended multi-purpose grease.

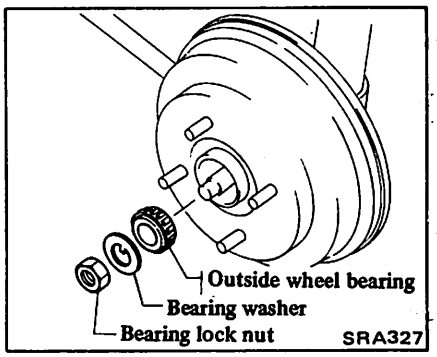


3. Place inside bearing in hub and install a new grease seal, coating sealing lips with recommended multi-purpose grease.



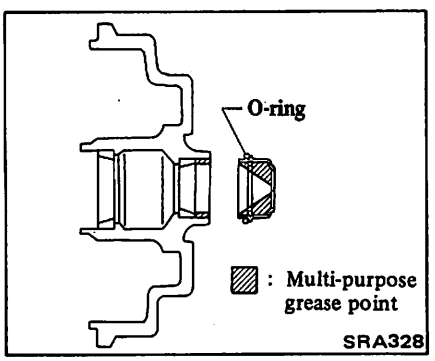
4. Apply recommended multi-purpose grease sparingly to each part.
- Threaded portion of spindle.
- Contacting surface of wheel bea nut.
- Contacting surface of bearing washer.

5. Put hub assembly on spindle, then install outside bearing, bearing washer and wheel bearing nut.



6. Adjust wheel bearing preload.
Refer to Section MA for adjustment.

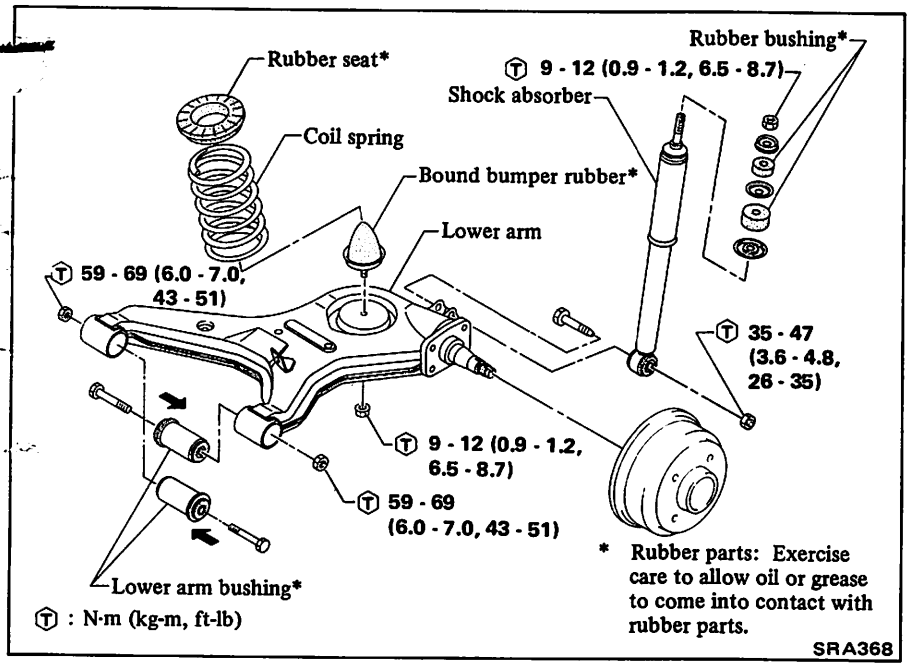
7. Pack hub cap with recommended multi-purpose grease. Coat O-ring with recommended multi-purpose grease.



8. Install hub cap with O-ring on hub.
9. Install wheel.

Ⓣ : Wheel nut
78 - 98 N·m
(8.0 - 10.0 kg-m, 58 - 72 ft-lb)

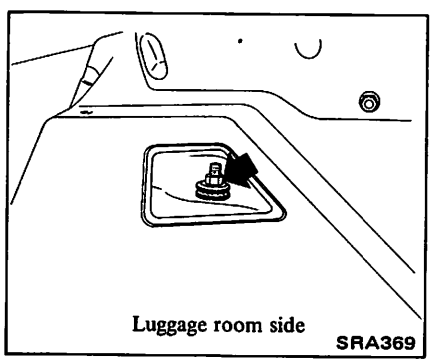
REAR SUSPENSION

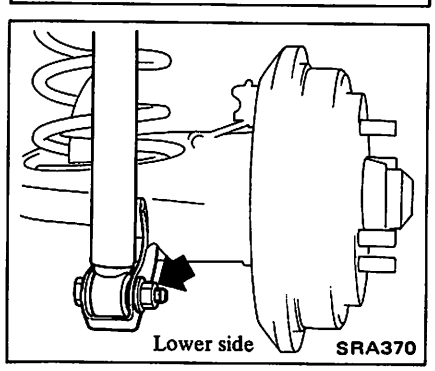


SHOCK ABSORBER

REMOVAL

1. Block front wheels and raise rear of vehicle, and then support it with safety stands. Refer to Section GI for Lifting Points and Towing.
2. Remove nut and bolts from shock absorber.





3. Lower jack slowly. Remove shock absorber.

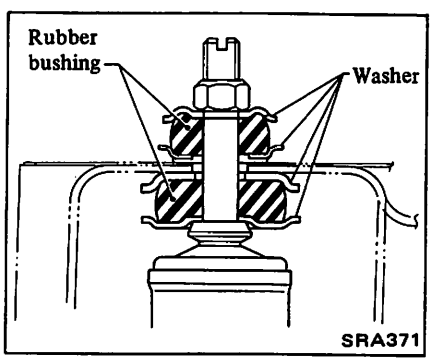
INSPECTION

1. Test shock absorber and compare with specification given in Service Data and Specifications. Replace if necessary.
2. Check for cracks.
3. Check all rubber parts for wear, cracks, damage or deformation. Replace if necessary.

INSTALLATION

Install shock absorber in reverse order of removal.

When installing upper end of shock absorber, bushing and washer must be located and oriented as shown below.



T : Shock absorber upper end nut
9 - 12 N·m
(0.9 - 1.2 kg-m,
6.5 - 8.7 ft-lb)

Shock absorber lower end bolt
35 - 47 N·m
(3.6 - 4.8 kg-m,
26 - 35 ft-lb)

CAUTION:
a. Be careful not to damage or bend piston rod during operation.
b. Do not open or heat gas filled type shock absorbers.

COIL SPRING

REMOVAL

1. Block front wheels with chocks.
2. Jack up vehicle and support it with safety stands.
3. Remove wheel and tire.
4. Securely support lower end of rear arm with jack.
5. Remove shock absorber lower end bolt. Refer to Shock Absorber.
6. Lower jack slowly. Remove coil spring.

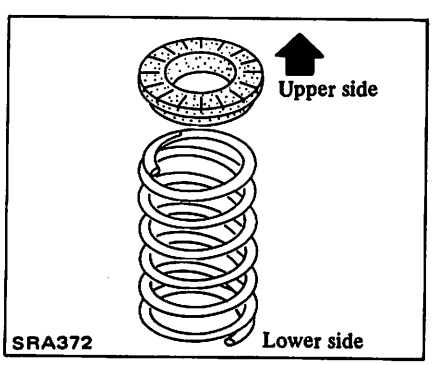
INSPECTION

1. Check coil spring for yield, deformation or cracks.
2. Test spring and compare with specifications given in S.D.S.
3. Check all rubber parts for wear, cracks, damage or deformation. Replace if necessary.

INSTALLATION

Install coil spring in reverse order of removal.

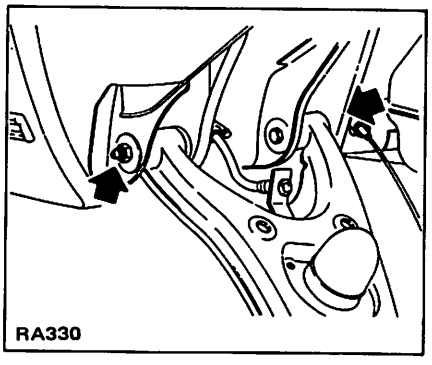
CAUTION:
Correctly fit flattened end of coil spring on spring seat.



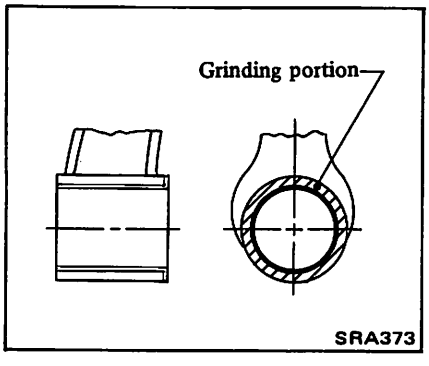
REAR ARM

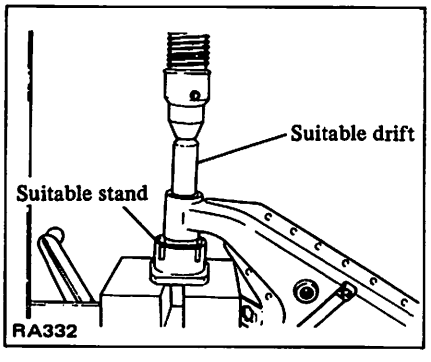
REMOVAL

1. Remove coil spring. Refer to Coil Spring.
2. Loosen flare nut connecting brake tube, and detach brake tube. Install brake line plug.
3. Detach hand brake wire.
4. Remove brake drum. Refer to Rear Axle.
5. Remove rear arm bolts.



6. Grind the flanged portion of rear arm bushing.
Set the grinding portion of rear arm on Tool, press bushing out using suitable Drift.





INSPECTION

Rear arm

1. Examine rear arms to ensure they are not deformed or cracked.
2. Check rubber bushings for wear, damage or separation. Replace if necessary.

Rear arm bushing

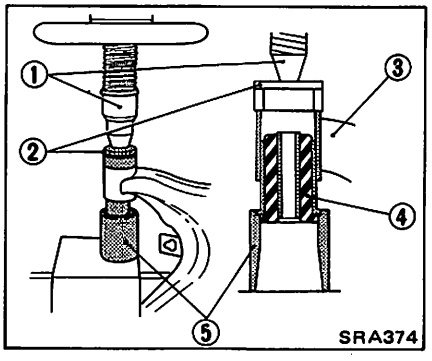
Check condition of bushing without removing it from rear suspension arm. If bushing shows indications of cracks, deformation, or other damage, replace it.

Bound bumper

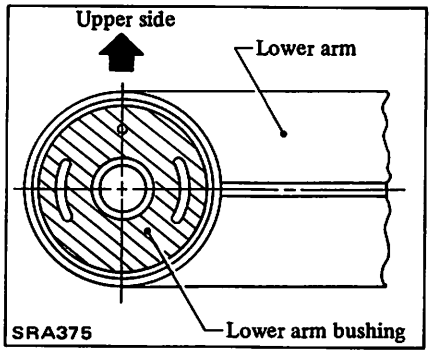
If bound bumper is deteriorated, cracked, or damaged to such an extent that it is no longer serviceable, replace it.

INSTALLATION

1. Press bushing into rear arm collar, using Tool.



1 Press
2 Suitable plate
3 Rear arm
4 Bushing
5 Suitable stand



2. Install rear arm in the reverse order of removal.

At first, tighten rear arm attaching bolts temporarily. Final tightening should be carried out with vehicle under normal load.

CAUTION:
When installing brake tubes, use Flare Nut Torque Wrench GG94310000.

Ⓣ : Rear arm attaching bolt
59 - 69 N·m
(6 - 7 kg-m,
43 - 51 ft-lb)
Shock absorber lower end bolt
35 - 47 N·m
(3.6 - 4.8 kg-m,
26 - 35 ft-lb)
Brake disc attaching bolt
25 - 33 N·m
(2.5 - 3.4 kg-m,
18 - 25 ft-lb)
Brake tube flare nut
15 - 18 N·m
(1.5 - 1.8 kg-m,
11 - 13 ft-lb)
Brake hose connector
17 - 20 N·m
(1.7 - 2.0 kg-m,
12 - 14 ft-lb)
Wheel nut
78 - 98 N·m
(8.0 - 10 kg-m,
58 - 72 ft-lb)

3. Bleed air out of brake system. Refer to section BR.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

GENERAL SPECIFICATIONS

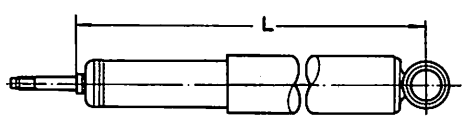
COIL SPRING

	Sedan	Hatchback	Wagon
Wire diameter mm (in)	11.0 (0.433)	10.8 (0.425)	11.0 (0.433)
Coil diameter mm (in)	100 (3.94)		
Free length mm (in)	299 (11.77)	304 (11.97)	314 (12.36)
Spring constant N/mm (kg/mm, lb/in)	23.05 (2.35, 131.6)		
Identification color	White 1 & Blue 2	Red 1 & Blue 2	Green 1 & White 2

SHOCK ABSORBER

	Other	Wagon
Maximum length "L" mm (in)	552 (21.73)	
Stroke mm (in)	227 (8.94)	
Damping force [at 0.3 m (1.0 ft)/Sec.]		
Expansion N (kg, lb)	441 (45, 99)	588 (60, 132)
Compression N (kg, lb)	196 (20, 44)	294 (30, 66)

*: Wagon model



SRA112

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Wheel bearing lock nut	39 - 44	4.0 - 4.5	29 - 33
Shock absorber lock nut (upper end)	9 - 12	0.9 - 1.2	6.5 - 8.7
Shock absorber lock bolt (lower end)	59 - 69	6.0 - 7.0	43 - 51
Brake tube flare nut	15 - 18	1.5 - 1.8	11 - 13
Brake hose connector	17 - 20	1.7 - 2.0	12 - 14
Brake disc attaching bolt	25 - 33	2.5 - 3.4	18 - 25
Wheel nut	78 - 98	8.0 - 10.0	58 - 72
Lower arm to body	59 - 69	6.0 - 7.0	43 - 51
Bumper rubber to lower arm	9 - 12	0.9 - 1.2	6.5 - 8.7

INSPECTION AND ADJUSTMENT

WHEEL ALIGNMENT AND WHEEL BEARING

Refer to section MA.

TROUBLE DIAGNOSES AND CORRECTIONS

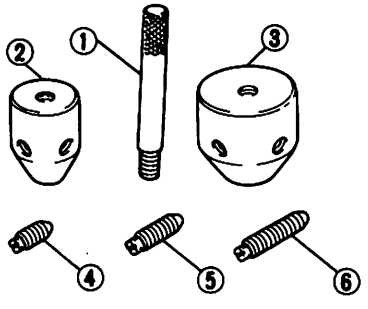
When rear axle and suspension are suspected of being noisy, it is advisable to make thorough test to determine whether the noise originates in the tires, road surface, exhaust, engine, transaxle, wheel bearings or suspension.

Noise which originates in other places cannot be corrected by adjustment or replacement of parts in the rear axle and rear suspension.

Condition	Probable cause	Corrective action
Noise (Unusual sound).	Loose wheel nuts.	Tighten to specified torque.
	One or more securing bolts loose.	Tighten to specified torque.
	Lack of lubricating grease.	Lubricate as required.
	Faulty shock absorber.	Replace.
	Damaged or worn wheel bearing.	Replace.
	Unbalance of wheel and tire.	Balance.
	Damage to the rubber parts such as lower arm bushing.	Replace damaged parts.
	Breakage of coil spring.	Replace.
Instability in driving This problem is also related to the front suspension. For trouble diagnoses, also refer to Section FA.	Loose wheel nuts.	Tighten to specified torque.
	Malfunctioning of shock absorber.	Repair or replace.
	Incorrect wheel alignment.	Adjust.
	Worn coil spring.	Replace.
	Damaged lower arm bushing or bound bumper.	Replace.
	Worn or damaged wheel bearing.	Replace.
	Loose or broken lower arm.	Retighten or replace.

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
KV401021S0 (–)	Bearing outer race drift set
① ST35325000 (–)	Drift bar
② KV40102110 (–)	Drift (A)
③ KV40102120 (–)	Drift (B)
④ KV40102130 (–)	Screw (A)
⑤ KV40102140 (–)	Screw (B)
⑥ KV40102150 (–)	Screw (C)



BRAKE SYSTEM

SECTION BR

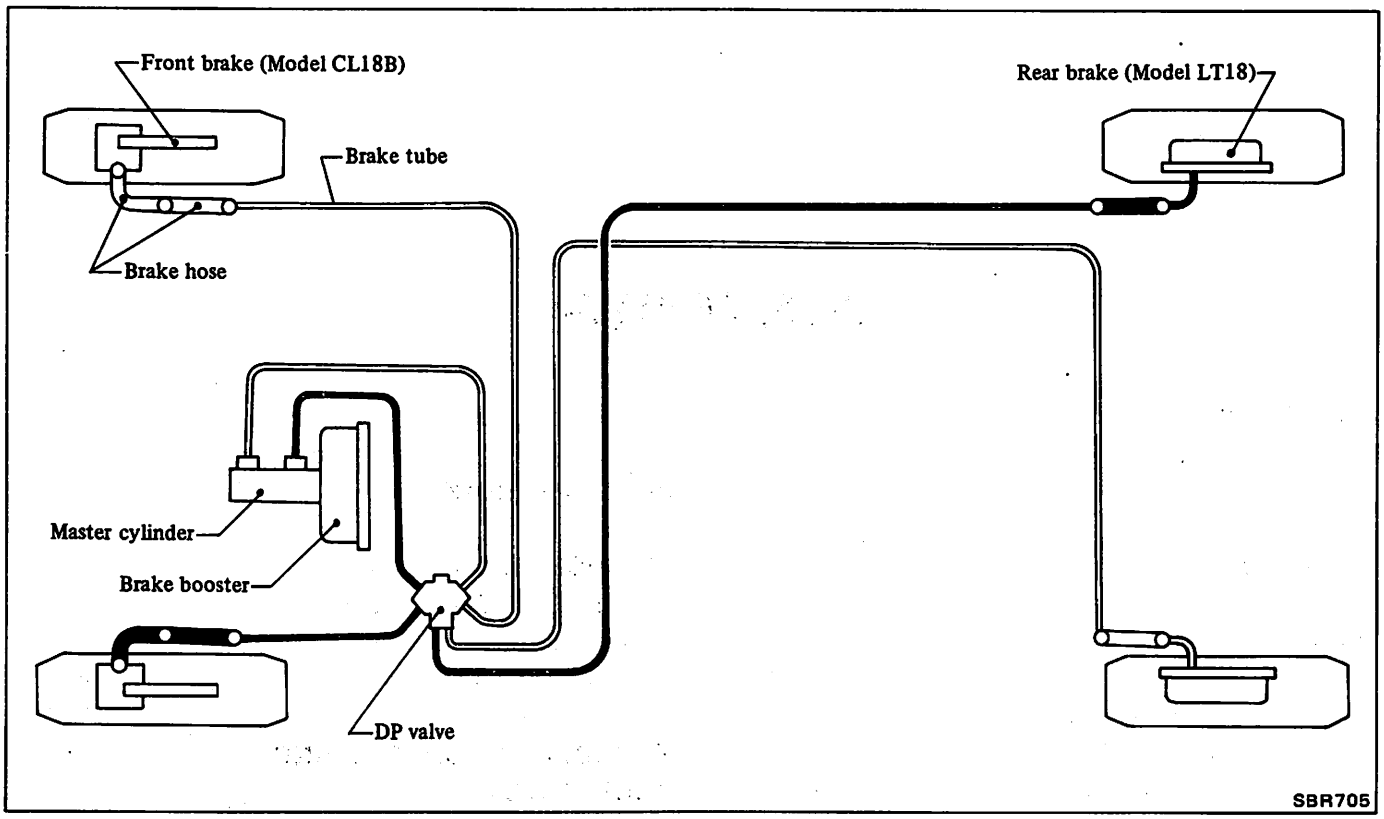
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DESCRIPTION ..... BR- 2
SERVICE BRAKE ..... BR- 3
Bleeding hydraulic system ..... BR- 3
Brake pedal ..... BR- 3
Brake hydraulic line ..... BR- 4
DP (Dual Proportioning) valve ..... BR- 4
Master cylinder ..... BR- 5
Front disc brake —CL18B— ..... BR- 6
Front disc rotor —CL18B— ..... BR- 8
Front disc brake —AD20V— ..... BR- 9
Front disc rotor —AD20V— BR-11
Rear drum brake
—LT18A and LT20A— BR-12
Brake booster BR-14
Vacuum pump (Diesel engine model) ... BR-16
PARKING BRAKE BR-18
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SERVICE DATA AND SPECIFICATIONS (S.D.S.) BR-19
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Refer to section MA (Brake System) for:

- CHECKING FOOT BRAKE
- CHECKING PARKING BRAKE

DESCRIPTION



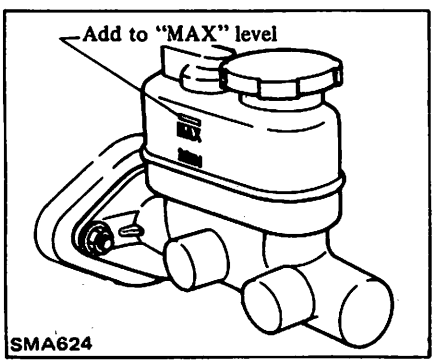
- The brake system is a hydraulically controlled, dual line type which operates independently on right front and left rear wheel, and left front and right rear wheel.
- The brake booster is a power assist device which utilizes engine intake manifold vacuum.
- The DP valve is a pressure control device for the rear brakes.
- The rear brake is equipped with a mechanically operated parking brake mechanism.
- The pad clearance and shoe clearance for both front disc and rear drum brakes are automatically adjusted.

SERVICE BRAKE

BLEEDING HYDRAULIC SYSTEM

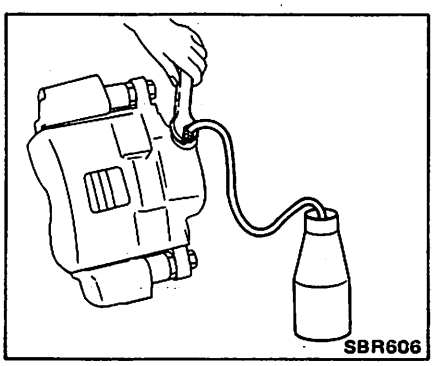
1. Top up reservoir with recommended brake fluid.

a. Do not mix two different brand brake fluids.
b. Carefully monitor brake fluid level at master cylinder during bleeding operation.
c. Do not reuse drained brake fluid.

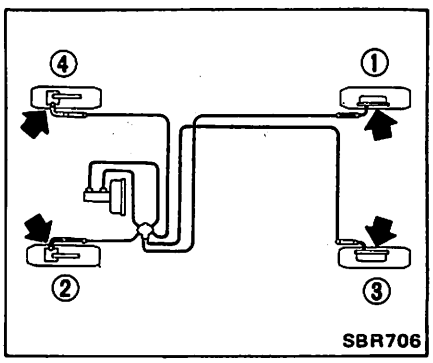


2. Install bleeder hose on bleeder valve. Push down on brake pedal slowly until it is fully depressed, then open bleeder valve to exhaust air. Then close bleeder valve and allow brake pedal to return. Repeat bleeding operation until no air bubbles show in hose.

a. Be careful not to splash brake fluid on painted areas.
b. Brake fluid containing air is white and contains air bubbles.
c. Brake fluid containing no air runs out of bleeder valve in a solid stream free of air bubbles.

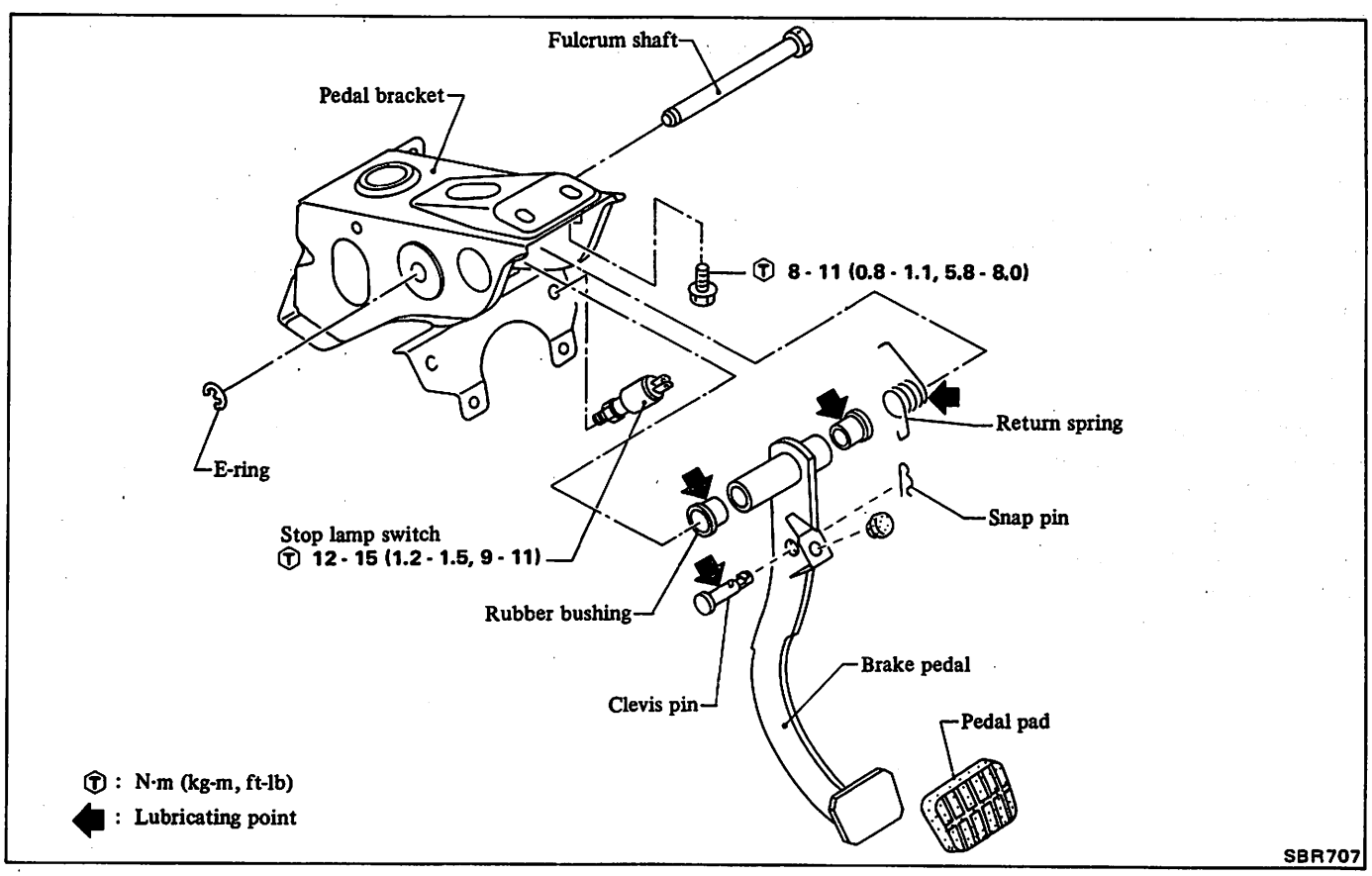


3. Bleed air in the following sequence.



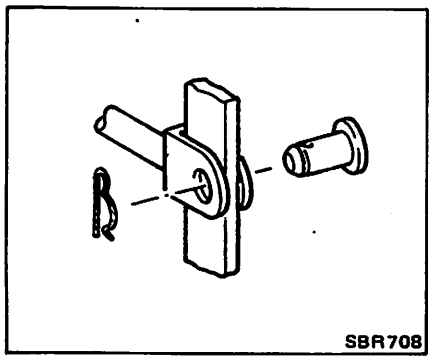
Ⓣ: Air bleeder
7 - 9 N·m
(0.7 - 0.9 kg-m, 5.1 - 6.5 ft-lb)

BRAKE PEDAL

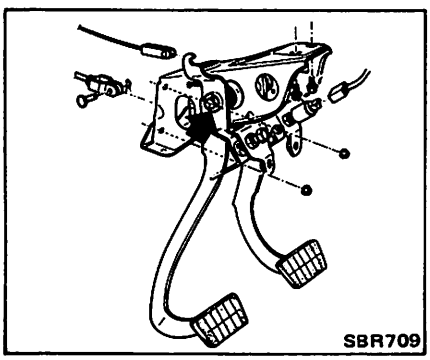


REMOVAL

1. Remove instrument lower cover and heater duct.
2. Remove snap pin and clevis pin.



3. Remove fulcrum shaft. Brake pedal can then be taken out.



INSPECTION

Check brake pedal for the following items, servicing as necessary.

1. Check brake pedal for bend.
2. Check return springs for fatigue.
3. Check clevis for deformation and crack at welded part.

INSTALLATION

1. Apply coating of recommended multi-purpose grease to sliding portion and return spring.
2. Adjust brake pedal after installation is completed. Refer to Section MA for adjustment.

Ⓣ : Input rod lock nut
16 - 22 N·m
(1.6 - 2.2 kg-m,
12 - 16 ft-lb)
Stop lamp switch lock nut
12 - 15 N·m
(1.2 - 1.5 kg-m,
9 - 11 ft-lb)

BRAKE HYDRAULIC LINE

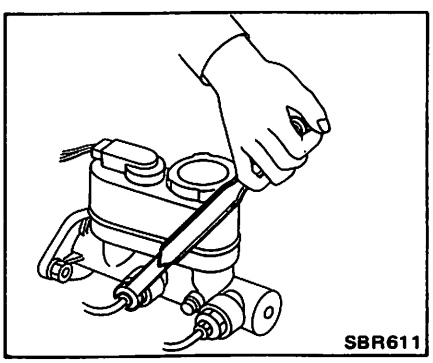
INSPECTION

Check brake lines (tubes and hoses) for evidence of cracks, deterioration or other damage. Replace any faulty parts.
If leakage occurs at end around joints, re-tighten or, if necessary, replace faulty parts.

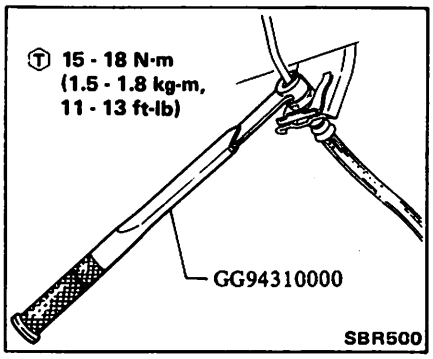
REMOVAL AND INSTALLATION

CAUTION:
a. When removing and installing brake tube, use Tool GG94310000.
b. Cover openings to prevent entrance of dirt whenever disconnecting hydraulic line.

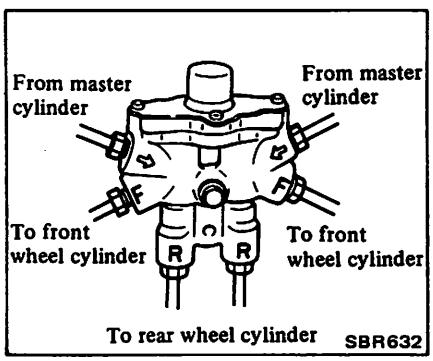
- To remove brake tube, disconnect flare nuts on both ends, and remove retainers and clips.



- To remove brake hose, first remove flare nut securing brake tube to hose, then withdraw lock spring. Next disconnect the other side. Do not twist brake hose.



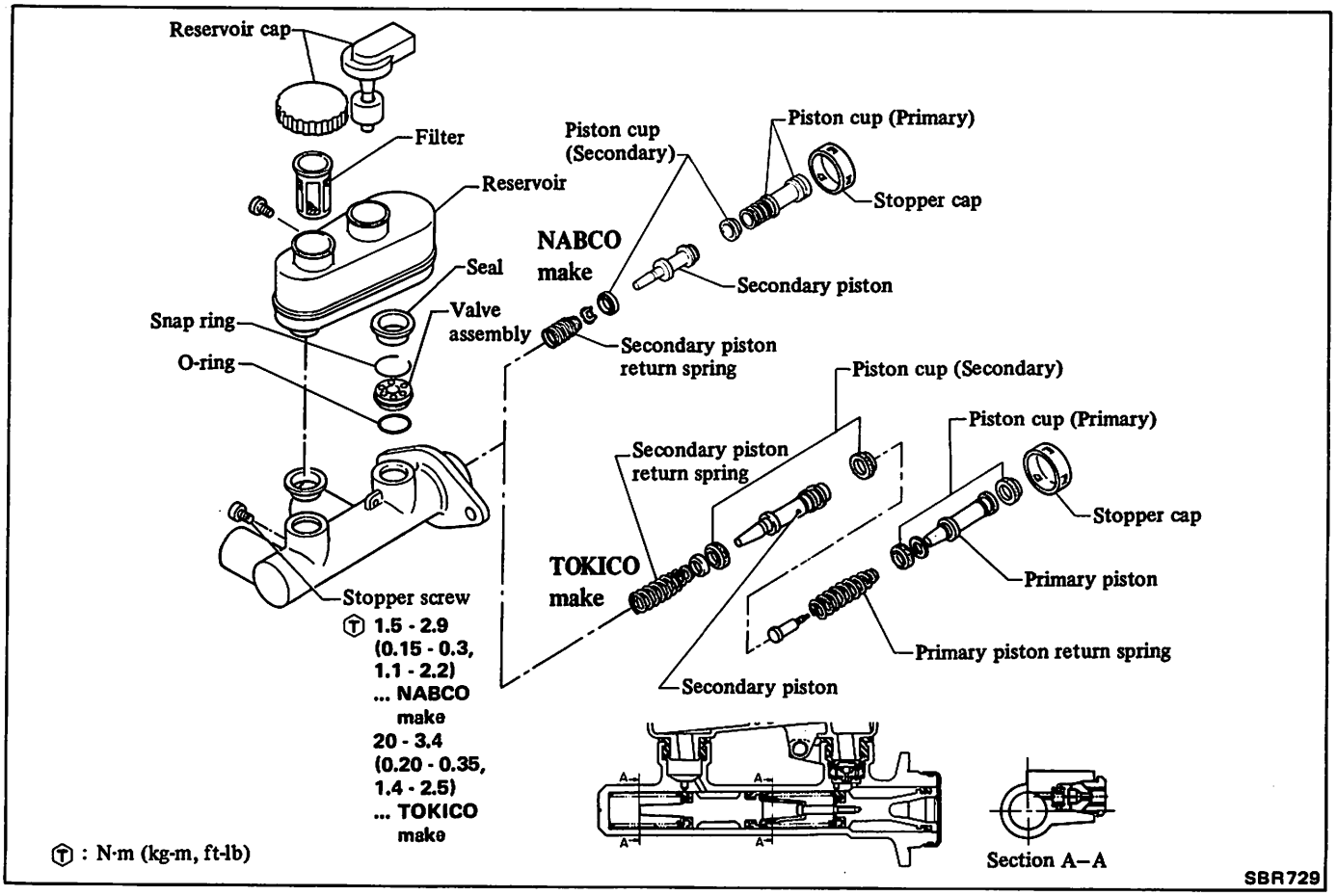
DP (Dual Proportioning) VALVE



Do not disassemble DP valve.

Ⓣ : Brake tube flare nut
15 - 18 N·m
(1.5 - 1.8 kg-m,
11 - 13 ft-lb)
DP valve to body
4 - 5 N·m
(0.4 - 0.5 kg-m,
2.9 - 3.6 ft-lb)

MASTER CYLINDER



DISASSEMBLY

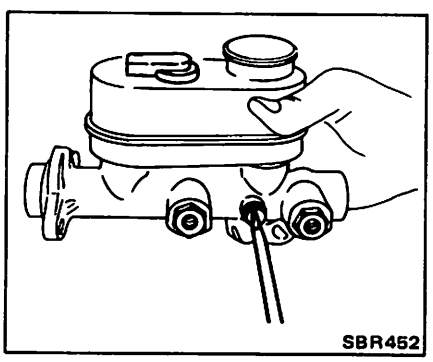
There is no interchangeability of repair kits or component parts between NABCO and TOKICO makes.
When replacing the repair kit or component parts, ascertain the brand of the brake master cylinder body. Be sure to use parts of the same make as the former ones.

1. Pry off stopper ring.

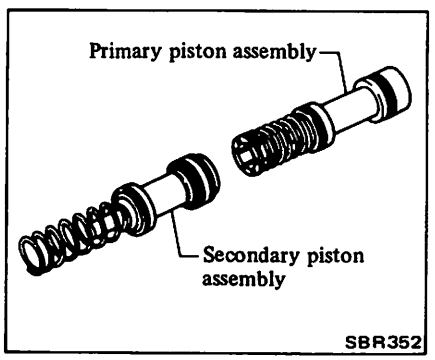
Primary piston assembly can then be taken out.

2. Remove stopper screw.

Secondary piston assembly can then be taken out.



3. Disassemble piston assembly. Do not disassemble primary piston assembly of NABCO make.



4. Remove piston cups and discard them.
5. Remove seal on valve assembly side.
6. Remove snap ring and then valve assembly.
7. Remove O-ring.

Do not use O-ring again.

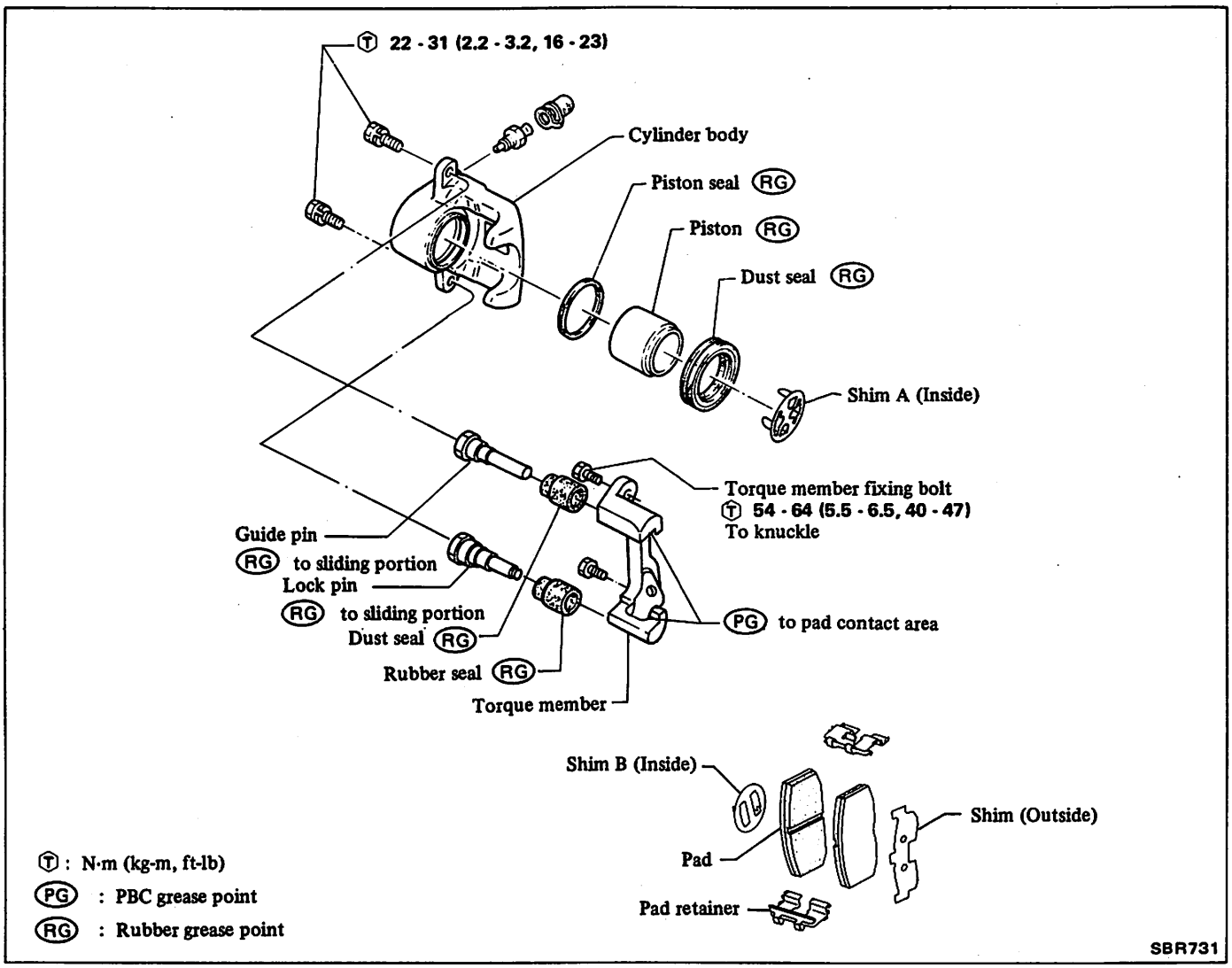
INSPECTION

1. Clean all parts in a brake fluid.
2. Check the parts for evidence of abnormal wear or damage.

ASSEMBLY

a. Replace piston cups and packing with new ones.
b. Apply brake fluid or rubber grease to sliding contact surface of parts to facilitate assembly of master cylinder.

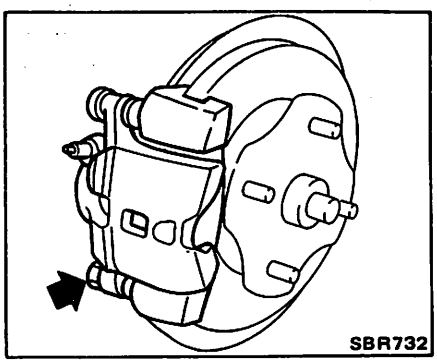
FRONT DISC BRAKE –CL18B–



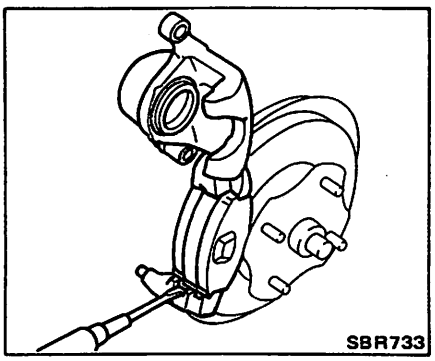
PAD REPLACEMENT

Removal

1. Jack up front of vehicle and support it on safety stands. Refer to section GI for lifting points and towing.
2. Remove lock pin.



3. Open cylinder body upward. Remove pad retainers and pads.



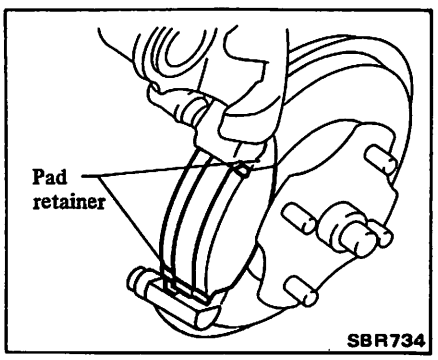
CAUTION:
When cylinder body is open, do not depress brake pedal, or piston will jump out.

Installation

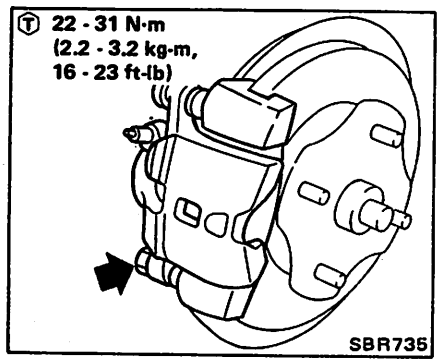
1. Clean piston end and surroundings of pin bolts.
2. Apply a coat of PBC grease to pad-to-torque member clearance.

Be careful not to get grease on pads or rotor.

3. Install inner pad. Pull cylinder body to outer side.
4. Install outer pad, then pad retainers.

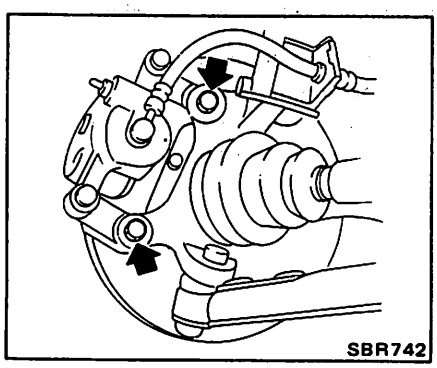


5. Tighten lock pin.



REMOVAL AND INSTALLATION

1. Disconnect brake line at brake tube and hose connection
2. Remove caliper mounting bolts.

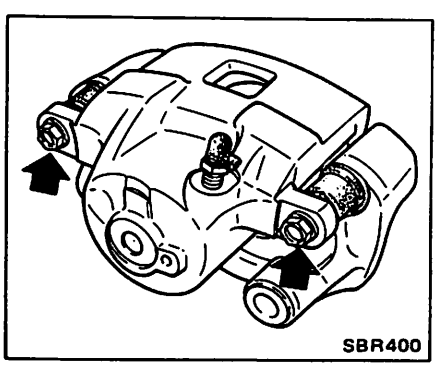


Install caliper assembly in the reverse order of removal.

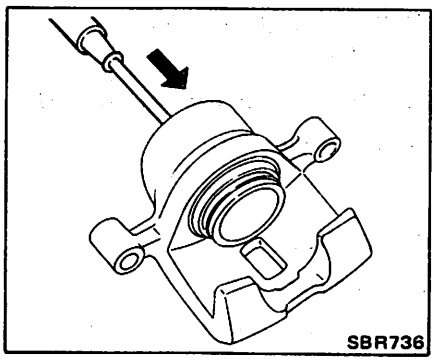
Ⓣ: Caliper fixing bolt
54 - 64 N·m
(5.5 - 6.5 kg-m,
40 - 47 ft-lb)

DISASSEMBLY

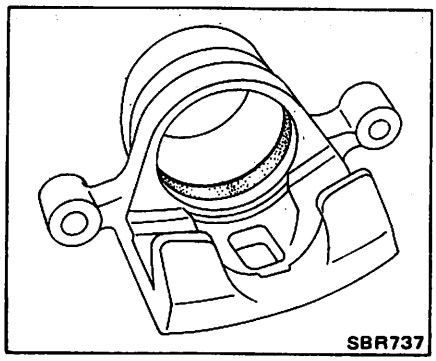
1. Separate cylinder body and torque member.



2. Remove brake hose. Press out piston with dust seal and retainer ring.



3. Remove piston seal.



4 Remove guide pin and lock pin from torque member.

INSPECTION

Clean all parts and check as follows.

CAUTION:
Use brake fluid to clean. Never use mineral oil.

Cylinder body

1. Check inside surface of cylinder for score, rust, wear, damage or presence of foreign substances. If any surface fault is detected, replace cylinder body.
2. Minor damage from rust of foreign substances may be eliminated by polishing surface with a fine emery paper. If damage is major, cylinder assembly must be replaced.

Torque member

Check for wear, cracks or other damage. Replace if any fault is detected.

Piston

Check piston for score, rust, wear, damage or presence of foreign substances. Replace if any fault is detected.

CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is stuck to sliding surface.

Piston seal and dust seal

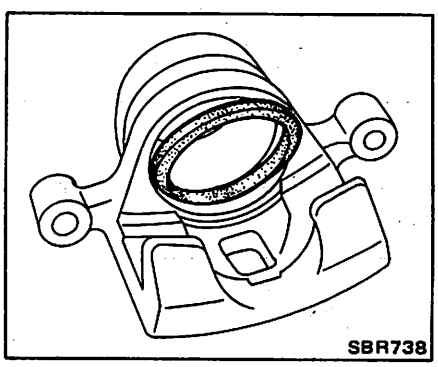
Replace piston seal and dust seal at each disassembly.

Guide pin, lock pin and boots

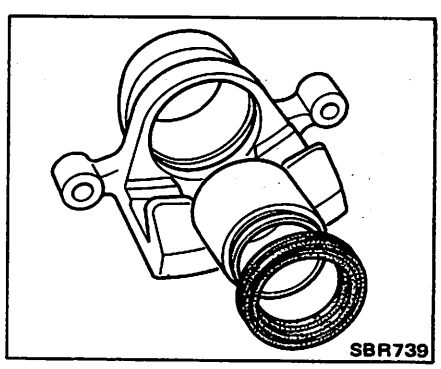
Check for wear, cracks or other damage. Replace if any fault is detected.

ASSEMBLY

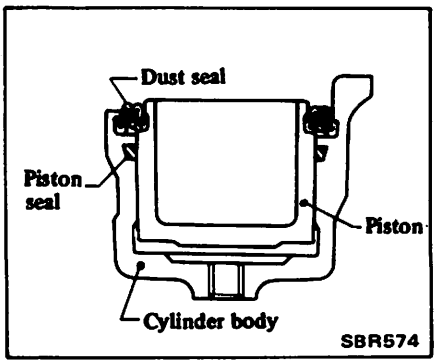
1. Install piston seal applying rubber grease or brake fluid to seal groove and seal.



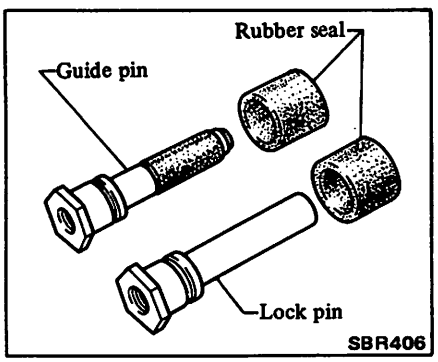
2. Apply rubber grease or brake fluid to sliding portions and inside of dust seal.



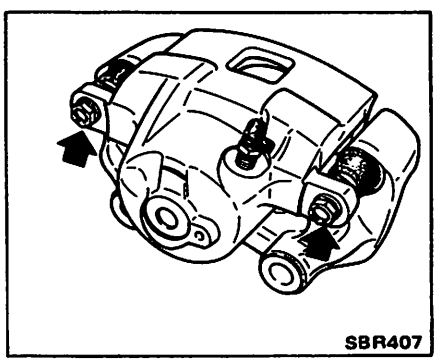
3. With dust seal fitted to piston, insert dust seal into groove on cylinder body and install piston.
4. Properly secure dust seal.



5. Apply a coat of rubber grease to guide pin and lock pin sliding portion. Install lock pin boot, guide pin boot, lock pin and guide pin.



6. Attach torque member to cylinder body.



Ⓣ : 22 - 31 N·m
(2.2 - 3.2 kg-m, 16 - 23 ft-lb)

FRONT DISC ROTOR —CL18B—

REMOVAL AND INSTALLATION

Refer to section FA.

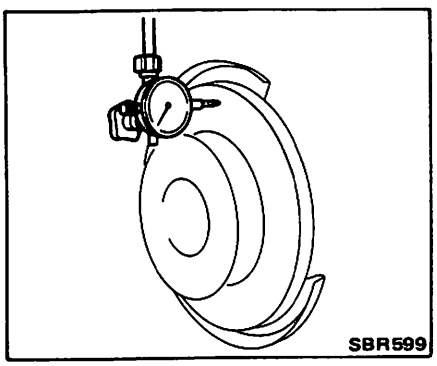
INSPECTION

Sliding surface

If there are cracks or considerable chips, repair or replace.

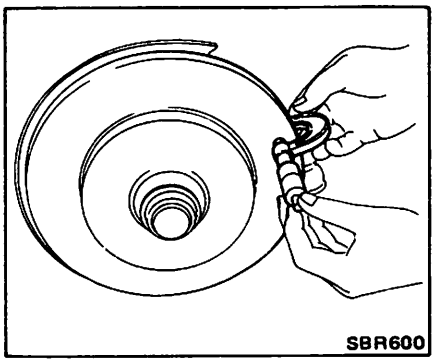
Runout

Adjust wheel bearing correctly. Measure runout.



Rotor repair limit:
Maximum runout
(Total indicator reading at center of rotor pad contact surface)
Less than 0.07 mm (0.0028 in)

Thickness

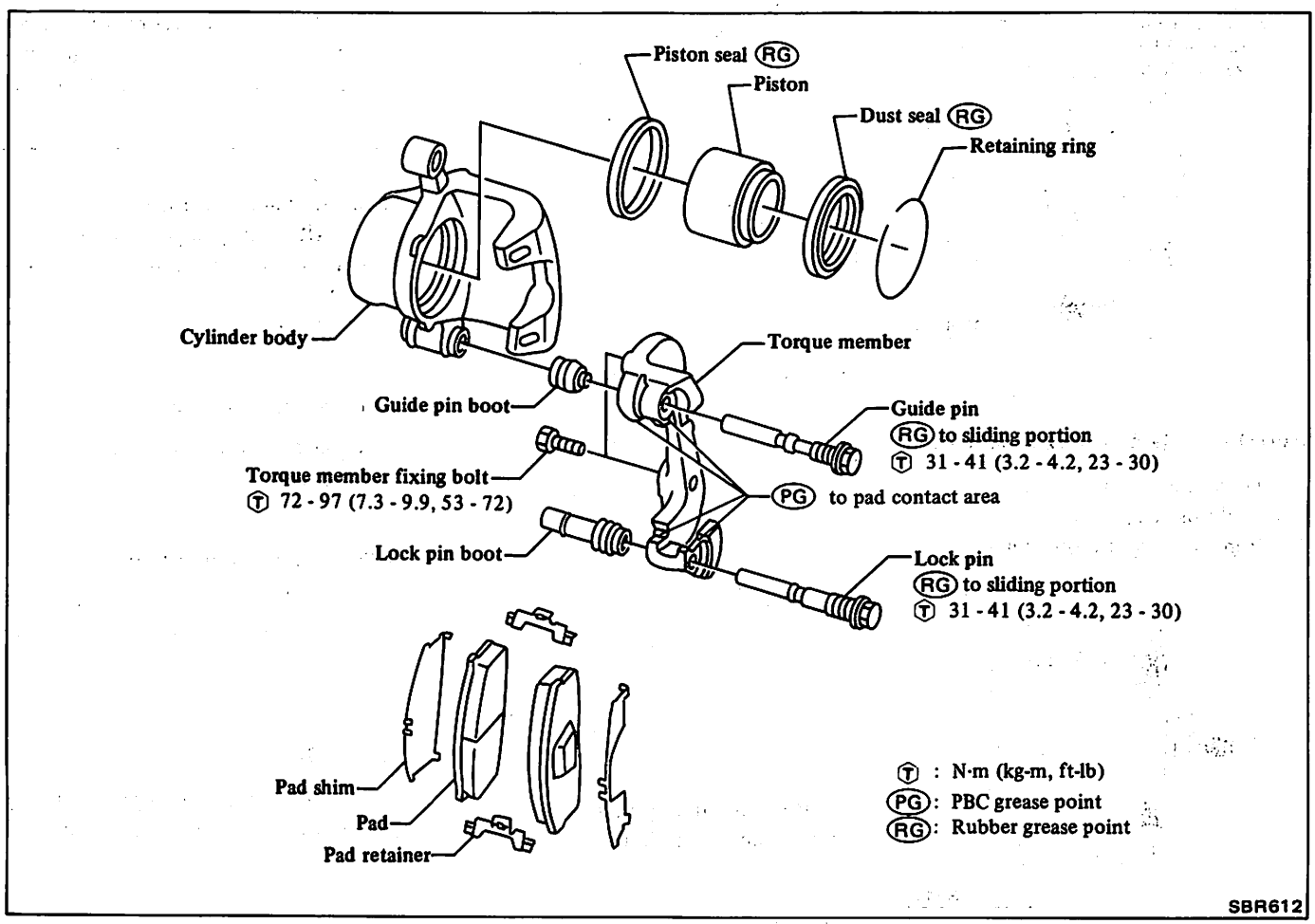


Rotor repair limit:
Minimum thickness
More than 10 mm (0.39 in)

Parallelism (Thickness variation)

Rotor repair limit:
Maximum parallelism
(Circumferential direction)
0.03 mm (0.0012 in)

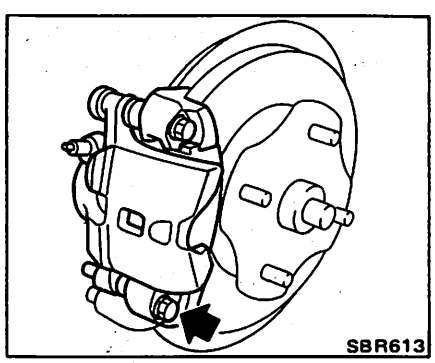
FRONT DISC BRAKE –AD20V–



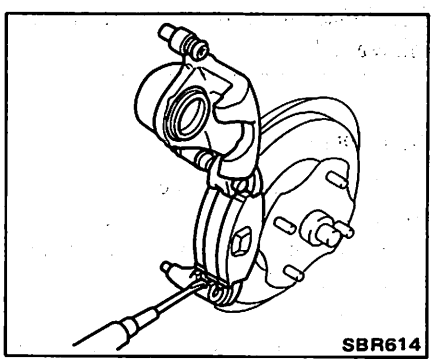
PAD REPLACEMENT

Removal

1. Jack up front of vehicle and support it on safety stands. Refer to Section GI for lifting points and towing.
2. Remove guide pin.



3. Open cylinder body upward. Remove pad retainers and pads.



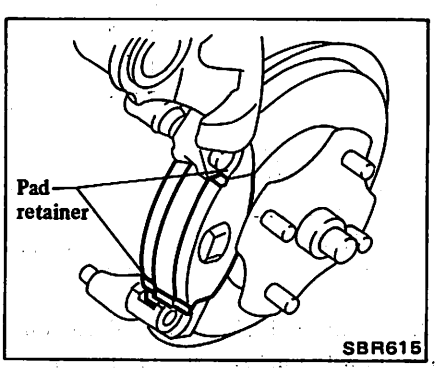
CAUTION:
When cylinder body is open, do not depress brake pedal, or piston will jump out.

Installation

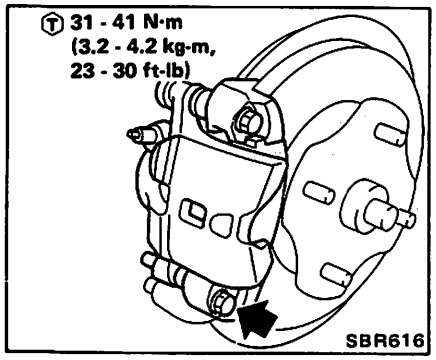
1. Clean piston end and surroundings of pin bolts.
2. Apply a coat of PBC grease to pad-to-torque member clearance.

Be careful not to get grease on pads or rotor.

3. Install inner pad. Pull cylinder body to outer side.
4. Install outer pad, then pad retainers.

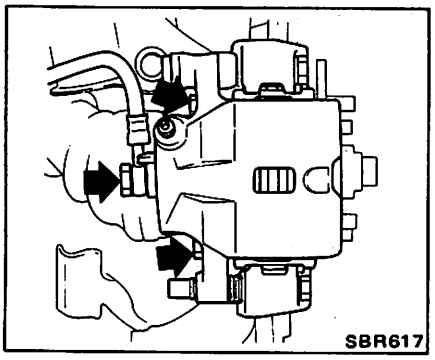


5. Tighten guide pin.



REMOVAL AND INSTALLATION

1. Disconnect brake line at brake tube and hose connection
2. Remove caliper mounting bolts.

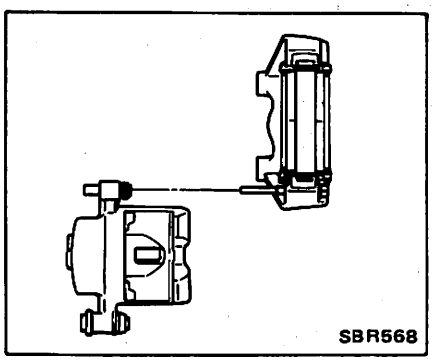


Install caliper assembly in the reverse order of removal.

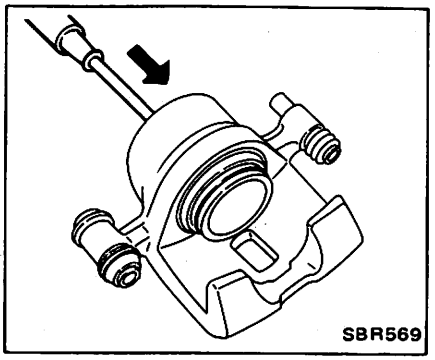
Ⓣ: Caliper fixing bolt
72 - 97 N·m
(7.3 - 9.9 kg-m,
53 - 72 ft-lb)

DISASSEMBLY

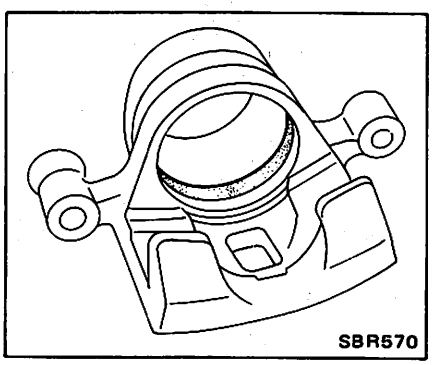
1. Separate cylinder body and torque member.



2. Remove brake hose. Press out piston with dust seal and retainer ring.



3. Remove piston seal.



4. Remove guide pin, lock pin, guide pin boot and lock pin boot.

INSPECTION

Clean all parts and check as follows:

CAUTION:
Use brake fluid to clean. Never use mineral oil.

Cylinder body

1. Check inside surface of cylinder for score, rust, wear, damage or presence of foreign substances. If any surface fault is detected, replace cylinder body.
2. Minor damage from rust of foreign substances may be eliminated by polishing surface with a fine emery cloth. If damage is major, cylinder assembly must be raplaced.

Torque member

Check for wear, cracks or other damage. Replace if any fault is detected.

Piston

Check piston for score, rust, wear, damage or presence of foreign substances. Replace if any fault is detected.

CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is stuck to sliding surface.

Piston seal and dust seal

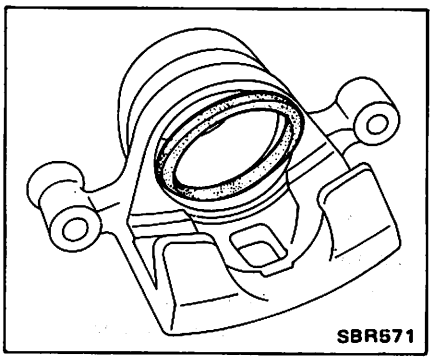
Replace piston seal and dust seal at each disassembly.

Guide pin, lock pin and boots

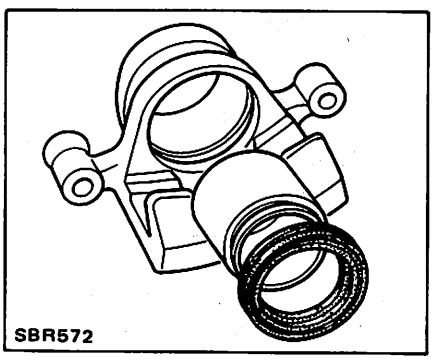
Check for wear, cracks or other damage. Replace if any fault is detected.

ASSEMBLY

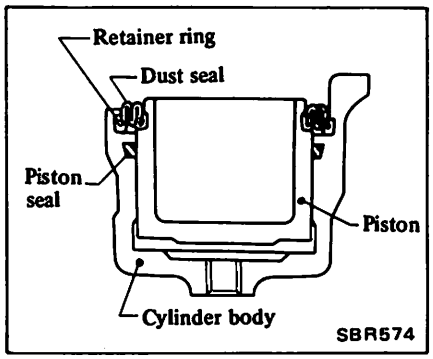
1. Install piston seal applying rubber grease or brake fluid to seal groove and seal.



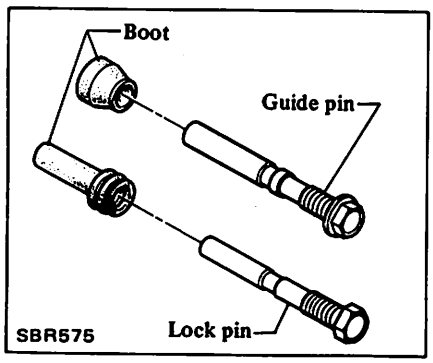
2. Apply rubber grease or brake fluid to sliding portions and inside of dust seal.



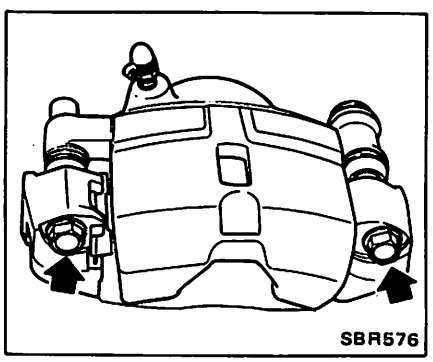
3. With dust seal fitted to piston, insert dust seal into groove on cylinder body and install piston.
4. Install retainer ring and properly secure dust seal.



5. Apply a coat of rubber grease to guide pin and lock pin sliding portion. Install lock pin boot, guide pin boot, lock pin and guide pin.



6. Attach torque member to cylinder body.



Ⓣ: **31 - 41 N·m (3.2 - 4.2 kg-m, 23 - 30 ft-lb)**

FRONT DISC ROTOR –AD20V–

REMOVAL AND INSTALLATION

Refer to section FA.

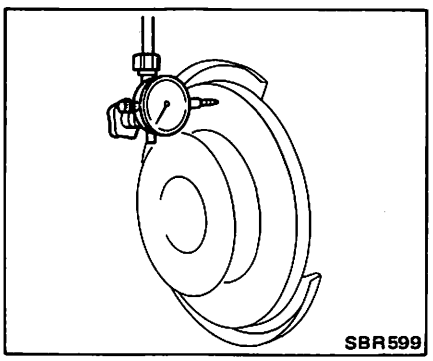
INSPECTION

Sliding surface

If there are cracks or considerable chips, repair or replace.

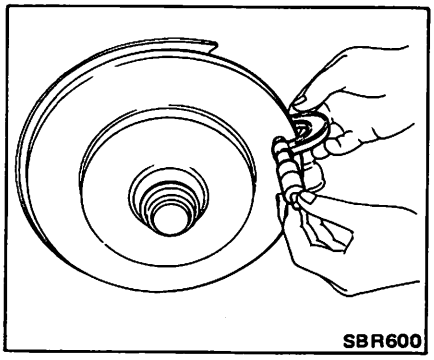
Runout

Adjust wheel bearing correctly. Measure runout.



Rotor repair limit:
Maximum runout (Total indicator reading at center of rotor pad contact surface)
0.07 mm (0.0028 in)

Thickness

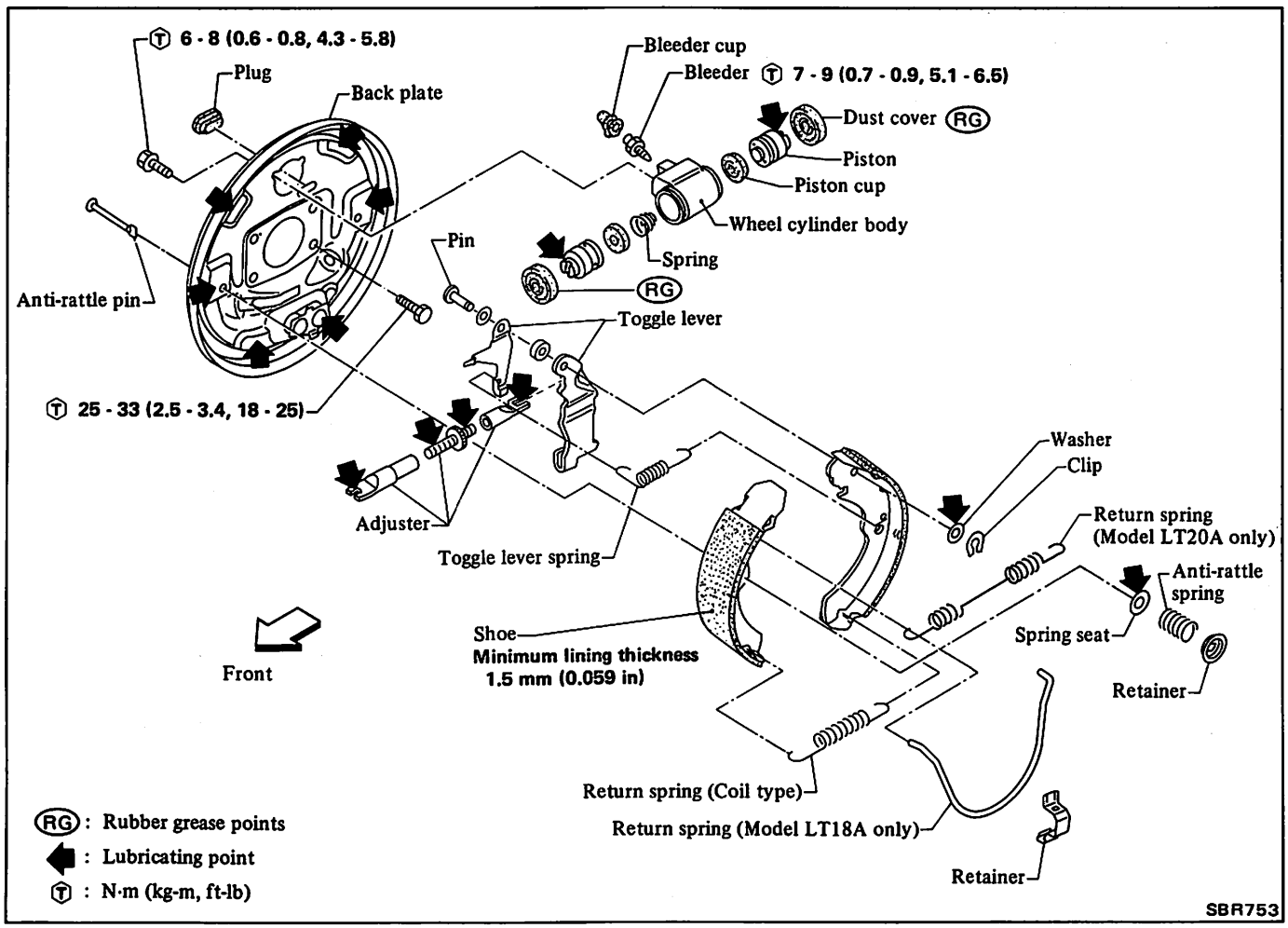


Standard thickness:
18 mm (0.71 in)
Rotor repair limit:
Minimum thickness
16 mm (0.63 in)

Parallelism (Thickness variation)

Rotor repair limit:
Maximum parallelism (Circumferential direction)
0.03 mm (0.0012 in)

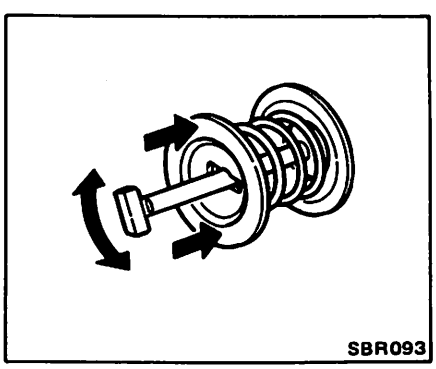
REAR DRUM BRAKE –LT18A and LT20A–



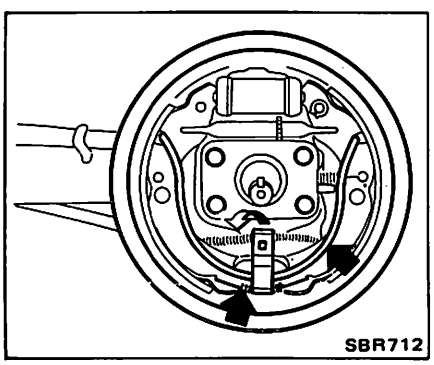
SHOE REPLACEMENT

Removal

1. Remove wheel and brake drum. Refer to Section RA for removal.
2. Remove parking brake rear cable.
3. Remove anti-rattle spring and pin.



4. Remove retainer and then return spring and brake shoe.

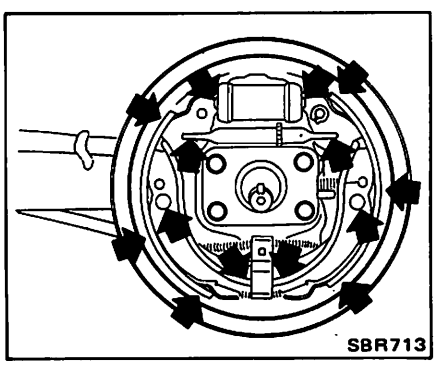


5. Remove toggle lever. Refer to Adjuster.

Installation

Apply brake grease to the following contact areas:

- Shoe to wheel cylinder and anchor
- Shoe to back plate
- Shoe to adjuster
- Spring seat to shoe



Before installing new shoes, set shoe-to-drum clearance [0.23 to 0.32 mm (0.0091 to 0.0126 in)] with the adjuster.

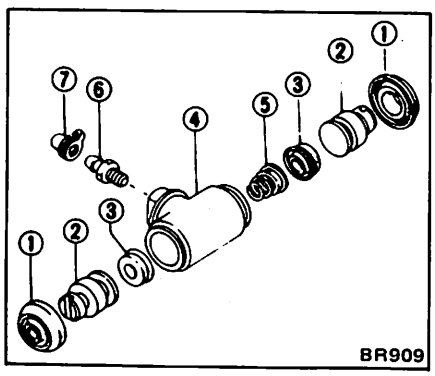
After installation is completed, adjust shoe-to-drum clearance by operating parking brake several times.

WHEEL CYLINDER

Removal

1. Remove brake shoe.
2. Disconnect brake tube.
3. Then remove wheel cylinder.

Disassembly



1 Dust cover
2 Piston
3 Piston cup
4 Wheel cylinder body
5 Spring
6 Bleeder
7 Bleeder cap

Inspection

1. Replace any cylinder or piston which is scratched, scored or worn on its sliding contact surface.
2. Replace worn parts if piston-to-cylinder clearance is beyond limit.
3. Replace any piston cup which is worn or otherwise damaged.
4. Replace if contacting face of cylinder and shoe is worn locally or in step.
5. Replace any damaged dust cover, fatigued piston spring or faulty threaded parts.
6. Replace any tube connector which is worn on its threaded portion.

Assembly

a. Apply a coating of rubber grease or brake fluid to piston cup at assembly.

b. Charge with rubber grease or equivalent before installing dust cover.

c. The brake wheel cylinder is available in both NABCO make and TOKICO make. There is no interchangeability of repair kits or component parts between NABCO and TOKICO makes.
When replacing the repair kit or component parts, ascertain the brand of the brake wheel cylinder body. Be sure to use parts of the same make as the former ones.

Installation

Ⓣ : Wheel cylinder fixing bolt
6 - 8 N·m
(0.6 - 0.8 kg-m,
4.3 - 5.8 ft-lb)

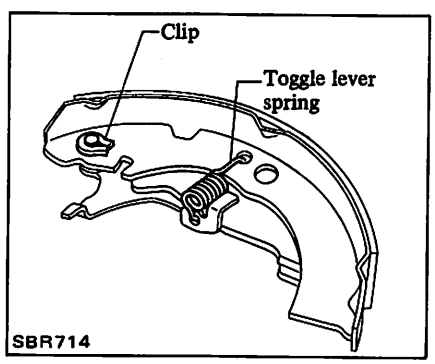
ADJUSTER

Removal

1. Separate equalizer and rear cable.
2. Remove brake shoe.

Refer to Shoe Replacement.

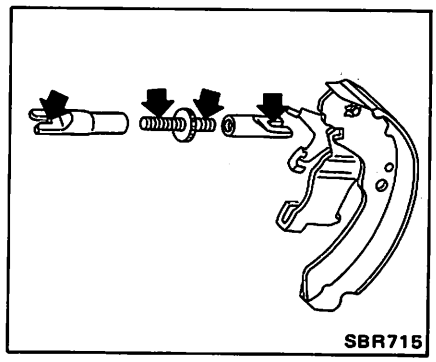
3. Remove adjuster assembly.
4. Remove toggle lever spring and clip, and then separate toggle lever and shoe.



Installation

Lubricating points:

- Adjuster nut and rod threads
- Mating surfaces between adjuster and toggle lever.



Right side brake:
Right thread adjuster
Left side brake:
Left thread adjuster

After installation is completed, adjust shoe-to-drum clearance by operating parking brake several times.
Then adjust parking brake system.

Refer to section MA for adjustment.

BRAKE DRUM

Inspection

1. Check inner diameter of brake drum to make sure it is properly round and tapered. If it is not, repair or replace brake drum.

Standard inner diameter:
180.0 mm (7.09 in)
Maximum inner diameter:
181.0 mm (7.13 in)
Out-of-roundness (ellipticity):
Less than
0.03 mm (0.0012 in)
Radial run-out
(Total indicator reading):
Less than
0.05 mm (0.0020 in)

2. Contact surface with which linings come into contact should be fine-finished with No. 120 to 150 emery paper.
3. Using a drum racer, finish brake drum by machining if it shows any sign of score marks, partial wear or stepped wear on its contact surface.

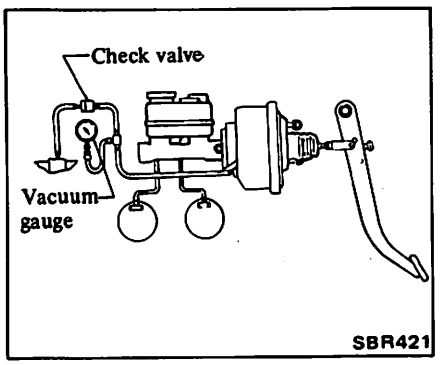
After brake drum has been completely re-conditioned or replaced, check drum and shoes for proper contact pattern.

BRAKE BOOSTER

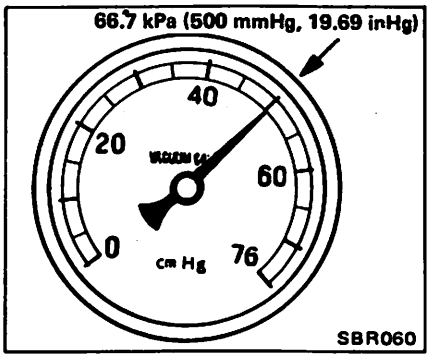
INSPECTION

Airtight test (No load)

1. Connect a vacuum gauge between check valve and brake booster.



2. Start engine and increase engine speed. Stop engine when vacuum is 66.7 kPa (500 mmHg, 19.69 inHg).



3. If vacuum pressure drops more than the specified value, correct the cause in accordance with the following chart.

Maximum vacuum leakage (15 seconds after engine is stopped):
3.3 kPa (25 mmHg, 0.98 inHg)

Probable cause	Corrective action
Air leakage at check valve.	Inspect check valve.
Air leakage at output rod seat.	Replace brake booster as an assembly.
Air leakage between valve body and seal.	
Air leakage at valve plunger seat.	
Damaged piping or connectors	Repair or replace.

Airtight test (Under load)

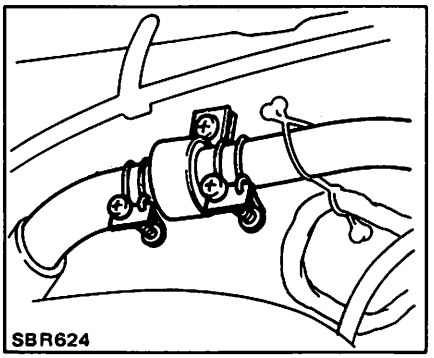
Keep brake pedal fully depressed. Following procedures are same as for no-load conditions.

Maximum vacuum leakage (15 seconds after engine is stopped)
3.3 kPa (25 mmHg, 0.98 inHg)

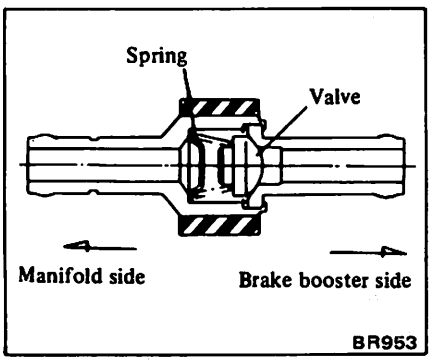
Probable cause	Corrective action
Air leakage at check valve.	Inspect check valve.
Damaged diaphragm.	Replace brake booster as an assembly.
Air leakage at poppet assembly seat and valve body.	

Check valve

1. Remove check valve.



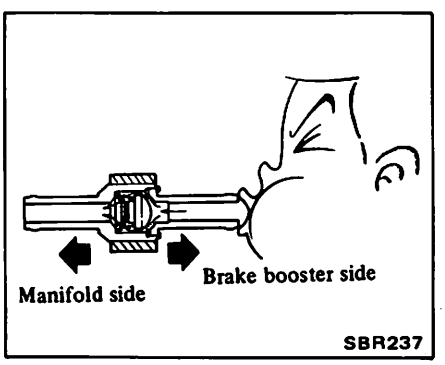
2. Apply a vacuum pressure of 66.7 kPa (500 mmHg, 19.69 inHg) to the port of check valve on the brake booster side.



3. If vacuum pressure drops more than the specified value in 15 seconds, replace check valve with a new one.

Maximum vacuum leakage of check valve:
1.3 kPa (10 mmHg, 0.39 inHg)

4. When pressure is applied to the brake booster side of check valve and valve does not open, replace check valve with a new one.



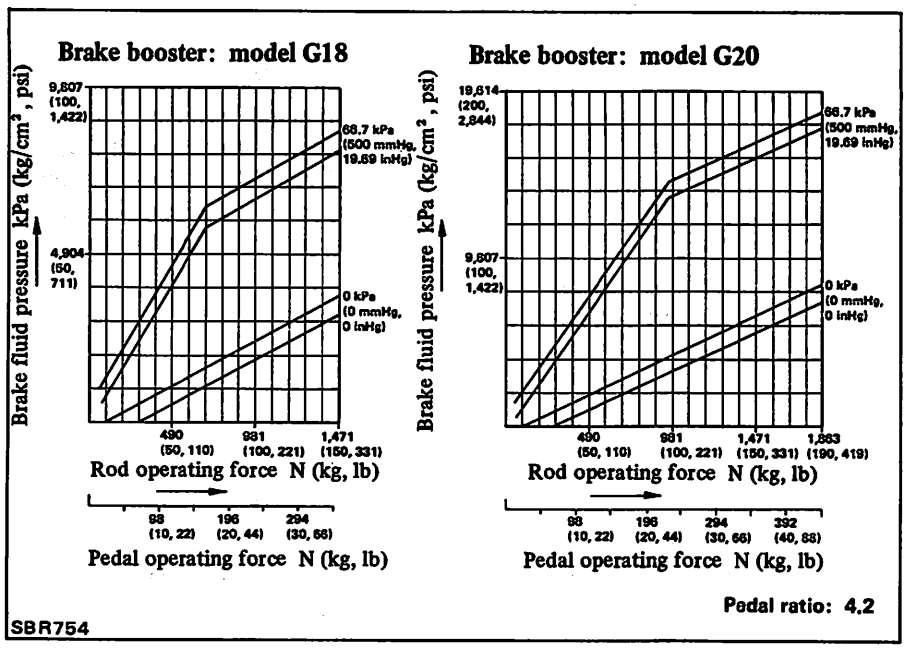
Operating test

1. Connect an oil pressure gauge to brake line, at connection on master cylinder.
2. Install a pedal force gauge on brake pedal.
3. Start engine, and increase engine speed until a vacuum pressure of 66.7 kPa (500 mmHg, 19.69 inHg) is registered on vacuum pressure gauge. With a steady vacuum pressure of 66.7 kPa (500 mmHg, 19.69 inHg), measure oil pressure with respect to each pedal operating force.

Relationship between oil pressure and pedal operating force is illustrated in the following figures. If test results are not as specified, check brake booster for condition in manner described under "Inspection" before removal of this unit.

Also check brake line for evidence of fluid leakage.

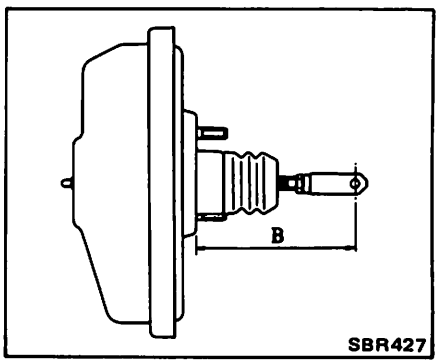
Determine whether source of problem is in brake booster or check valve. Before you reach a final conclusion, always inspect check valve first.



Input rod length

Adjust length by turning clevis.

Length "B":
150 mm (5.91 in)

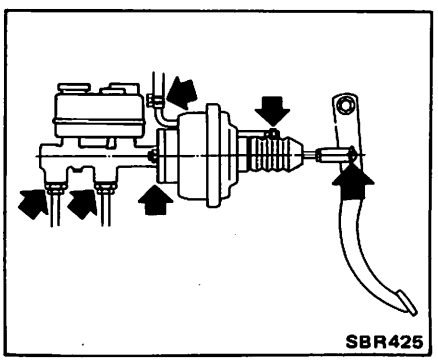


INSTALLATION

Ⓣ : Master cylinder to brake booster
8 - 11 N·m
(0.8 - 1.1 kg-m,
5.8 - 8.0 ft-lb)
Brake booster to pedal bracket
8 - 11 N·m
(0.8 - 1.1 kg-m,
5.8 - 8.0 ft-lb)
Input rod lock nut
16 - 22 N·m
(1.6 - 2.2 kg-m,
12 - 16 ft-lb)

REMOVAL

To remove brake booster, detach the following points.



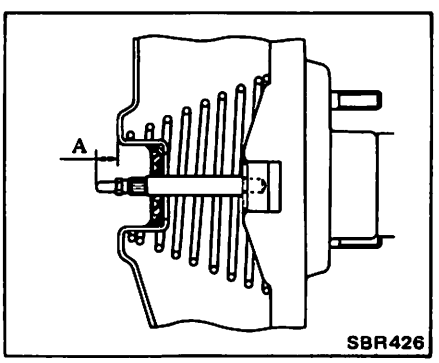
ADJUSTMENT

Output rod length

PV servo cannot be adjusted as output rod thread portion is secured by adhesion.

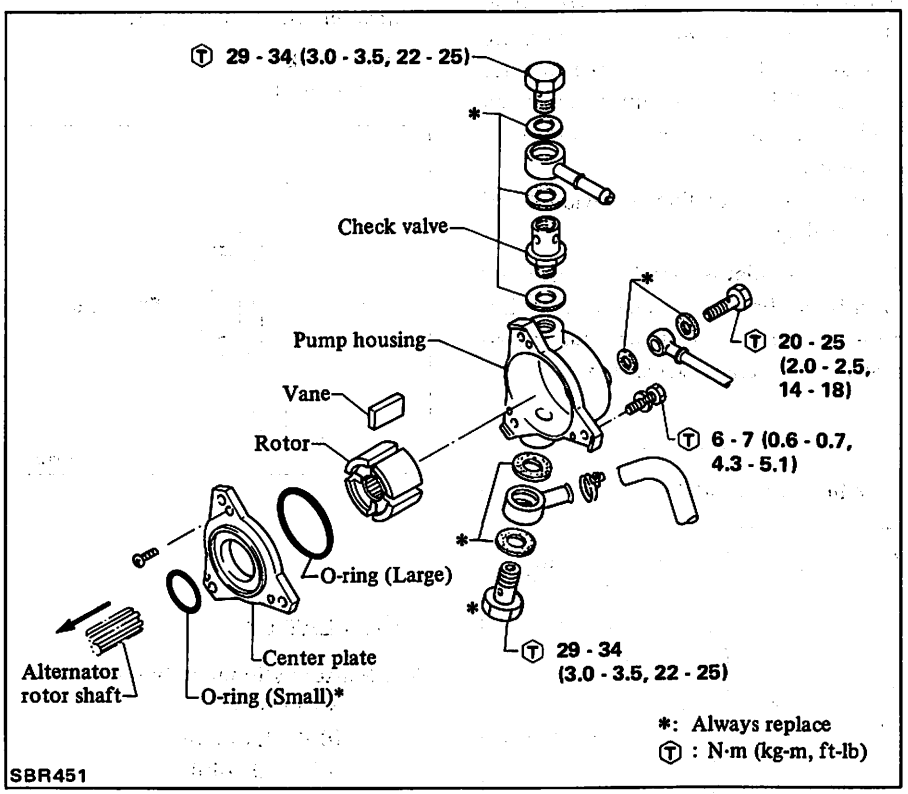
1. Check length.

Length "A":
10.275 - 10.525 mm
(0.4045 - 0.4144 in)



2. If length is not within specifications, replace brake booster assembly.

VACUUM PUMP (Diesel engine model)

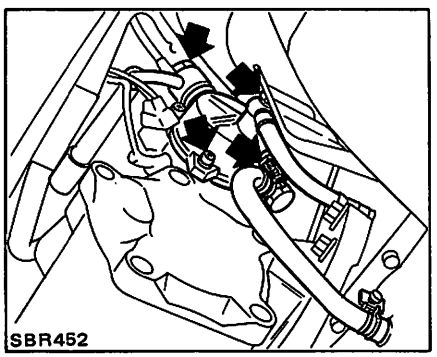


REMOVAL AND INSTALLATION

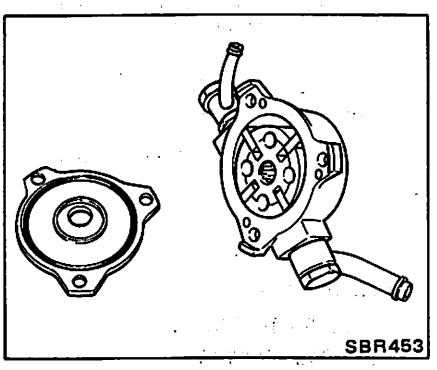
1. Drain oil from vacuum pump

Manually rotate fan belt clockwise to discharge any oil which may have accumulated in vacuum pump.

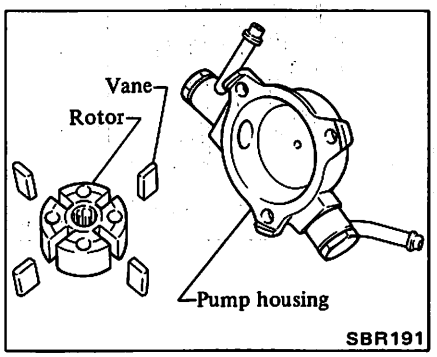
2. Remove vacuum pump assembly from alternator.



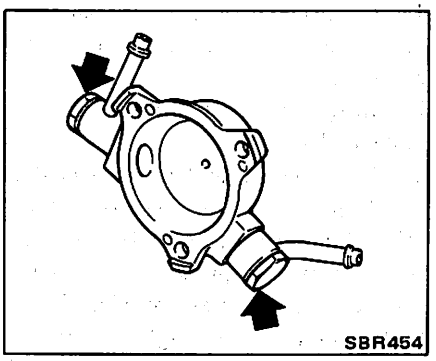
3. Separate center plate and vacuum pump housing.



4. Disassemble rotor, vane and vacuum pump housing.



5. Disconnect valve assembly.



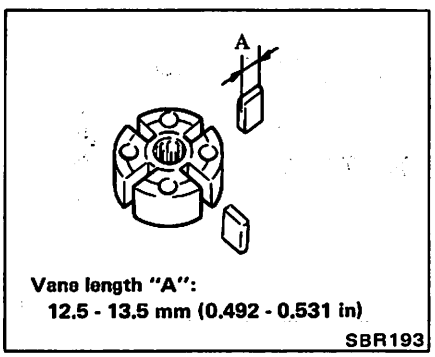
6. Install vacuum pump in the reverse order of removal.

After installing vacuum pump, fill vacuum pump with engine oil [approximately 5 mℓ (0.2 US fl oz, 0.2 Imp fl oz)] and then check that alternator rotates smoothly by turning it manually.

INSPECTION

Clean all parts and check them as follows:

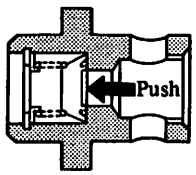
- Check for wear or scratches on mating surfaces of rotor and vacuum pump housing and of rotor and center plate. If any wear or scratches are noted, replace those parts.
- Check for wear or scratches on vanes. If necessary, replace.



- Check inner wall of vacuum pump housing for wear. If necessary, replace.

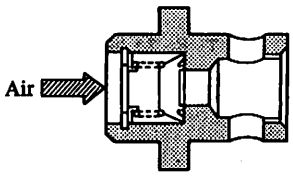
  Vacuum pump housing inner diameter:
  57.0 - 57.1 mm (2.244 - 2.248 in)

- Check rotor shaft opening and serrated end of rotor shaft for wear. If necessary, replace.
- Check valve locations and copper washers for bending or deformity. If necessary, replace.
- Check operation of valves. If necessary, replace.



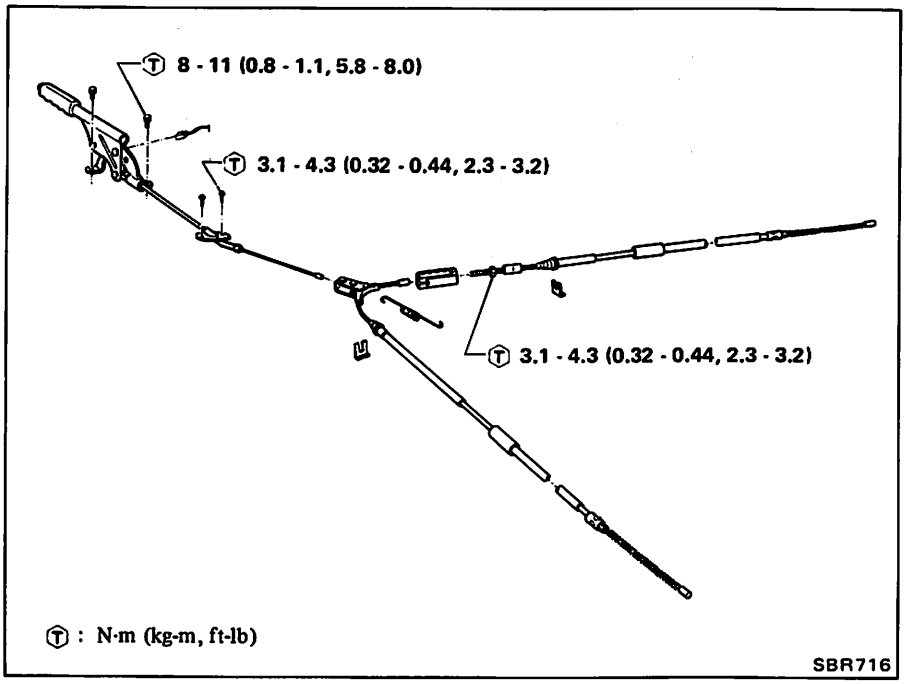
Checking operation of valve SBR194

Air pressure:
98 - 490 kPa (1 - 5 kg/cm², 14 - 71 psi)



Checking air leakage of valve SBR195

PARKING BRAKE

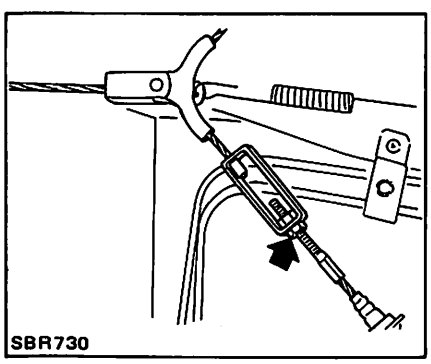


PARKING BRAKE CONTROL

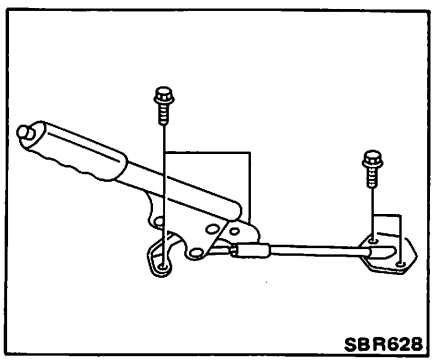
REMOVAL

Control lever and front cable

1. Separate equalizer and rear cable.

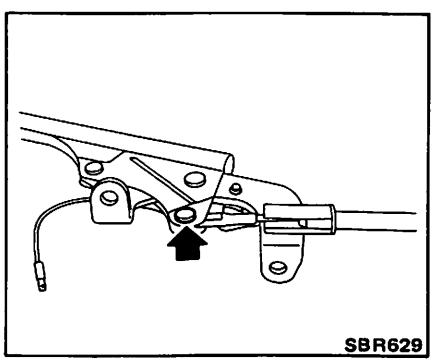


2. Remove center console.
3. Disconnect parking brake lamp switch harness connector.
4. Remove seat belt anchor bolts.
5. Remove control lever attaching bolts and front cable bracket attaching screws.



6. Remove front cable out through driver's compartment.
7. If necessary separate front cable from parking brake lever by breaking pin.

Front cable, clevis pin and cotter pin are available as service parts.



Rear cable

Refer to Adjuster (Rear drum brake –LT18–).

INSPECTION

1. Check control lever for wear or other damage. Replace if necessary.
2. Check wires for discontinuity or deterioration. Replace if necessary.
3. Replace malfunctioning warning lamp and switch.
4. Check parts at each connection and, if found deformed or damaged, replace.

INSTALLATION

Install parking brake control assembly following the reverse procedure of removal. Closely observe the following items:

When installing, apply a coat of grease to sliding contact surfaces.

Ⓣ: Control lever to floor panel
8 - 11 N·m
(0.8 - 1.1 kg-m,
5.8 - 8.0 ft-lb)
Front cable to floor panel
3.1 - 4.3 N·m
(0.32 - 0.44 kg-m,
2.3 - 3.2 ft-lb)
Rear cable adjusting nut lock nut
3.1 - 4.3 N·m
(0.32 - 0.44 kg-m,
2.3 - 3.2 ft-lb)
Rear seat belt anchor bolt
24 - 31 N·m
(2.4 - 3.2 kg-m,
17 - 23 ft-lb)

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

GENERAL SPECIFICATIONS

	Type		CL18B	AD20V
Front brake	Cylinder dia.	mm (in)	48.1 (1.894)	51.1 (2.012)
	Pad width x thickness x length	mm (in)	37.0 x 10.0 x 94.0 (1.457 x 0.394 x 3.701)	43 x 10 x 105 (1.69 x 0.39 x 4.13)
	Rotor outer dia.	mm (in)	240 (9.45)	232 (9.13)
Rear brake	Type		LT18A	LT20A
	Cylinder dia.	mm (in)	17.46 (11/16)	
	Lining width x thickness x length	mm (in)	35.0 x 4.0 x 172.8 (1.378 x 0.157 x 6.803)	35 x 4.8 x 195 (1.38 x 0.189 x 7.68)
	Drum inner dia.	mm (in)	180 (7.09)	203.2 (8)
Master cylinder inner dia.		mm (in)	19.05 (3/4) Small 23.81 (15/16) Large	20.64 (13/16) Small 25.40 (1) Large
Brake booster type			G18	G20
Dual proportioning valve Split point kPa (kg/cm², psi) x reducing ratio			3,432 (35, 498) x 0.4	2,452 (25, 356) x 0.4

INSPECTION AND ADJUSTMENT

BRAKE PEDAL AND PARKING BRAKE

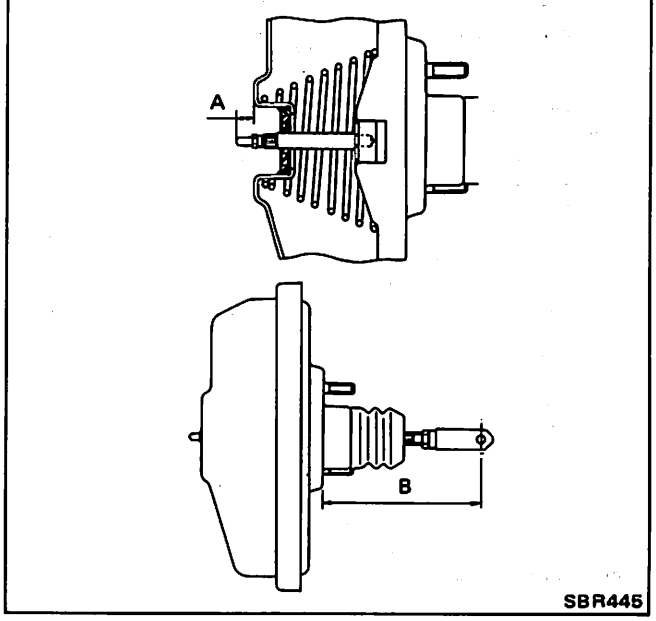
Refer to section MA.

CHECK VALVE

Maximum vacuum leakage [15 seconds after 66.7 kPa (500 mmHg, 19.69 inHg) pressure is applied] kPa (mmHg, inHg)	1.3 (10, 0.39)

BRAKE BOOSTER

Maximum vacuum leakage (15 seconds after engine is stopped) kPa (mmHg, inHg)	3.3 (25, 0.98)
Output rod length "A" mm (in)	10.275 - 10.525 (0.4045 - 0.4144)
Input rod length "B" mm (in)	150 (5.91)



FRONT DISC BRAKE

Unit: mm (in)

		CL18B	AD20V
Pad wear limit	Minimum thickness	2.0 (0.079)	
Rotor wear limit	Maximum runout	Less than 0.07 (0.0028)	
	Maximum parallelism	Less than 0.03 (0.0012)	
	Minimum thickness	More than 10.0 (0.394)	More than 16 (0.63)

REAR BRAKE

Unit: mm (in)

		CL18B	AD20V
Lining wear limit	Minimum thickness	1.5 (0.059)	
Drum wear limit	Maximum inner diameter	181.0 (7.13)	204.5 (8.05)
	Out-of-roundness	Less than 0.03 (0.0012)	
	Radial runout	Less than 0.05 (0.0020)	
	Taper [Measured at a point 45 mm (1.77 in) from inlet]	Less than 0.04 (0.0016)	

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Pedal bracket to body	8 - 11	0.8 - 1.1	5.8 - 8.0
Brake booster to pedal bracket	8 - 11	0.8 - 1.1	5.8 - 8.0
Master cylinder to brake booster	8 - 11	0.8 - 1.1	5.8 - 8.0
Brake booster input rod lock nut	16 - 22	1.6 - 2.2	12 - 16
Stop lamp switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Secondary piston stopper bolt			
TOKICO make	2.0 - 3.4	0.2 - 0.35	1.4 - 2.5
NABCO make	1.5 - 2.9	0.15 - 0.30	1.1 - 2.2
DP valve mounting bolt	4 - 5	0.4 - 0.5	2.9 - 3.6
Air bleeder	7 - 9	0.7 - 0.9	5.1 - 6.5
Brake tube flare nut	15 - 18	1.5 - 1.8	11 - 13
Brake hose connector	17 - 20	1.7 - 2.0	12 - 14
Disc brake baffle plate			
CL18B	3.2 - 4.3	0.33 - 0.44	2.4 - 3.2
AD20V	8 - 11	0.8 - 1.1	5.8 - 8.0
Torque member fixing bolt			
CL18B	54 - 64	5.5 - 6.5	40 - 47
AD20V	72 - 97	7.3 - 9.9	53 - 72
Cylinder body to torque member			
CL18B	22 - 31	2.2 - 3.2	16 - 23
AD20V	31 - 41	3.2 - 4.2	23 - 30
Disc rotor to wheel hub	25 - 33	2.5 - 3.4	18 - 25
Drum brake back plate			
LT18A	25 - 33	2.5 - 3.4	18 - 25
LT20A	22 - 26	2.2 - 2.7	16 - 20
Wheel cylinder to back plate	6 - 8	0.6 - 0.8	4.3 - 5.8

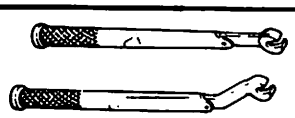
TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Excessive pedal travel	Low brake fluid level or empty master cylinder reservoir.	Fill and bleed as necessary. Test for source of leakage by examining all lines, connections and wheel cylinder.
	Leakage in master cylinder.	Overhaul master cylinder.
	Deteriorated check valve.	Replace check valve and bleed system.
	Air in system.	Bleed system.
	Faulty brake adjustment.	Adjust shoe-to-drum clearance.
	Excessive lateral play on disc caused by loose or worn wheel bearings or steering parts.	Replace or adjust faulty parts.
Spongy pedal	Low fluid level in master cylinder.	Top with fluid and inspect for leakage.
	Air in system.	Correct as necessary.
	Faulty brake adjustment.	Adjust shoe-to-drum clearance.
	Reservoir filler cap vent hole clogged.	Clean and bleed system.
	Swollen hose due to deterioration or use of poor quality hose.	Replace hose and bleed system.
	Distorted brake shoes, or excessively worn or cracked brake drum.	Replace faulty parts.
	Soft or swollen caliper seals.	Drain hydraulic system, flush with alcohol and replace all seals.
	Use of a brake fluid with too low boiling point.	Replace with specified brake fluid and bleed system.
Poor braking effect	Fluid leakage in brake lines.	Check master cylinder, piping and wheel cylinder for leaks, and repair.
	Low brake fluid level or empty master cylinder reservoir.	Fill and bleed as necessary.
	Air in brake lines.	Bleed system.
	Excessive shoe-to-drum clearance.	Adjust.
	Grease, oil, mud or water on linings or pads.	Clean brake mechanism and check for cause of problem. Replace linings or pads.
	Deterioration of linings or pads.	Replace.
	Local fit of linings or pads.	Shave or replace.
	Linings or pads excessively worn.	Replace.
	Master cylinder or wheel cylinders in poor condition.	Repair or replace.
	Frozen or seized caliper pistons on disc brakes.	Disassemble caliper and free up as required.
	Binding mechanical linkage at brake pedal and shoes.	Free up as required.

Condition	Probable cause	Corrective action
Unbalanced brakes	Improper tire inflation.	Inflate to correct pressure.
	Improper adjustment of shoe-to-drum clearance.	Readjust.
	Grease, oil, mud or water on linings or pads.	Clean brake mechanism and check for cause of problem. Replace linings or pads.
	Mud in brake drum.	Clean.
	Deterioration of linings or pads.	Replace.
	Excessive wear of linings or pads.	Replace.
	Wheel cylinder in poor condition.	Repair or replace.
	Poor sliding condition of brake shoe.	Adjust.
	Looseness of cylinder body or back plate securing bolts/nuts.	Fasten or replace.
	Scored or out-of-round drums.	Recondition or replace brake drum as required. Check for improper lining contact with drum and grind lining if necessary.
	Sticking wheel cylinder cups.	Recondition or replace cylinder.
	Deformation of back plate.	Replace.
	Incorrect adjustment of wheel bearings.	Adjust.
	Incorrect adjustment of wheel alignment.	Adjust.
Brakes fade	Brake fluid has too low boiling point.	Drain and fill system with approved fluid.
	Use of improper linings or brake linings are contaminated.	Replace linings.
	Brake drums are out-of-round.	Repair or replace as necessary.
	Hydraulic connections, master cylinder and wheel cylinders are corroded or damaged.	Repair as necessary.
	Bleed screw is open.	Close screw and bleed system.
Brake chatters	Groove or out-of-round brake drum or rotor.	Grind or replace as required.
	Loose or bent support plate.	Tighten support plate bolts to specified torque, or replace plate.
	Distorted brake shoes or pads.	Replace as necessary.
	Grease or brake fluid on linings.	Replace linings.
Brake squeals	Dirty or scored brake drums.	Blow out assembly with compressed air or refinish drum.
	Distorted brake shoes or bent support plate.	Replace faulty unit.
	Weak or broken brake shoe retaining spring or return spring.	Replace if faulty.
	Glazed or contaminated brake lining.	Cam ground lining to eliminate glaze. If it does not, replace linings.
Brakes drag	Pedal linkage is binding or output rod adjustment is too long.	Lubricate linkage, check pedal return spring for condition and adjust output rod as necessary.

Condition	Probable cause	Corrective action
(Brakes drag)	Master cylinder compensator part is obstructed.	Blow out foreign matter with compressed air.
	Seized master cylinder piston.	Disassemble master cylinder and replace piston. Bleed system.
	Poor shoe condition.	Clean and repair.
	Poor wheel cylinder condition.	Repair or replace.
	Deformation of piston cups.	Replace.
	Poor condition of caliper because of faulty piston seals.	Replace piston seals.
	Excessive runout of rotor.	Turn rotor on lathe or replace.
	Parking brake will not return.	Check and repair.
	Clogged master cylinder return port.	Clean.
	Clogged brake lines.	Check and clean.
	Incorrect adjustment of wheel bearings.	Adjust.
	Improper shoe-to-drum clearance.	Inspect auto-adjuster operation.
	Weak shoe return springs.	Replace.
	No free travel in brake shoe return.	Adjust pedal height.
Pedal pulsates	Out-of-round or off-center drum.	Turn drum or replace as necessary.
	On disc brakes, lateral runout of brake rotor is excessive.	Check with dial indicator, turning disc by hand. If runout exceeds specifications, repair or replace disc.
	Excessive variation in thickness of brake rotor surfaces.	Measure around disc face with micrometer. Replace disc as required.
Rear lock (Under light brake pedal force)	Improper tire pressures.	Check and adjust.
	Excessive wear of tires.	Check and replace.
	Faulty DP valve.	Replace.
Rear lock (Under heavy brake pedal force)	Improper tire pressures.	Check and adjust.
	Excessive wear of tires.	Check and replace.
	Poor front braking effect.	
	• Grease, oil, mud or water on linings or pads.	Clean or replace.
	• Excessive wear of linings or pads.	Replace.
	• Local fit of linings or pads.	Shave or replace.
	• Master cylinder or wheel cylinder in poor condition.	Repair or replace.

SPECIAL SERVICE TOOL

Tool number (Kent-Moore No.)	Tool name
GG94310000 (–)	Flare nut torque wrench 

STEERING SYSTEM

SECTION ST

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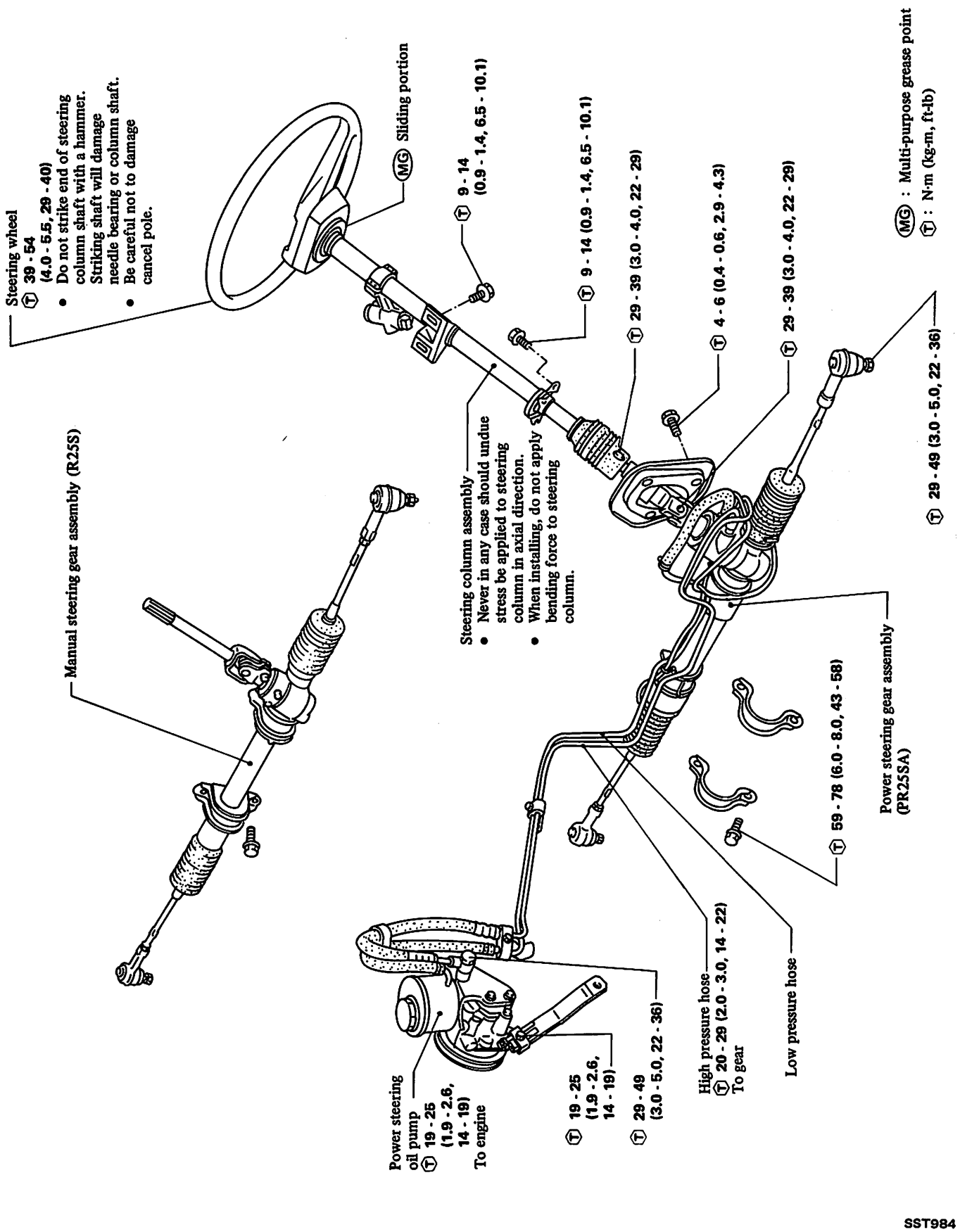
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Refer to section MA (Front Axle and Front Suspension) for:

CHECKING WHEEL ALIGNMENT

- Toe-in
- Front wheel turning angle

STEERING SYSTEM



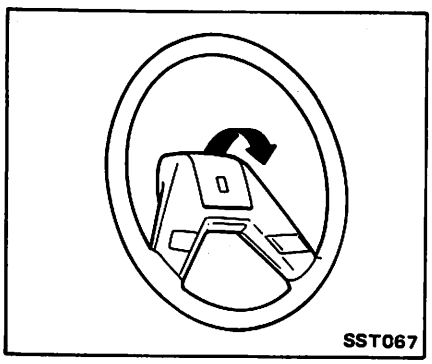
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STEERING WHEEL AND COLUMN

STEERING WHEEL

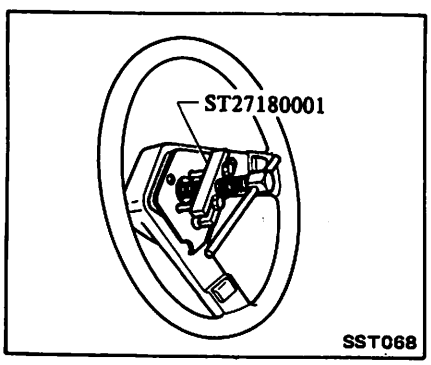
REMOVAL

1. Disconnect battery ground cable.
2. Remove horn pad and steering wheel nut.



3. Remove steering wheel using **Tool.**

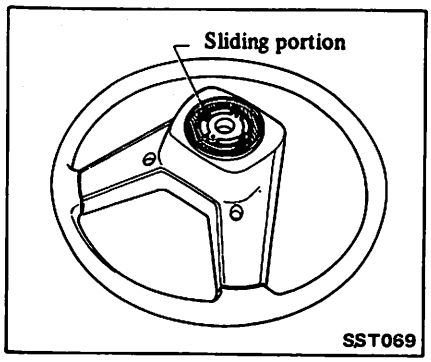
CAUTION:
Do not strike end of steering column shaft with a hammer. Striking shaft will damage bearing or column shaft.



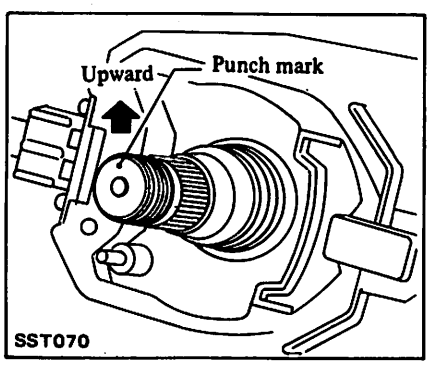
INSTALLATION

Install steering wheel in the reverse order of removal. Observe the following instructions.

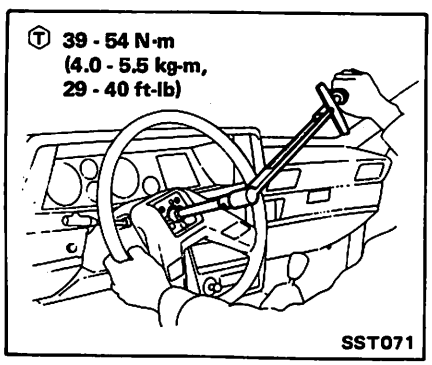
1. Apply grease to sliding portions.



2. Install steering wheel **on column shaft in a straight-ahead position.**



3. Tighten steering wheel nut.

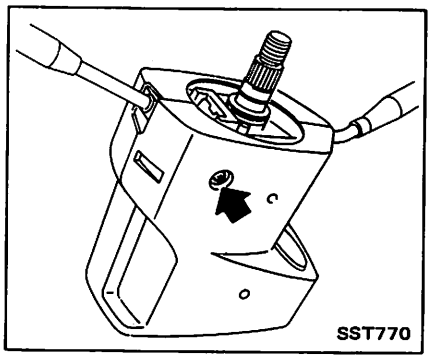


4. After installing steering wheel, **turn it clockwise and counterclockwise, checking for catch or drag. Also check horn operation.**

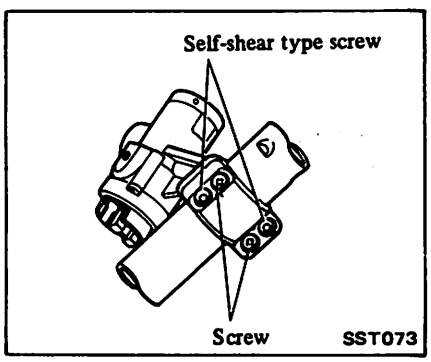
STEERING LOCK

REMOVAL

1. Remove steering wheel. Refer to Steering Wheel for removal.
2. Remove steering column shell cover.

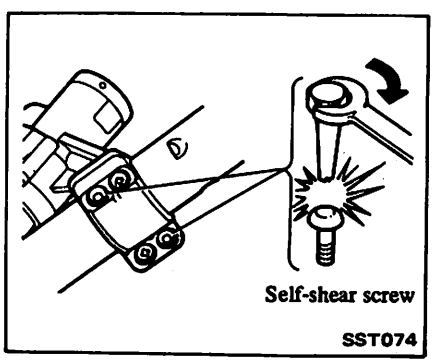


3. Break self-shear type screws **with a drill or other appropriate tool.**
4. Remove screws and disconnect steering lock.



INSTALLATION

1. Align steering lock hole in steering column tube with mating portion of steering lock.
2. Install screws and self-shear type screws and then cut off self-shear type screw heads.

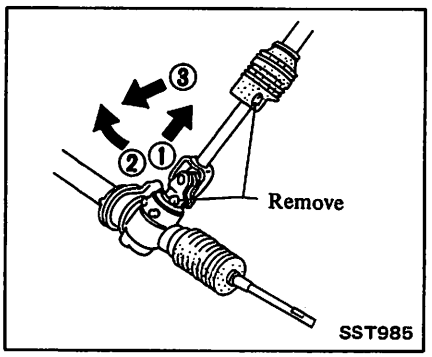


STEERING LOWER JOINT

REMOVAL

Remove steering lower joint.

If necessary, remove hole cover.

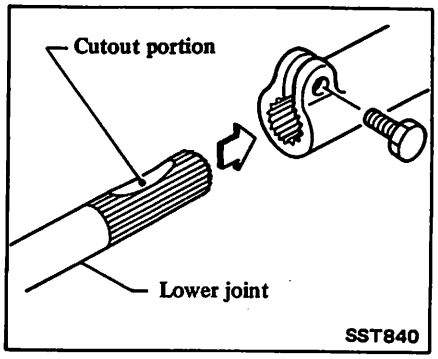


INSTALLATION

1. Set wheels in the straight ahead position.

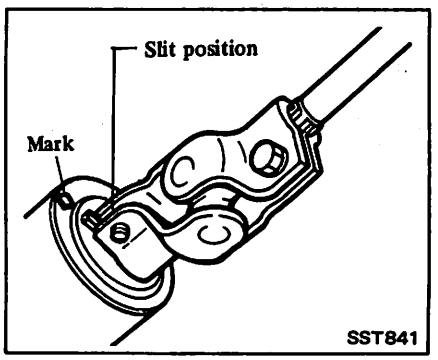
2. Fit steering lower joint into steering column.

- **Apply grease to portion where lower joint and hole cover make contact.**
- **When fitting, be sure tightening bolt faces cutout portion perfectly.**



3. Fit steering lower joint into steering gear.

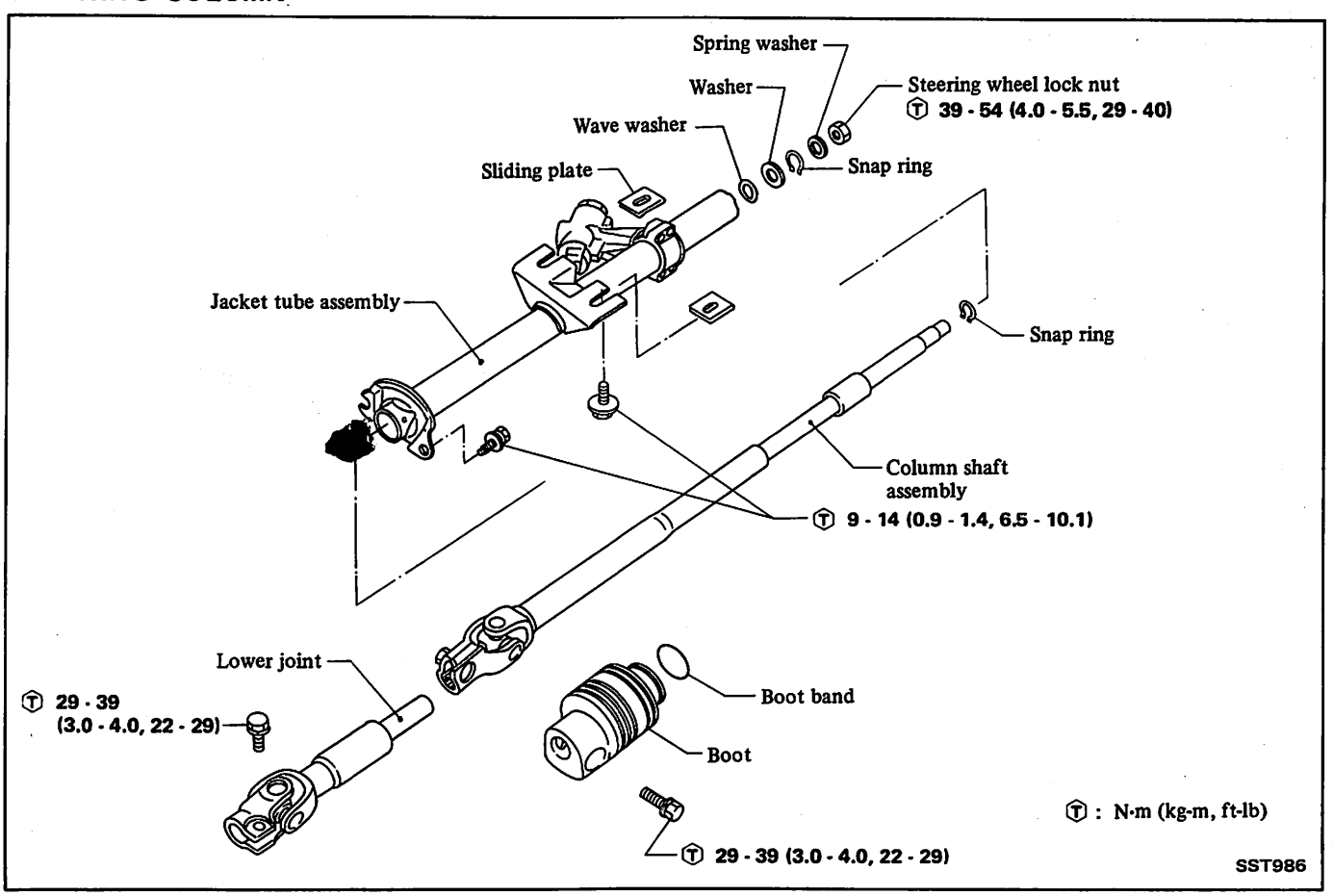
Ensure that slit position of steering lower joint is aligned with steering gear cap or spacer mark.



4. Install steering lower joint bolts.

Ⓣ : **Lower joint to column**
29 - 39 N·m
(3.0 - 4.0 kg-m,
22 - 29 ft-lb)
Lower joint to gear
29 - 39 N·m
(3.0 - 4.0 kg-m,
22 - 29 ft-lb)

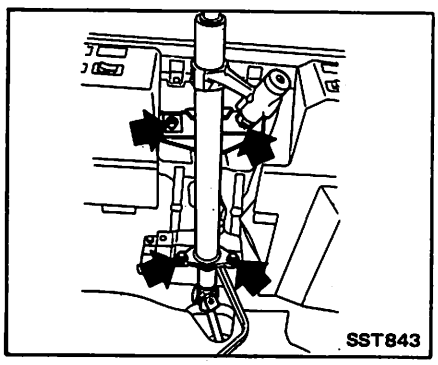
STEERING COLUMN



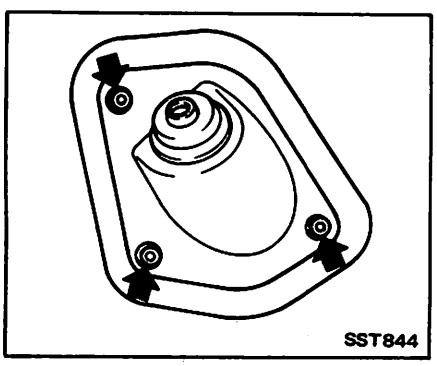
REMOVAL

1. Remove steering wheel. Refer to Steering Wheel for removal.
2. Remove steering lower joint. Refer to Steering Lower Joint for removal.
3. Remove steering column shell cover.
4. Remove combination switch assembly.
5. Remove heater ducts.
6. Draw out steering column assembly.

Be careful not to lose sliding plate.



7. Remove hole cover.



INSTALLATION

Install in the reverse order of removal.

- **Properly position sliding plate on steering column.**
- **Loosely tighten all lower bracket and clamp retaining bolts; then retighten them securely.**
- **After installing, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight-forward position to left and right locks are equal.**

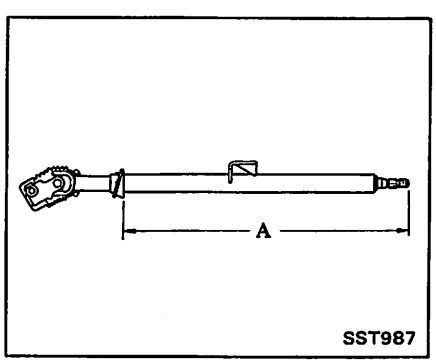
CAUTION
Make sure that undue stress is not applied to steering column.

Ⓣ : Lower bracket to pedal bracket
9 - 14 N·m
(0.9 - 1.4 kg-m,
6.5 - 10.1 ft-lb)
Steering column clamp
9 - 14 N·m
(0.9 - 1.4 kg-m,
6.5 - 10.1 ft-lb)

INSPECTION

1. When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace faulty parts.
(1) Check column bearings for damage or unevenness. If so, lubricate with recommended multi-purpose grease or replace with a new one as steering column assembly
(2) Check jacket tube for deformation or breakage, and replace if necessary.
2. When the vehicle comes into light collision, check dimension "A". If they are not within specifications, replace steering column as an assembly.

Column length "A":
481.3 - 484.3 mm
(18.95 - 19.07 in)

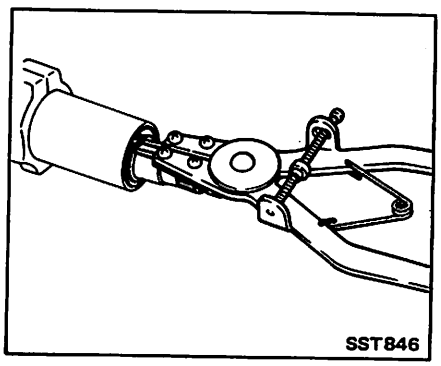


DISASSEMBLY AND ASSEMBLY

While disassembling and assembling, unlock steering lock with a key.

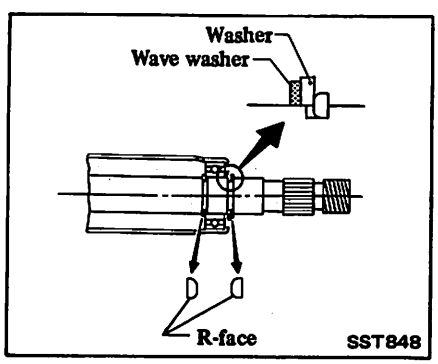
1. Remove snap ring, and then separate each part.

Do not reuse snap ring once it has been removed.

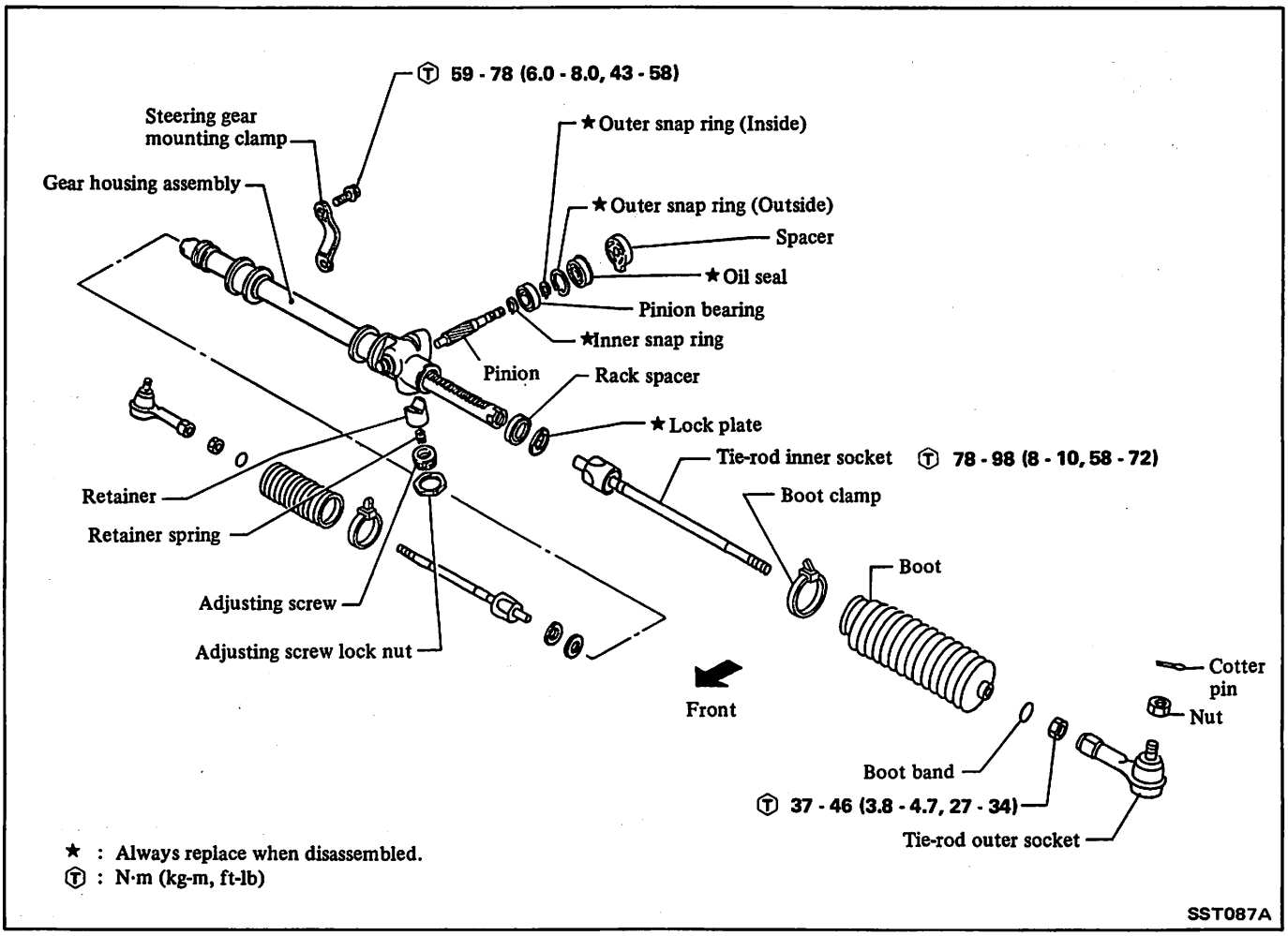


2. Assemble steering column, observing the following instructions.

a. **Apply grease to portion between steering column joint and joint cover.**
b. **Apply a coat of grease to column bearing and lower bushing.**
c. **Make sure that undue stress is not applied to column shaft in axial direction.**
d. **Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.**

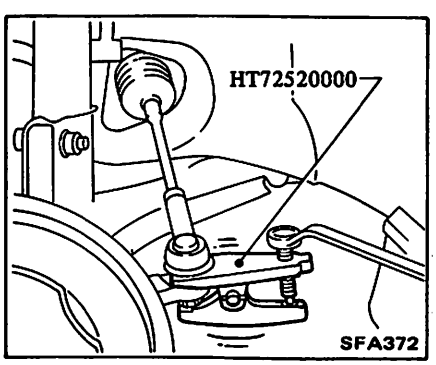


MANUAL STEERING GEAR (Model: R25S) AND LINKAGE

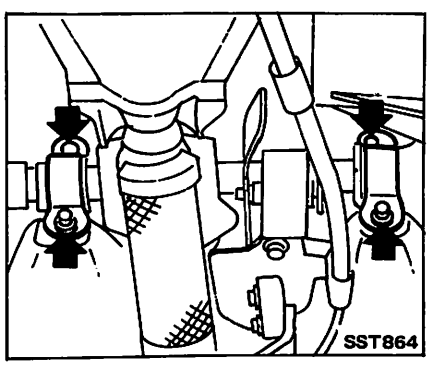


REMOVAL

1. Jack up front of vehicle and support it with safety stand.
2. Remove tie-rod from steering knuckle using Tool.



3. Loosen steering gear mounting bolts in advance to facilitate removal of lower joint.



4. Remove lower joint.

Refer to Steering Lower Joint for removal.

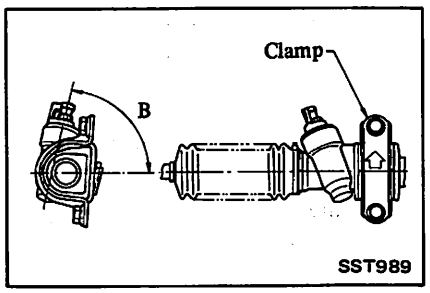
5. Remove bolts securing steering gear housing to body. Then remove steering gear and linkage assembly from vehicle.

INSTALLATION

Install steering gear and linkage in reverse order of removal.

- **Install both mounting rubber and clamp with arrow marks pointing upward.**

"B" angle: 76.5°

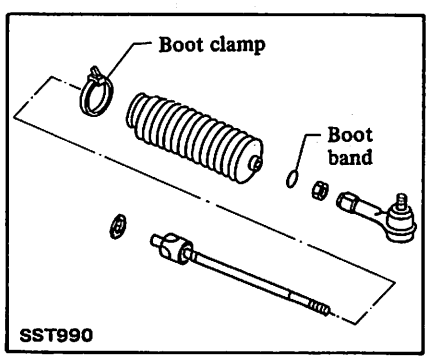


Ⓣ : **Tie-rod to steering knuckle**
29 - 49 N·m
(3.0 - 5.0 kg-m,
22 - 36 ft-lb)
Gear housing clamp bolt
59 - 78 N·m
(6.0 - 8.0 kg-m,
43 - 58 ft-lb)
Lower joint to pinion gear
29 - 39 N·m
(3.0 - 4.0 kg-m,
22 - 29 ft-lb)
Lower joint to steering column
29 - 39 N·m
(3.0 - 4.0 kg-m,
22 - 29 ft-lb)

Check wheel alignment, and if necessary adjust.
Refer to Section MA.

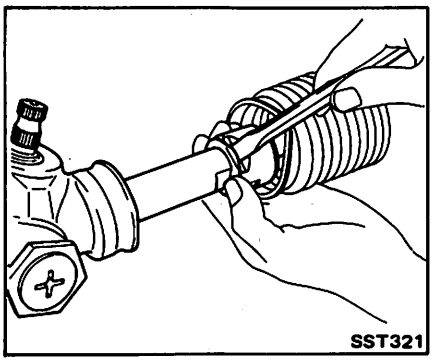
DISASSEMBLY

1. Clamp steering gear and linkage assembly in a vise using patches on steering gear housing to prevent scarring.
2. Remove boot clamps. (Both left and right)



3. Flatten lock plates.

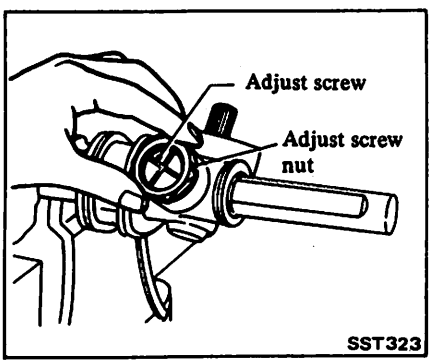
Always replace lock plate when disassembled.



4. Disconnect tie-rod inner socket. And remove tie rod assembly from rack.

CAUTION:
Do not disassemble inner socket assembly and outer socket assembly.

5. Loosen adjust screw lock nut and remove adjust screw.
Then take retainer spring and retainer out.



6. Remove oil seal from gear housing and **discard seal.**
7. Pry off snap ring from gear housing.

Discard snap ring once it has been removed.

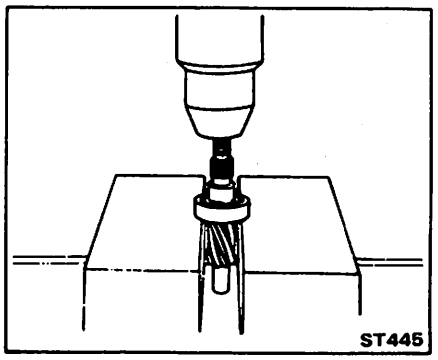
8. Draw pinion assembly out.
9. Draw rack out from gear housing.

Pinion gear

1. Pry off snap rings securing pinion bearing from the side of bearing.

Discard snap rings once they have been removed.

2. Press out bearing from pinion shaft.



INSPECTION

Thoroughly clean all parts in cleaning solvent, and blow dry with compressed air, if available.

Rack

Thoroughly examine rack gear. If rack gear is damaged, cracked or worn, replace.

Pinion

Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace.

Tie-rod outer ball joint

Ball joint is assembled at factory and cannot be disassembled.
1. Check ball joint for play. If ball stud is worn and play in axial direction is excessive or joint is hard to swing, replace as a complete unit.

Tie-rod outer ball joint:
Swinging torque
0.3 - 2.9 N·m
(3 - 30 kg-cm,
2.6 - 26.0 in-lb)

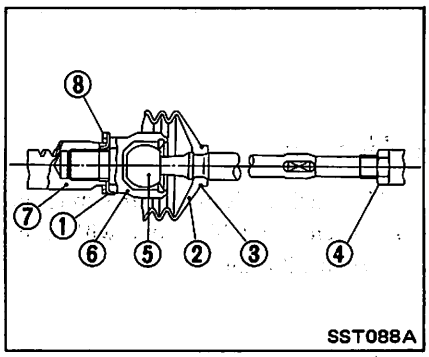
2. Check condition of dust cover. If it is cracked excessively, replace ball joint.

Tie-rod inner ball joint

Ball joint is assembled at factory and cannot be disassembled.

1. Check ball joint for play. If ball stud is worn and play in axial direction is excessive or joint is hard to swing, replace as a complete unit.

Tie rod inner ball joint:
Swinging torque
0.5 - 7.4 N·m
(5 - 75 kg-cm,
4.3 - 65.1 in-lb)
Axial play
0 mm (0 in)



1 Lock plate
2 Boot
3 Boot band
4 Lock nut
5 Inner ball joint
6 Inner socket
7 Rack
8 Rack spacer

2. Check condition of boot. If it is cracked excessively, replace boot.

Pinion bearing

Inspect bearings to see that they roll freely and are free from cracked, pitted, or worn balls, rollers and races. Replace if necessary.

Oil seal

Always replace oil seal at each disassembly.

ASSEMBLY AND ADJUSTMENT

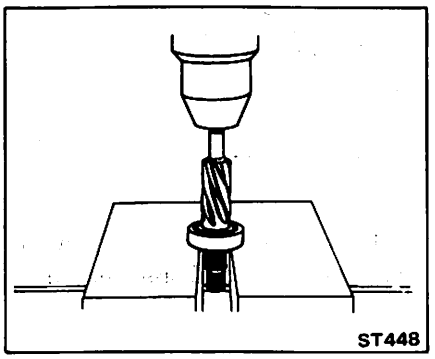
Assemble steering gear in reverse order of disassembly. Observe following instructions.

Rack and pinion

1. Install inside snap ring Ⓐ onto pinion gear.

Inside snap ring thickness:
1.19 - 1.24 mm
(0.0469 - 0.0488 in)

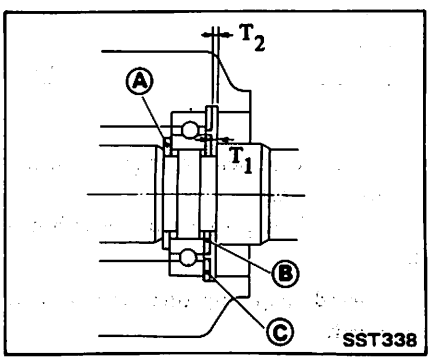
2. Press bearing onto pinion gear.



3. Install snap ring Ⓑ onto pinion gear.

Snap rings Ⓑ and Ⓒ should be of such thickness that axial play T_1 and T_2 is less than 0.1 mm (0.004 in).
To ensure proper axial play, select snap ring of proper thickness.

- **Pinion bearing outside snap ring: Refer to S.D.S.**
- **Snap rings should be fitted to grooves correctly.**

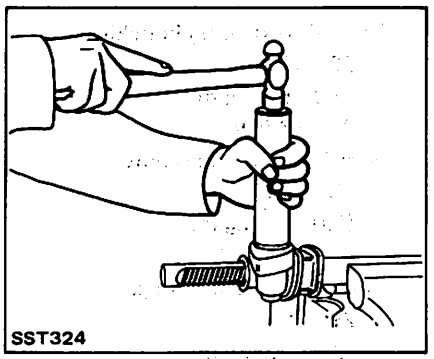


4. Clamp steering gear housing in a vise.

5. Sparingly apply recommended multi-purpose grease to toothed faces and friction surfaces of rack.
6. Insert rack gear from gear housing side.

- **Pay attention to direction of rack teeth.**

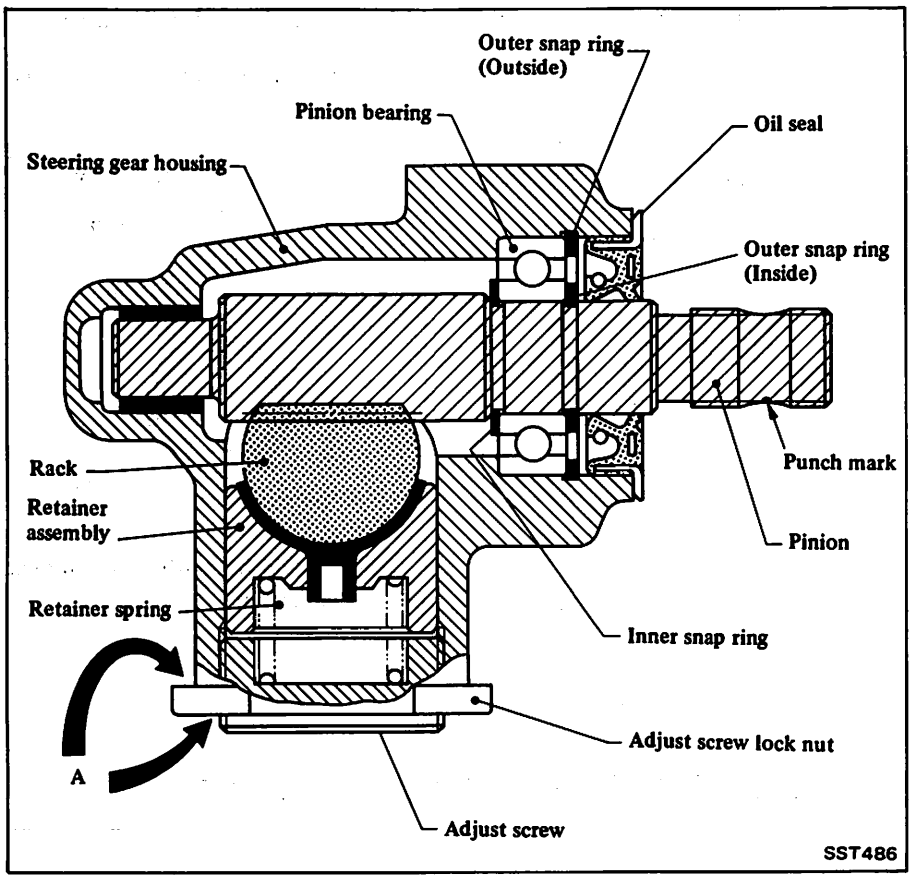
7. Properly mesh pinion with rack and insert pinion assembly into groove.
8. Make sure that rack protrudes by the same amount from both ends of housing.
9. Secure pinion bearing to gear housing with snap ring.
10. Fit new oil seal.



Pack sealing lips with multi-purpose grease.

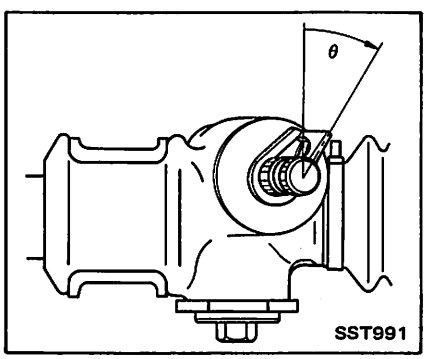
11. Make sure that pinion assembly rotates smoothly.
12. Apply an adequate amount of recommended multi-purpose grease to steering gear retainer.
13. Insert retainer and retainer spring into housing. Turn retainer adjust screw in, and install adjust screw lock nut.
14. Fully tighten adjust screw at 2.9 N·m (30 kg-cm, 26 in-lb) and then back it off 10° to 15° degrees.
15. Apply suitable liquid sealant around lock nut at "A" and tighten lock nut.

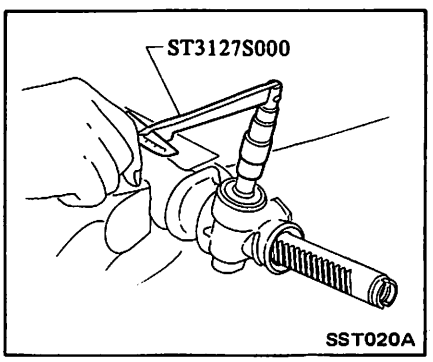
Ⓣ : 39 - 59 N·m
(4 - 6 kg-m,
29 - 43 ft-lb)



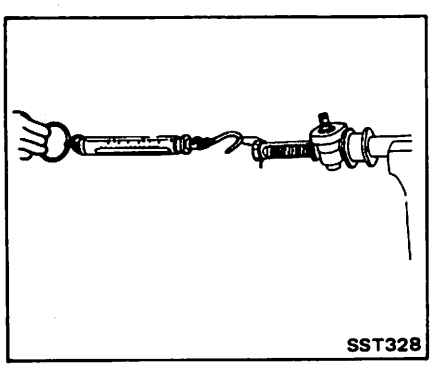
16. Set spacer at neutral position.

Spacer set angle "θ":
–38.3° - –25.3°





Rack starting force:
98 - 137 N
(10 - 14 kg, 22 - 31 lb)
in neutral position



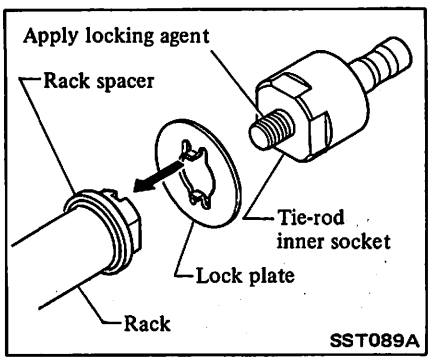
17. Upon completion of gear assembly, measure pinion rotating torque and rack starting force. Readjust retainer adjust screw as necessary.

Pinion rotating torque:
Less than 1.5 N·m
(15 kg-cm, 13 in-lb)

Tie-rod and boot

1. Fit boot and boot band on tie rod inner socket.
2. Fit rack spacer to rack end (CD engine equipped model only).
3. Fit tie-rod inner socket to rack end together with new lock plate.

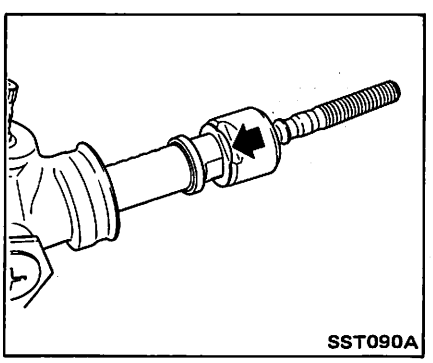
Be sure lock plate ratchet enters groove at end portion of rack.



4. After tightening tie-rod inner socket to specified torque, securely bend lock plate at 2 cutout portions of tie rod inner socket.

To prevent damage to boot, remove burrs after bending lock plate.

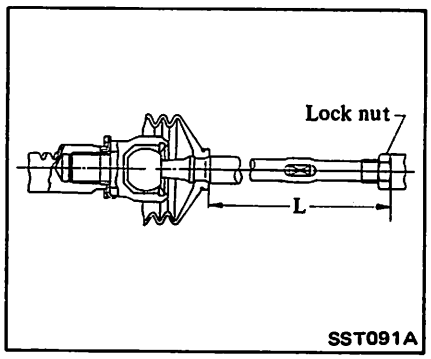
Ⓣ : 78 - 98 N·m
(8 - 10 kg-m,
58 - 72 ft-lb)



5. Fit lock nut and outer socket to inner socket, and tighten lock nut with tie rod length that has been set to the length specified.

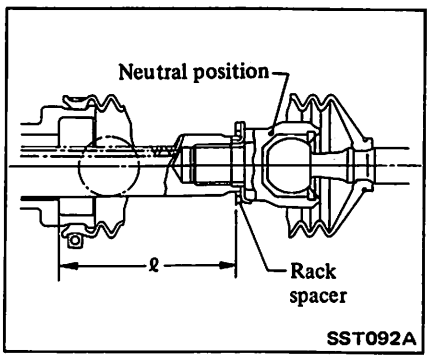
Ⓣ : 37 - 46 N·m
(3.8 - 4.7 kg-m,
27 - 34 ft-lb)

Tie-rod length "L":
175.9 mm (6.93 in)



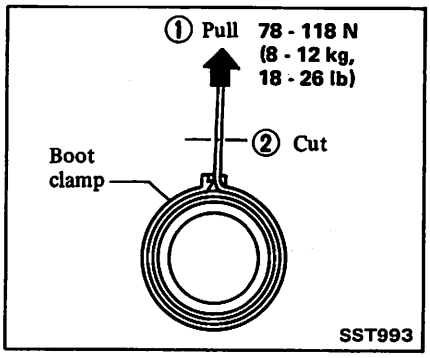
6. Measure rack stroke.

Rack stroke "ℓ" (both sides):
E engine equipped model (Without rack spacer)
73.5 mm (2.894 in)
CD engine and manual transaxle equipped model (With rack spacer)
70.0 mm (2.756 in)
CD engine and automatic transaxle equipped model (With rack spacer)
65.5 mm (2.579 in)



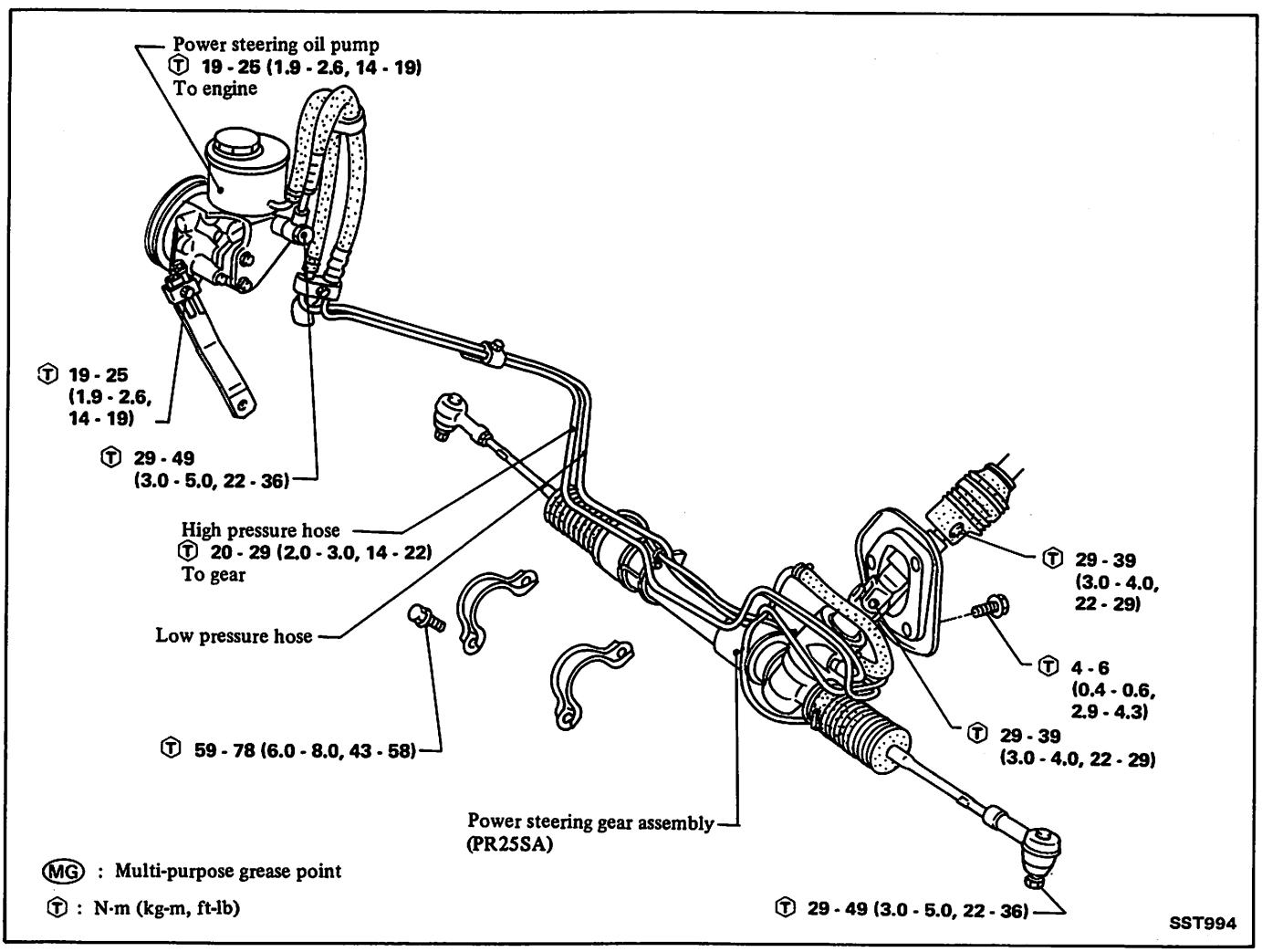
7. Install boot to gear housing, then tighten inside boot clamp securely.

Apply sealant between boot and gear housing.



Boot should be neither too inflated nor too elongated.

POWER STEERING SYSTEM (Model: PR25SA)



DESCRIPTION

POWER STEERING SYSTEM

The major components are as follows:

- Power steering pump
- Power steering gear and linkage
- Hydraulic piping

POWER STEERING GEAR AND OIL PUMP

The integral power steering gear and oil pump are an accurate hydraulic pressure mechanism.

Only the sealing parts can be replaced. The remaining parts must be replaced as an assembly.

CAUTION:

a. The parts which can be disassembled are strictly limited, and never disassemble other parts than the specified ones.
b. Disassembly should be performed in a place as clean as possible.
c. Hands should be cleaned before disassembly.
d. Do not use a rag. Be sure to use nylon or paper cloth.
e. Be sure to follow procedures and cautions indicated in the Service Manual.

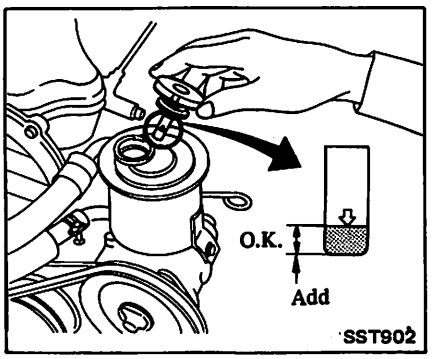
POWER STEERING SYSTEM

INSPECTION

Fluid level

1. Check the fluid level in reservoir by observing the dipstick when the fluid is cold. Add fluid as necessary to bring the level into the proper range on dipstick.

CAUTION:
Do not overfill.



2. Check fluid level and leakage.

Recommended fluid is Automatic Transmission Fluid "Dexron Type".

Refer to Section MA for "Recommended Lubricant".

Fluid capacity (With pump, each hose and steering gear assembly):

Approximately 0.9 ℓ
(1 US qt, 3/4 Imp qt)

Pump belt adjustment

Refer to Checking and Adjusting Drive Belts (Section MA) for drive belt tension.

Check fluid leakage

1. Run engine at idle speed or 1,000 rpm.

Make sure temperature of fluid in pump rises to 60 to 80°C (140 to 176°F).

2. Turn steering wheel to right-to-left several times.
3. Hold steering wheel at each "lock" position for five seconds and carefully check the following points for fluid leakage.

- Pinion housing
- Rear housing and rear cover
- Rack end (Both sides)
- Cylinder
- Pulley
- Suction pipe
- Connector
- Rear cover
- If fluid leakage at connectors is noticed, once loosen flare nut and then retighten.

CAUTION:
Do not hold steering wheel at lock position for more than fifteen seconds at a time.

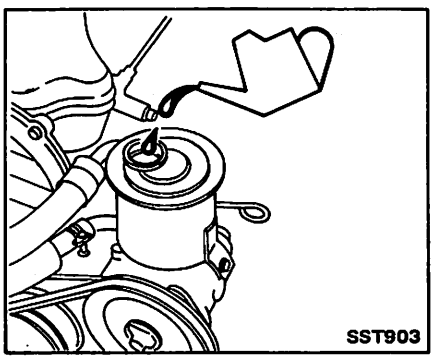
Hydraulic system check

To determine whether problem is in steering gear or power steering pump, measure operating pressure.

Before conducting hydraulic system test, carefully check belt tension and condition of driving pulley.

Tires must be inflated to normal pressure.

1. Check fluid level and fluid leakage, **adding fluid if necessary.**

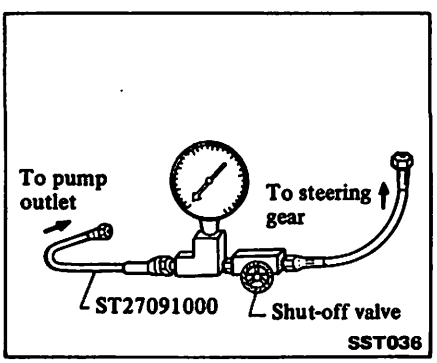


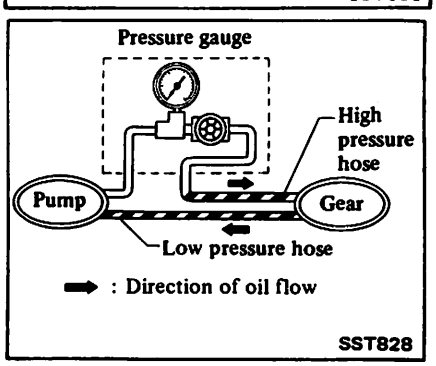
2. Run engine.

Make sure temperature of fluid in pump rises to 60 to 80°C (140 to 176°F).

3. Stop engine.
4. Set **Tool.** And bleed air.

- **Gauge must be between shut-off valve and power steering pump.**
- **Use pressure Gauge Adapter KV48102500 when installing Pressure Gauge ST27091000.**





5. Open shut-off valve.
6. Check fluid level, **adding fluid if necessary.**
7. Run engine at idle **for 3 to 5 seconds.**
8. Stop engine and check fluid level, **adding fluid if necessary.**
9. Run engine and **check fluid level again, adding fluid if necessary.**
10. Turn steering wheel fully in left or right until fluid reaches operating temperature.

- **Be sure that all connections are tight.**
- **Expel any air from system.**

11. Check pressure **with steering wheel fully turned in left and right.**

CAUTION:
Do not hold steering wheel at lock position for more than fifteen seconds, as this would abnormally increase fluid temperature and cause undue gear and pump wear.

Pressure should be as follows:

Normal pressure:
5,198 - 5,786 kPa
(53 - 59 kg/cm^2,
754 - 839 psi) at idling

12. If oil pressure is abnormal, slowly close shut-off valve and check oil pressure to determine which part is faulty, as follows:

Pressure	Faulty part
Normal	Gear
Abnormal	Pump

CAUTION:
Do not close shut-off valve for more than fifteen seconds, as this would abnormally increase lubricant temperature and cause undue pump wear.

13. Replace any part that is faulty.

CAUTION:
The power steering system consists primarily of an accurate hydraulic pressure unit.
Any abnormality in one of this unit's parts will cause the other part(s) to malfunction, or the oil to deteriorate. Whenever faulty parts must be replaced, oil should be discarded and all other parts should be cleaned.

14. Open shut-off valve, pour fresh oil into and bleed air from power steering system, as outlined in the "Bleeding Hydraulic System" section.
15. **Repeat steps 10 through 14** above until oil pressure is normal.

After checking hydraulic system, remove Tool and add fluid as necessary, then completely bleed air out of system.

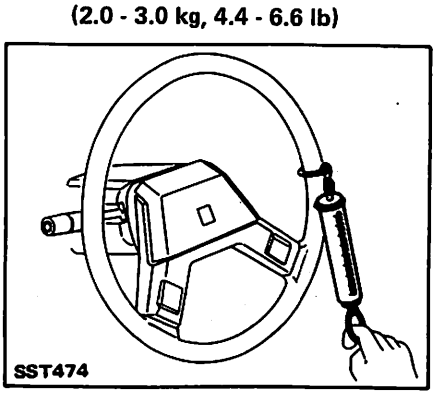
Steering wheel turning force check

1. Park vehicle on a level, dry surface and set parking brake firmly.
2. Bring power steering fluid up to adequate operating temperature. **[Approximately 60 to 80°C (140 to 176°F)].**

- **Fluid temperature can be warmed up more easily by idling engine and at the same time turning steering wheel from left to right for about two minutes. Alternatively, drive vehicle several miles.**
- **Tires must be inflated to normal pressure.**

3. Check steering wheel turning force when steering wheel has been turned 360° from straight-ahead position.

Steering wheel turning force:
19.6 - 29.4 N
(2.0 - 3.0 kg, 4.4 - 6.6 lb)



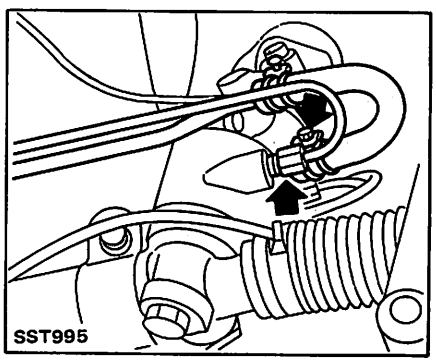
REMOVAL

Power steerling gear and linkage

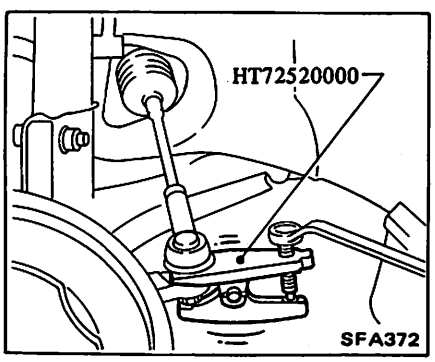
CAUTION
- **Whenever disconnecting hydraulic lines, cover openings to prevent foreign matter from entering.**
- **When installing or carrying power steering gear, be sure to hold gear, and not tube. When tube is held, it may be deformed or fluid will leak out from connector.**

1. Jack up front of vehicle and support it with safety stand.
2. Disconnect hose clamp.
3. Disconnect flare nut and hose at steering gear and drain fluid.

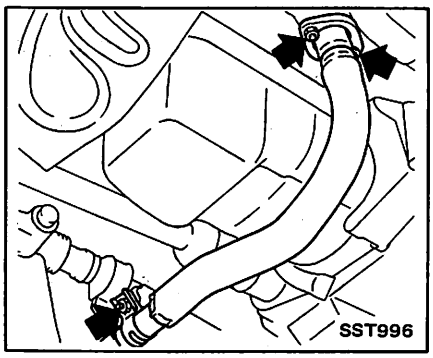
Be careful not to damage flare nut.



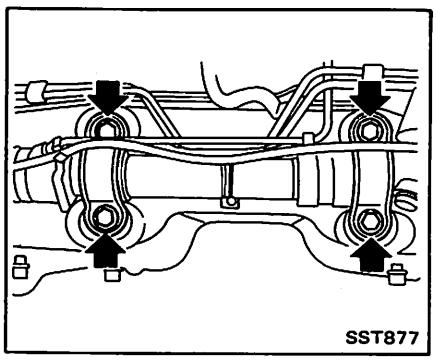
4. Remove cotter pins and nuts fastening tie-rod ball studs, and detach tie-rod ball studs from knuckle arms with Tool.



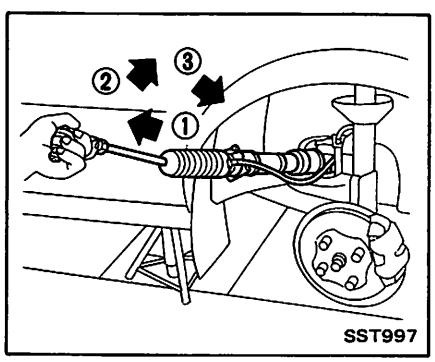
5. Support transaxle with a jack.
6. Remove exhaust tube.



7. Remove rear engine mounting.
8. Remove steering gear mounting bolts.



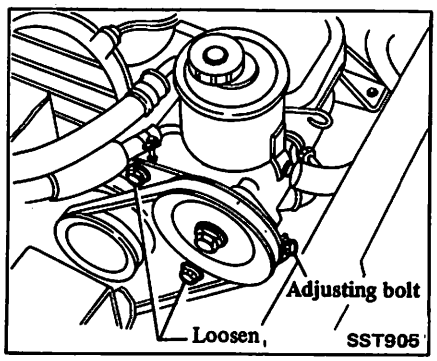
9. Remove steering lower joint.
Refer to Steering Lower Joint for removal.
10. Remove steering gear and linkage from vehicle.



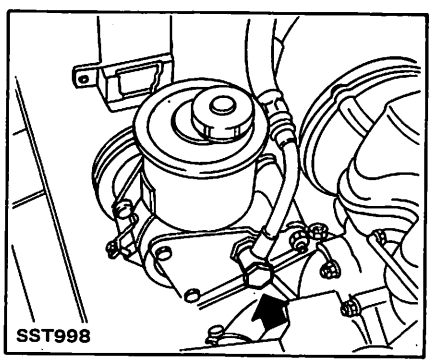
Oil pump and hoses

CAUTION:
Whenever disconnecting hydraulic lines, cover openings to prevent foreign matter from entering.

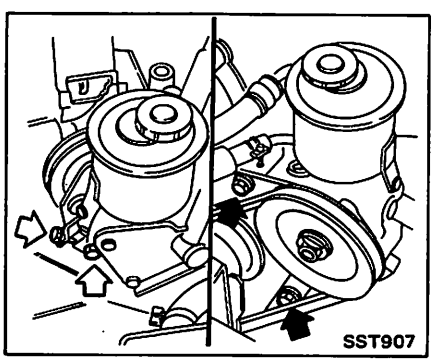
1. Loosen power steering pump adjusting bolt lock bolt.
2. Turn adjusting bolt counterclockwise to loosen pump belt.



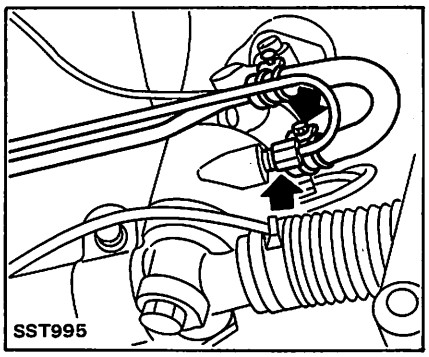
3. Remove power steering pump belt.
4. Disconnect pressure hose at power steering pump, and drain fluid. Then remove return hose clamp.



5. Remove power steering pump assembly.



6. Disconnect hoses on steering gear side.



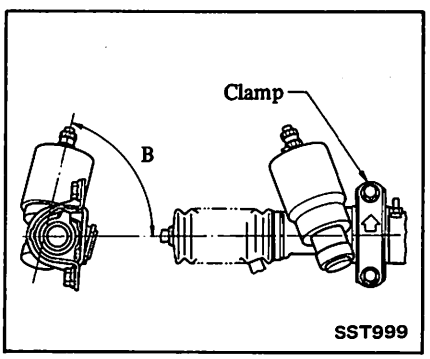
7. Disconnect hose clamp bolts and remove hoses from vehicle.

INSTALLATION AND ADJUSTMENT

Power steering gear and linkage

Install steering gear and linkage in the reverse order of removal.

- Install both mounting rubber and clamp with arrow marks pointing upward.



"B" angle: 70.7°

Ⓣ : Tie-rod to knuckle
29 - 49 N·m
(3.0 - 5.0 kg-m,
22 - 36 ft-lb)
Gear housing clamp bolt
59 - 78 N·m
(6.0 - 8.0 kg-m,
43 - 58 ft-lb)
High pressure hose to gear
20 - 29 N·m
(2.0 - 3.0 kg-m,
14 - 22 ft-lb)

Check wheel alignment, and if necessary adjust.

Refer to Section MA.

After installation is completed, fill fluid and bleed system.

Oil pump and hoses

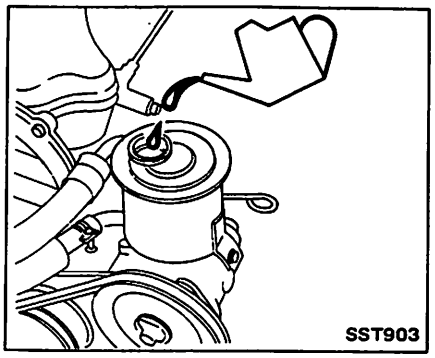
Install oil pump and hoses in the reverse order of removal.

Ⓣ : **High pressure hose to pump**
29 - 49 N·m
(3 - 5 kg-m,
22 - 36 ft-lb)
High pressure hose to gear
20 - 29 N·m
(2.0 - 3.0 kg-m,
14 - 22 ft-lb)
Pump mounting bolt
19 - 25 N·m
(1.9 - 2.6 kg-m,
14 - 19 ft-lb)

After installation is completed, fill fluid and bleed system.

Bleeding hydraulic system

1. Raise front end of car until wheels clear ground.
2. Quickly turn steering wheel **all the way to right and left ten times and lightly touch wheel stoppers.**
3. Check fluid level, **adding fluid if necessary.**
4. Run engine. **Make sure temperature of fluid in pump rises to 60 to 80°C (140 to 176°F) with a temperature indicator.**
5. Stop engine, **adding fluid if necessary.**


SST903

6. Run engine for 3 to 5 seconds.
7. Stop engine, **adding fluid if necessary.**
8. Quickly turn steering wheel **all the way to right and left ten times and lightly touch wheel stoppers.**
9. Check fluid level, **adding fluid if necessary.**
10. Start engine at idle.

Repeat steps 6 through 10 until air will be bled from pump.

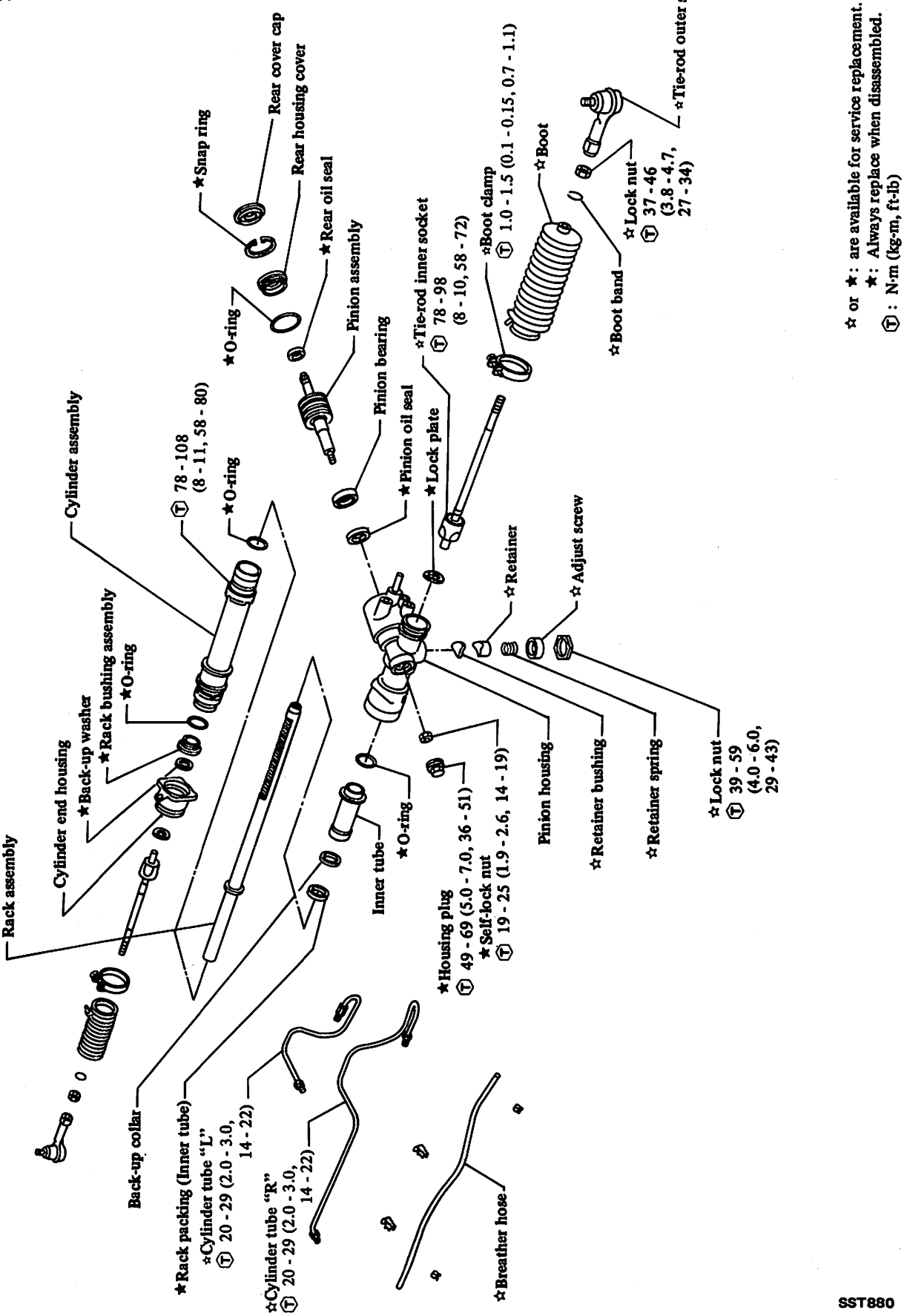
11. If air cannot be bled completely in steps 1 through 10, proceed as follows:

Turn steering wheel to right and left from lock to lock five to ten times. Carefully check fluid leakage with steering wheel held at each lock position for five seconds.

CAUTION:
Do not hold steering wheel at lock position for more than fifteen seconds at a time.

POWER STEERING GEAR AND LINKAGE

DISASSEMBLY



☆ or ★: are available for service replacement.
★: Always replace when disassembled.
Ⓣ: N·m (kg-m, ft-lb)

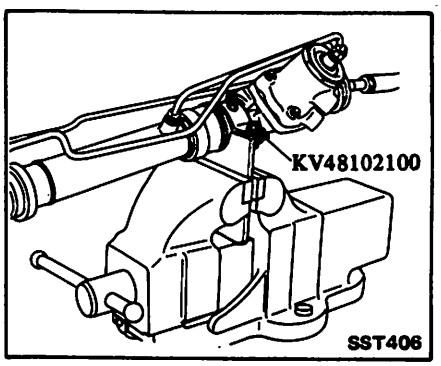
SST880

CAUTION:
When disassembling and reassembling, do not allow any foreign matter to enter or contact any parts of steering gear.

Measuring pinion rotating torque and rack starting force

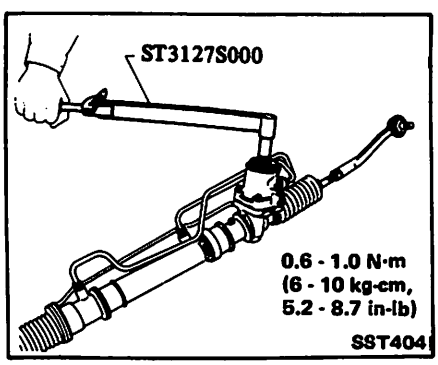
Prior to disassembling, measure pinion rotating torque and rack starting force. If they are not within specifications, adjust retainer adjust screw. **If adjustments cannot be made properly, replace steering gear assembly.**

Install steering gear on Tool KV48102100 in a vice.



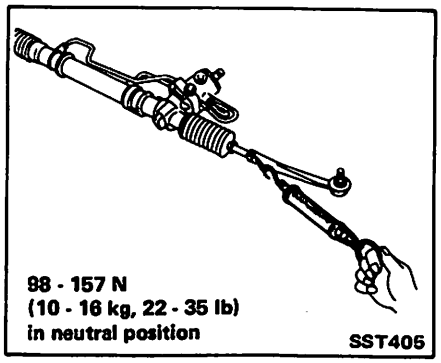
Before measuring, be sure to disconnect cylinder tube and drain fluid.

a. Pinion rotating torque



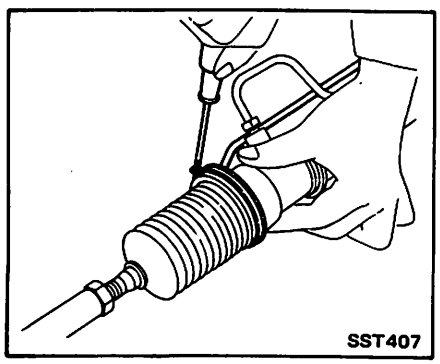
- **Pinion assembly can be turned by wrapping vinyl tape around serration area of stub shaft and fitting socket wrench.**

b. Rack starting force



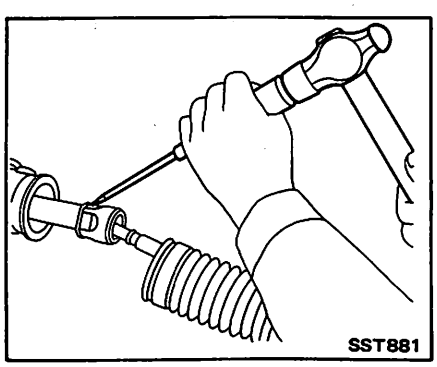
Tie-rod and breather hose

1. Install steering gear on Tool KV48102100 in a vice.
2. Remove boot clamp and then remove breather hose. (Both left and right)



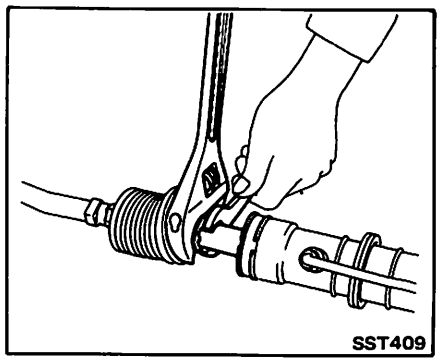
3. Flatten lock plate.

Always replace lock plate when disassembled.

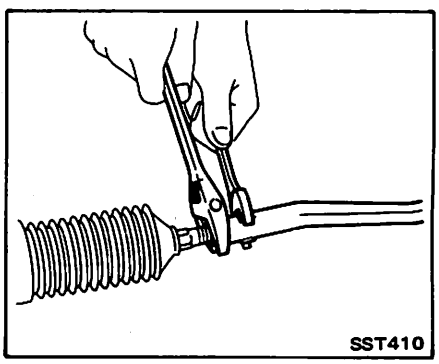


4. Disconnect tie-rod inner socket and remove tie-rod assembly from steering gear assembly.

Use a wrench of approximately 6 mm (0.24 in) in thickness which can be placed in the thickness across flats of rack.



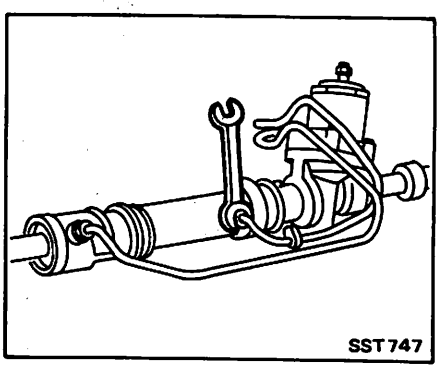
5. Remove tie-rod inner socket from tie-rod outer socket.



CAUTION:
Do not disassemble inner socket assembly and outer socket assembly.

Cylinder tubes

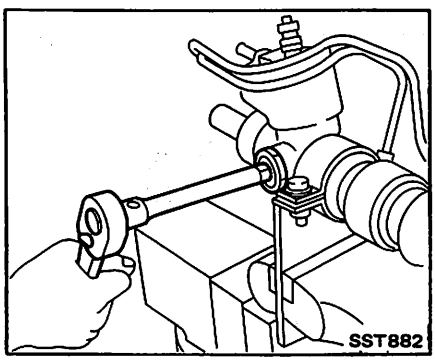
1. Install steering gear on Tool KV48102100 in a vice.
2. On cylinder tube "L", first disconnect flare nut at cylinder side and then the other one at pinion housing side.



3. Remove cylinder tube "R" in the same way.

Retainer

1. Install steering gear on Tool KV48102100 in a vice.
2. Loosen adjust screw lock nut and then remove retainer adjust screw. Take retainer out.

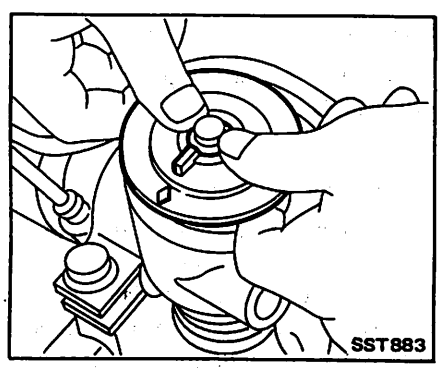


Rear cover oil seal and pinion oil seal

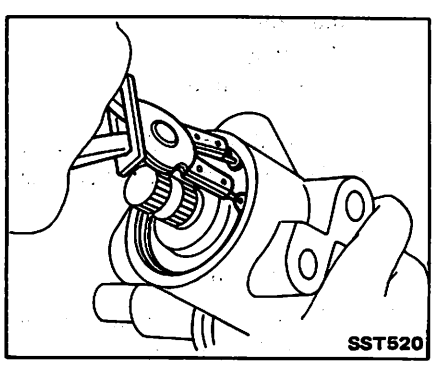
1. Install steering gear on Tool KV48102100 in a vice.
2. Remove retainer.

Refer to Retainer for disassembly.

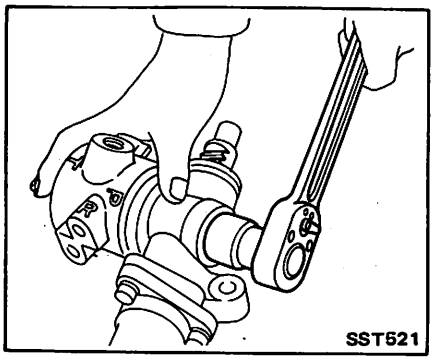
3. Remove rear cover cap.



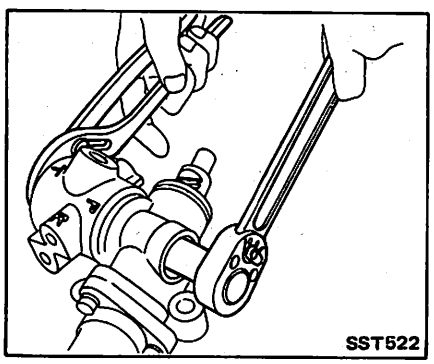
4. Remove snap ring and **discard.**



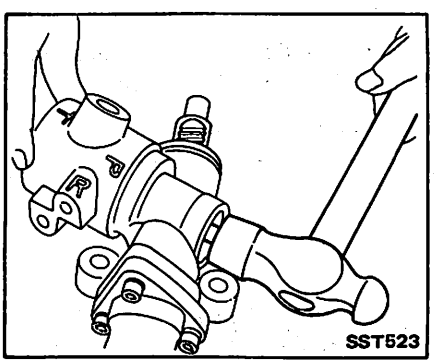
5. Remove housing plug and **discard.**



6. Remove self-locking nut and **discard.**

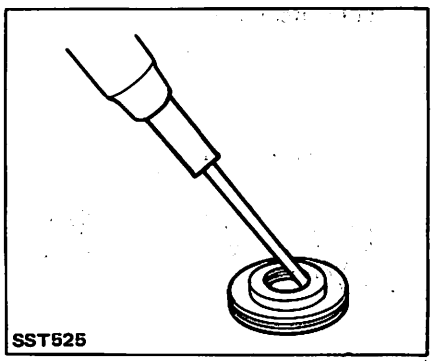


7. Draw pinion assembly out by **lightly** tapping it with a plastic hammer.

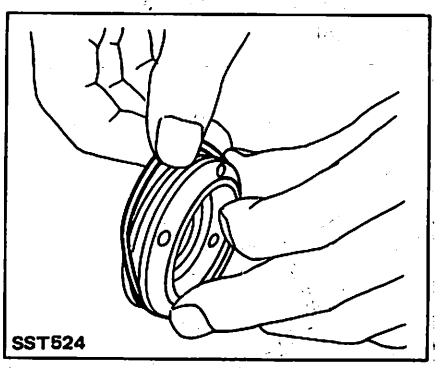


8. Separate rear housing cover from pinion and then remove rear oil seal using suitable tool.

Always replace oil seal when disassembled.

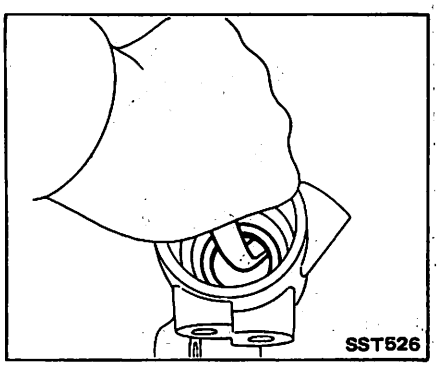


9. Remove O-ring and **discard.**



10. Remove pinion oil seal using suitable tool as necessary.

Always replace oil seal when disassembled.



Rack bush assembly
(Cylinder end housing)

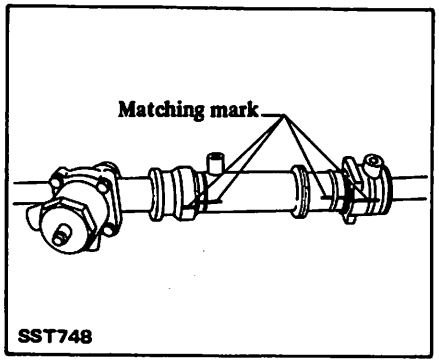
1. Install steering gear on Tool KV48102100 in a vice.
2. Remove tie-rod and breather hose.

Refer to Tie-Rod and Breather Hose for disassembly.

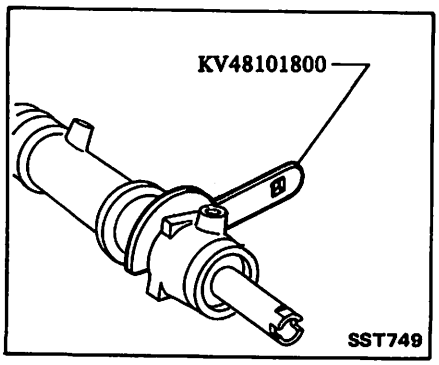
3. Remove cylinder tubes.

Refer to Cylinder Tubes for disassembly.

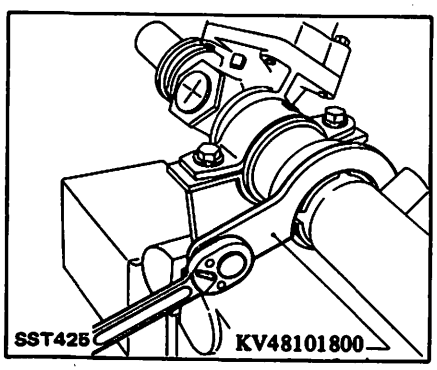
4. Put matching mark.



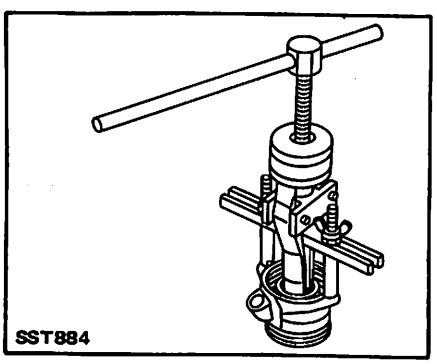
5. Remove cylinder end housing using Tool.



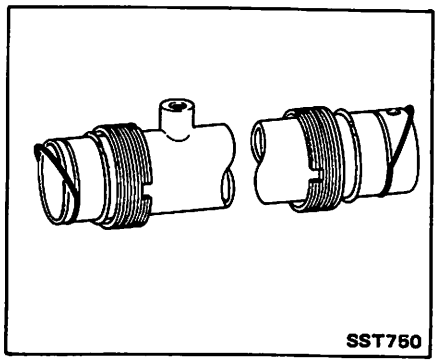
6. Disconnect cylinder lock nut using Tool and separate cylinder from pinion housing.



7. Remove rack bush assembly using suitable tool and **discard it.**



8. Remove cylinder O-rings and **discard.**



Rack packing (Inner tube)

1. Install steering gear on Tool KV48102100 in a vice.
2. Remove tie-rod and breather hose.

Refer to Tie-Rod and Breather Hose for disassembly.

3. Remove cylinder tubes.

Refer to Cylinder Tubes for disassembly.

4. Remove retainer.

Refer to Retainer for disassembly.

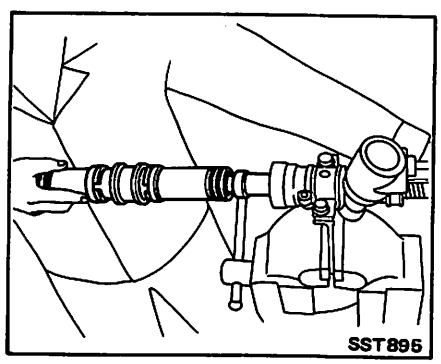
5. Remove cylinder end housing and cylinder assembly.

Refer to Rack Bush Assembly (Cylinder End Housing) for disassembly.

6. Remove pinion assembly.

Refer to Rear Cover Oil Seal and Pinion Oil Seal for disassembly.

7. Draw out rack assembly.

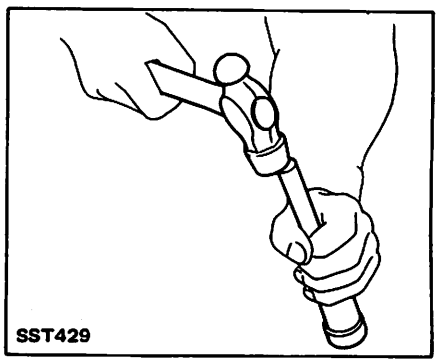


8. Remove inner tube assembly.
9. Remove O-ring from pinion housing.

Always replace O-ring when disassembled.

10. Remove rack packing and back-up collar using suitable tool.

Always replace rack packing when disassembled.



INSPECTION

Thoroughly clean all parts in cleaning solvent or automatic transmission fluid "Dexron Type", and blow dry with compressed air, if available.

Oil seals and O-rings

Always replace oil seals and O-rings when disassembled.

Snap rings

Always replace snap rings when disassembled.

Tie-rod outer ball joint

Ball joint is assembled at factory and cannot be disassembled.

1. Check ball joint for play. If ball stud is worn and play in axial direction is excessive or joint is hard to swing, replace as a complete unit.

Tie-rod outer ball joint:
Swinging torque
0.3 - 2.9 N·m
(3 - 30 kg-cm,
2.6 - 26.0 in-lb)

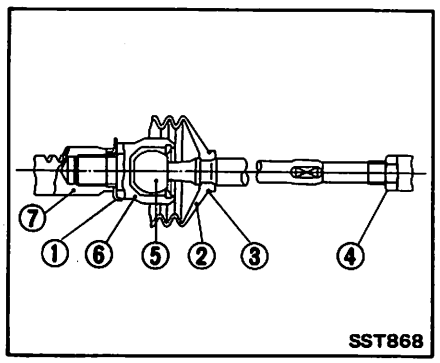
2. Check condition of dust cover. If it is cracked excessively, replace ball joint.

Tie-rod inner ball joint

Ball joint is assembled at factory and cannot be disassembled.

1. Check ball joint for play. If ball stud is worn and play in axial direction is excessive or joint is hard to swing, replace as a complete unit.

Tie-rod inner ball joint:
Swinging torque
0.5 - 7.4 N·m
(5 - 75 kg-cm,
4.3 - 65.1 in-lb)
Axial play
0 mm (0 in)



1 Lock plate
2 Boot
3 Boot band
4 Lock nut
5 Inner ball joint
6 Inner socket
7 Rack

2. Check condition of boot. If it is cracked excessively, replace boot.

Cylinder tubes and breather hose

Check cylinder tubes and breather hose for scratches or other damage. Replace if necessary.

Steering gear component parts

Thoroughly examine those component parts. If those parts are damaged, cracked or worn, replace as steering gear assembly.

ASSEMBLY AND ADJUSTMENT

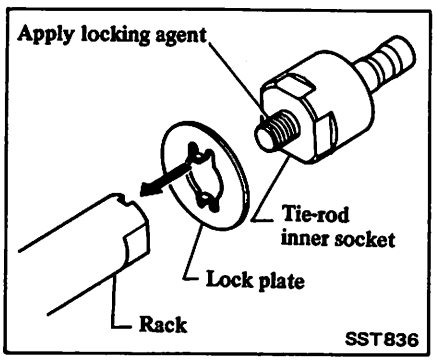
CAUTION:
a. When assembling power steering gear, apply a coat of automatic transmission fluid "Dexiron Type" as necessary.
b. Be careful not to damage or deform O-rings and oil seals when installing them.

Assemble power steering gear and linkage in reverse order of disassembly. Observe the following instructions.

Tie-rod and breather hose

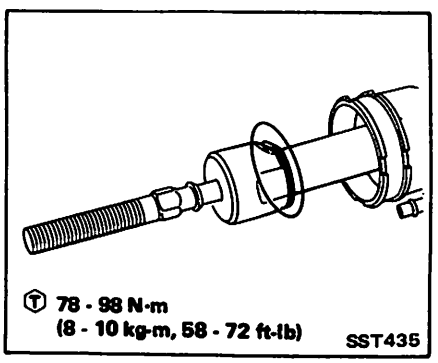
1. Apply locking agent to threaded portion of inner socket and fit inner socket to rack end together with new lock plate.

Be sure lock plate ratchet enters groove at end portion of rack so that rack and inner socket fit snugly.



2. Tighten inner socket and securely bend lock plate at 2 cut-out portions of inner socket.

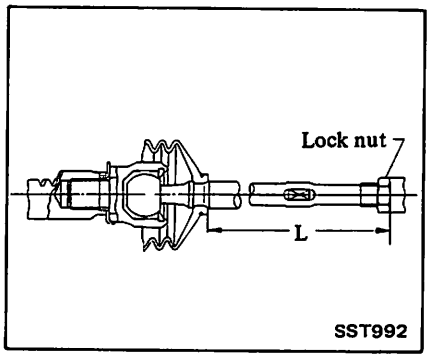
To prevent damage to boot, remove burrs after bending lock plate.



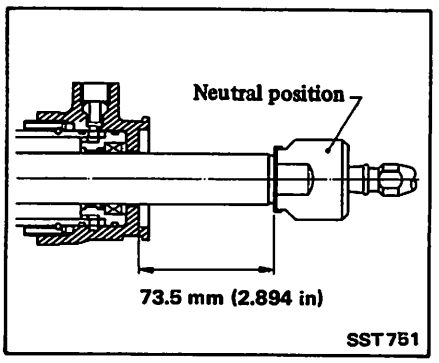
3. Fit lock nut and outer socket to inner socket, and tighten lock nut with the rod length that has been set to the length specified.

T : **37 - 46 N·m**
(3.8 - 4.7 kg-m,
27 - 34 ft-lb)

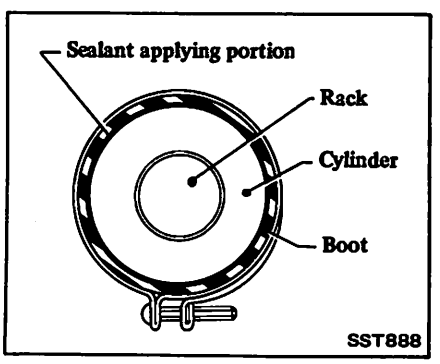
Tie-rod length "L":
175.9 mm (6.93 in)



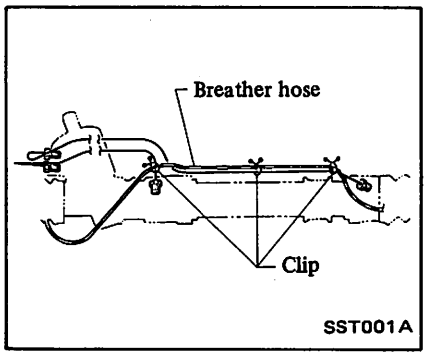
4. Measure rack stroke (both sides).

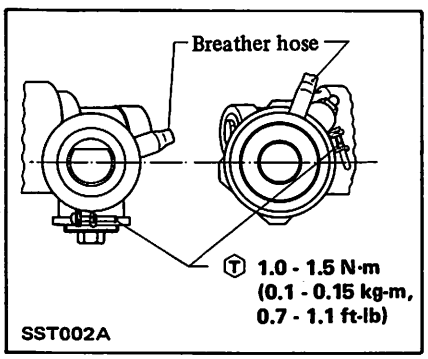


5. Apply a coat of sealant to contact surfaces between boot and cylinder before installing boot.



6. Set breather hose as shown below, and tighten boot clamp.



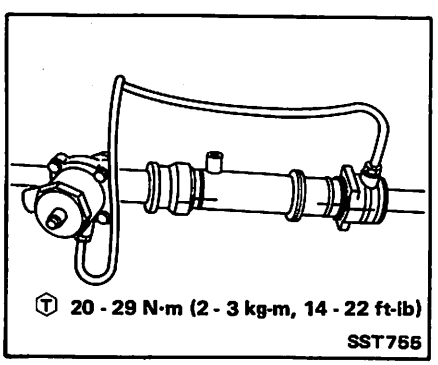


7. Upon completion of assembly, make sure that rack operates smoothly, that boot is not deformed, and that clamp is tightly in place.

Cylinder tubes

1. On cylinder tube "R", temporarily tighten flare nut at pinion housing side and then the other one at cylinder side. Finally tighten these nuts to specified torque.

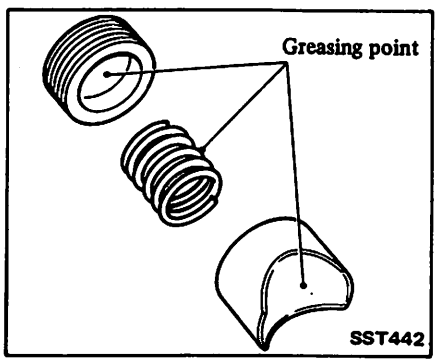
Be careful not to damage flare nut.



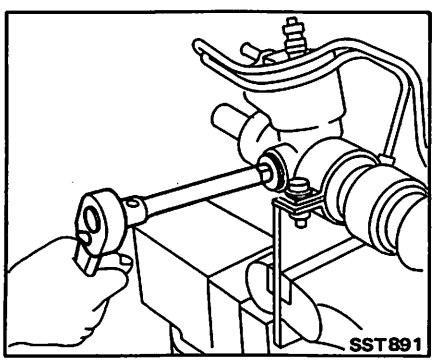
2. Install and tighten flare nuts for cylinder tube "L" in the same way.

Retainer

1. Apply a coat of grease to contact surfaces with rack, and install retainer to pinion housing.



2. Install retainer spring and fully tighten adjust screw at 2.9 N·m (30 kg-cm, 26 in-lb).

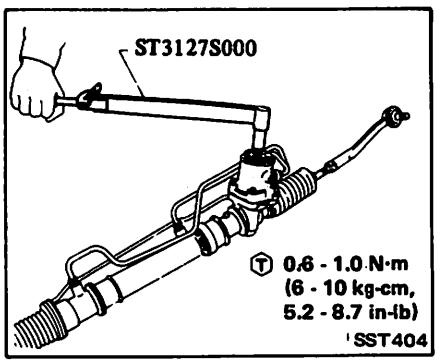


3. Turn back adjust screw 10 to 15° and tighten lock nut.

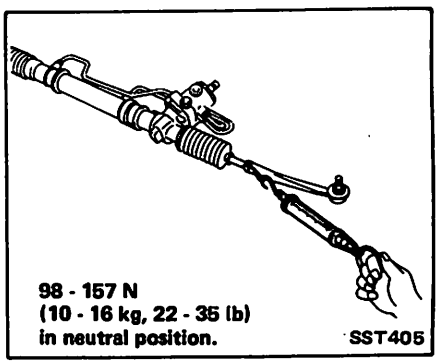
T: 39 - 59 N·m
(4 - 6 kg-m,
29 - 43 ft-lb)

4. Measure pinion rotating torque and rack starting force. If they are not within specifications, readjust.

a. Pinion rotating torque

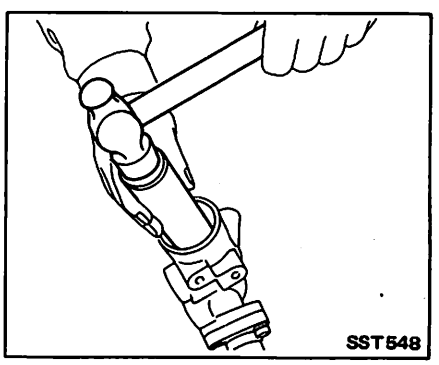


b. Rack starting force

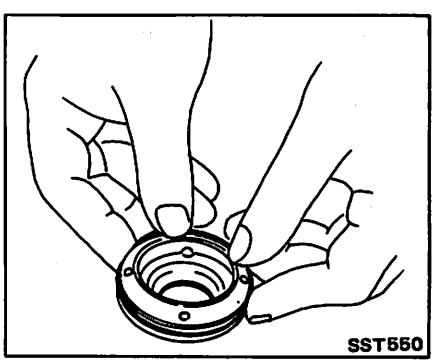


Rear cover oil seal and pinion oil seal

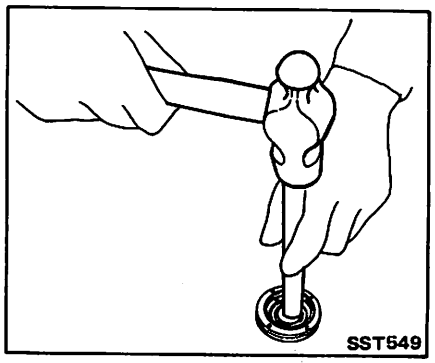
1. Install new pinion oil seal to pinion housing using suitable tool.



2. Apply a coat of automatic transmission fluid to new O-ring prior to installation.

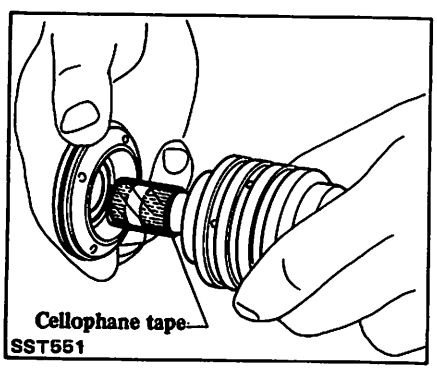


3. Apply a coat of automatic transmisstion fluid to new rear oil seal and install it to rear housing cover using suitable tool.



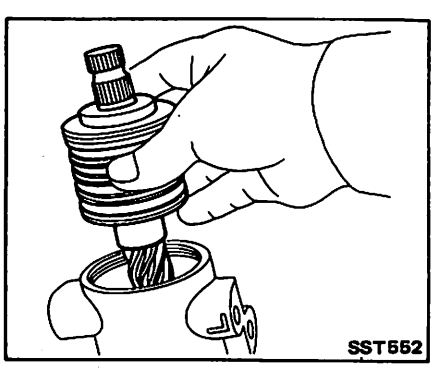
4. Install rear housing cover assembly to pinion.

Wrap cellophane tape around pinion serrations to prevent oil seal from being damaged.

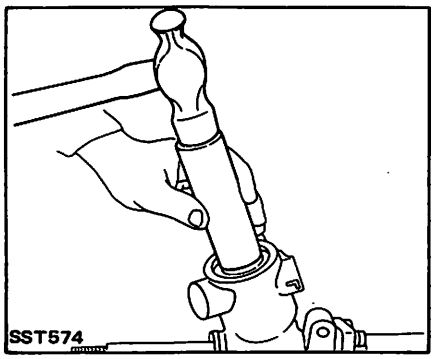


5. Install pinion assembly to pinion housing.

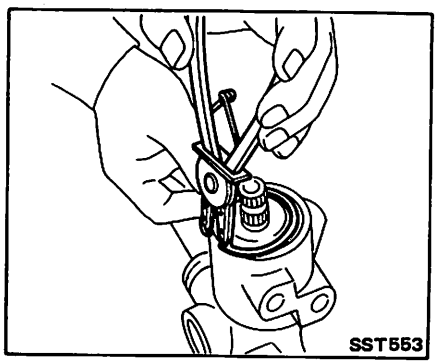
a. Apply a coat of grease to gear surfaces of pinion and rack.
b. Be careful not to damage pinion teflon ring.



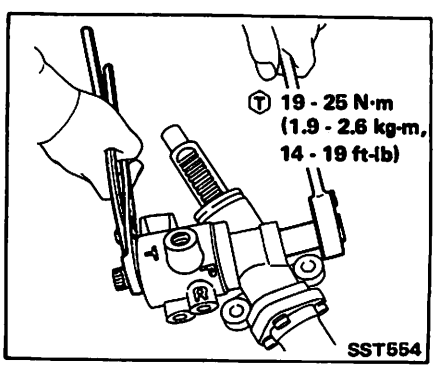
When installing pinion assembly, use suitable tool.



6. Install snap ring.



7. Tighten self-lock nut using suitable tool and wrapping pinion shaft serrations with a cloth to prevent pinion shaft from turning.

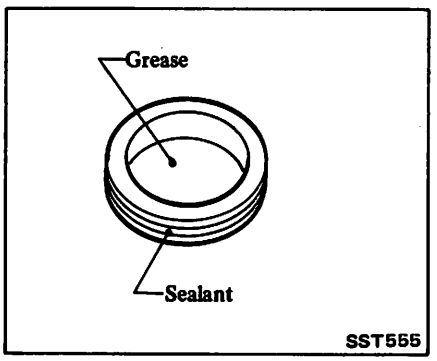


8. Install retainer and adjust pinion rotating torque.

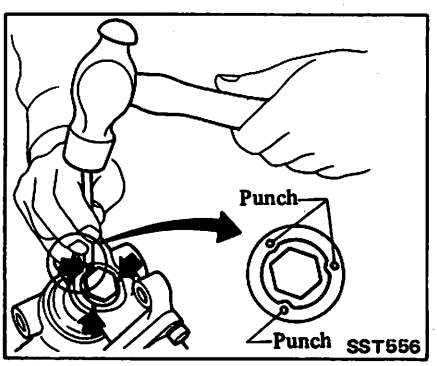
Refer to Retainer for assembly.

9. Apply grease to housing plug, coat its threads with sealant, and tighten plug.

Ⓣ : 49 - 69 N·m
(5 - 7 kg-m,
36 - 51 ft-lb)

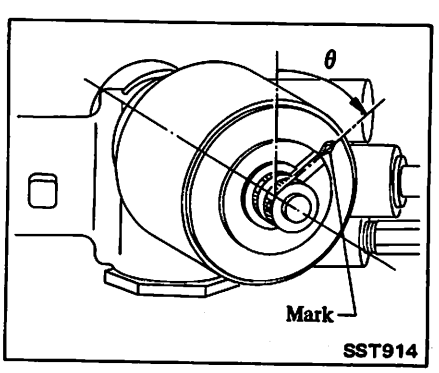


10. Stake housing plug at three places with a punch.



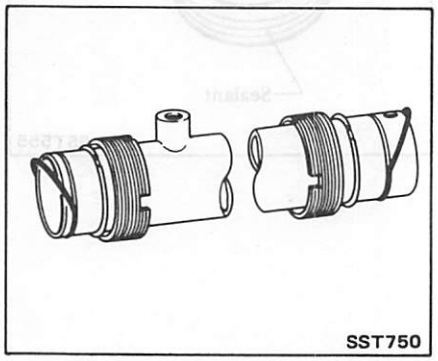
11. Set rear cover cap at neutral position.

Rear cover set angle "θ":
–39° - –29°



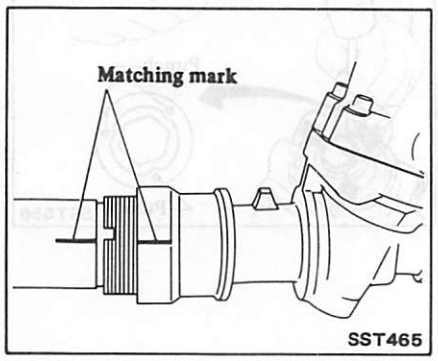
Rack bush assembly
(Cylinder end housing)

1. Apply a coat of automatic transmission fluid to new O-ring before installing it on cylinder.

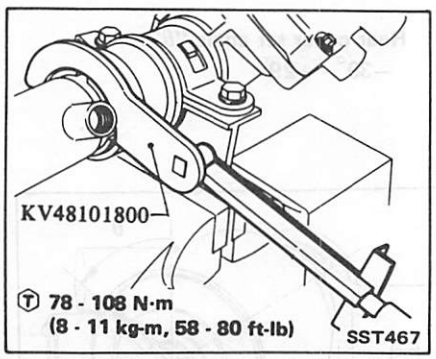


2. Position cylinder on pinion housing by aligning matching marks.

Be careful not to damage piston teflon ring.

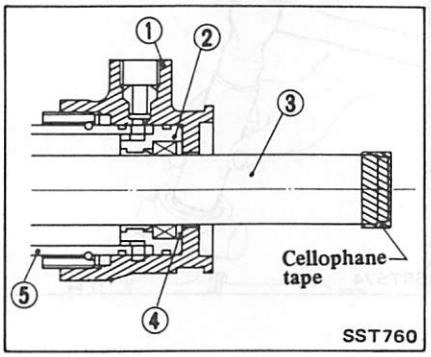


3. Tighten cylinder lock nut using Tool.



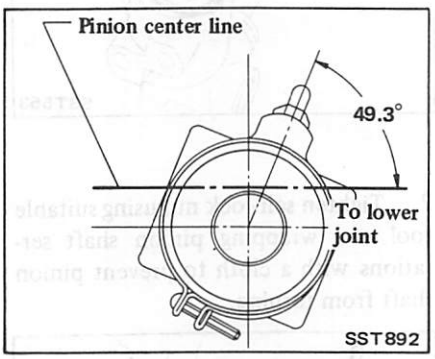
4. Wrap cellophane tape around rack end. Then place a new rack bush assembly and back-up washer onto rack end. Next align cylinder end housing at matching marks.

Apply a coat of grease to rack.

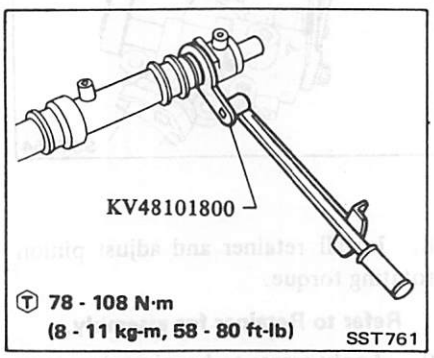


1	Cylinder end housing	3	Rack
2	Rack bush assembly	4	Back-up washer
		5	Cylinder assembly

If matching marks are not present, position cylinder end housing as follows:



5. Tighten cylinder end housing using Tool.



6. Install cylinder tubes.

Refer to Cylinder Tubes for assembly.

7. Install tie-rod and breather hose.

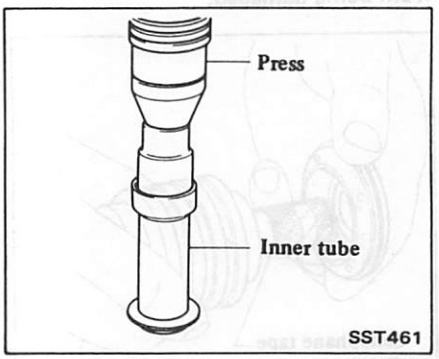
Refer to Tie Rod and Breather Hose for assembly.

Rack packing (Inner tube)

1. Apply a coat of automatic transmission fluid to new O-ring when installing it to pinion housing.

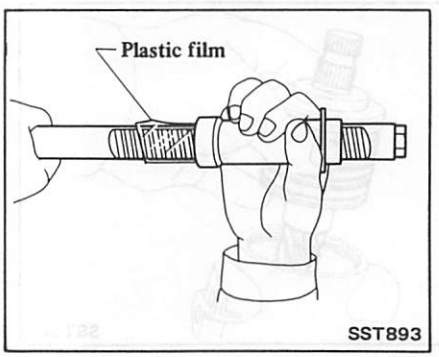
2. Attach back-up collar to inner tube and press new rack packing into place, using a suitable tool.

Pressing force:
Less than 5,884 N
(600 kg, 1,323 lb)

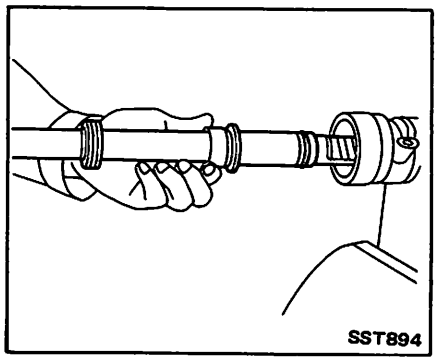


3. Insert inner tube assembly.

- **Place plastic film on inner side of rack packing to prevent damage by rack teeth.**
- **Always remove plastic film after rack packing is positioned properly.**



4. Insert rack assembly, and then set inner tube assembly to pinion housing.



5. Install pinion assembly.

Refer to Rear Cover Oil Seal and Pinion Oil Seal for assembly.

6. Install cylinder and rack bush assembly.

Refer to Rack Bush Assembly (Cylinder end housing) for assembly.

7. Install retainer and adjust pinion rotating torque.

Refer to Retainer for assembly.

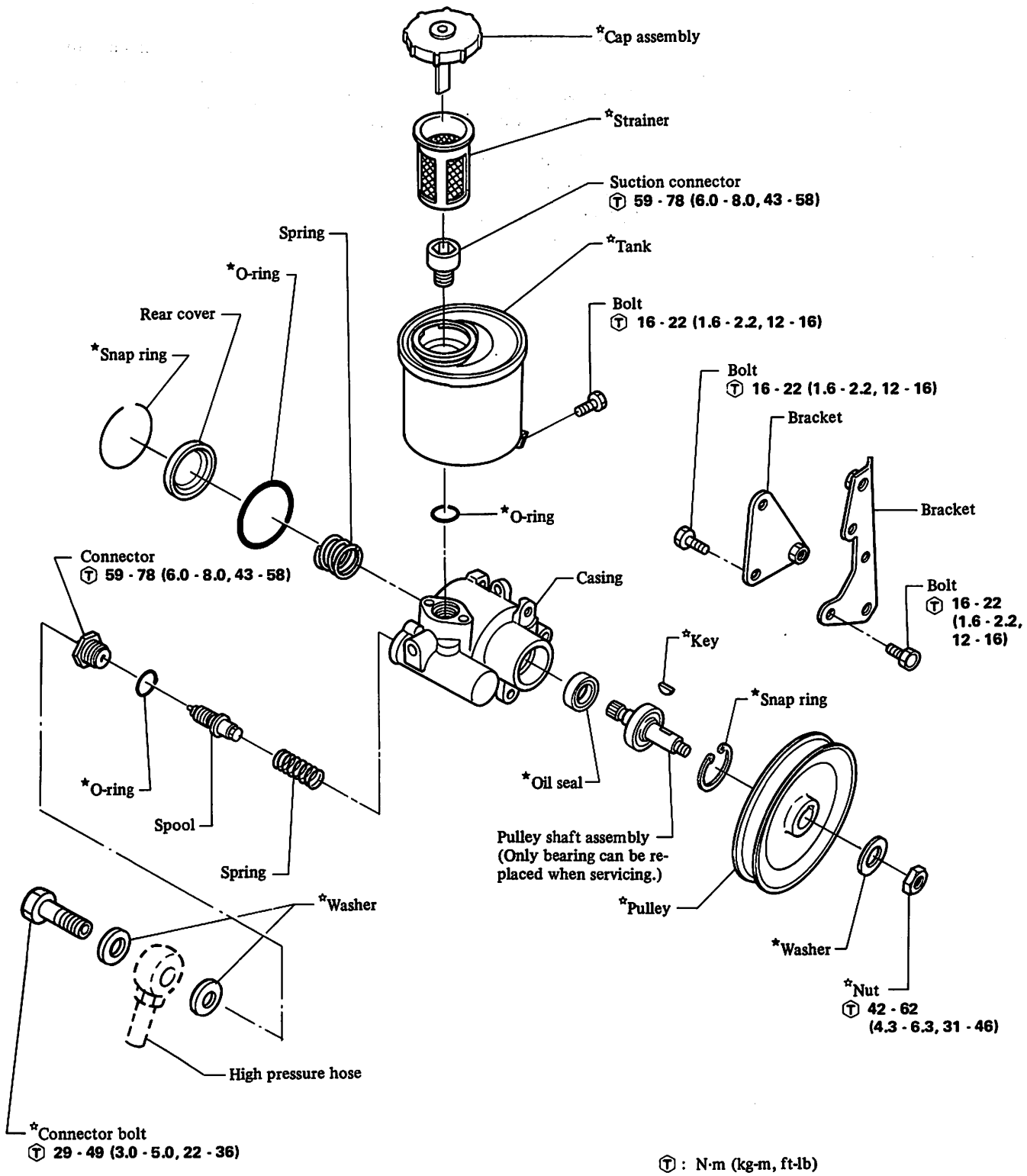
8. Install cylinder tubes.

Refer to cylinder Tubes for assembly.

9. Install tie-rod and breather hose.

Refer to Tie-Rod and Breather Hose for assembly.

POWER STEERING OIL PUMP

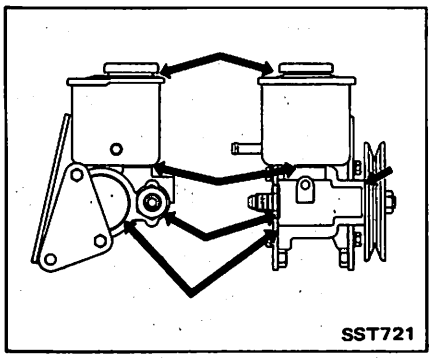


Ⓣ : N·m (kg-m, ft-lb)
★ or ☆: are available for service replacement.
★: always replace when disassembled.

SST003A

The power steering oil pump should be disassembled only if any of the following phenomena is noted.

- **Oil leak at the following points**



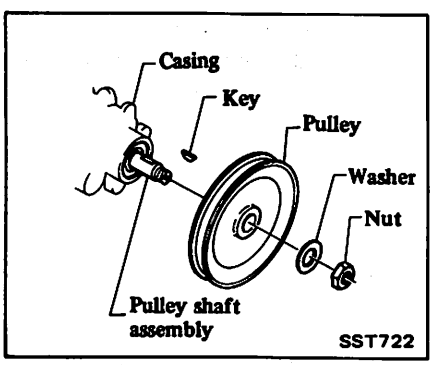
- **Deformed or damaged pulley**
- **Deformed or damaged cap assembly or strainer**

CAUTION:
This power steering oil pump is a precision hydraulic unit. Extreme care should be taken to prevent entry of dust, dirt, metal chips, etc. into oil pump during disassembly.

DISASSEMBLY

Pulley

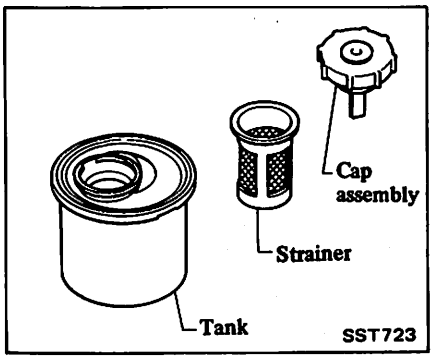
Remove pulley.



Do not reuse washer once it has been removed.

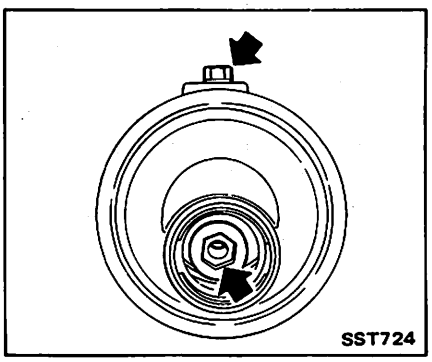
Cap assembly and strainer

Remove cap assembly.

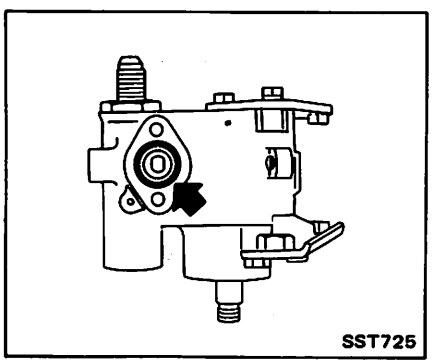


Tank O-ring

1. Remove tank.



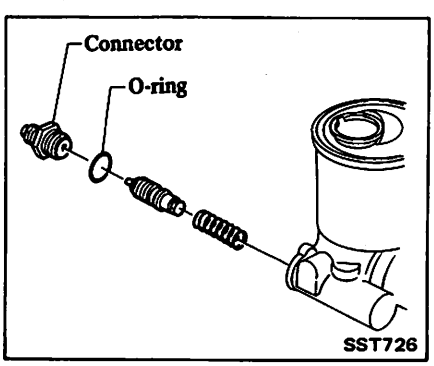
2. Remove O-ring.



Do not reuse O-ring once it has been removed.

Connector

Remove connector, then remove O-ring.



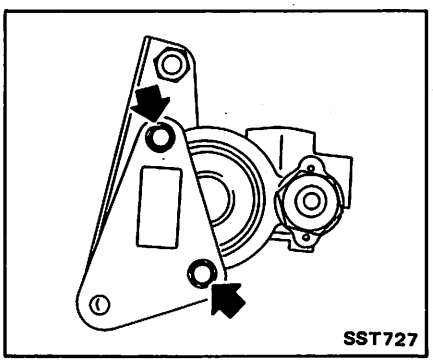
Do not reuse O-ring once it has been removed.

Rear cover O-ring

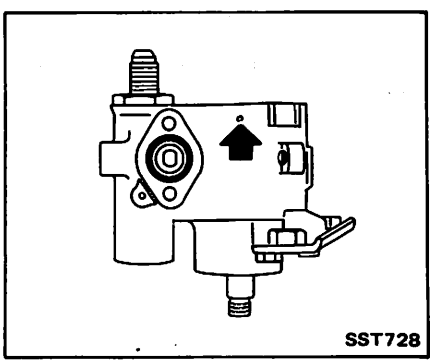
1. Remove tank.

Refer to "Tank O-ring" for disassembly.

2. Remove bracket.

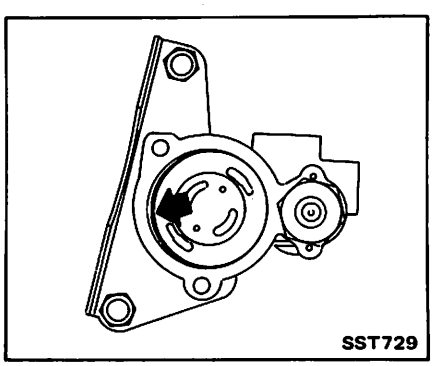


3. Remove snap ring.



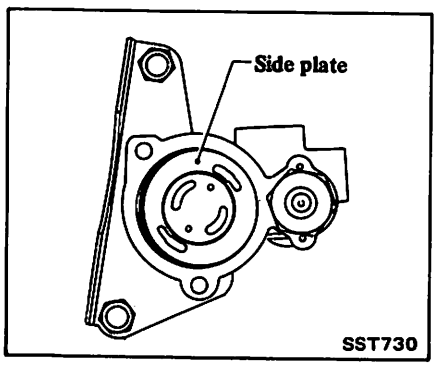
Do not reuse snap ring once it has been removed.

4. Remove rear cover and spring.
5. Remove O-ring.



Do not reuse O-ring once it has been removed.

CAUTION:
Do not face rear cover side of housing downwards, nor jar the housing; otherwise, the side plate, etc. may fall. If dropped, do not attempt to reassemble them; rather replace oil pump assembly.

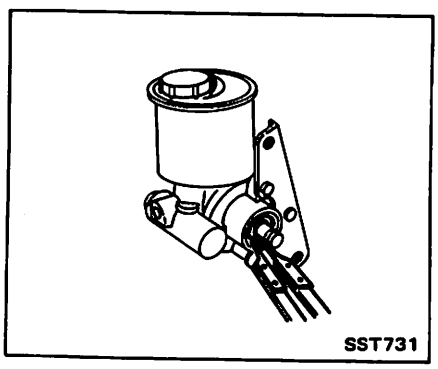


Pulley shaft oil seal

1. Remove pulley.

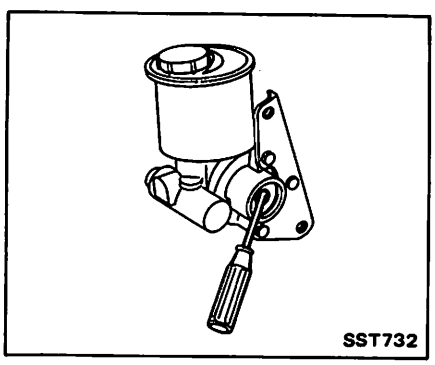
Refer to "Pulley" for disassembly.

2. Remove snap ring, then remove pulley shaft assembly.



Do not reuse snap ring once it has been removed.

3. Remove oil seal.



Do not reuse oil seal once it has been removed.

INSPECTION

Wash clean all disassembled parts in suitable cleaning solvent.

Discard any oil seals and O-rings which have once been removed.

Replace oil seal and O-ring if sealing surface is deformed or cracked.

Pulley and pulley shaft

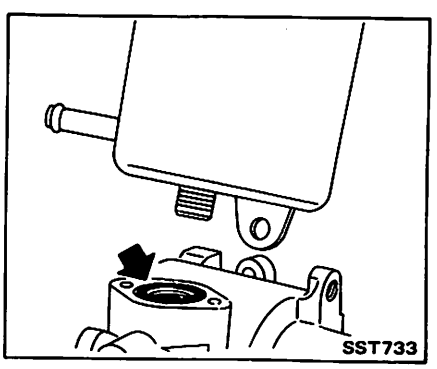
a. **If pulley is cracked or deformed, replace it.**
b. **If an oil leak is noticed around pulley shaft oil seal, replace it.**
c. **If key or pulley's key groove is deformed or worn, replace oil pump assembly.**

Cap assembly and strainer

a. **If cap assembly is deformed, damaged, or cracked, replace it.**
b. **If an oil leak is noticed, replace cap assembly. If cap contacting portion of tank is damaged or deformed, replace tank.**

Tank

a. **If tank is deformed or cracked, replace it.**
b. **If an oil leak is noticed, replace O-ring.**



Connector

a. **If connector is deformed or cracked, replace oil pump assembly.**
b. **If an oil leak is noticed, replace O-ring.**

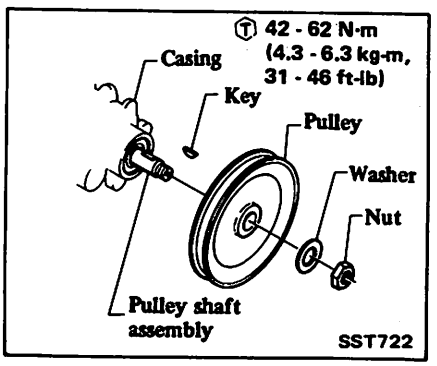
Rear cover

If an oil leak is noticed, replace O-ring.

CAUTION:
a. **When disassembling, reassembling or inspecting, use utmost care not to damage housing and rear cover contacting portion. If damaged accidentally, do not attempt to reassemble them; rather replace oil pump assembly.**
b. **When rear cover is removed, do not face housing downwards; or the side plate, etc. may fall. If dropped, do not attempt to reassemble them; rather replace oil pump assembly.**

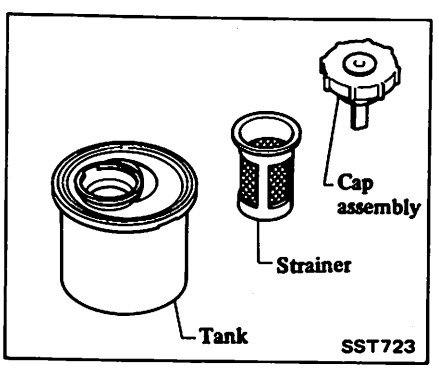
ASSEMBLY

Pulley



a. **Always use new washer.**
b. **After tightening nuts securely, be sure to bend washer.**

Cap assembly and strainer

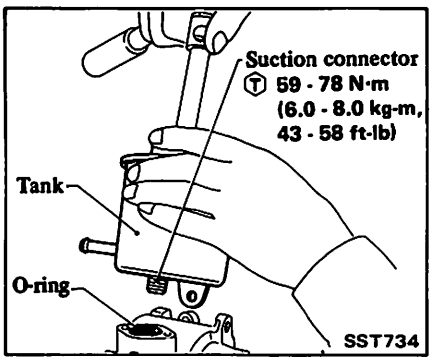


Tank O-ring

1. Install new O-ring.

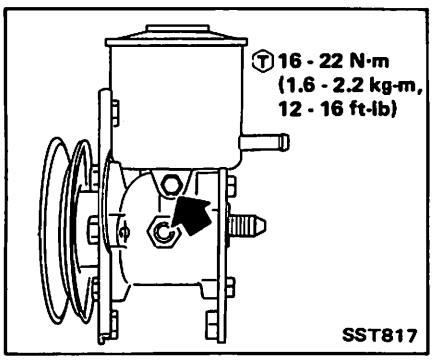
a. Before installing, apply a thin coat of vaseline to O-ring.
b. Make certain that O-ring is installed properly.

2. Install tank.



Use utmost care not to damage O-ring when installing suction connector.

3. Install bolt.

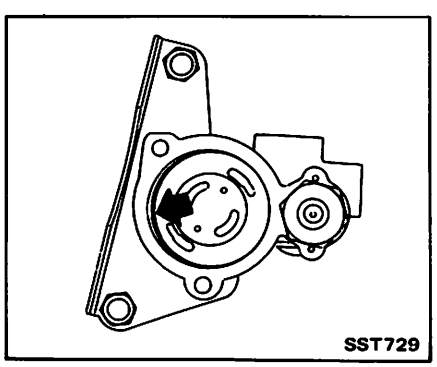


4. Install cap assembly.

Refer to "Cap assembly and strainer" for assembly.

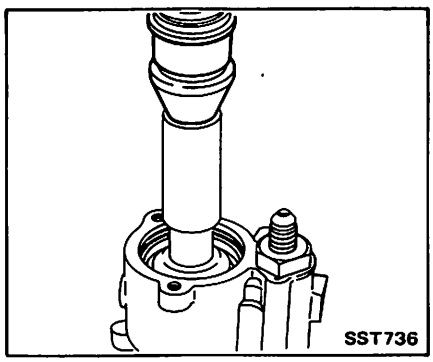
Rear cover O-ring

1. Install new O-ring.

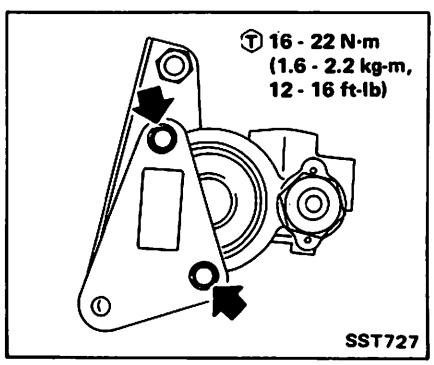


a. Before installing, apply a thin coat of vaseline to O-ring.
b. Make certain that O-ring is installed properly.

2. Install spring, and press rear cover with a hydraulic press so that snap ring can be installed.



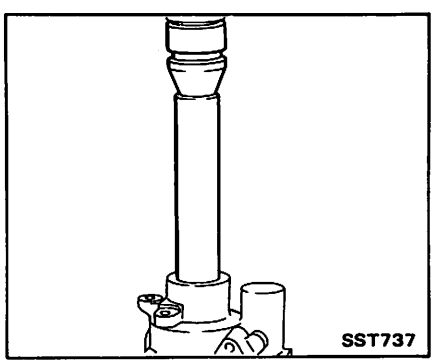
3. Install new snap ring.
4. Install bracket.



5. Assemble by referring to "Assembly of Tank O-ring".

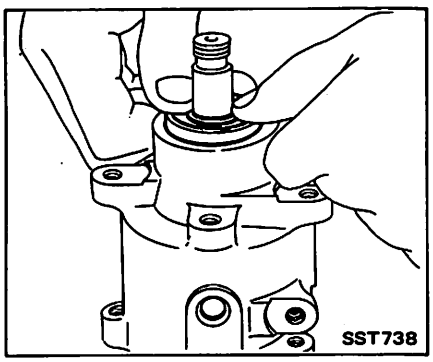
Pulley shaft oil seal

1. Using a suitable tool, install new oil seal.

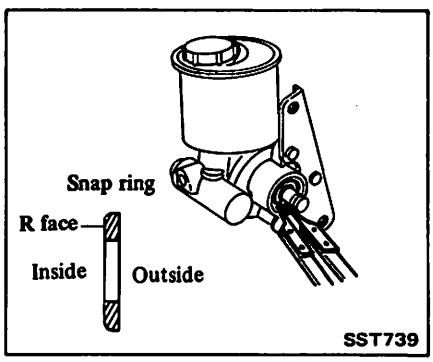


Before installing, apply a thin coat of vaseline to oil seal.

2. Securely install pulley shaft assembly by adjusting with screwdriver until rotor comes to the center position.



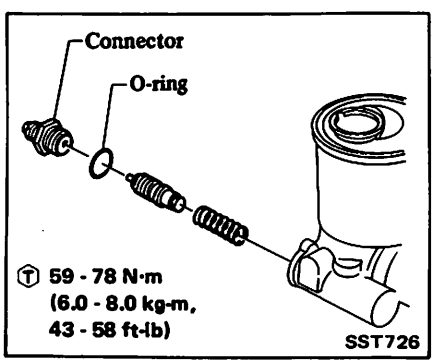
3. Install new snap ring.



4. Install pulley.

Refer to "Pulley" for assembly.

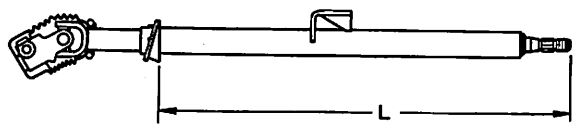
Connector



a. Before installing, apply a thin coat of vaseline to O-ring.
b. Make certain that O-ring is installed properly.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

GENERAL SPECIFICATIONS

Steering gear type		R25S* [Manual steering]	PR25SA* [Power steering]
Steering column		Collapsible column	
Steering column length "L"	mm (in)	481.3 - 484.3 (18.95 - 19.07)	
Non tilt type  SST987			
Turns of steering wheel (Lock to lock)	E15, E16	3.9	3.33
	CD17 M/T	3.7	
	CD17 A/T	3.5	
Steering overall gear ratio		21.55	18.45

* New model code.
R25S and PR25SA correspond to RP15L and IPRP15L respectively.

P R 25 S A
- 25: Rack diameter [mm (in)]
- R: Rack and pinion type
- P: Power steering

INSPECTION AND ADJUSTMENT

GENERAL

Steering gear type		R25S	PR25SA
Steering wheel axial play	mm (in)	0 (0)	
Steering wheel play	mm (in)	Less than 35 (1.38)	

STEERING GEAR AND LINKAGE

	R25S	PR25SA
Tie-rod outer ball joint Swinging torque N·m (kg-cm, in-lb)	0.3 - 2.9 (3 - 30, 2.6 - 26.0)	0.3 - 2.9 (3 - 30, 2.6 - 26.0)
Tie-rod inner ball joint Swinging torque N·m (kg-cm, in-lb)	0.5 - 7.4 (5 - 75, 4.3 - 65.1)	0.5 - 7.4 (5 - 75, 4.3 - 65.1)
Tie-rod length mm (in)	175.9 (6.93)	175.9 (6.93)
Pinion gear rotating torque (Pinion gear and rack gear assembly) N·m (kg-cm, in-lb)	Less than 1.5 (15, 13)	0.6 - 1.0 (6 - 10, 5.2 - 8.7)
Rack force to pull (At neutral position) N (kg, lb)	98 - 137 (10 - 14, 22 - 31)	98 - 157 (10 - 16, 22 - 35)
Pinion bearing outer snap ring (Inside)		–

mm (in)

Thickness	Part No.
1.04 - 1.09 (0.0409 - 0.0429)	48265-78500
1.09 - 1.14 (0.0429 - 0.0449)	48266-78500
1.14 - 1.19 (0.0449 - 0.0469)	48267-78500
1.19 - 1.24 (0.0469 - 0.0488)	48268-78500
1.24 - 1.29 (0.0488 - 0.0508)	48269-78500
1.29 - 1.34 (0.0508 - 0.0528)	48270-78500

Pinion bearing outer snap ring (Outside)		–

mm (in)

Thickness	Part No.
1.55 - 1.60 (0.0610 - 0.0630)	48271-78500
1.60 - 1.65 (0.0630 - 0.0650)	48272-78500
1.65 - 1.70 (0.0650 - 0.0669)	48273-78500
1.70 - 1.75 (0.0669 - 0.0689)	48274-78500

Steering wheel turning force N (kg, lb)	–	19.6 - 29.4 (2.0 - 3.0, 4.4 - 6.6)
Normal operating temperature at fluid °C (°F)	–	60 - 80 (140 - 176)
Fluid capacity ℓ (US qt, Imp qt)	–	Approximately 0.9 (1, 3/4)

TIGHTENING TORQUE

STEERING COLUMN

Unit	N·m	kg-m	ft-lb
Steering wheel nut	39 - 54	4.0 - 5.5	29 - 40
Lower joint to column	29 - 39	3.0 - 4.0	22 - 29
Lower joint to gear	29 - 39	3.0 - 4.0	22 - 29
Hole cover to dash panel	4 - 6	0.4 - 0.6	2.9 - 4.3
Lower bracket to pedal bracket	9 - 14	0.9 - 1.4	6.5 - 10.1
Steering column clamp or mounting bracket	9 - 14	0.9 - 1.4	6.5 - 10.1

STEERING GEAR AND LINKAGE

Model R25S

Unit	N·m	kg-m	ft-lb
Tie-rod to knuckle	29 - 49	3.0 - 5.0	22 - 36
Tie-rod lock nut	37 - 46	3.8 - 4.7	27 - 34
Tie-rod to gear	78 - 98	8.0 - 10.0	58 - 72
Gear housing clamp bolt	59 - 78	6.0 - 8.0	43 - 58
Retainer lock nut	39 - 59	4.0 - 6.0	29 - 43

Model PR25SA

Unit	N·m	kg-m	ft-lb
Gear and linkage			
Tie-rod to knuckle	29 - 49	3.0 - 5.0	22 - 36
Tie-rod lock nut	37 - 46	3.8 - 4.7	27 - 34
Tire-rod to gear	78 - 98	8 - 10	58 - 72
Gear housing clamp bolt	59 - 78	6.0 - 8.0	43 - 58
Boot clamp securing bolt	1.0 - 1.5	0.1 - 0.15	0.7 - 1.1
Retainer lock nut	39 - 59	4.0 - 6.0	29 - 43
Housing plug	49 - 69	5.0 - 7.0	36 - 51
Self lock nut	19 - 25	1.9 - 2.6	14 - 19
Cylinder tube flare nut	20 - 29	2.0 - 3.0	14 - 22
Cylinder lock nut	78 - 108	8 - 11	58 - 80
Oil pump, tank and hoses			
High pressure hose to pump	29 - 49	3.0 - 5.0	22 - 36
High pressure to gear	20 - 29	2.0 - 3.0	14 - 22
Pump to bracket	19 - 25	1.9 - 2.6	14 - 19
Pump belt adjusting bracket fixing bolt	19 - 25	1.9 - 2.6	14 - 19
Pump bracket	16 - 22	1.6 - 2.2	12 - 16
Pulley lock nut	42 - 62	4.3 - 6.3	31 - 46
Connector	59 - 78	6.0 - 8.0	43 - 58
Suction connector	59 - 78	6.0 - 8.0	43 - 58

TROUBLE DIAGNOSES AND CORRECTIONS

Except for the following probable causes and corrective actions, refer to Trouble Diagnoses and Corrections in Front Axle and Front Suspension section.

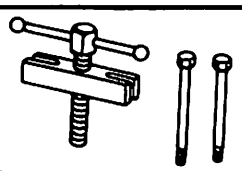
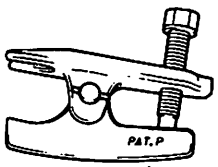
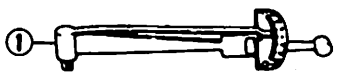
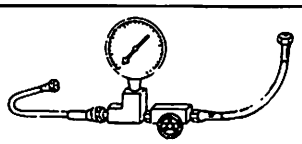
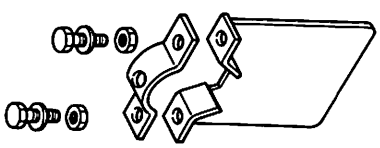
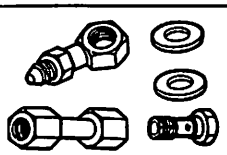
MANUAL STEERING

Condition	Probable cause	Corrective action
Excessive wheel play.	Insufficiently tightened or improperly installed steering gear housing.	Retighten.
	Damaged steering linkage or ball joint.	Replace faulty parts.
	Incorrect adjustment of steering gear.	Adjust.
Vibration, shock or shimmying of steering wheel.	Insufficiently tightened or improperly installed steering gear housing.	Retighten.
	Wear of steering linkage.	Replace faulty parts.
	Worn column bearing, weakened column bearing spring, or loose clamp.	Replace or retighten.
Car pulls to right or left.	Deformed steering linkage and/or suspension link.	Replace.
Stiff or heavy steering wheel.	Insufficient lubricants or mixing impurities in steering linkage or excessively worn steering linkage.	Replenish grease or replace the part.
	Worn or damaged steering gear and bearing.	Replace.
	Incorrectly adjusted steering gear.	Adjust.
	Deformed steering linkage.	Replace.
	Interference of steering column with turn signal switch.	Adjust.

POWER STEERING

Condition	Probable cause	Corrective action
Fluid pressure does not build up.	Pump drive belt slipping on pulley.	Readjust belt tension.
	Pump malfunctioning.	Replace.
	Fluid leaking through hose connectors.	Replace or retighten.
	Fluid leaking through power steering gear.	Replace or retighten.
	Fluid leaking through power steering oil pump.	Replace.
Steering wheel moves heavily.	Lack of fluid in power steering pump.*	Refill.
	Air present in fluid.	Bleed air.
	Fluid pressure too low.	See "Hydraulic system check".
	Wheel alignment out of specifications or air pressure in tires too low.*	Re-align or inflate tires to correct pressure.
	Steering column out of alignment.*	Repair or replace.
	Worn or damaged ball joint at suspension and steering linkage.*	Replace.
Steering wheel fails to return.	Refer to items marked "*" above.	
	Front wheel caster improperly adjusted.	Readjust.
	Internal gears dragged or gouged.	Replace gear assembly.
Steering effort is not the same in both directions.	Fluid leakage in steering gear.	Replace sealing parts.
	Stuffy fluid passage in steering gear.	Replace gear assembly.
Unstable running.	Wheel bearing not properly adjusted.	Readjust.
	Stuck or damaged control valve in steering gear.	Replace gear assembly.
	Front wheel alignment not properly.	Readjust.
	Excessive steering gear play.	Readjust backlash or replace gear assembly.
	Play at suspension and linkage ball joint.	Replace.
Noisy pump.	Lack of fluid in power steering pump.	Refill.
	Hoses or filter clogged.	Clean or, if necessary, replace.
	Loose pulley.	Repair.
	Belt noisy or slapping.	Readjust belt tension.
	Broken pump part.	Replace.

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	Unit application	
		R25S	PR25SA
ST27180001 (J25726)	Steering wheel puller 	X	X
HT72520000 (J25730-A)	Ball joint remover 	X	X
ST3127S000 (See J25765) ① GG91030000 (J25765) ② HT62900000 (–) ③ HT62940000 (–)	Preload gauge Torque wrench  Socket adapter (Useless)  Socket adapter (Useless) 	X	X
ST27091000 (J26357)	Pressure gauge 	–	X
KV48101800 (J28820)	Cylinder lock nut wrench 	–	X
KV48102100 (J28817)	Power steering stand 	–	X
KV48102500 (–)	Pressure gauge adapter 	–	X

SECTION BF

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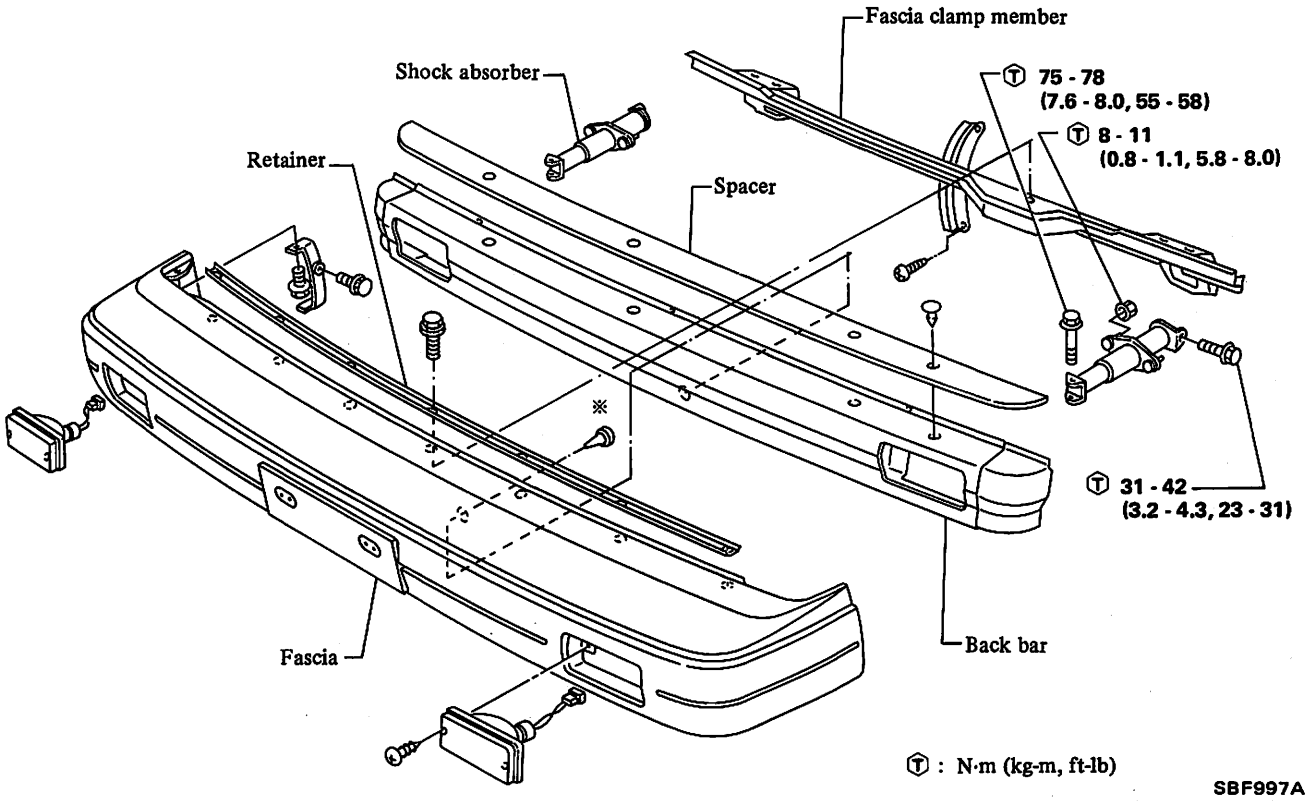
REAR SPOILER BF-27
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BODY ALIGNMENT BF-27
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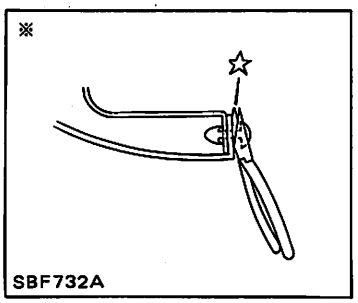
BODY FRONT END

FRONT BUMPER

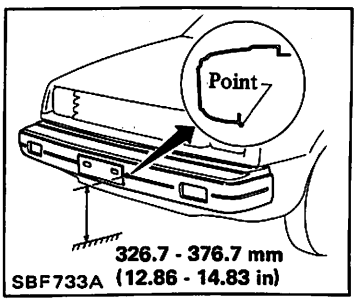
REMOVAL AND INSTALLATION



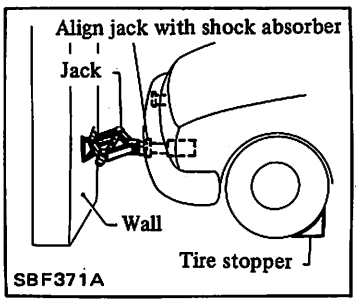
DISASSEMBLY



BUMPER HEIGHT



SHOCK ABSORBER



Shock absorber

1. Check shock absorber for oil leakage, cracks or deformation.
2. Function of shock absorber;

(1) Place vehicle in front of a wall. Apply parking brake and place tire stoppers securely.

(2) Place a jack between bumper and wall; jack is positioned squarely with bumper directly in line with shock absorber to be checked.

(3) Apply pressure to compress shock absorber at least 10.0 mm (0.394 in).

Use a jack with capacity of more than 600 kg (1,323 lb).

(4) Make sure bumper returns to its original position when jack is retracted. Replace if necessary.

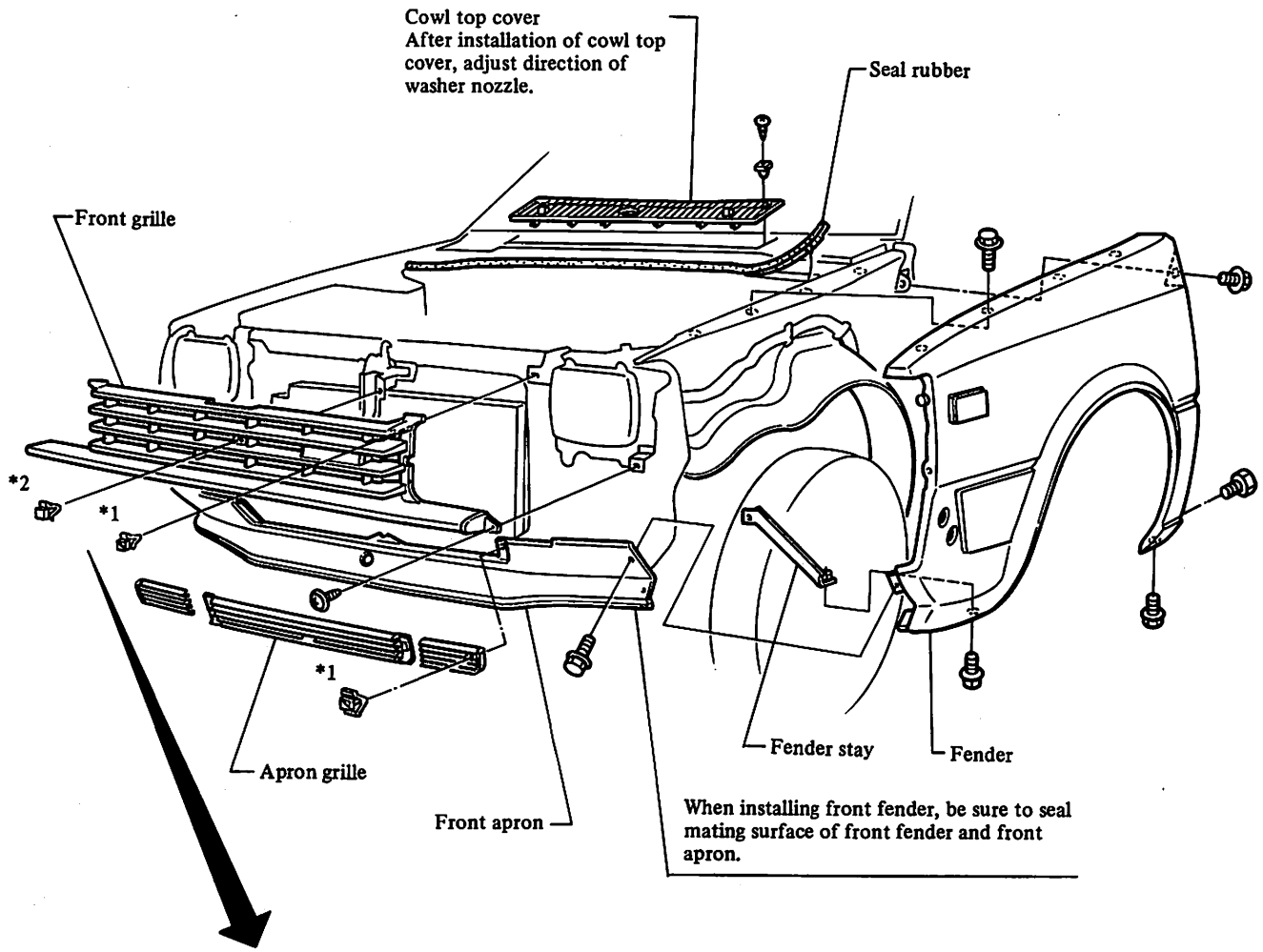
CAUTION:

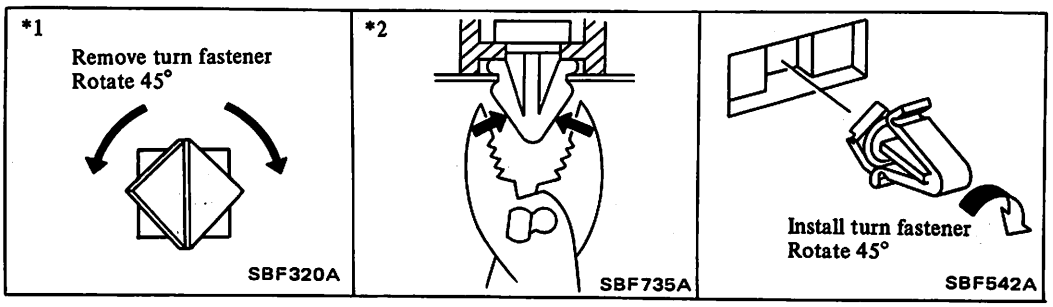
It is not recommended to confirm proper installation by driving into walls or other barriers as this could cause personal injury or damage to the vehicle.

When replacing shock absorbers, make sure they are of the same type and rating, and manufactured by the same maker.

FRONT FENDER

REMOVAL AND INSTALLATION





CAUTION:

a. Grille is made of plastic, so do not use excessive force.

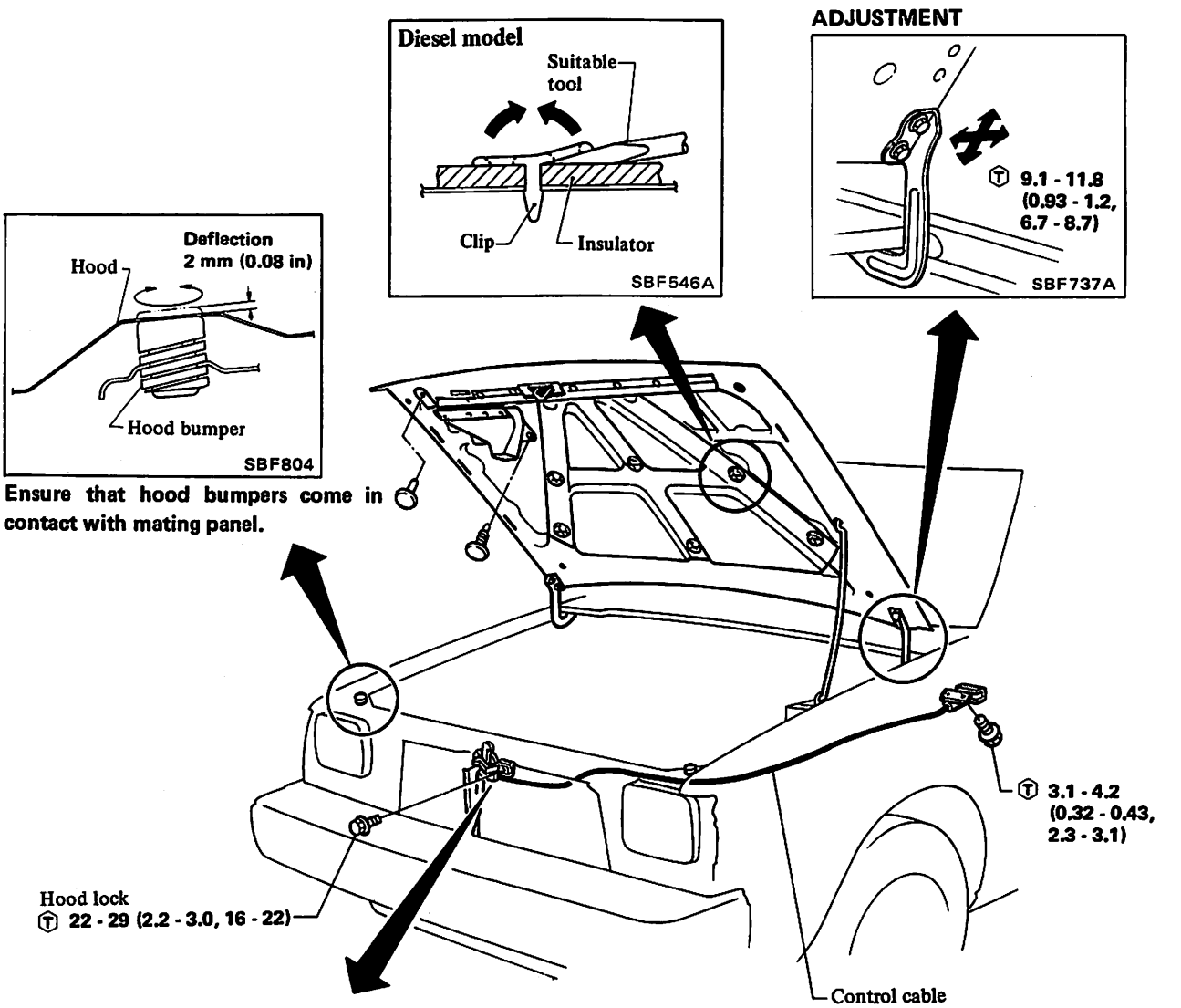
b. Take care to keep oil away from grille.

SBF998A

HOOD

REMOVAL AND INSTALLATION

When removing and installing hood, place a cloth or other padding on hood corners to avoid scratching vehicle body.



- When installing hood lock, ensure that striker rod is positioned in the center of lock slit. Then, temporarily tighten the lock.
- With the lock temporarily tightened, properly adjust hood height and securely tighten the lock.
- Ensure that safety catch engages at least 5 mm (0.20 in) with mating part.
- Check hood lock control operation. Apply a coat of grease to hood lock's engaging mechanism.

- Do not attempt to bend cable forcibly. Doing so increases effort required to unlock hood.

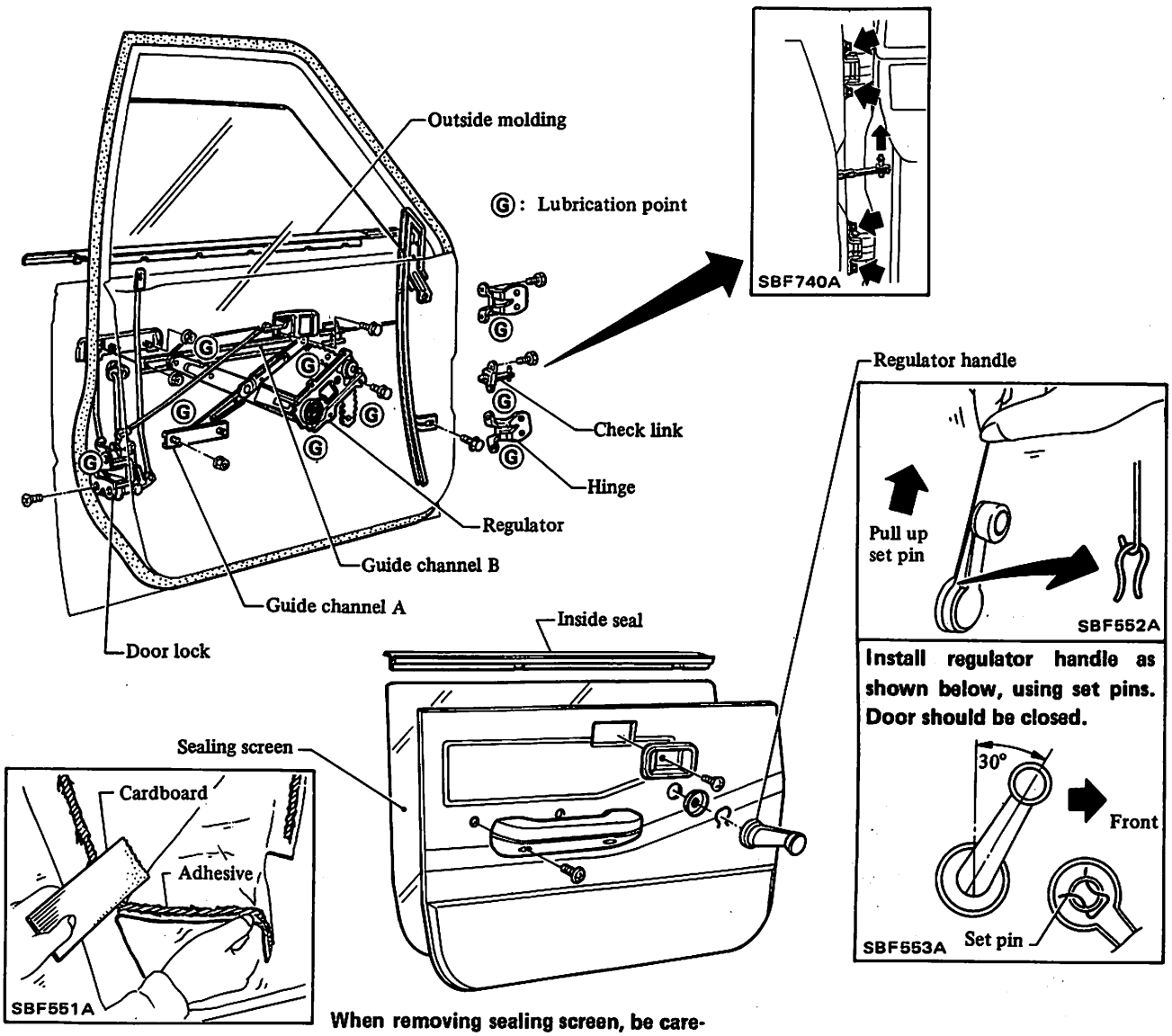
Ⓣ : N·m (kg-m, ft-lb)

SBF999A

DOOR

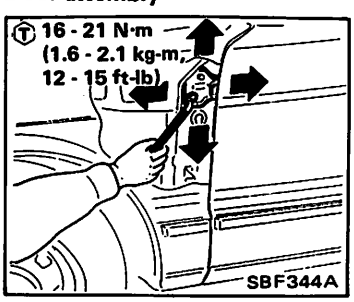
FRONT DOOR

REMOVAL AND INSTALLATION

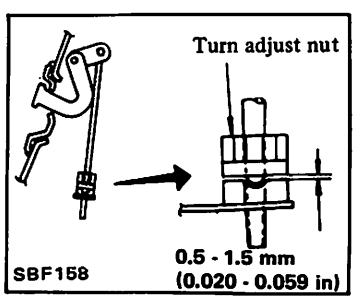


ADJUSTMENT

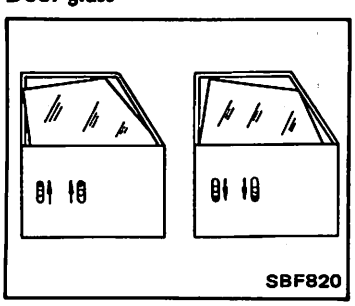
Door assembly



Outside handle



Door glass

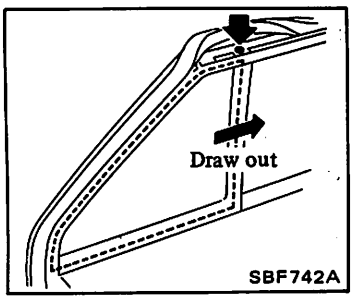


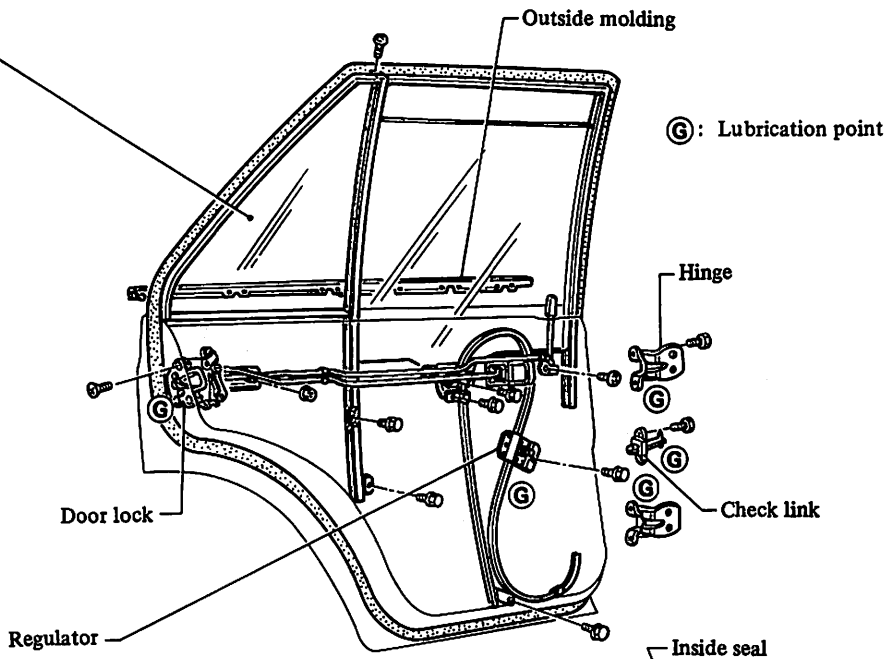
SBF741A

REAR DOOR

REMOVAL AND INSTALLATION

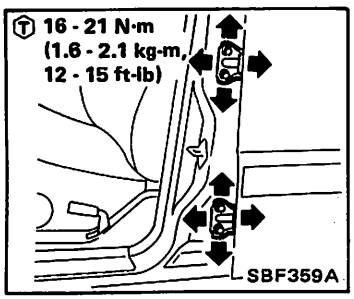
Removal and installation procedures are basically the same as those for front door.



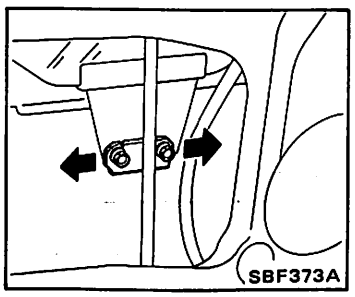


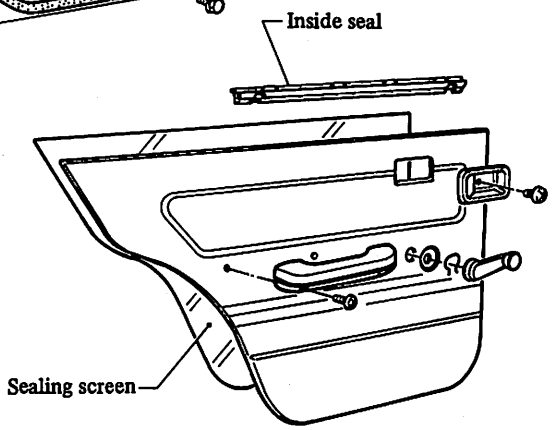
ADJUSTMENT

Door assembly



Door glass





Outside handle

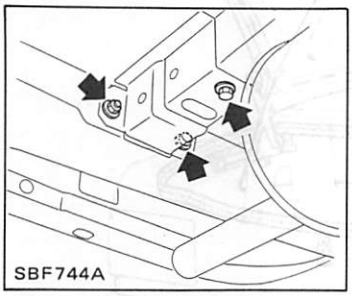
Refer to front door.

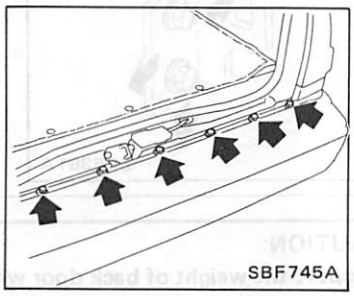
SBF743A

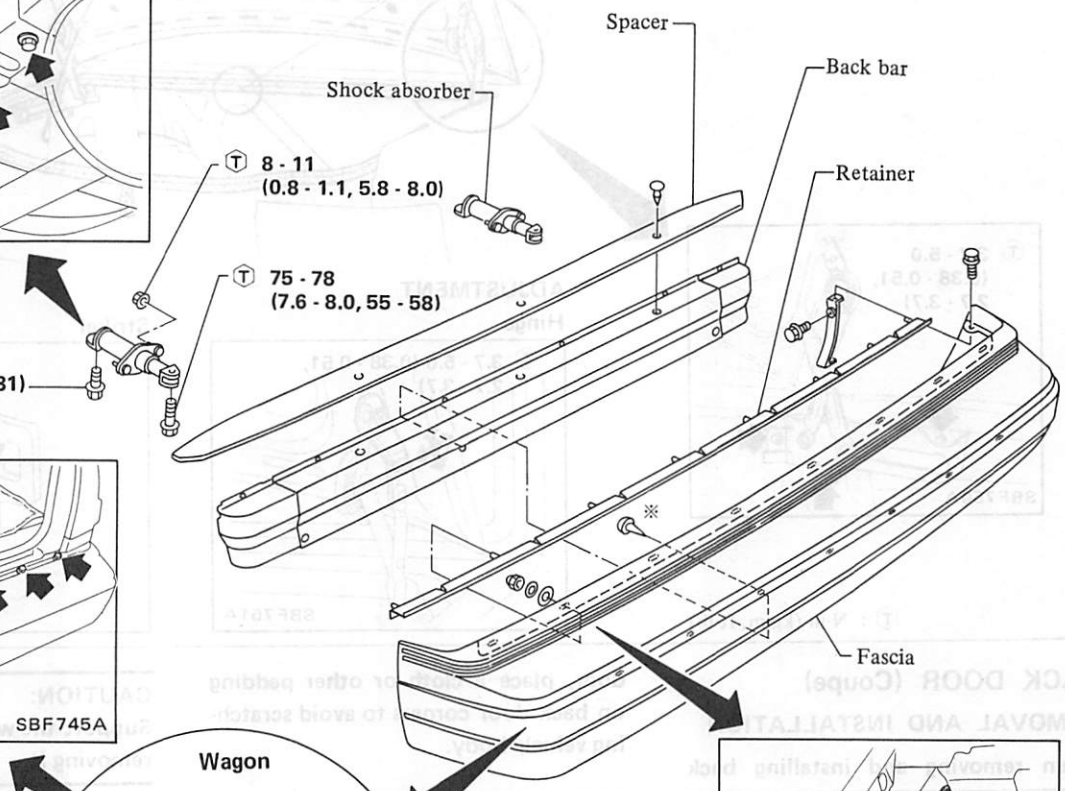
BODY REAR END

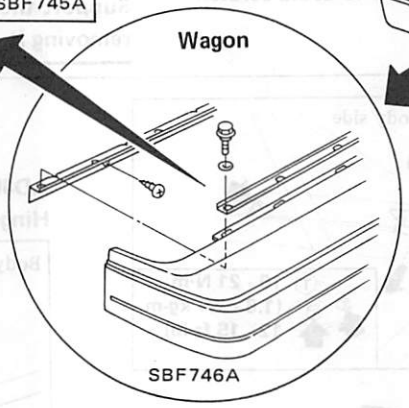
REAR BUMPER

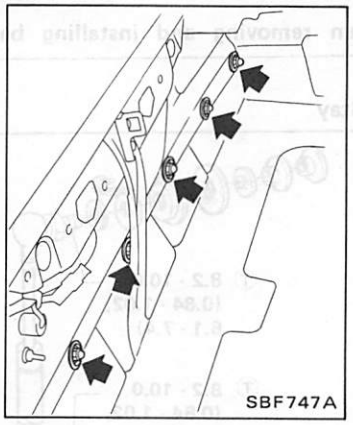
REMOVAL AND INSTALLATION



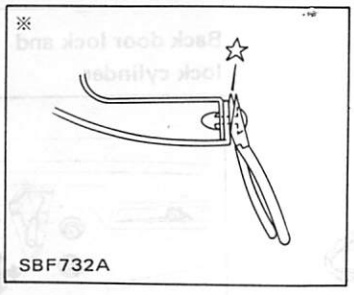




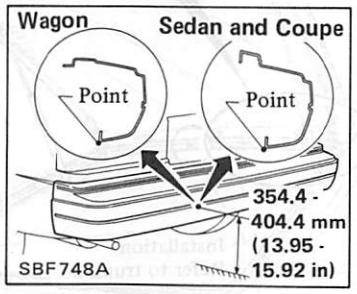




DISASSEMBLY



BUMPER HEIGHT



SHOCK ABSORBER

- Refer to front bumper.

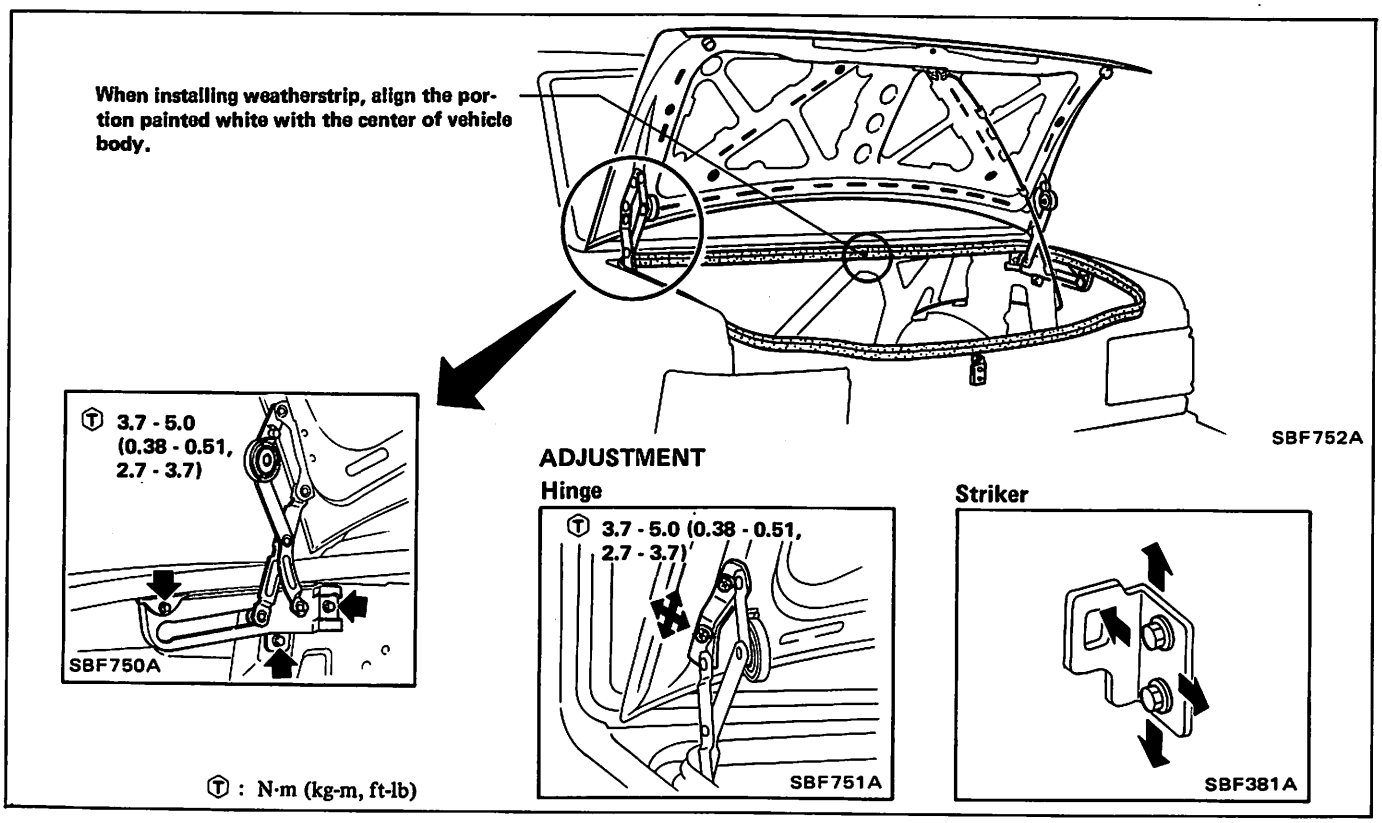
Ⓣ : N·m (kg-m, ft-lb)

SBF749A

TRUNK LID

REMOVAL AND INSTALLATION

When removing and installing trunk lid, place a cloth or other padding on trunk lid corners to avoid scratching vehicle body.

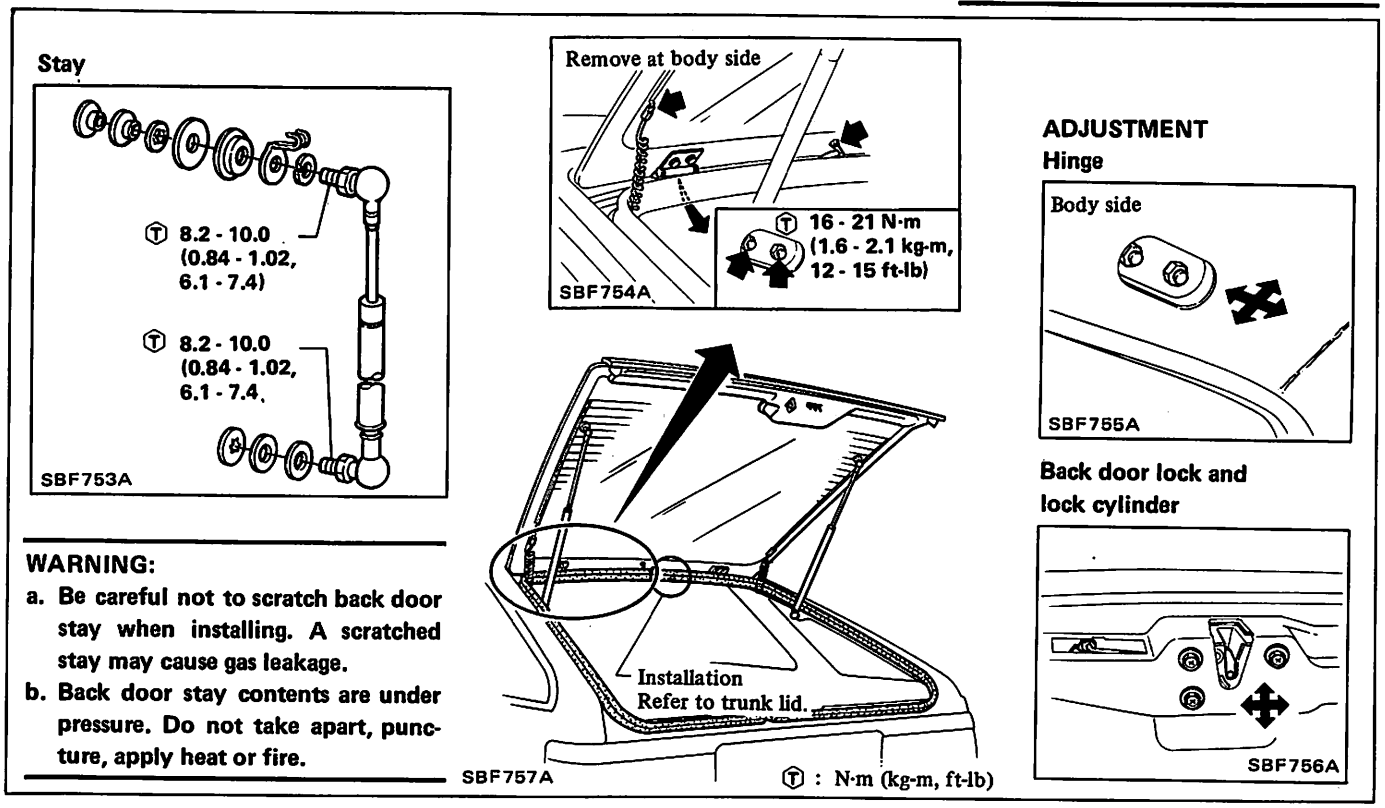


BACK DOOR (Coupe)

REMOVAL AND INSTALLATION

When removing and installing back door, place a cloth or other padding on back door corners to avoid scratching vehicle body.

CAUTION:
Support the weight of back door when removing it.



WARNING:

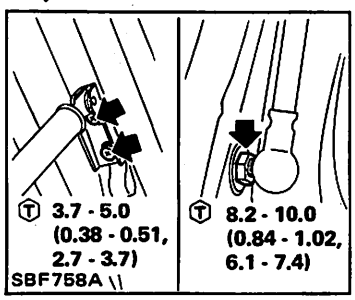
a. Be careful not to scratch back door stay when installing. A scratched stay may cause gas leakage.
b. Back door stay contents are under pressure. Do not take apart, puncture, apply heat or fire.

BACK DOOR (Wagon)

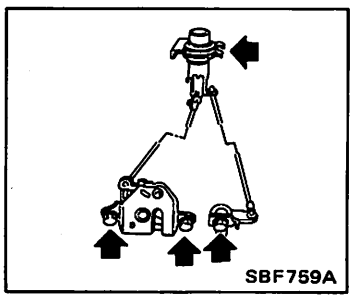
REMOVAL AND INSTALLATION

When removing and installing back door, place a cloth or other padding on back door corners to avoid scratching vehicle body.

Stay

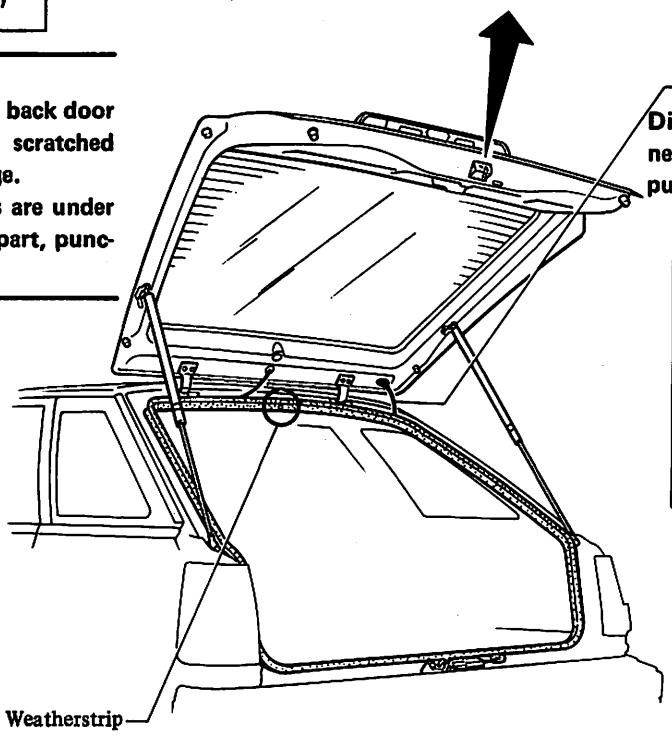


Black door lock

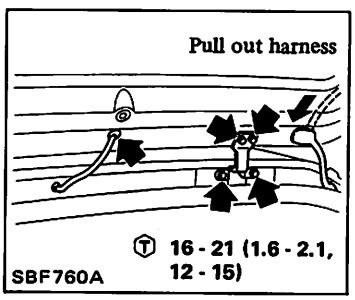


WARNING:

a. Be careful not to scratch back door stay when installing. A scratched stay may cause gas leakage.
b. Back door stay contents are under pressure. Do not take apart, puncture, apply heat or fire.



Disconnect back door harness connectors, tie free ends with string and pull out of back door side.

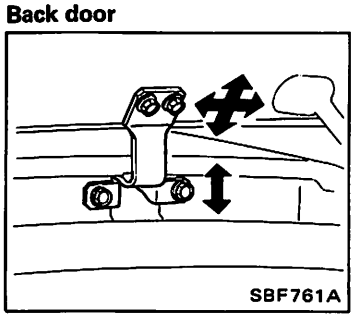


Ⓣ : N·m (kg-m, ft-lb)

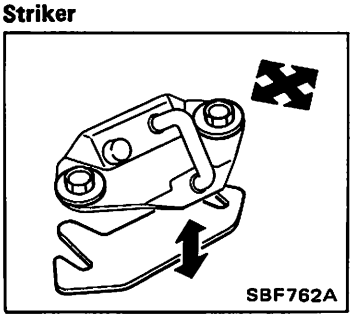
When installing weatherstrip, align white paint indicated with the center of vehicle body.

ADJUSTMENT

Back door



Striker



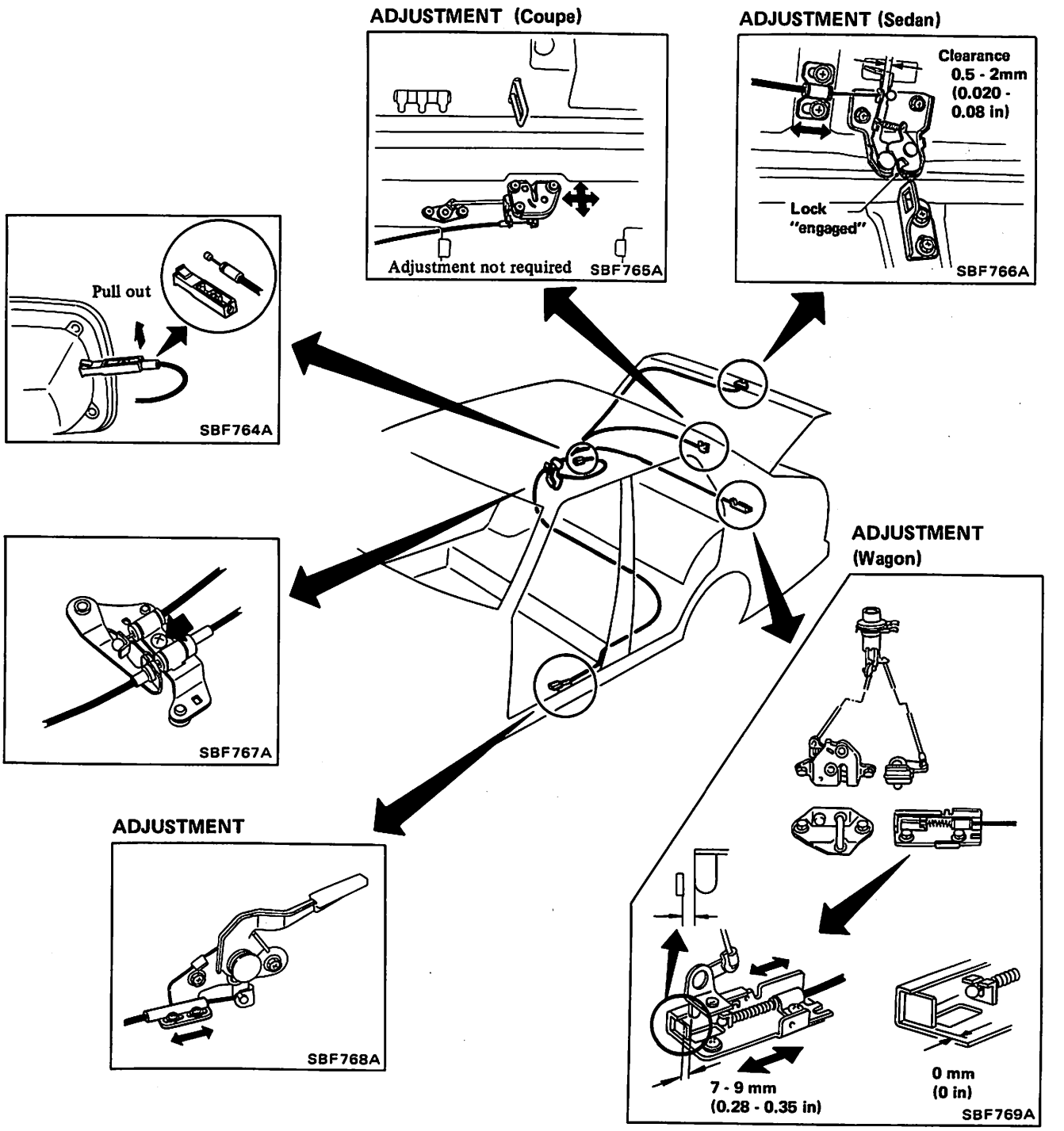
Back door lock does not need adjustment.

SBF763A

TRUNK LID/BACK DOOR OPENER AND FUEL FILLER LID OPENER

REMOVAL AND INSTALLATION

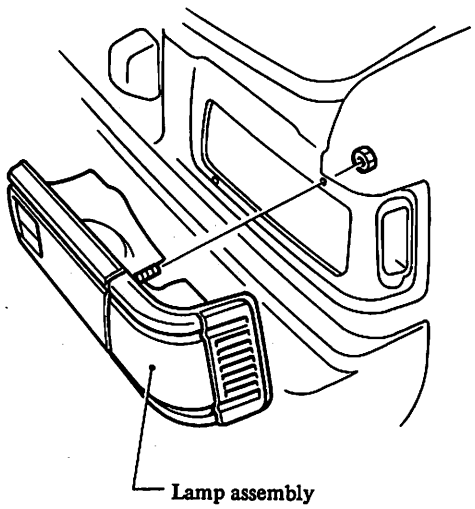
- **Install cable without bending it forcibly.**
- **After installation, make sure that trunk lid, back door and fuel filler lid open smoothly.**



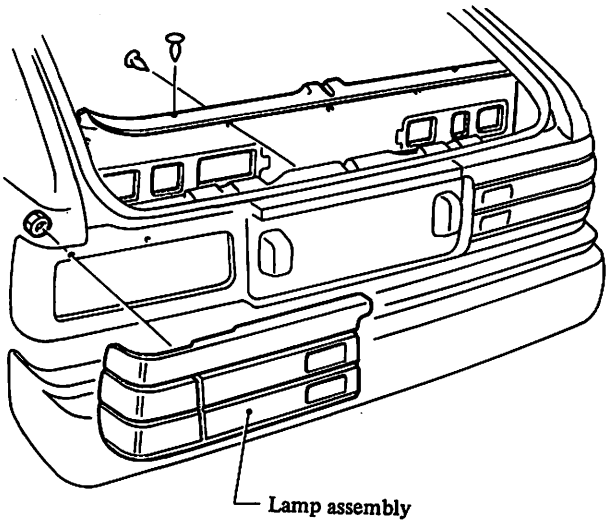
REAR COMBINATION LAMP

REMOVAL AND INSTALLATION (Sedan and Coupe)

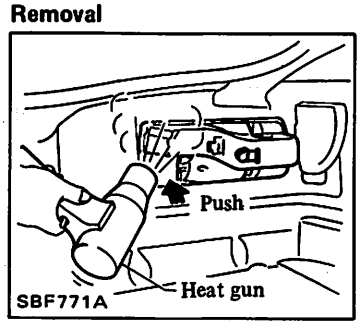
Sedan



Coupe

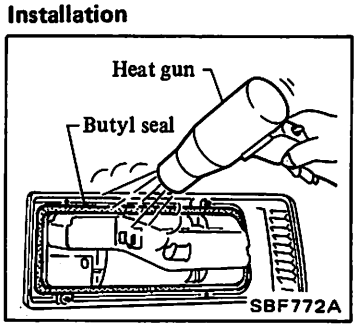


Removal



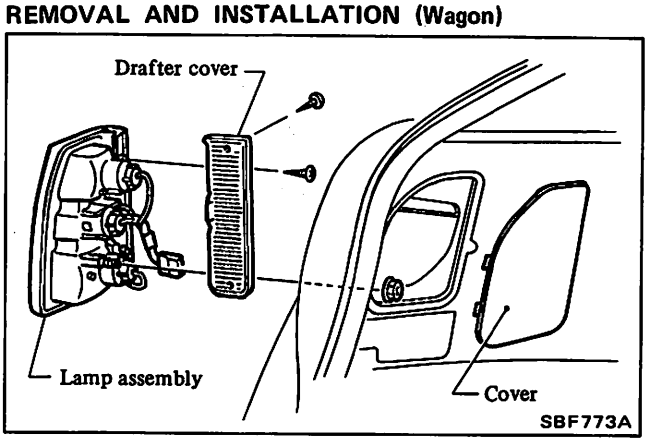
- Warm up lamp assembly area to a temperature of a little below 60°C (140°F).

Installation



- Warm up lamp assembly area to a temperature of a little below 60°C (140°F).
- Apply butyl seal evenly as it tends to become thin in the corners.

REMOVAL AND INSTALLATION (Wagon)



SBF774A

WINDSHIELD AND WINDOWS

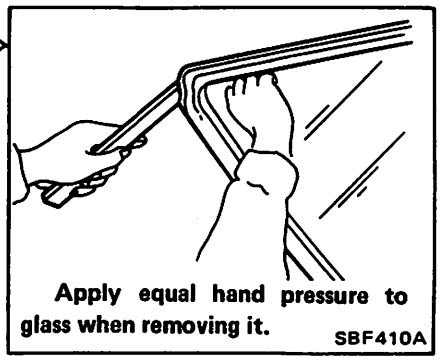
WINDSHIELD

REMOVAL AND INSTALLATION

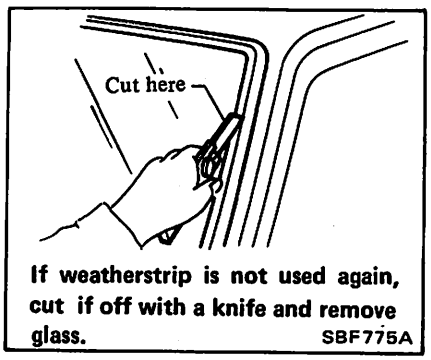
Remove moldings.

For molding removal and installation procedures, refer to "Trim and Molding".

Remove glass.



Apply equal hand pressure to glass when removing it. SBF410A

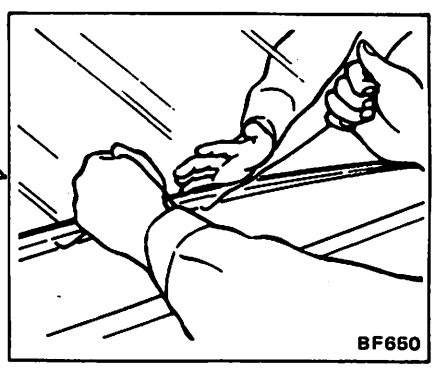


If weatherstrip is not used again, cut if off with a knife and remove glass. SBF775A

Body side:

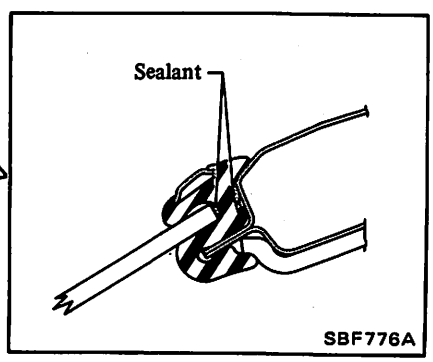
Clean flange surface with non-leaded gasoline.

Tap glass from the outside while pulling cord from the inside until weatherstrip is fitted in body flange.



BF650

Apply sealant.



SBF776A

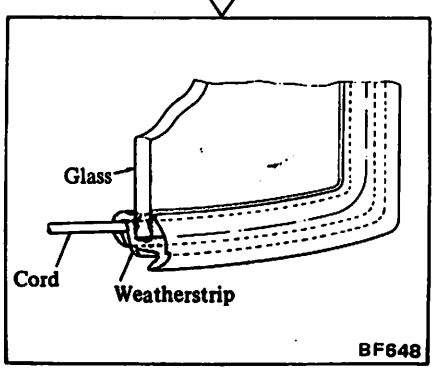
Wipe excess sealer off glass and body.

Glass side:

Clean glass surface thoroughly with non-leaded gasoline.

Install weatherstrip to glass, and install molding.

Insert a strong cord.



BF648

- **To facilitate cord's installation, apply soapy water to it, so it will fit into weatherstrip's groove easily.**
- **Insert cord so that its ends are at bottom center glass.**

REAR WINDOW (Sedan)

REMOVAL AND INSTALLATION

Follow the same procedures as for Windshield.

BACK DOOR WINDOW (Coupe)

REMOVAL AND INSTALLATION

Back door window glass cannot be disassembled. Replace as a glass assembly, if necessary.

BACK DOOR WINDOW (Wagon)

REMOVAL AND INSTALLATION

A pre-mixed, one-part sealant to cement window glass to window opening is available.

After using this sealant, it is highly recommended that the vehicle should remain stationary for about 24 hours so that the sealant can cure well.

CAUTION:

a. Use Genuine Nissan Sealant Kit "72891 U2025" or equivalent. Sealant kit consists of Primer-A, Primer-E, caution label and sealant which is made from silicone. Using this kit, proceed to operations described in removal and installation.

b. It is not recommended to use the sealant passed more than 12 months from the production date. Production date is shown on the cartridge.

c. Open cartridge only at the time of use.

d. Keep Primers and sealant in a cool, dry place. Ideally, sealant should be stored in a refrigerator.

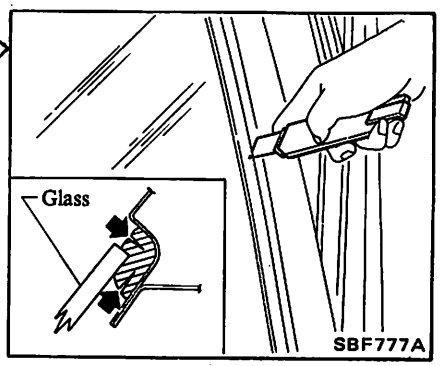
WARNING:

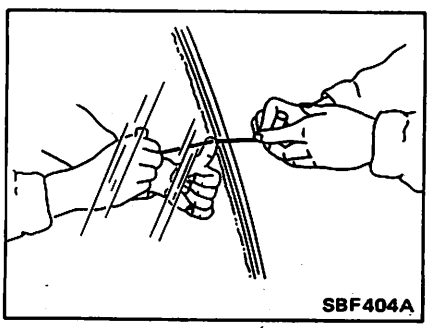
Keep heat or open flames away as Primers are flammable.

Remove molding and welt. → For molding removal and installation procedures, refer to "Trim and Molding".

↓

Remove glass.





CAUTION:

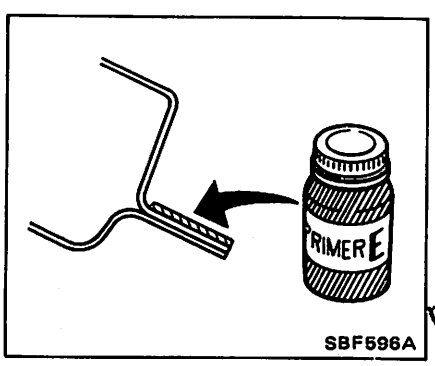
Be careful not to scratch glass when removing.

Body side:

Remove old sealant, and clean bonding surface thoroughly with non-leaded gasoline.

↓

Apply Primer E.



CAUTION:

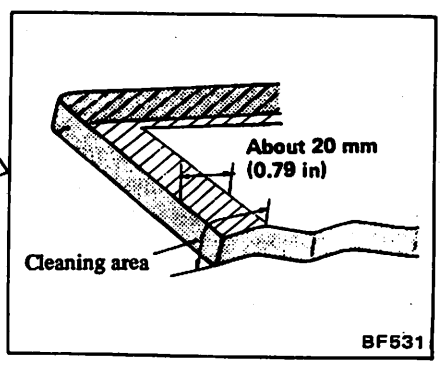
Allow Primers to dry for 10 to 15 minutes before proceeding to the next step.

↓

Ⓐ

Glass side:

Clean bonding surface thoroughly with non-leaded gasoline.

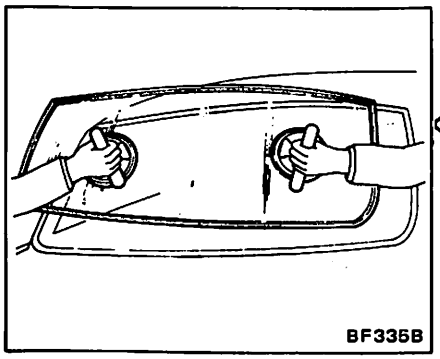


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Ⓑ

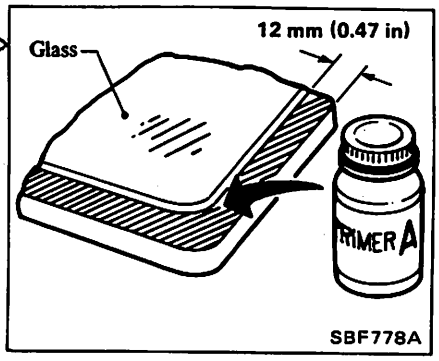
Ⓐ

Ⓑ


BF335B

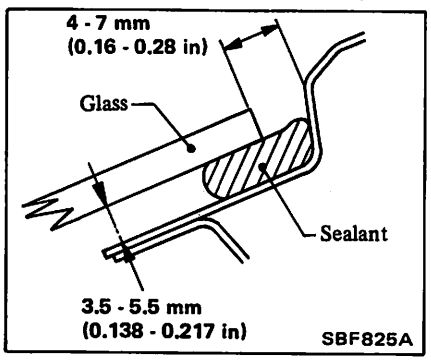
Set glass in position and press glass lightly and evenly.

Apply Primer A.



SBF778A

CAUTION:
Do not apply Primer A to window opening flanges.



SBF825A

Do not direct stream of water at fresh adhesive material.

After installing attach caution label to glass surface.

Check for water leakage.

Apply sealant.

Install moldings and welt.

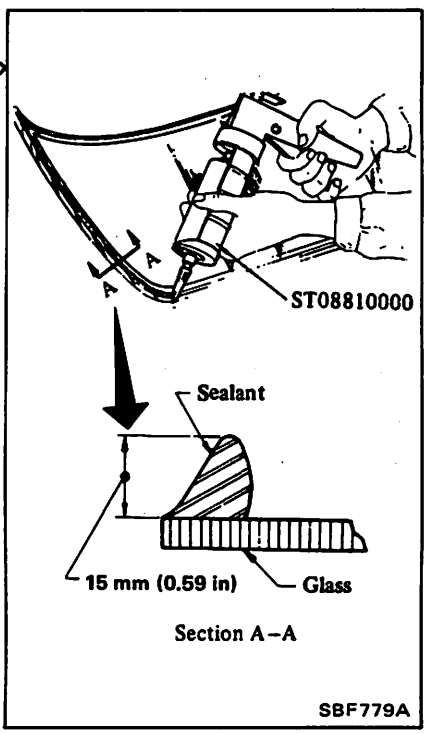
Wipe excess sealant off glass and body.



BF698B

Be sure that it does not obstruct visibility. The label, noting the fact that sealing will be impaired if door is opened or closed with window closed before sealant has dried, will be furnished with the kit.

CAUTION:
Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.



SBF779A

CAUTION:
Sealant starts to harden 15 minutes after it is applied; therefore, window glass should be installed in window opening in body within 15 minutes of applying sealant.

Reference: Period required for sealant to dry to desired hardness.

Unit: days

Temperature °C (°F) \ Relative humidity %	90	50	25
25 (77)	1.5	2.5	6
10 (50)	3	5.3	10
–10 (14)	10	17	34

REPAIRING LEAKS

Leaks can be repaired without removing and reinstalling glass in the following manner:

1. To stop leaks, first remove moldings in area of leak.
2. Mark location of leak.

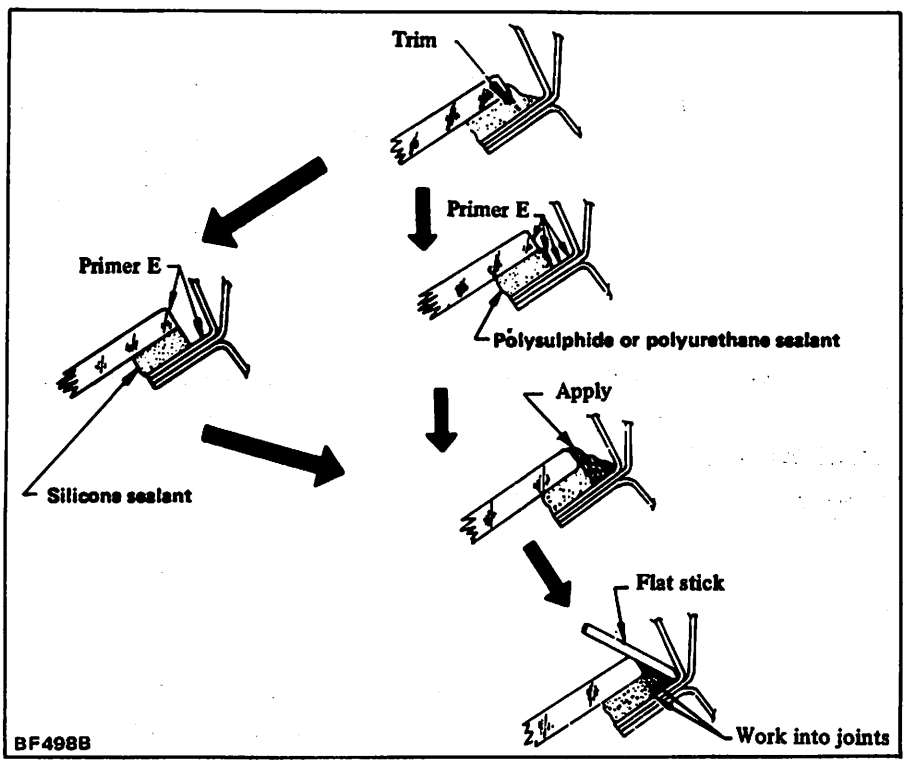
If water is leaking between sealant and body or between glass and sealant, determine extent of leak by pushing glass outwards.

Apply water to leak area while pushing on glass.

Mark extent of leak point.

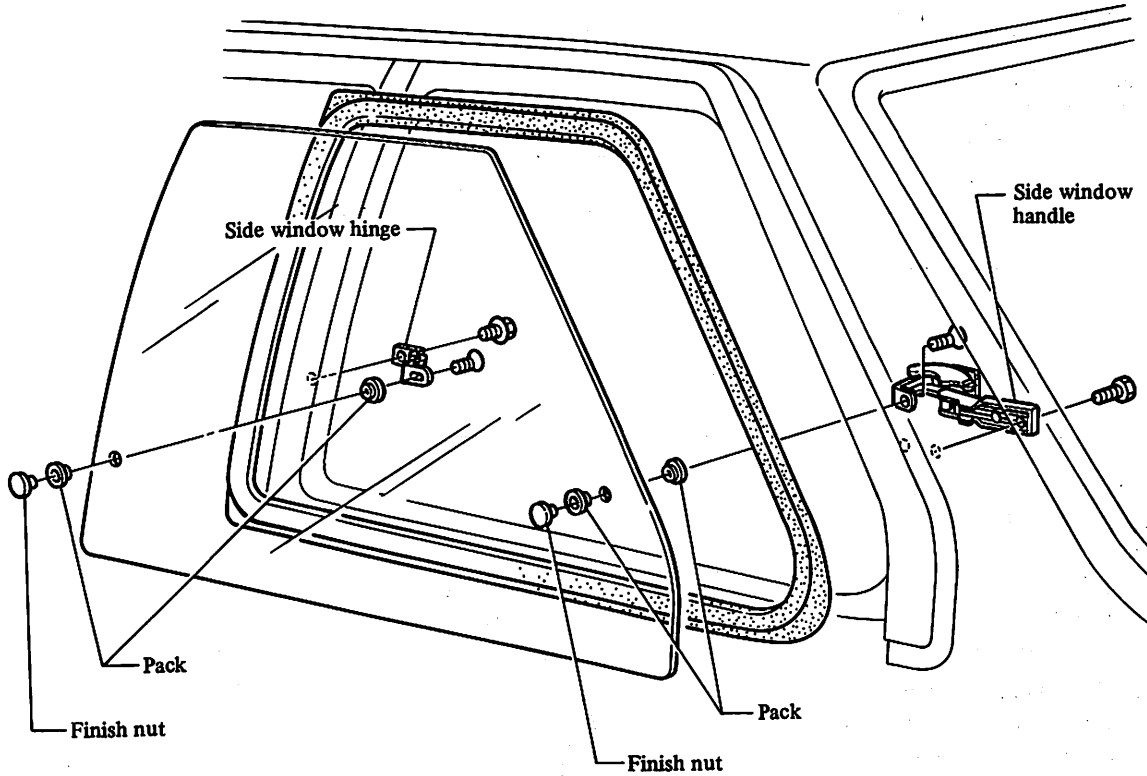
3. Apply Primer and then sealant to leak points, following procedures shown below.

CAUTION:
Do not apply Primer to old silicone sealant.



SIDE WINDOW (2-door Sedan)

REMOVAL AND INSTALLATION

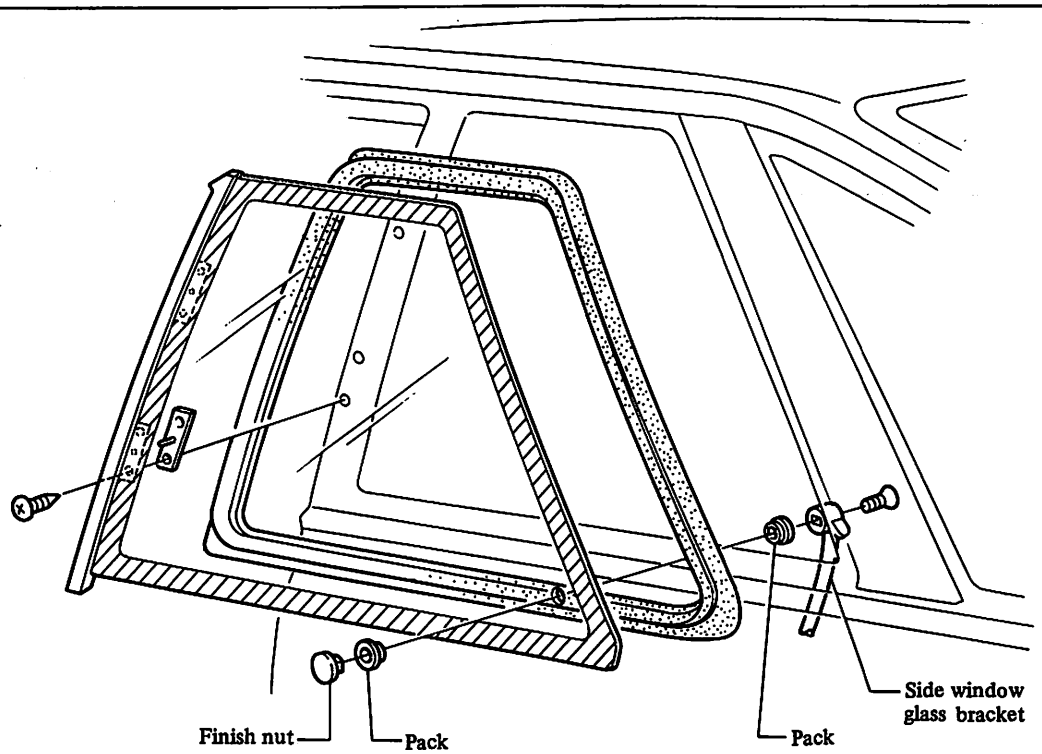


After aligning the holes properly, insert a finish nut in side window hinge hole and side window handle hole.

SBF780A

SIDE WINDOW (Coupe)

REMOVAL AND INSTALLATION

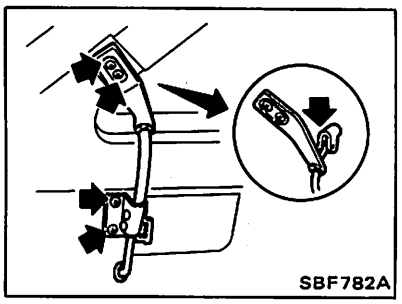


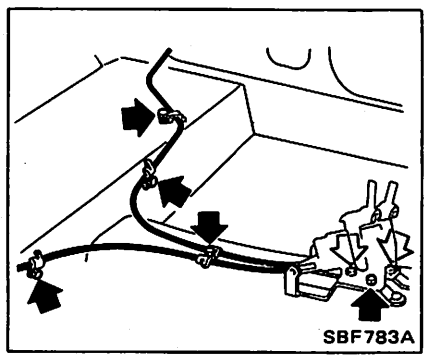
After aligning the holes properly, insert finish nut in side window glass bracket hole.

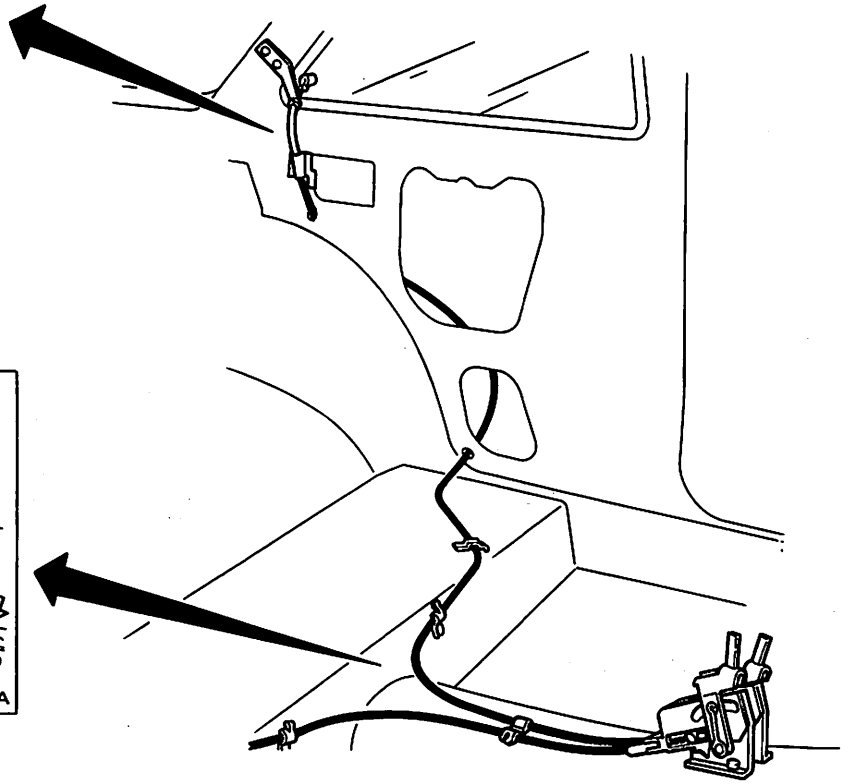
SBF781A

SIDE WINDOW OPENER

REMOVAL AND INSTALLATION



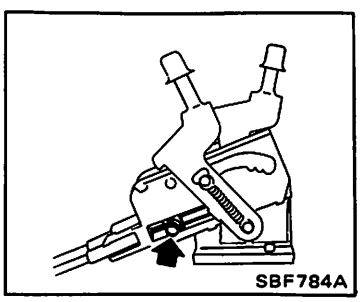




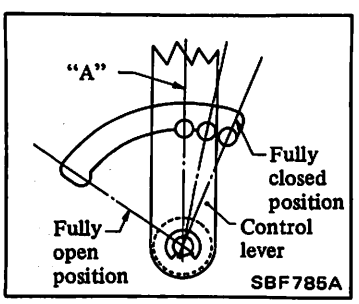
SBF786A

Adjustment

1. Loosen screw securing control wire end.



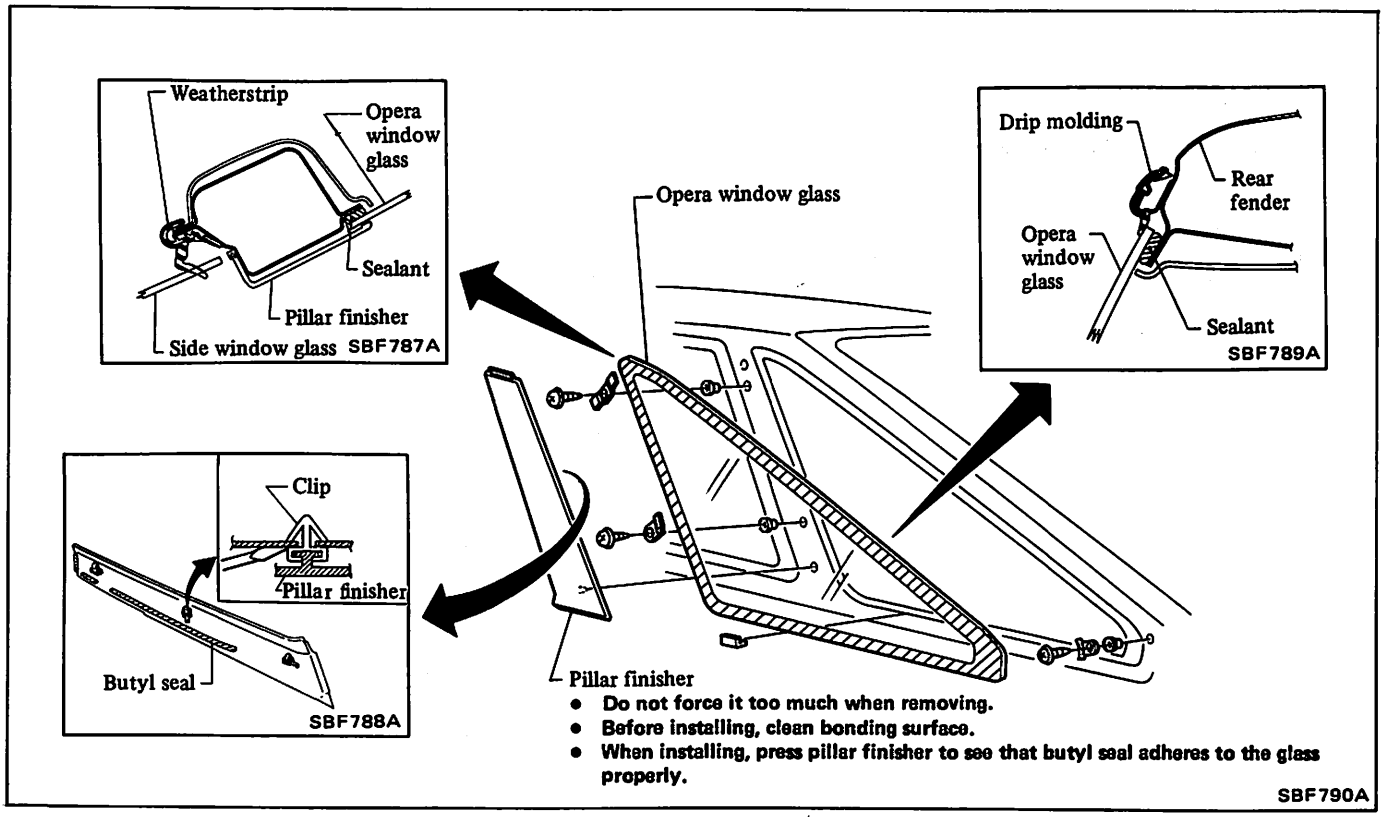
2. Set control lever to position "A" while side window is lightly touching weatherstrip, then tighten screw to secure control wire end.



OPERA WINDOW (Coupe)

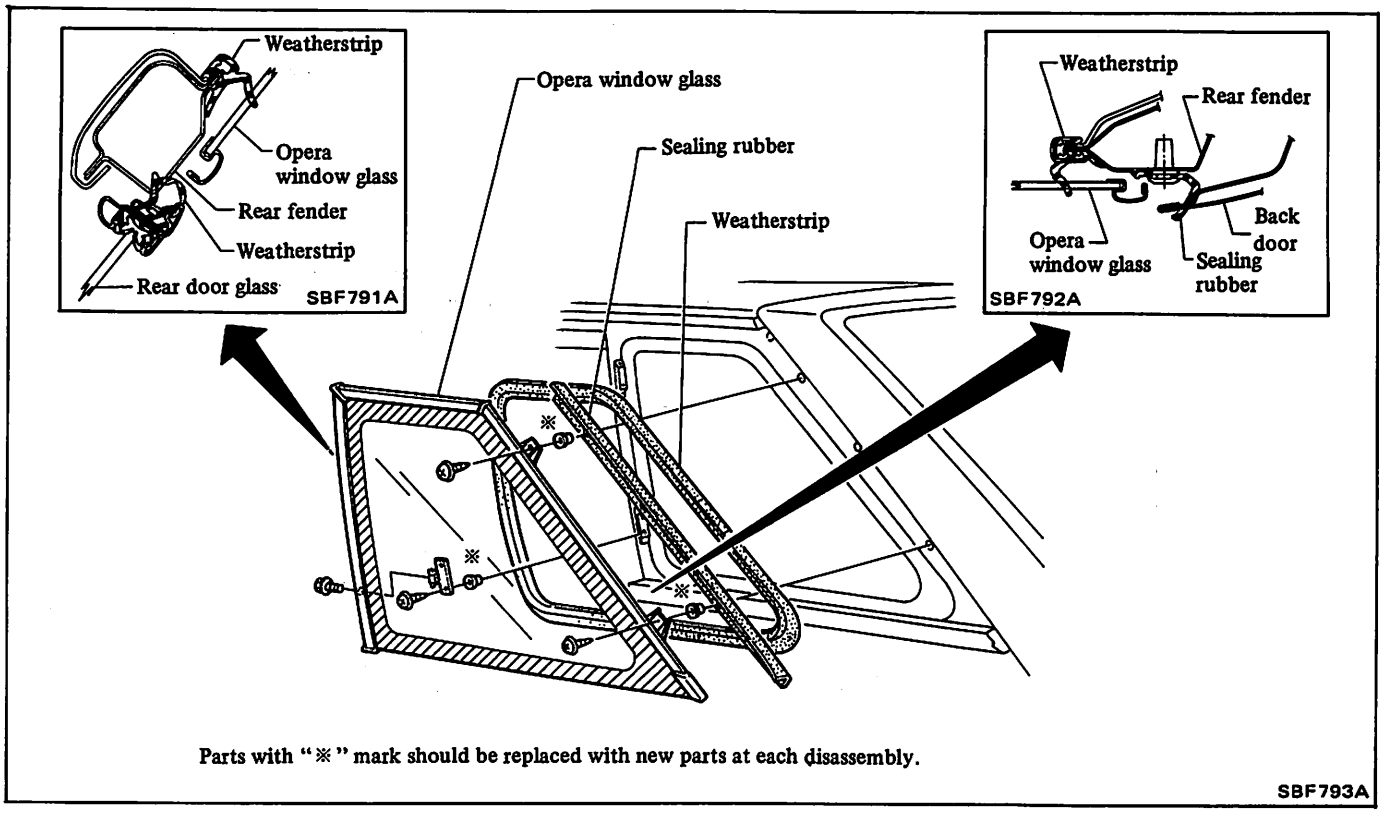
REMOVAL AND INSTALLATION

Remove and install opera window in the same way as back door window (Wagon).



OPERA WINDOW (Wagon)

REMOVAL AND INSTALLATION

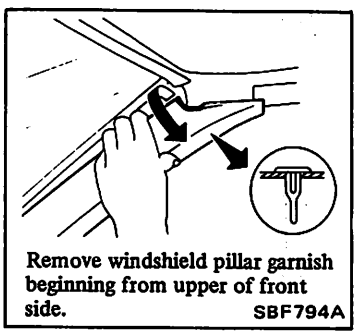


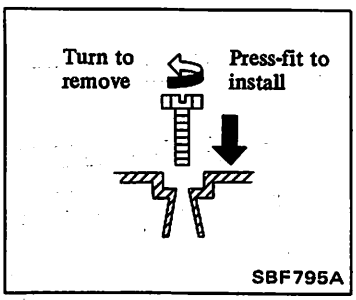
TRIM AND MOLDING

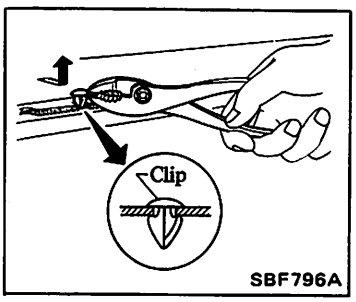
BODY SIDE TRIM

CAUTION: Body side trim is made of plastic so do not use excessive force.

REMOVAL AND INSTALLATION





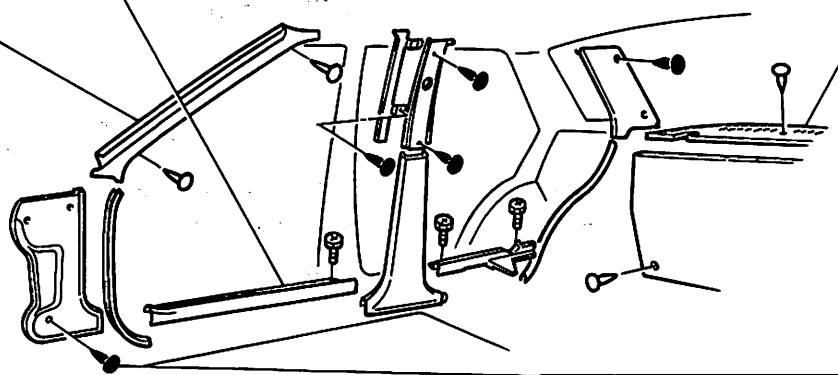


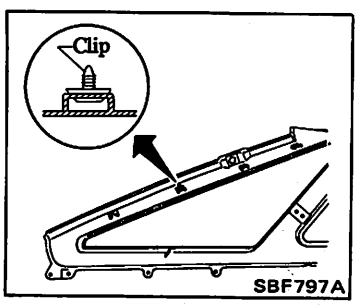
Kicking plate

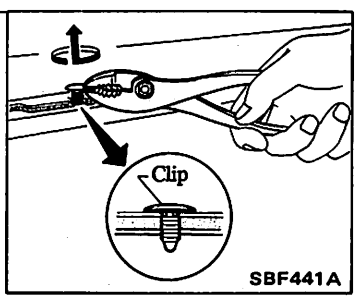
Rear parcel trim

Sedan

Windshield pillar garnish







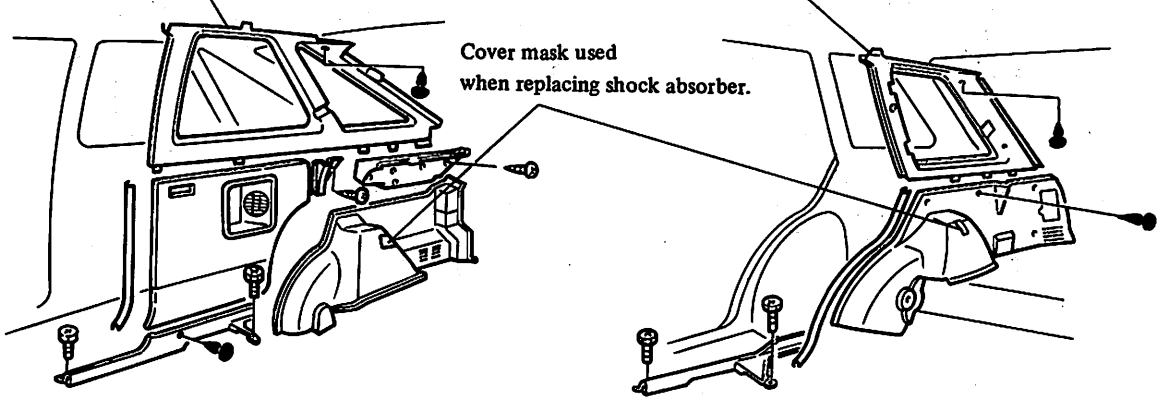
Luggage upper finisher

Coupe

Wagon

Luggage upper finisher

Cover mask used when replacing shock absorber.

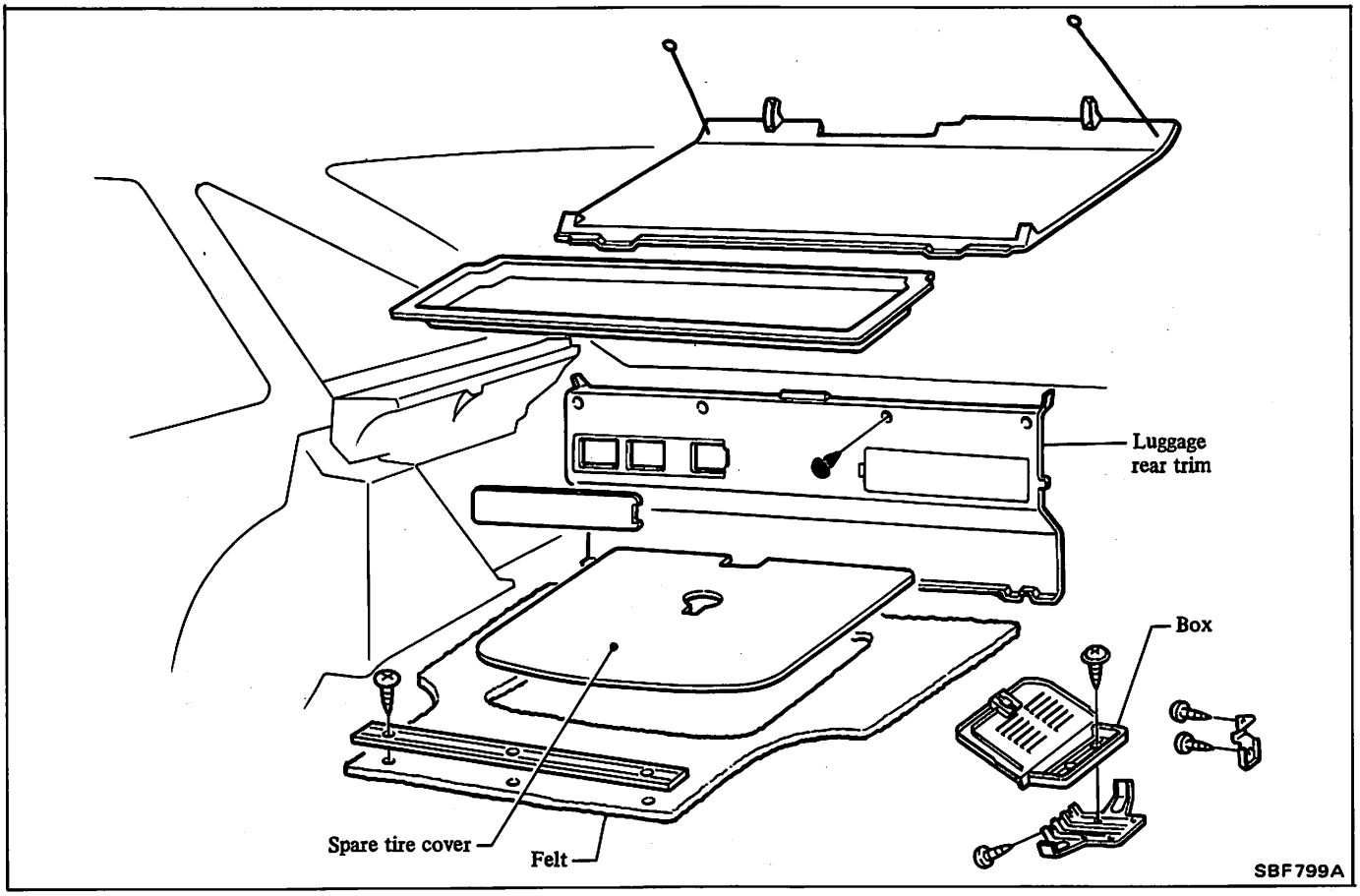


SBF798A

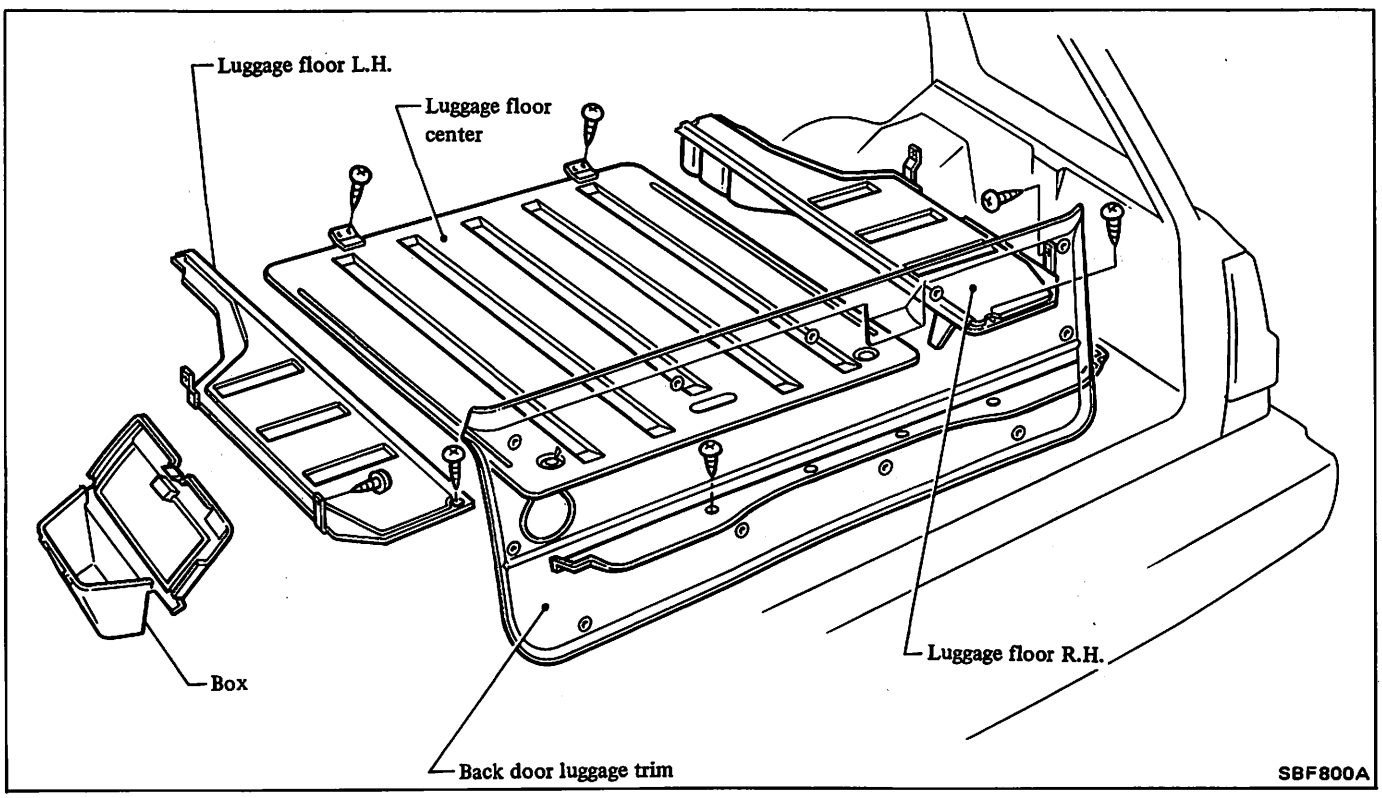
LUGGAGE ROOM TRIM

REMOVAL AND INSTALLATION

Coupe

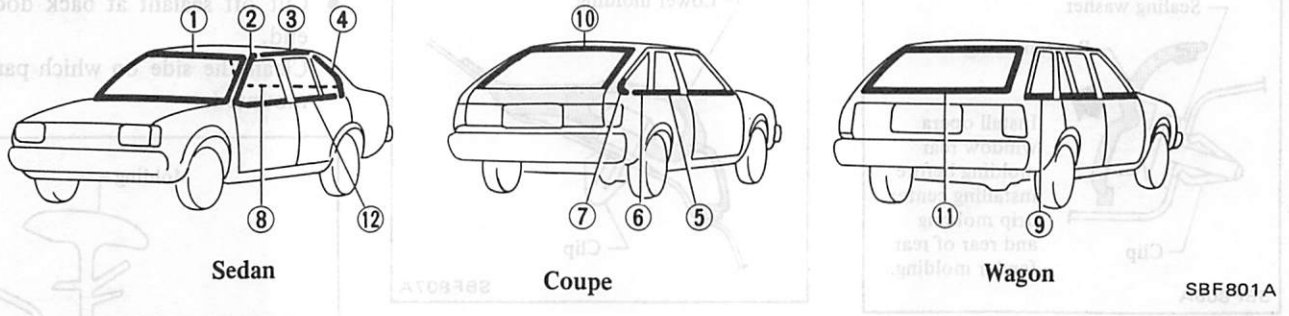


Wagon



MOLDING

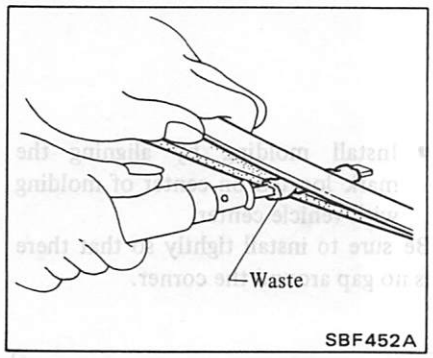
REMOVAL AND INSTALLATION



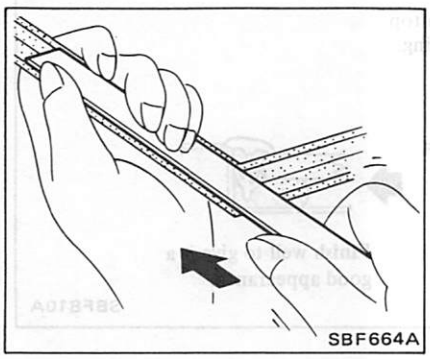
Sedan Coupe Wagon

① Windshield molding

Removal

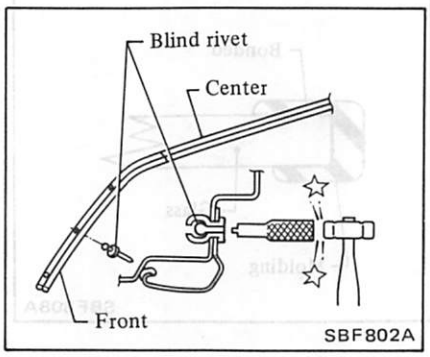


Installation



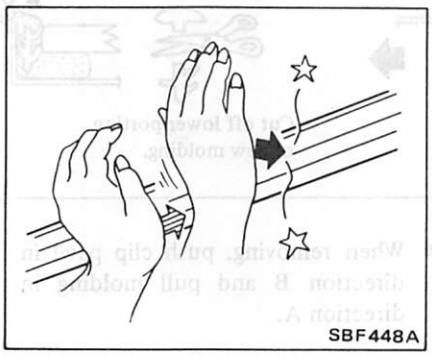
- **It is preferable to install glass after mounting molding on weatherstrip.**
- **When replacing molding with glass attached, be careful not to deform molding or scratch weatherstrip.**
- **To make installation easier, apply soapy water to the groove in the weatherstrip molding.**

② Front drip molding



- If rivet projects out after installing molding, file it down with a file or suitable tool.

③ Center drip molding



Sedan:

- Install center drip molding by aligning drip channel cutout on the body with front end of molding.

Coupe:

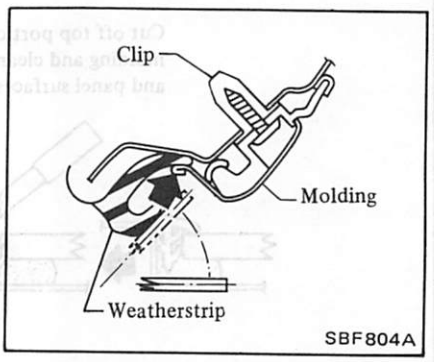
- Install center drip molding by aligning end of opera window rear molding and rear end of center drip molding.

Wagon:

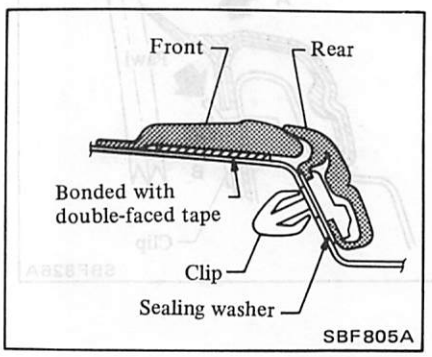
- Install center drip molding starting from molding rear end by keeping enough clearance between back door and molding.

④ Rear drip molding

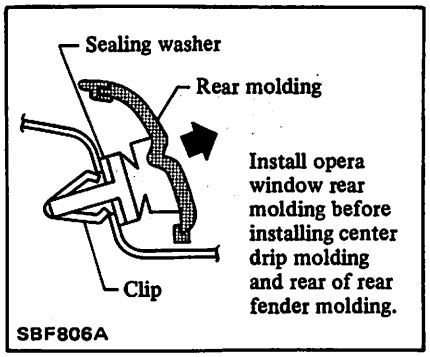
- For 4-door Sedan, follow the same procedures as for "Front drip molding".
- 2-Door sedan.



⑤ ⑥ Front and rear of rear fender molding



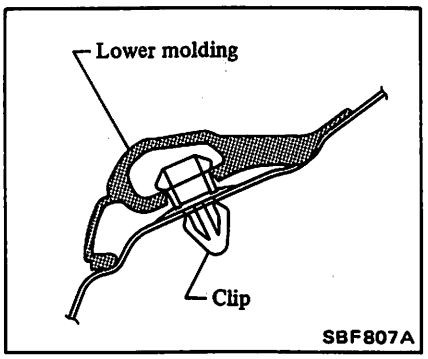
⑦ Opera window rear molding



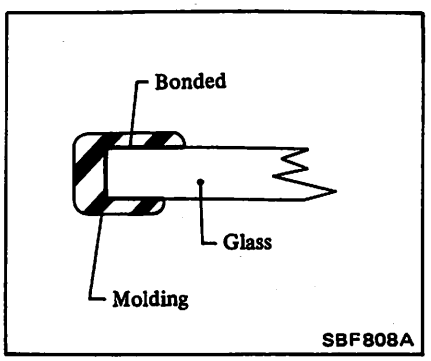
⑧ Rear window molding

- Follow the same procedures as for "Windshield molding".

⑨ Opera window lower molding

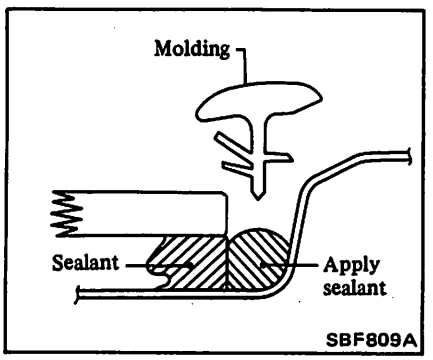


⑩ Back door window molding (Coupe)



⑪ Back door window molding (Wagon) — Method 1

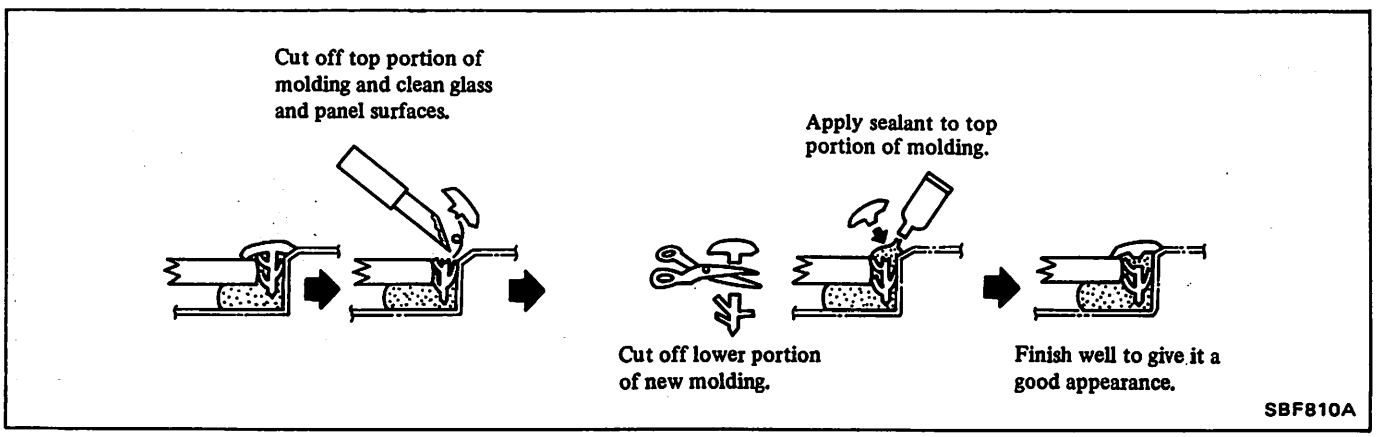
- Cut off sealant at back door glass end.
- Clean the side on which panel was mounted.



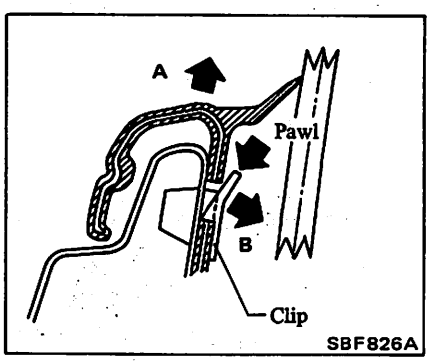
- Install molding by aligning the mark located on center of molding with vehicle center.

Be sure to install tightly so that there is no gap around the corner.

Method 2



⑫ Door molding

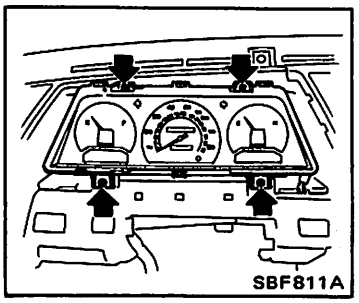


- When removing, push clip pawl in direction B and pull molding in direction A.

INSTRUMENT AND SEAT

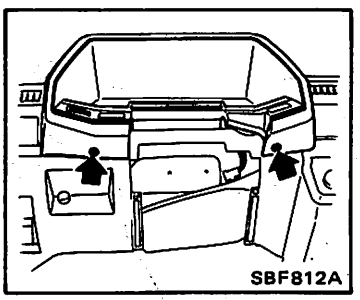
INSTRUMENT

REMOVAL AND INSTALLATION

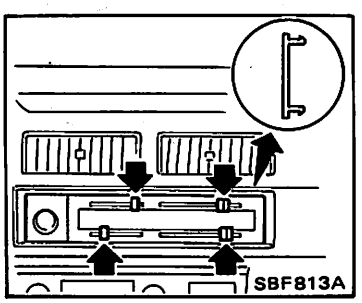

SBF811A

Combination meter

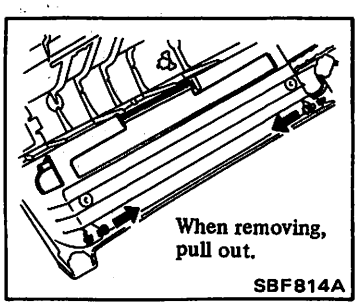
Cluster lid A


SBF812A

Heater control

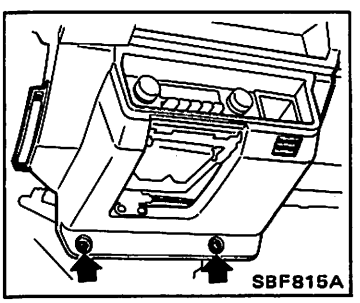

SBF813A

Glove box



SBF814A

Cluster lid C


SBF815A

Be sure to remove the following parts.

- Choke control cable
- Harness connectors
- Hood lock control cable
- Speedometer cable
- Radio feeder cable

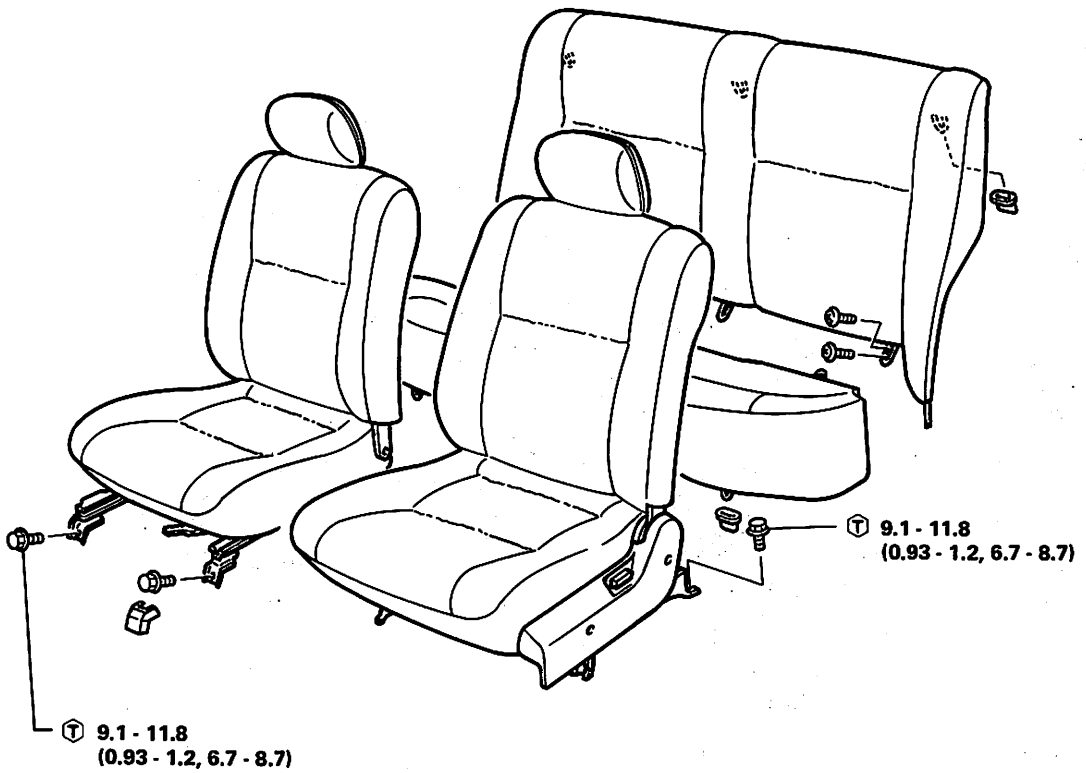
SBF816A

SEAT

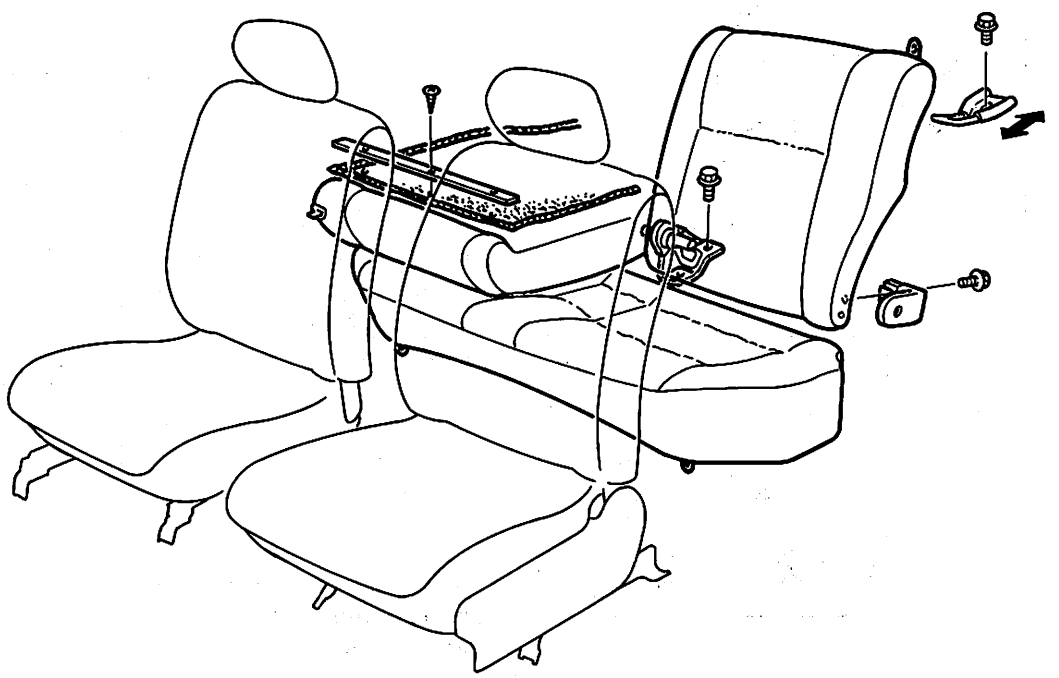
REMOVAL AND INSTALLATION

CAUTION:
Be sure to remove the thin polyethylene covers:
1) Pre-delivery service
2) Parts replacements

Sedan



Coupe and Wagon



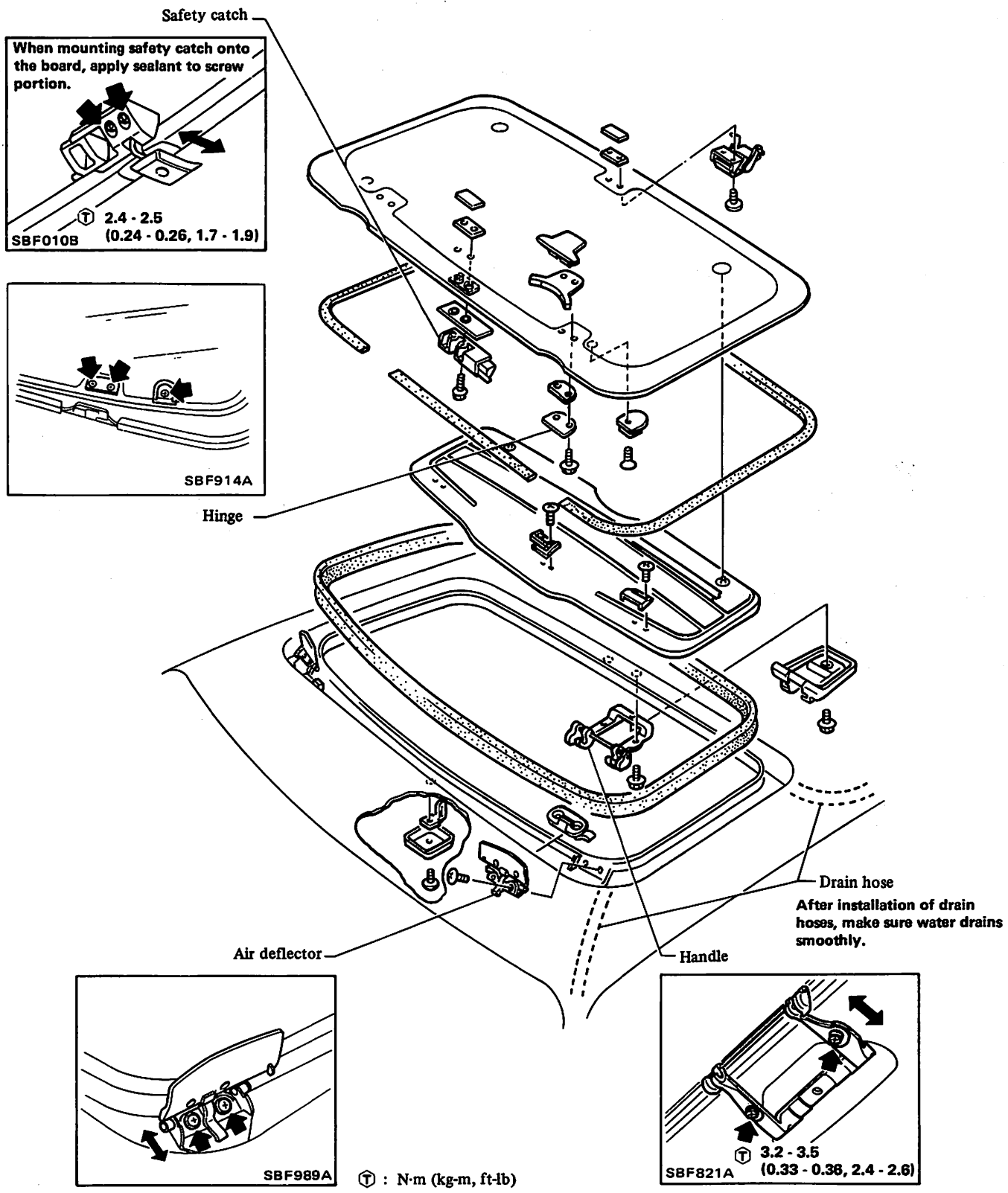
Ⓣ : N·m (kg-m, ft-lb)

SBF817A

SUN ROOF

SUN ROOF

REMOVAL AND INSTALLATION

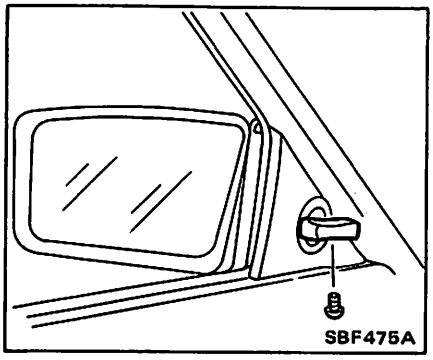


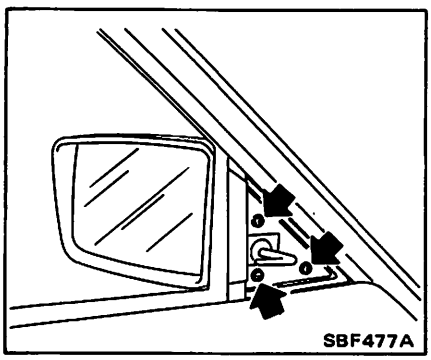
SBF009B

MIRROR

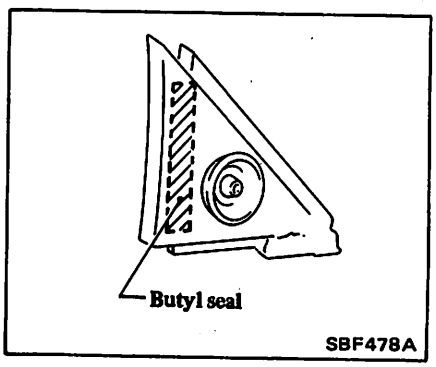
DOOR MIRROR

REMOVAL AND INSTALLATION





Apply a coat butyl seal to rear surface of finisher door corner during installation to prevent water leakage.

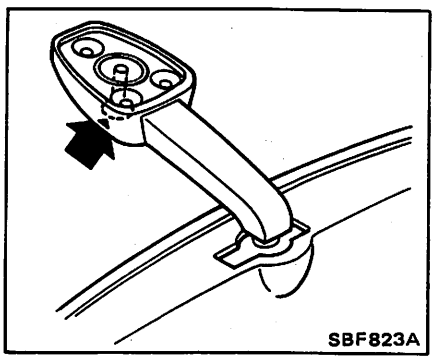


INSIDE MIRROR

STANDARD MODEL

Replacement of broken mirror base:

1. Remove all broken pieces of base from roof rail.
2. Clean any pieces of base from stay.

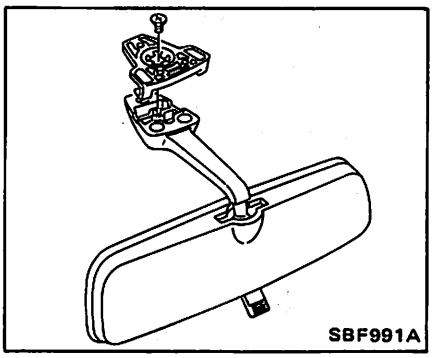


3. Position new base on stay.
4. Install inside mirror assembly on roof rail.

DELUXE MODEL

When spring plate of mirror base can be used

1. Remove mirror base from roof rail.
2. Remove connecting screw from stay.
3. Assemble mirror base and stay.



4. Install inside mirror assembly on roof rail.

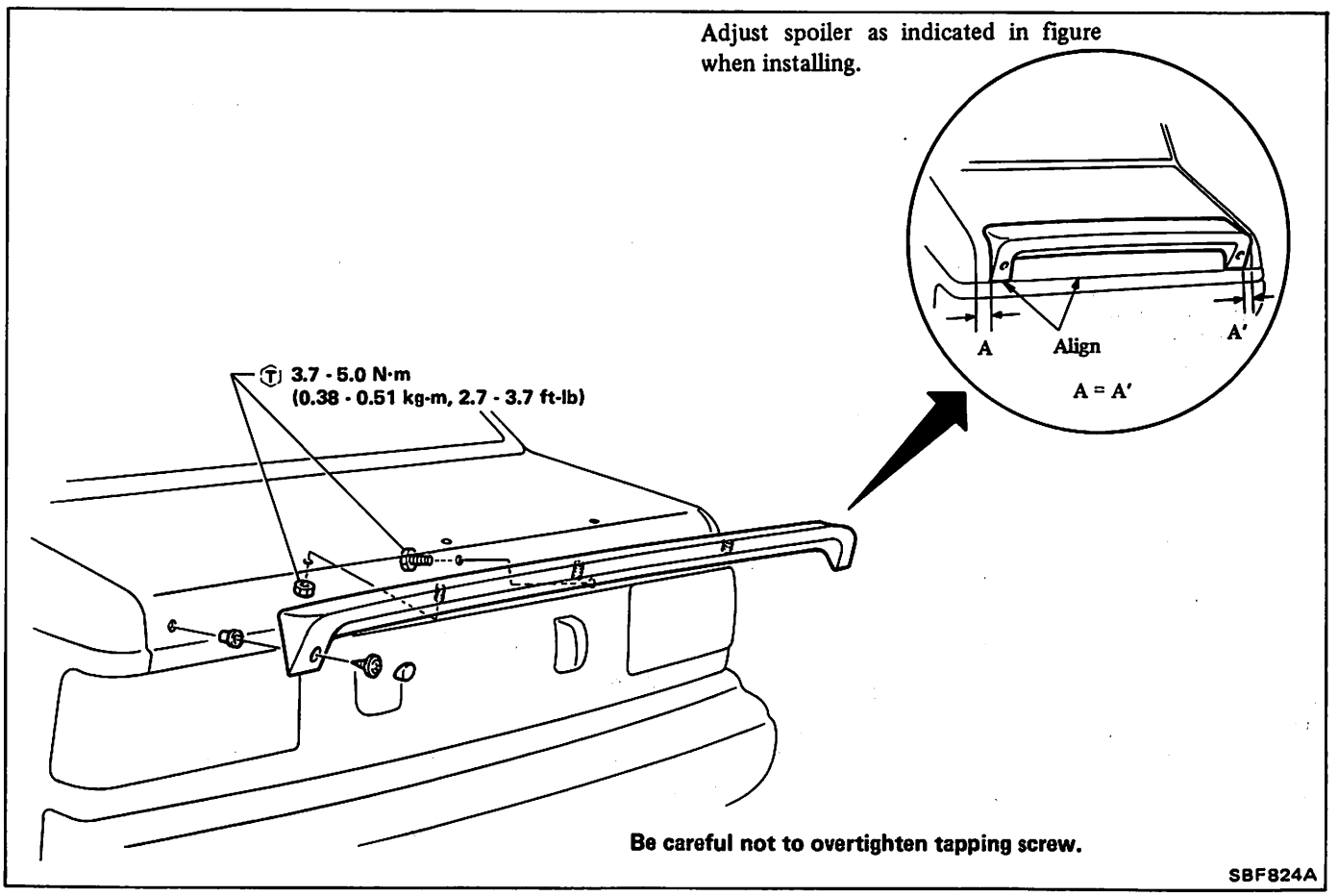
When spring plate of mirror base cannot be used

Replace mirror base.

REAR SPOILER

REAR SPOILER

REMOVAL AND INSTALLATION



BODY ALIGNMENT

DESCRIPTION

DIMENSION LINES

All dimensions indicated in the drawings/illustrations are the standard design values.

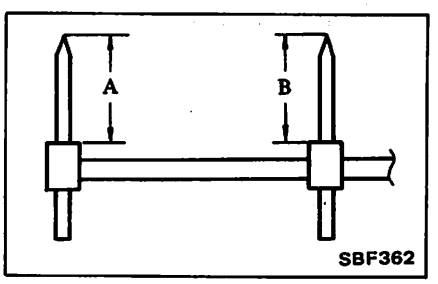
1. Thin dimension line – Indicates a distance from a phantom line of the vehicle body to a point to be measured and cannot be measured with a measuring tape or tram tracking gauge.
2. Thick dimension line – Indicates a direct (or an actual) distance or length between two points and can be measured with a measuring tape or tram tracking gauge.

MEASUREMENT OPERATIONS

When vehicle body measurements are taken in accordance with the thick line, careful consideration should be given to the following points.

1. Measurement method

(1) When a tram tracking gauge is used, adjust pointers (A) and (B) to equal lengths as shown in the figure below. Check the pointers and gauge itself to make sure there is no free play.



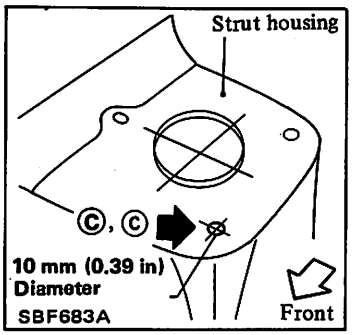
(2) When a measuring tape is used, check to be sure there is no elongation, twisting or bending.

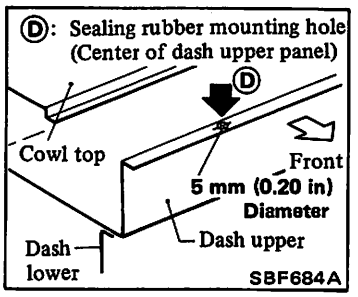
If a part or parts of the vehicle body interferes with measurement when using the measuring tape, you cannot measure the distance of length accurately.

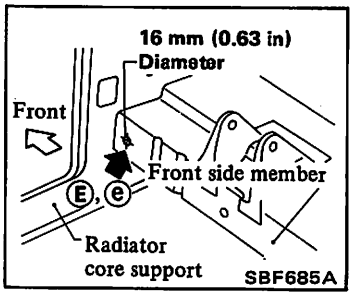
2. Measurement point

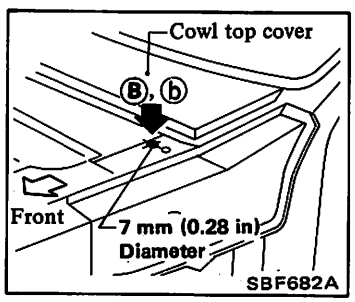
Measurements should be taken at the center of mounting holes.

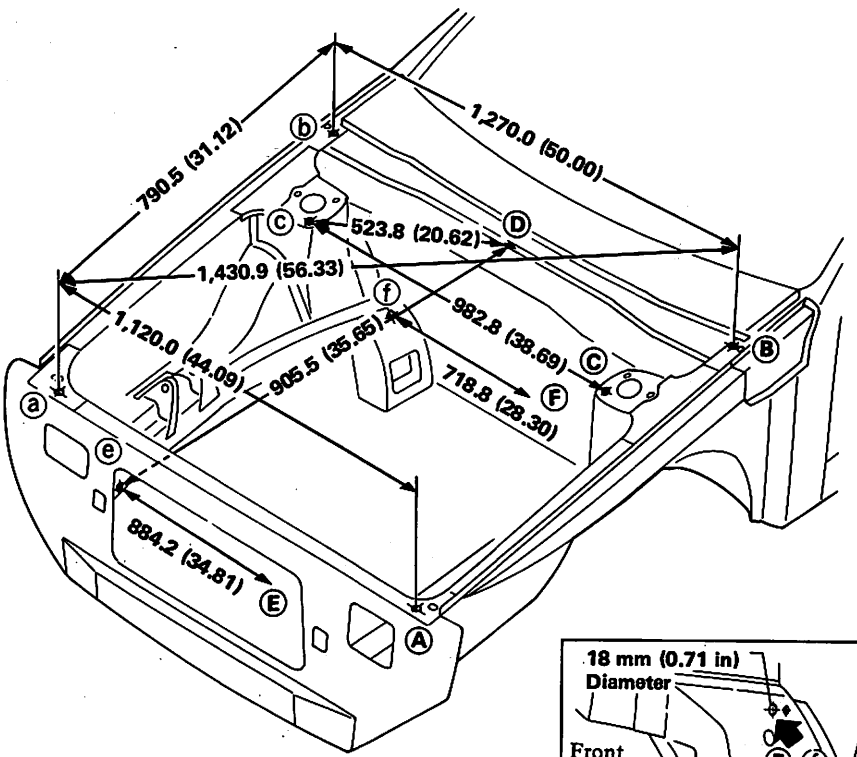
ENGINE COMPARTMENT

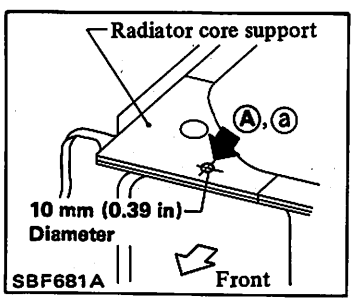


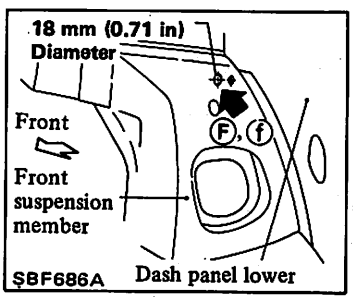








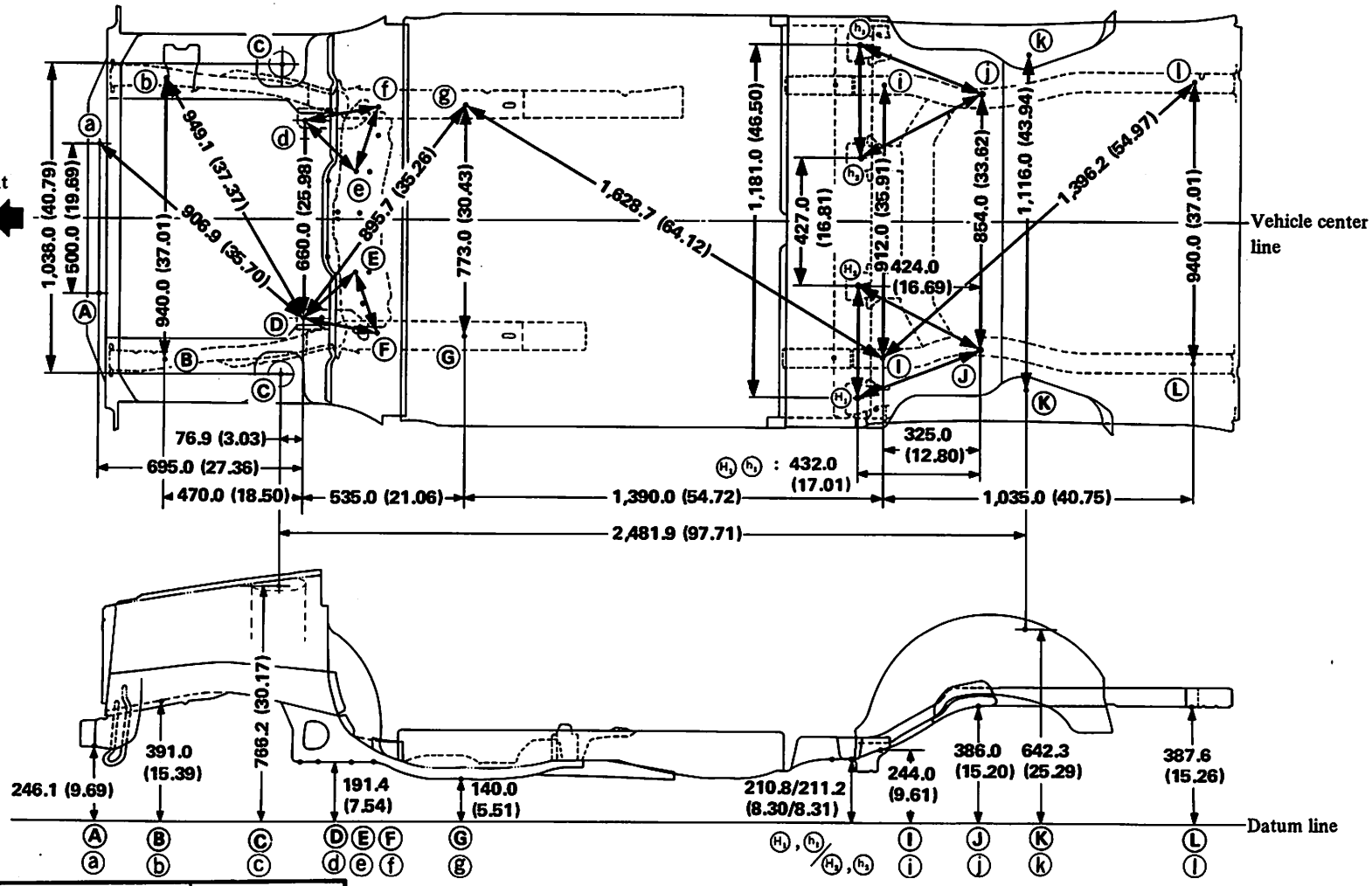




Measuring points	Measurement	
	mm	in
Ⓓ - ⓕ , Ⓓ - Ⓕ	520.5	20.49
Ⓔ - Ⓕ , ⓔ - ⓕ	668.9	26.33
Ⓔ - ⓕ , ⓔ - Ⓕ	1,040.7	40.97

Unit: mm (in)

SBF680A



Measuring point	Measurement mm (in)
Ⓓ - Ⓔ	230.9 (9.09)
ⓓ - ⓔ	242.5 (9.55)
Ⓔ - Ⓕ	214.8 (8.46)
ⓔ - ⓕ	230.8 (9.09)
Ⓓ - Ⓕ , ⓓ - ⓕ	249.7 (9.83)
Ⓗ₁ - Ⓗ₂ , ⓗ₁ - ⓗ₂	377.1 (14.85)
Ⓗ₁ - Ⓙ , ⓗ₁ - ⓙ	494.0 (19.45)
Ⓗ₂ - Ⓙ , ⓗ₂ - ⓙ	505.9 (19.92)

Unit: mm (in)

Ⓐ , ⓐ : Hole for locating at underside of member cross front [14 mm (0.55 in) dia.]
Ⓑ , ⓑ : Hole for locating at underside of member side front [16 mm (0.63 in) dia.]
Ⓒ , ⓒ : Front strut housing center
Ⓓ , ⓓ : Hole for installing transverse link at underside of member front suspension mounting [16 mm (0.63 in) dia.]
Ⓔ , ⓔ : Hole for installing transverse link at underside of member cross dash lower [15 mm (0.59 in) dia.]
Ⓕ , ⓕ : Hole for installing transverse link at underside of extension front side member [14 mm (0.55 in) dia.]
Ⓖ , ⓖ : Hole for locating at underside of extension front side member [16 x 20 mm (0.63 x 0.79 in) dia.]
Ⓗ₁ , ⓗ₁ : Hole at underside of bracket rear suspension mounting outer [11 mm (0.43 in) dia.]
Ⓗ₂ , ⓗ₂ : Hole at underside of bracket rear suspension mounting inner [16 mm (0.63 in) dia.]
Ⓘ , ⓘ : Hole for locating at front end of member side rear [16 mm (0.63 in) dia.]
Ⓙ , ⓙ : Hole for locating at underside of member side rear [14 mm (0.55 in) dia.]
Ⓚ , ⓚ : Upperside rear shock absorber mounting center [14 mm (0.55 in) dia.]
Ⓛ , ⓛ : Hole for locating at rear end of member side rear [13 mm (0.51 in) dia.]

SBF687A

HEATER & AIR CONDITIONER

SECTION HA

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- Fast idle control device (F.I.C.D.) HA-27

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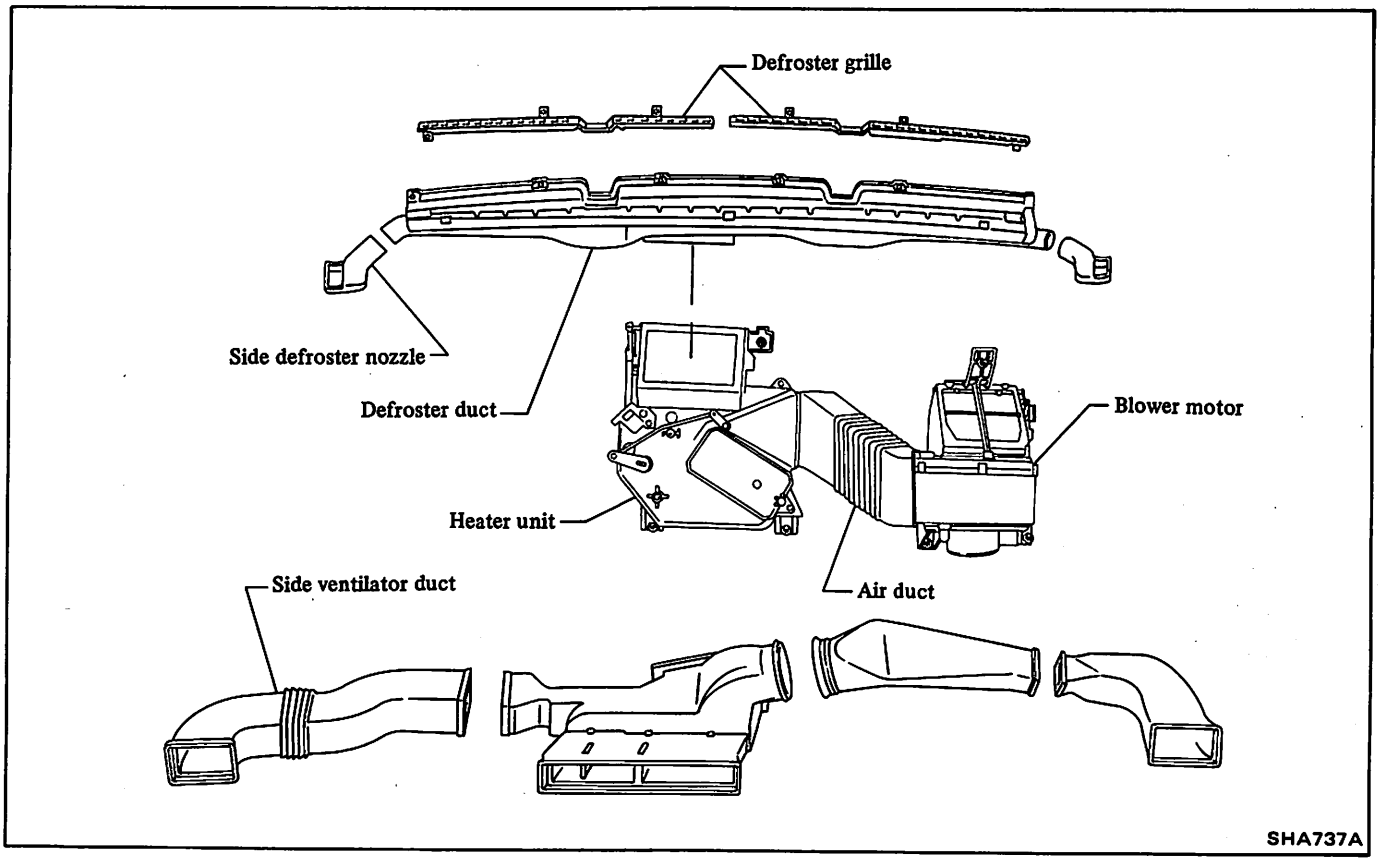
HA

Refer to section MA (Basic Mechanical System) for:

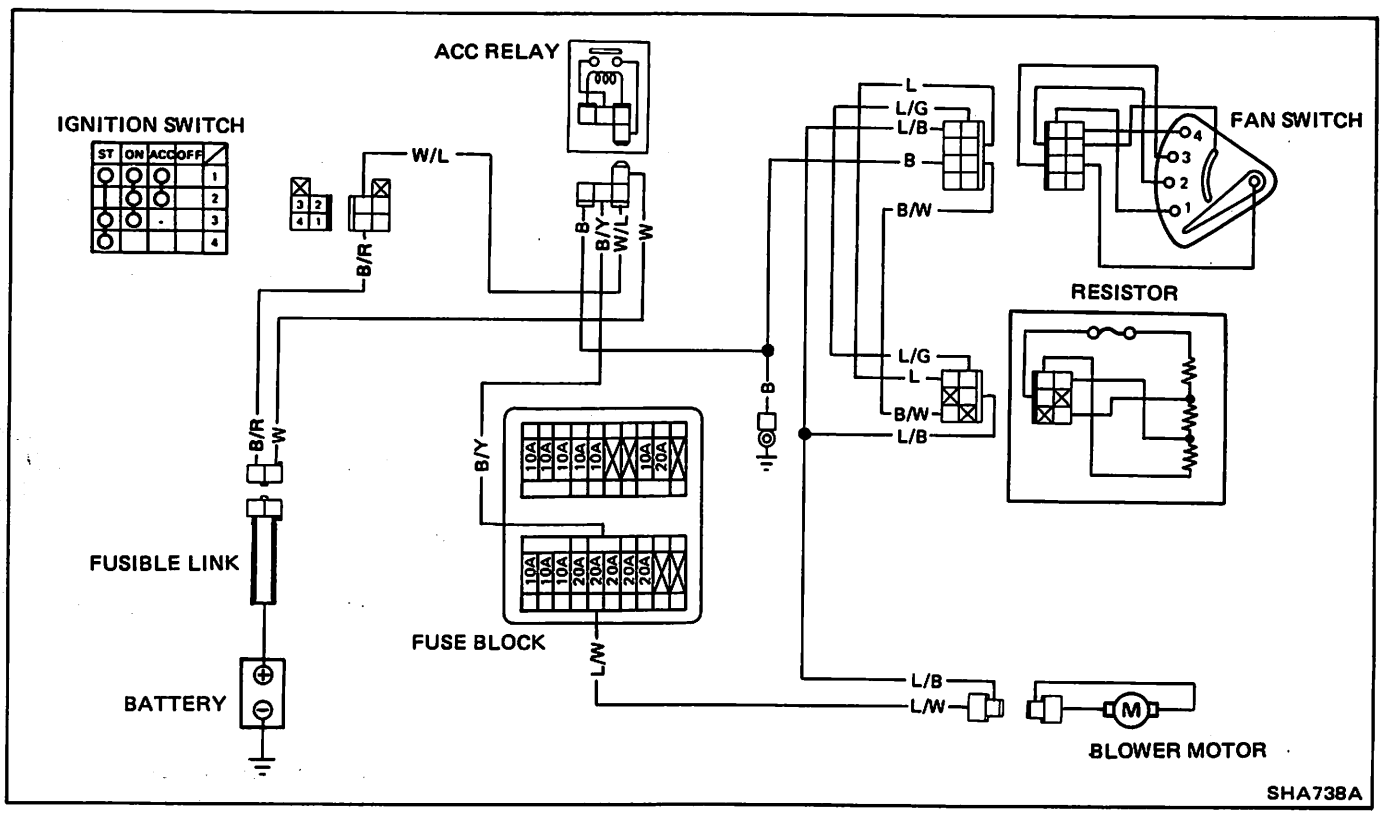
- CHECKING AND ADJUSTING DRIVE BELTS

DESCRIPTION (Heater)

HEATER COMPONENTS

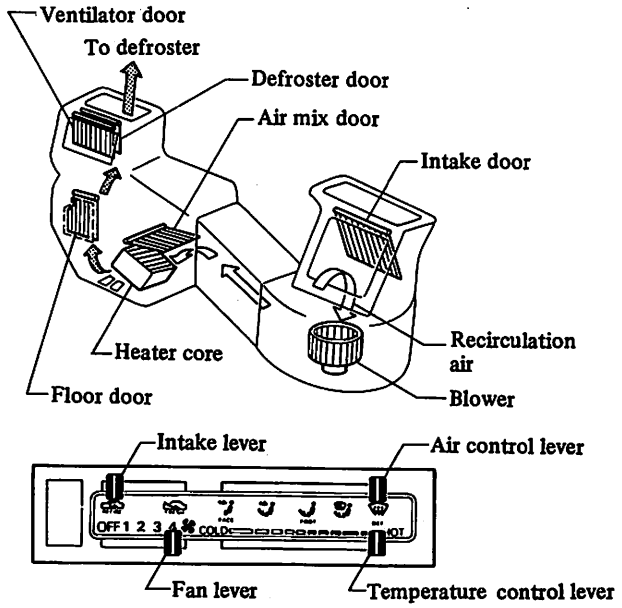


ELECTRICAL DIAGRAM

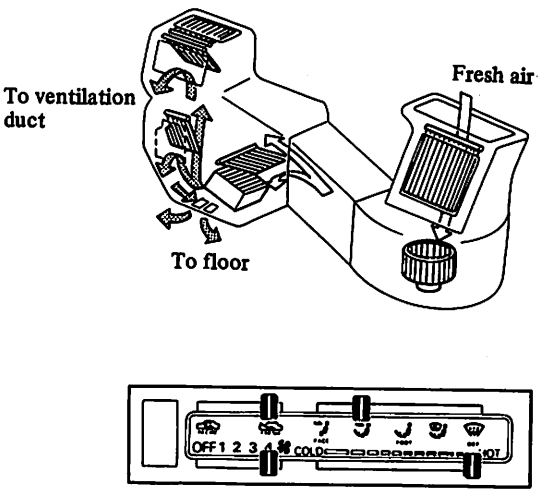


AIR FLOW

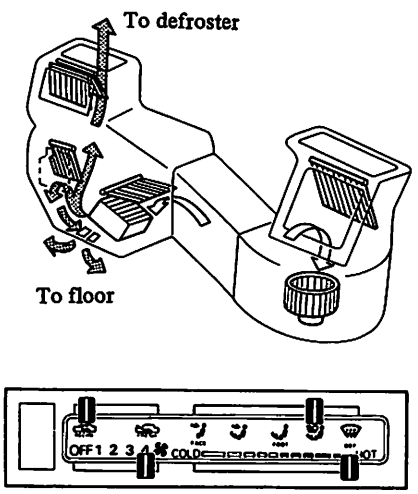
Defroster



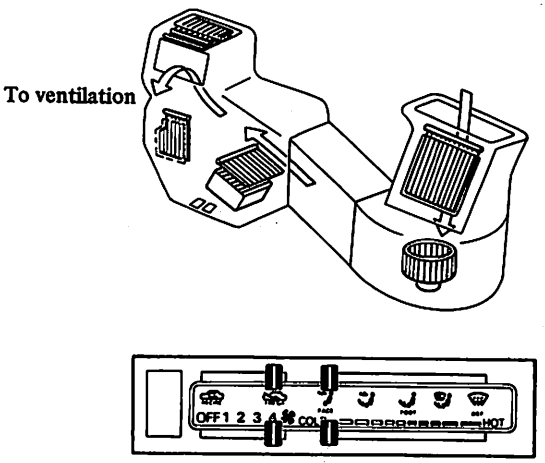
Ventilation and Floor



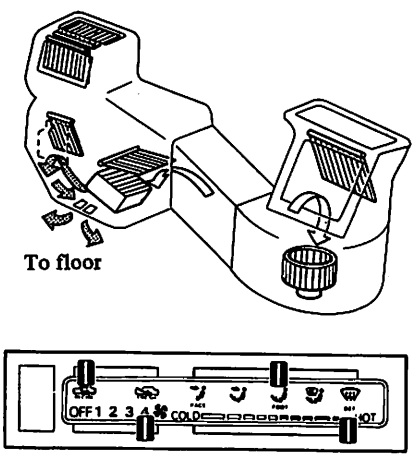
Defroster and Floor



Ventilation



Floor

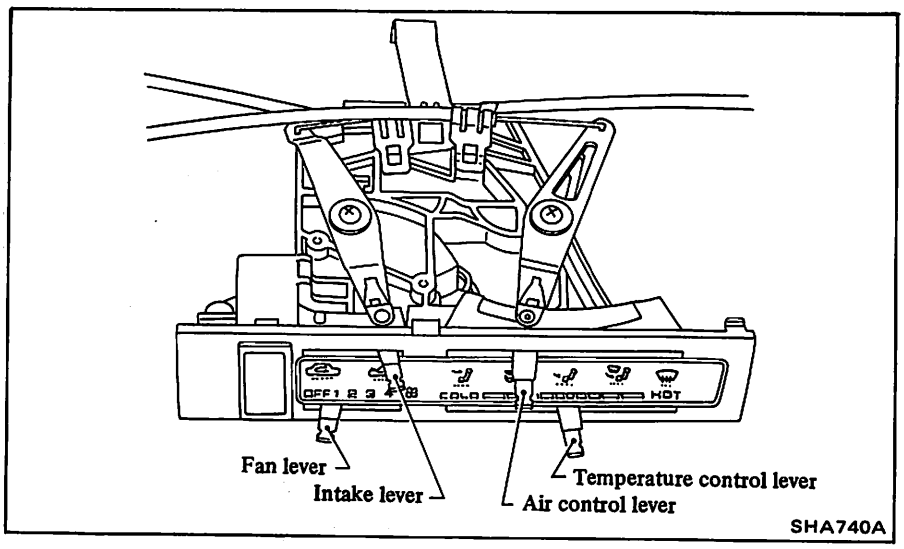


TROUBLE DIAGNOSES AND CORRECTIONS (Heater)

Condition	Probable cause	Corrective action
Insufficient heating performance.		
No heated air discharged.	Cooling water temperature too low.	Check thermostat. Replace as necessary.
	Heater core plugged.	Clean.
	Insufficient cooling water level.	Refill.
	Malfunctioning air mix door.	Adjust control cable.
	Malfunctioning heater cock.	Adjust control cable. Check heater cock. Replace as necessary.
Insufficient air flow to floor.	Blower motor speed too low.	Check motor terminal voltage. Repair poor connection and discontinuity. Replace motor if necessary.
	Malfunctioning floor door.	Adjust control cable.
	Malfunctioning door control cable and lever.	Replace as necessary.
Insufficient defrosting performance.		
Cold air discharged.	Refer to "No heated air discharged".	
Insufficient air flow to defroster.	Malfunctioning defroster door (or faulty seal).	Adjust control cable.
	Malfunctioning door control cable and lever.	Replace as necessary.
	Defroster nozzle plugged.	Clean.
	Leak at defroster duct-to-nozzle connection.	Correct.
Air does not discharge from correct outlets.	Defroster, vent or floor door sticking.	Repair.
Blower motor does not operate.	Refer to Trouble Diagnoses and Corrections (Air conditioner).	
Control lever drags.	Inner wire rubbing against outer case end.	Adjust control cable.
	Control cable bent excessively.	Correct.
	Malfunctioning doors, door levers, etc.	Check and correct.
Outside air comes in with REC position.	Air intake door not operating properly.	Repair or replace.
	Malfunctioning door control cable and lever.	Replace as necessary.
	Control cable out of adjustment.	Adjust control cable.
Noise from blower motor.	Loose bolt in blower motor.	Check and tighten.
	Broken fan blade(s).	Replace fan.

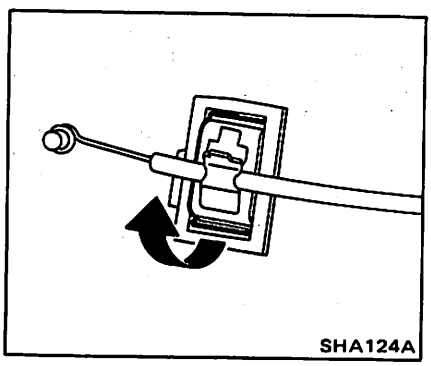
SERVICE PROCEDURES (Heater)

HEATER CONTROL ASSEMBLY

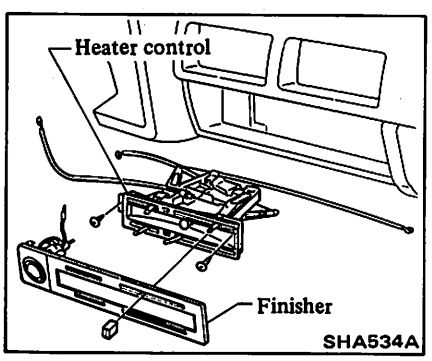


REMOVAL AND INSTALLATION

1. Remove control cables by unfastening clamps at door levers.



2. Disconnect harness connector.
3. Remove heater control finisher and mounting bolts, and remove heater control assembly.

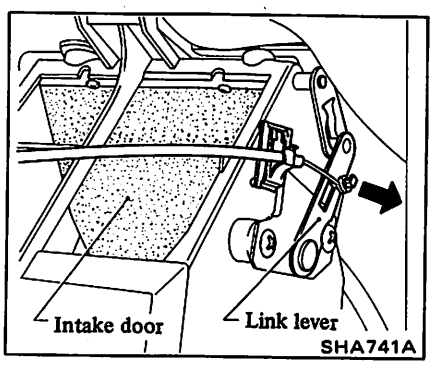


4. Installation is in the reverse order of removal.

ADJUSTMENT

Intake door control cable

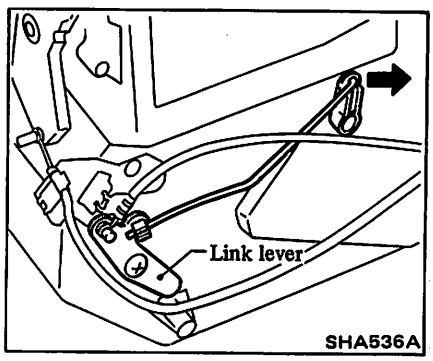
1. Set intake lever at "RECIRC" position.
2. Set intake door at recirculation position.
3. Connect control cable to link lever and securely clamp the cable.



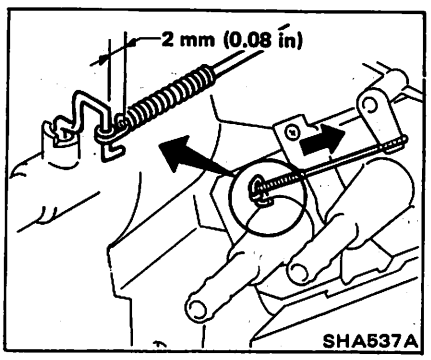
4. Check knob to see if it moves smoothly.

TEMP. control cable

1. Set TEMP. control lever at max. "COLD POSITION".
2. With air mix door knob moved in direction of arrow, connect TEMP. control rod to link lever.
3. Connect control cable to link lever and clamp the cable.



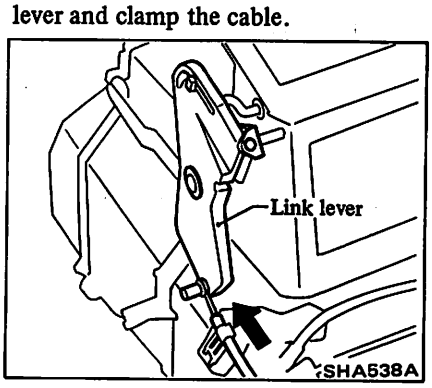
4. Pull control rod of water cock in direction of arrow so as to make clearance of about 2 mm (0.08 in) between ends of rod and link lever and connect the rod to door lever.



5. Check knob to see if it moves smoothly.

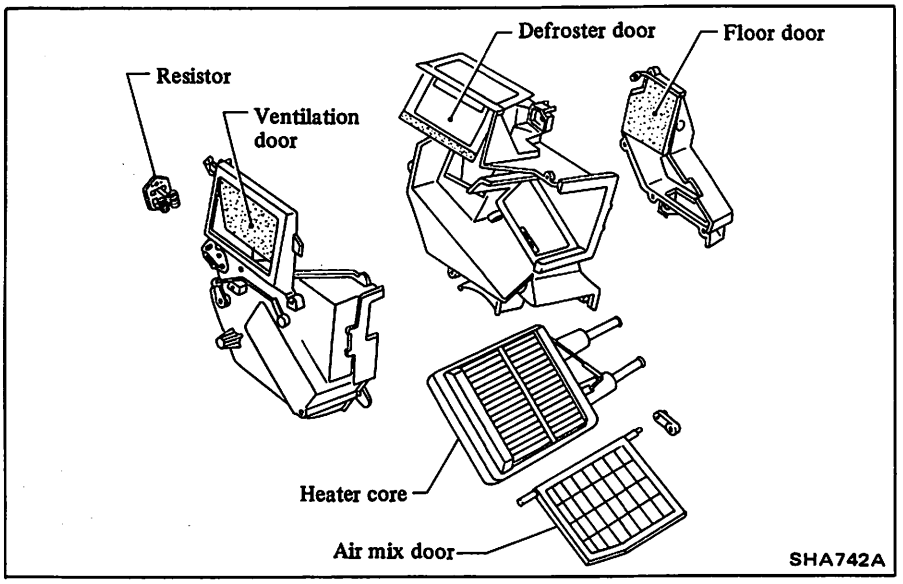
Air control cable

1. Set air control lever at "DEF" position.
2. Move link lever in direction of arrow.
3. Connect air control cable to link lever and clamp the cable.



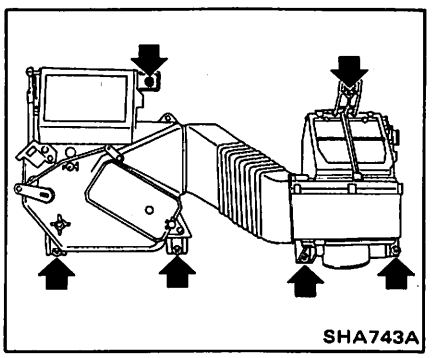
4. Check knob to see if it moves smoothly.

HEATER UNIT



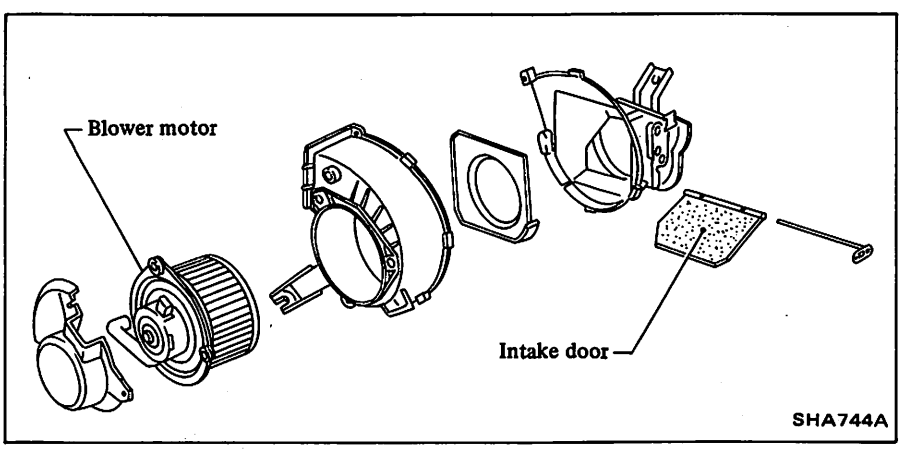
REMOVAL AND INSTALLATION

1. Set TEMP. lever to max. "HOT" position and drain engine coolant.
2. Disconnect heater hoses at engine compartment.
3. Remove instrument assembly. Refer to BF section.
4. Remove heater control assembly.
5. Remove heater unit assembly.



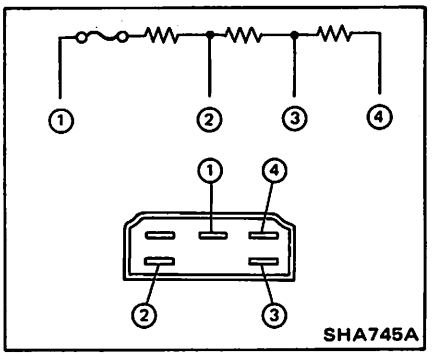
6. Installation is in the reverse order of removal.

BLOWER MOTOR



RESISTOR

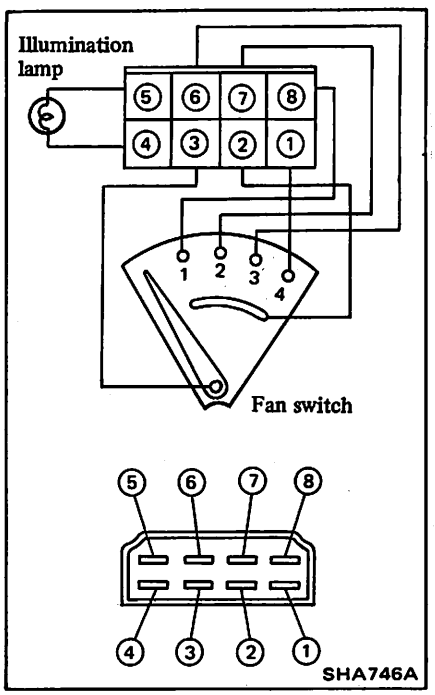
INSPECTION



FAN SWITCH

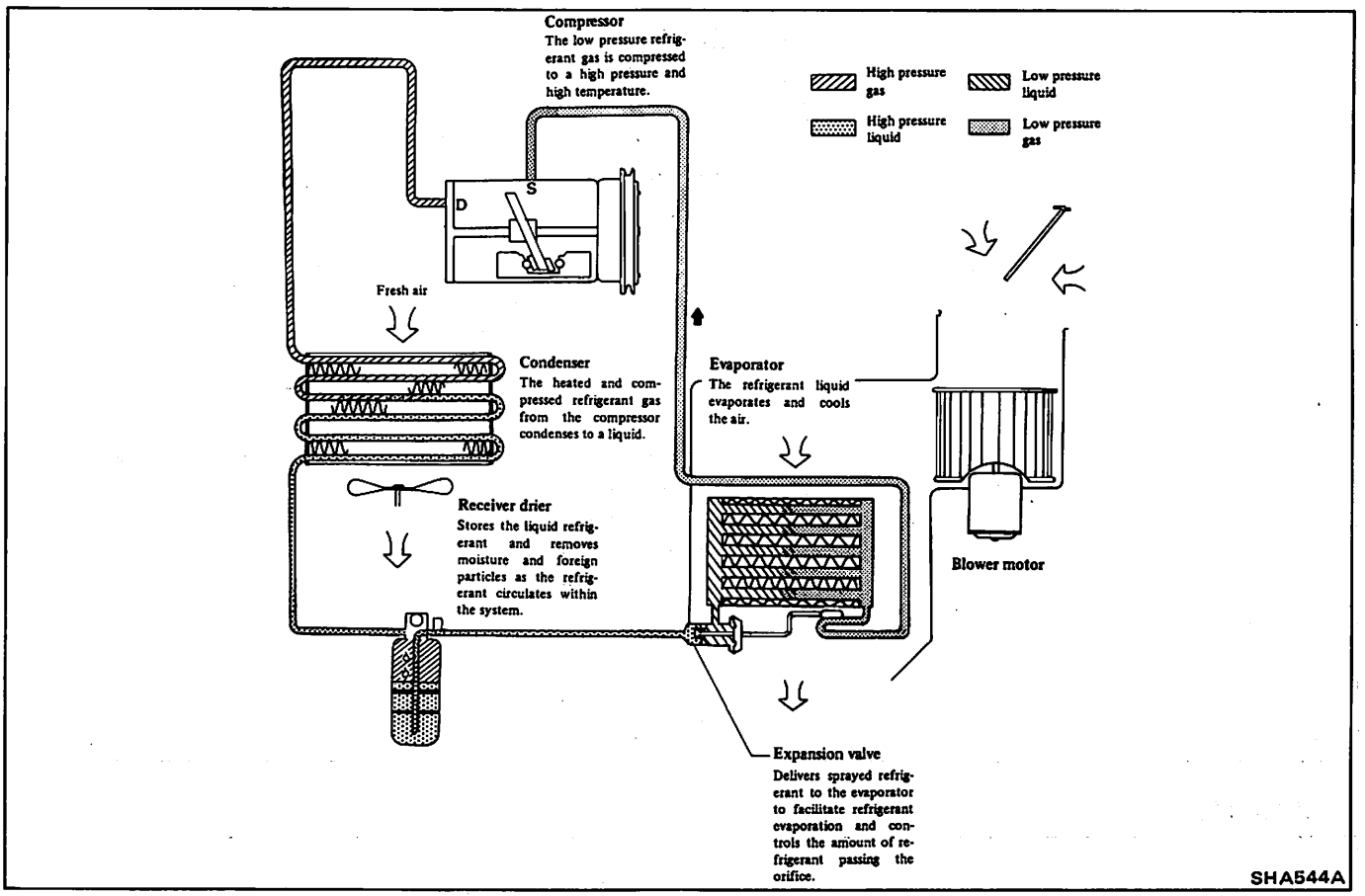
INSPECTION

Check to make sure that continuity exists at each position of fan switch.

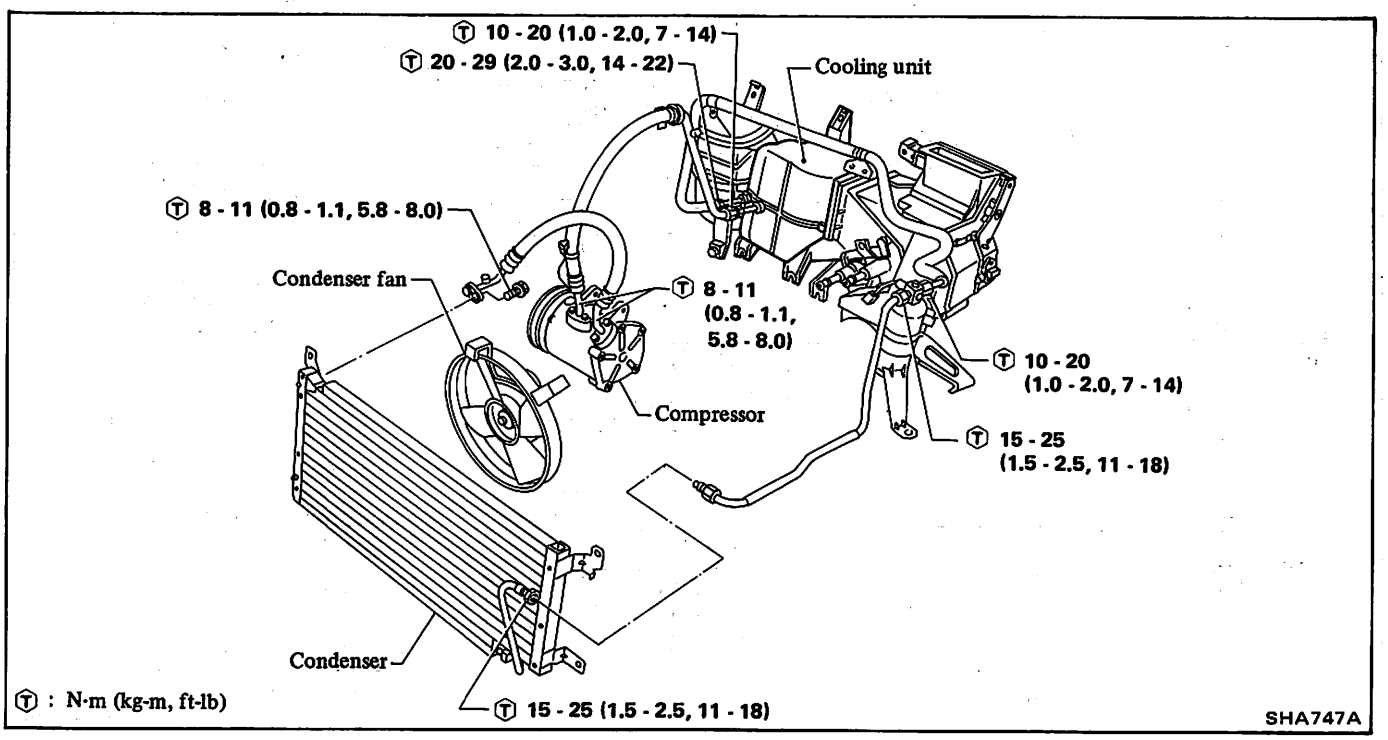


DESCRIPTION

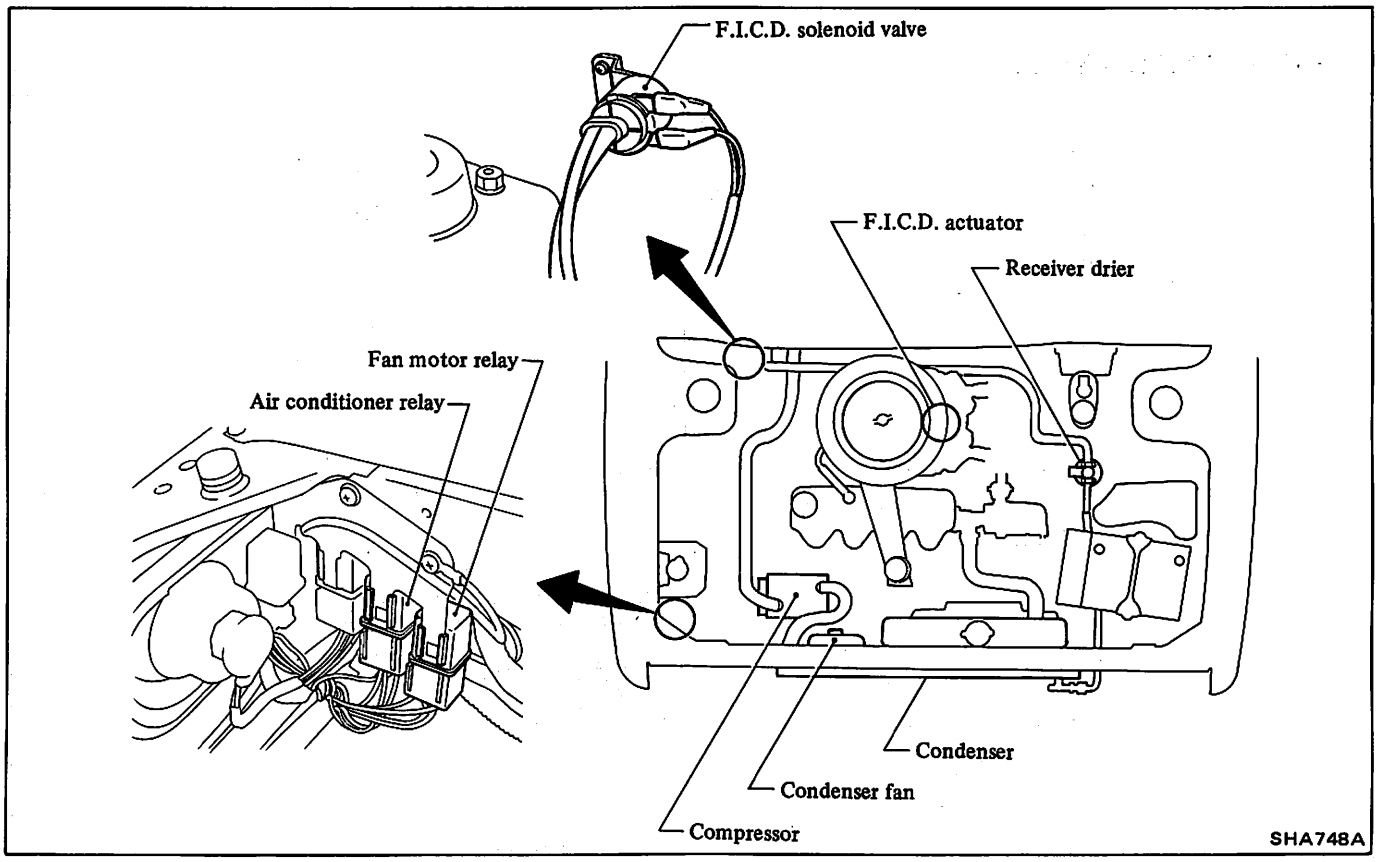
REFRIGERATION CYCLE



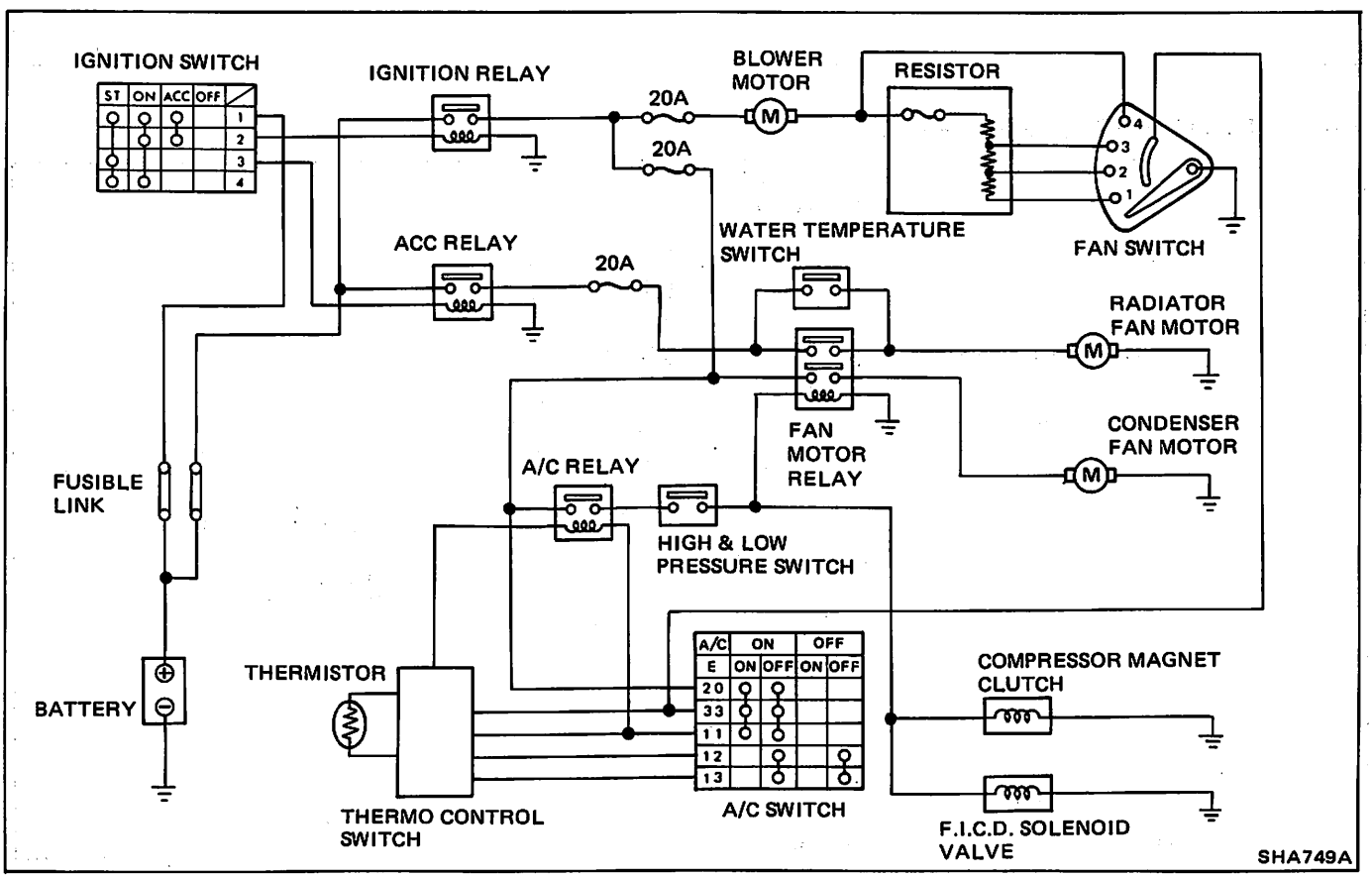
AIR CONDITIONER COMPONENTS



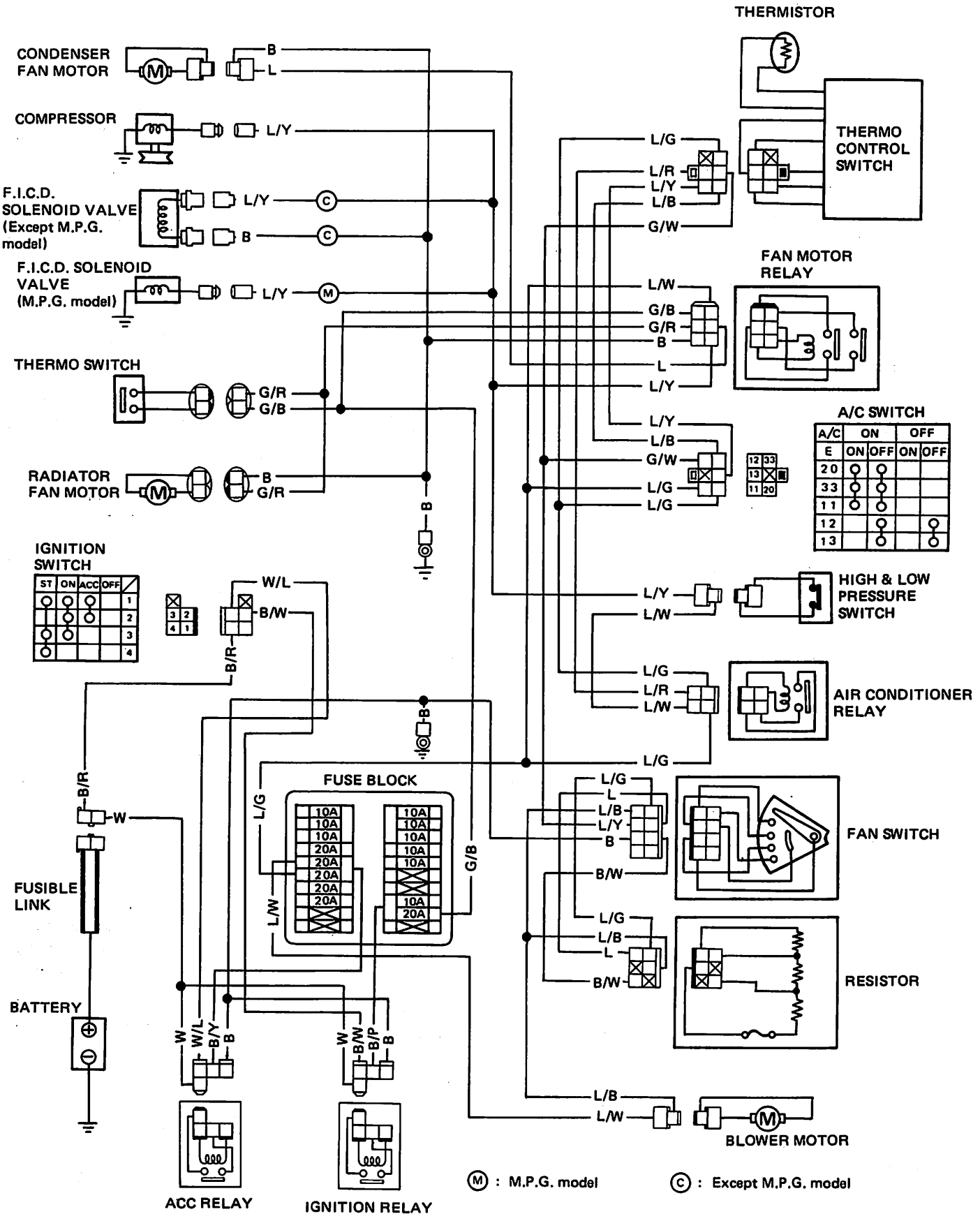
LOCATION OF COMPONENT PARTS



SCHEMATIC



WIRING DIAGRAM



SHA750A

GENERAL SERVICE

PRECAUTIONS

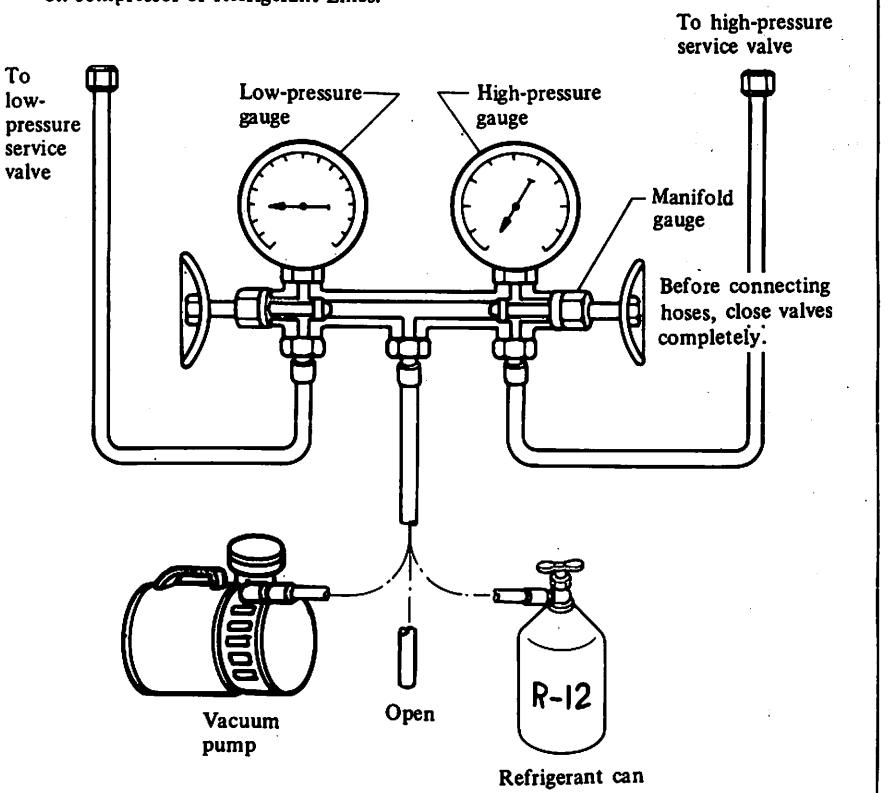
WARNING:

1. **Since direct contact of the liquid refrigerant with your skin will cause frostbite, always be careful when handling the refrigerant. Always wear goggles to protect your eyes when working around the system.**
2. **The refrigerant service container has a safe strength. However, if handled incorrectly, it will explode. Therefore, always follow the instructions on the label. In particular, never store it in a hot location [above 52°C (126°F)] or drop it from a high height.**
3. **The refrigerant gas is odorless and colorless and breathing may become difficult due to the lack of oxygen. Since the refrigerant gas is heavier than air and will lay close to the floor, be especially careful when handling it in small, confined spaces.**
4. **The refrigerant itself is nonflammable. However, a toxic gas (phosgene gas) is produced when it contacts fire and special care is therefore required when checking for leaks in the system with a halide torch.**
5. **Do not steam clean on the system, especially condenser since excessively high pressure will build up in the system, resulting in explosion of the system.**

INSTALLING MANIFOLD GAUGE

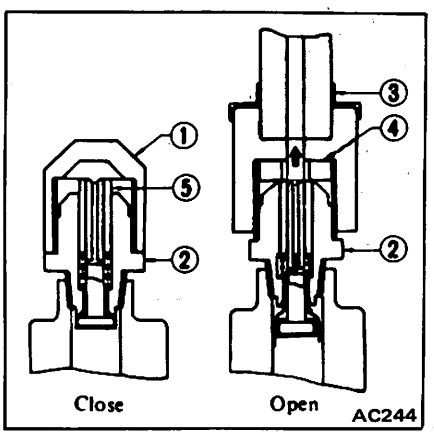
Hoses for the low-pressure service valve (suction valve) and high-pressure service valve (discharge valve) should be connected securely to "high" and "low" connection, respectively, on the manifold gauge.

Refer to identification marks ("S": Suction side or "D": Discharge side) on compressor or Refrigerant Lines.



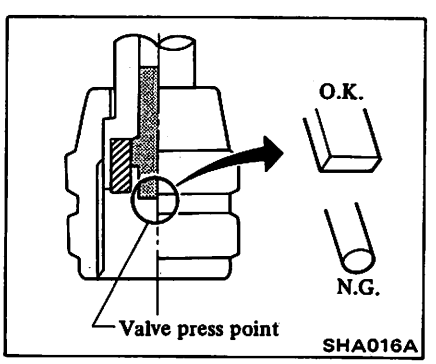
Connection to service valve

1. Fully close both valves of manifold gauge. Connect high- and low-pressure charging hoses to manifold gauge.
2. Remove caps from service valves. Connect high- and low-pressure charging hoses to service valves in system.



1 Cap
2 Service valve
3 Charging hose
4 Packing
5 Check valve

Be careful not to use manifold gauge valve with other similar-looking press point, or insufficient evacuating may occur.



Disconnection from service valve

1. Fully close both valves of manifold gauge.
2. Quickly disconnect two charging hoses from service valves and install caps on service valves.

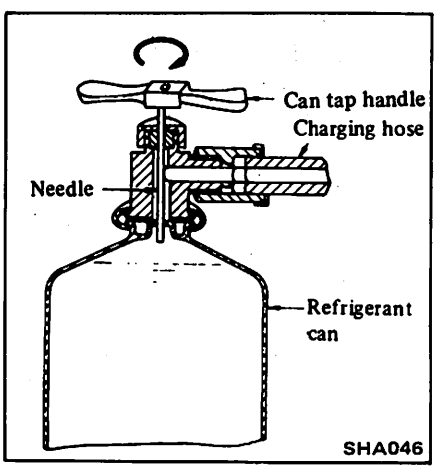
CAUTION:
Do not over-tighten valve cap.

HANDLING REFRIGERANT SERVICE CAN TAP

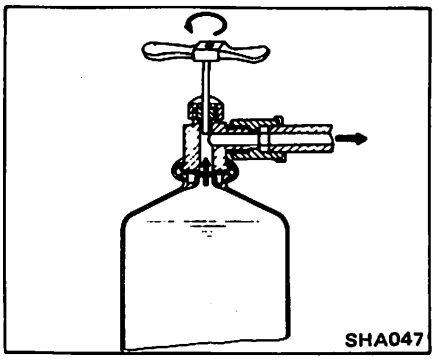
The following procedures apply to conventional can taps.

For correct usage, refer to the manufacturer's instructions.

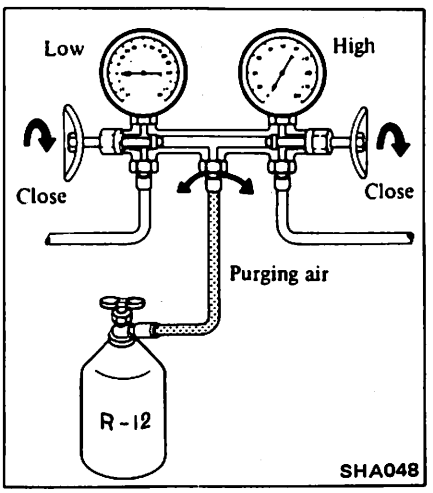
1. Connect charging hose between manifold gauge and can tap.
2. Fully turn in (close) valve stem of manifold gauge.
3. Attach can tap to refrigerant can by turning can tap handle fully counterclockwise.
4. Make a hole in refrigerant can by turning can tap handle clockwise.



5. Turn the handle fully counterclockwise to raise the needle. Refrigerant gas will flow up to the manifold gauge.



6. Purge air from charging hose by loosening charging hose nut at manifold gauge.



DISCHARGING REFRIGERANT

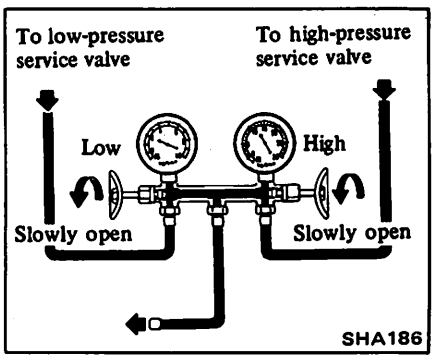
The pressurized refrigerant gas inside the system must be discharged at a pressure approaching atmospheric pressure prior to evacuating refrigerant inside the system.

1. Close high- and low-pressure valves of manifold gauge fully.
2. Connect two charging hoses of manifold gauge to their respective service vavles.

WARNING:
Securely connect high pressure (discharge) service valve to that of manifold gauge with a hose; also connect low pressure (suction) service valve to that of manifold gauge.

3. Open both manifold gauge valves and discharge refrigerant from system.

Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.



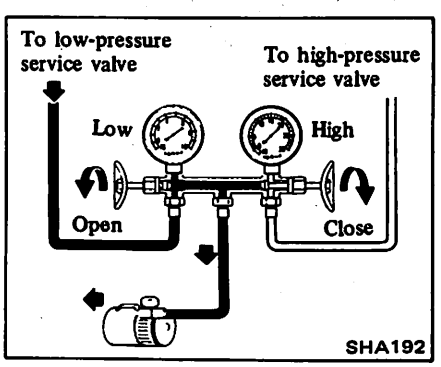
EVACUATING AND CHARGING REFRIGERANT SYSTEM

EVACUATING REFRIGERANT SYSTEM

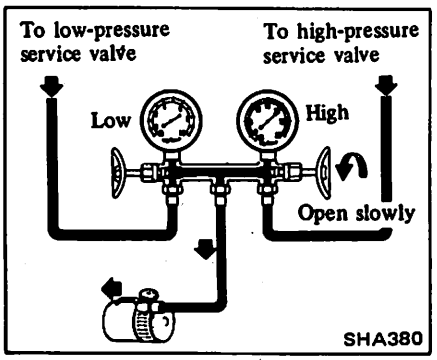
1. Install manifold gauge on system and discharge refrigerant from system until pressure reaches atmospheric pressure.

WARNING:
Securely connect high pressure (discharge) service valve to that of manifold gauge with a hose; also connect low pressure (suction) service valve to that of manifold gauge.

2. Connect center charging hose to vacuum pump.
3. Close both valves of manifold gauge fully. Then start vacuum pump.
4. Open low-pressure valve and suck old refrigerant from system.



5. When low-pressure gauge reading has reached to approximately 66.7 kPa (500 mmHg, 19.69 inHg), slowly open, high-pressure valve.



6. When pressure inside system has dropped to 94.6 kPa (710 mmHg, 27.95 inHg), fully close both valves of manifold gauge and stop vacuum pump. Let it stand for 5 to 10 minutes in this state and confirm that the reading does not rise.

a. The low-pressure gauge reads lower by 3.3 kPa (25 mmHg, 0.98 inHg) per 300 m (1,000 ft) elevation. Perform evacuation according to the following table.

Elevation m (ft)	Vacuum of system* kPa (mmHg, inHg)
0 (0)	94.6 (710, 27.95)
300 (1,000)	91.3 (685, 26.97)
600 (2,000)	88.0 (660, 25.98)
900 (3,000)	84.6 (635, 25.00)

*: Values show reading of the low-pressure gauge.

b. The rate of ascension of the low-pressure gauge should be less than 3.3 kPa (25 mmHg, 0.98 inHg) in five minutes.

If the pressure rises or the specified negative pressure can not be obtained, there is a leak in the system. In this case, repair the leak as described in the following.

(1) Charge system with a can of refrigerant [about 0.4 kg (0.9 lb)]. Refer to Charging Refrigerant.

(2) Check for refrigerant leakage with a leak detector. Repair any leakages found. Refer to Checking for Leaks (MA section).

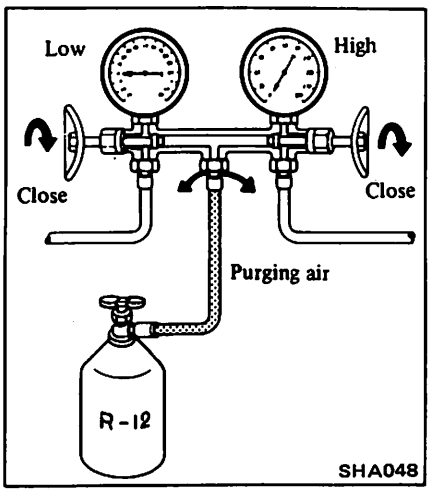
(3) Discharge refrigerant again, and then evacuate system.

CHARGING REFRIGERANT SYSTEM

1. Evacuate refrigerant system.
2. Close manifold gauge valves securely and disconnect charging hose from vacuum pump.
3. Purge air from center charging hose.

(1) Connect center charging hose to refrigerant can through can top.

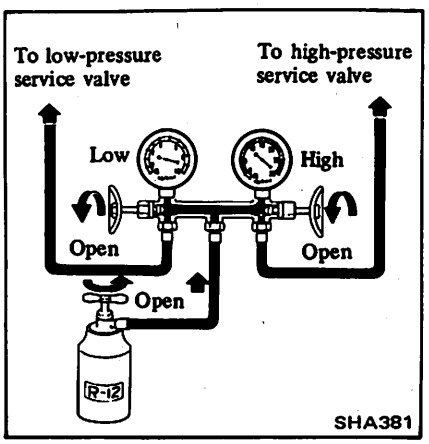
(2) Break seal of refrigerant can and purge air.



4. Charge refrigerant into system.

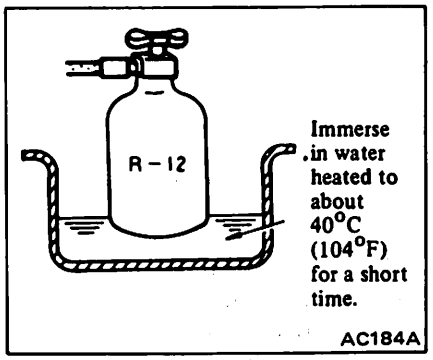
(1) **In case of charging refrigerant gas**

Open high- and low-pressure valves of manifold gauge and charge refrigerant into system.



When refrigerant charging speed is slow, immerse refrigerant can in water, heated to a temperature of about 40°C (104°F), for a short time.

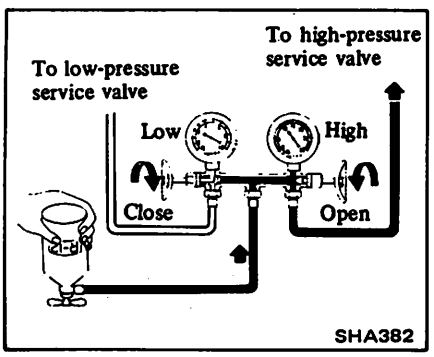
WARNING:
a. Under no circumstances the refrigerant can be warmed in water heated to a temperature of over 52°C (126°F).
b. A blow torch or stove must never be used to warm up the can.



(2) **In case of charging liquefied refrigerant**

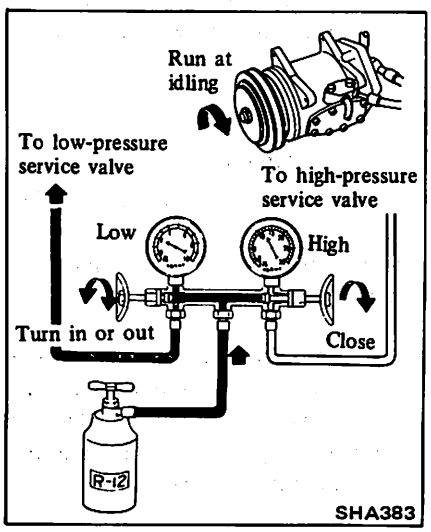
Open high pressure valve of manifold gauge and charge liquefied refrigerant into system with can upside down.

CAUTION:
When charging liquefied refrigerant into the system with the can turned upside down to reduce charging time, charge it only through high pressure (discharge) service valve. After completion of charging, the compressor should always be turned several times manually.



5. **When refrigerant charging speed slows down,** charge it while running the compressor for ease of charging. After having taken the steps up to 3 above, proceed with charging in the following order.
(1) Shut off high pressure valve of manifold gauge.
(2) Run the engine at idling speeds below 1,500 rpm.
(3) Set mode dial, temperature dial and fan lever at maximum cool and speed respectively.
(4) Charge refrigerant while controlling low-pressure gauge reading at 275 kPa (2.8 kg/cm^2, 40 psi) or less by turning in or out low-pressure valve of manifold gauge.

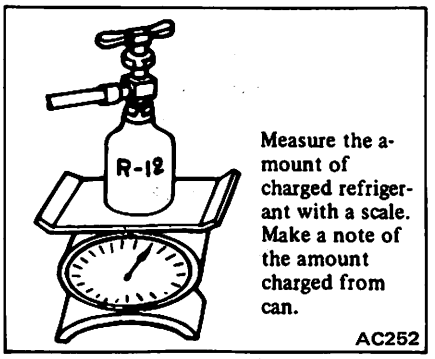
WARNING:
Never charge refrigerant through high pressure side (discharge side) of system since this will force refrigerant back into refrigerant can and can may explode.



6. When refrigerant can is empty, fully close both valves of manifold gauge and replace refrigerant can with a new one.

Before charging refrigerant from new can, **purge air from inside charging hose.**
7. Charge the specified amount of refrigerant into system by weighing charged refrigerant with scale. Overcharging will cause discharge pressure to rise.

Refrigerant capacity:
0.8 - 1.0 kg (1.8 - 2.2 lb)



The state of the bubbles in sight glass should only be used for checking whether the amount of charged refrigerant is small or not. Refer to Checking Refrigerant Level (Section MA). The amount of charged refrigerant can be correctly judged by means of discharge pressure.

8. Close manifold gauge valves. Then detach charging hoses from service valves of system. Be sure to install valve cap on service valve.
9. Confirm that there are no leaks in system by checking with a leak detector.
Refer to Checking for Leaks (MA section).

Conducting a performance test prior to removing manifold gauge is a good service operation. Refer to Performance Test.

COMPRESSOR OIL LEVEL CHECK

Almost all compressor oil is circulating in the system together with refrigerant. If an excessive quantity of oil is charged into the system, most of the oil goes around the system and stays in the condenser or in the evaporator, thus causing considerable reduction in the cooling capacity of the system. Insufficient compressor oil leads to poor lubrication of the compressor. Whenever replacing any component of the refrigeration system, the original total oil charge must always be maintained.

Amount of oil in the system:
150 mℓ
(5.1 US fl oz, 5.3 Imp fl oz)

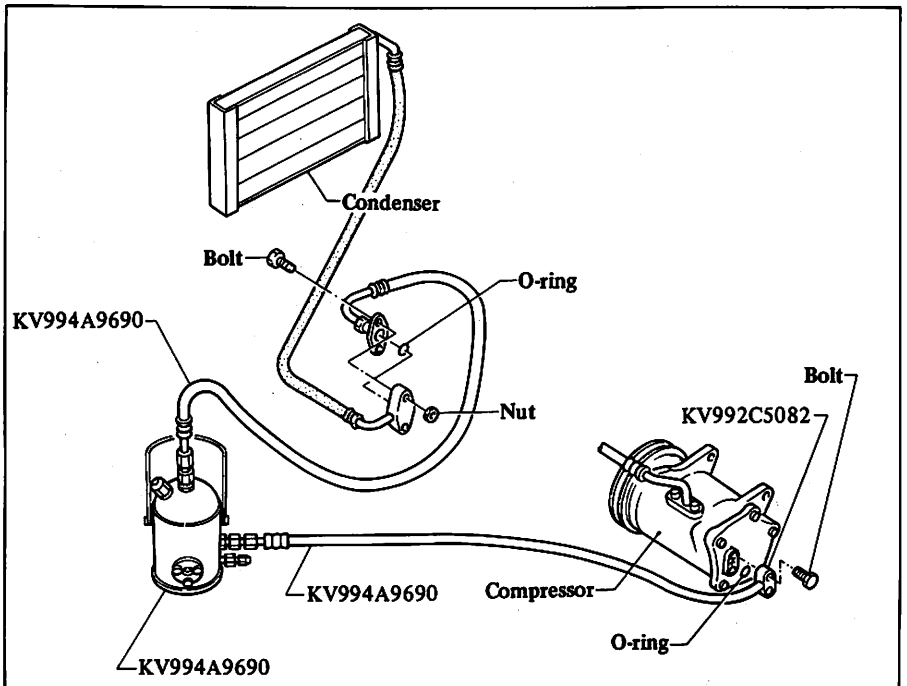
Check and adjust the quantity of oil according to the following procedures.

CAUTION:
a. The oil should not be transfused from a container into another, as the failure will possibly cause moisture to mix with the oil.
b. The used oil should not be returned into a container.
c. The oil should not be used if its state of preservation is not clear enough.

Checking and adjusting (Using oil separator)

The Tool KV994A9690 is used to efficiently withdraw the oil in the refrigeration system (that is, to separate oil and refrigerant). If an excessive quantity of oil is charged in the system, or if the quantity of oil in the system is unknown, adjust the quantity of oil in the system to specification, proceeding as follows:

1. Discharge air conditioning system. Refer to Discharging System.
2. Using two special flexible hoses in Tool KV994A9690 and adapter connectors in Tools KV992C5081 and KV992C5082 (MJS170), connect oil separator between compressor discharge side and condenser.



When installing adapter connector on compressor side, reuse original bolts and O-ring. When installing flexible hose and adapter connector on condenser side, use same size O-ring and M8 bolts and nuts of nominal size.

SHA150A

3. Evacuate and charge system. Refer to General Service for evacuating and charging system.
4. Fully open all windows or all doors of car.
5. Operate compressor at engine idling with air conditioner set for maximum cooling and high fan speed.

Never allow engine speed to exceed idling speed.

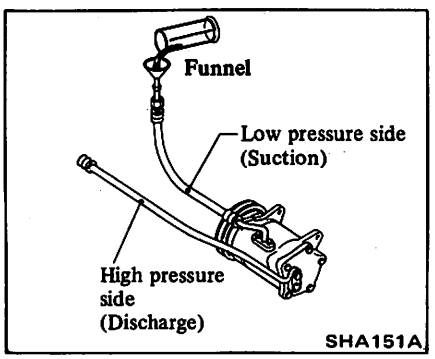
6. Observe oil separator oil level gauge. If rise of oil level has stopped, immediately stop compressor operation. (This indicates that oil has been withdrawn.)

CAUTION:
Do not continue oil withdrawal operation more than 10 minutes.

In some case, fluid refrigerant may be mixed with oil, causing unusual rise of oil level. In such a case, stop compressor operation after ten minutes of withdrawal operation.

7. Discharge system. Refer to General Service for discharging system.
8. Disconnect oil separator.
9. Connect refrigerant lines to original positions.
10. Disconnect low flexible hose from compressor suction valve.
11. Add oil from compressor suction valve.

Amount of oil to be added:
120 mℓ
(4.1 US fl oz, 4.2 Imp fl oz)



SHA151A

a. Oil remains unremoved in the system about 30 mℓ (1.0 US fl oz, 1.1 Imp fl oz)
b. To facilitate replenishment, it is a good practice to disconnect the low-pressure (flexible) hose to the evaporator and add oil to the compressor through the hose.

12. After charging, rotate compressor clutch with hand 5 to 10 turns.
13. Connect low flexible hose to compressor suction valve. Evacuate and charge system. Refer to General Service for evacuating system and charging refrigerant.
14. Conduct leak test and performance test.
15. Gradually loosen drain cap of oil separator to release residual pressure. Remove cap and drain oil.
16. To prevent formation of rust and intrusion of moisture or dust, perform the following before placing oil separator kit into storage.
(1) Cap each opening of flexible hose and double union securely.
(2) Cap oil separator, evacuate it from service valve, and charge refrigerant.

Checking and adjusting
(Alternate method)

If the oil Separator is not available, control the quantity of oil in accordance with the table below when charging compressor oil into the system.

a. When replacing two or more of the parts indicated in the chart below, follow each instruction under the proper charging method column for the correct amount of oil to be added.
b. The total amount of oil to be added must never exceed 150 mℓ (5.1 US fl oz, 5.3 Imp fl oz).
c. The method of adding oil is the same as in the case of using the oil separator. Oil is added into the compressor.

OIL CHARGE TABLE

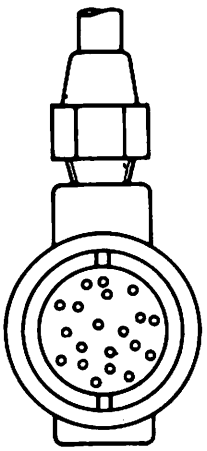
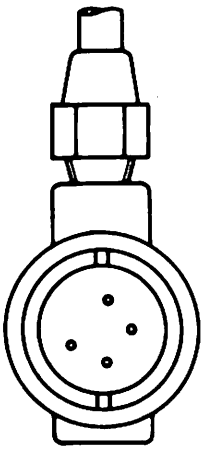
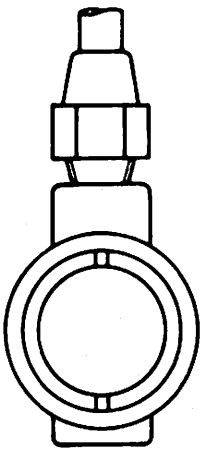
Condition		Proper charging method	Amount of oil to be added mℓ (US fl oz, Imp fl oz)
Replacement of compressor		1. Remove all oil from new and old compressors.* 2. Charge new compressor with the same amount of oil as was in old compressor.	
Replacement of evaporator		Add amount of oil shown in right column.	70 (2.4, 2.5)
Replacement of condenser	There is no sign of oil leakage from condenser.	Oil need not be added.	–
	There are evidences of a large amount of oil leakage from condenser.	Add amount of oil shown in right column.	50 (1.7, 1.8)
Replacement of flexible hose or copper tube	There is no sign of oil leakage.	Oil need not be added.	–
	There are evidences of a large amount of oil leakage.	Add amount of oil shown in right column.	50 (1.7, 1.8)
Gas leakage	There is no sign of oil leakage.	Oil need not be added.	–
	There are evidences of a large amount of oil leakage.	Add amount of oil shown in right column.	50 (1.7, 1.8)

* Remove compressor oil as follows:

1. **With the compressor upside down, completely drain the oil through the suction port (from the embossed letter "s" mark side).**
   Be sure to use a clean container to receive the oil.
2. **When the oil stops flowing out, rotate the clutch hub two or three times to completely drain the oil.**

REFRIGERANT LEVEL CHECK

1. Open doors fully.
2. Start the engine.
3. Set air conditioner switch to "ON" position.
4. Set temperature lever to maximum cold position.
5. Set blower to maximum speed.
6. Check sight glass after the lapse of about five minutes. Judge according to the following table.

Amount of refrigerant / Check item	Almost no refrigerant	Insufficient	Suitable	Too much refrigerant
Temperature of high pressure and low pressure lines.	Almost no difference between high pressure and low pressure side temperature.	High pressure side is warm and low pressure side is fairly cold.	High pressure side is hot and low pressure side is cold.	High pressure side is abnormally hot.
State in sight glass.	Bubbles flow continuously. **Bubbles will disappear and something like mist will flow when refrigerant is nearly gone.**  AC256	The bubbles are seen at intervals of 1 - 2 seconds.  AC257	Almost transparent. Bubbles may appear when engine speed is raised and lowered. **No clear difference exists between these two conditions.**  AC258	No bubbles can be seen.
Pressure of system.	High pressure side is abnormally low.	Both pressure on high and low pressure sides are slightly low.	Both pressures on high and low pressure sides are normal.	Both pressures on high and low pressure sides are abnormally high.
Repair.	**Stop compressor immediately** and conduct an overall check.	Check for gas leakage, repair as required, replenish and charge system.		Discharge refrigerant from service valve of low pressure side.

a. The bubbles seen through the sight glass are influenced by the ambient temperature. Since the bubbles are hard to show up in comparatively low temperatures below 20°C (68°F), it is possible that a slightly larger amount of refrigerant would be filled, if supplied according to the sight glass. Be sure to recheck the amount when it exceeds 20°C (68°F). In higher temperature the bubbles are easy to show up.

b. When the screen in the receiver drier is clogged, the bubbles will appear even if the amount of refrigerant is normal. In this case, the outlet side pipe of the receiver drier becomes considerably cold.

CHECKING COMPRESSOR DRIVE BELT

Refer to Engine Maintenance for inspection and adjustment.

CHECKING HOSES AND PIPES

Check heater and air conditioner for damaged hoses or pipes due to interference or friction with adjoining parts. If damage is minor, repair those affected hose or pipes. If damage is major and if there is the possibility of encountering holes, replace the affected parts.

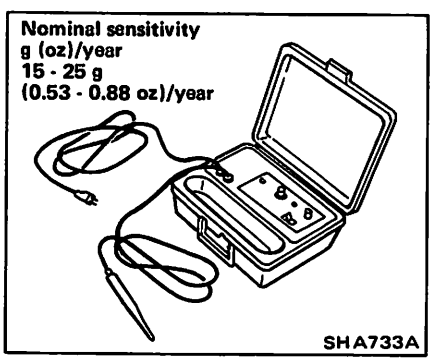
Carefully check hoses and pipes, especially those located close to moving parts or sharp edge of panel.

CHECKING REFRIGERANT LEAKS

Conduct a leak test with electric leak detector whenever leakage of refrigerant is suspected and when conducting service operations which are accompanied by disassembly or loosening of connection fittings.

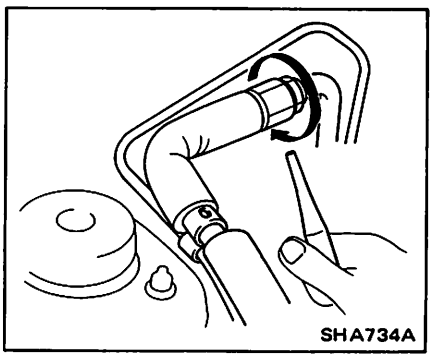
Electric leak-detector

The leak detector is a delicate device that detects small amounts of halogen. **In order to use the device properly, read the manuals put out by each maker and perform the specified maintenance and inspections.**

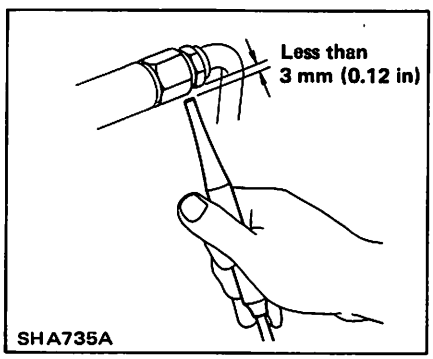


General precautions for handling leak detector

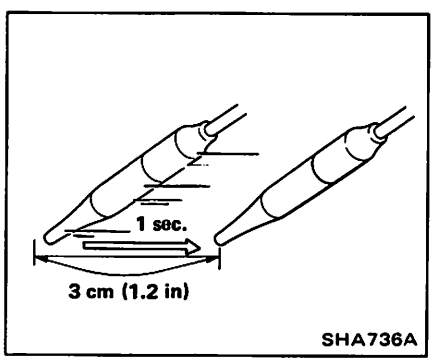
1. The probe must be correctly aimed at the point to be checked. Each fitting must be checked around its entire periphery. Refrigerant gas is heavier than air, so the underside of the fitting must also be checked.



2. The probe must be held as close as possible to the checking point, within 3 mm (0.12 in) of the object.



3. The detector requires a certain length of time to react to the gas. The moving speed of the probe must be maintained at less than 3 cm (1.2 in)/sec.



Measurement standard

If any reaction is noted using a detector having a nominal sensitivity of 15 to 25 g (0.53 to 0.88 oz)/year, that portion checked be found as leaking, and therefore must be repaired.

- The nominal sensitivity of the detector is determined under the assumption that all the leaking gas is collected by the detector. Accordingly, the quantity of gas actually leaking can amount to five to ten times the indicated value. Generally speaking, leakage of 150 to 200 g (5.29 to 7.05 oz) of refrigerant can cause insufficient cooling.
- Oil deposited during assembling must be wiped off before inspection. Refrigerant easily dissolves in oil, and the presence of oil can cause an error in measurement. This precaution is important when checking a used car for refrigerant leakage.
- If any trace of oil is noted at and around connection fittings, it is a sure indication that refrigerant is leaking.

MAJOR CHECK POINTS

(1) Compressor
- Compressor shaft seal (rotate the compressor by hand)
- Flexible hose connections
- Front and rear head gaskets
- Service valve

(2) Condenser
- Condenser pipe fitting
- Condenser inlet and outlet pipe connections

(3) Refrigerant lines
- Line connections

(4) Evaporator housing
- Inlet and outlet line connections
- Expansion valve

If a gas leak is detected, proceed as follows:

1. Check torque on the connection fitting and, if too loose, tighten to the proper torque. Refer to S.D.S. Check for gas leakage with a leak detector.
2. If leakage continues even after the fitting has been retightened, discharge refrigerant from system, disconnect the fittings, and check its seating face for damage. Always replace even if damage is slight.
3. Check compressor oil and add oil if required.
4. Charge refrigerant and recheck for gas leaks. If no leaks are found, evacuate and charge system.

OFF-SEASON MAINTENANCE

Even in the off-season, turn the compressor for 10 minutes at least once a month by running the engine at idling rpm.

PERFORMANCE TEST

PERFORMANCE CHART

TEST CONDITION

Testing must be performed as follows:

Car location:	Indoors or in the shade
Doors:	Closed
Door window:	Open
Hood:	Open
TEMP. lever position:	Max. COLD
Air control lever position:	(Ventilation)
INTAKE lever position:	RECIRC
FAN lever position:	4
Engine speed:	1,500 rpm
Time required before starting testing after air conditioner starts operating:	More than 10 minutes

TEST READING

Recirculating-to-discharge air temperature table

Inside air (Recirculating air at blower inlet)		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
40 - 60	25 (77)	6.0 - 8.5 (43 - 47)
	30 (86)	9.0 - 12.5 (48 - 55)
	35 (95)	13.0 - 18.5 (55 - 65)
60 - 80	25 (77)	8.5 - 12.8 (47 - 55)
	30 (86)	12.5 - 18.4 (55 - 65)
	35 (95)	18.5 - 26.7 (65 - 80)

Ambient air temperature-to-compressor pressure table

Ambient air		High pressure (Discharge side) kPa (kg/cm², psi)	Low pressure (Suction side) kPa (kg/cm², psi)
Relative humidity %	Air temperature °C (°F)		
40 - 80	25 (77)	1,118 - 1,353 (11.4 - 13.8, 162 - 196)	127 - 206 (1.3 - 2.1, 18 - 30)
	30 (86)	1,353 - 1,657 (13.8 - 16.9, 196 - 240)	157 - 255 (1.6 - 2.6, 23 - 37)
	35 (95)	1,638 - 2,040 (16.7 - 20.8, 237 - 296)	186 - 304 (1.9 - 3.1, 27 - 44)

a. The pressure will change in the following manner with changes in conditions:

- **When blower speed is low, discharge pressure will drop.**
- **When the relative humidity of intake air is low, discharge pressure will drop.**

b. The temperature will change in the following manner with changes in conditions:
When the ambient air temperature is low, the outlet air temperature will become low.

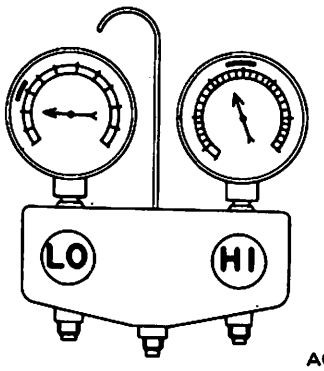
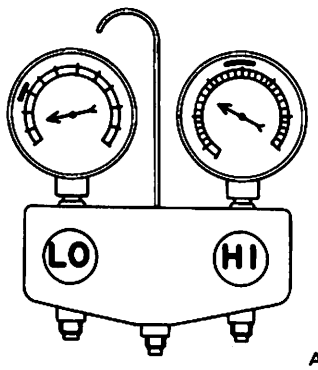
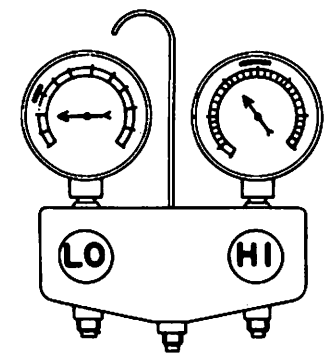
If the test reveals that there is any abnormality in system pressure, isolate the cause and repair. Refer to Performance Test Diagnoses.

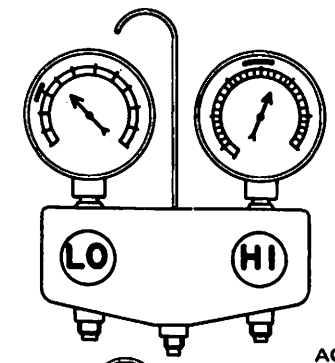
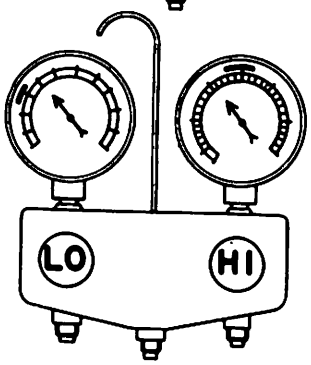
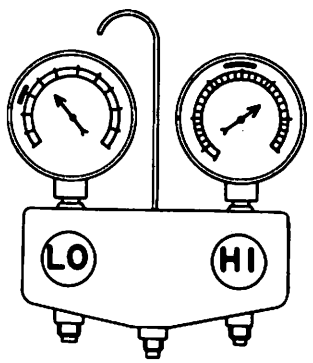
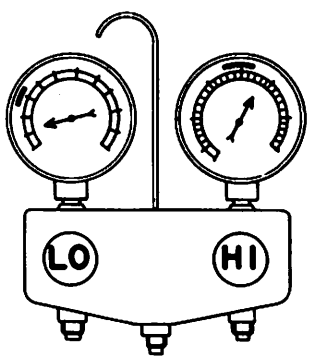
PERFORMANCE TEST DIAGNOSES

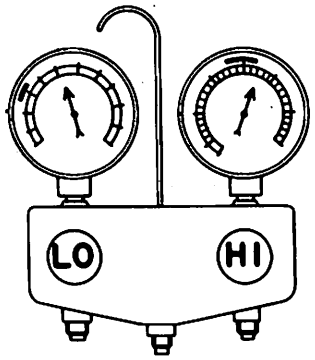
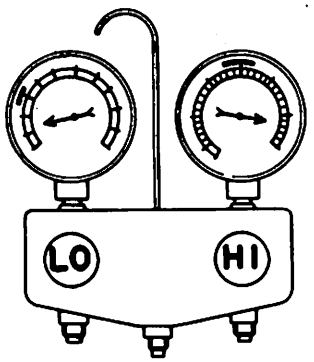
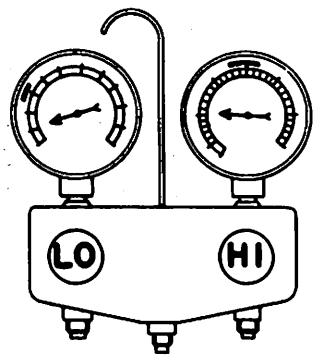
Characteristics revealed on the manifold gauge reading for the air conditioning system are shown in the following.

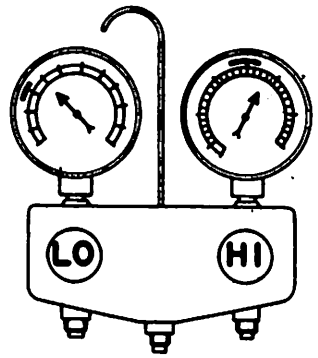
As to the method of a performance test, refer to the item of "Performance Test".

In the following table, the portion smeared with ink on each gauge scale indicates a range based on the assumption that the air conditioning system is in good order. This range is described in PERFORMANCE CHART.

Condition	Probable cause	Corrective action
INSUFFICIENT REFRIGERANT CHARGE  AC352A Insufficient cooling. Bubbles appear in sight glass.	Refrigerant is small, or leaking a little.	1. Leak test. 2. Repair leak. 3. Charge system. **Evacuate, as necessary, and recharge system.**
ALMOST NO REFRIGERANT  AC353A No cooling action. In sight glass appear a lot of bubbles or something like mist.	Serious refrigerant leak.	**Stop compressor immediately.** 1. Leak test. 2. Discharge system. 3. Repair leak(s). 4. Replace receiver drier if necessary. 5. Check oil level. 6. Evacuate and recharge system.
FAULTY EXPANSION VALVE  AC354A Slight cooling. Sweating or frosted expansion valve inlet.	Expansion valve restricts refrigerant flow. • Expansion valve is clogged. • Expansion valve is inoperative. Valve stuck closed. Thermal bulb has lost charge.	If valve inlet reveals sweat or frost: 1. Discharge system. 2. Remove valve and clean it. Replace it if necessary. 3. Evacuate system. 4. Charge system. If valve does not operate: 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.

Condition		Probable cause	Corrective action
 AC355A	Insufficient cooling. Sweated suction line.	Expansion valve allows too much refrigerant through evaporator.	Check valve for operation. If suction side does not show a pressure decrease, replace valve.
 AC356A	No cooling. Sweating or frosted suction line.	Faulty expansion valve.	1. Discharge system. 2. Replace valve. 3. Evacuate and replace system.
AIR IN SYSTEM  AC359A	Insufficient cooling. Sight glass shows occasional bubbles.	Air mixed with refrigerant in system.	1. Discharge system. 2. Replace receiver drier. 3. Evacuate and charge system.
MOISTURE IN SYSTEM  AC360A	After operation for a while, pressure on suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As a warning of this, reading shows 39 kPa (0.4 kg/cm^2, 6 psi) vibration.	Drier is saturated with moisture. Moisture has frozen at expansion valve. Refrigerant flow is restricted.	1. Discharge system. 2. Replace receiver drier (twice if necessary). 3. Evacuate system completely. (Repeat 30-minute evacuating three times.) 4. Recharge system.

Condition	Probable cause	Corrective action
FAULTY CONDENSER  AC361A No cooling action: engine may overheat. Bubbles appear in sight glass of drier. Suction line is very hot.	Usually a malfunctioning condenser.	• Check fan belt and fluid coupling. • Check condenser for dirt accumulation. • Check engine cooling system for overheat. • Check for refrigerant overcharge. **If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.**
HIGH PRESSURE LINE BLOCKED  AC362A Insufficient cooling. Frosted high pressure liquid line.	Drier clogged, or restriction in high pressure line.	1. Discharge system. 2. Remove receiver drier or strainer and replace it. 3. Evacuate and charge system.
FAULTY COMPRESSOR  AC363A Insufficient cooling.	Internal problem in compressor, or damaged gasket and valve.	1. Discharge system. 2. Remove and check compressor. 3. Repair or replace compressor. 4. Check oil level. 5. Replace receiver drier. 6. Evacuate and charge system.

Condition		Probable cause	Corrective action
TOO MUCH OIL IN SYSTEM (Excessive)  AC364A	Insufficient cooling.	Too much oil circulates with refrigerant, causing the cooling capacity of the system to be reduced.	Refer to Oil Level Check for correcting oil level.

SERVICE PROCEDURES

PRECAUTIONS FOR REMOVAL AND INSTALLATION

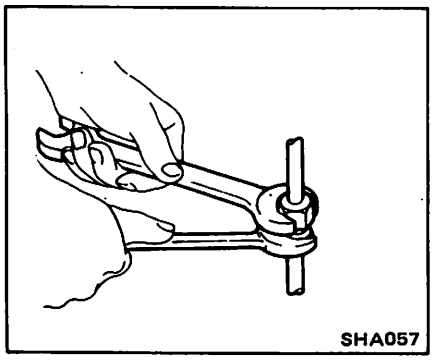
When replacing refrigerant cycle components, observe the following:

1. Disconnect battery ground cable.
2. Before starting work, be sure to discharge system.

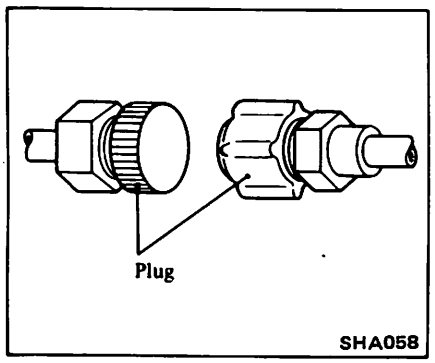
WARNING:
Gradually loosen discharge side hose fitting, and remove it after remaining pressure has been released.

CAUTION:

- When disconnecting or connecting tubes, be sure to use two wrenches on both tubes.


SHA057

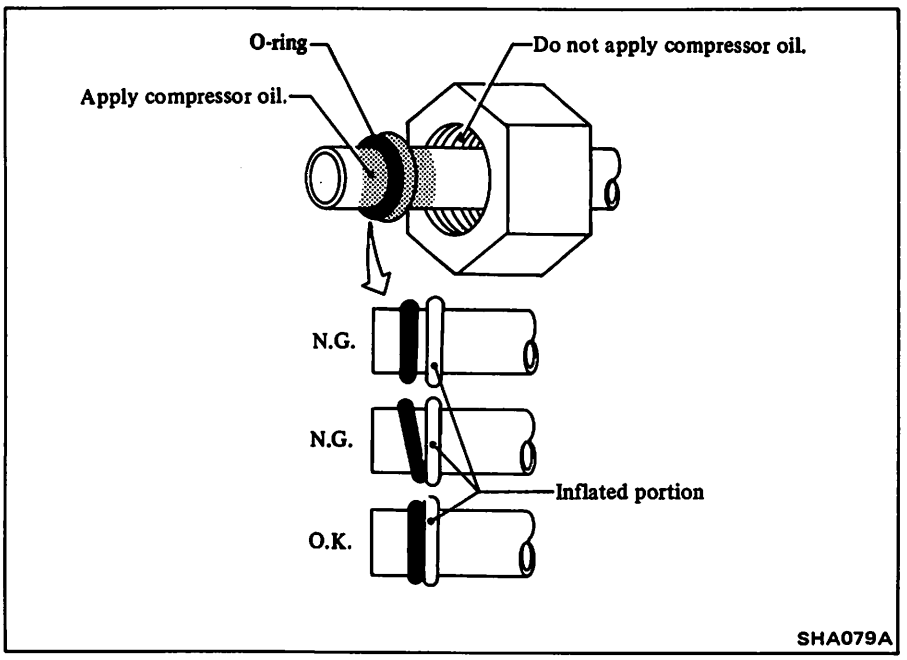
- After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.



SHA058

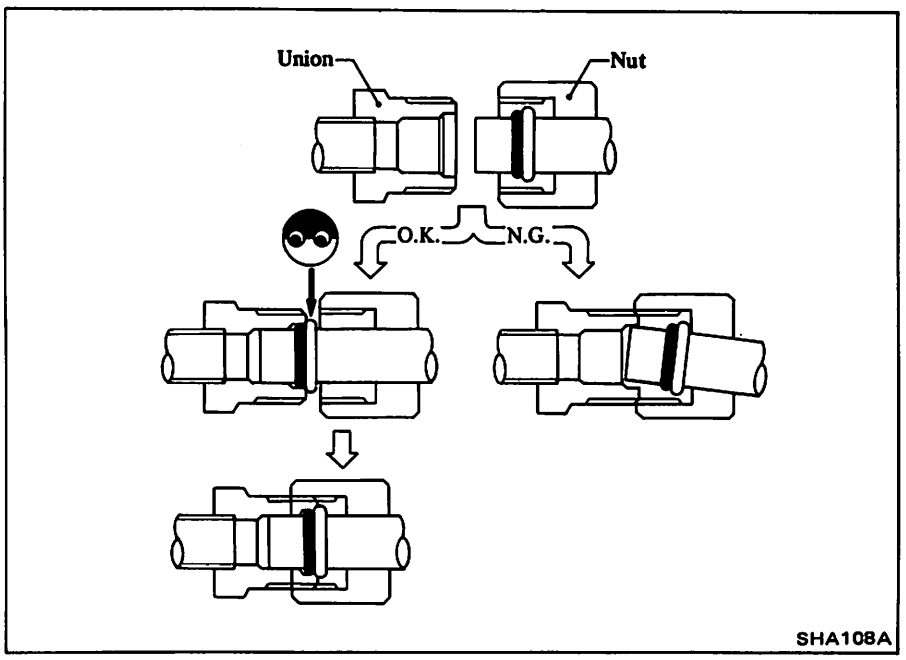
- Compressed air must never be used to clean dirty line. Clean with refrigerant gas.
- Do not reuse used O-ring.

- When connecting tube, apply compressor oil to portions shown in illustration. Be careful not to apply oil to threaded portion.
- O-ring must be closely attached to inflated portion of tube.



SHA079A

- After inserting tube into union until O-ring is no more visible, tighten nut to specified torque.

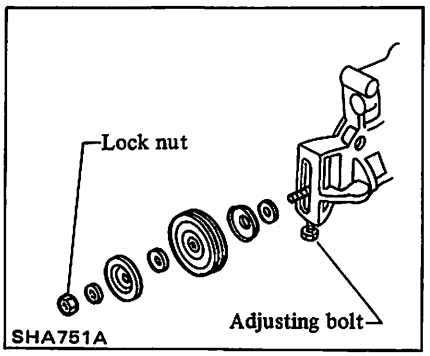


SHA108A

COMPRESSOR IDLER PULLEY

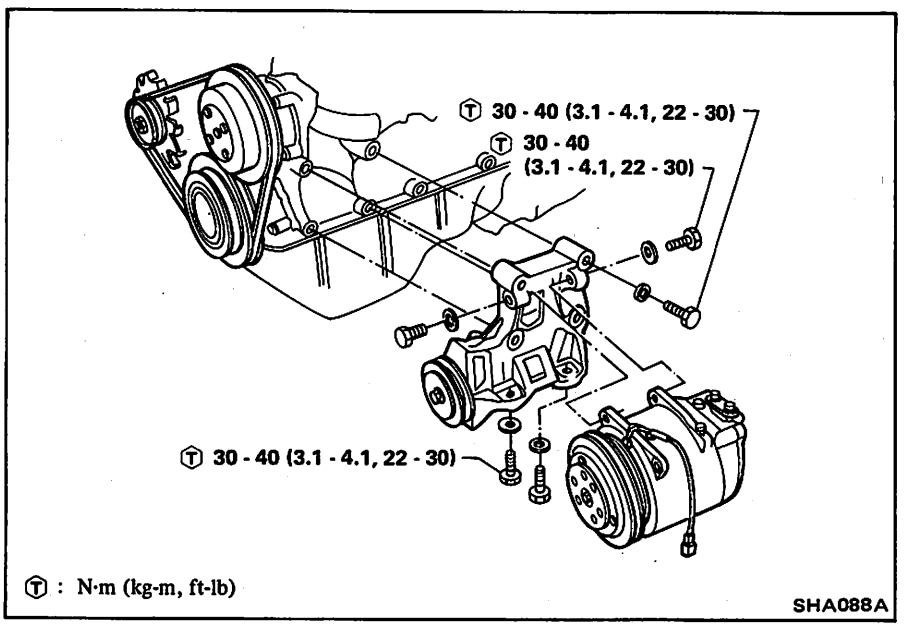
REMOVAL AND INSTALLATION

1. Loosen idler pulley lock nut and fully loosen adjusting bolt.
2. Remove drive belt.
3. Remove idler pulley assembly.
4. Installation is in the reverse order of removal.



Refer to Checking and Adjusting Drive Belts (Section MA) for drive belt tension.

COMPRESSOR



REMOVAL AND INSTALLATION

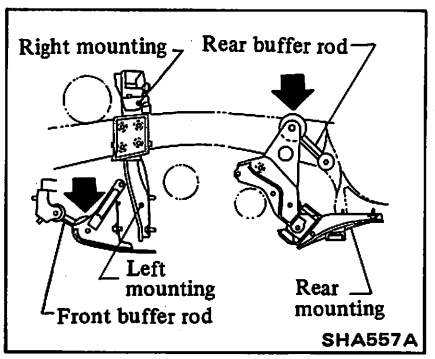
1. Disconnect battery ground cable.
2. Discharge refrigerant from system. Refer to General Service.
3. Block rear wheels with chocks and raise front of car, and then support it with safety stands. Refer to section GI for Lifting Points and Towing.
4. Remove compressor drive belt.
5. Disconnect compressor clutch harness.
6. Disconnect high and low flexible hoses from compressor.
7. Remove compressor.

CAUTION:
Do not attempt to leave the compressor on its side or upside down for more than 10 minutes, as the compressor oil will enter the low pressure chambers. If, under that condition, compressor should be operated suddenly, internal damage would result. To expel oil from chambers, hand-crank compressor several times in its installed condition.

8. Installation is in the reverse order of removal.

When connecting high and low flexible hoses to compressor, install new O-ring into connection.

After installing compressor on engine, loosen bolts securing front and rear buffer rods on engine side and tighten them again. When tightening bolts, be careful not to place your hand or any other object on engine.



Ⓣ : Front and rear buffer rods
39 - 49 N·m
(4.0 - 5.0 kg-m,
29 - 36 ft-lb)

CONDENSER

REMOVAL AND INSTALLATION

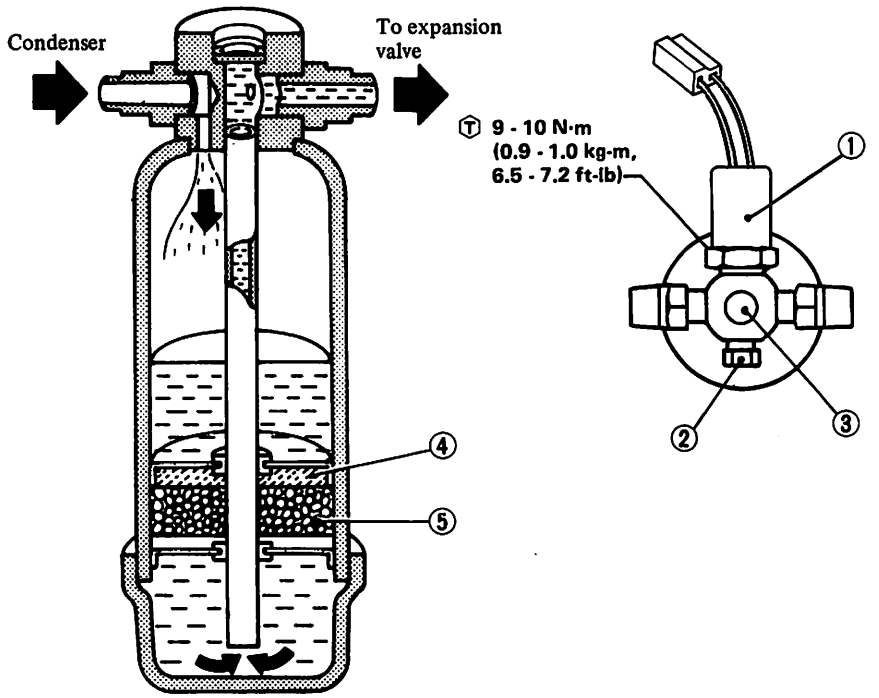
1. Disconnect battery ground cable.
2. Discharge refrigerant from system. Refer to General Service.
3. Remove radiator grille.
4. Disconnect refrigerant lines from condenser.
5. Remove condenser cooling fan.
6. Remove radiator fixing bolts and nuts.
7. Remove condenser fixing bolts, then remove condenser pushing away radiator in the direction of engine side.

INSPECTION

Inspect joints of inlet and outlet pipes for cracks and scratches. Upon finding any problem which may cause gas to leak, repair or replace condenser.
Condenser fins or air passages clogged with dirt, insects or leaves will reduce cooling efficiency of condenser. In such a case, clean fins or air passages with compressed air.

CAUTION:
a. Do not clean condenser with steam. Be sure to use cold water or compressed air.
b. Plug all openings to prevent entrance of dirt and moisture into receiver drier.

RECEIVER DRIER



1 High & Low pressure switch: Turns off when refrigerant pressure reaches at more than 2,452 kPa (25 kg/cm², 356 psi) and less than 216 kPa (2.2 kg/cm², 31 psi), cutting compressor power supply.
2 High pressure valve: Opens at pressures above 3,727 kPa (38 kg/cm², 540 psi), thereby discharging refrigerant to the atmosphere.
3 Sight glass
4 Strainer: Removes foreign material in refrigerant.
5 Desiccant: Removes water in refrigerant.

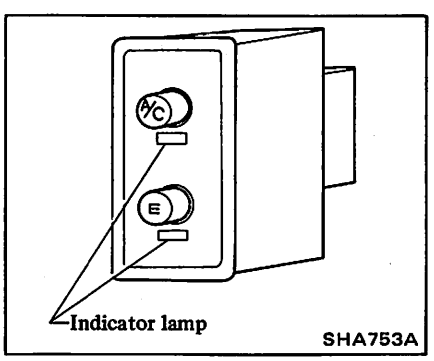
SHA752A

CAUTION:
Plug all openings to prevent entrance of dirt and moisture into receiver drier.

"A/C" switch		ON	ON	OFF	OFF
"E" switch		OFF	ON	ON	OFF
Indicator lamp	"A/C" side	ON	ON	OFF	OFF
	"E" side	OFF	ON	OFF	OFF
Air conditioner		Operated (Max.)	Operated (Economy)	Not operated	Not operated

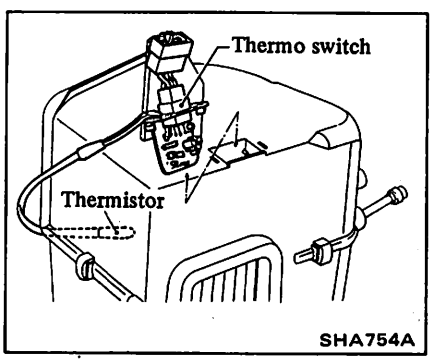
AIR CONDITIONER SWITCH AND THERMO SWITCH

The air conditioner switch consists of "A/C" and "E" push buttons and sets the Max. or Economy condition on the air conditioner. The specified temperature in the evaporator which turns the air conditioner on or off is different for Max. and Economy modes.



SHA753A

The thermistor detects the evaporator temperature and the thermo switch turns the compressor on or off. The thermo switch has a variable thermo control design for greater fuel economy.



SHA754A

Maximum/Economy	Evaporator temperature °C (°F)	Compressor
Maximum	Below 0 - 1 (32 - 34)	OFF
	Above 2.5 - 3.5 (37 - 38)	ON
Economy	Below 4 - 6 (39 - 43)	OFF
	Above 7 - 8.5 (45 - 47)	ON

COOLING UNIT

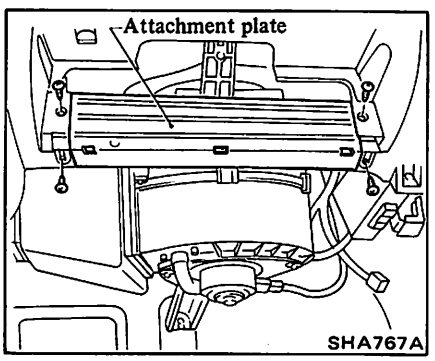
REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Discharge refrigerant from system.
3. Disconnect refrigerant lines from evaporator.

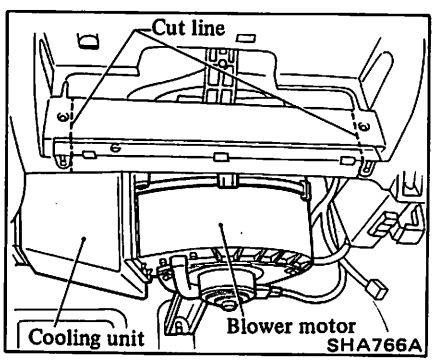
Remove piping grommet and cover.

CAUTION:
Immediately plug up all openings to prevent entrance of dirt and moisture.

4. Remove passenger side instrument lower cover and glove box. (Refer to section BF.) Remove attachment plate from instrument panel.

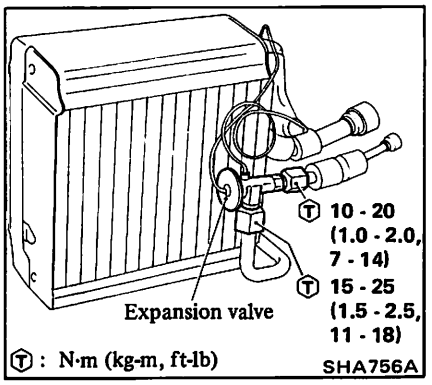


For vehicles with factory installed air conditioner, cut instrument panel with hacksaw blade on cut-lines. Before cutting, cover blower motor vent holes with tape. After cutting, brush the shavings away from the area around blower motor and remove tape.



5. Remove blower motor unit.
6. Remove cooling unit.
7. Installation is in the reverse order of removal. After reinstalling the cooling unit, install the attachment plate to the instrument panel.

EVAPORATOR



1. Clean fins and check for corrosion.

CAUTION:
a. Do not clean evaporator with steam. Be sure to use cold water or compressed air.
b. Do not disassemble expansion valve. Replace as assembly if necessary.

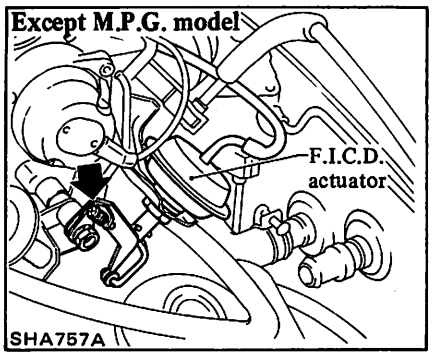
2. Check for gas leaks at fins and expansion valve.

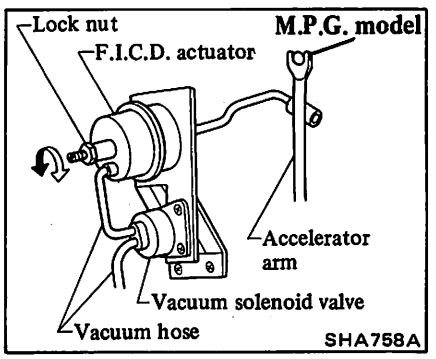
If there are leaks, retighten or replace.

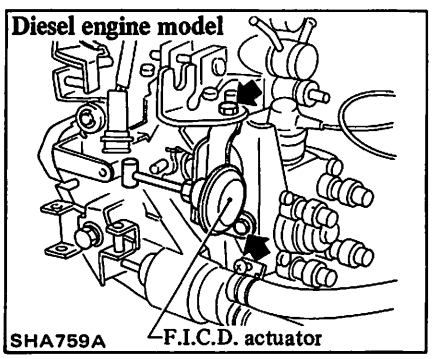
FAST IDLE CONTROL DEVICE (F.I.C.D.)

ADJUSTMENT OF IDLE SPEED

1. Run engine until it reaches operating temperature.
2. With air conditioning system OFF (when compressor is not operated), make sure that engine is at correct idle speed.
3. With air conditioning system ON (Air conditioner switch at "A/C" position, fan control lever at "4" position), make sure that compressor, F.I.C.D. actuator and solenoid valve are functioning properly.
4. Set idle speed at the specified value.



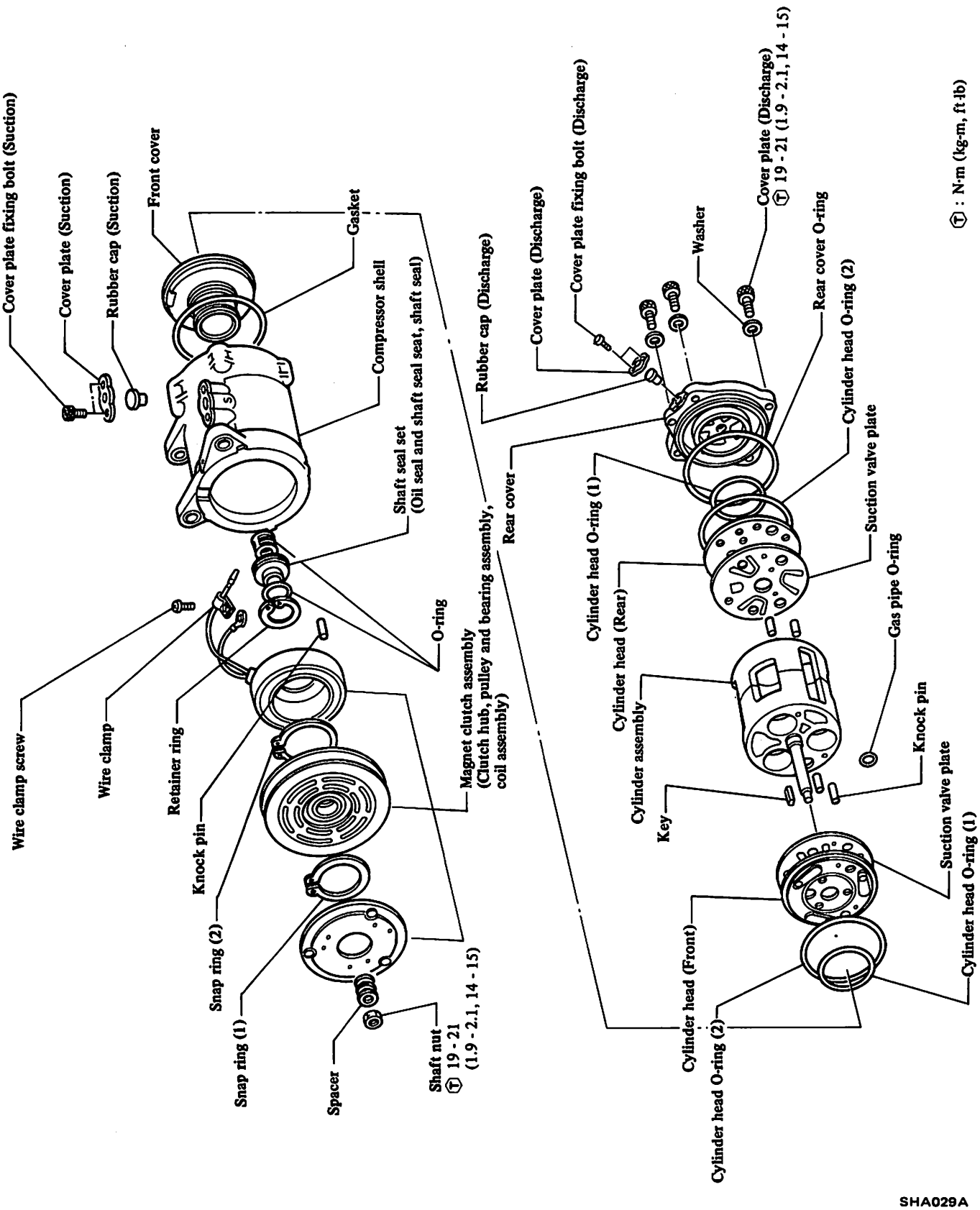




Engine revolution:
Gasoline engine model
M/T 800±50 rpm
A/T 620±40 rpm
(Shift lever should be in "D" position.)
Diesel engine model
M/T 900±50 rpm
A/T 900±50 rpm
(Shift lever should be in "N" position.)

When adjusting engine revolution, apply parking brake and tire stoppers.

COMPRESSOR—Model MJS170



SHA029A

DESCRIPTION

The MJS170 compressor employs an oil-mist jet system in which some lubricant is mixed in the refrigerant and the mixture is sprayed directly to the sliding portions from the compressor suction side.

PRELIMINARY CLEANING

Before starting work, remove dirt from outside the detached compressor. Clean the workbench, tool, and your hands.

COMPRESSOR CLUTCH

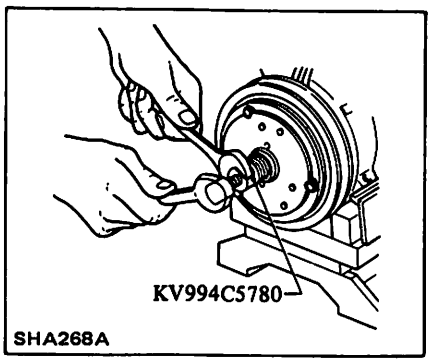
The most likely source of problem is clutch slippage. Factors are listed here. Exercise ample care.

1. Clearance between clutch hub and pulley should be 0.5 to 0.8 mm (0.020 to 0.031 in) at all peripheral points.
2. Make sure that there is no oil or dirt on friction surfaces of clutch disc (clutch hub) and pulley. Remove any oil or dirt with a dry rag.
3. Make sure that terminal voltage at magnetic coil is above 10.5V.

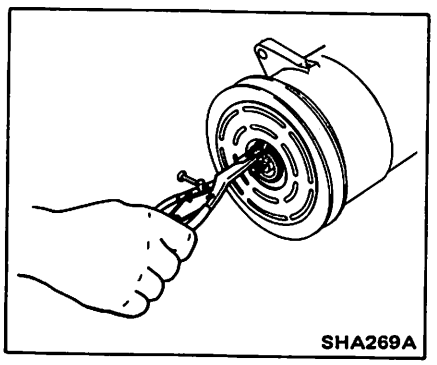
REMOVAL

CAUTION:
Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil will enter low pressure chamber.

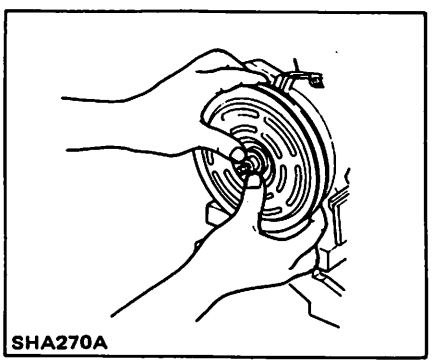
1. Using Tool KV99412302, hold clutch hub. With suitable socket wrench, remove shaft nut from shaft.
2. Using Tool KV994C5780, remove clutch hub. Thread tool into the bore of clutch hub, hold tool with wrench, and then thread in center bolt.



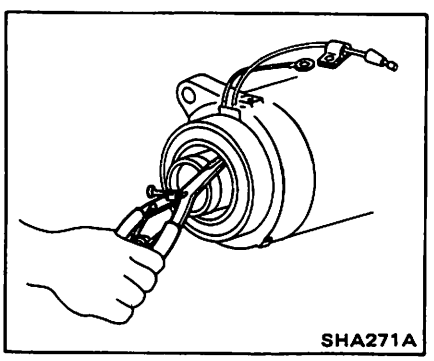
3. Pry inner snap ring off.



4. Remove pulley and bearing assembly. When the assembly can not be removed by hand, use Tools KV994C5781 and KV994C5782.



5. Remove clamping screws that secure coil assembly leads. Remove inner snap ring from coil assembly.



6. Remove coil assembly from front cover.

INSPECTION

1. Check friction surfaces of clutch for damage due to excessive heat, or excessive grooving due to slippage. If necessary, replace coil, pulley and bearing assembly, and clutch hub as a set.
2. Oil or dirt on friction surfaces should be cleaned with a suitable solvent and a dry rag.
3. Check coil for shorted or opened binding leads.

INSTALLATION

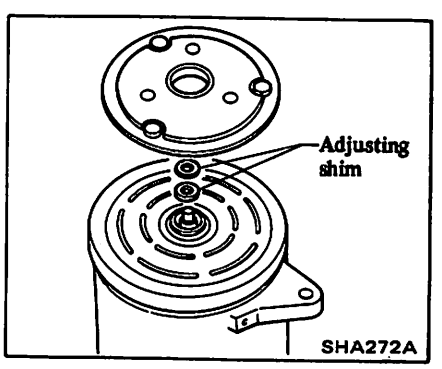
1. Install coil assembly on compressor, properly positioning terminals. Install snap ring, using snap ring plier.

Be careful not to confuse snap ring's outside and inside surfaces.

2. Using a plastic mallet, drive pulley and bearing assembly onto the neck of the front cover. Turn the pulley, making sure that there is no noise and that rotation is free. Also make sure that there is no pulley play.
3. Install inner snap ring, using snap ring plier.

Remove all oil from clutch pulley.

4. Fit key and clutch hub to shaft. Select adjusting spacer which gives the correct clearance between pulley and clutch hub.



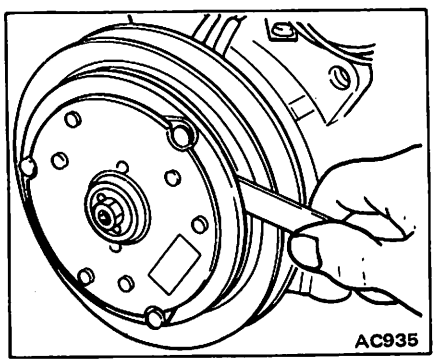
5. Coat shaft nut with Locklite.

Ⓣ : **Shaft nut**
19 - 21 N·m
(1.9 - 2.1 kg-m,
14 - 15 ft-lb)

6. Using a thickness gauge, measure the clutch hub-to-pulley clearance.

Hub-to-pulley clearance:
0.5 - 0.8 mm
(0.020 - 0.031 in)

If the specified clearance is not obtained, replace adjusting spacer and readjust.

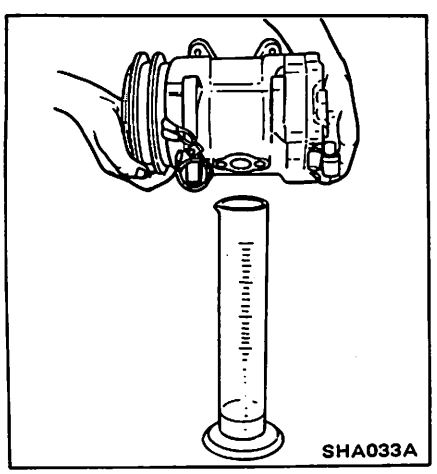


When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch some thirty times. Break-in operation raises the level of transmitted torque.

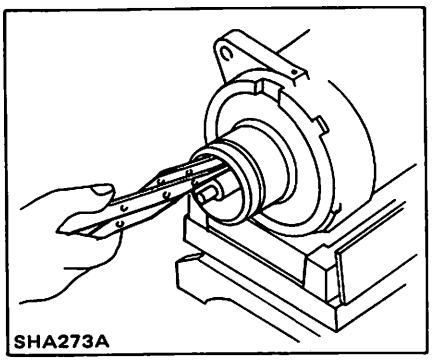
SHAFT SEAL

REMOVAL

1. Turn compressor upside down, and drain oil from suction port.

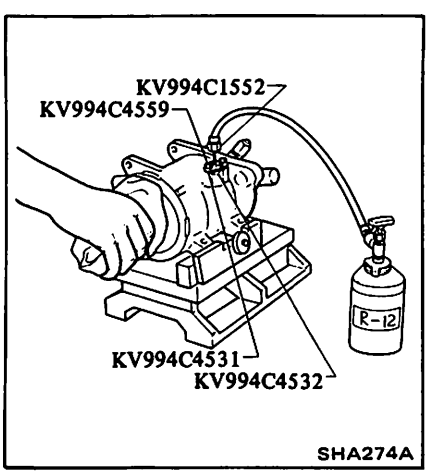


2. Remove clutch hub, pulley and bearing assembly, and coil assembly. Refer to Compressor Clutch for removal.
3. Using snap ring plier, compress and remove retainer ring.



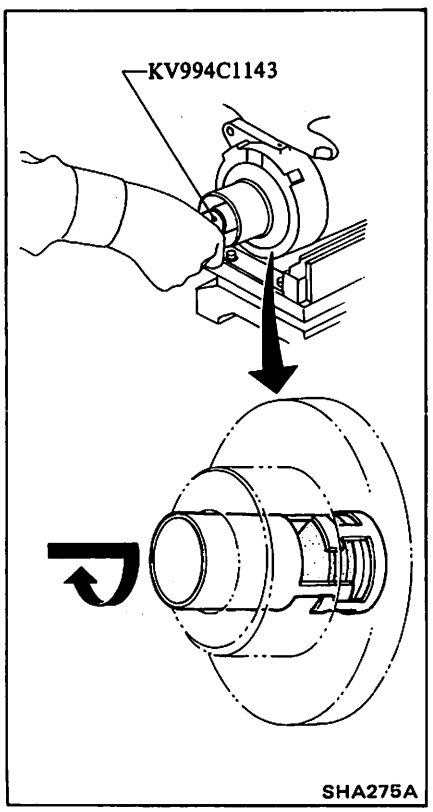
4. Remove key.
5.
(1) Plug low and high pressure (suction and discharge) openings of compressor with Tools KV994C4531, KV994C4532 and KV994C4559.
(2) Insert Tool KV994C1552 into hole in middle of blind cover at low pressure side and connect Tool to refrigerant can.
(3) Wrap rag around shaft. Apply pressure 196 to 490 kPa (2 to 5 kg/cm^2, 28 to 71 psi) from low pressure (suction) service valve of compressor, and receive shaft seal seat in rag.

CAUTION:
Use refrigerant for pressurizing. Do not use compressed air as it involves moisture in the system.



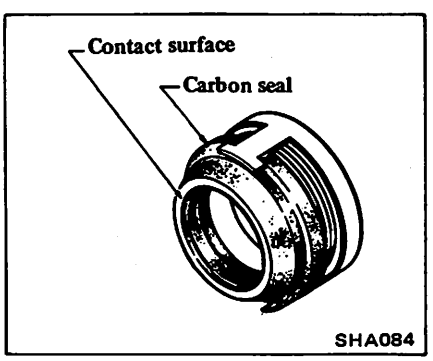
If shaft seal seat cannot be pulled out, reset it to its original position, and again try to pressurize.

6. Insert Shaft Seal Remover & Installer KV994C1143 through the open end of front cover. Depress carbon seal and hook tool at the case projection of shaft seal. Slowly pull out tool, thereby removing shaft seal.

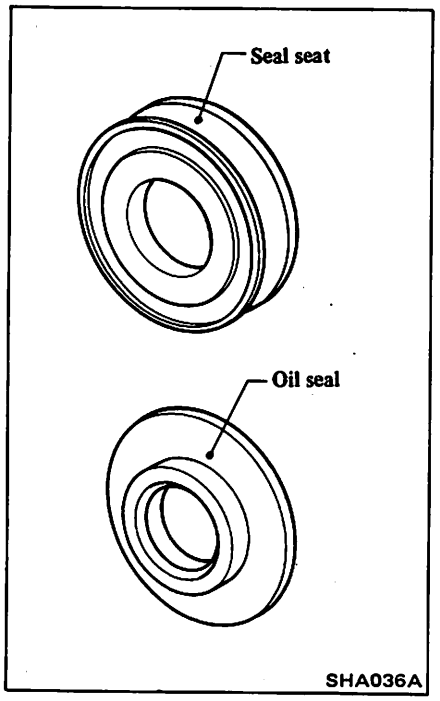


INSPECTION

1. Check carbon seal surface of shaft seal for damage. A very slight scratch on carbon seal's surface could cause gas leakage.



2. Check O-ring and the carbon seal contact surface of shaft seal seat for damage. Make sure that O-ring contact surface at front cover is not damaged. Make sure that grease is applied to oil seal in shaft seal seat.



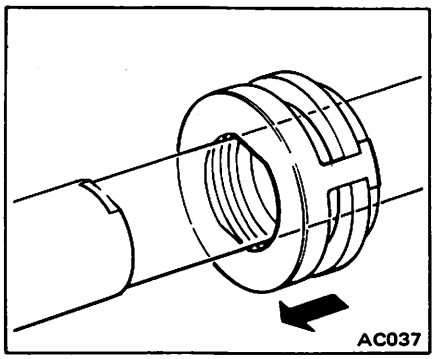
INSTALLATION

Do not reuse shaft seal and shaft seal seat.

CAUTION:
In placing a new seal kit on the workbench, make sure that the contact surface faces upward. Take necessary steps to avoid damage.

1. Make sure that the shaft seal contact surface is free of dirt and amply lubricated with compressor oil.
2. Cap Tool KV994C5784 to the top end of compressor shaft.
3. Using Tool KV994C1143, insert shaft seal with shaft seal case and shaft cutout aligned.

Apply force to turn the seal somewhat to the left and right. Insure that shaft seal seats properly in the shaft cutout.

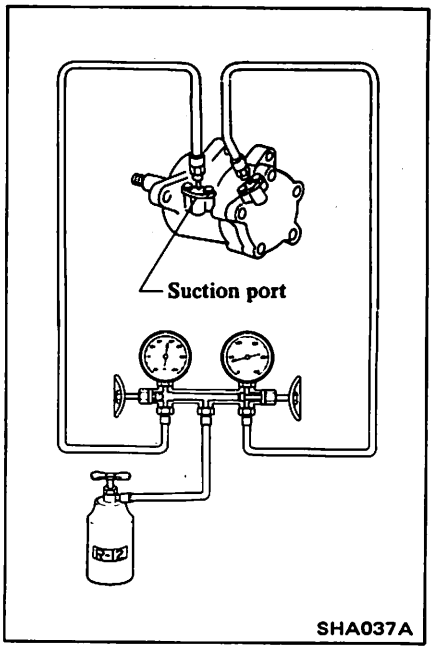


4. Fit O-ring to the outside groove of shaft seal seat, making sure that it seats properly.
5. Apply quite a bit of compressor oil on contact surface and around shaft seal seat so that it can slide easily in front cover. Lightly coat surface of shaft with compressor oil. Following this, push in shaft seal seat and oil seal so that it seats properly at the land of front cover.
6. Install key.
7. Using snap ring pliers, compress retainer ring and fit it into front cover. Seat retainer ring firmly in the groove. Thoroughly wipe grease or oil from shaft surface.
8. Install Tool KV99412329 to the shaft of compressor, and turn the shaft 5 to 6 turns in the clockwise direction.
9. Then, check for gas leakage as follows.

(1) Plug low and high pressure (suction and discharge) openings of compressor with Tool KV994C4531, KV994C4532 and KV994C4559.
(2) Install Tool KV994C1552, changing hose and refrigerant can to manifold gauge and insert Tool KV994C1552 into hole in middle of blind cover at low pressure side.

Connect refrigerant can to the middle hose of manifold gauge.

(3) Open valve of can tap, charge refrigerant through low pressure (suction) service side and purge air between high pressure hose and Tool KV994C1552.
(4) Conduct a leak test. If there is a leak, remove and then install parts again.

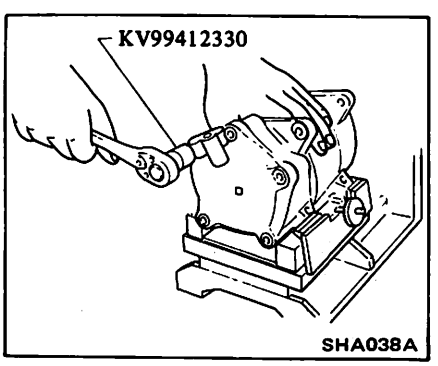


10. Install compressor clutch assembly. Refer to Compressor Clutch for installation.
11. From suction port, charge compressor with same amount of new oil as was drained before. Refer to Oil Level Check for required amount of oil.

REAR COVER AND REAR CYLINDER HEAD

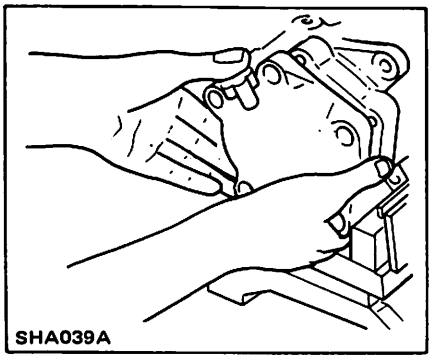
REMOVAL

1. Turn compressor upside down, and drain oil from suction port.
2. Using Tool KV99412330, remove rear cover mounting bolts. Starting at the top, loosen all bolts one turn in an alternating pattern. Then remove bolts in turn.

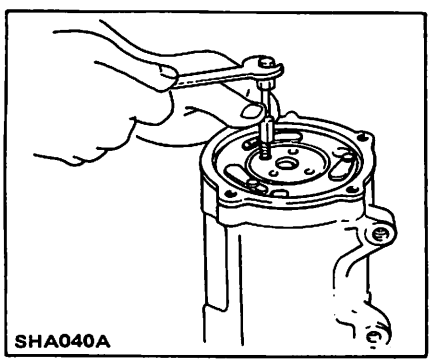


3. Grasp rear cover and carefully separate it from compressor. Tap flange lightly and alternately as required with a plastic mallet.

CAUTION:
Do not tap on compressor shaft.


SHA039A

4. Remove three O-rings. Discard used O-rings.
5. Remove rear cylinder head, suction valve plate, two pins and O-ring. Carefully remove suction valve plate, avoiding deformation.
6. When removal proves difficult, use Tool KV994C5785. Insert this tool into refrigerant passage (refer to page 10) in cylinder head. With nut in firm contact with the back side of cylinder head, tighten bolt slowly to break loose the head.


SHA040A

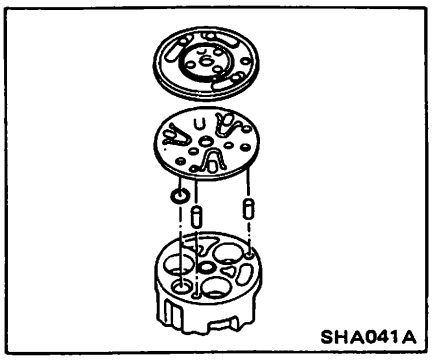
INSPECTION

1. Make sure that the cylinder surface which comes into contact with suction valve plate is not scratched.
2. Check suction valve plate and cylinder head valve for signs of damage.

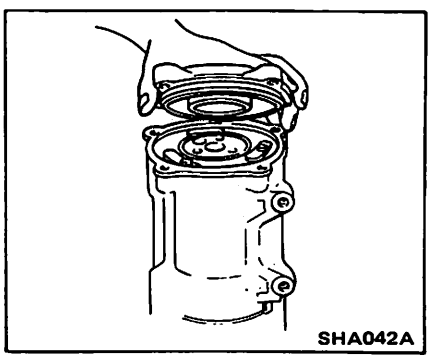
INSTALLATION

Do not reuse old gasket and O-ring.

Using clean compressor oil, remove dirt and other matter from rear cover, cylinder head and suction valve plate. Clean the workbench.
1. Using suitable blocks, position compressor with the front face downward and the rear upward.
2. Install two pins and gas pipe O-ring in the rear of cylinder. Coat O-ring beforehand with an ample amount of oil.
3. Apply a coat of compressor oil to cylinder surface.
4. Install suction valve plate, making sure that three valves properly align with cylinders.


SHA041A

5. Assemble cylinder head and install three O-rings in their respective positions. Coat O-rings with ample amount of oil before installation.
6. Carefully fit rear cover to the rear of compressor.


SHA042A

7. Using Allen Socket KV99412330, tighten up five bolts in an alternating pattern, starting at the top. Do not forget lock washers.

Ⓣ : **Rear cover fixing bolt**
19 - 21 N·m
(1.9 - 2.1 kg-m,
14 - 15 ft-lb)

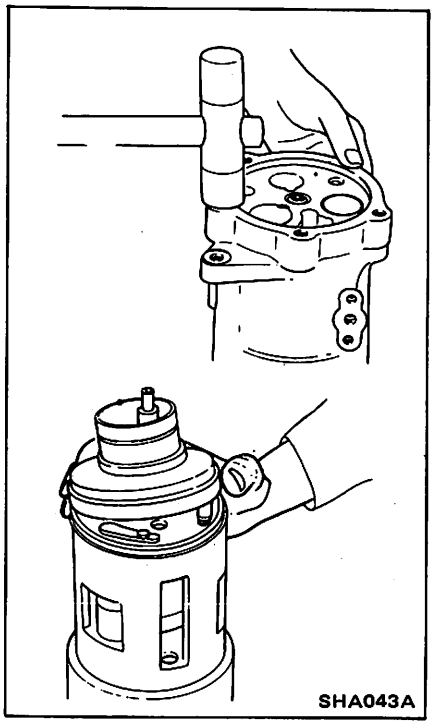
From suction port, charge compressor with same amount of new oil as was drained before. Refer to Oil Level Check for required amount of oil.

FRONT COVER, FRONT CYLINDER HEAD AND CYLINDER

REMOVAL

1. Turn compressor upside down, and drain oil from suction valve.
2. Remove compressor clutch assembly. Refer to Compressor Clutch.
3. Using snap ring pliers, remove shaft seal retainer ring. Then remove shaft seal seat. Refer to Shaft Seal. Removal of shaft seal is not absolutely necessary. It may be removed when cylinder assembly is removed from front cover. In fact, this approach facilitates work.
4. Remove rear cover, three O-rings, cylinder head, suction valve plate, two pins and O-ring in that order. Refer to Rear Cover and Rear Cylinder Head. This exposes the rear part of cylinder.
5. With the front facing downward, support compressor shell. Using a plastic mallet, tap at the rear end of the shell flange, driving shell straight downward. Discard front cover gasket.
6. Detach front cover from cylinder assembly.
7. Remove shaft seal from the shaft.
8. Remove two O-rings, cylinder head, suction valve plate, two pins and O-ring. In removing two pins, proceed carefully to avoid cylinder head damage. Discard old O-rings.

CAUTION:
Do not deform suction valve plate when removing it.

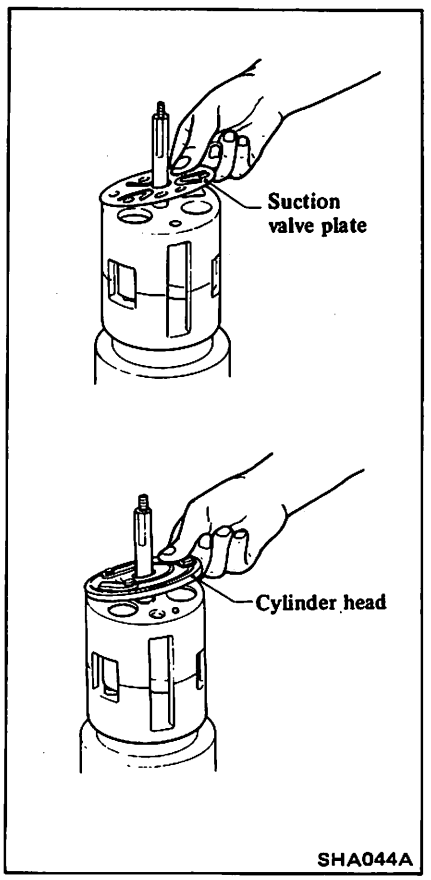


INSTALLATION

Note that designs of front and rear suction plates are identical but that designs of front and rear cylinder heads are not.

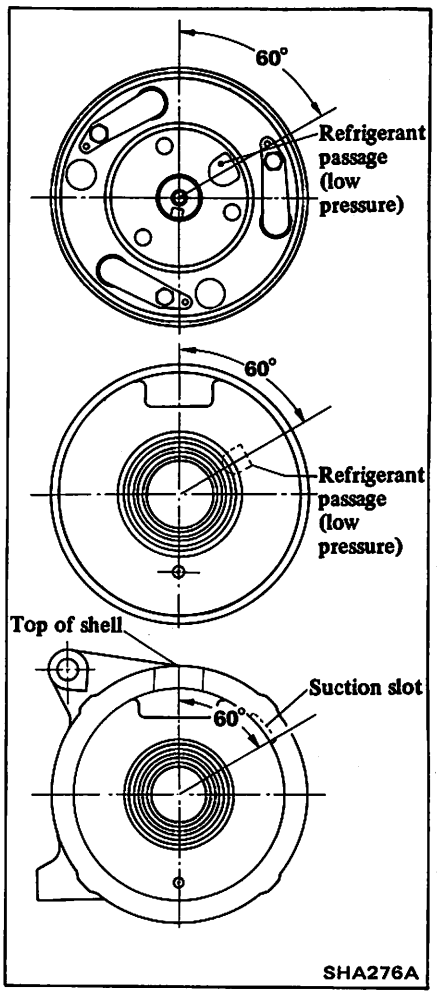
Discard old O-rings and install new ones.

1. Using suitable blocks, face cylinder assembly upward. Install two pins and O-ring. Lubricate O-ring before assembly.
2. Position suction valve plate in the order listed while making sure that three valves of suction valve plate are aligned with cylinder.
3. Apply a coat of oil on both suction plate's surfaces before assembling it.

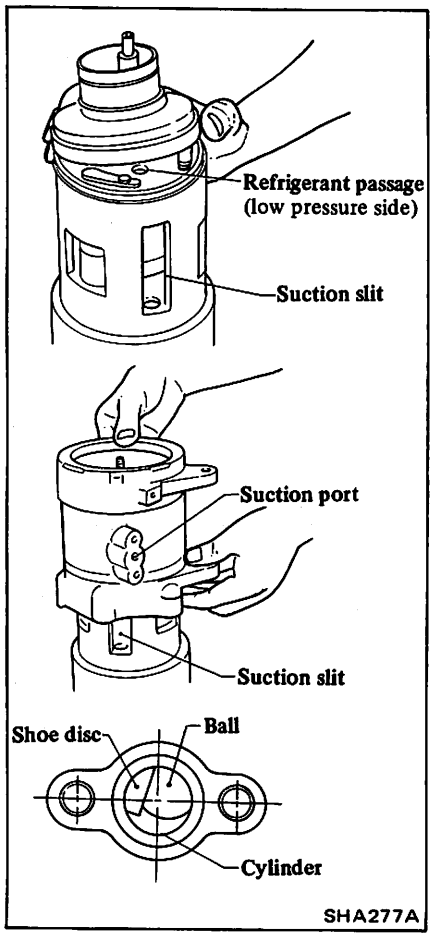


4. Align shaft seal with the shaft cutaway. Firmly seat shaft seal at the shaft land. Attempt to turn shaft seal to clockwise and counterclockwise, confirming that it is seated properly.
5. Install two O-rings on cylinder head. Coat O-rings with ample amount of oil before installation.
6. Install front cover as follows:

Front cover must be installed in such a manner that clutch terminal can be positioned in cut portion of shell when these three parts are assembled. For this purpose, install front cover on cylinder head so that angle between threaded hole in front cover and low pressure side refrigerant passage in cylinder head is about 60°.



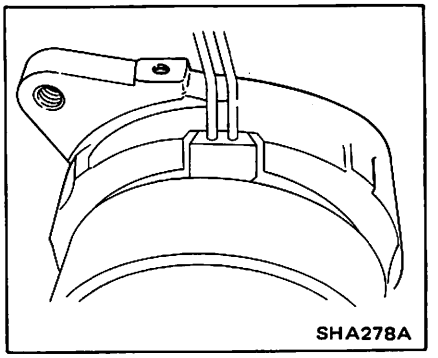
7. Install gasket on front cover. Install shell on cylinder head. In this case, adjust position of shell so that suction inlet of shell opens in the same direction as suction slot of cylinder assembly. Then, make sure swash plate is visible in suction inlet by removing suction valve.



8. Turn over the assembled shell and cylinder, that is, with the front downward.

CAUTION:
Hold securely with hand shell and cylinder assembly to prevent possible mismatching. Otherwise, O-ring will be deflected or moved.

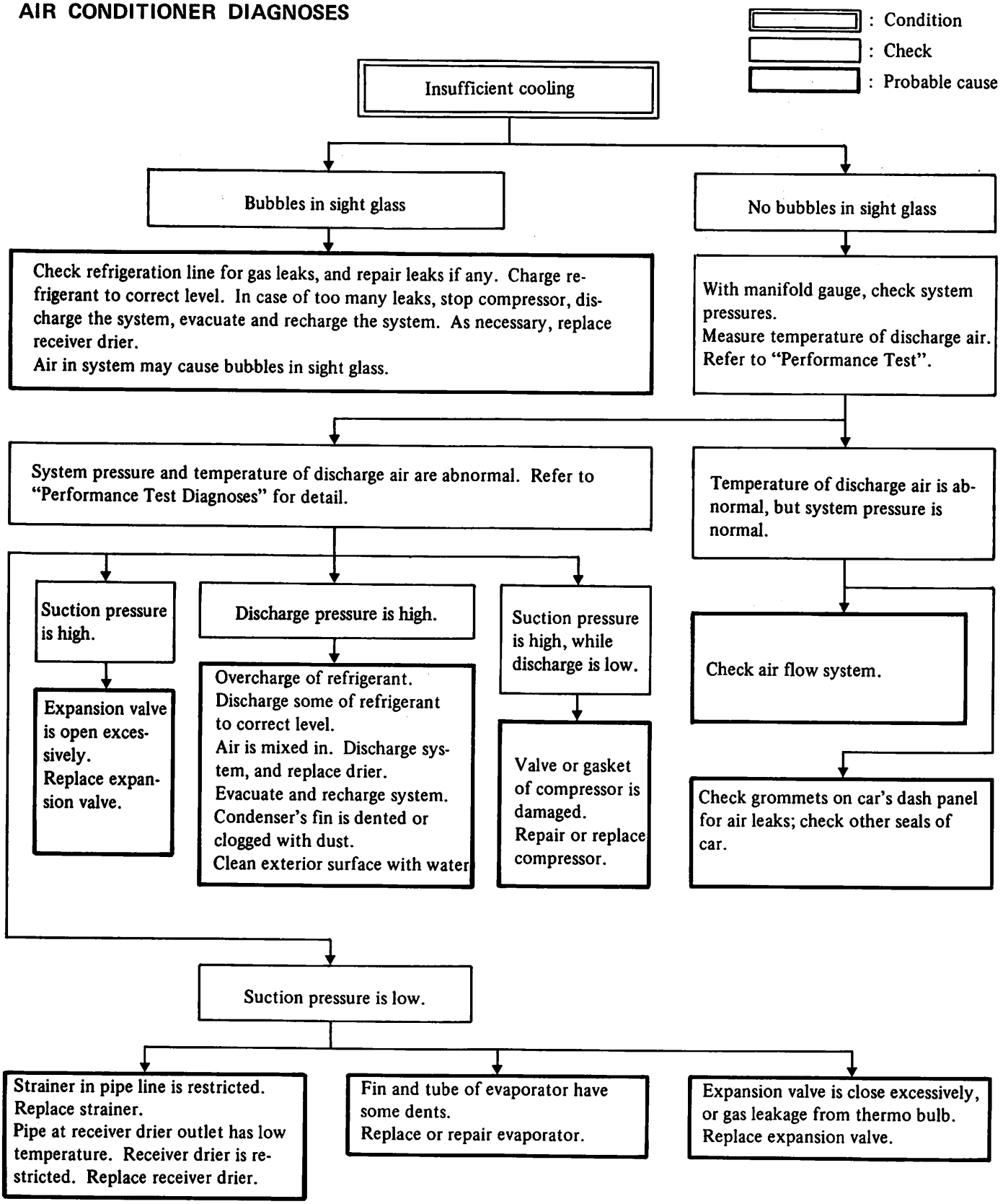
9. Continue with work up to installation of rear cover. Refer to Rear Cover and Rear Cylinder Head for installation.
10. Install shaft seal seat. Refer to Shaft Seal for installation.
11. Install and adjust compressor clutch. Refer to Compressor Clutch for installation.
12. Make sure that clutch terminal is in cut portion provided on top of shell. If no coincidence is observed, repeat installation procedure starting from step 3.

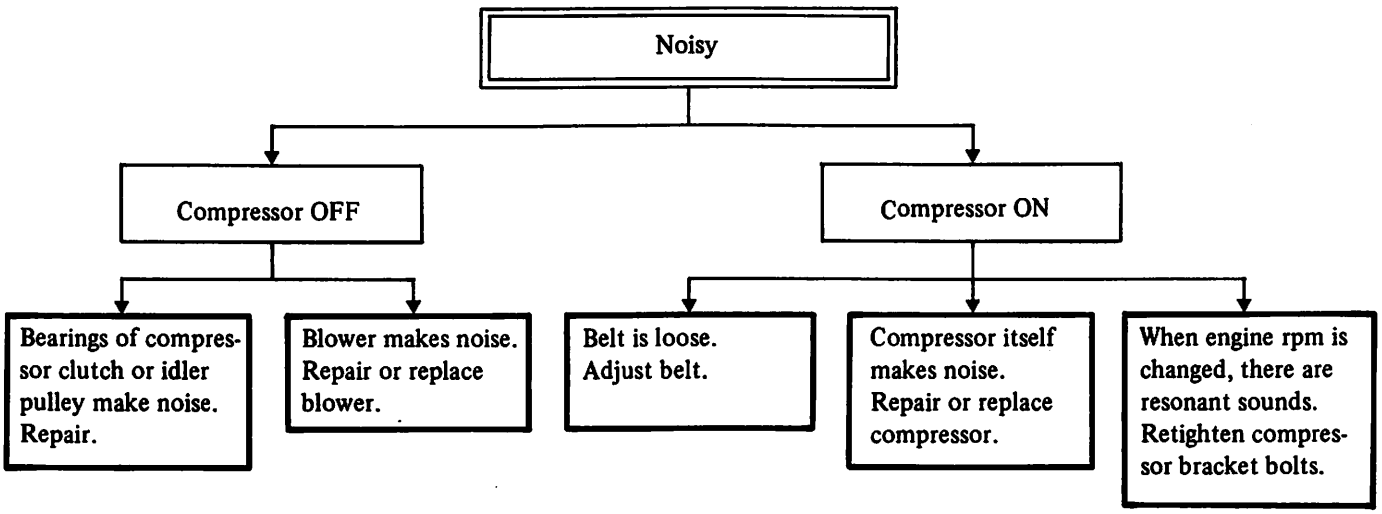


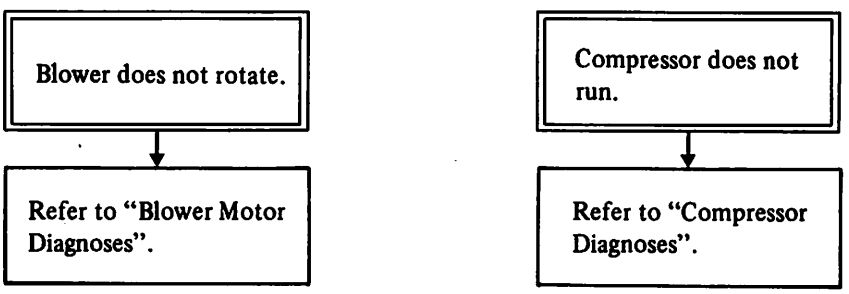
13. Conduct a leak test. Refer to Shaft Seal for gas leak test.
14. From suction port, charge compressor with same amount of new oil as was drained before. Refer to Oil Level Check for required amount of oil.

TROUBLE DIAGNOSES AND CORRECTIONS

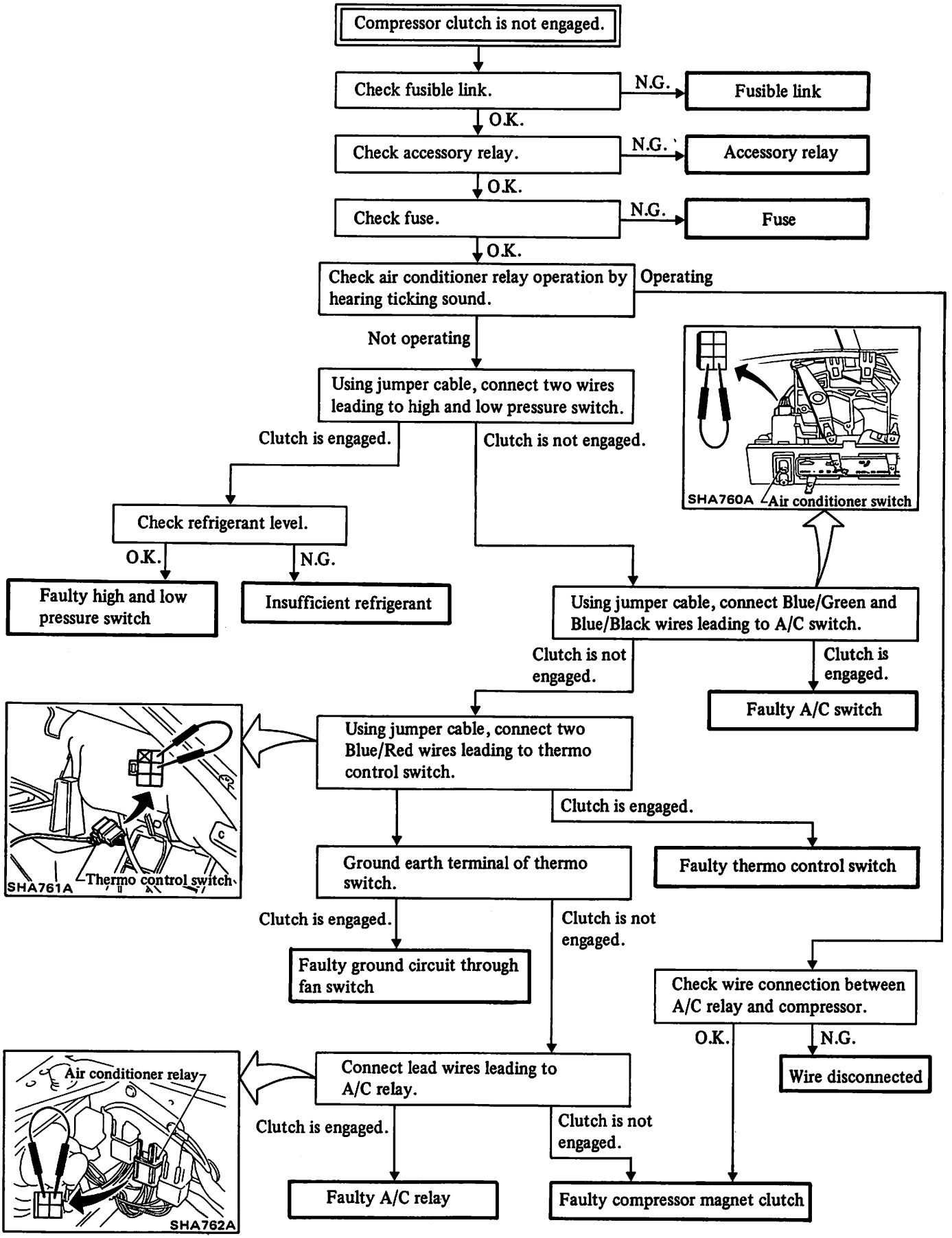
AIR CONDITIONER DIAGNOSES



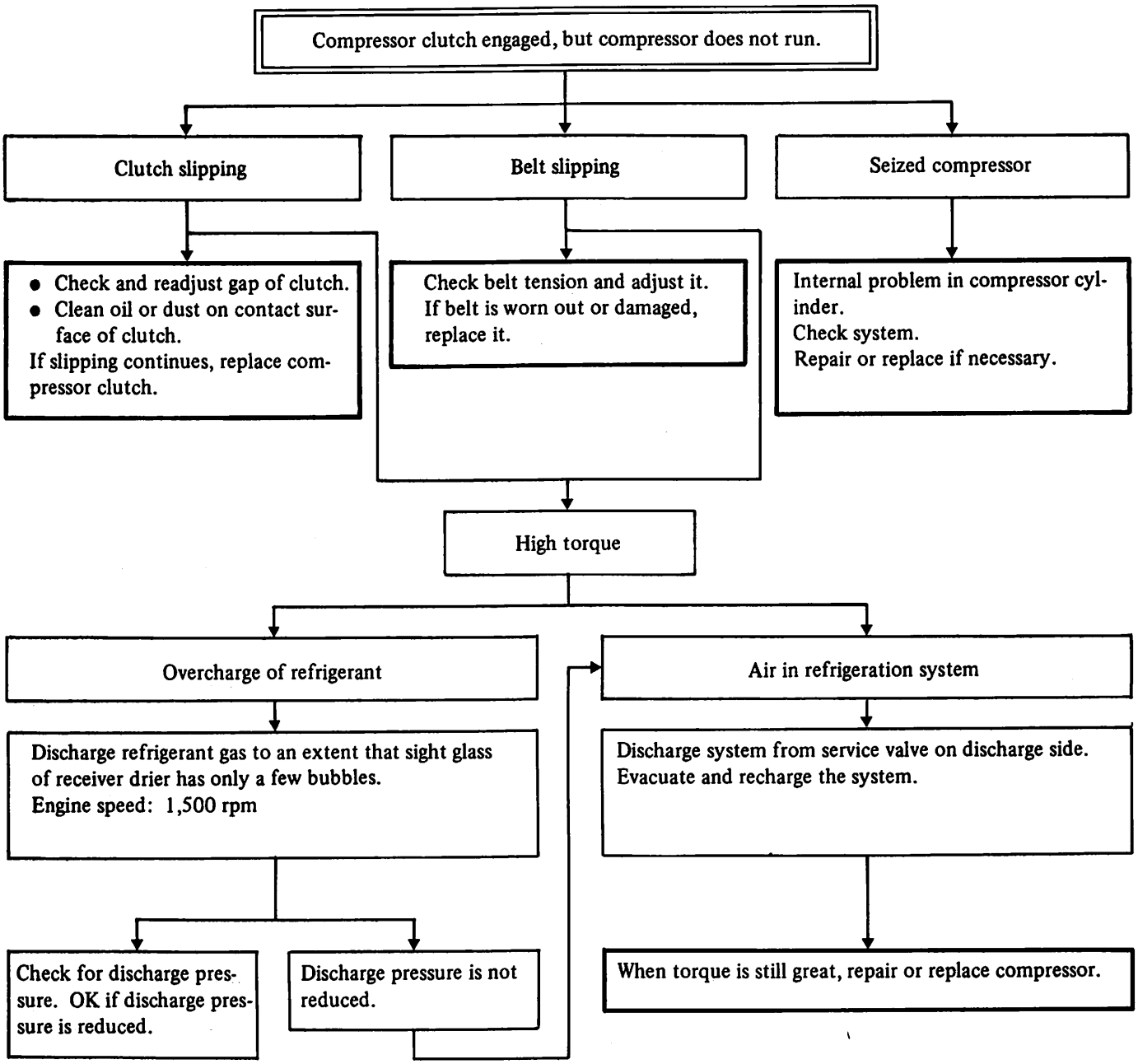

Noisy
Compressor OFF
Compressor ON
Bearings of compressor clutch or idler pulley make noise. Repair.
Blower makes noise. Repair or replace blower.
Belt is loose. Adjust belt.
Compressor itself makes noise. Repair or replace compressor.
When engine rpm is changed, there are resonant sounds. Retighten compressor bracket bolts.

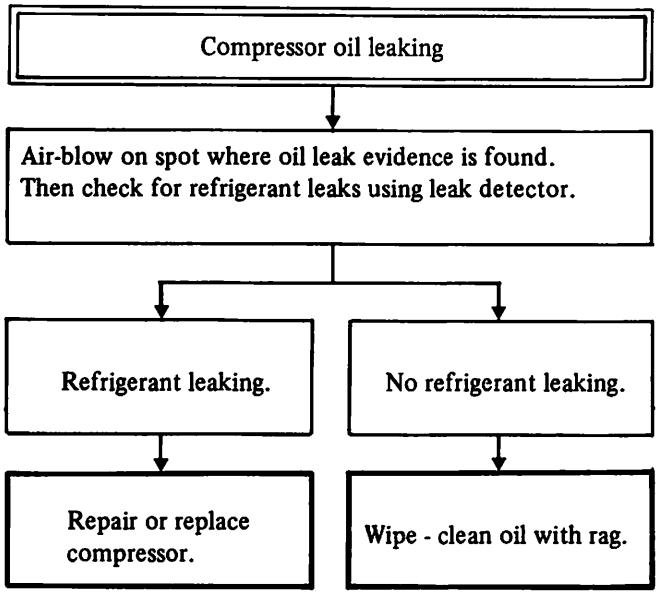

Blower does not rotate.
Refer to "Blower Motor Diagnoses".
Compressor does not run.
Refer to "Compressor Diagnoses".

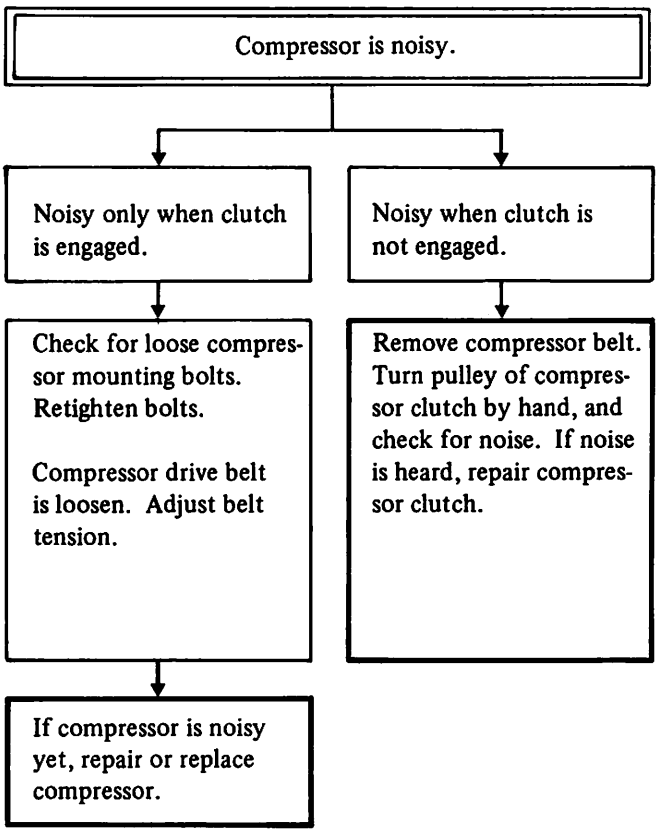
COMPRESSOR CLUTCH DIAGNOSES



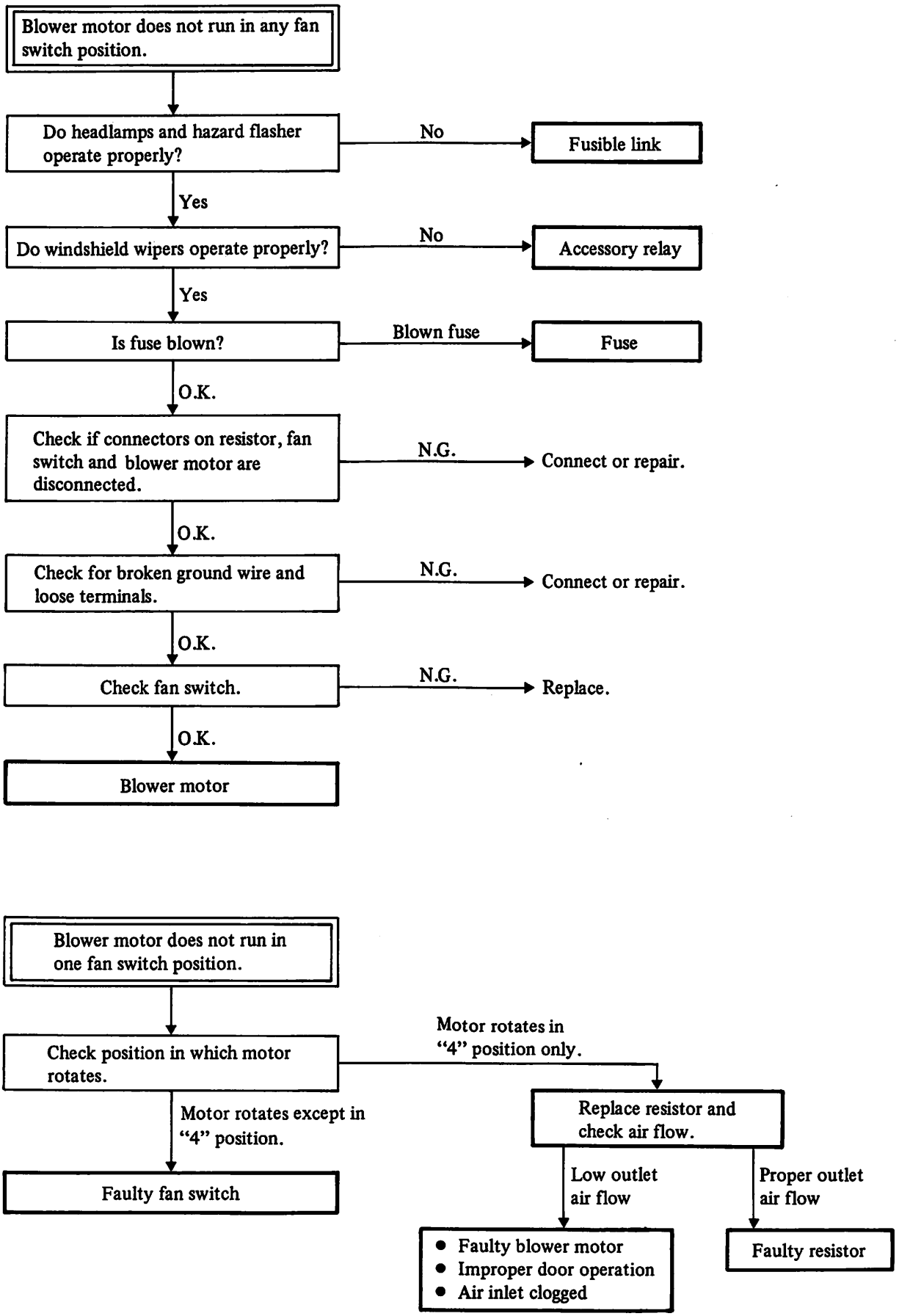
COMPRESSOR DIAGNOSES



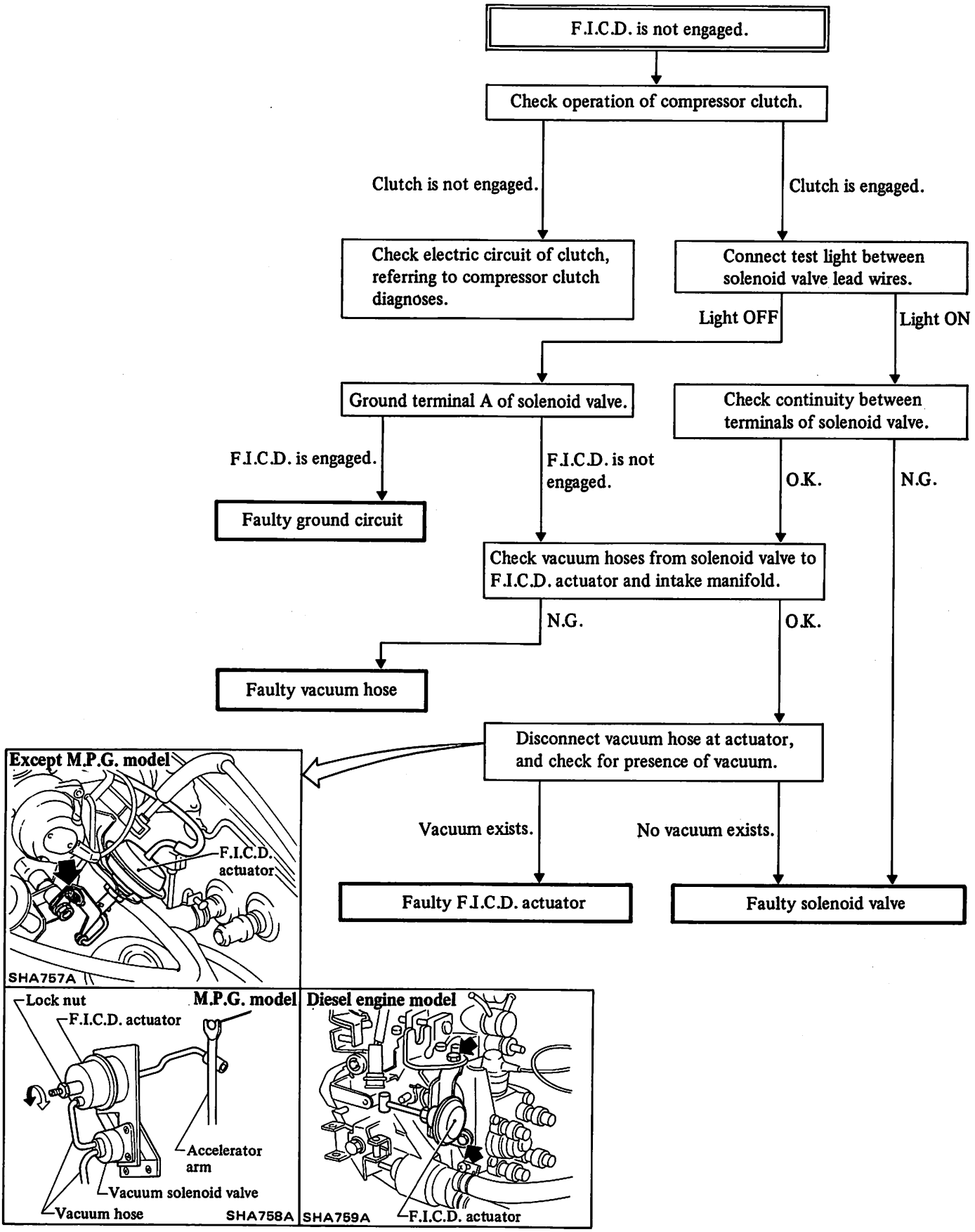

Compressor oil leaking
Air-blow on spot where oil leak evidence is found.
Then check for refrigerant leaks using leak detector.
Refrigerant leaking.
No refrigerant leaking.
Repair or replace compressor.
Wipe - clean oil with rag.


Compressor is noisy.
Noisy only when clutch is engaged.
Noisy when clutch is not engaged.
Check for loose compressor mounting bolts.
Retighten bolts.
Compressor drive belt is loosen. Adjust belt tension.
Remove compressor belt.
Turn pulley of compressor clutch by hand, and check for noise. If noise is heard, repair compressor clutch.
If compressor is noisy yet, repair or replace compressor.

BLOWER MOTOR DIAGNOSES



FAST IDLE CONTROL DEVICE DIAGNOSES



SERVICE DATA AND SPECIFICATIONS (S.D.S.)

GENERAL SPECIFICATIONS

COMPRESSOR

Model	MJS170
Type	Swash plate
Displacement cm^3 (cu in)/rev.	170 (10.37)
Cylinder bore x stroke mm (in)	40.0 x 22.6 (1.575 x 0.890)
Direction of rotation	Clockwise (viewed from drive end)
Type of driving belt	A type

LUBRICATING OIL

Model	MJS170
Type	SUNISO 5GS
Capacity mℓ (US fl oz, Imp fl oz)	150 (5.1, 5.3)

REFRIGERANT

Type	R-12
Capacity kg (lb)	0.8 - 1.0 (1.8 - 2.2)

INSPECTION AND ADJUSTMENT

BELT TENSION

	Used belt	New belt
Fan belt/Applied pressure mm (in)/N (kg, lb)	9 - 11 (0.35 - 0.43)/ 98 (10, 22)	7 - 9 (0.28 - 0.35)/ 98 (10, 22)

COMPRESSOR

Model	MJS170
Clutch hub to pulley clearance mm (in)	0.5 - 0.8 (0.020 - 0.031)

ENGINE IDLING SPEED

When F.I.C.D. is ON	Gasoline engine	M/T	800±50 rpm
		A/T	620±40 rpm ("D" position)
	Diesel engine	M/T	900±50 rpm
		A/T	900±50 rpm ("N" position)

TIGHTENING TORQUE

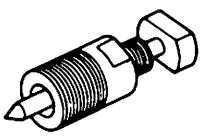
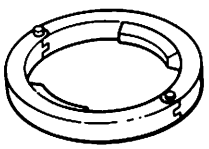
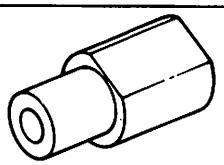
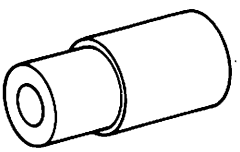
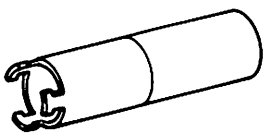
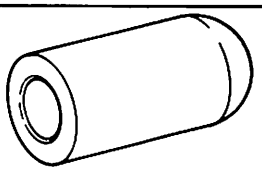
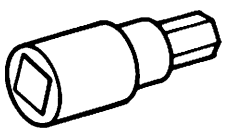
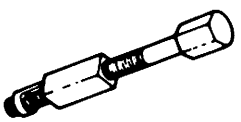
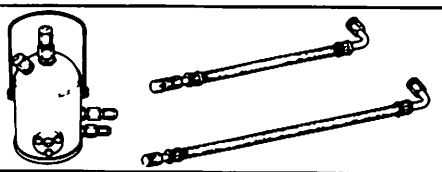
BRACKET AND PIPE

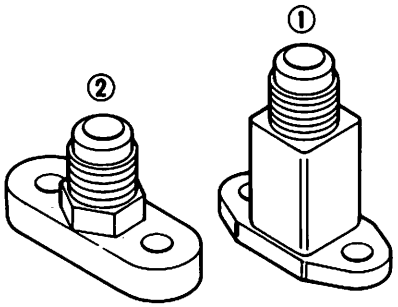
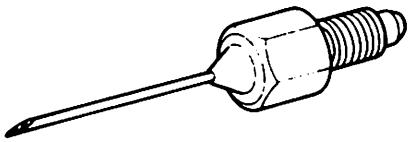
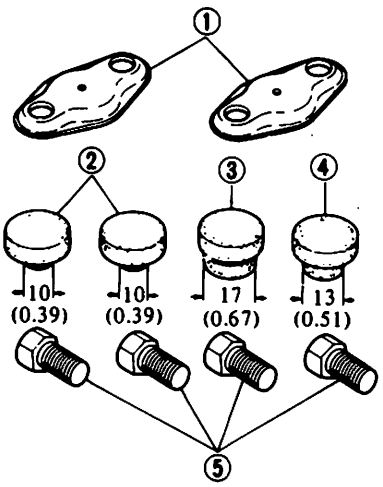
	N·m	kg-m	ft-lb
Compressor bracket to cylinder block	30 - 40	3.1 - 4.1	22 - 30
Compressor to compressor bracket	30 - 40	3.1 - 4.1	22 - 30
Flexible hose to compressor at condenser	14 - 18	1.4 - 1.8	10 - 13
Pipes at compressor	14 - 18	1.4 - 1.8	10 - 13
High pressure pipe (from condenser to receiver drier)	15 - 25	1.5 - 2.5	11 - 18
High pressure pipe (from receiver drier to cooling unit)	10 - 20	1.0 - 2.0	7 - 14
Low pressure pipe	20 - 29	2.0 - 3.0	14 - 22
Low pressure switch	9 - 10	0.9 - 1.0	6.5 - 7.2
High pressure switch	9 - 10	0.9 - 1.0	6.5 - 7.2

COMPRESSOR

	MJS170		
	N·m	kg-m	ft-lb
Shaft nut	19 - 21	1.9 - 2.1	14 - 15
Rear cover fixing bolt	19 - 21	1.9 - 2.1	14 - 15
Cover plate fixing bolt	15 - 17	1.5 - 1.7	11 - 12

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
KV99412302 (J24878-1)	Clutch hub wrench 
KV994C5780 (–)	Clutch hub puller 
KV994C5781 (–)	Puller adapter 
KV99412329 (J26072)	Shaft handle socket 
KV994C5782 (–)	Puller pilot 
KV994C1143 (–)	Shaft seal remover and installer 
KV994C5784 (–)	Shaft seal pilot 
KV99412330 (–)	Allen socket 
KV994C5785 (–)	Cylinder head remover 
KV994A9690 (–)	Oil separator kit 

Tool number (Kent-Moore No.)	Tool name
KV992C5079 (–) ① KV992C5081 (–) ② KV992C5082 (–)	Adapter connector set Adapter connector A Adapter connector B 
KV994C1552 (–)	Charge nozzle 
KV994C4548 (–) ① KV994C4531 (–) ② KV994C4532 (–) ③ KV994C4533 (–) ④ KV994C4534 (–) ⑤ KV994C4559 (–)	Blind cover set Blind cover Gasket Gasket (Useless) Gasket (Useless) Bolt 
	Unit: mm (in)

ELECTRICAL SYSTEM

SECTION EL

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For other electrical systems, refer to the following sections:

- EMISSION CONTROL SYSTEM ... EF & EC section
- HEATER AND AIR CONDITIONER ... HA section

ELECTRICAL DIAGNOSIS INTRODUCTION

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

The key to timely and accurate diagnosis of electrical problems is to:

- Have a basic understanding of electrical principles and electrical component operation.
- Be able to interpret wiring diagram and schematics.
- Know the various test methods and when to use each.
- Have a systematic approach to identify the specific cause of an electrical problem.

BASIC RULE OF ELECTRICITY

A complete electrical circuit must have:

- A Source (battery, alternator)
- A Load (lights, coil, amplifiers, motor, etc.)
- Electrical Pathway (connecting from the source to the load and back to the source); (wires, switches, body of vehicle (ground).

Remembering this basic rule will make it a lot easier to troubleshoot electrical problems.

WIRING DIAGRAMS

There is a schematic illustrating each electrical circuit. Accurate diagnosis of electrical problems requires that you effectively use and interpret this diagram. Since it uses a special language, i.e., symbols, codes and abbreviations, let's review the following chart.

ELECTRICAL SYMBOLS AND ABBREVIATIONS

SYMBOLS

- Single filament bulb
- Dual filament bulb
- Fuse
- Fusible link
- Diode
- Motor
- Transistor
- Resistor
- Coil
- Variable resistor
- Thermistor
- Reed switch
- Circuit breaker
- Condenser
- Switch (Normally open)
- Switch (Normally closed)
- Ground
- No connection between wires
- Connection between wires

CONNECTORS

- Pin-type connector (Male)
- Pin-type connector (Female)
- Plain-type connector (Male)
- Plain-type connector (Female)
- Bullet connector (Female and male)
- Plain connector (Female and male)

WIRE COLOR CODING

B	= Black	BR	= Brown
W	= White	OR	= Orange
R	= Red	P	= Pink
G	= Green	PU	= Purple
L	= Blue	GY	= Gray
Y	= Yellow	SB	= Sky blue
LG	= Light Green		

In case of color coding using a Stripe. Base Color is given first, followed by the Stripe Color:

Example: L/W = Blue with White Stripe

ABBREVIATIONS

- Ⓢ : Sedan
- Ⓒ : Coupe
- Ⓦ : Wagon
- Ⓜ : M/T models
- Ⓐ : A/T models

To trace a problem in any electrical circuit, several types of diagrams can be used.

POWER SUPPLY ROUTING

This diagram is helpful in identifying specific problems in the power supply portion of the electrical circuits. For example, let's say a vehicle has inoperative instrument meter lights. A quick check proves that all other lights in the vehicle are operative. The power supply diagram shows that there cannot be a problem between the battery, ignition relay, ignition switch of fuse since the power supply circuit for the instrument meter lights is common with the clearance, tail, side marker, and license plate lights. Therefore, the cause of this specific problem must lie past the fuse, such as in the wiring, meter lights, or ground.

SCHEMATIC

A schematic is a very simplified wiring diagram useful for tracing electrical current flow and studying the operation of an electrical circuit.

WIRING DIAGRAM

This diagram is a more "true to life" layout of a complete circuit than the schematic. It identifies types and number of connectors, electrical terminal positions in the connector, color coding of wires, and connector codes.

In order to quickly find the exact location of a connector, the connector codes can be cross-referenced to the harness layout illustrations in the back of this section.

HARNESS DIAGRAM
(Foldout page)

The harness diagram shows the actual harness components. It will assist in locating interrelated circuits i.e., circuits which share common ground circuits, power circuits, etc.

TESTING

Many people think of electrical testing as connecting electrical test instruments into a circuit and measuring amps, volts and ohms. But there is really a lot more. In fact using test instruments should be one of the last steps in correcting an electrical problem.

SIGHT AND SOUND play an important role in electrical testing. Relays click, blowers spin, air condition clutches engage, lights illuminate, etc. Even though we cannot observe current flowing through a wire or a component, we can observe the effect it has on an electrical component. Sight and sound testing methods should be thoroughly exhausted before hooking-up any test instrument.

SUBSTITUTION is another test method. For example, you suspect a bad ground at the tail lamp. Try a jumper wire from ground to the lamp. What about a questionable fuse? Simply replace it with another. In several instances substitution may turn out to be the most effective method of correcting an electrical problem.

TEST INSTRUMENTS

Problems that cannot be solved through sight, sound, or substitution can be solved by using the appropriate test instrument.

A general rule to follow while trouble-shooting is to perform the easiest and least expensive checks first. This often means giving some careful thought to a trouble-shooting plan. Some of the most frustrating and confusing electrical problems begin with a haphazard and planless start. Make sure the checks you have selected are going to give the answers you need. If you test the wrong circuit, sue the wrong meter, or forget to check the meter scale and calibration, you just can't diagnose the problem.

TROUBLE-SHOOTING APPROACH

You should have a routine procedure or approach when trouble-shooting a problem, a method you are familiar with which gives you the maximum amount of information at minimum expense and effort. Sometimes it is helpful to ask yourself some questions first. For example:

WHAT IS THE PROBLEM? While this may seem a foolish question at first glance, the problem involved may not be the same as started on the repair order or even as observed by the customer. Sometimes, other problems or symptoms have been overlooked. Do not forget to identify the problem and controls involved. Check to see what electrical components work and what components do not work. This is an opportune time to use sight and sound testing methods.

HOW DOES THE CIRCUIT WORK? Once the electrical problem has been identified, consult the wiring diagram in the service manual.

Study the simplified schematic to develop an understanding of how the circuit is supposed to work. Then use harness layout illustration, power supply routing diagram, and vehicle wiring diagram. Get an idea of how the circuit is laid out in the vehicle and how it interrelates with other circuits.

WHICH TEST IS BEST? Stop and think of exactly what information you need to reach a proper solution. Decide which test will give you the most information. Do not forget to think of where you are going to make your test connections. Make sure you are performing your test at the most advantageous point. You do not want to dismantle a dash assembly to check a component which could be tested at a more accessible location. For instance, it is much easier to check terminal connectors and plugs than to break into a harness.

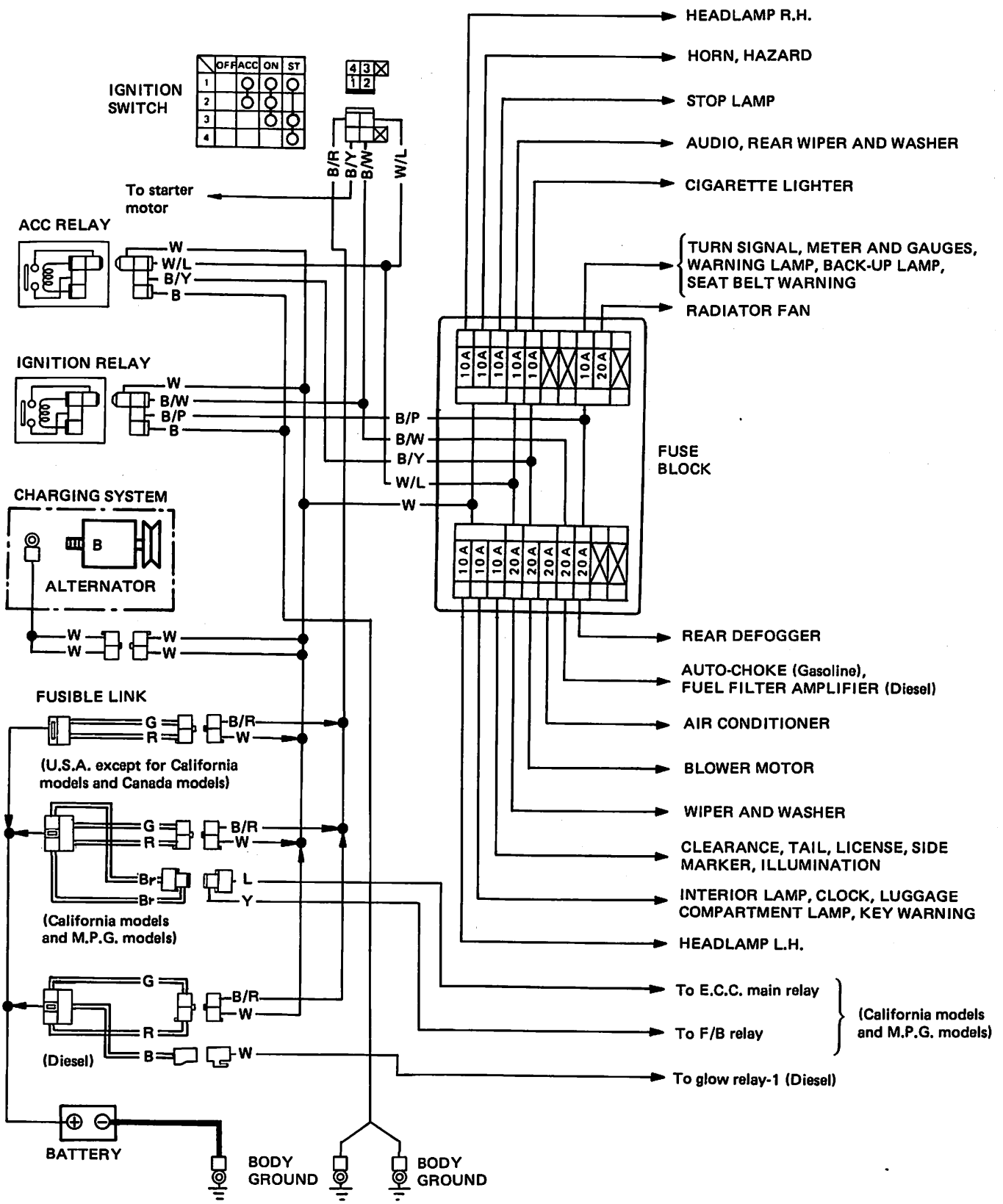
Once the tests have been performed, you should have the information you need to reach a logical conclusion and solve the problem but, if not, then review your testing procedure. Be certain that you are performing the test correctly and your procedure is valid.

Remember the most complex circuits are constructed from combinations and/or variations of the basic circuit: Source, Conductors, and Load. If you keep this in mind, use the service manual, and follow a logical trouble-shooting sequence, you can effectively troubleshoot electrical problems.

POWER SUPPLY

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

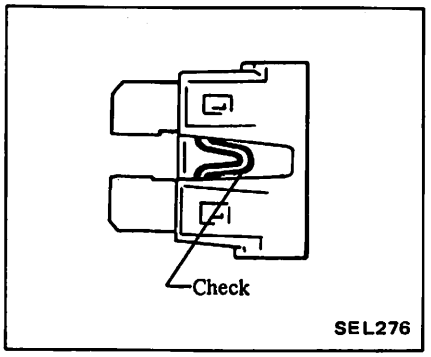
SCHEMATIC/POWER SUPPLY ROUTING



SEL701C

FUSE

INSPECTION



CAUTION:

a. If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of problem.

b. Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken with this link to ensure that it does not come into contact with any other wiring harness or vinyl or rubber parts.

A melted fusible link can be detected either by visual inspection or by feeling with finger tip. If its condition is questionable, use circuit tester or test lamp.

a. If fuse is blown, be sure to eliminate cause of problem before installing new fuse.

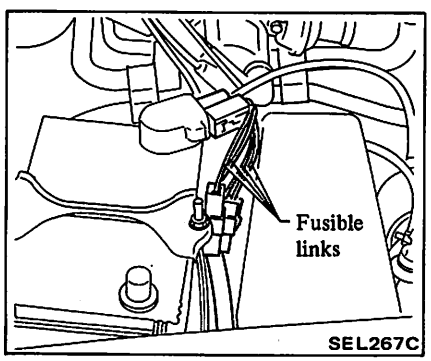
b. Use fuse of specified rating. Never use fuse of more than specified rating.

c. Do not install fuse in oblique direction; always insert it into fuse holder properly.

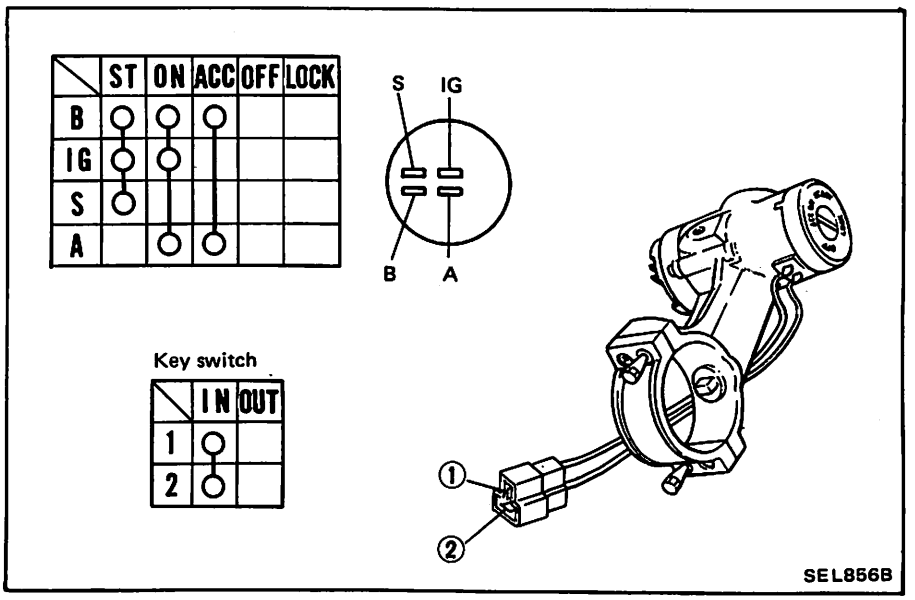
d. Remove fuse for clock if vehicle is not used for a long period of time.

FUSIBLE LINK

LOCATION



IGNITION SWITCH



IGNITION AND ACCESSORY RELAYS

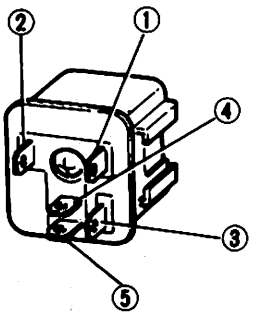
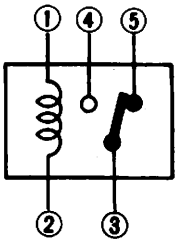
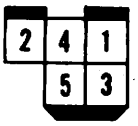
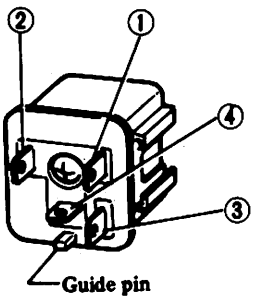
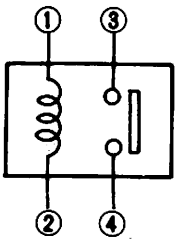
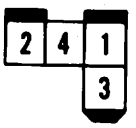
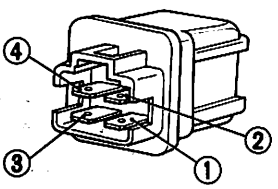
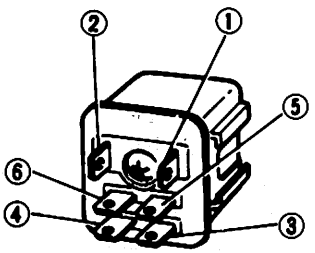
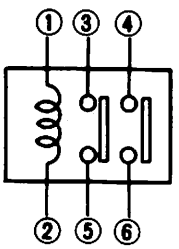
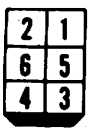
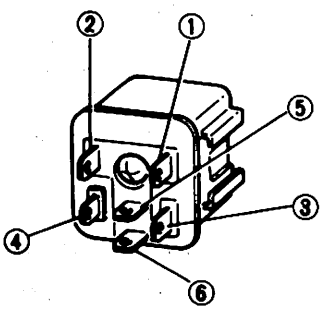
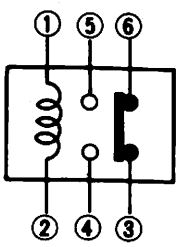
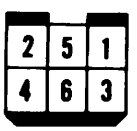
LOCATION

Ignition and accessory relays are located on the fuse block. Refer to page EL-82.

INSPECTION

Ignition relay and accessory relays are 1M type standardized relay. Refer to page EL-7.

STANDARDIZED RELAY

Type	Outer view	Circuit	Symbols	Case color
1T				BLACK
1M				BLUE
				BLACK
2M				BROWN
1M-1B				GRAY

SEL451C

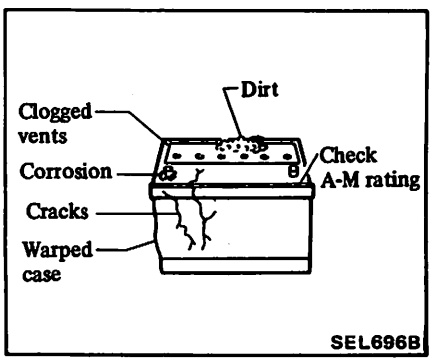
BATTERY

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

WARNING:
Never touch positive and negative terminals at the same time with bare hands. This could result in injury.

CAUTION:
a. If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
b. If the battery cables are disconnected, they should be tightly clamped to the battery terminals to secure a good contact.

VISUAL INSPECTION



1. Check battery rating against that of original factory equipment.
2. Check for cracks and warpage of the case.
3. Make sure cables are clean and tight.
4. Check acid level.
5. Make sure vents are not cloggged.
6. Make sure top of battery is clean.

CLEANING

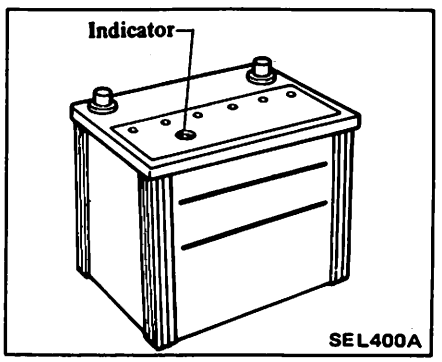
Use a stiff brush and a common baking soda and water solution to clean the battery surface, terminals and cable ends.

CAUTION:
Never allow the solution to enter individual cells. The baking soda will react with the battery acid. Also remember that battery acid is harmful to the eyes, skin and clothing.

MAINTENANCE-FREE TYPE

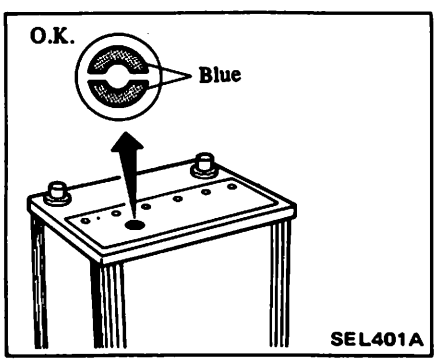
CONDITION CHECK

Battery condition can be checked using indicator on battery.



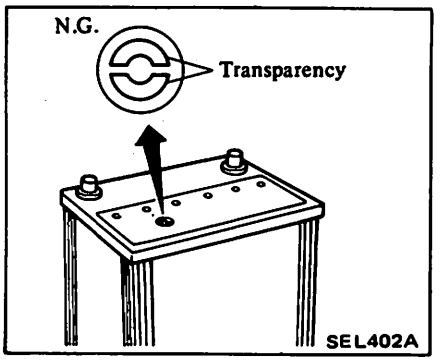
Good condition

When blue indicator is shown, battery is properly charged.



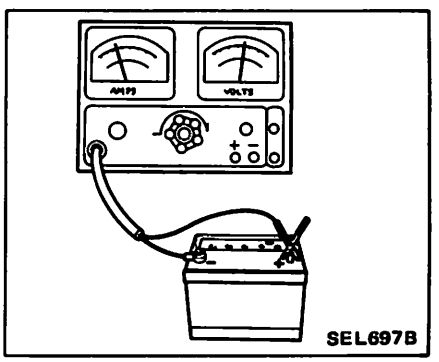
Lack of charge condition

When transparent indicator is shown, battery is not charged and requires recharging.



TEST

Battery capacity test



1. Check battery rating against that of original factory equipment.
2. With battery connected to tester as shown, turn load knob until a draw of 3 times the battery rating is shown. (Example: Battery rating 60AH Turn load to 180A draw.)
3. Hold this draw for 15 seconds, then look at voltage. If voltage remains at 9.6 volts or above, THE BATTERY IS GOOD. You need not perform any further tests. If voltage drops below 9.6 volts, then proceed to next test.

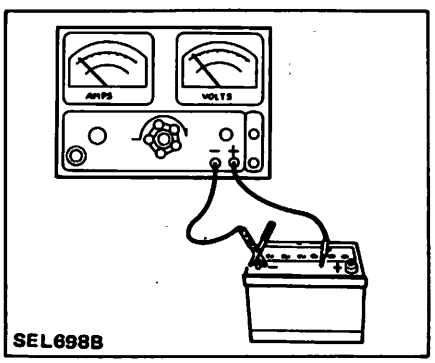
Three-minute charge test

This test identifies a battery as being sulfated and should only be performed if the battery has failed the capacity test.

1. Connect a good quality battery charger.
2. Turn charger to a fast rate not over 40A.
3. After three minutes, check voltmeter reading. If it is over 16.5 volts, battery should be replaced.

Battery leakage test

Check to make sure battery is not discharging across top, between two posts.



1. Set voltmeter to low range.
2. Touch negative lead of voltmeter to negative battery post.
3. Touch positive lead of voltmeter to top of battery, and move it around.

If reading goes over 0.5 volts, then clean off top of battery and retest.

Battery draw test

For discharging problems after other battery tests show that the battery is good and capable of holding a charge perform the battery draw test.

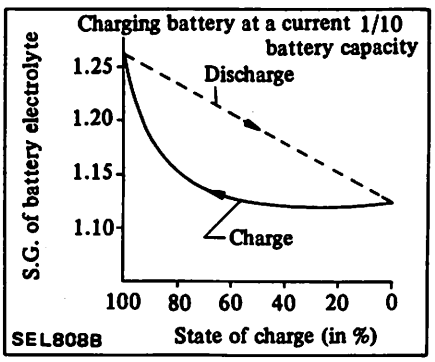
1. Disconnect battery ground cable.
2. Insert test light in series between cable end and the negative battery post.
3. With all switches and systems off the test light should not be lit.
4. If the light is lit begin disconnecting fuses and units until the light goes out. **The clock is designed to run at all times. Be sure it is not the cause of the light being on.**
5. Repair the circuit causing the draw.

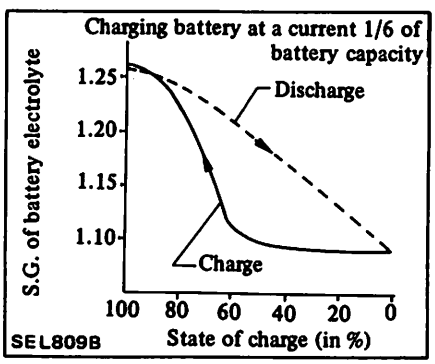
CHARGING

Description

Charging rate and specific gravity of battery electrolyte

The relationship between the charged condition of the battery and the specific gravity of battery electrolyte differs, as shown in figures below, when the battery is discharging and when it is being charged.





As can be seen from these figures, the battery has the following features:

- The specific gravity of battery electrolyte increases very slowly while the battery is being charged.
- The smaller the charging current, the slower the specific gravity of the electrolyte increases.

Indicator

- The indicator will turn from blue to transparent when the battery charge drops to 20 to 30%.
- The indicator will turn blue when the battery charge is between 65 and 90% under charging.

Charging

If the indicator turns transparent (indicating that battery charge is required), charge the battery in the following manner:

WARNING:
a. Keep battery away from open flame while it is being charged.
b. When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
c. Do not allow electrolyte temperature to go over 45°C (113°F).

Standard method

Charge the battery at 1/10 the current of battery capacity. When the indicator turns from transparent to blue, continue to charge the battery for an additional two hours, then stop charging.

Quick charge

Charge the battery at a current of 40 amperes [except for NS40SL(S)MF] and 20 amperes [for NS40SL(S)MF] for approximately 45 minutes.
Never charge more than 45 minutes.

CAUTION:
Charging the battery at a current of more than 10 amperes while using quick charge methods will shorten the service life of the battery. Use the standard method to charge the battery unless circumstances requires otherwise.

Charging current and time required for charging

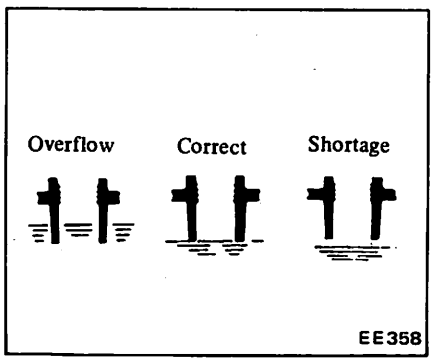
Charging current	Time required
1/6 of battery capacity	Approx. 4 - 5 hours
1/10 of battery capacity	Approx. 8 - 10 hours

If the battery is run down and has not been used for a long period of time, it will be hard to charge and it will require a longer time to charge than under normal circumstances. In such a case, extend the charging time as required while observing the indicator.

LOW MAINTENANCE TYPE

CHECKING ELECTROLYTE LEVEL

Check for electrolyte level in **each cell.**

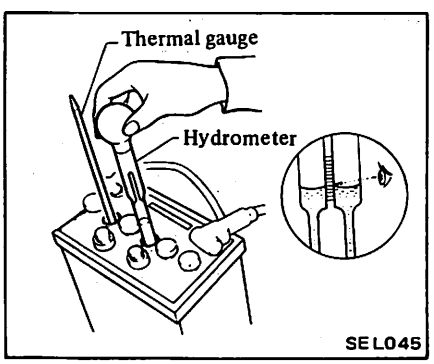


If the level is short, pour **distilled water.**

CHECKING SPECIFIC GRAVITY

1. Read hydrometer and thermal gauge indications at eye level.

Read top level with scale.



2. Correct **specific gravity at 20°C (68°F).**

$S_{20} = St + 0.0007 (t - 20)$

Where,

St: Specific gravity of electrolyte at t°C

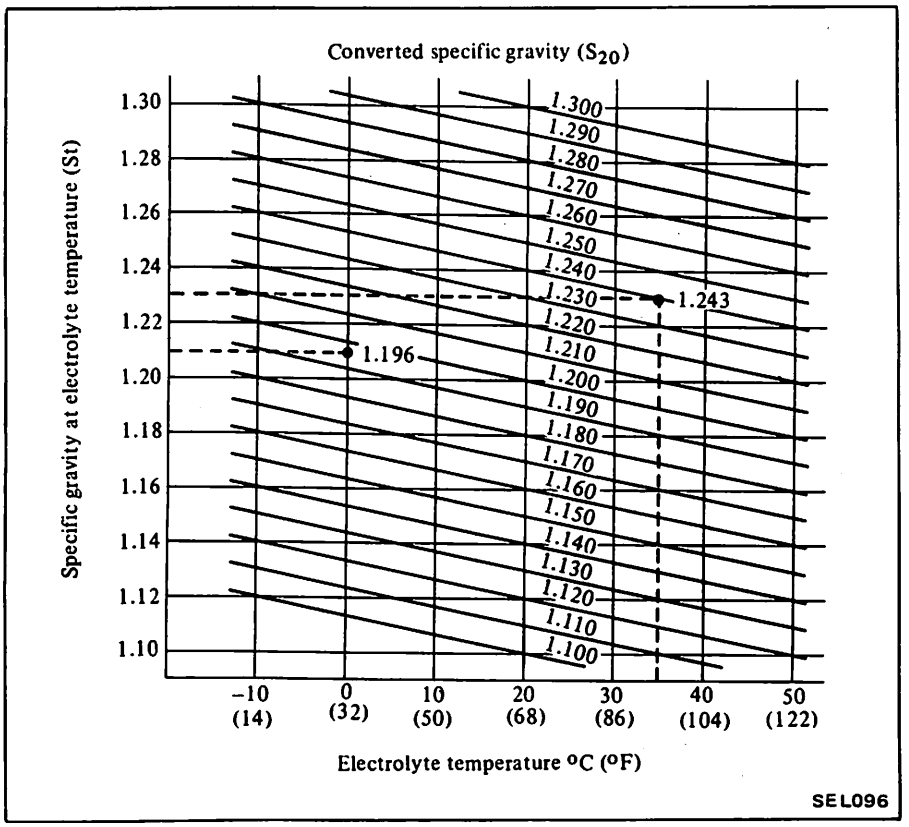
S_{20}: Specific gravity of electrolyte corrected at 20°C (68°F)

t: Electrolyte temperature

Examples:

1. When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.230, specific gravity corrected at 20°C (68°F) is 1.243.

2. When electrolyte temperature is 0°C (32°F) and specific gravity of electrolyte is 1.210, specific gravity corrected at 20°C (68°F) is 1.196.

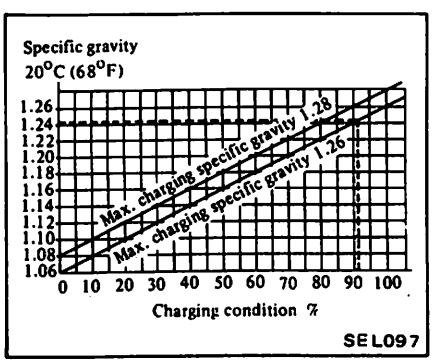


3. Determine charging state of battery.

Examples:

Charging state of battery whose max. charging specific gravity is 1.26, and whose specific gravity corrected at 20°C (68°F) is 1.243, is 92%.

For battery whose max. charging specific gravity is 1.28, charging state is 82% at a corrected specific gravity of 20°C (68°F).



4. Recharge battery if its rate drops below 70% of full charge.

CHARGING

CAUTION:

a. Carry out charging with negative cable removed.

b. Do not allow electrolyte temperature to go over 45°C (113°F).

Clean corroded terminal with a brush and common baking-soda solution.

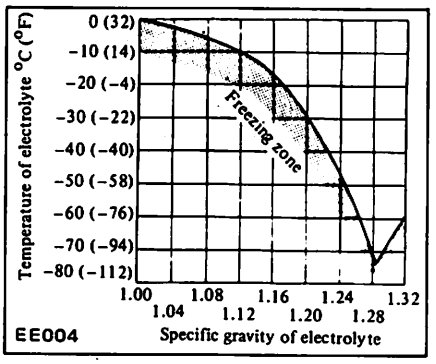
WARNING:

a. Keep battery away from open flame while it is being charged.

b. When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.

BATTERY FREEZING

CAUTION:
Use extreme caution to avoid freezing battery.



SERVICE DATA AND SPECIFICATIONS (S.D.S.)

BATTERY

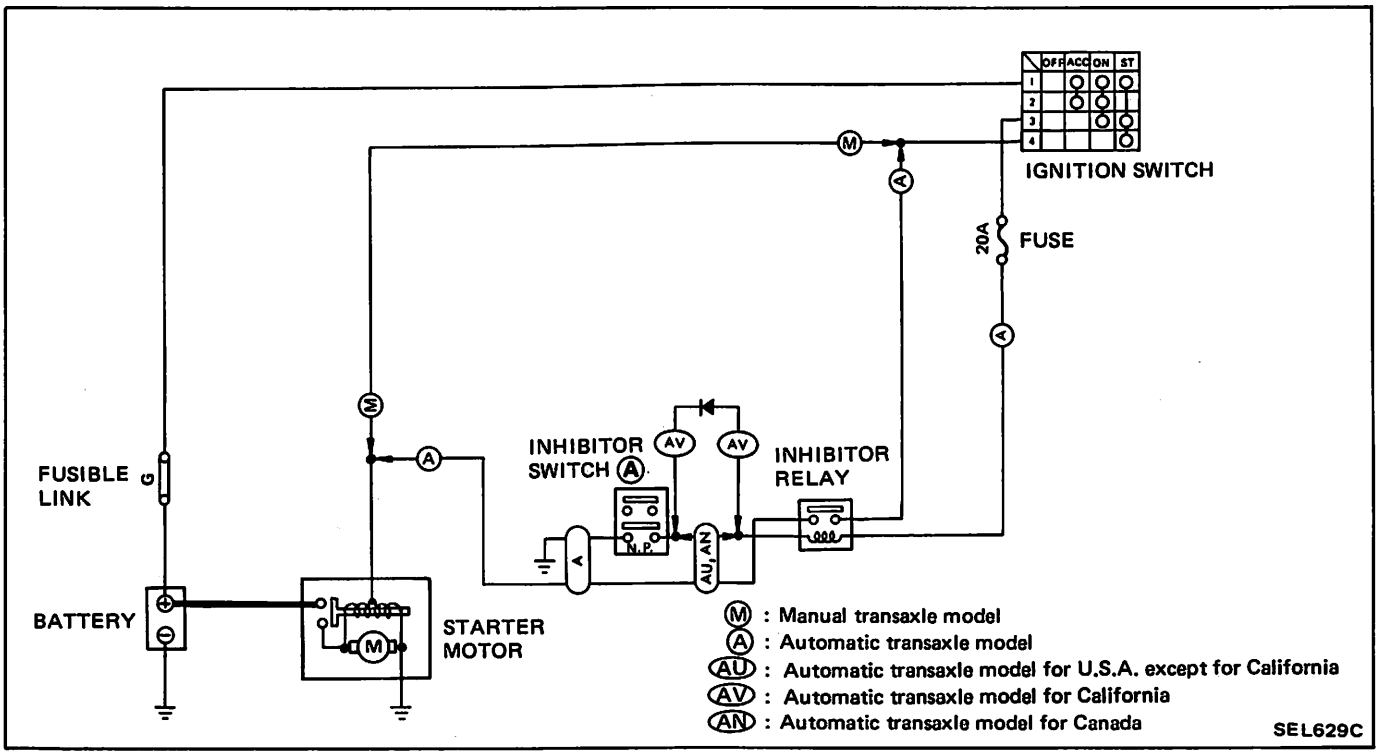
Applied model	Gasoline engine model					Diesel engine model
	U.S.A.			Canada		All
	Except M.P.G. model	M.P.G. standard model	M.P.G. deluxe model	M.P.G. model	Except M.P.G. model	All
Type	N60MFL	NS40SL(S)MF	N50ZL		NS70LMF	NX120-7L-MF
	Maintenance-free		Low-maintenance		Maintenance-free	
Capacity V-AH	12-60	12-30	12-60		12-65	12-80

STARTING SYSTEM

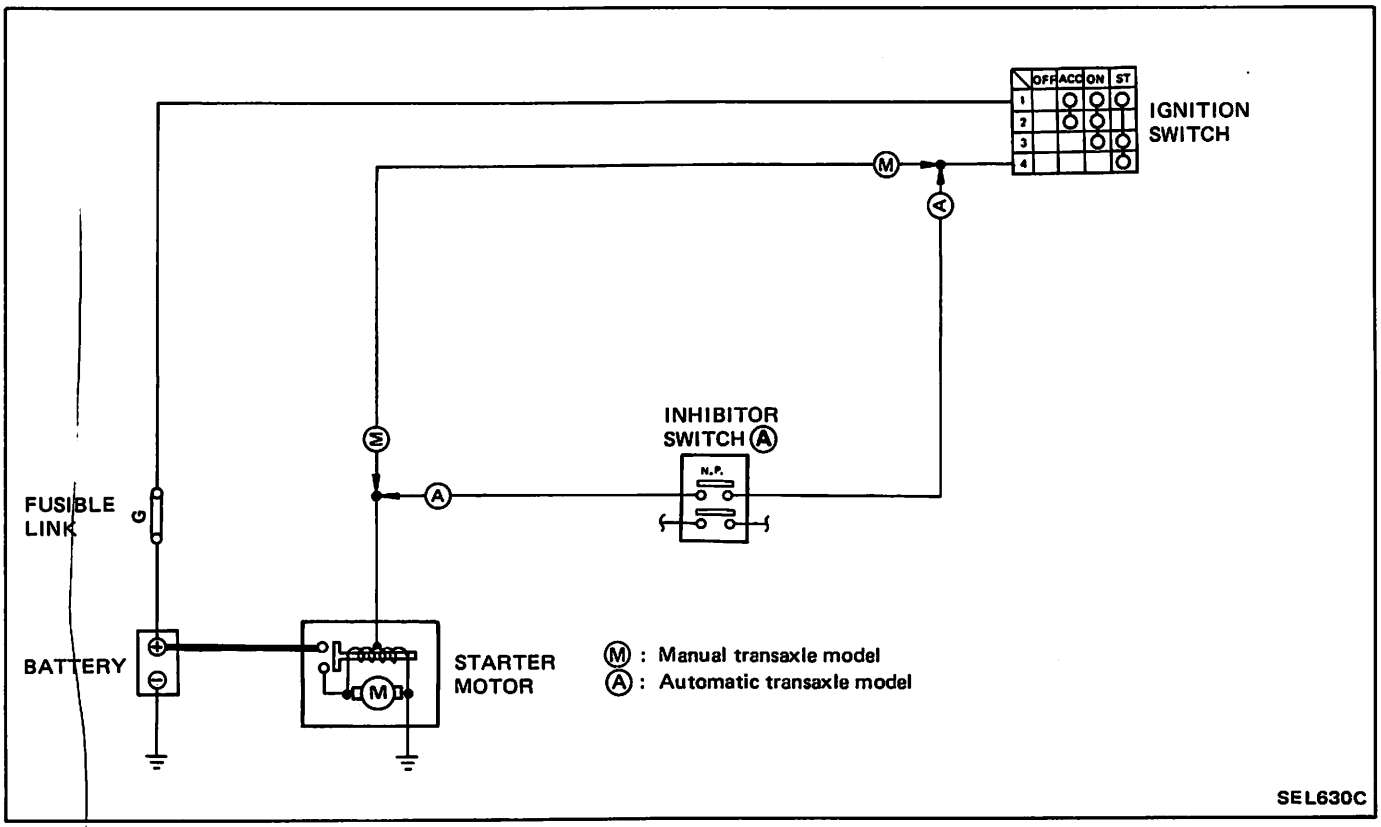
CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

SCHEMATIC

GASOLINE ENGINE MODEL



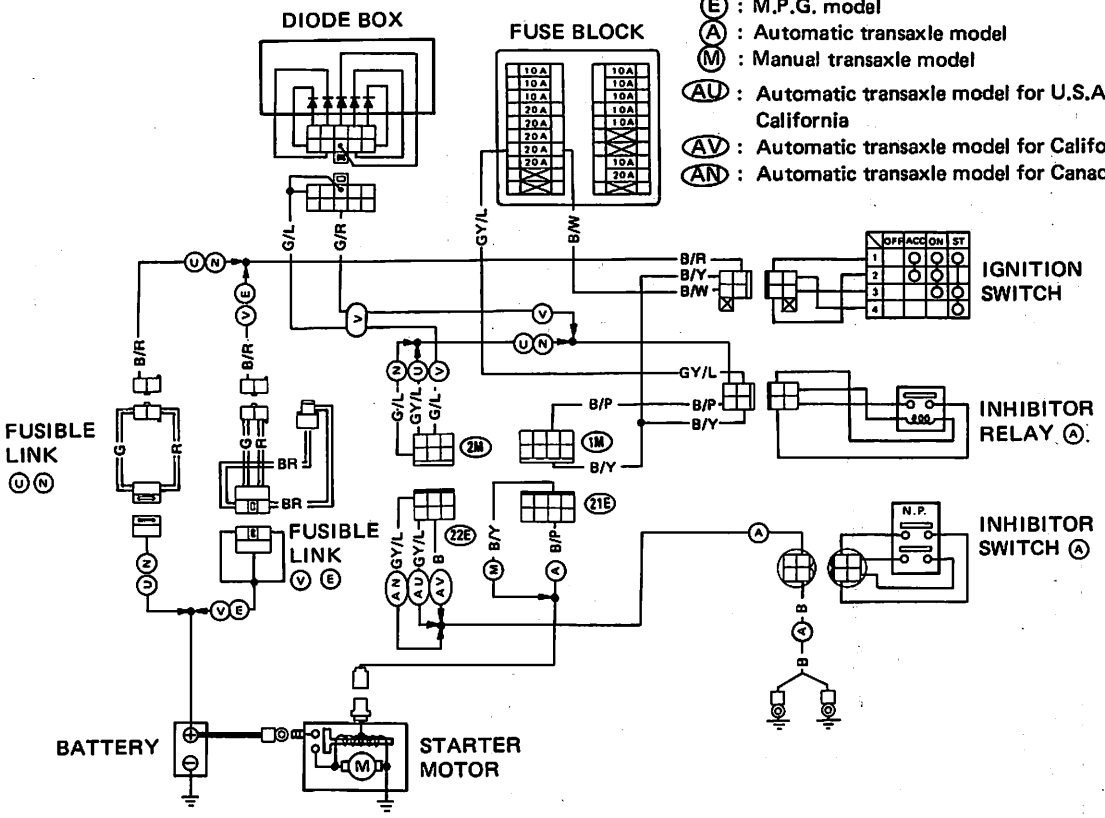
DIESEL ENGINE MODEL



WIRING DIAGRAM

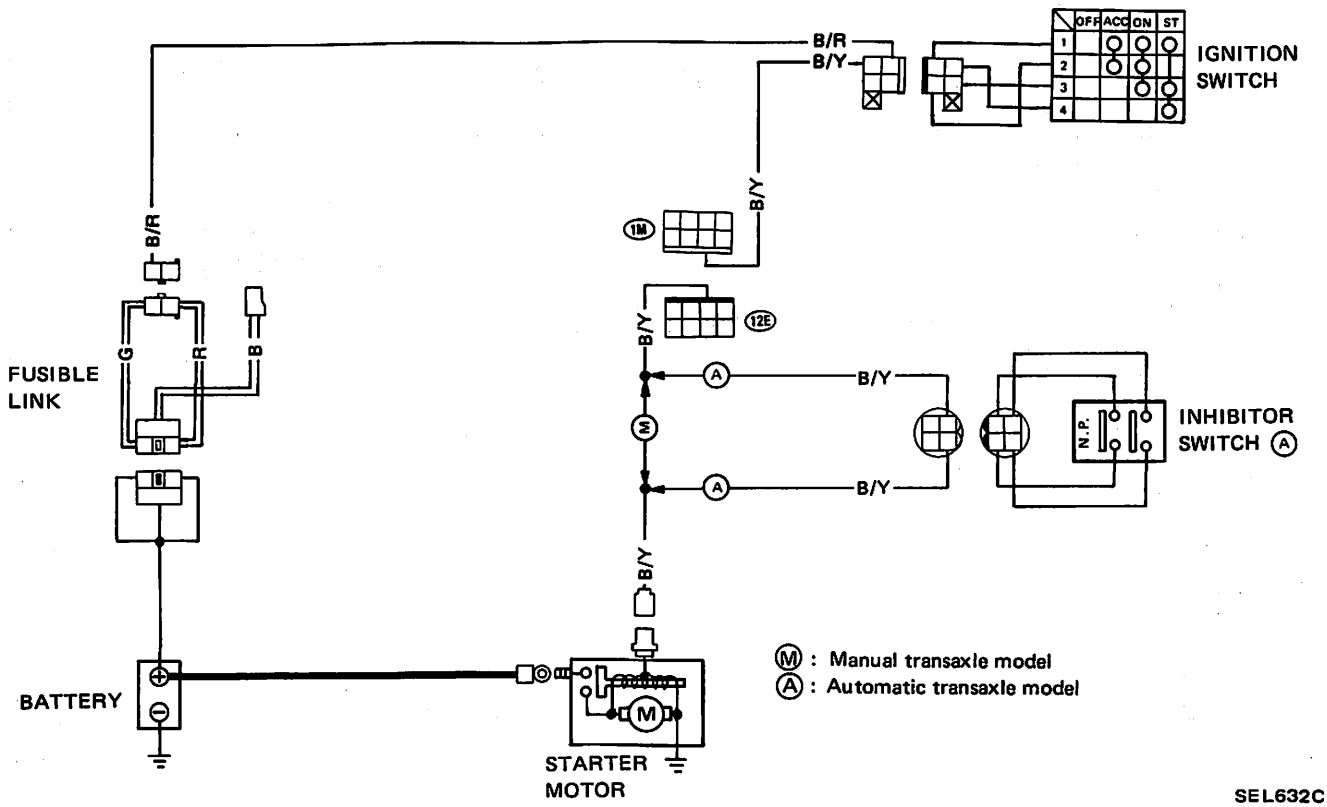
GASOLINE ENGINE MODEL

Ⓤ : U.S.A. model except for California and M.P.G. model
Ⓥ : California model
Ⓝ : Canada model except for M.P.G. model
Ⓔ : M.P.G. model
Ⓐ : Automatic transaxle model
Ⓜ : Manual transaxle model
ⒶⓊ : Automatic transaxle model for U.S.A. except for California
ⒶⓋ : Automatic transaxle model for California
ⒶⓃ : Automatic transaxle model for Canada



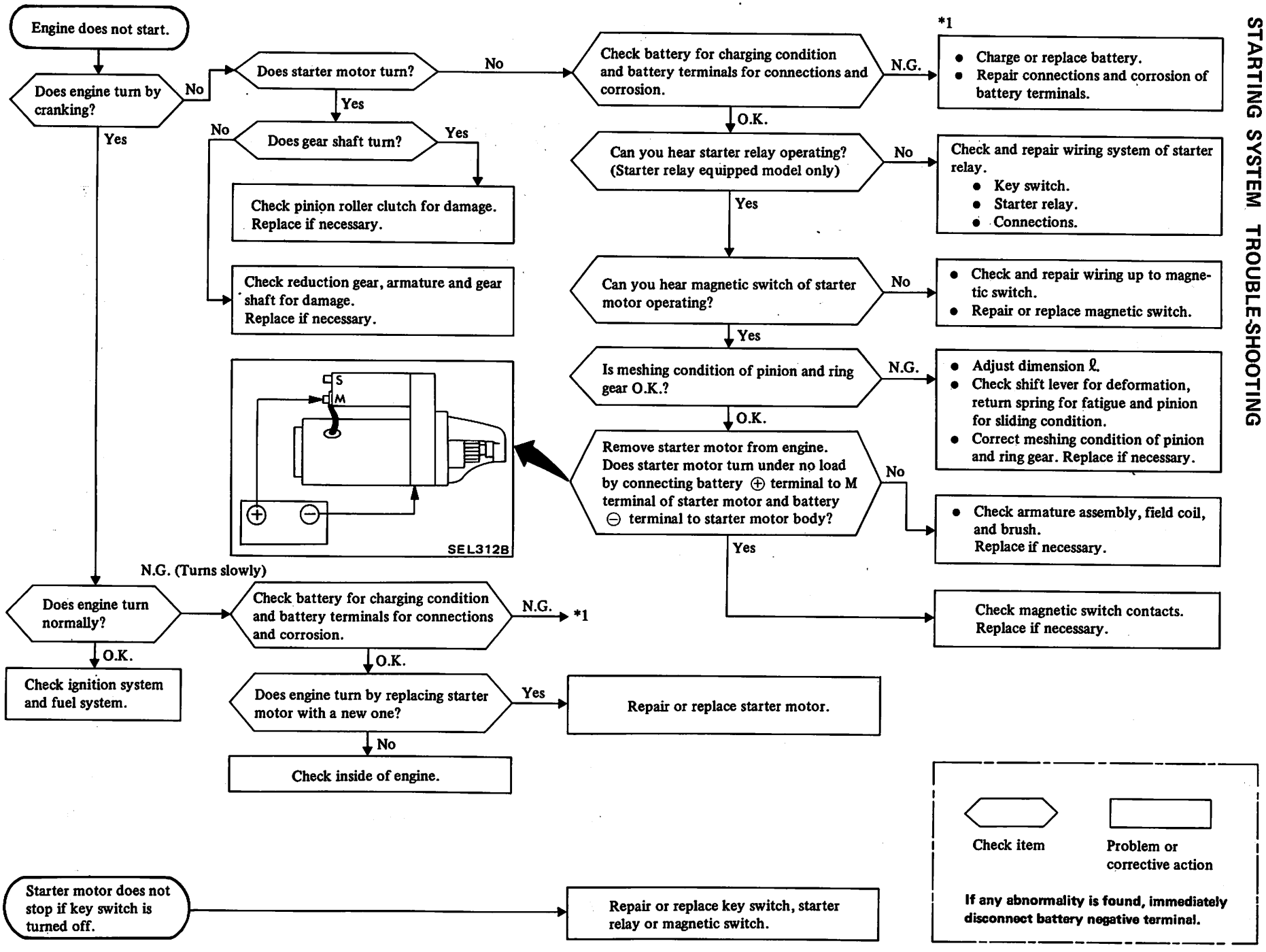
SEL631C

DIESEL ENGINE MODEL



Ⓜ : Manual transaxle model
Ⓐ : Automatic transaxle model

SEL632C


Engine does not start.
Does engine turn by cranking?
No
Yes
Does starter motor turn?
No
Yes
Does gear shaft turn?
No
Yes
Check pinion roller clutch for damage. Replace if necessary.
Check reduction gear, armature and gear shaft for damage. Replace if necessary.
Check battery for charging condition and battery terminals for connections and corrosion.
N.G.
*1
Charge or replace battery.
Repair connections and corrosion of battery terminals.
O.K.
Can you hear starter relay operating? (Starter relay equipped model only)
No
Check and repair wiring system of starter relay.
Key switch.
Starter relay.
Connections.
Yes
Can you hear magnetic switch of starter motor operating?
No
Check and repair wiring up to magnetic switch.
Repair or replace magnetic switch.
Yes
Is meshing condition of pinion and ring gear O.K.?
N.G.
Adjust dimension ℓ.
Check shift lever for deformation, return spring for fatigue and pinion for sliding condition.
Correct meshing condition of pinion and ring gear. Replace if necessary.
O.K.
Remove starter motor from engine. Does starter motor turn under no load by connecting battery ⊕ terminal to M terminal of starter motor and battery ⊖ terminal to starter motor body?
No
Check armature assembly, field coil, and brush. Replace if necessary.
Yes
Check magnetic switch contacts. Replace if necessary.
S
M
SEL312B
N.G. (Turns slowly)
Does engine turn normally?
O.K.
Check ignition system and fuel system.
Check battery for charging condition and battery terminals for connections and corrosion.
N.G.
*1
O.K.
Does engine turn by replacing starter motor with a new one?
Yes
Repair or replace starter motor.
No
Check inside of engine.
Starter motor does not stop if key switch is turned off.
Repair or replace key switch, starter relay or magnetic switch.
Check item
Problem or corrective action
If any abnormality is found, immediately disconnect battery negative terminal.

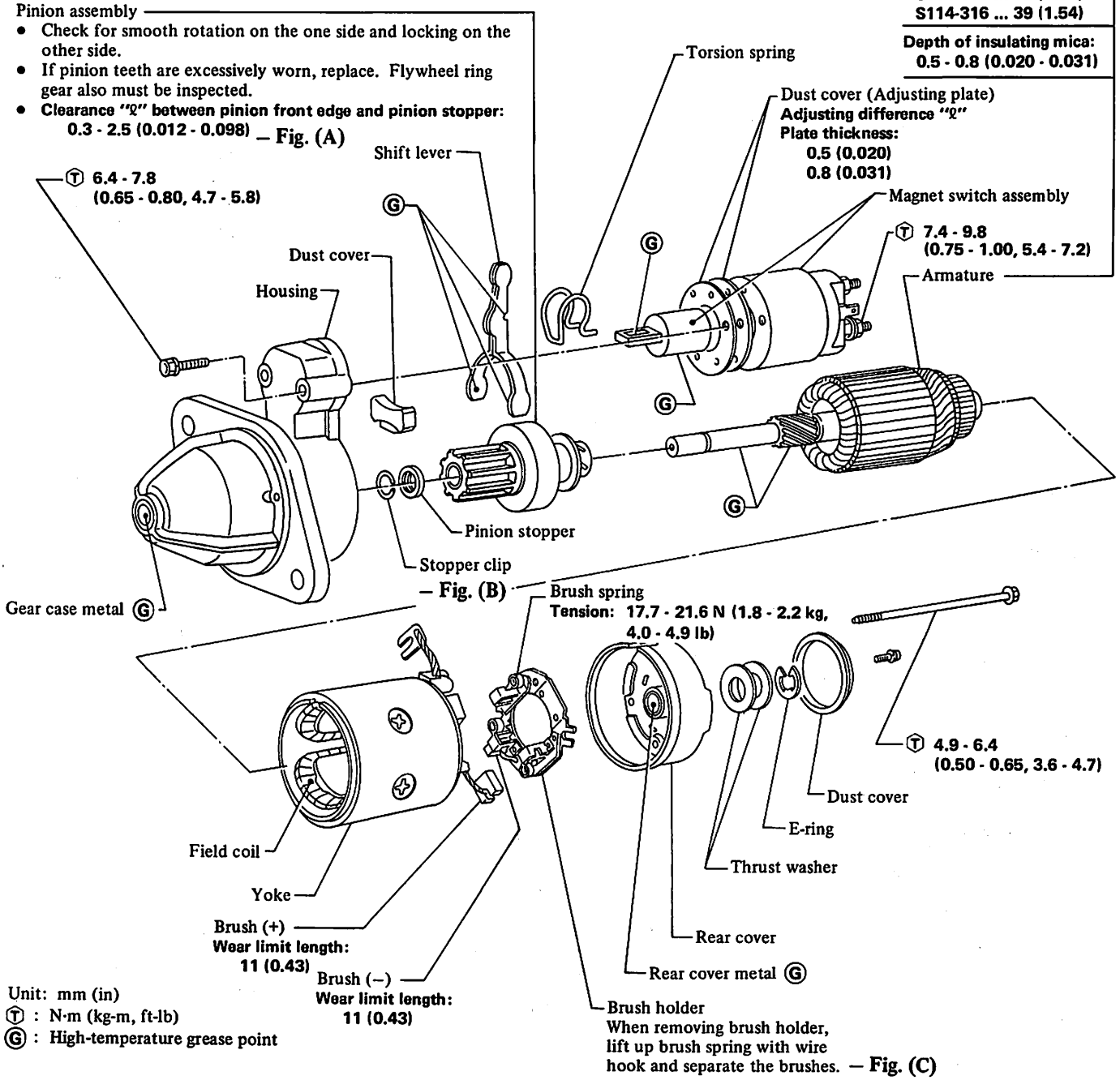
STARTER MOTOR

S114-315, -316 (Gasoline engine M/T models)

Commutator min. dia:
S114-315 ... 32 (1.26)
S114-316 ... 39 (1.54)

Depth of insulating mica:
0.5 - 0.8 (0.020 - 0.031)

Pinion assembly
- Check for smooth rotation on the one side and locking on the other side.
- If pinion teeth are excessively worn, replace. Flywheel ring gear also must be inspected.
- **Clearance "ℓ" between pinion front edge and pinion stopper:**
  0.3 - 2.5 (0.012 - 0.098) – Fig. (A)



Unit: mm (in)
Ⓣ : N·m (kg-m, ft-lb)
Ⓖ : High-temperature grease point

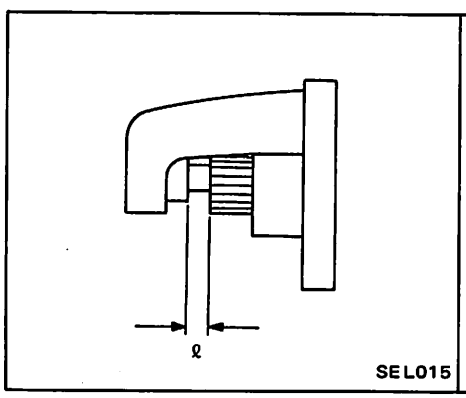


Fig. (A)

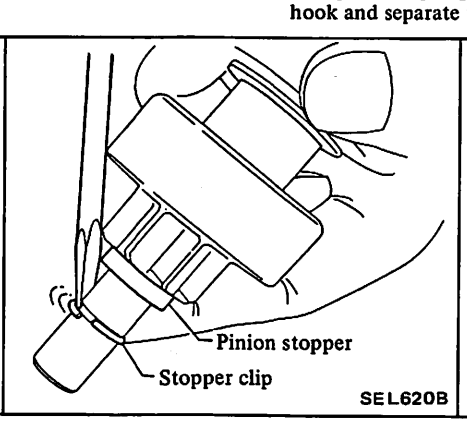


Fig. (B)

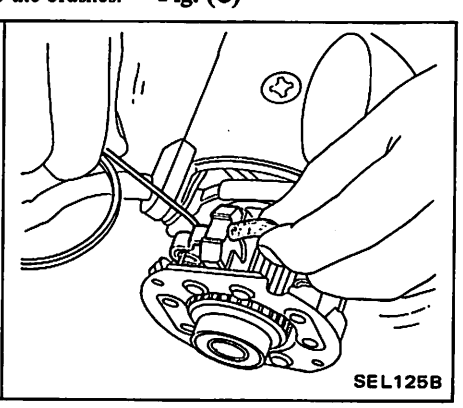
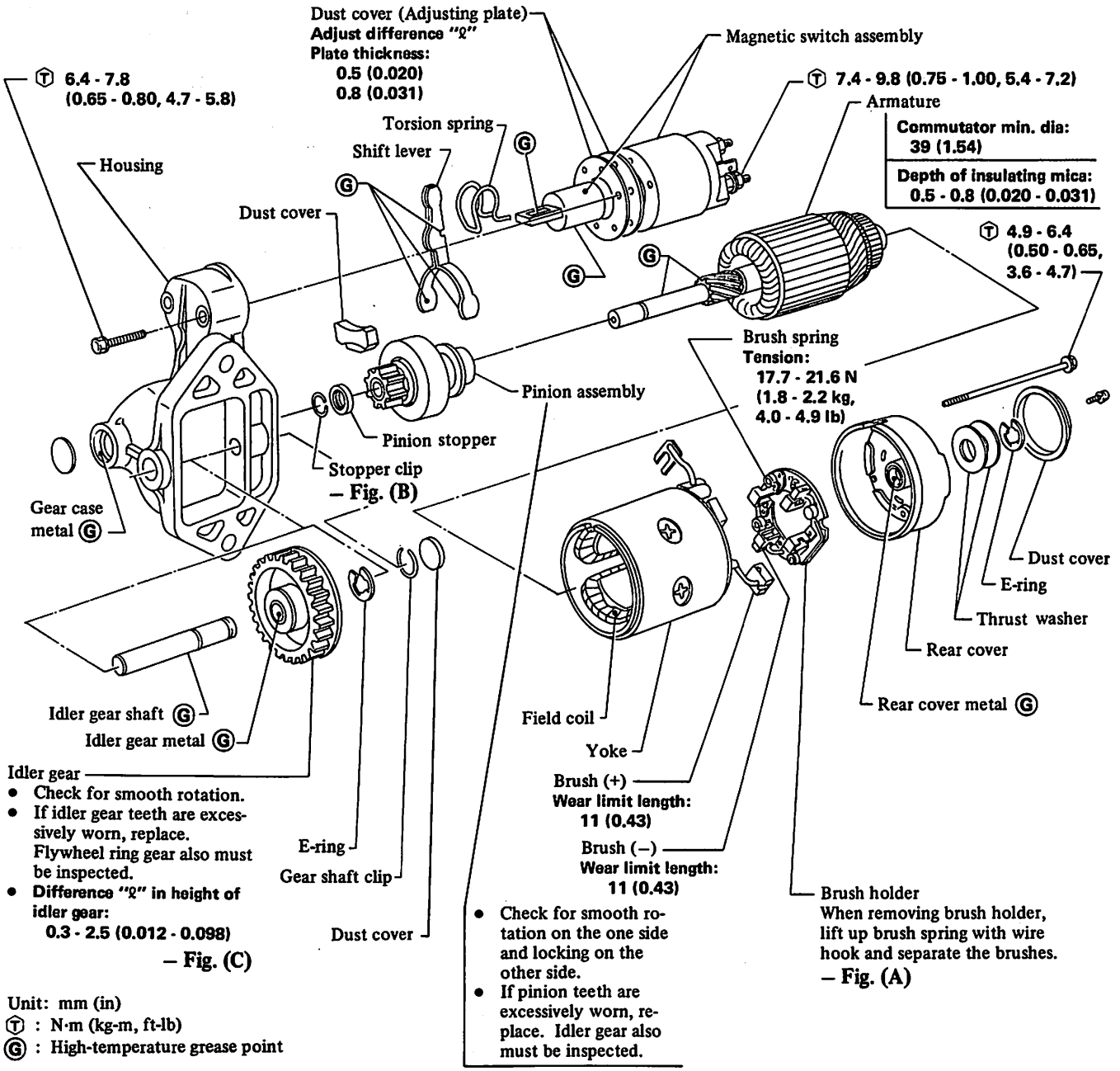


Fig. (C)

SEL245C

S114-317, -345 (Gasoline engine A/T models)



Unit: mm (in)
Ⓣ : N·m (kg-m, ft-lb)
Ⓖ : High-temperature grease point

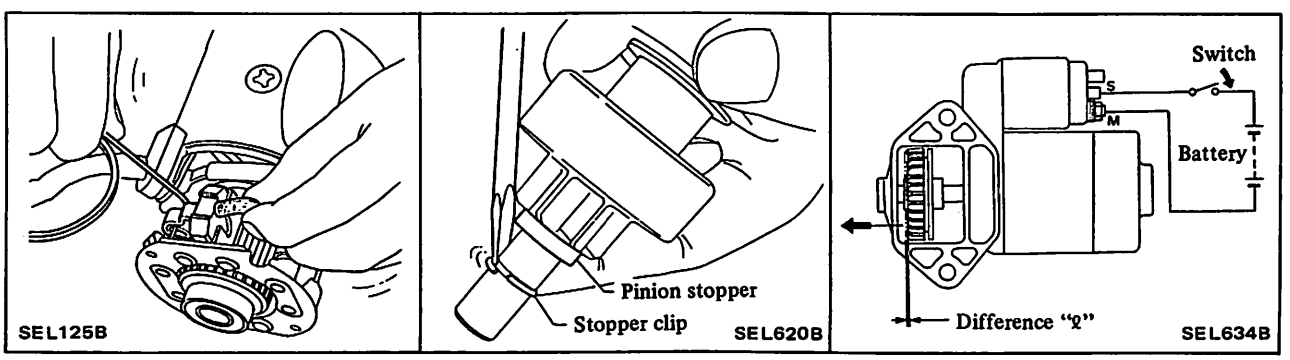
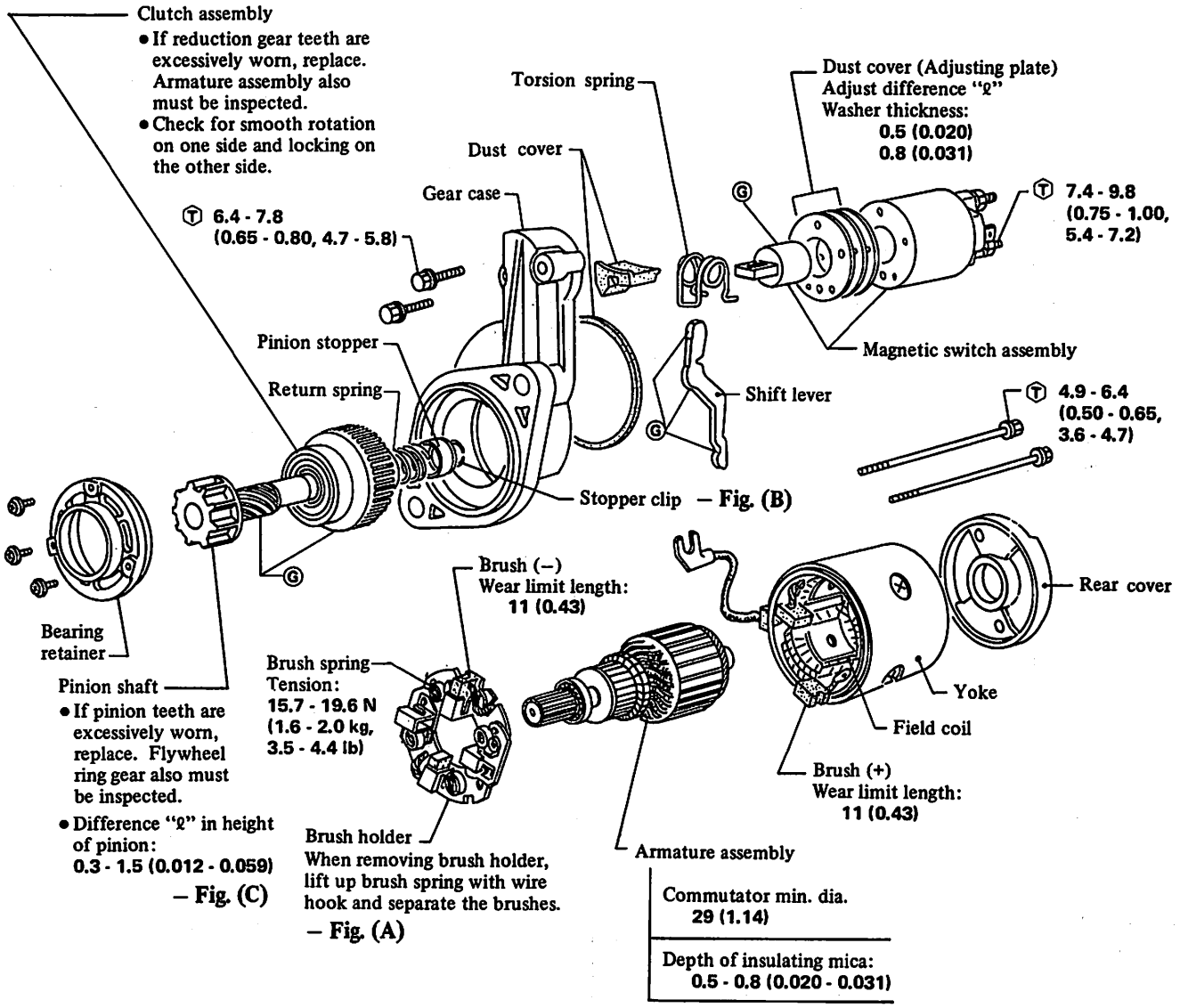


Fig. (A) Fig. (B) Fig. (C) SEL246C

S114-357 (Diesel engine model)



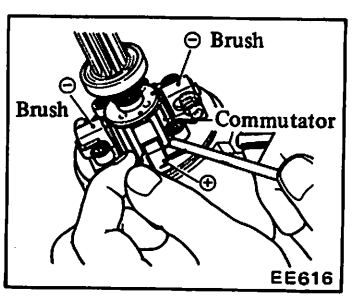


Fig. (A)

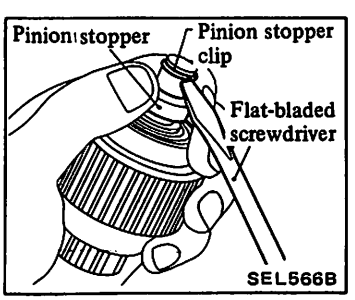


Fig. (B)

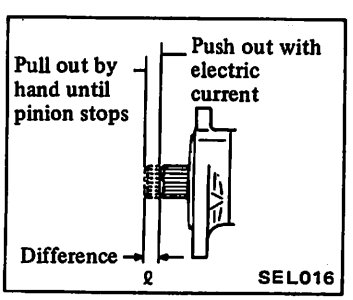


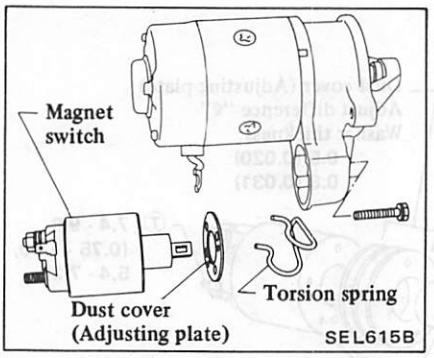
Fig. (C)

SEL633C

DISASSEMBLY

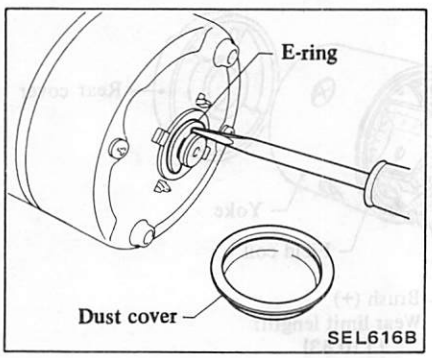
Gasoline engine model

1. Remove magnetic switch.

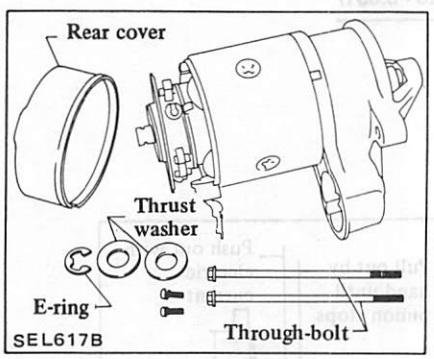


2. Remove rear cover.

(1) Remove dust cover, E-ring and thrust washer(s).

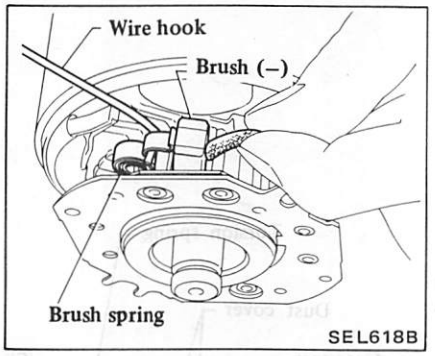


(2) Remove brush holder setscrews and through-bolts.



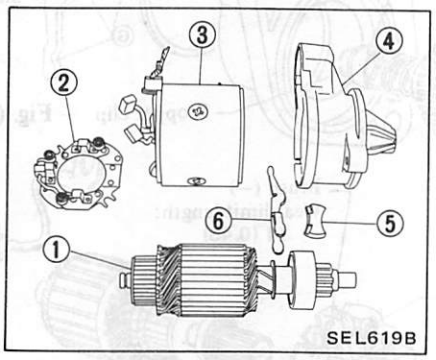
3. Remove brush holder.

(1) Lift brush spring and hold it against side surface of negative brush. This causes the brush to separate from commutator.



(2) Remove positive brush from brush holder by lifting the brush spring.

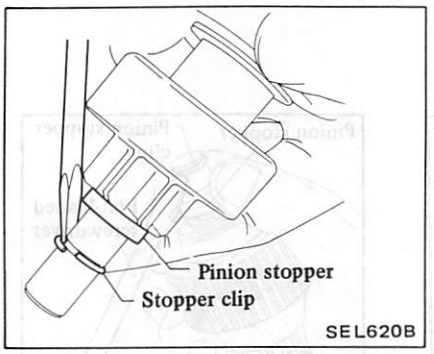
4. Remove yoke and withdraw armature assembly and shift lever.



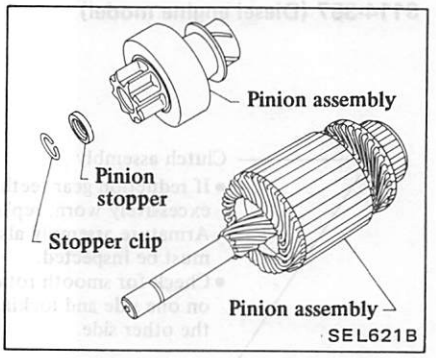
1 Armature assembly
2 Brush holder
3 Yoke
4 Housing
5 Dust cover
6 Shift lever

5. Remove pinion assembly from armature assembly.

(1) Move pinion stopper toward pinion, and remove pinion stopper clip with a flat-bladed screwdriver.

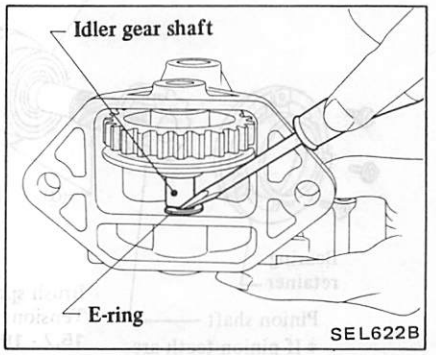


(2) Remove pinion stopper, and detach pinion assembly.

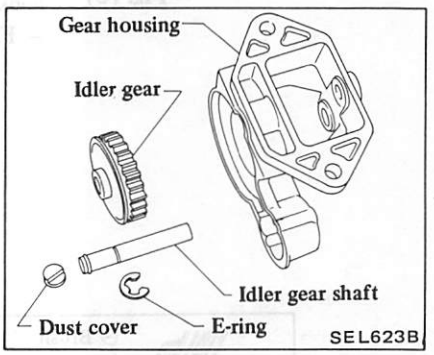


6. Remove idler gear (A/T models only).

(1) Remove E-ring from idler gear shaft.

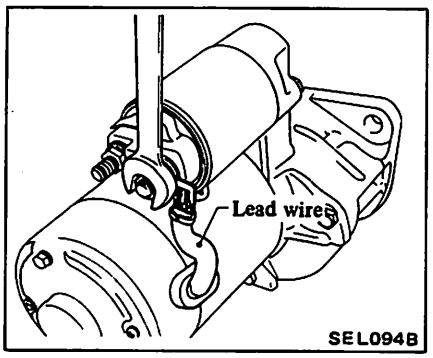


(2) Remove dust cover, and drive out idler gear shaft with a hammer or similar tool.



Diesel engine model

1. Disconnect lead wire.



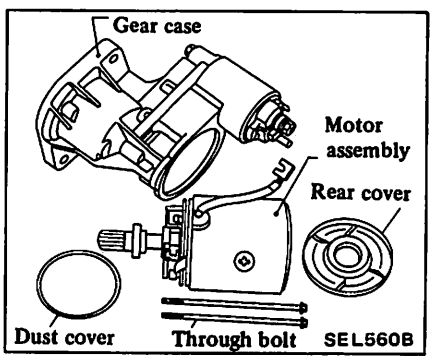
2. Remove rear cover.

CAUTION:
Be careful not to damage dust cover.

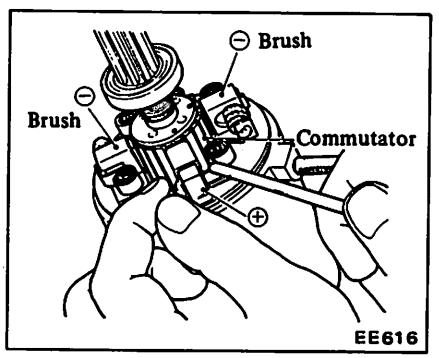
3. Remove yoke assembly, armature and brush holder.

(1) Remove yoke, armature and brush holder as an assembly from center housing.

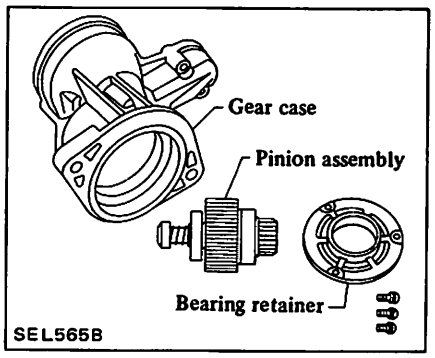
CAUTION:
Be careful not to knock brush, commutator or coil against any adjacent part.



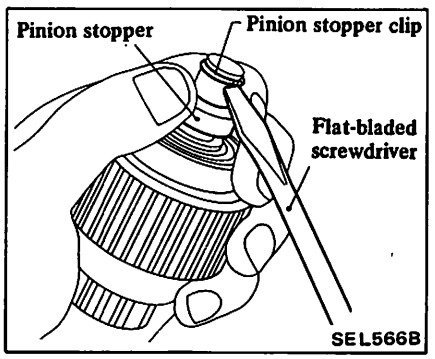
(2) Lift up brush (–) and remove brush (+), then remove brush holder.



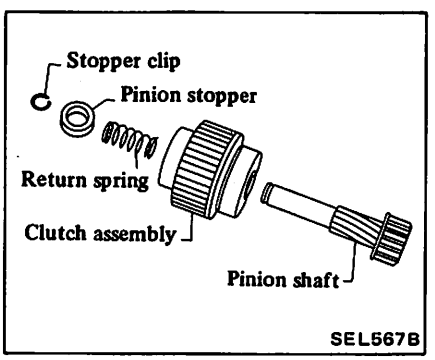
(3) Draw out armature from yoke. Remove bearing retainer and draw out pinion assembly.



4. Remove pinion stopper clip.



5. Remove pinion shaft.

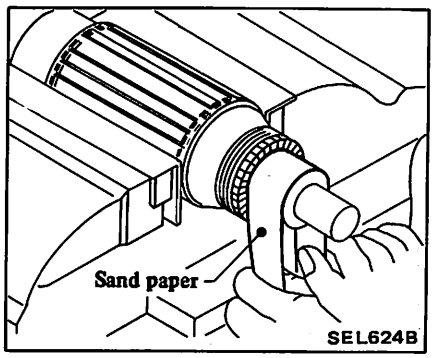


INSPECTION

Armature assembly

1. Check commutator surface.

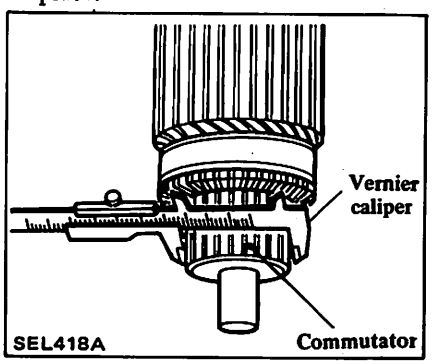
- Rough ... Sand lightly with No. 500 ~600 sandpaper.



2. Check diameter of commutator.

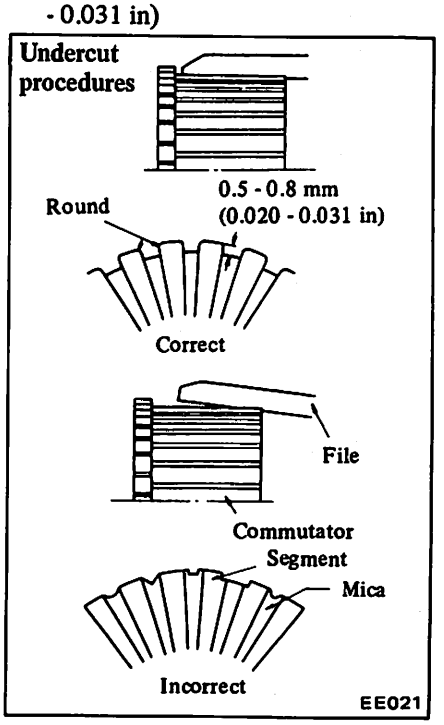
Commutator minimum diameter:
Refer to S.D.S.

- Less than specified value ... Replace.

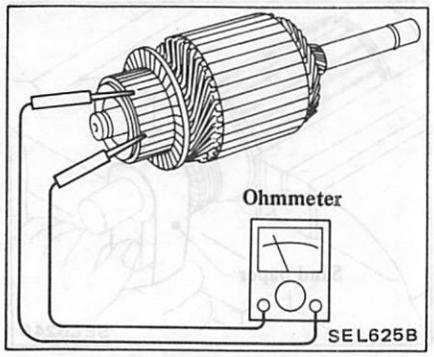


3. Check depth of insulating mica from commutator surface.

- Less than 0.2 mm (0.008 in) ... Undercut to 0.5 - 0.8 mm (0.020 - 0.031 in)

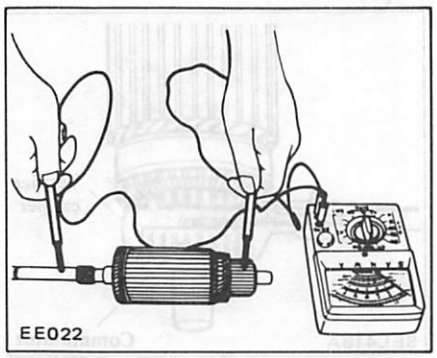


4. Continuity test (between two segments side by side).



- No continuity ... Replace.

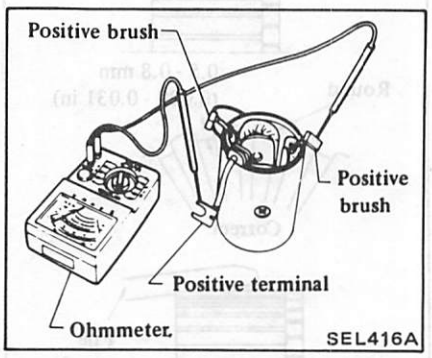
5. Insulation test (between each commutator bar and shaft).



- Continuity exists ... Replace.

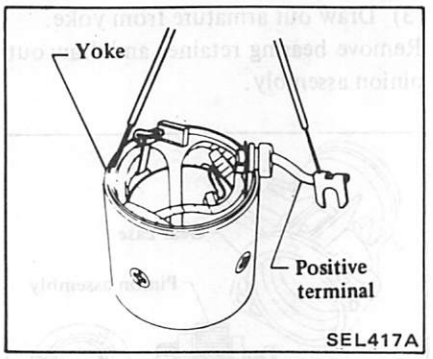
Field coil

1. Continuity test (between field coil positive terminal and positive brushes).



- No continuity ... Replace field coil.

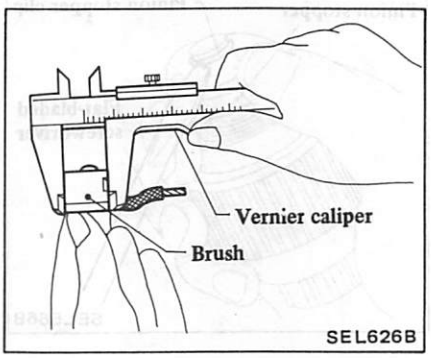
2. Insulation test (between field coil positive terminal and yoke).



- Continuity exists ... Replace field coil.

Brush

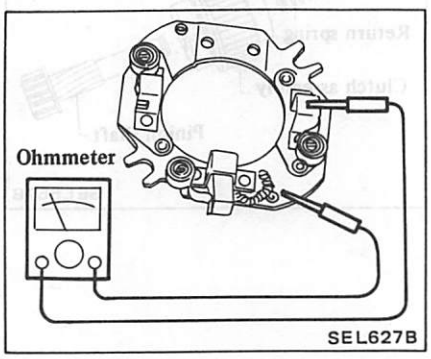
Check wear of brush.
Wear limit length: Refer to S.D.S.



- Excessive wear ... Replace.

Brush holder

1. Perform insulation test between brush holder (positive side) and its base (negative side).



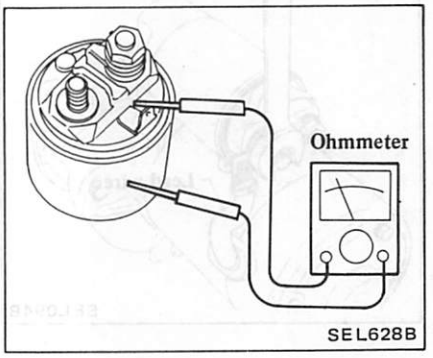
- Continuity exists ... Replace.

2. Check brush holder to see if it moves smoothly.

- If brush holder is bent, replace it; if sliding surface is dirty, clean.

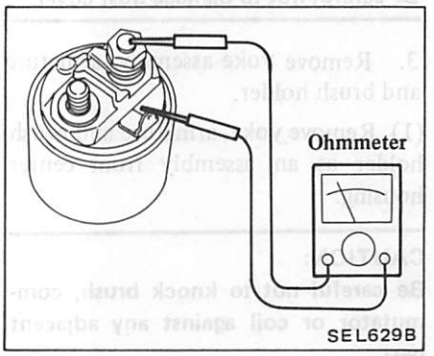
Magnetic switch

1. Continuity test (between "S" terminal and switch body).



- No continuity ... Replace.

2. Continuity test (between "S" terminal and "M" terminal).

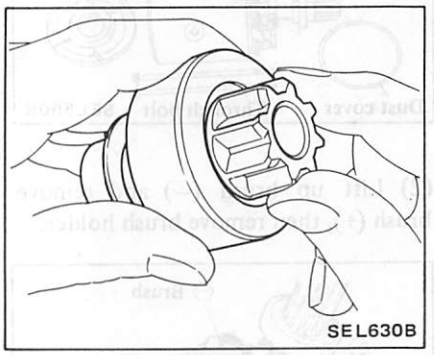


- No continuity ... Replace.

Pinion assembly

1. Check clutch.

Check pinion to see that it locks properly when turned in "drive" direction and rotates smoothly when turned in reverse.



- Pinion does not lock in either direction or unusual resistance is evident ... Replace.

2. Inspect pinion teeth.

- Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)

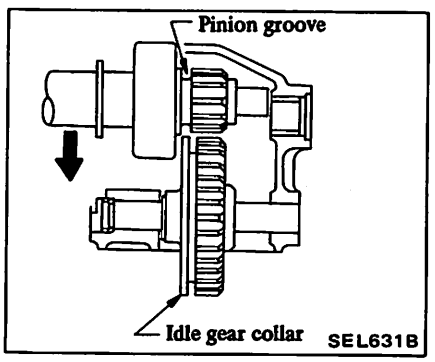
ASSEMBLY

To assemble, reverse order of disassembly. Note the following:

a. Apply grease to:

- Frictional surface of pinion
- Moving portion of shift lever
- Plunger of magnetic switch
- Rear cover metal (Gasoline engine models)
- Gear case metal (Gasoline engine models)
- Reduction gear (Diesel engine models)

b. Gasoline engine A/T models
When installing armature assembly to gear case, properly align groove in pinion gear with flange of idler gear.

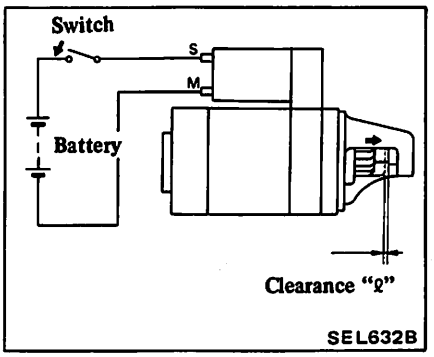


c. Check pinion to see if its engagement length is correct.

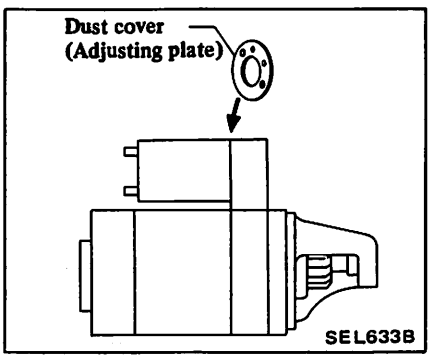
(Gasoline engine M/T models)

With pinion driven out by magnetic switch, push pinion back to remove slack and measure clearance "ℓ" between the front edge o the pinion and the pinion stopper.

Clearance "ℓ":
Refer to S.D.S.



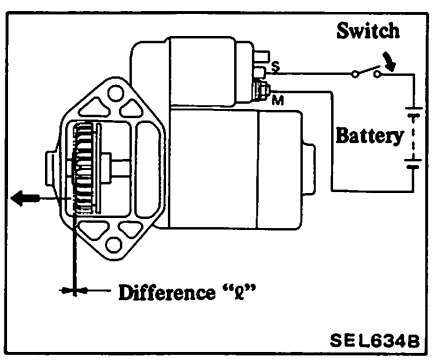
- Not in the specified value ... Adjust by dust cover (Adjusting plate).



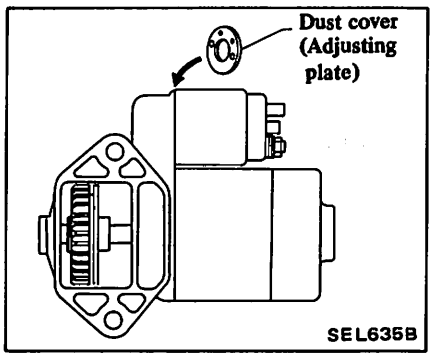
(Gasoline engine A/T models)

Measure difference in length "ℓ" of idler gear's front edge when idler gear is forced out by the magnetic switch and then when it is pulled out by hand.

Difference "ℓ":
Refer to S.D.S.



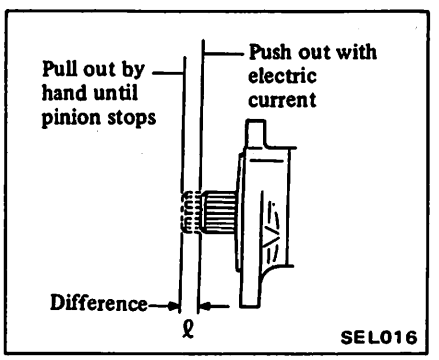
- Not in the specified value ... Adjust by dust cover (Adjusting plate).



(Diesel engine model)

Compare difference "ℓ" in height of pinion when it is pushed out with magnetic switch energized and when it is pulled out by hand until it touches stopper.

Difference "ℓ":
Refer to S.D.S.



- Not in the specified value ... Adjust by dust cover (Adjusting plate).

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

STARTER MOTOR

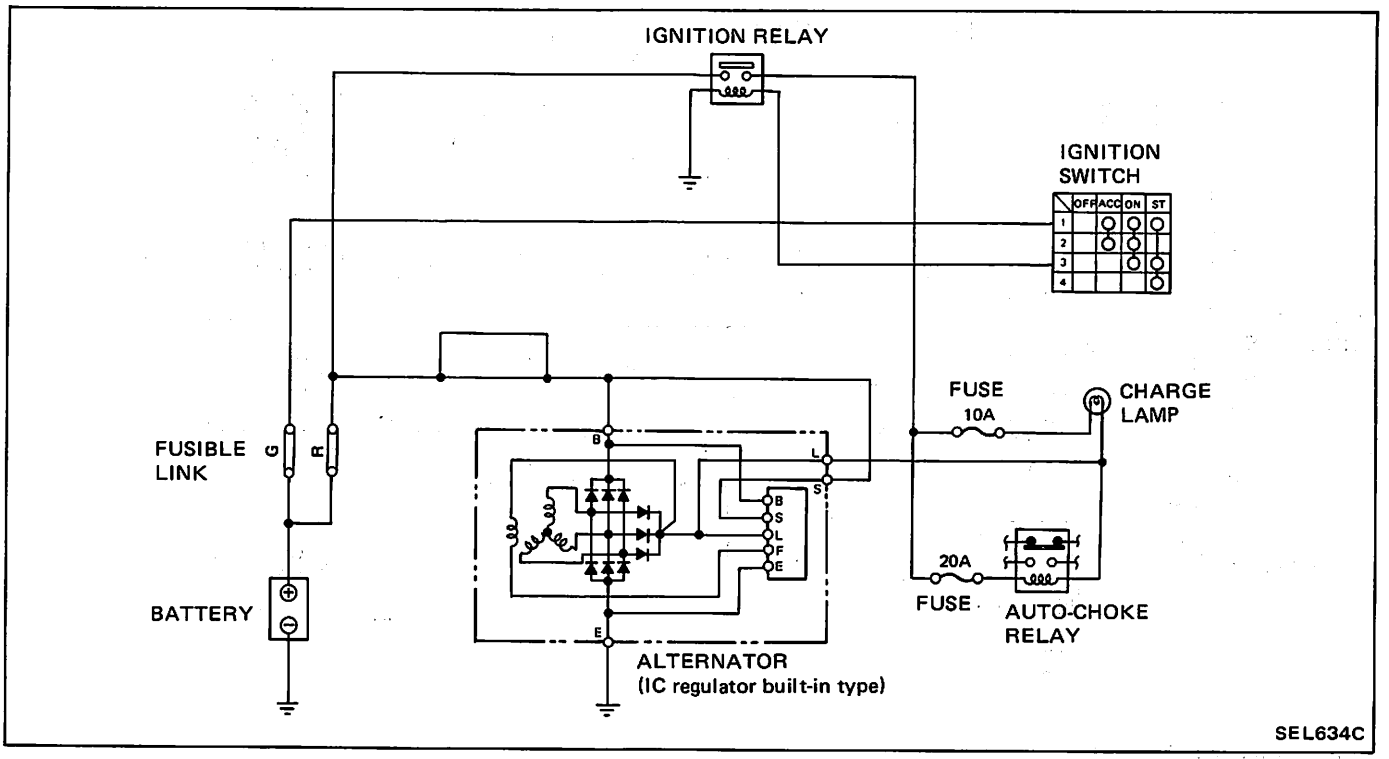
Type		S114-315	S114-316	S114-317	S114-345	S144-357
Applied model		Gasoline engine model				Diesel engine model
		M/T models for U.S.A.	M/T models for Canada and optional for U.S.A. M/T models	A/T models for U.S.A.	A/T models for Canada	All
System voltage	V	12	12	12	12	12
No load						
Terminal voltage	V	11.5	11.5	11.5	11.5	11
Current	A	Less than 60	Less than 60	Less than 60	Less than 60	Less than 100
Revolution	rpm	More than 7,000	More than 7,000	More than 7,000	More than 2,000	More than 3,900
Outer diameter of commutator	mm (in)	More than 32 (1.26)	More than 39 (1.54)	More than 39 (1.54)	More than 39 (1.54)	More than 29 (1.14)
Minimum length of brush	mm (in)	11 (0.43)	11 (0.43)	11 (0.43)	11 (0.43)	11 (0.43)
Brush spring tension	N (kg, lb)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)	15.7 - 19.6 (1.6 - 2.0, 3.5 - 4.4)
Clearance between bearing metal and armature shaft	mm (in)	Less than 0.2 (0.008)	Less than 0.2 (0.008)	Less than 0.2 (0.008)	Less than 0.2 (0.008)	–
Clearance "ℓ" between pinion front edge and pinion stopper	mm (in)	0.3 - 2.5 (0.012 - 0.098)	0.3 - 2.5 (0.012 - 0.098)	–	–	–
Difference "ℓ" in height of idler gear	mm (in)	–	–	0.3 - 2.5 (0.012 - 0.098)	0.3 - 2.5 (0.012 - 0.098)	0.3 - 1.5 (0.012 - 0.059)

CHARGING SYSTEM

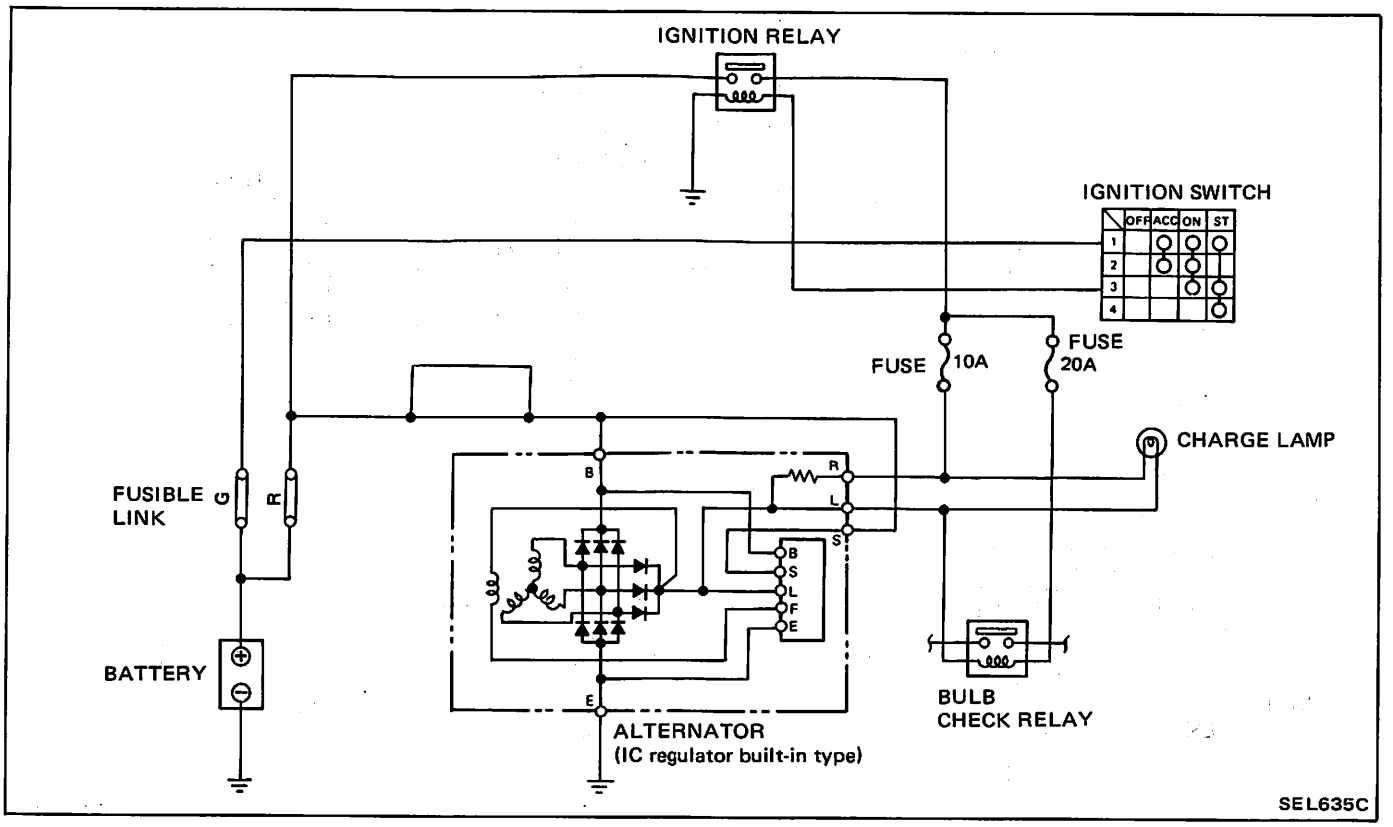
CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

SCHEMATIC

GASOLINE ENGINE MODELS

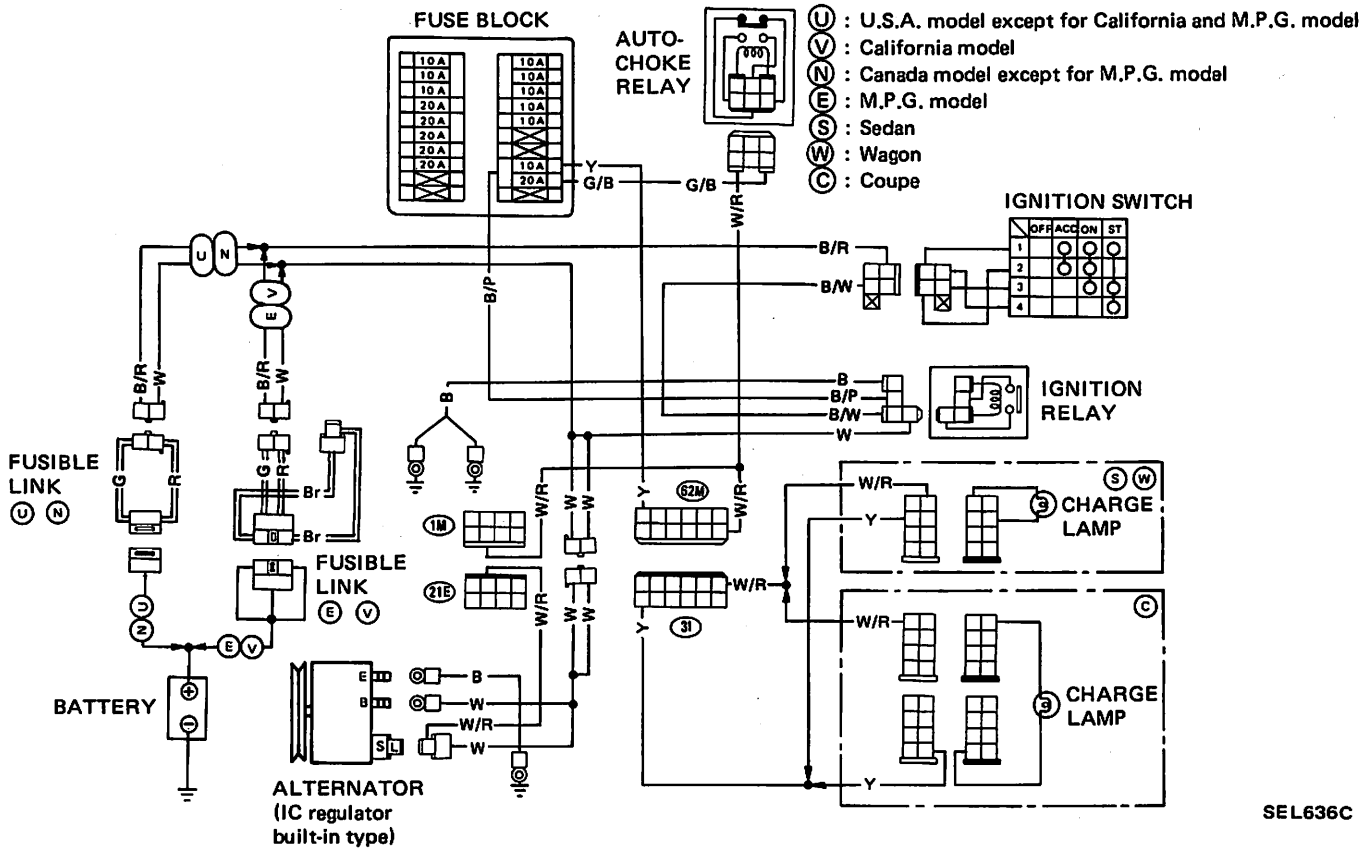


DIESEL ENGINE MODELS



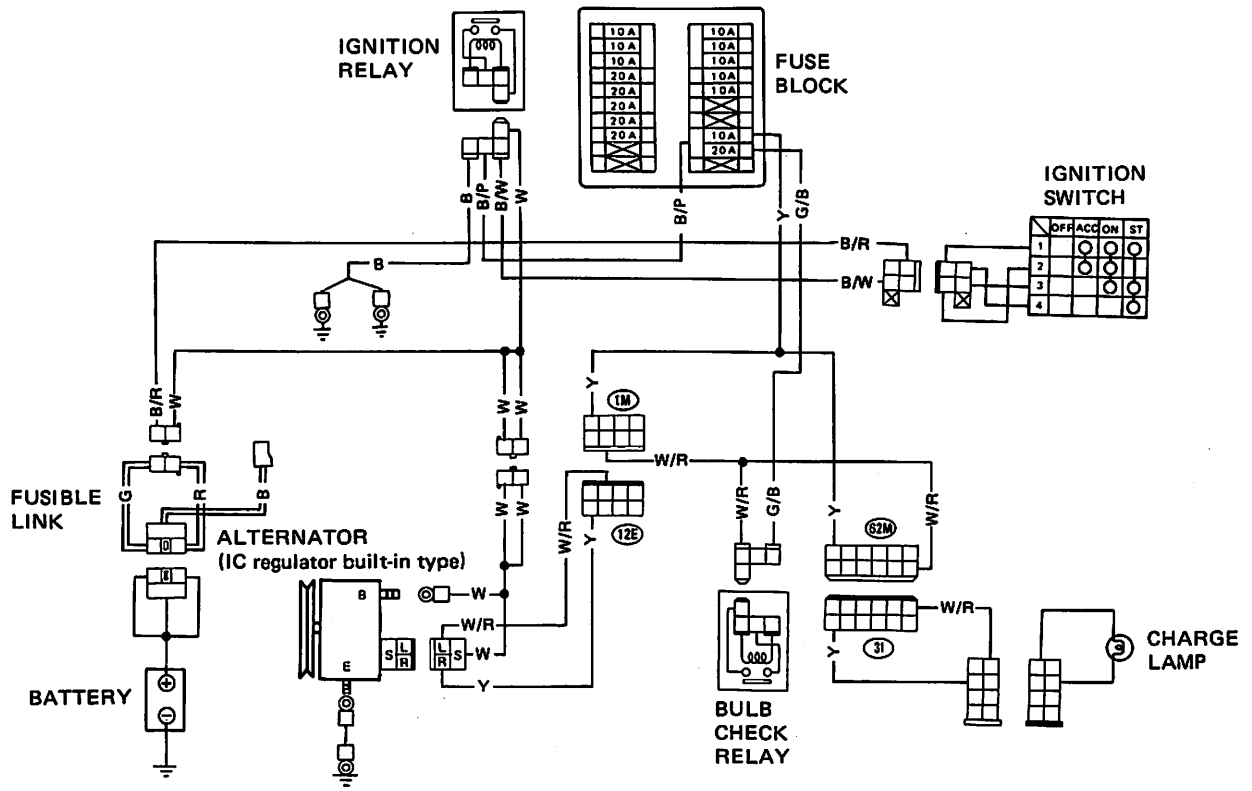
WIRING DIAGRAM

GASOLINE ENGINE MODELS



SEL636C

DIESEL ENGINE MODELS



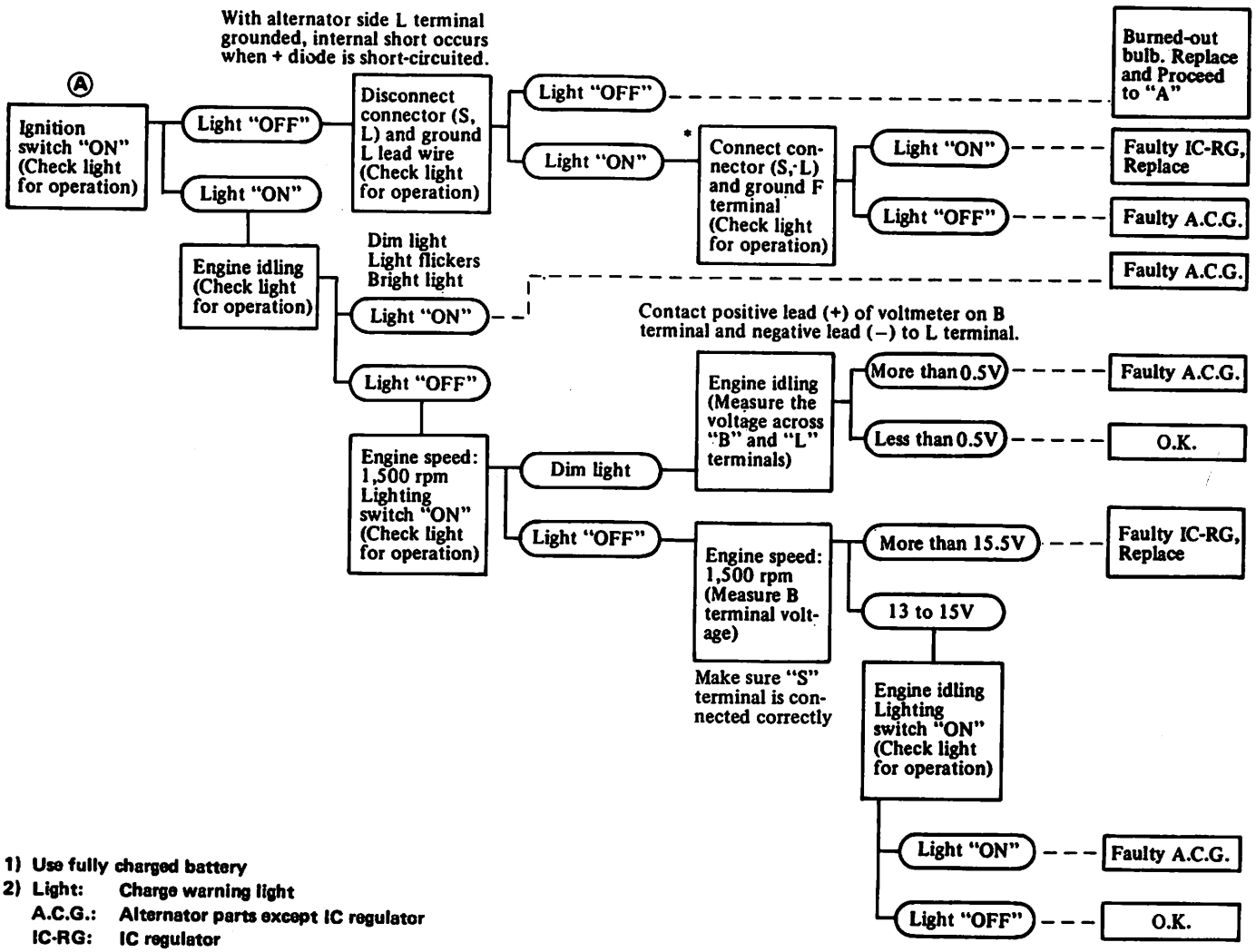
SEL637C

CHARGING SYSTEM TROUBLE-SHOOTING

Before conducting an alternator test, make sure that the battery is fully charged.

A 30-Volt voltmeter and suitable test probes are necessary for the test.

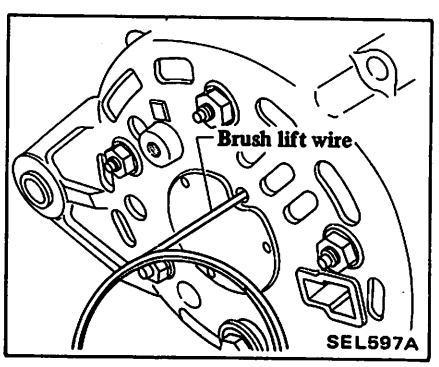
The alternator can be checked easily by referring to the Inspection Table.



1) Use fully charged battery
2) Light: Charge warning light
   A.C.G.: Alternator parts except IC regulator
   IC-RG: IC regulator
   O.K.: IC-alternator is in good condition
3) When reaching "Faulty A.C.G.", remove alternator from car and disassemble, inspect and correct or replace faulty parts.
4) * Method of grounding F terminal

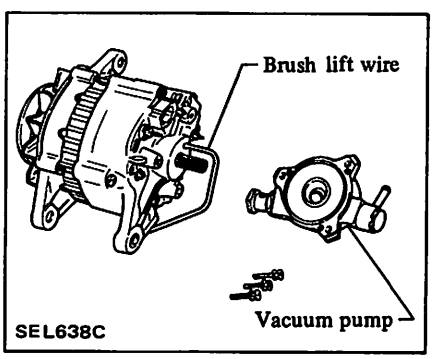
Gasoline engine model

Contact tip of wire with brush and attach wire to alternator body.



Diesel engine model

Remove vacuum pump and connect tip of wire with brush and attach wire to alternator body.



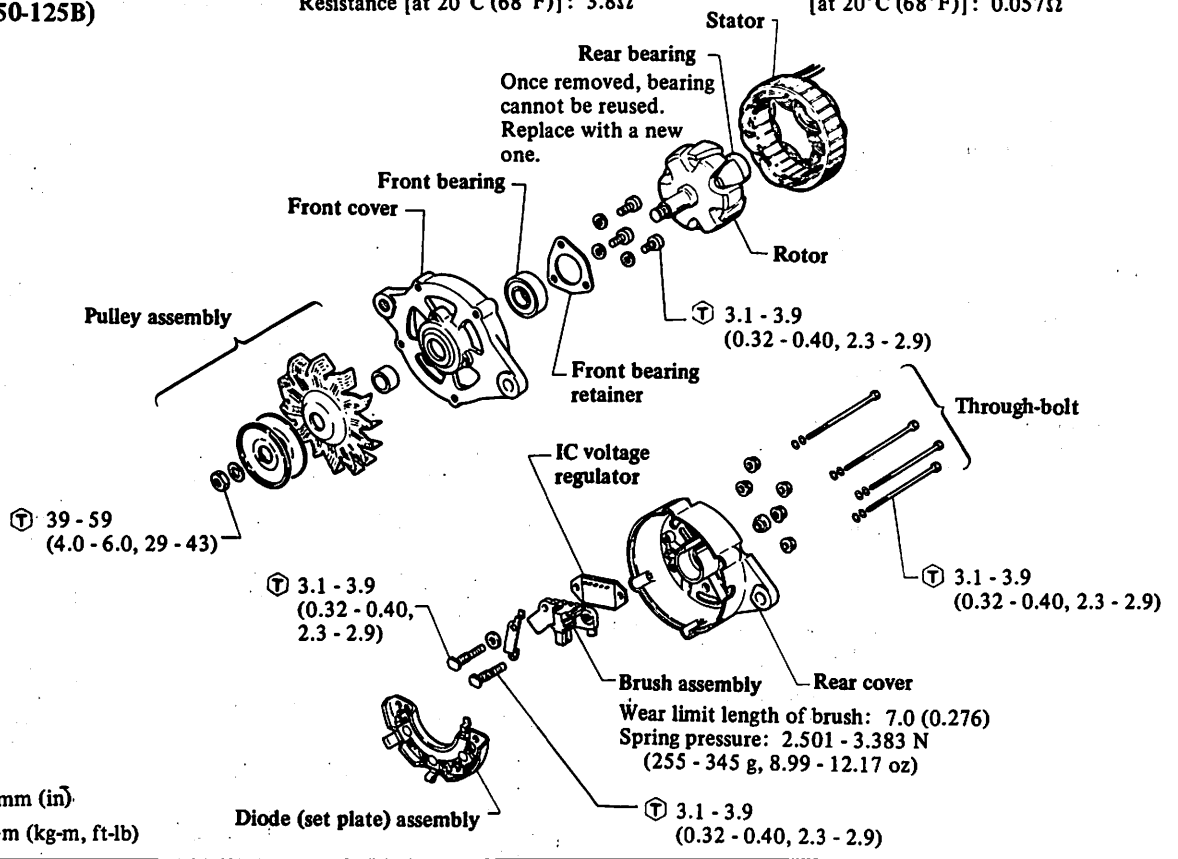
5) Terminals "S", "L", "BAT" and "E" are marked on rear cover of alternator.

ALTERNATOR

Gasoline engine model (LR150-125B)

Slip ring dia.: more than 30 (1.18)
Resistance [at 20°C (68°F)]: 3.8Ω

Resistance per phase [at 20°C (68°F)]: 0.057Ω

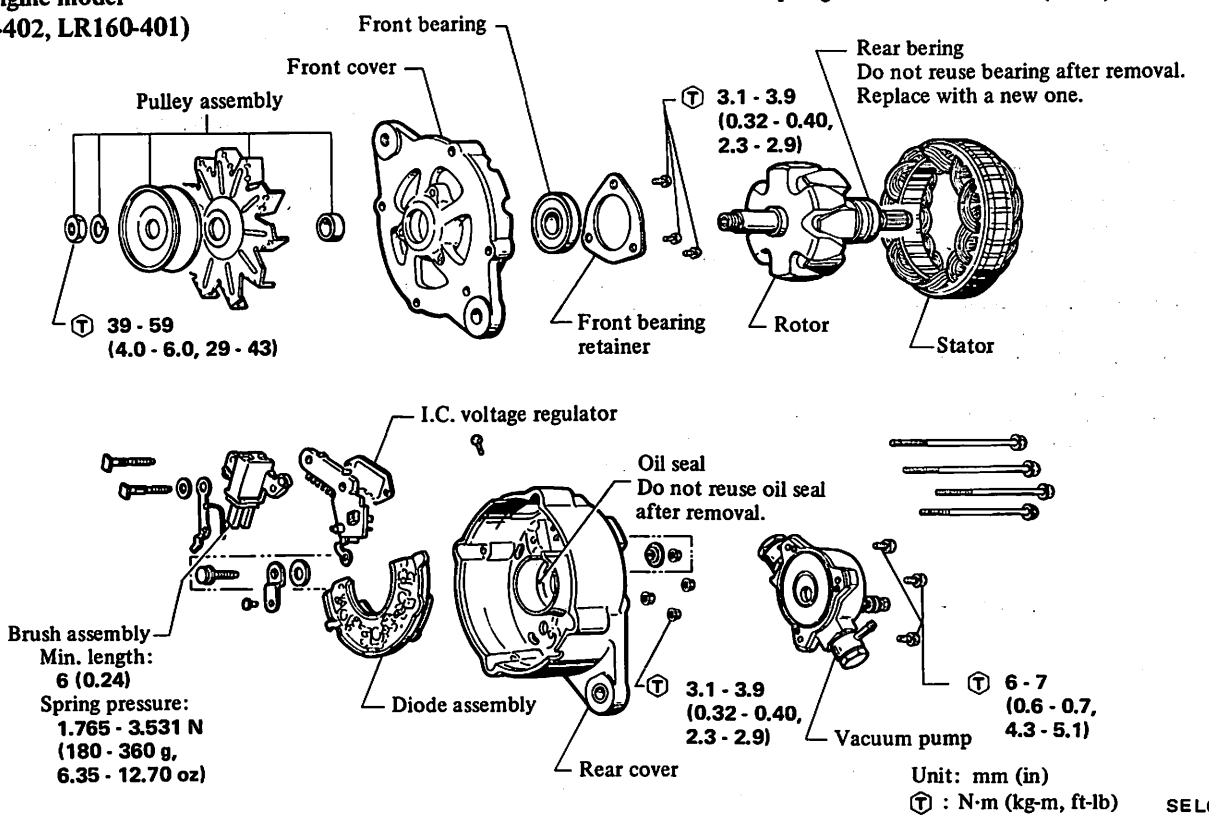


Unit: mm (in)
Ⓣ : N·m (kg-m, ft-lb)

SEL583A

Diesel engine model (LR150-402, LR160-401)

Slip ring dia.: more than 33.6 (1.323)

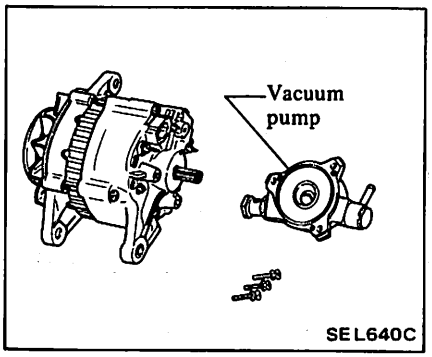


Unit: mm (in)
Ⓣ : N·m (kg-m, ft-lb)

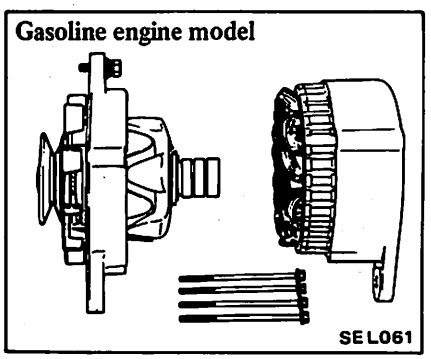
SEL639C

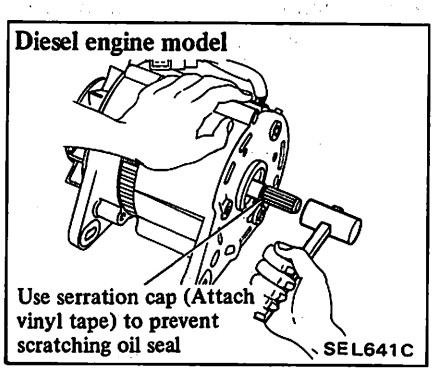
DISASSEMBLY

1. Remove vacuum pump (Diesel engine model only).

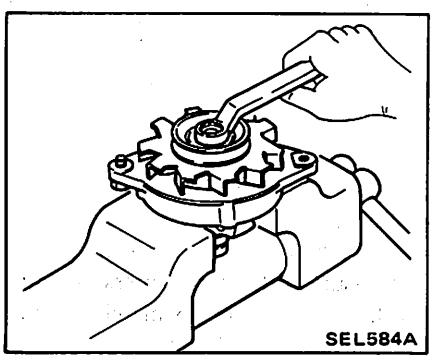


2. Remove through-bolts and the separate front cover and rear cover.

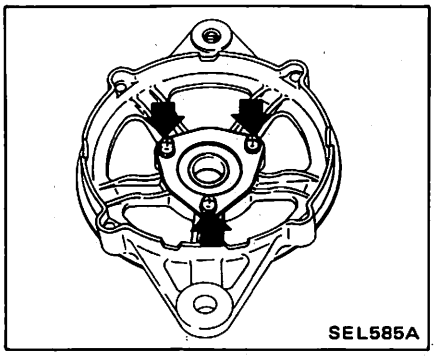




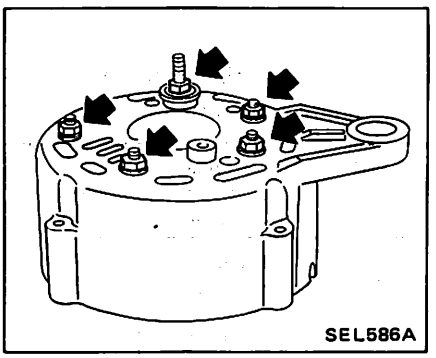
3. Remove pulley and fan.
(1) Place rear cover side of rotor in a vice.
(2) Remove pulley nut.



4. Remove setscrews from bearing retainer.



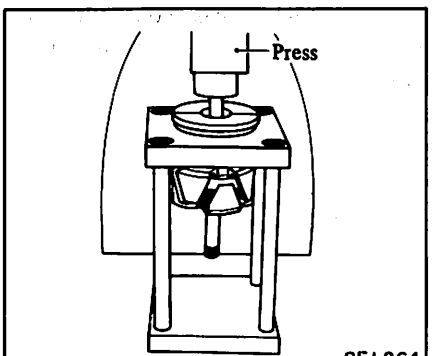
5. Remove attaching nuts and take out stator assembly.

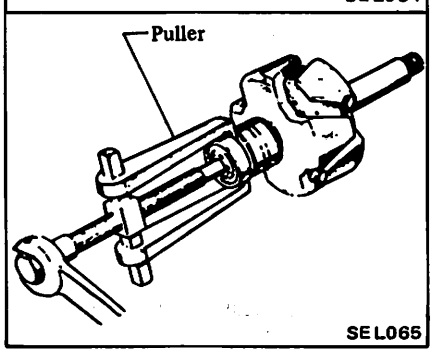


Rotor

Pull rear bearing off from rotor assembly with a press or bearing puller.

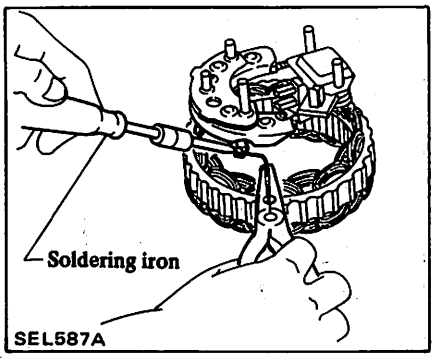
Once removed, bearing cannot be reused. Replace with a new one.





Stator

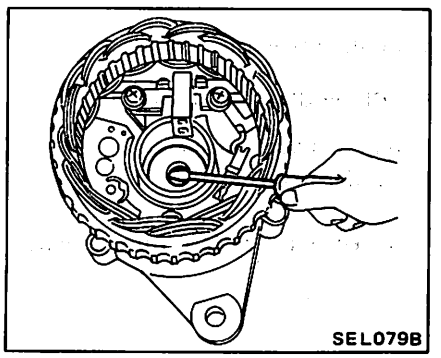
Disconnect stator coil leas wires from diode terminals



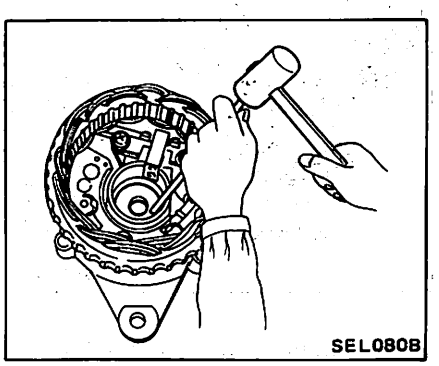
Replacement of oil seal (Only diesel engine model)

If oil leaks from oil seal or any abnormalities are found after inspection, replace oil seal.

1. Pry off oil seal.



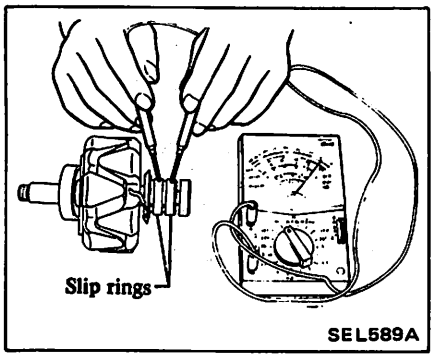
2. Apply engine oil to seal and install oil seal in position.



INSPECTION

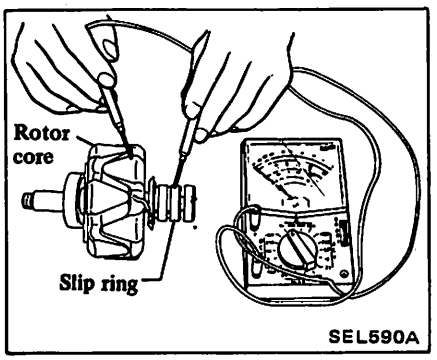
Rotor

1. Continuity test.



- No continuity ... Replace rotor.

2. Insulation test



- Continuity exists ... Replace rotor.

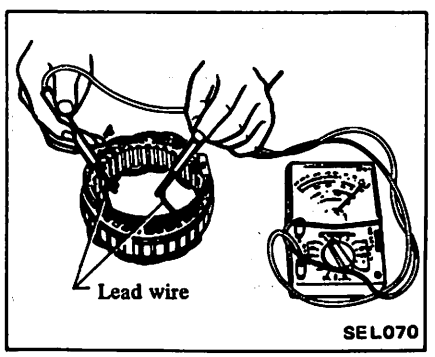
3. Check slip ring for wear.

Slip ring outer diameter:
Refer to S.D.S.

If necessary, replace rotor assembly.

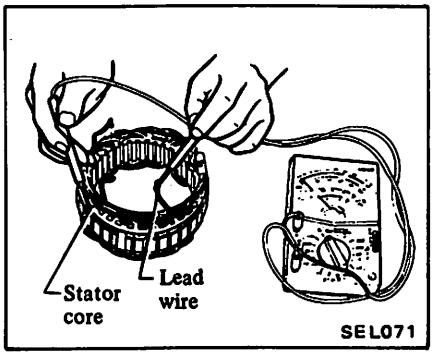
Stator

1. Continuity test



- No continuity ... Replace stator.

2. Insulation test



- Continuity exists ... Replace stator.

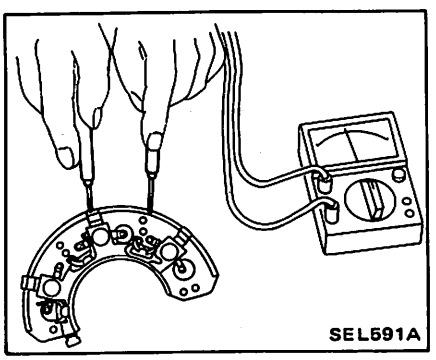
Diode

Perform a continuity test on diodes in both directions, using an ohmmeter.

Circuit tester terminal		Conduction
Positive	Negative	
(+) plate Holder plate	Diode terminal	Yes
Diode terminal	(+) plate Holder plate	No
(–) plate Rear cover	Diode terminal	No
Diode terminal	(–) plate Rear cover	Yes

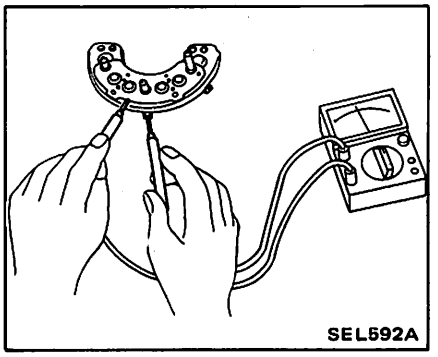
Some ohmmeters use a reverse polarity, in which case continuity will be exactly opposite from the chart above.

Positive diode



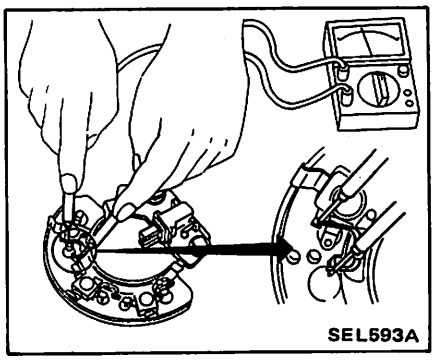
- Conduction test is N.G. ... Replace diode assembly.

Negative diode



- Conduction test is N.G. ... Replace diode assembly.

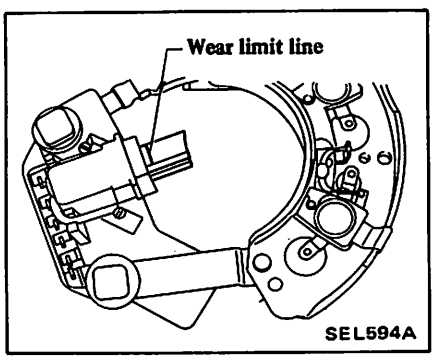
Sub-diode



- Conduction test is N.G. ... Replace diode assembly.

Brush

1. Check smooth movement of brush.
- Not smooth ... Check brush holder and clean.
2. Check brush for wear.

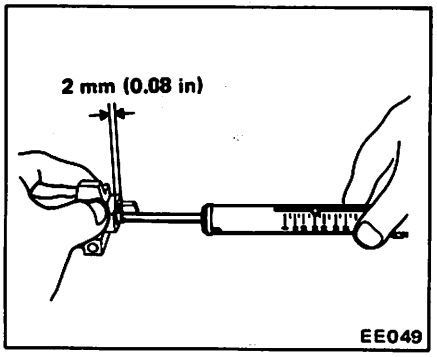


3. Check brush pig tail for damage.
- Damaged ... Replace.
4. Check brush spring pressure.

Measure brush spring pressure with brush projected approximately 2 mm (0.08 in) from brush holder.

Spring pressure:
Refer to S.D.S.

When brush is worn, pressure decreases approximately 0.196 N (20 g, 0.71 oz) per 1 mm (0.04 in) wear.



- Not in the specified value ... Replace brush assembly.

Oil seals (Only diesel engine model)

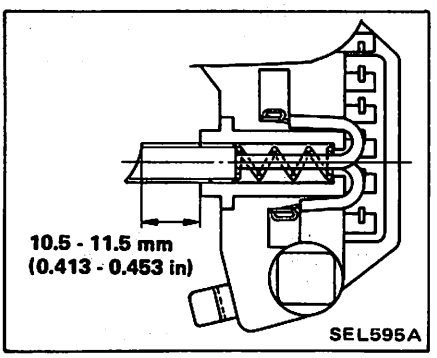
- Check oil seal for wear, cracks or deformation. Replace if necessary.
- Do not reuse oil seal once removed.

ASSEMBLY

Assemble alternator in the reverse order of disassembly, noting the following:

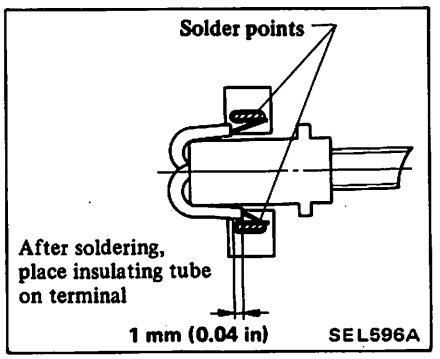
1. When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.
2. When soldering brush lead wire, observe the following.

(1) Position brush so that it extends 11 mm (0.43 in) from brush holder.



(2) Coil lead wire 1.5 times around terminal groove. Solder outside of terminal.

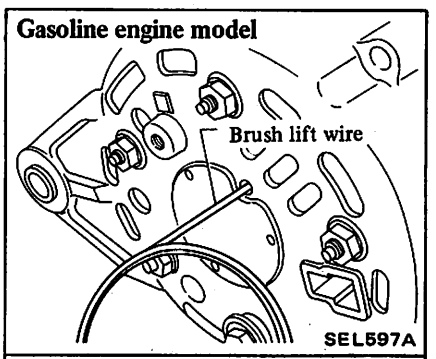
Ⓣ : Brush holder
3.1 - 3.9 N·m
(0.32 - 0.4 kg-m,
2.3 - 2.9 ft-lb)
Diode and IC regulator
3.1 - 3.9 N·m
(0.32 - 0.4 kg-m,
2.3 - 2.9 ft-lb)
Bearing retainer
3.1 - 3.9 N·m
(0.32 - 0.4 kg-m,
2.3 - 2.9 ft-lb)

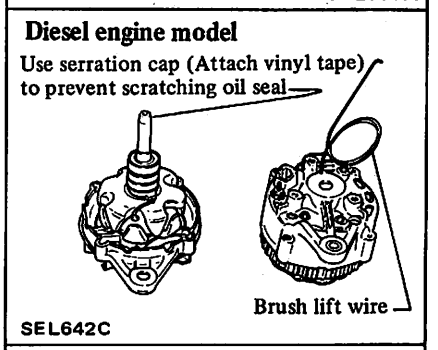


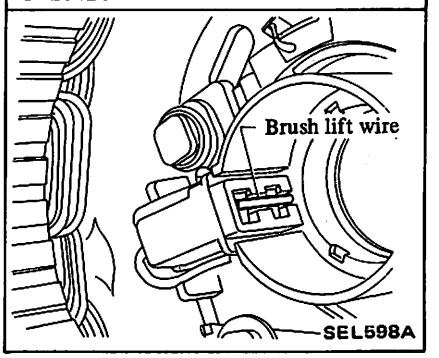
3. Tighten pulley nut and make sure that deflection of V-groove is proper.

Ⓣ : Pulley nut
39 - 59 N·m
(4 - 6 kg-m,
29 - 43 ft-lb)
V-groove deflection:
0.3 mm (0.012 in)

4. Before installing front and rear sides of alternator, push brush up with fingers and retain brush, by inserting brush lift into brush lift hole from outside.







5. After installing front and rear sides of alternator, pull brush lift by pushing toward center.

Do not pull brush lift by pushing toward outside of cover as it will damage slip ring sliding surface.

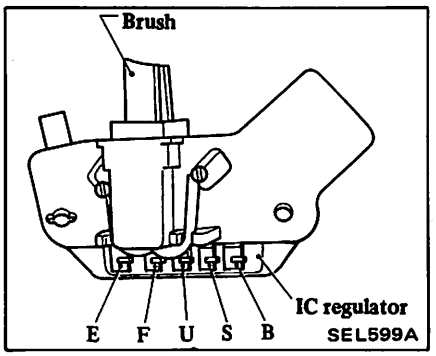
6. Tighten through-bolts.

Ⓣ : Through-bolts
3.1 - 3.9 N·m
(0.32 - 0.4 kg-m,
2.3 - 2.9 ft-lb)

IC VOLTAGE REGULATOR

DESCRIPTION

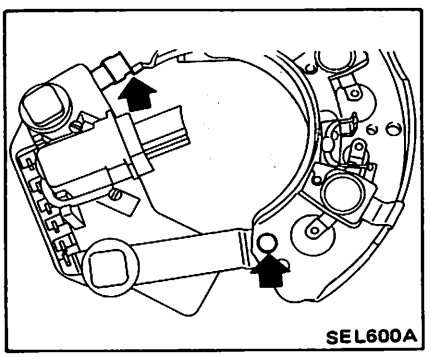
The regulator consists essentially of integrated circuits incorporating transistors. These transistors interrupt and admit current flow to the alternator rotor coil, thus maintaining its output voltage at a constant value. Unlike in a mechanical type regulator, an electronic relay employing transistors is utilized. These transistors are enclosed in a very compact, sealed case. On the charge warning lamp circuit, a diode monitors generating voltage at the stator so that when the monitored voltage and charging voltage are equal during re-charging, the charge warning lamp is turned off. Accordingly, a charge warning relay is not employed in this circuit.



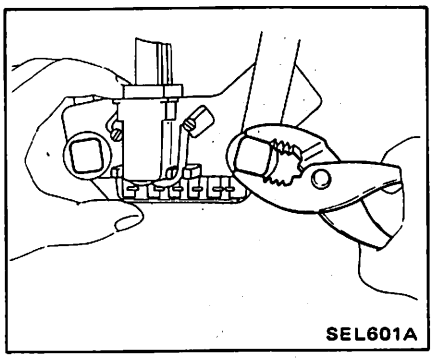
REPLACEMENT

Removal should be done only when IC regulator is being replaced.

1. Remove rivet and solder.



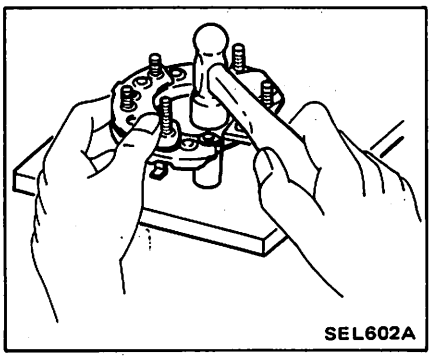
2. Remove the terminals solder and take out bolts.



When installing the regulator, reverse order removal noting following.

(1) Put IC regulator on brush holder and press-fit bolts using hand press.

(2) Stake rivets using Tool.



SERVICE DATA AND SPECIFICATIONS (S.D.S.)

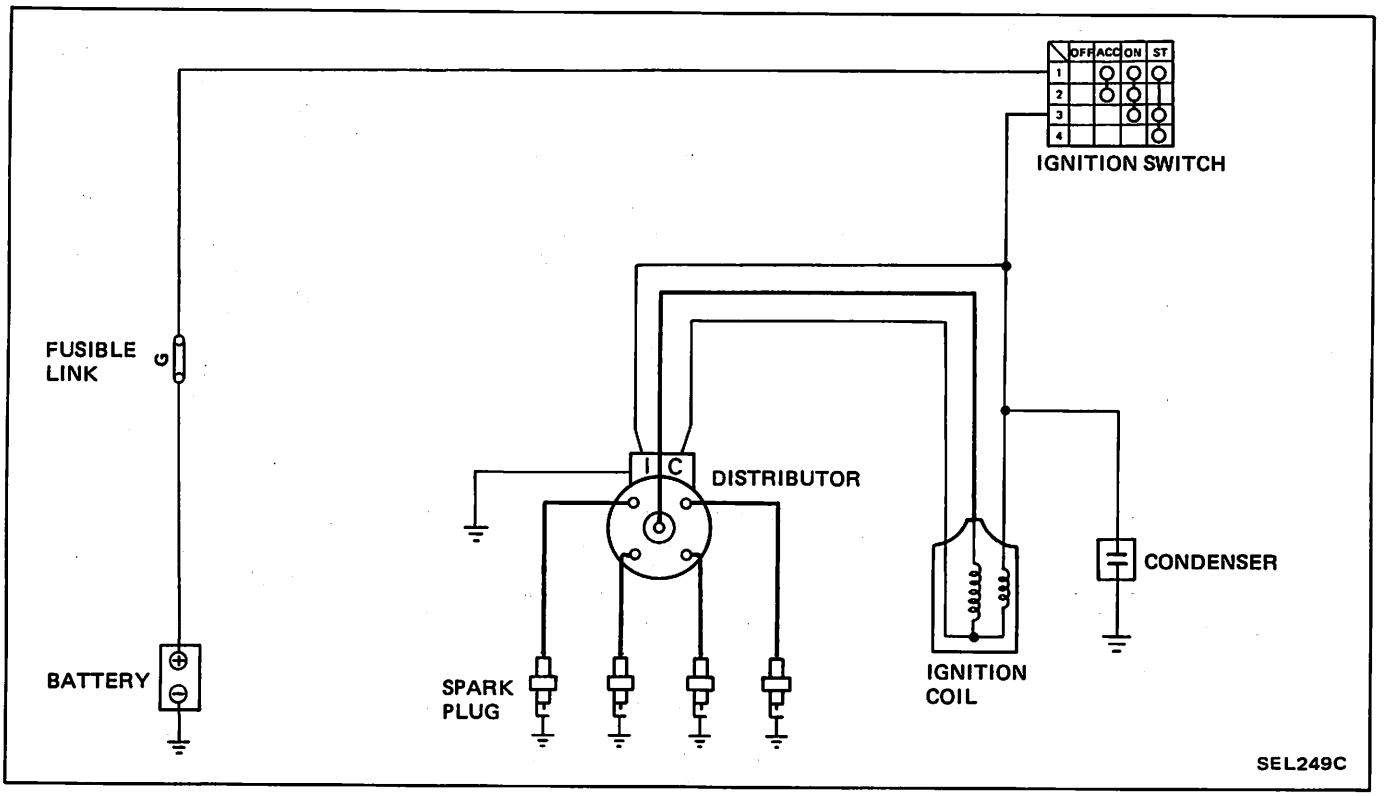
ALTERNATOR

Type	LR150-125B	LR150-402	LR160-401
Applied model	Gasoline engine model	Diesel engine models: Non-California models for U.S.A.	Diesel engine models: California, Canada and non-California optional models for U.S.A.
Nominal rating V-A	12-50	12-50	12-60
Ground polarity	Negative	Negative	Negative
Minimum revolution under no-load (When 14 volts is applied) rpm	Less than 900	Less than 1,000	Less than 1,000
Hot output current A/rpm	More than 42/2,500 More than 50/5,000	More than 16/1,300 More than 42/2,500 More than 50/5,000	More than 50/2,500 More than 60/5,000
Regulated output voltage V	14.4 - 15.0	14.4 - 15.0	14.4 - 15.0
Brush wear limit mm (in)	More than 7.0 (0.276)	More than 6.0 (0.236)	More than 6.0 (0.236)
Brush spring pressure N (g, oz)	2.501 - 3.383 (255 - 345, 8.99 - 12.17)	1.765 - 3.531 (180 - 360, 6.35 - 12.70)	1.765 - 3.531 (180 - 360, 6.35 - 12.70)
Slip ring outer diamter mm (in)	More than 30 (1.18)	More than 33.6 (1.323)	More than 33.6 (1.323)

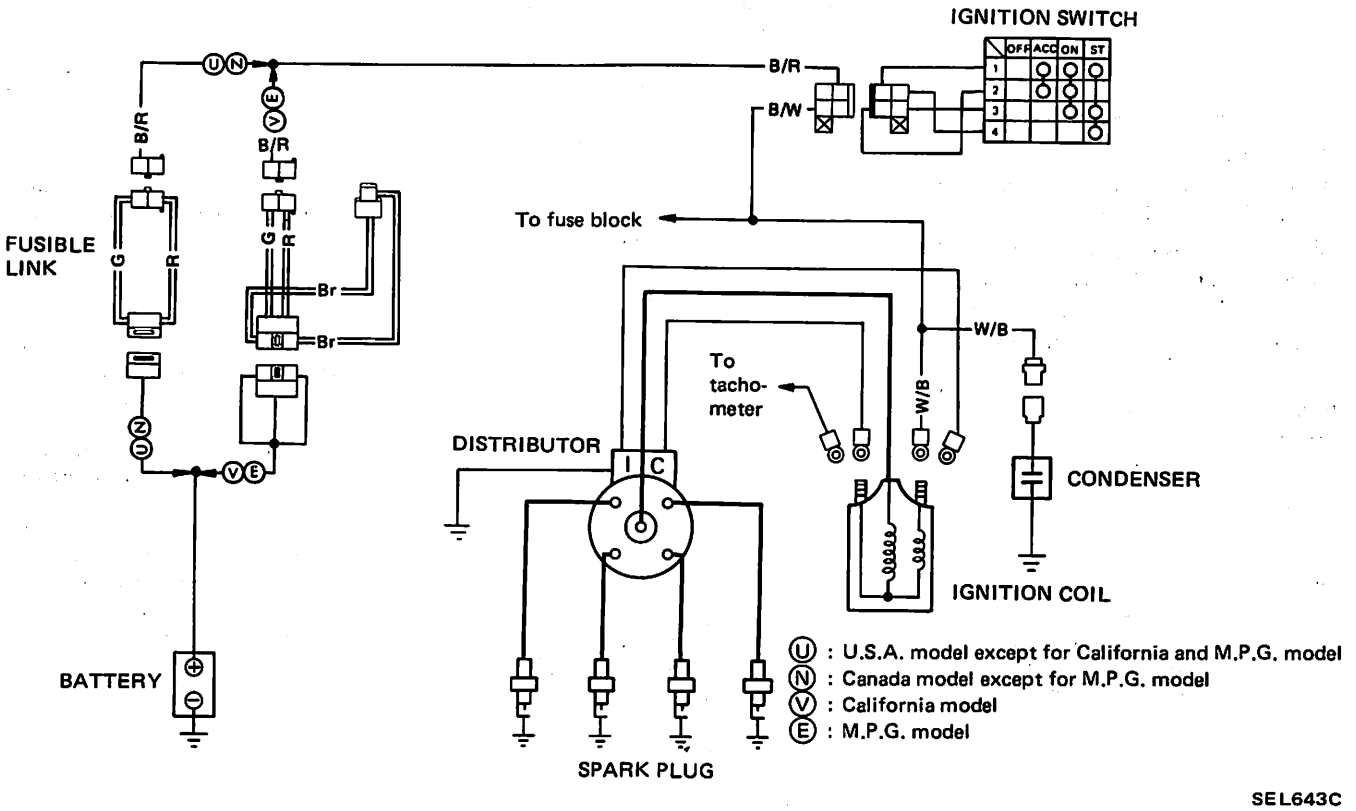
IGNITION SYSTEM

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

SCHEMATIC



WIRING DIAGRAM



IC IGNITION SYSTEM TROUBLE-SHOOTING

Engine turns erratically.

Engine cranks but does not start.

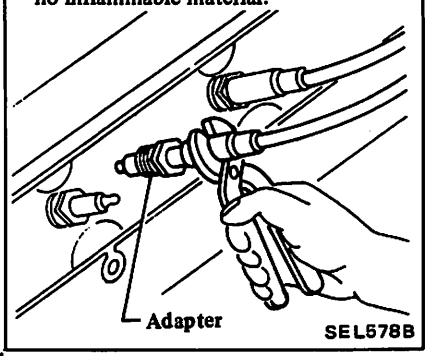
Check ignition timing.

N.G. → Adjust.

O.K. →

Attach adapter *1 to high tension cable and position tip of adapter approx. 6 mm (0.24 in) away from cylinder block. With adapter held in that position, crank engine to see if spark jumps across gaps between tip and cylinder block at regular intervals.

Before cranking, disconnect fuel cut solenoid harness connector.
Before operation, make sure there is no inflammable material.

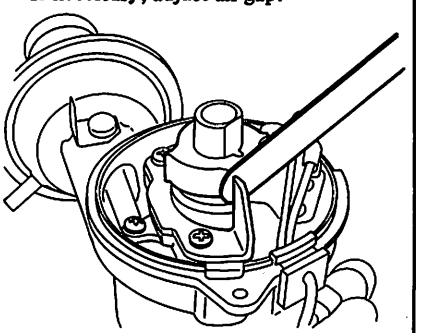


N.G. ↓

Check air gap between reluctor and stator.

O.K. ↓

Specified range ... Refer to S.D.S.
If necessary, adjust air gap.



Check IC ignition system.
IC Ignition System is best checked using J-26350 Transistor Ignition Analyzer. However, if an analyzer is not available, a volt-ohm-milliammeter (V.O.M.) may be used to diagnose transistor ignition malfunctions. While this method requires more time, it can nevertheless provide accurate results. Follow the steps in the sequence indicated. If a fault is found, correct the problem before continuing. If all tests indicate "O.K." replace the IC Ignition Unit. DO NOT REPLACE THE UNIT UNTIL ALL TESTS HAVE BEEN COMPLETED AND INDICATE "O.K.".

Go to test table.

Check for burned or fouled spark plug.

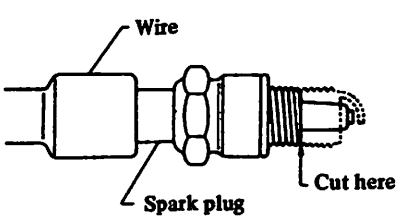
N.G. → Clean or replace.

O.K. → Check fuel system.

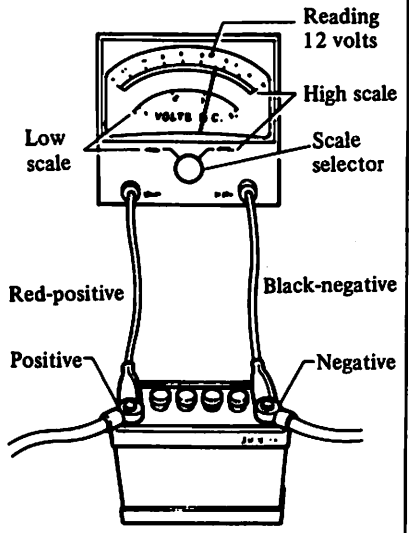
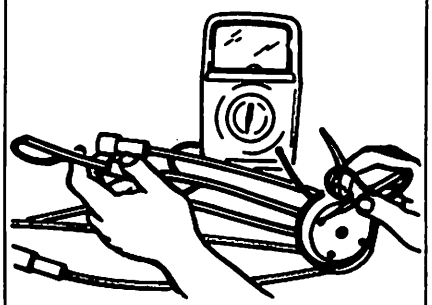
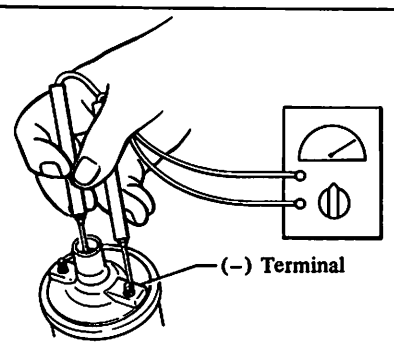
WARNING:
When current is flowing, never touch with bare hand high tension cables or any other parts with high voltage. If parts are moist, touching them could cause an electric shock, even if they are insulated. Always wear dry, well-insulated gloves or wrap affected parts with dry cloth before handling.

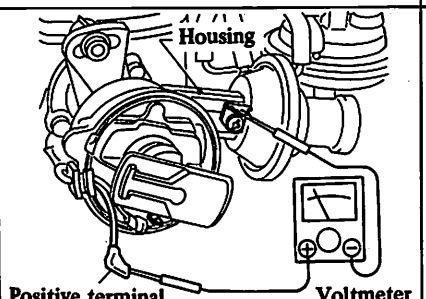
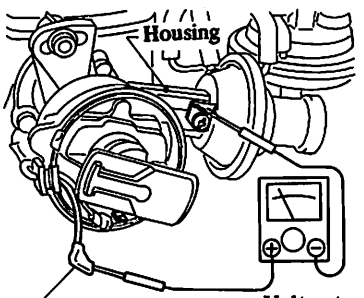
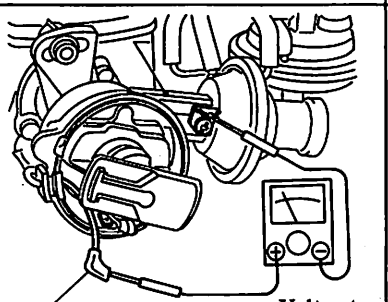
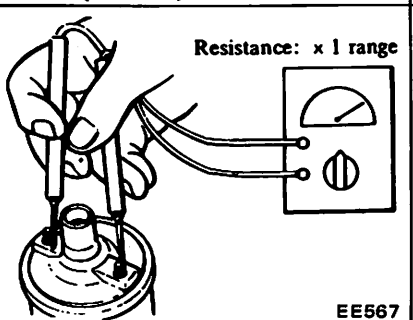
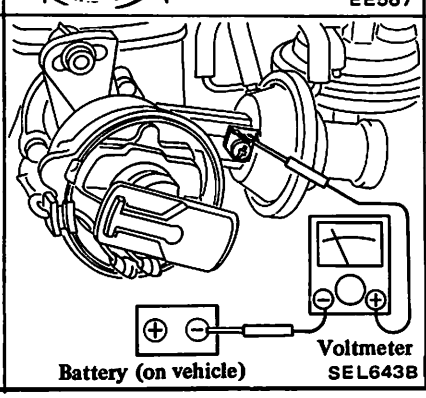
NOTE:
1. **When performing the following tests, use a multitester which can measure accurately in the following ranges; 0 to 20V. D.C.; 0 to 1,000Ω; 0 to 10V A.C.; 0 to 50,000Ω.**
2. **If possible, start the vehicles and let it run for 5 to 15 minutes with the hood closed. This will bring all components to normal operating temperature, and will make it easier to diagnose intermittent problems.**
3. **It is not necessary to disconnect the harness connectors when performing the tests which follow. Simply insert the meter probes into the back of appropriate connector cavity.**

*1:
Preparation of spark plug for checking
Many things can be utilized as an adapter. However, it is recommended that a used spark plug whose threaded portion has been half cut off as shown in the figure be utilized.

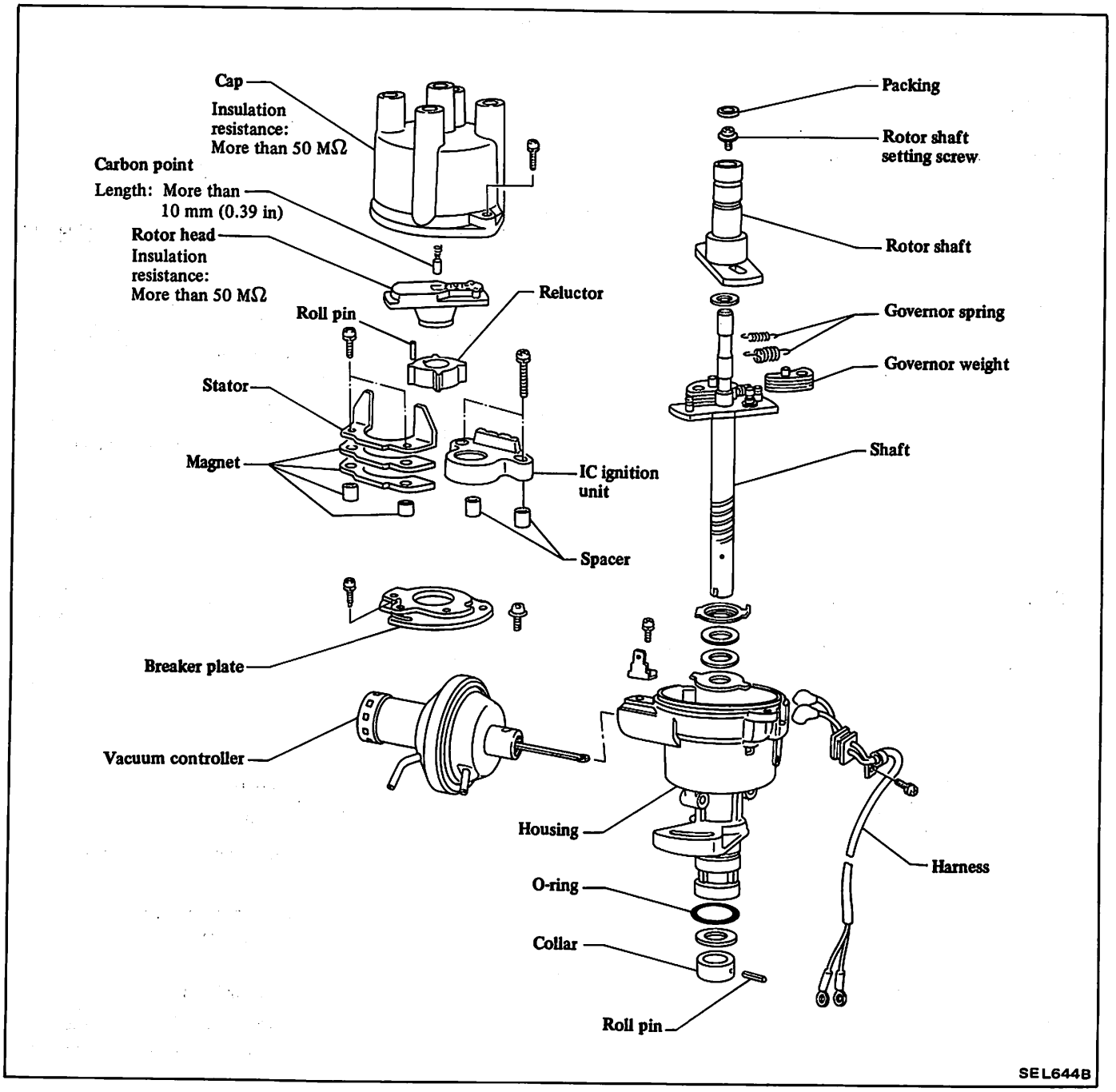


TEST TABLE

TEST	TEST METHOD	CONDITIONS	RESULT	ACTION
1. Battery Voltage (no load)	 SEL103	1. Ignition key in "OFF" position. 2. Connect voltmeter as illustrated and set to appropriate scale. 3. Read and record battery voltage reading. Battery voltage ☐	11.5 - 12.5 volts	Proceed to Step 2.
			Below 11.5 volts	Battery, charging system or starting system – Faulty. Refer to applicable sections in Service Manual to correct the situation.
2. Battery Cranking Voltage		1. Connect voltmeter as illustrated and set to appropriate scale. 2. Remove coil wire from distributor cap and ground it. 3. Read voltmeter while cranking engine for approximately 15 seconds. 4. Record voltage reading. Battery cranking voltage ☐	Voltage reading greater than 9.6 volts	Battery O.K. Proceed to Step 3.
			Voltage reading less than 9.6 volts	Battery, charging system or starting system – Faulty. Refer to applicable sections in Service Manual to correct the situation.
3. Secondary Wiring	 EF125	1. Connect ohmmeter as illustrated and measure the resistance of each high tension cable.	Resistance readings less than 30,000 ohms	Distributor cap and high tension cables – O.K. Proceed to Step 4.
			Resistance readings greater than 30,000 ohms	Replace high tension cable(s) and/or distributor cap as required.
4. Ignition Coil Secondary Circuit	 SEL104	1. Ignition key in "OFF" position. 2. Coil wire removed from coil. 3. Connect ohmmeter as illustrated.	7,300 - 11,000 ohms	Ignition coil secondary windings – O.K. Proceed to step 5 for California
			Resistance reading not between 7,300 - 11,000 ohms	Faulty ignition coil – replace

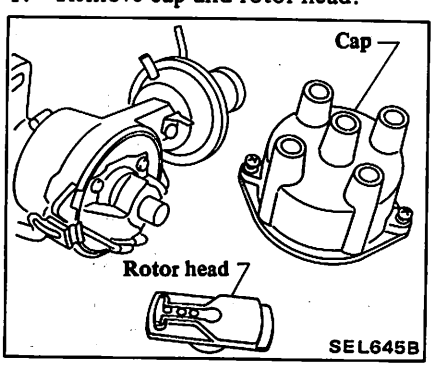
TEST	TEST METHOD	CONDITIONS	RESULT	ACTION
5. Power Supply Circuit		1. Connect voltmeter as illustrated and set to appropriate scale. 2. Turn ignition key to "ON" position.	11.5 - 12.5 volts	Proceed to Step 6.
			Below 11.5 volts	Check wiring from ignition switch to IC unit.
6. Power Supply Circuit (Cranking)		1. Connect voltmeter as illustrated and set to appropriate scale. 2. Pull out coil wire from distributor cap and ground it. 3. Turn key to "START" position and observe voltmeter while engine is cranking.	Voltage reading is less than 1 volt below battery cranking voltage and is greater than 8.6 volts.	Proceed to Step 7.
			Voltage reading is more than 1 volt below battery cranking voltage and/or is below 8.6 volts.	Check ignition switch and wiring from switch to IC unit.
7. Ignition Primary Circuit		1. Connect voltmeter as illustrated and set to appropriate scale. 2. Ignition key in "ON" position.	11.5 - 12.5 volts	Proceed to Step 9.
			Below 11.5 volts	Proceed to Step 8.
8. Ignition Coil Primary Circuit		1. Ignition key in "OFF" position. 2. Coil wire removed from coil. 3. Connect ohmmeter as illustrated.	1.04 - 1.27 ohms	Ignition coil primary winding O.K. Check ignition switch and wiring from ignition switch to coil and IC unit.
			Resistance reading not between 1.04 - 1.27 ohms	Faulty ignition coil – replace.
9. I.C. Unit Ground Circuit		1. Connect voltmeter as illustrated and set to appropriate scale. 2. Pull out coil wire from distributor cap and ground it. 3. Turn key to "START" position and observe voltmeter while engine is cranking.	0.5 volts or less	Replace IC ignition unit assembly.
			More than 0.5 volts	Check distributor ground, wiring from chassis ground to battery including battery cable connections.

DISTRIBUTOR

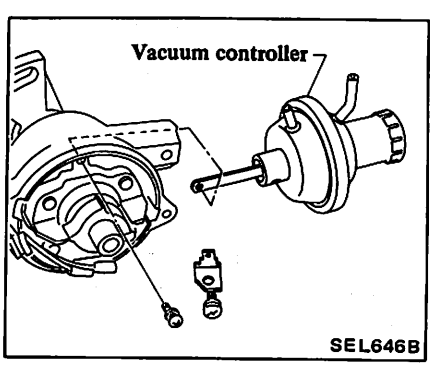


DISASSEMBLY

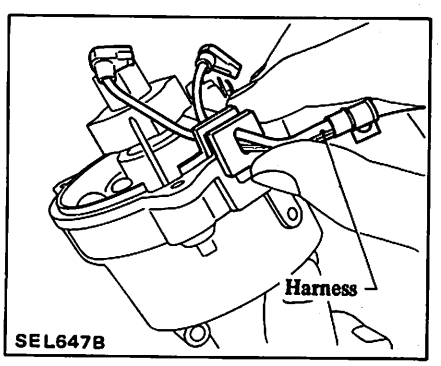
1. Remove cap and rotor head.



2. Remove vacuum controller.

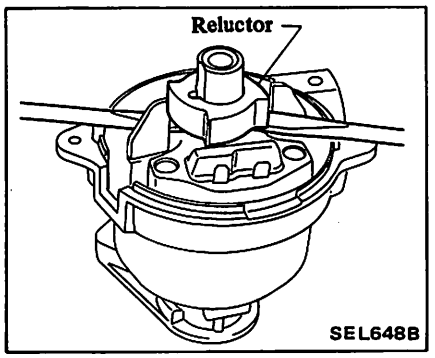


3. Remove harness from housing.

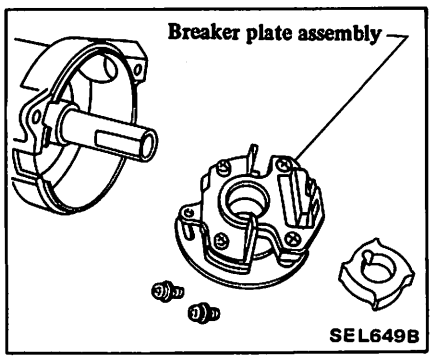


4. Insert a flat-bladed screwdriver under lower side of reluctor, and pry reluctor from shaft. Remove roll pin from reluctor.

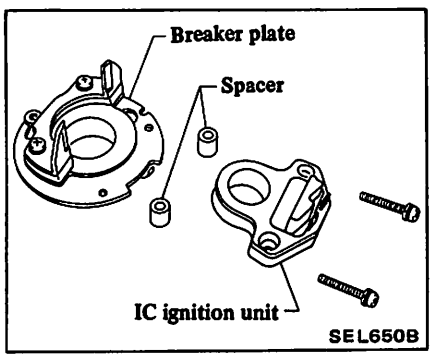
CAUTION:
When removing reluctor, be careful not to distort or damage the teeth.



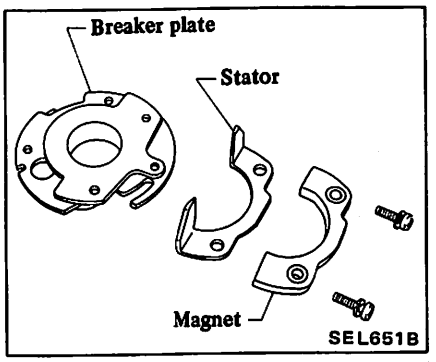
5. Remove breaker plate assembly.



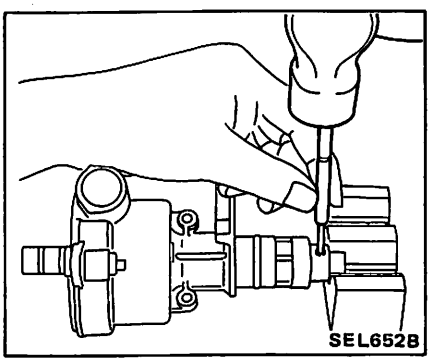
6. Remove IC ignition unit and spacer.



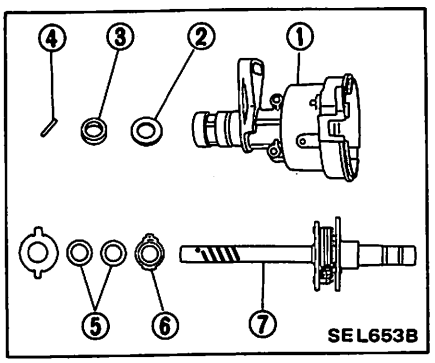
7. Remove magnet and stator from breaker plate.



8. Knock roll pin out and remove collar.

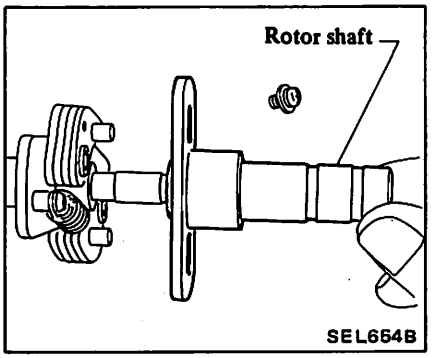


9. Draw out shaft assembly from housing.

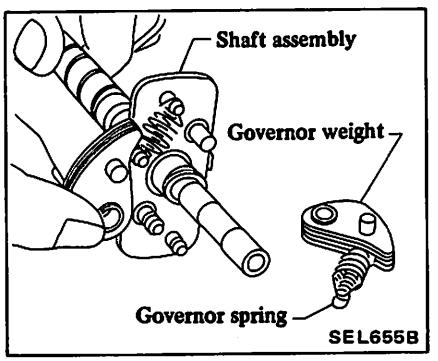


1 Housing
2 Thrust washer
3 Collar
4 Roll pin
5 Thrust washer
6 Thrust plate
7 Shaft

10. Remove packing from the top of rotor shaft and unscrew rotor shaft setscrew.
Remove rotor shaft.



11. Remove governor weight and governor spring from the shaft assembly.



INSPECTION

Carbon point

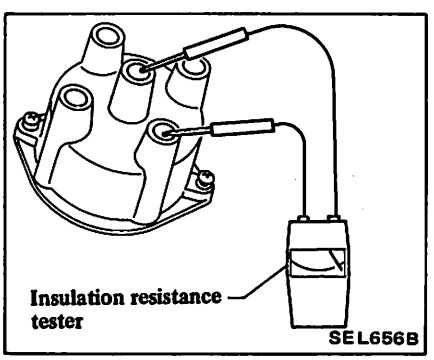
Check length of carbon point inside cap.

Carbon point length:
Refer to S.D.S.

Cap and rotor head

Measure insulation resistance between electrodes on ignition coil and side of spark plug.

Insulation resistance:
Refer to S.D.S.



- Less than specified value ... Replace.

Reluctor and stator

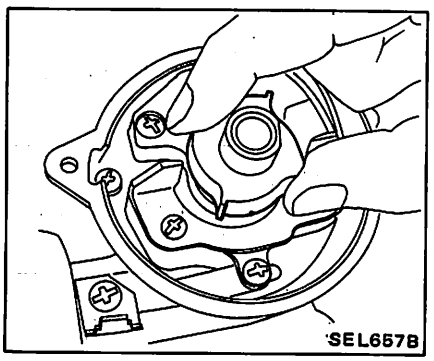
- Check reluctor and stator for bending or scratches. If necessary, replace.

Breaker plate

- If breaker plate shows any signs of binding or dragging, replace.

Centrifugal advance mechanical parts

- While preventing the shaft from turning, turn reluctor counterclockwise by hand and release it. It should return to its original position.



Vacuum advance mechanical parts

Apply negative pressure to vacuum controller with a vacuum pump to see if leakage is present. Also check breaker plate for smooth movement.

- If leak is found, replace vacuum controller.
- If breaker plate does not move smoothly, this condition could be due to sticky steel balls or pivot. Apply grease to steel balls or, if necessary, replace breaker plate assembly.

ASSEMBLY

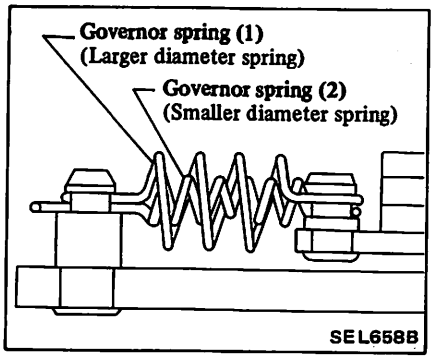
To assemble, reverse order of disassembly. Note the following:

a. Apply grease to:

- Shaft bearing metal
- Governor spring
- Frictional surface of governor weight
- Frictional surface of breaker plate

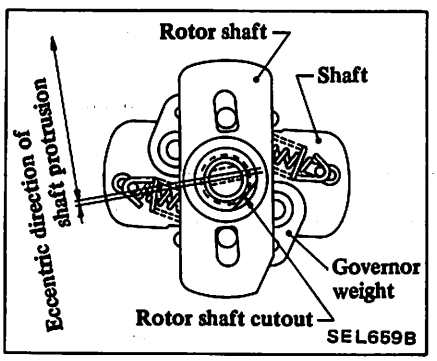
b. Installation of governor springs

Attach the smaller diameter spring to the hanger pins of shaft and governor weight first; then install the larger diameter spring.



c. Installation of rotor shaft

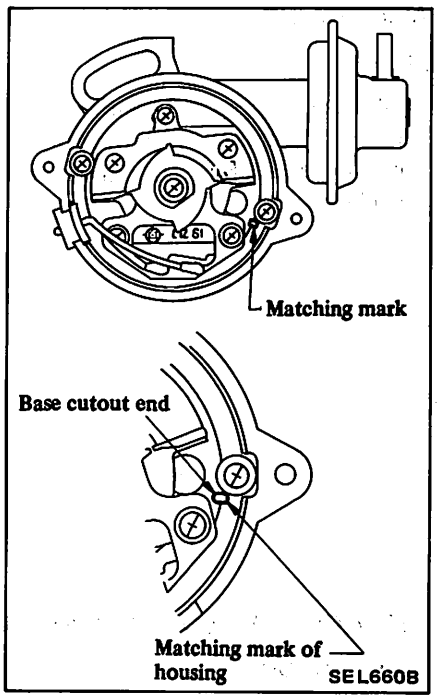
Position cutout direction of rotor shaft and eccentric direction of drive shaft protrusion as shown below; then install rotor shaft to drive shaft.



d. Use a new roll pin when installing collar.

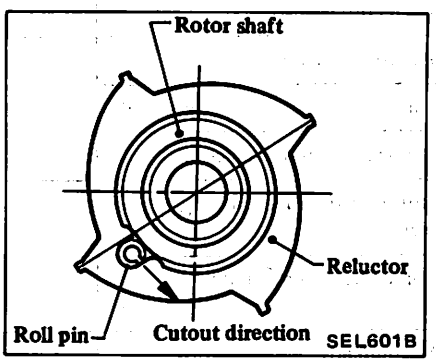
e. Installation of breaker plate

Ensure that alignment marks on breaker plate and housing are lined up properly.



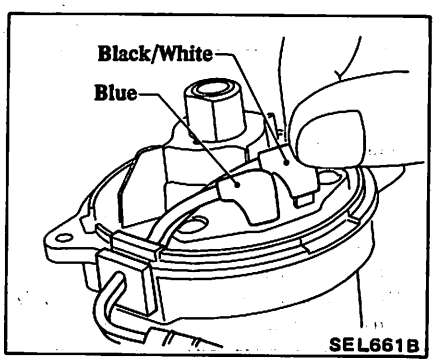
f. Inserting roll pin into reluctor

Position cutout direction of roll pin in parallel with notch in reluctor.



g. Connecting harness

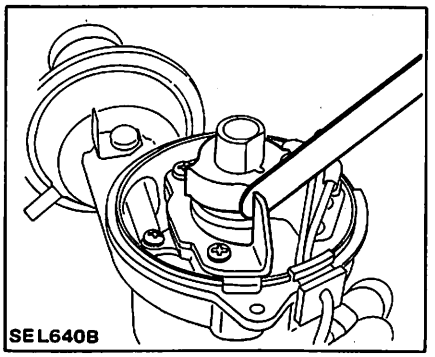
Ensure that harness to IC ignition unit is tightly secured.



ADJUSTMENT

Air gap

Measure air gap between reluctor and stator. If it is not within specifications, loosen stator retaining screws and adjust.



SERVICE DATA AND SPECIFICATIONS (S.D.S.)

DISTRIBUTOR

Type	D4R82-12	D4R82-13	D4R82-14	D4R82-21	D4R82-22	D4R82-25	D4R81-18	D4R81-08
Applied model	Except for M.P.G. model					M.P.G. model		
	U.S.A. M/T model	U.S.A. A/T model except California	California A/T model	Canada M/T model	Canada A/T model	Optional for U.S.A. except California	U.S.A. except California	Canada
Firing order	1-3-4-2							
Rotating direction	Counterclockwise							
Air gap mm (in)	0.3 - 0.5 (0.012 - 0.020)							
Cap insulation resistance MΩ	More than 50							
Rotor head insulation resistance MΩ	More than 50							
Cap carbon point length mm (in)	More than 10 (0.39)							
Vacuum advance [Distributor degree/distributor kPa (mmHg, inHg)]								
Advance side	0°/9.3 (70, 2.76) 4°/13.3 (100, 3.94) 10°/28.0 (210, 8.27)	0°/9.3 (70, 2.76) 3.7°/16.0 (120, 4.72) 6.5°/22.7 (170, 6.69)	0°/9.3 (70, 2.76) 4.35°/16.0 (120, 4.72) 7.5°/22.7 (170, 6.69)	0°/14.0 (105, 4.13) 3.6°/24.0 (180, 7.09) 6.5°/33.3 (250, 9.84)	0°/14.0 (105, 4.13) 20°/18.7 (140, 5.51) 3.5°/24.0 (180, 7.09)	0°/9.3 (70, 2.76) 9.0°/28.0 (210, 8.27)	0°/9.3 (70, 2.76) 4°/13.3 (100, 3.94) 9°/28.0 (210, 8.27)	0°/14.0 (105, 4.13) 3.8°/24.0 (180, 7.09) 6.5°/33.3 (250, 9.84)
Retard side	–					0°/12.0 (90, 3.54) 7.9°/20.0 (150, 5.91) 12.5°/26.7 (200, 7.87)	0°/24.0 (180, 7.09) −7°/34.7 (260, 10.24) −12.5°/46.7 (350, 13.78)	–
Centrifugal advance [Distributor degree/distributor rpm]	0°/700, 5°/1,300, 13°/2,600			0°/800, 13°/2,400		0°/700 5°/1,200 12°/2,700	0°/700 5°/1,200 12.5°/2,700	

IGNITION COIL

Type		HITACHI make CIT-72
Applied model		All
Primary voltage	V	12
Primary resistance [at 20°C (68°F)]	Ω	1.04 - 1.27
Secondary resistance [at 20°C (68°F)]	kΩ	7.3 - 11.0

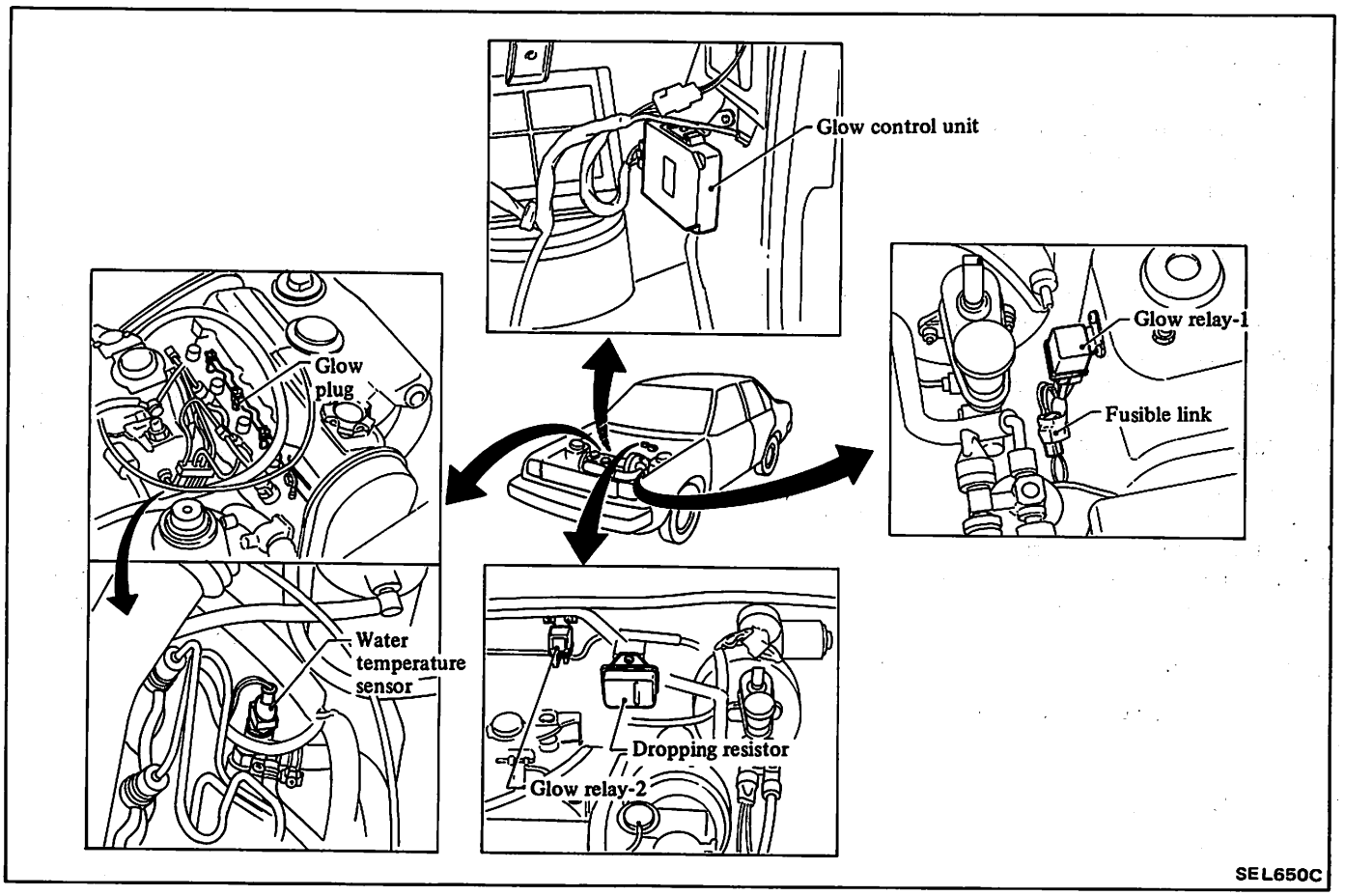
SPARK PLUG

Applied model		U.S.A.	Canada
Type			
Standard		BPR5ES-11	BPR5ES
Hot		BPR4ES-11	BPR4ES
Cold		BPR6ES-11	BPR6ES
Size (Screw dia. x reach)	mm (in)	14 x 19 (0.55 x 0.75)	
Plug gap	mm (in)	1.0 - 1.1 (0.039 - 0.043)	0.8 - 0.9 (0.031 - 0.035)

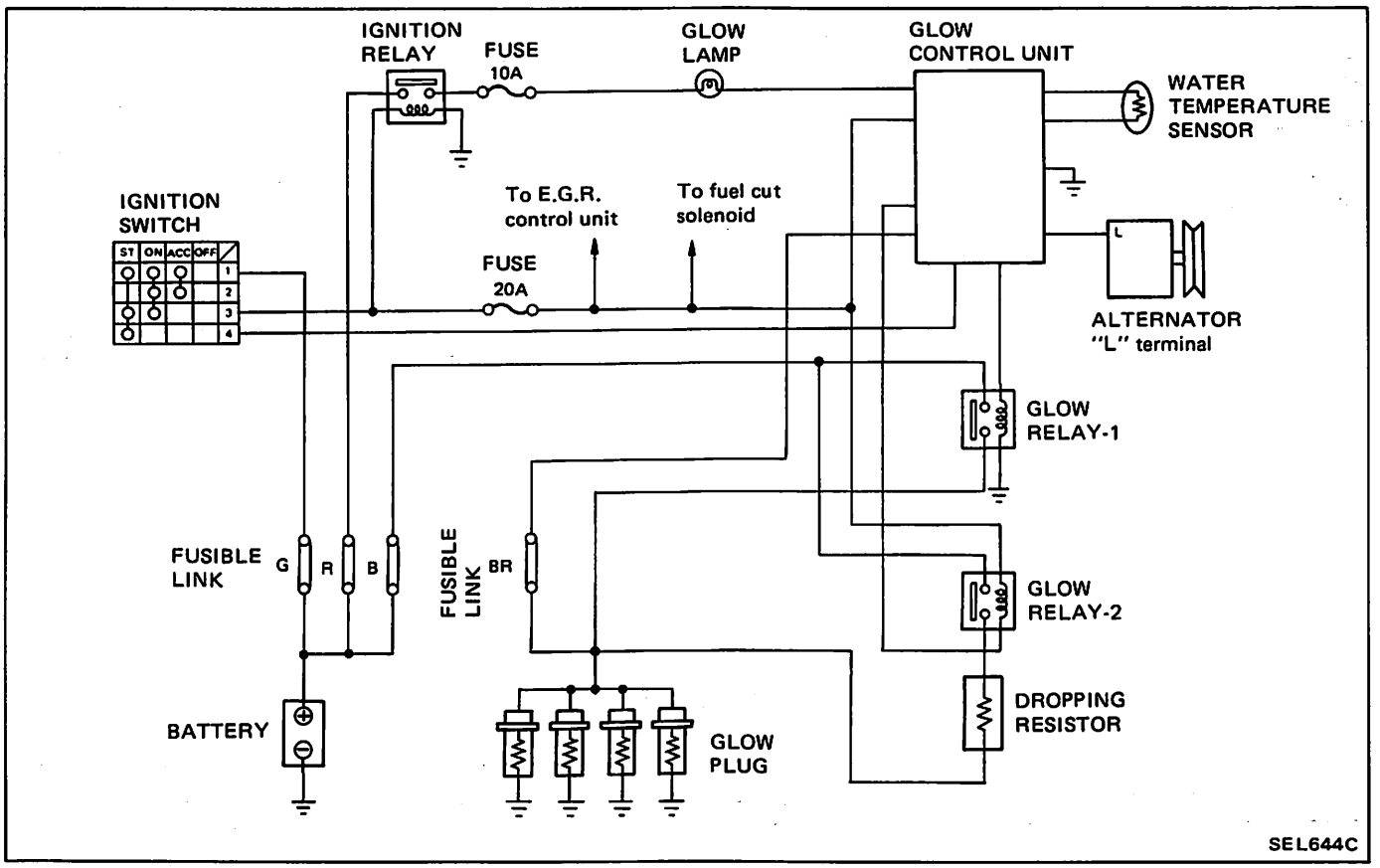
GLOW SYSTEM

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

LOCATION



SCHEMATIC



DESCRIPTION

The auto glow system provides the pre-glow (fast glow) operation before the engine starts as well as after-glow operation after the engine has started.

WATER TEMPERATURE SENSOR

The water temperature sensor is connected to the glow control unit. Sensor resistance varies with changes in the temperature of engine coolant.

ALTERNATOR "L" TERMINAL

The alternator "L" terminal is connected to the charge warning lamp. The voltage at "L" terminal rises from zero to alternator generating voltage when the engine starts.

GLOW PLUG RELAY-1

This is used for the pre-glow operation.

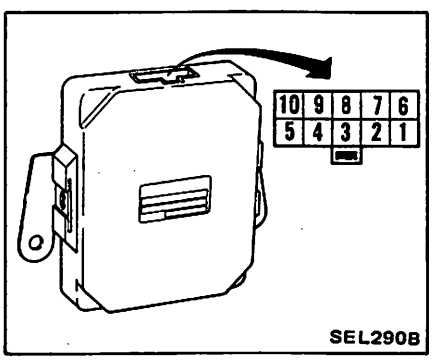
GLOW PLUG RELAY-2

This is used for the alfter-glow operation.

DROPPING RESISTOR

This resistor reduces the amount of current flowing through glow plugs during the after-glow operation.

GLOW CONTROL UNIT



This unit is operated by glow plug voltage, engine coolant temperature, generating voltage of the alternator and the ignition siwtch. It controls the following:

Glow lamp

The length of time for the glow lamp to light is controlled by the temperature of the engine coolant.

Pre-glow

1. Basically, the pre-glow system operates for about six seconds when the temperature of the engine coolant is lower than 50°C (122°F).
2. The length of time for the pre-glow system to operate is controlled by the terminal voltage of the glow plug.
3. And the length of time for the pre-glow system to operate is controlled by the duration of time from OFF to ON (ignition switch) for re-adjusting the engine.
4. After the engine starts, the pre-glow system turns off.

After-glow

1. The after glow system operates for a specified length of time after the ignition switch is turned from

OFF or ST to ON when the temperature of the engine coolant is below 50°C. (122°F).
The length of time for the after-glow system to operate is controlled by the temperature of the engine coolant. (about 5 to 32 seconds)
2. After pre-glow operation, the after-glow system turns off when the terminal voltage of the glow plug is higher than 7 volts.
3. However, when the ignition switch is in ST, the after-glow system is in operation.

Function of each terminal

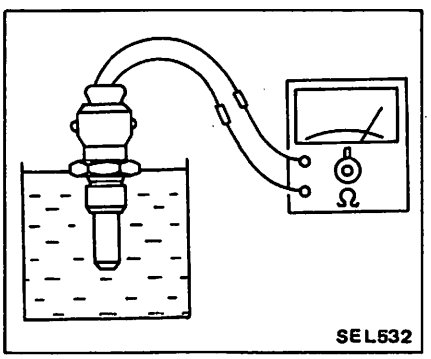
① Terminal:
A terminal at which voltage being applied to the glow plug is measured.
② Terminal:
Control unit's power source terminal
③ Terminal:
Control unit's ground terminal
④ Terminal:
A terminal that controls the ON-OFF operation of glow plug relay-1
⑤ Terminal:
A terminal connected to the water temperature sensor
⑥ Terminal:
A terminal connected to the "START" position of the ignition switch
⑦ Terminal:
Controls the ON-OFF operation of glow plug relay-2
⑧ Terminal:
A grounding terminal for the water temperature sensor
⑨ Terminal:
A terminal for the glow lamp
⑩ Terminal:
A terminal used to determine whether the engine has started or not

WATER TEMPERATURE SENSOR

INSPECTION

Measure resistance to temperature as shown.

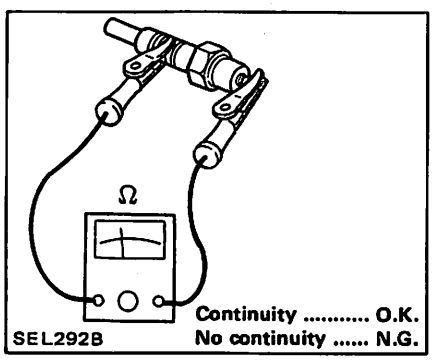
Temperature °C (°F)	Resistance kΩ
10 (50)	Approx. 3.7
20 (68)	Approx. 2.5
50 (122)	Approx. 0.85
80 (176)	Approx. 0.33



GLOW PLUG

INSPECTION

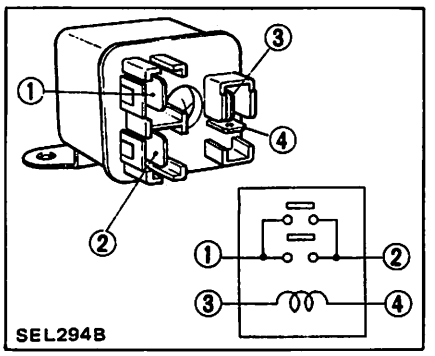
Check continuity test in glow plug.



Do not scratch glow plug pipe end.

GLOW PLUG RELAY

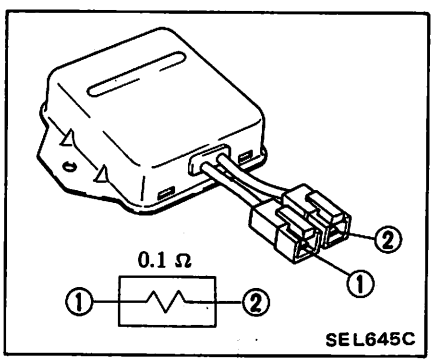
INSPECTION



DROPPING RESISTOR

INSPECTION

Resistance is approx. 0.1Ω.

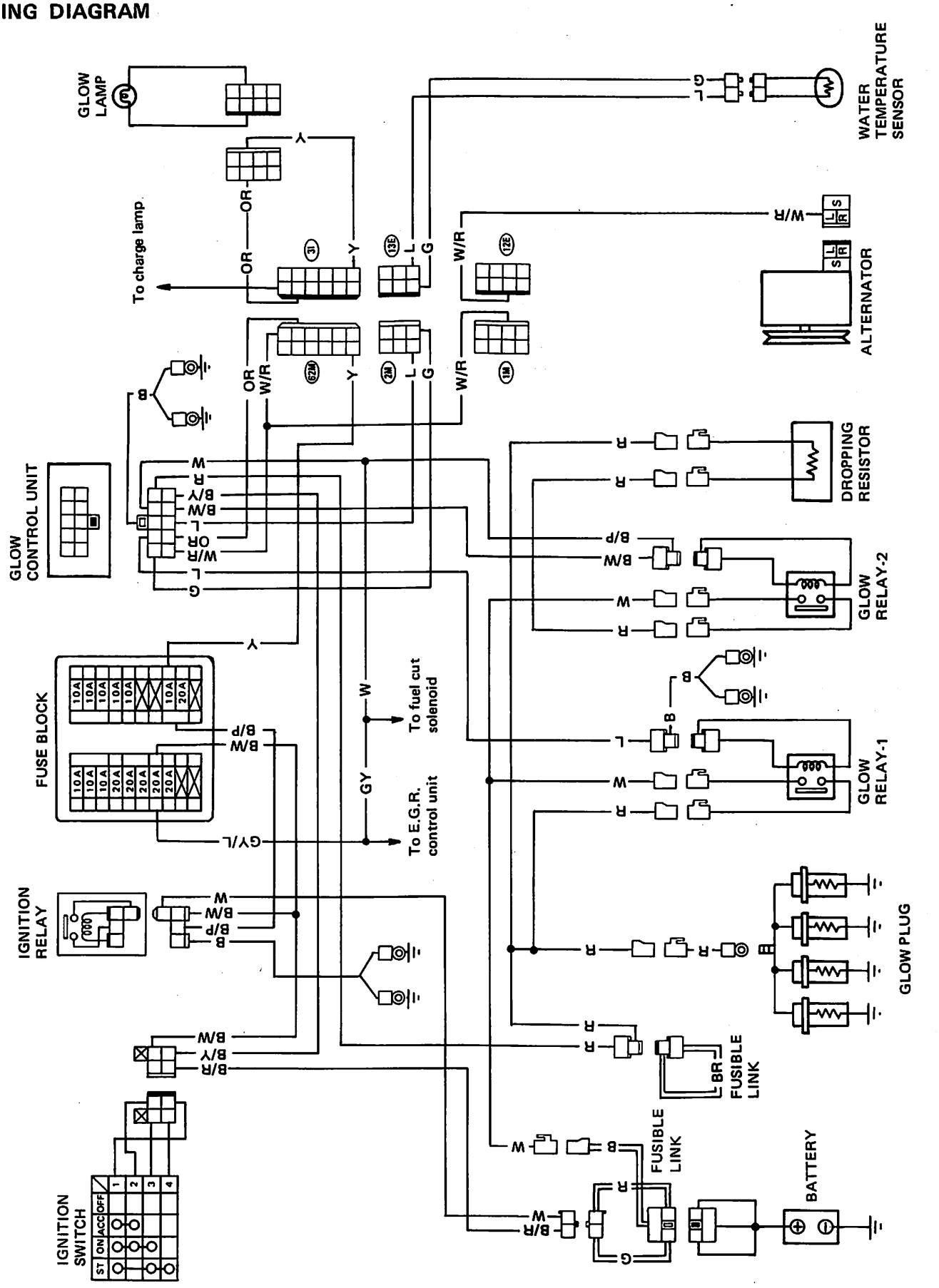


GLOW CONTROL UNIT

INSPECTION

Control unit must not be checked as a single unit. Check control unit for operation as a system, referring to "Trouble Diagnoses and Corrections".

WIRING DIAGRAM



SEL646C

TROUBLE DIAGNOSES AND CORRECTIONS

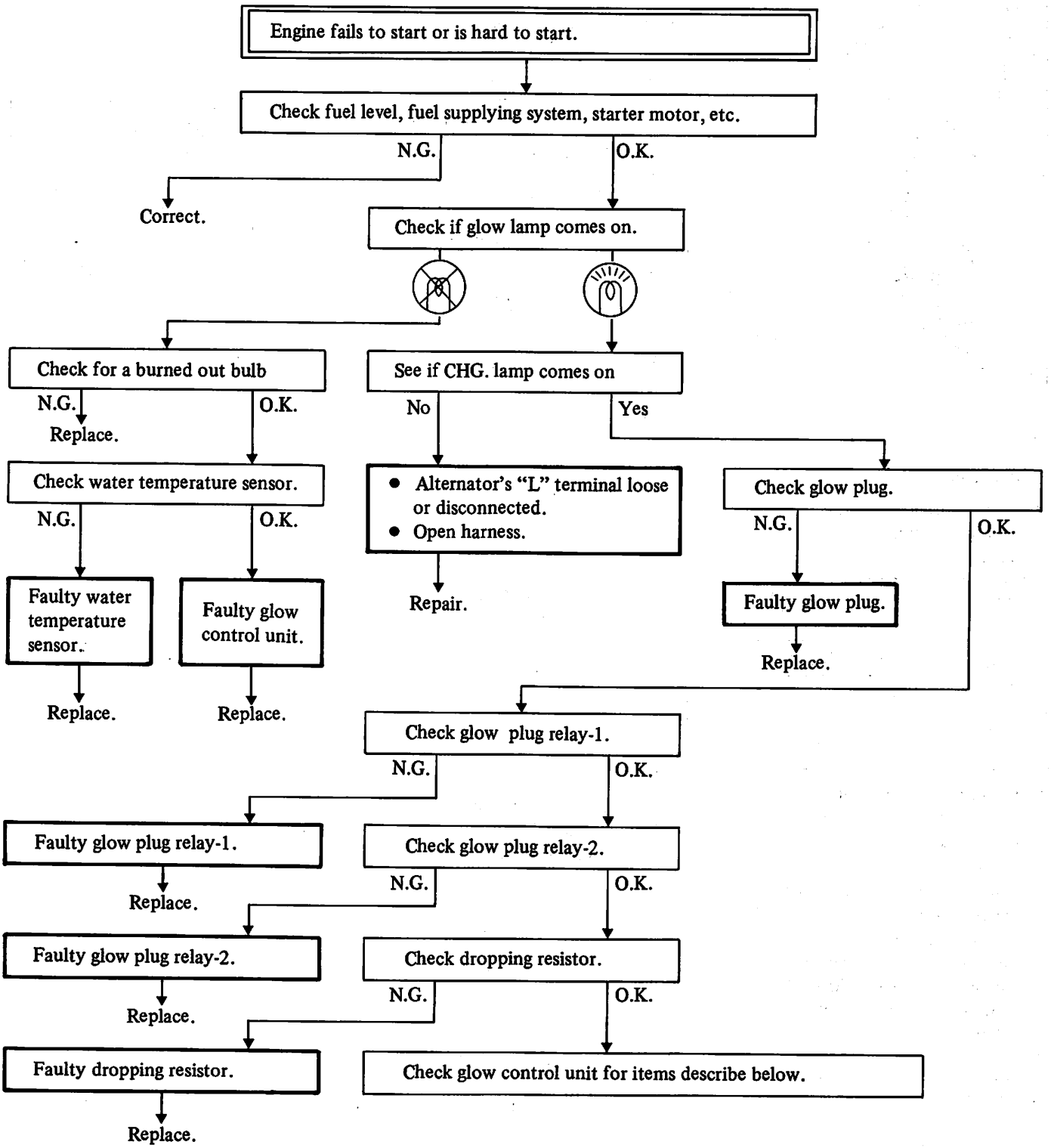
TROUBLE-SHOOTING CHART

Test condition

- BATTERY : O.K.
- FUSIBLE LINK : O.K.
- FUSE : O.K.
- IGNITION SWITCH : O.K.
- IGNITION RELAY : O.K.

: Condition
: Check
: Probable cause

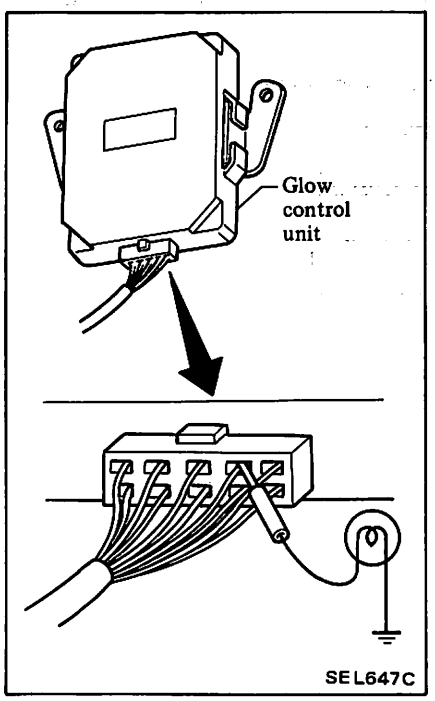
Before starting to troubleshoot the glow system, check connectors to determine if they are in good order.



Checking glow control unit

1. Pre-glow system

Connect test lamp to blue wire leading to glow control unit. Measure the length of time that the test lamp is lighted.



Normal condition

- Standard operation (Except re-start operation within 60 seconds)

Engine coolant temperature °C (°F)	Glow plug terminal voltage	Time (sec.)
Below 50 (122)	8V	Approx. 12
	10.5V	Approx. 6
Above 50 (122)	–	Approx. 0

- Re-start operation (within 60 sec.)
  Length of time (test lamp in ON): Below 6 sec.
  [e.g.]
  When re-starting the engine 5 seconds after the ignition switch is turned off, the lamp should be on for 1.4 seconds [engine coolant temperature: below 50°C (122°F), glow plug terminal voltage: 10.5 volts].
- Others

Ignition switch	CHG. lamp	Test lamp
ON	OFF	OFF

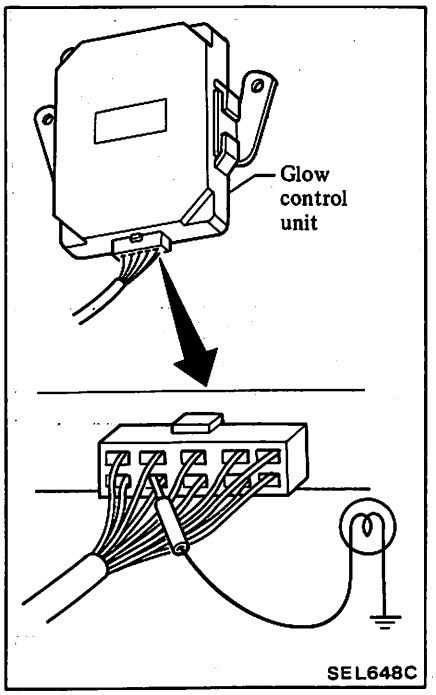
2. After-glow operation

Connect test lamp to black-and-white wire leading to glow control unit. Measure the length of time that the test lamp is lighted.

Normal condition

- When the ignition switch is turned ON from ST or OFF:

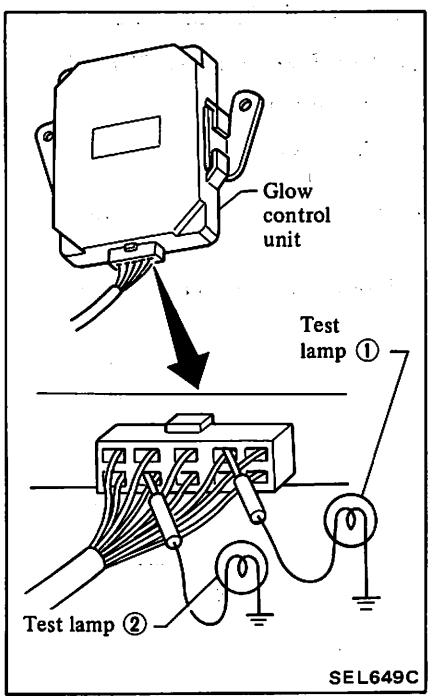
Engine coolant temperature °C (°F)	Time (sec.)
Below –25 (–13) (approx.)	Approx. 31
Approx. 20 (68)	Approx. 11
Approx. 30 - 50 (86 - 122)	Approx. 5
Above 50 (122) (approx.)	0



- When the ignition switch is in ST:
  Test lamp is ON (continuously)
  (Refer to above figure.)

- After-pre-glow operation:
  After the pre-glow system turns off, check operation of test lamp ②.
  (test lamp ① in OFF)

Glow plug terminal voltage	Test lamp ②
Above 7V	OFF
Below 7V	ON



LIGHTING SYSTEM

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

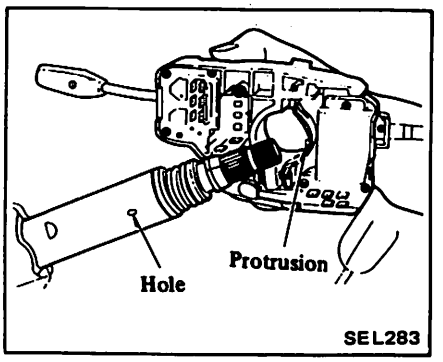
BULB SPECIFICATIONS

Item	Wattage (W)	SAE trade number
Headlamp (sealed beam)		
High/Low	65/55	–
Headlamp (Sealed beam halogen)		
High/Low	65/35	H6054
Front turn signal lamp	27	1156
Front side marker lamp	3.4	158
Clearance lamp	8	67
License plate lamp	10	–
	8	67
Rear combination lamps		
Turn signal	27	1156
Back-up	27	1156
Stop/Tail	27/8	1157
Rear side marker lamp	3.4	158
Luggage compartment lamp	5	–
Interior lamp	10	–

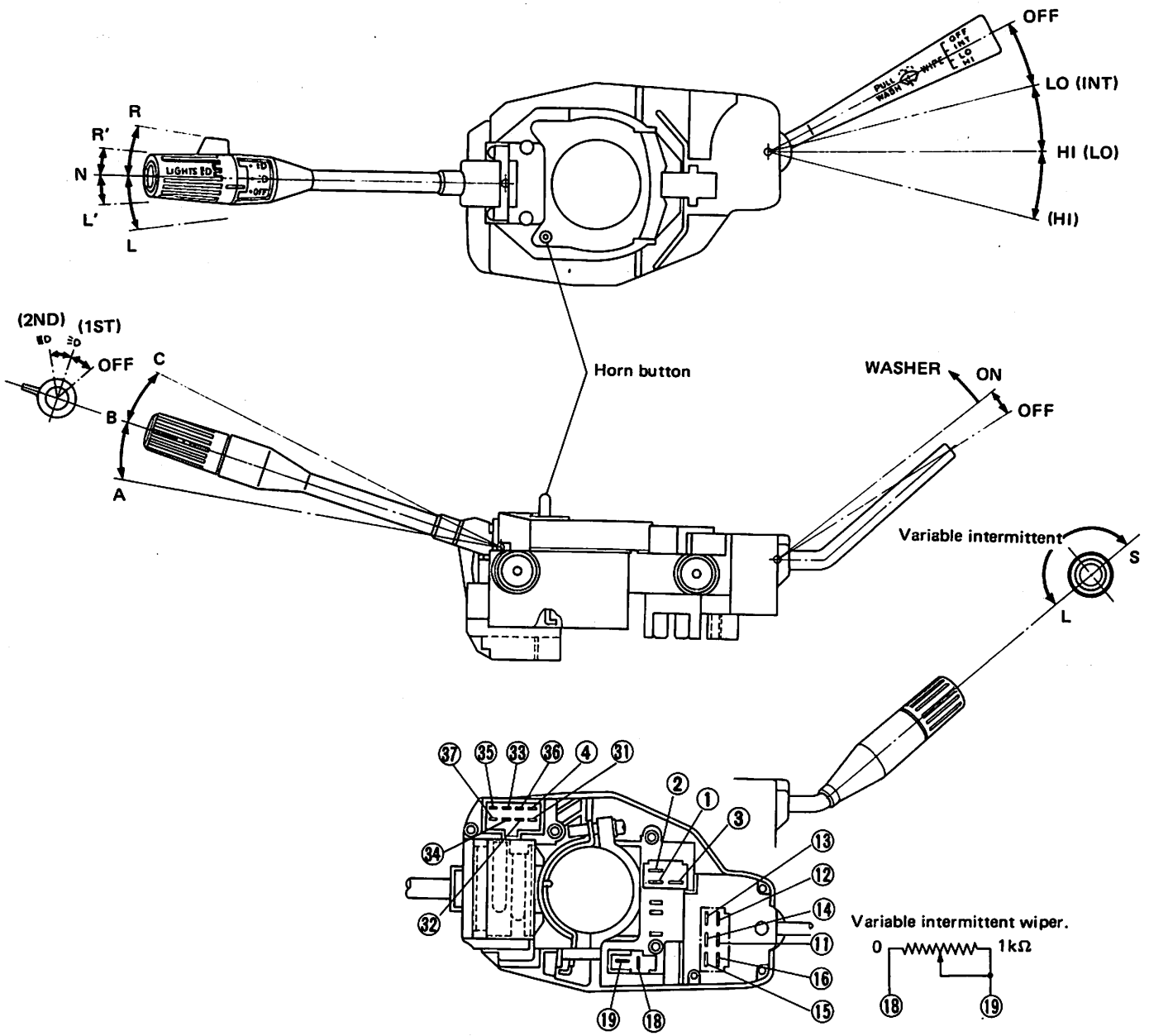
COMBINATION SWITCH

REMOVAL AND INSTALLATION

1. Remove steering wheel.
2. Remove steering column cover.
3. Disconnect all combination switch wires.
4. Loosen retaining screw and remove combination switch.
5. To install combination switch, align protrusion on switch body with hole on steering column, and tighten retaining screw.



INSPECTION



Turn signal switch

	LEVER				HORN
	R	R	N	L	L	
1	○			○		
2	○					
3				○		
4						○

HORN BUTTON

Without intermittent wiper

	WIPER			WASH
	OFF	LO	HI	
11				○
12	○			
13	○	○		
14				
15			○	
16		○	○	○

With intermittent wiper

	WIPER				WASH
	OFF	INT	LO	HI	
11					○
12	○	○			
13	○	○	○		
14		○			
15				○	
16		○	○	○	

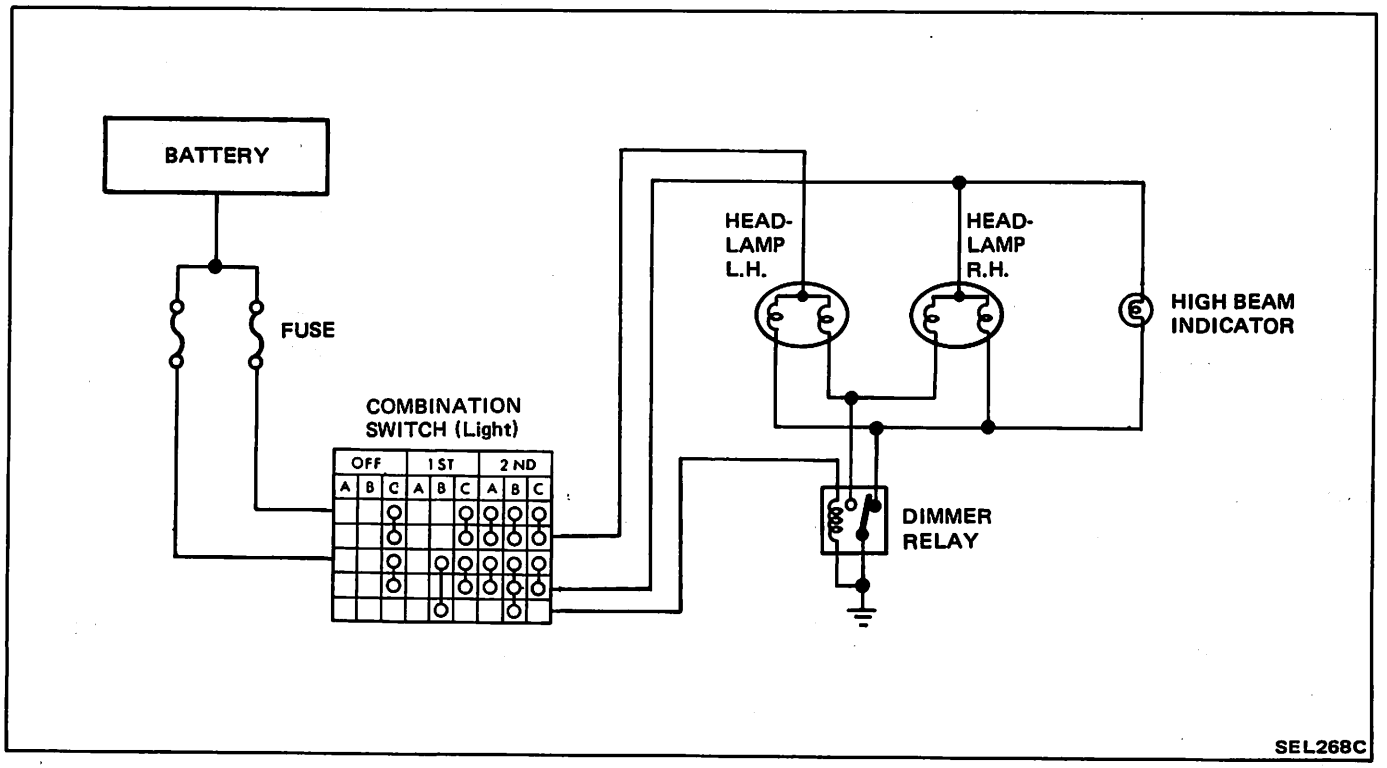
Lighting switch

	OFF			1ST			2ND		
	A	B	C	A	B	C	A	B	C
31		○			○	○	○	○	○
32					○	○	○	○	○
33		○		○	○	○	○	○	○
34		○			○	○	○	○	
35					○			○	
36				○	○	○	○	○	○
37				○	○	○	○	○	○

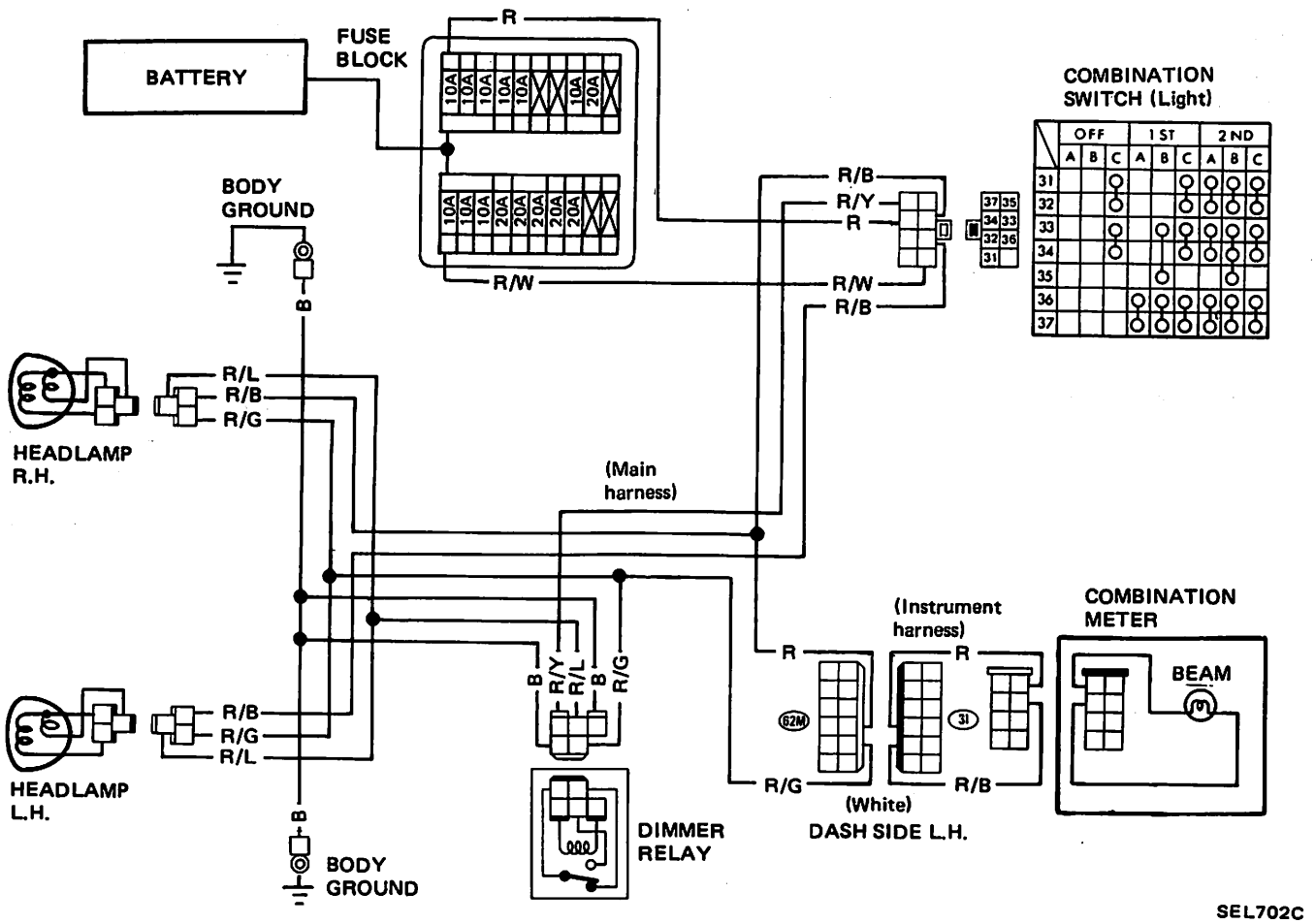
SEL375B

HEADLAMP

SCHEMATIC/HEADLAMP



WIRING DIAGRAM/HEADLAMP



TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause
Headlamps do not light for either high or low beam.	Burnt fusible link. Loose connection or open circuit. Faulty lighting switch. Faulty dimmer relay. No ground.
High beam cannot be switched to low beam or vice versa.	Faulty lighting switch. Faulty dimmer relay.
Headlamp dim.	Partly discharged or faulty battery. Faulty charging system. Poor ground or loose connection.
One headlamp dim.	Burnt fuse.
Headlamp lights on only one side.	Loose headlamp connection. Faulty headlamp beam.

LIGHTING SWITCH

Refer to "COMBINATION SWITCH".

DIMMER RELAY

Location

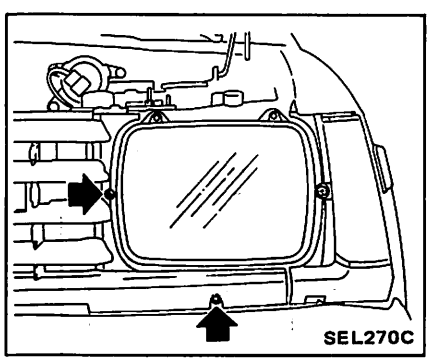
Dimmer relay is installed on the relay bracket in the L.H. hoodledge. Refer to page EL-81.

Inspection

Dimmer relay is 1T type standardized relay. Refer to EL-7.

AIMING ADJUSTMENT

To adjust headlamp's left-and-right aim, turn the adjusting knob that is located on the side of the headlamp; to adjust its up-and-down aim, turn the adjusting screw that is located on the bottom side of the headlamp.



Before making headlamp aiming adjustment, observe the following instructions.

a. Keep all tires inflated to correct pressures.

b. Place car and tester on one and same flat surface.

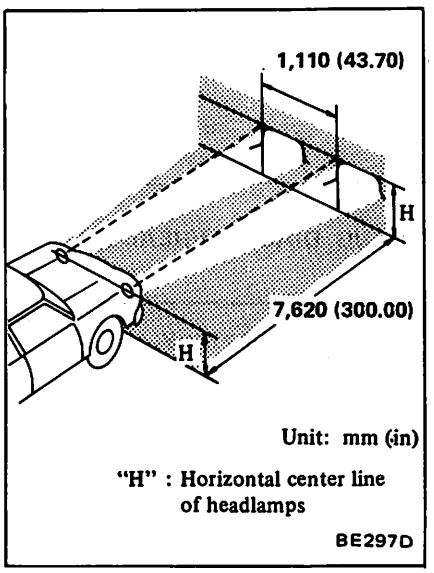
c. See that there is no load in car (coolant, engine oil filled up to correct level and full fuel tank) other than the driver (or equivalent weight placed in driver's position).

When performing headlamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. For operating instructions of any aimer, it should be in good repair, calibrated and used according to respective operation manuals supplied with the unit.

If any aimer is not available, aiming adjustment can be done as follows:

Sealed beam type

Turn headlamp low beam on.



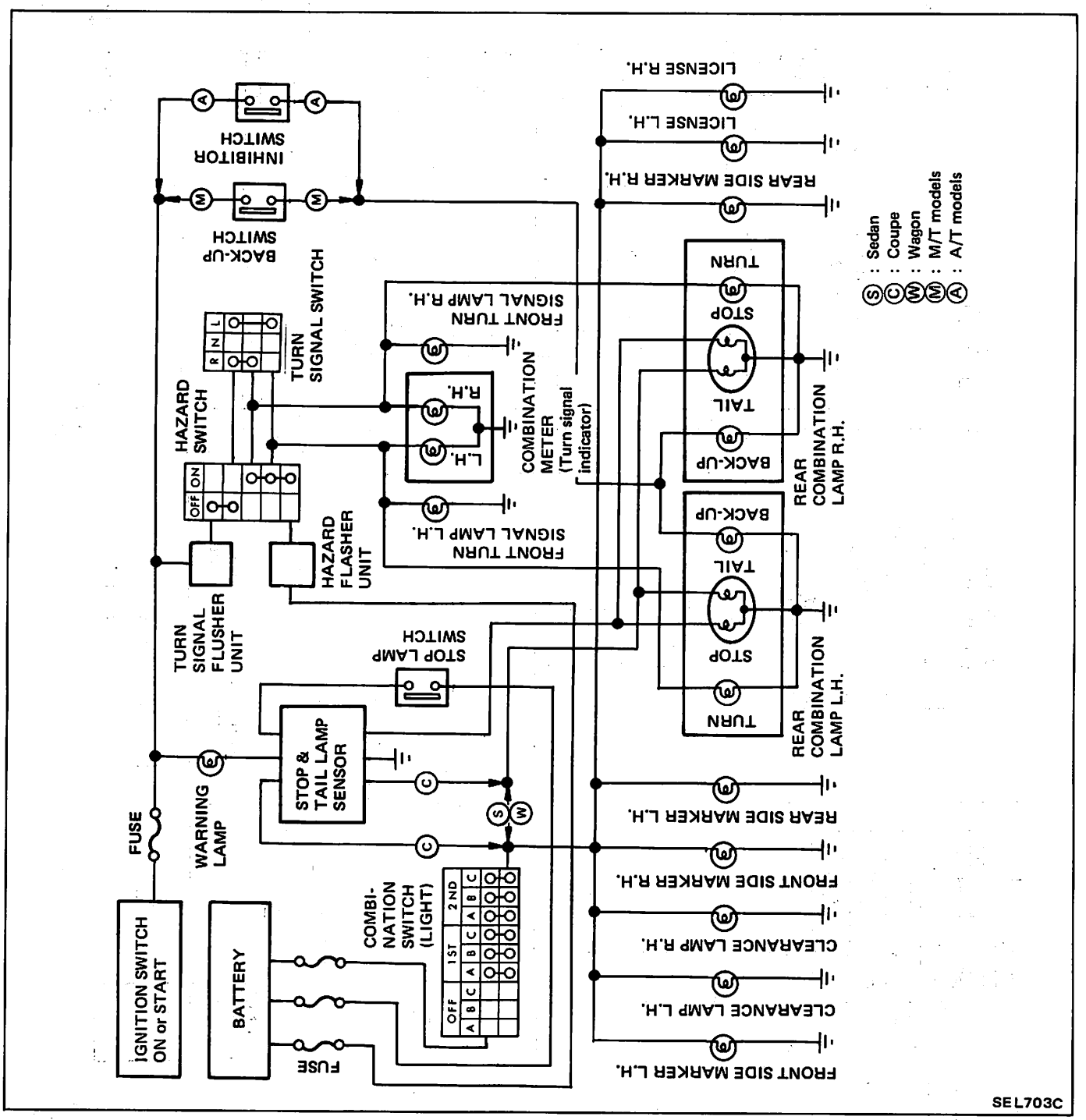
a. Adjust headlamps so that upper edge of hot spot is equal in height to headlamp height and left edge of hot spot is equal in height to each center line of headlamps.

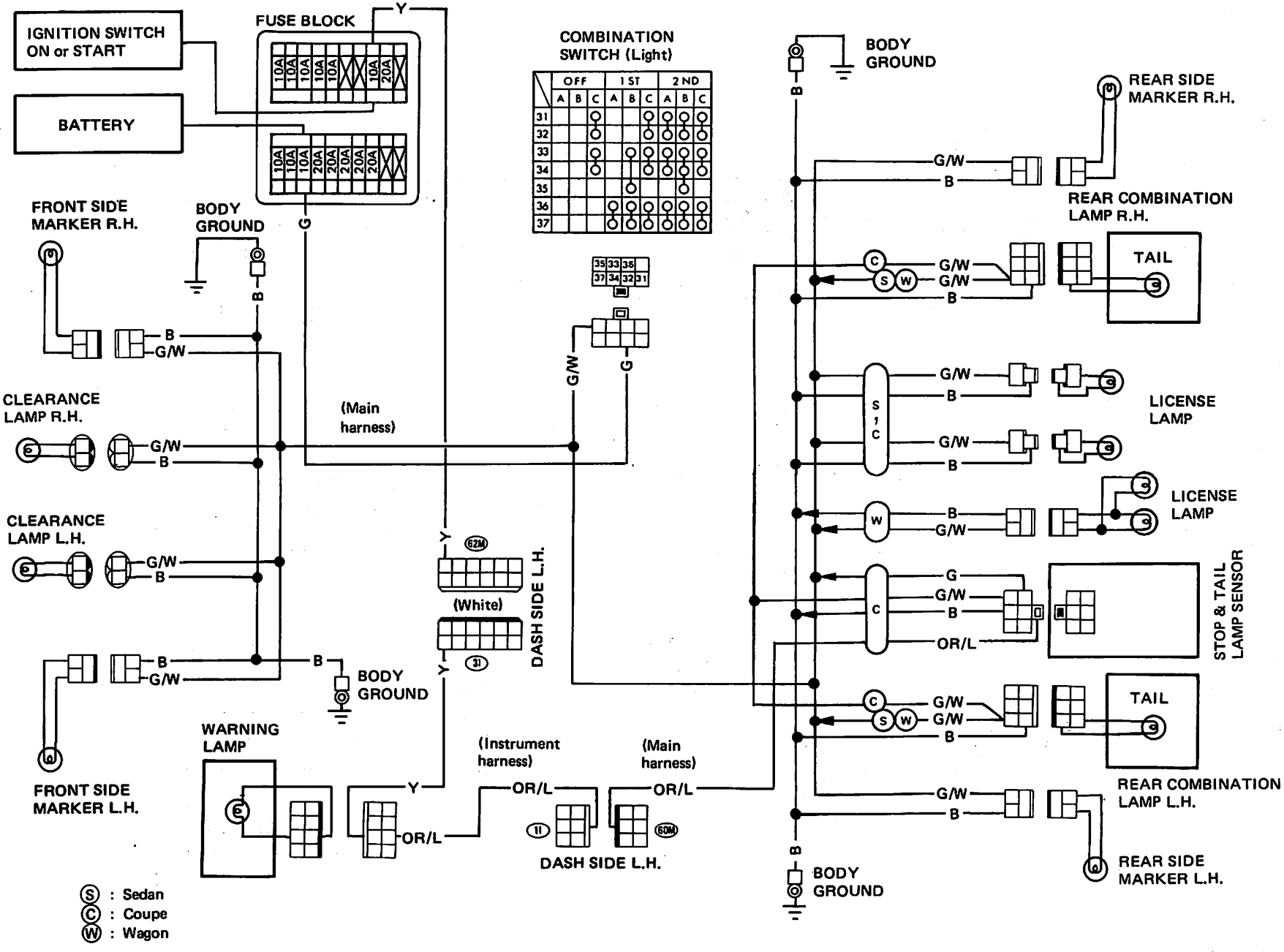
b. Dotted lines in illustration show center of headlamp.

EXTERIOR LAMPS

CAUTION: Do not wipe lens surface using cloth dampened with gasoline.

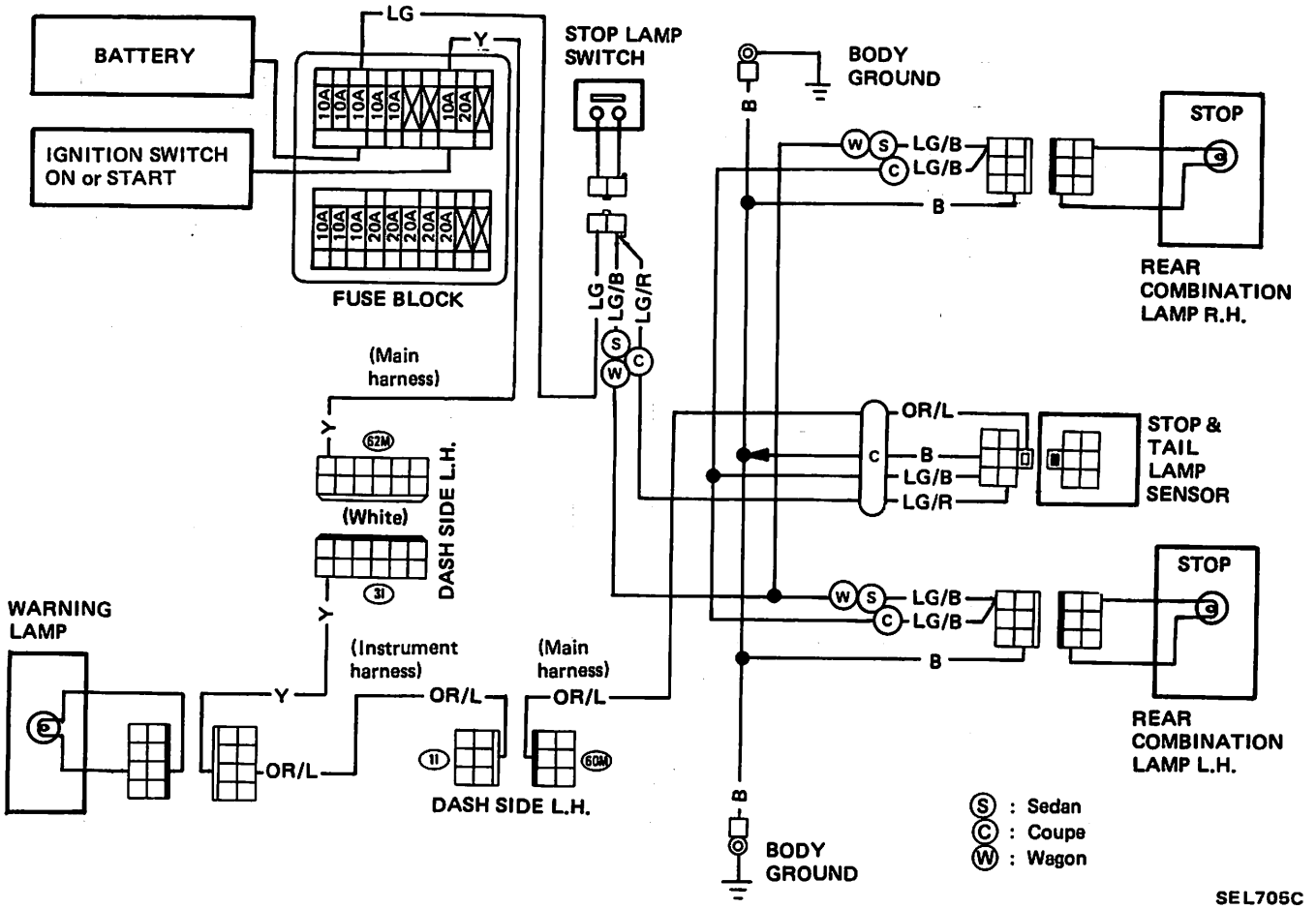
SCHEMATIC/EXTERIOR LAMPS



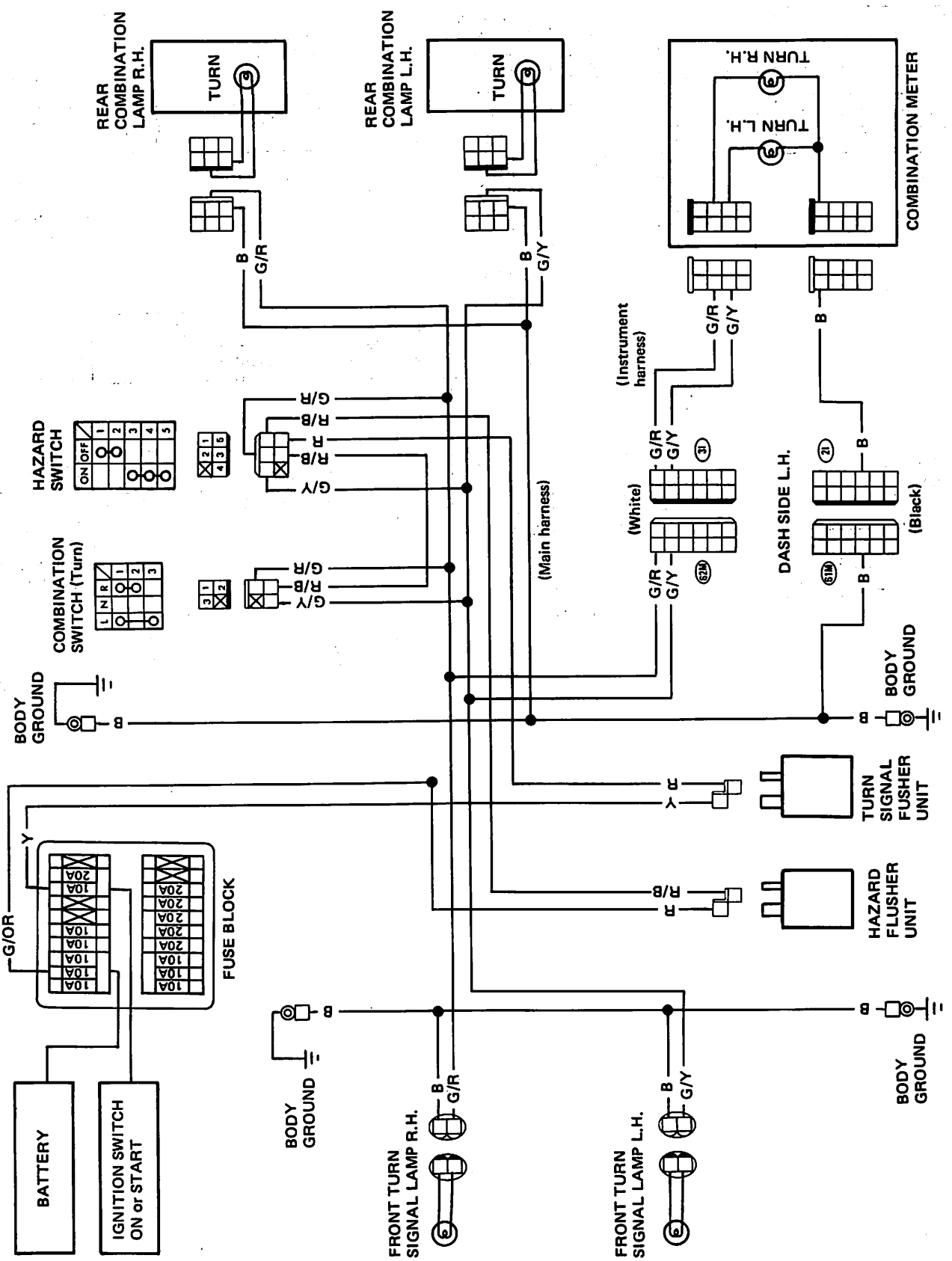

IGNITION SWITCH ON or START
BATTERY
FUSE BLOCK
10A 10A 10A 10A 10A 10A 20A
10A 10A 10A 20A 20A 20A 20A
COMBINATION SWITCH (Light)
OFF 1ST 2ND
A B C A B C A B C
31 32 33 34 35 36 37
FRONT SIDE MARKER R.H.
BODY GROUND
CLEARANCE LAMP R.H.
CLEARANCE LAMP L.H.
FRONT SIDE MARKER L.H.
(Main harness)
(White)
DASH SIDE L.H.
BODY GROUND
WARNING LAMP
(Instrument harness)
(Main harness)
DASH SIDE L.H.
BODY GROUND
REAR SIDE MARKER R.H.
REAR COMBINATION LAMP R.H.
TAIL
LICENSE LAMP
LICENSE LAMP
STOP & TAIL LAMP SENSOR
TAIL
REAR COMBINATION LAMP L.H.
REAR SIDE MARKER L.H.
G/W
B
OR/L
Y
G
S : Sedan
C : Coupe
W : Wagon

SEL704C

WIRING DIAGRAM/STOP LAMPS

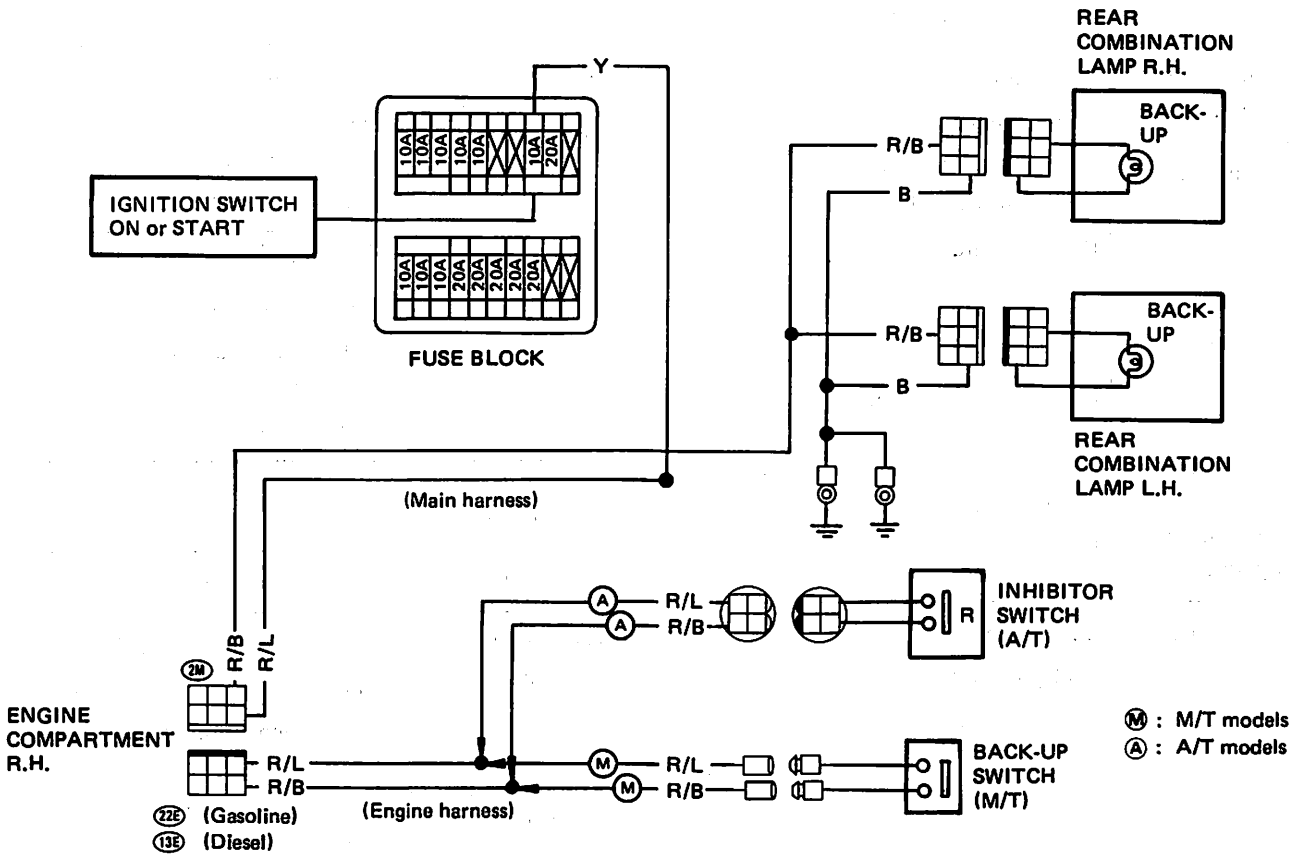


WIRING DIAGRAM/TURN SIGNAL AND HAZARD WARNING LAMPS



SEL706C

WIRING DIAGRAM/BACK-UP LAMPS



SEL707C

TROUBLE DIAGNOSES AND CORRECTIONS

Clearance, side marker, license and tail lamps

Condition	Probable cause
Neither left nor right lamp lights.	Burnt fuse. Burnt fusible link. Loose connection or open circuit. Faulty lighting switch. Faulty stop lmap sensor.
Tail lamp on only one side lights.	Burnt bulb. Loose bulb. Loose connection or open circuit.
Front or rear side lamps do not light.	Loose connection or open circuit. No ground.

Stop lamps

Condition	Probable cause
Neither left nor right lamp lights.	Burnt fuse. Faulty stop lamp switch. No ground. Loose connection or open circuit. Faulty stop lamp sensor.
Lamp on only one side lights.	Burnt bulb. Loose bulb. Loose connection or open circuit.

Turn signal and hazard warning lamps

Condition	Probable cause
Turn signals do not operate. (Hazard warning lamps operate)	Burnt fuse. Loose connection or open circuit. Faulty turn signal flasher unit. Faulty turn signal switch. Faulty hazard switch.
Hazard warning lamps do not operate. (Turn signals operate)	Burnt fuse. Faulty hazard flasher unit. Faulty hazard switch.
Turn and hazard flasher lamps do not operate.	Faulty hazard switch. Loose connection.
No flasher click is heard.	Burnt bulb. Faulty flasher unit. Loose connection.
Flashing cycle is too slow (Pilot lamp does not go out.), or too fast.	Bulb other than specified wattage being used. Burnt bulb. Loose connection. Faulty flasher unit.
Flashing cycle is irregular.	Burnt bulb. Loose connection. Bulbs other than specified wattage being used. Faulty flasher unit.

Back-up lamps

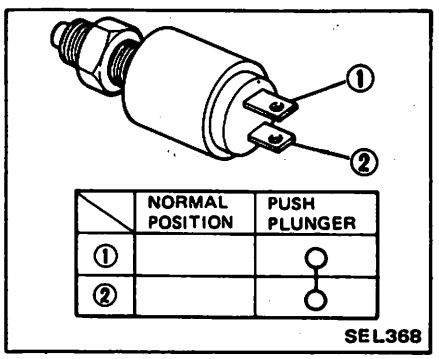
Condition	Probable cause
Neither left nor right lamp lights.	Faulty back-up lamp switch. Burnt fuse. Loose connection or open circuit.
Lamp on only one side lights.	Burnt bulb. Loose bulb. Loose connection or open circuit.

LIGHTING SWITCH

Refer to "COMBINATION SWITCH".

STOP LAMP SWITCH

Inspection



Adjustment

Refer to MA section.

STOP AND TAIL LAMP SENSOR

Location

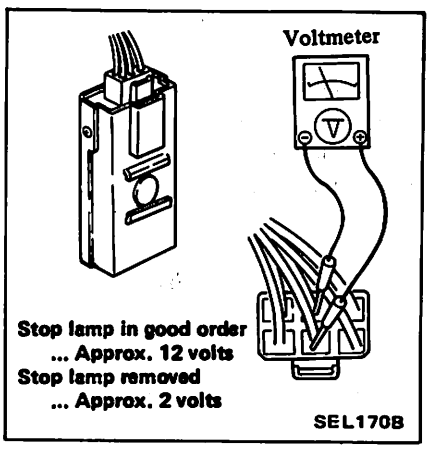
Stop and tail lamp sensor is attached to the left rear combination lamp unit. Refer to page EL-83.

Inspection

Before checking stop and tail lamp sensor, ensure that all bulbs meet specifications.

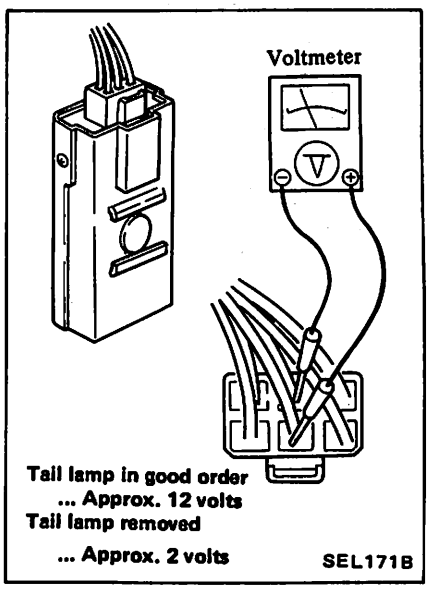
Stop lamp

1. Start engine.
2. Stop lamp switch on.



Tail lamp

1. Start engine.
2. Lighting switch on.

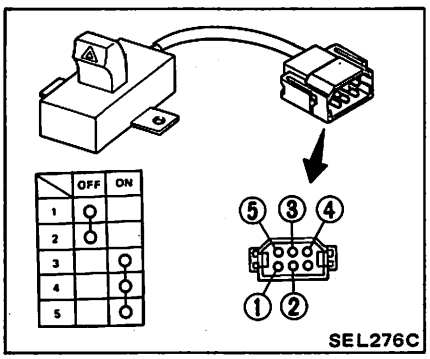


TURN SIGNAL SWITCH

Refer to "COMBINATION SWITCH".

HAZARD SWITCH

Inspection



TURN SIGNAL FLASHER UNIT
HAZARD FLASHER UNIT

Location

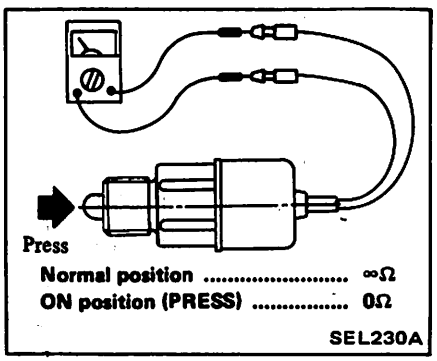
Turn signal flasher unit and Hazard flasher unit are located on the steering column support (back side of instrument panel). Refer to page EL-82.

BACK-UP LAMP SWITCH
(Manual transaxle)

Location

Back-up lamp switch is installed on the manual transaxle case. Refer to MT section.

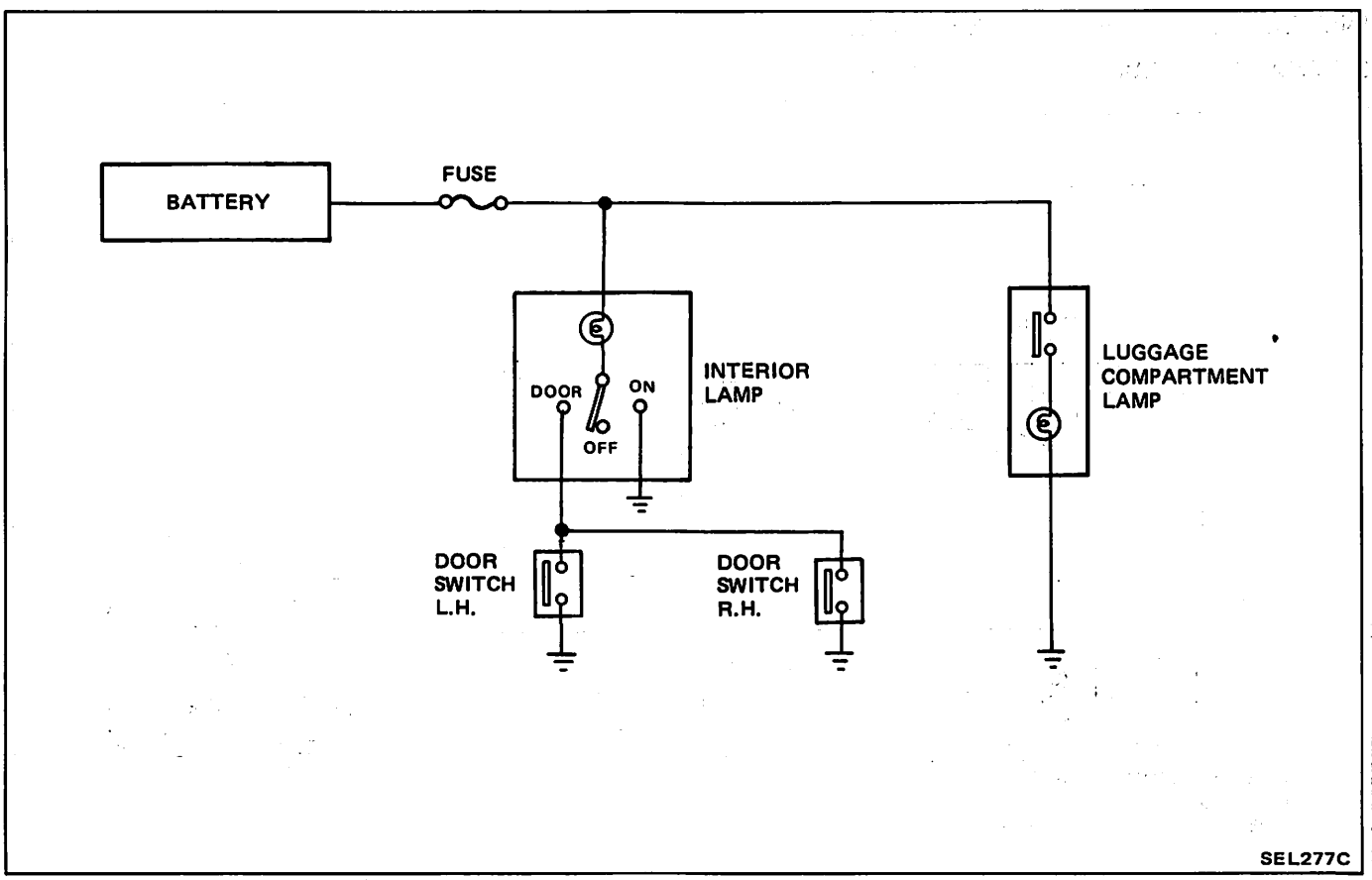
Inspection



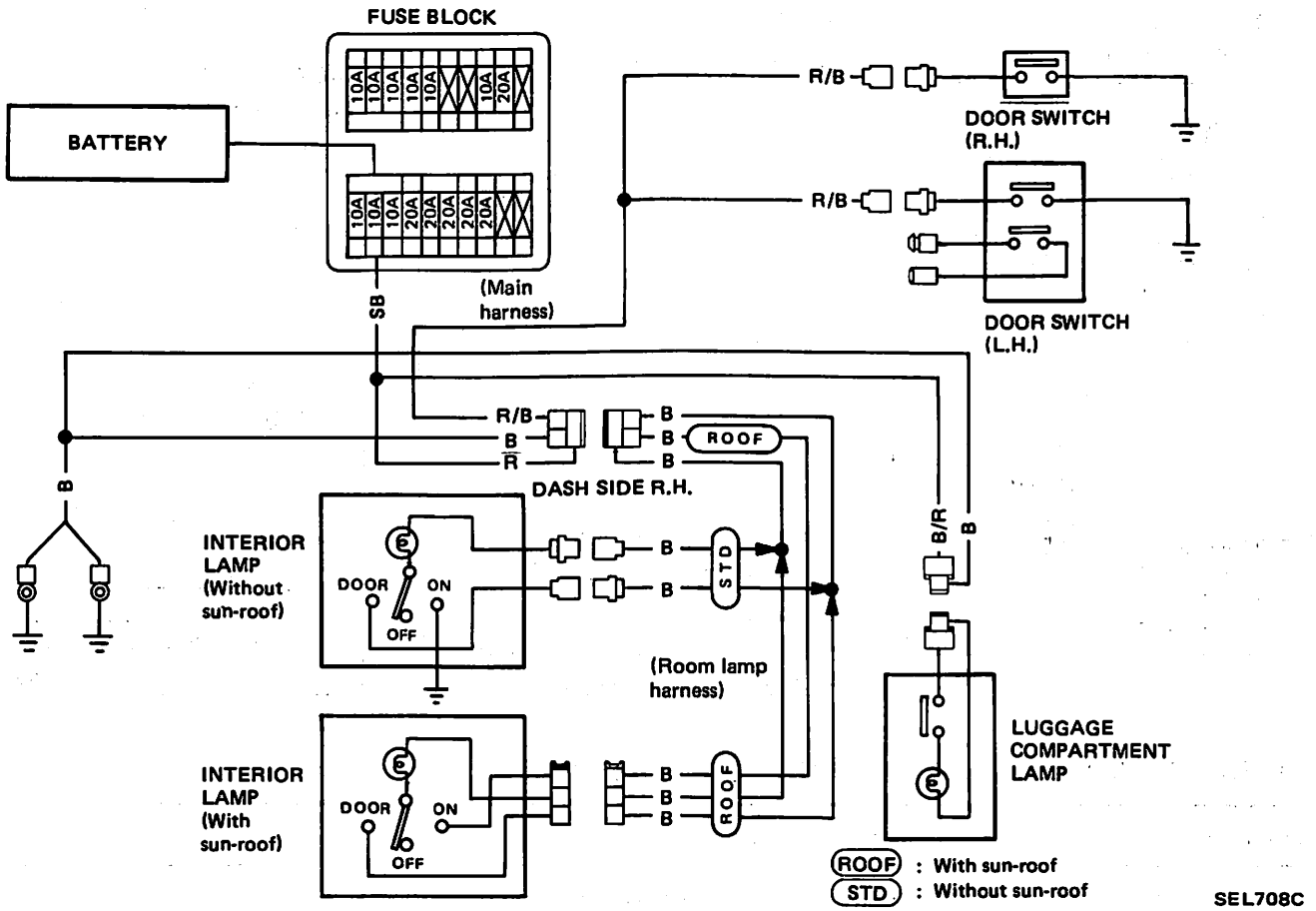
INTERIOR AND LUGGAGE COMPARTMENT LAMPS

CAUTION: Do not wipe lens surface using cloth dampened with gasoline.

SCHEMATIC/INTERIOR AND LUGGAGE COMPARTMENT LAMPS

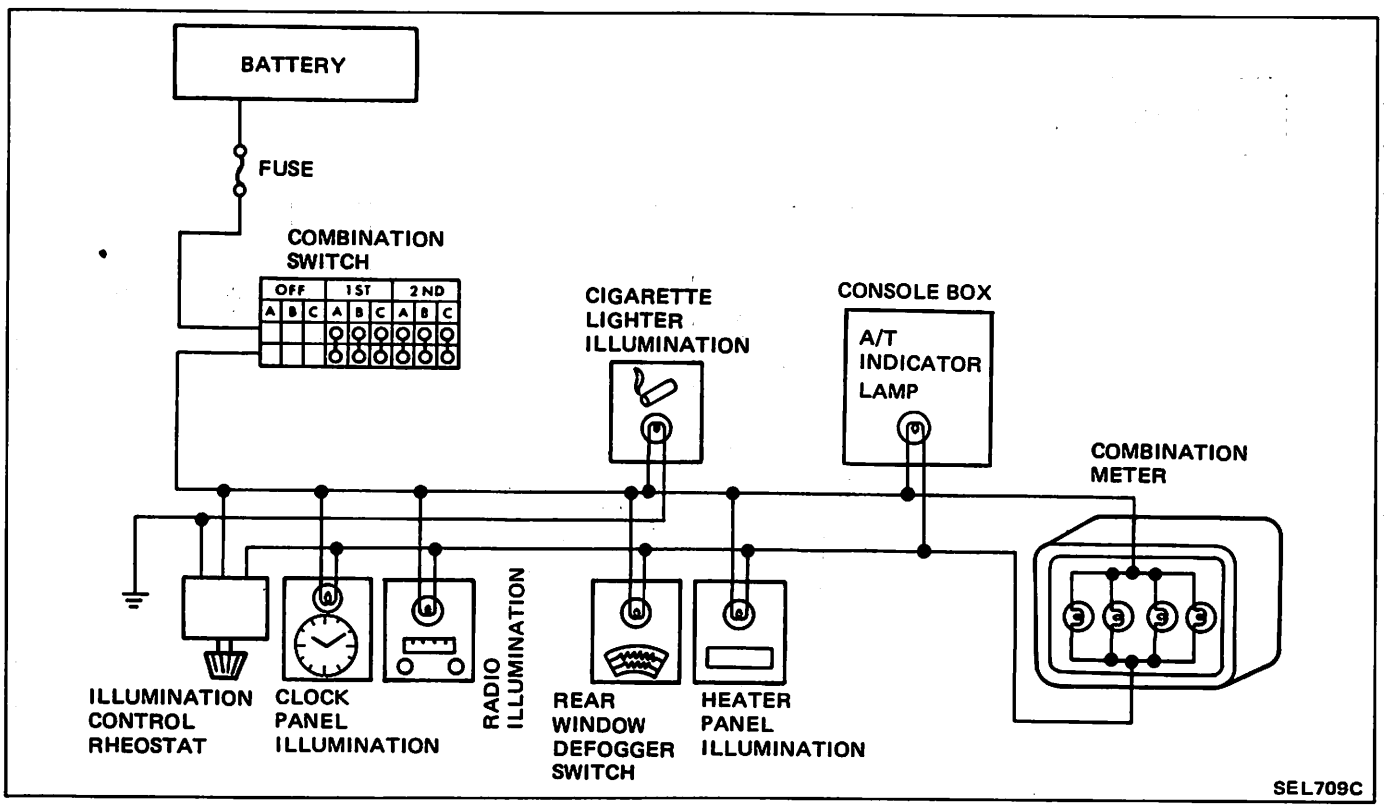


WIRING DIAGRAM/INTERIOR AND LUGGAGE COMPARTMENT LAMPS

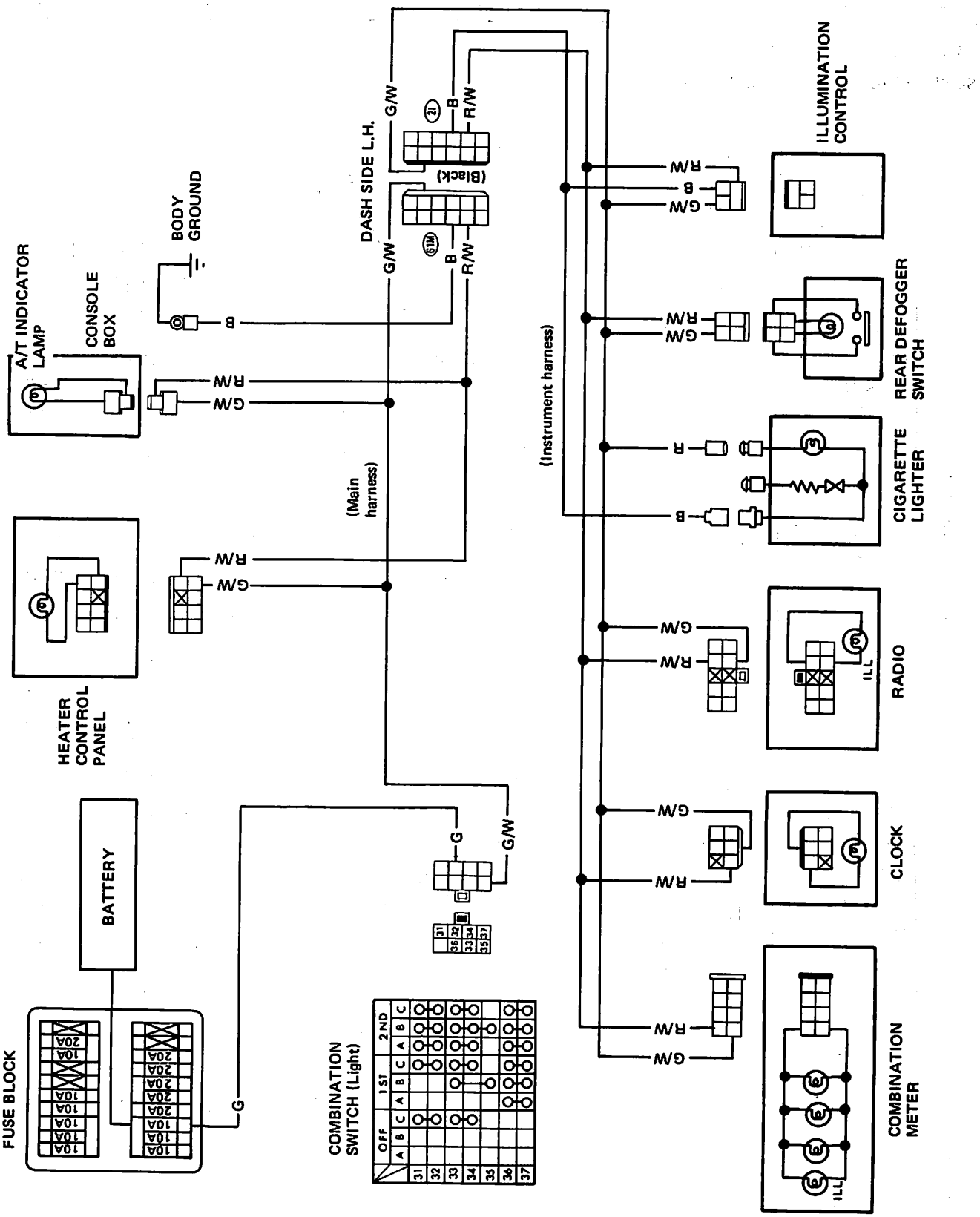


INSTRUMENT PANEL ILLUMINATION

SCHEMATIC/INSTRUMENT PANEL ILLUMINATION



WIRING DIAGRAM/INSTRUMENT PANEL ILLUMINATION



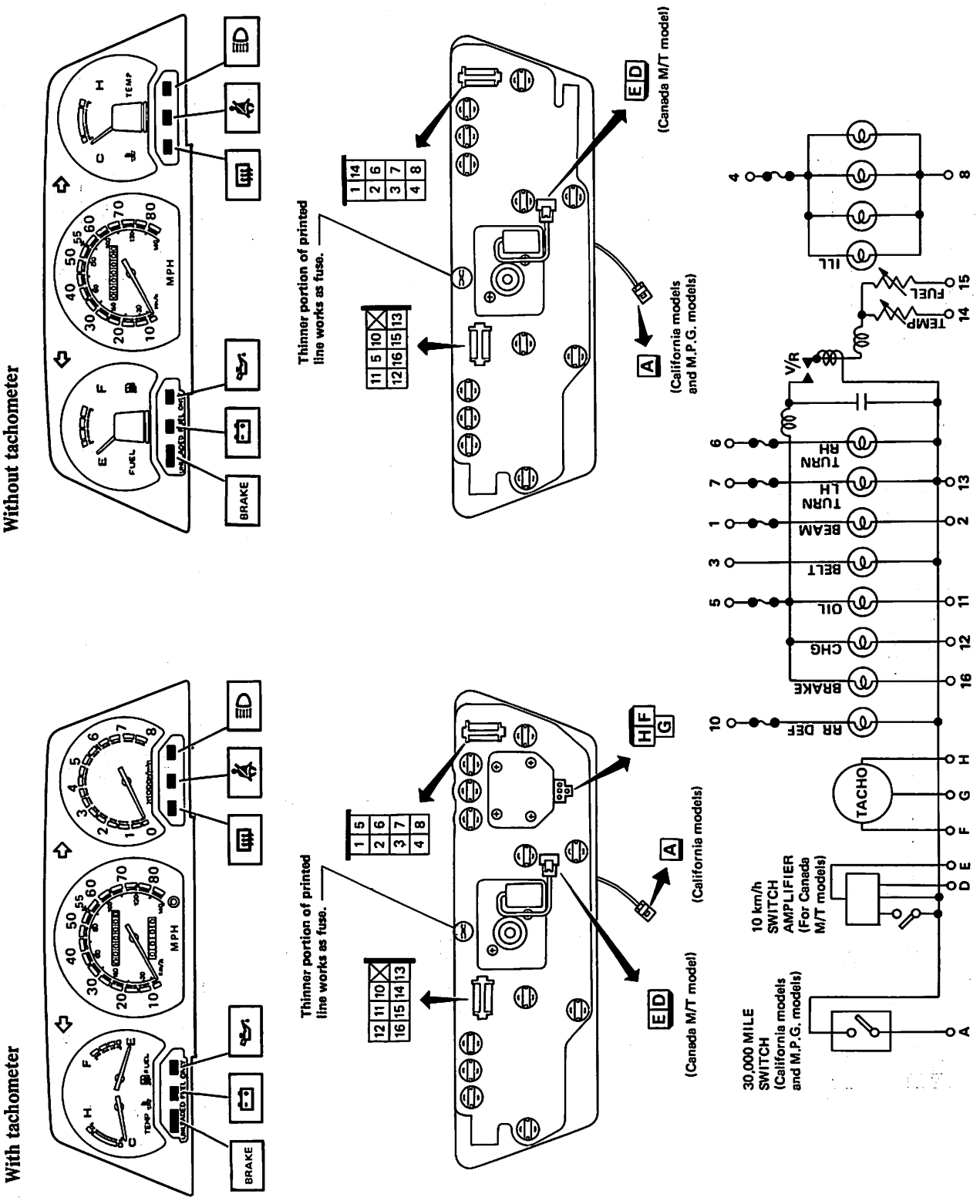
SEL710C

METERS, GAUGES AND WARNING SYSTEM

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

COMBINATION METER

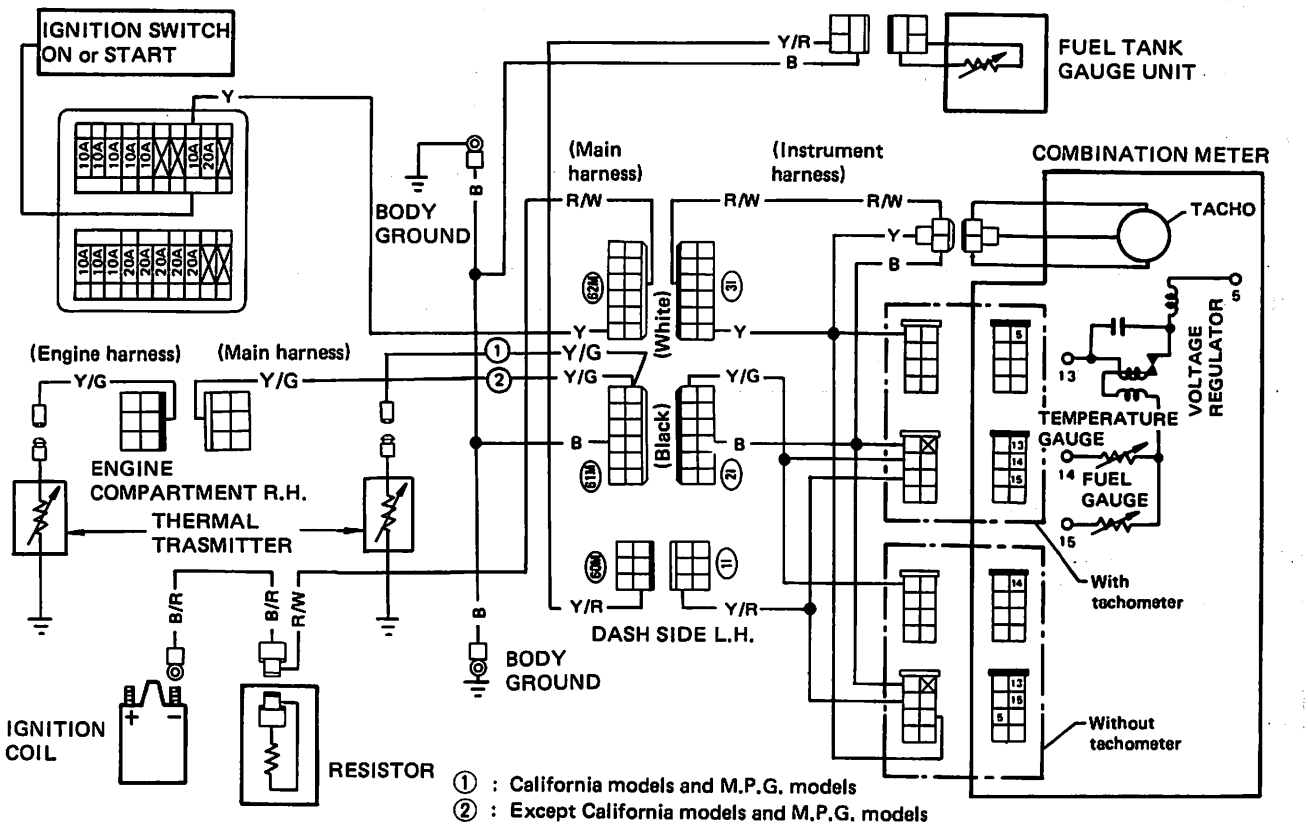
SCHEMATIC/COMBINATION METER.



SEL711C

METER AND GAUGES

WIRING DIAGRAM/GAUGES AND TACHOMETER



SEL712C

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause
Water temperature gauge	
Gauge does not operate.	Faulty thermal transmitter or loose terminal connection. (When wire to thermal transmitter is grounded, gauge pointer fluctuates.) Faulty water temperature gauge.
Gauge indicates only maximum temperature.	Faulty thermal transmitter. (Gauge pointer returns to original position when ignition switch is turned off.) Faulty water temperature gauge. (Gauge pointer indicates maximum temperature even after ignition switch is turned off.)
Gauge does not operate accurately.	Faulty water temperature gauge. Loose or poor connection.

Condition	Probable cause
Fuel level gauge	
Fuel level gauge does not operate.	Faulty fuel tank gauge unit. (Pointer deflects when fuel tank gauge unit yellow wire is grounded.) Faulty fuel level gauge. Loose connection or open circuit.
Pointer indicates only "F" position.	Faulty fuel tank gauge unit. Faulty fuel level gauge.
Fuel level gauge does not operate accurately.	Faulty fuel tank gauge unit. Faulty fuel gauge. Poor or loose connection.
Tachometer	
Tachometer pointer deflects.	Loose or poor connection. Faulty tachometer.
Tachometer pointer will not move.	Loose or poor connection. Faulty tachometer.

Condition	Probable cause
Speedometer	
Neither speedometer pointer nor odometer operates.	Loose speedometer cable union nut. Broken speedometer cable. Damaged transmission speedometer pinion gear. Faulty speedometer.
Unstable speedometer pointer.	Loose speedometer cable nut. Damaged speedometer cable. Faulty speedometer.
Unusual sound occurs in response to increase in driving speed.	Excessively bent or twisted speedometer cable inner wire or lack of lubrication. Faulty speedometer.
Inaccurate speedometer indication.	Faulty speedometer.
Inaccurate odometer operation.	Faulty speedometer.

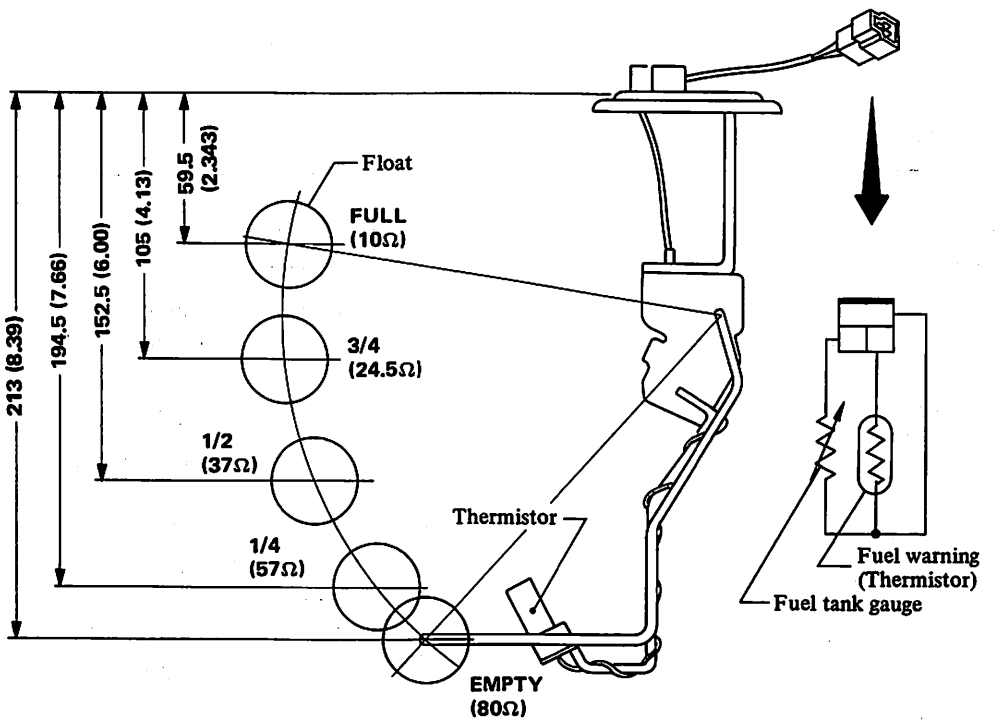
FUEL TANK GAUGE UNIT

Removal and installation

Refer to FE section.

Inspection

Float



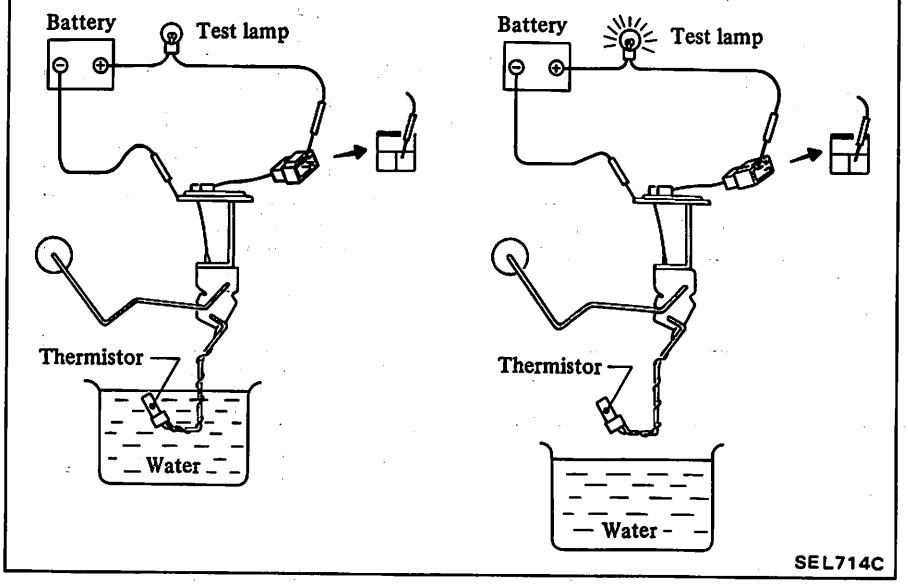
Unit: mm (in)

SEL713C

Thermistor (For warning lamp)

(1) Dip thermistor in water.
Test lamp should not illuminate.

(2) Remove thermistor from water.
Test lamp should illuminate after approx. 3 minutes.



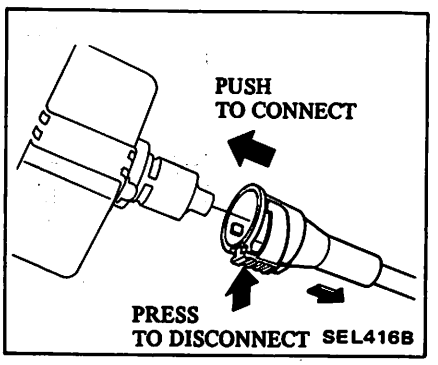
RESISTOR (For tachometer)

Location

Refer to Location of Electrical Units.

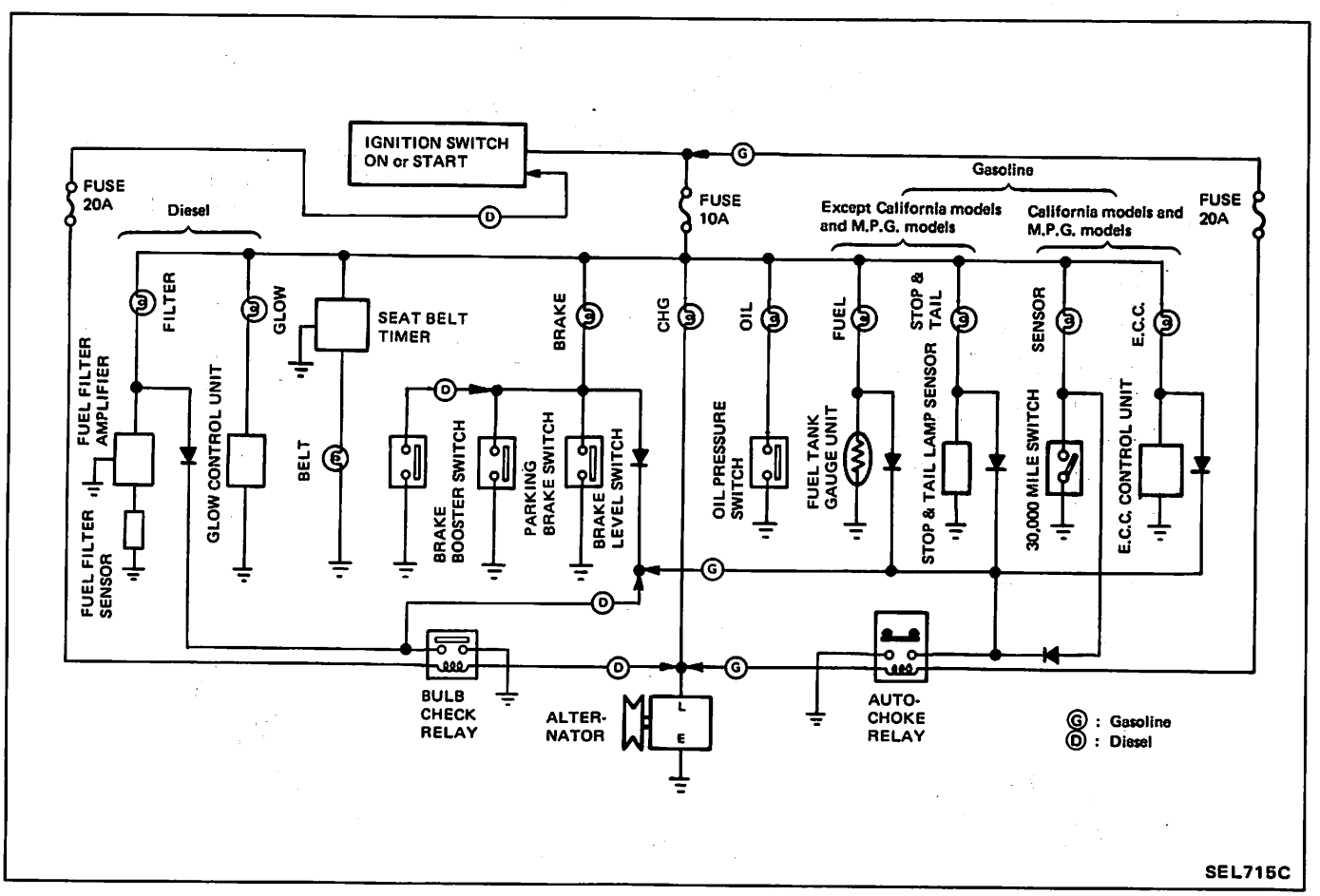
SPEEDOMETER CABLE

Removal and installation

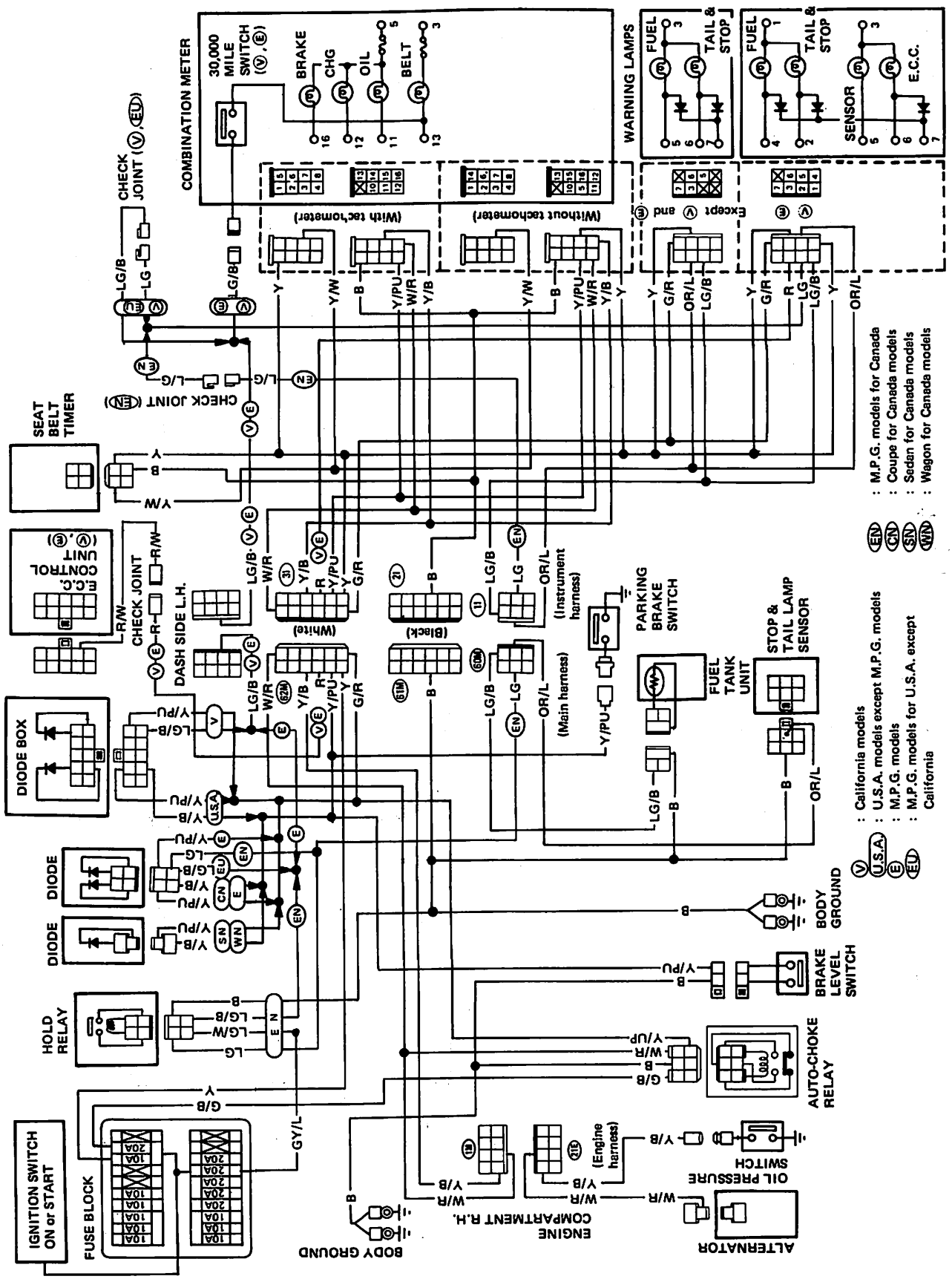


WARNING LAMPS

SCHEMATIC/WARNING LAMPS



WIRING DIAGRAM/WARNING LAMPS (Gasoline)



SEL716C

WIRING DIAGRAM/ WARNING LAMPS (Diesel)

SEL717C

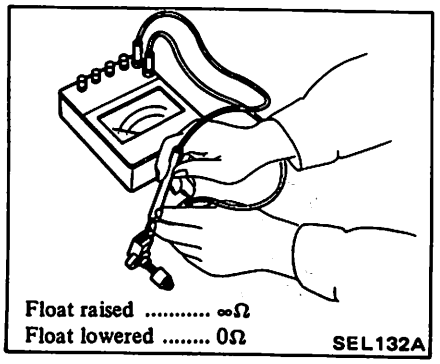
TROUBLE DIAGNOSES AND CORRECTIONS/ WARNING LAMPS

Condition	Probable cause
Charge warning lamp Lamp does not go out when engine is started.	Faulty charging system.
Lamp does not glow when ignition switch is turned "ON" without running engine.	Burnt bulb or loose bulb. Loose or poor connection. Faulty printed circuit sheet. Faulty alternator.
Oil pressure warning lamp Lamp does not light when ignition switch is set to "ON".	Faulty oil pressure switch or loose terminal connection. (When lead wire connected to oil pressure switch is grounded, warning lamp lights.) Burnt bulb or loose bulb. Loose connection or open circuit.
Lamp does not go out while engine is being operated.	Lack of engine oil. Oil pressure too low. Faulty oil pressure switch.
Brake warning lamp Lamp does not go out.	Faulty parking brake switch (When parking brake lever is released.) Faulty brake fluid level switch (When brake fluid level is normal). Faulty brake booster switch (When vacuum pressure is supplied)
Lamp does not glow when ignition switch is turned "ON" without running engine.	Burnt bulb or loose bulb. Faulty diode. Faulty auto-choke relay. Loose or poor connection.
Fuel warning lamp Lamp does not glow when fuel is almost empty.	Faulty fuel tank gauge unit. Burnt bulb or loose bulb.
Lamp does not go out with specified volume of fuel.	Faulty fuel tank gauge unit. Faulty auto-choke relay. Faulty alternator.

Condition	Probable cause
Stop & tail warning lamp Lamp does not glow when ignition switch is turned "ON" without running engine.	Burnt bulb or loose bulb. Faulty diode. Faulty auto-choke relay. Loose or poor connection.
Auto-glow warning lamp Lamp does not light when ignition switch is set to "ON".	Burnt bulb or loose connection. Faulty auto-glow system.
Lamp does not go out while engine is being operated.	Faulty auto-glow system.
Filter warning lamp Lamp does not go out after water is removed from fuel filter or engine is started.	Faulty fuel filter sensor. Faulty fuel filter amplifier.
Lamp does not glow when ignition switch is turned to "START" without engine running.	Burnt bulb or loose connection. Faulty bulb check relay. Faulty alternator.

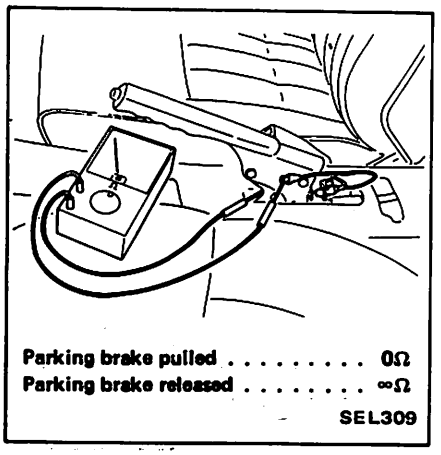
BRAKE FLUID LEVEL SWITCH

Inspection



PARKING BRAKE SWITCH

Inspection



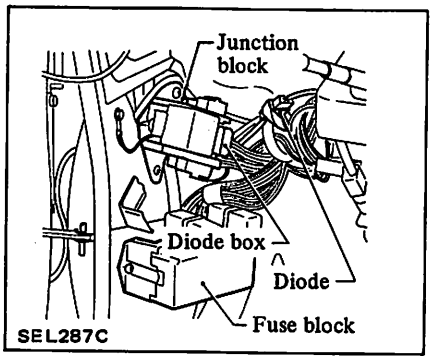
DIODE (For bulb check)

Location

For brake warning lamps

Diode for U.S.A. model is located in diode box which is mounted on junction block.

For Canada models, M.P.G. models and diesel models, it is attached with insulating tape to main harness near junction block as shown below.



For filter warning lamp (Diesel)

Diode is installed on the printed circuit board of combined warning lamps.

AUTO-CHOKE RELAY

[For bulb check (Gasoline)]

Location

Auto choke relay is installed on the relay bracket. Refer to page EL-81.

Inspection

Auto-choke relay is 1M-1B standardized relay. Refer to page EL-7.

BULB CHECK RELAY (Diesel)

Location

Bulb check relay is installed on the relay bracket. Refer to page EL-81.

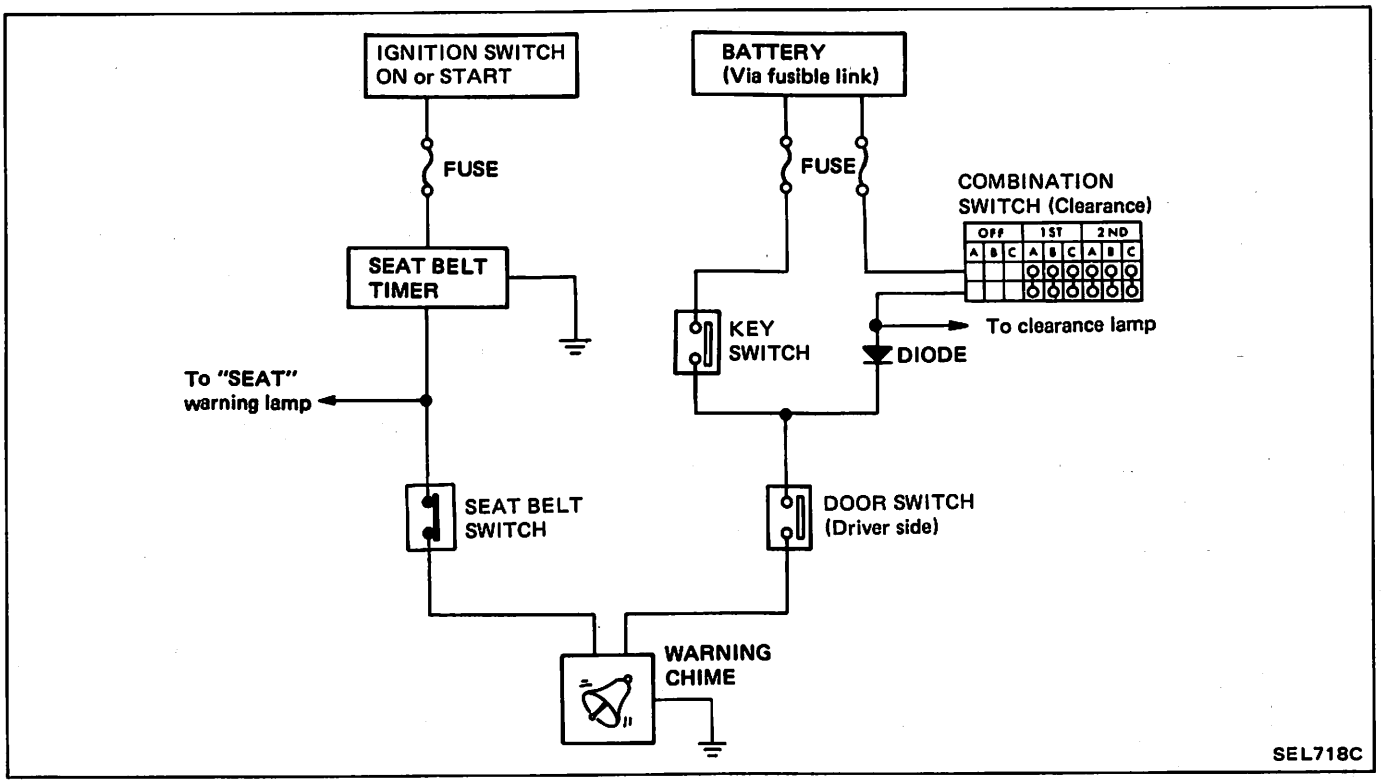
Inspection

Bulb check relay is 1M standardized relay.

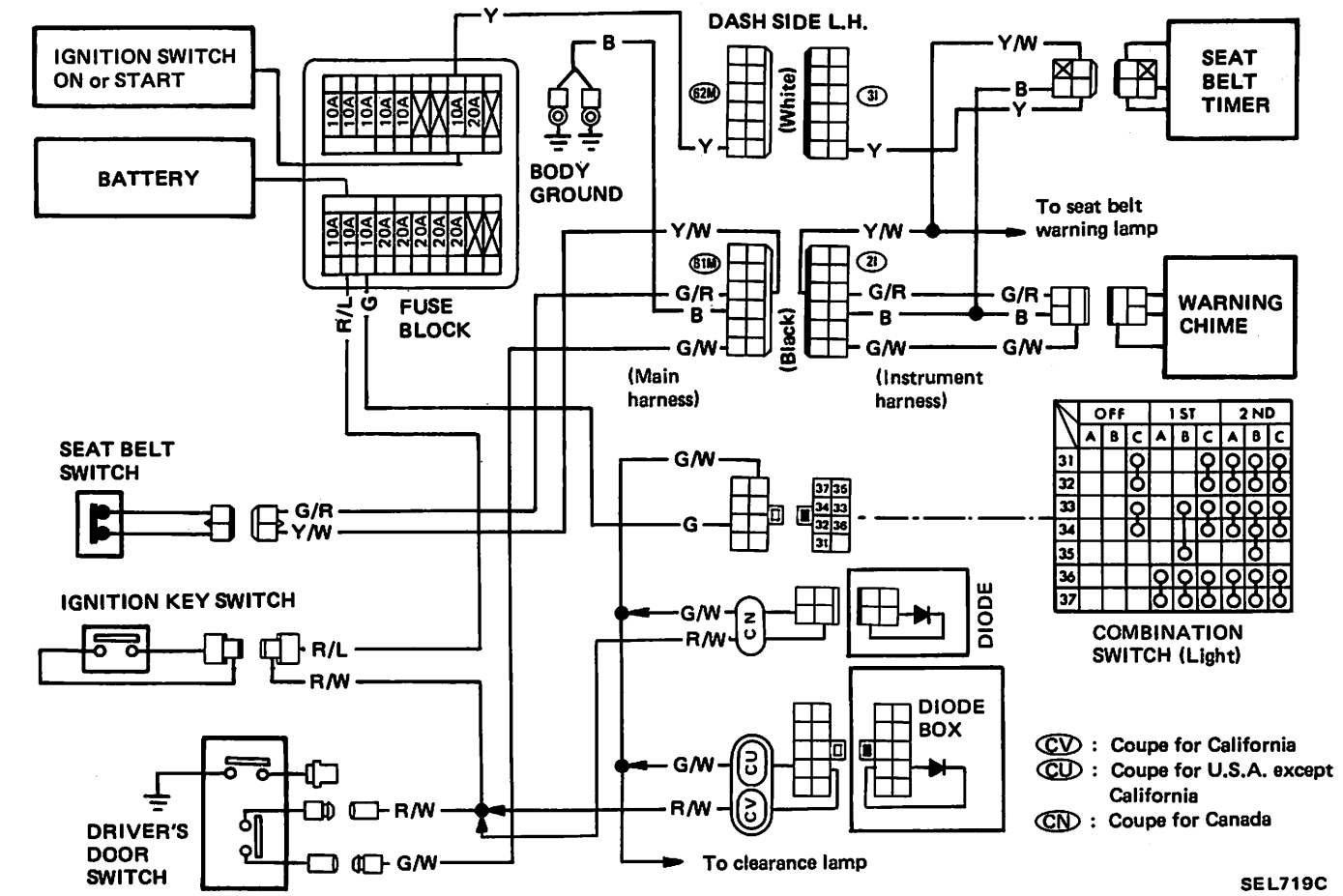
Refer to page EL-7.

WARNING CHIME

SCHEMATIC/SEAT BELT, KEY AND LIGHT WARNING



WIRING DIAGRAM/SEAT BELT, KEY AND LIGHT WARNING



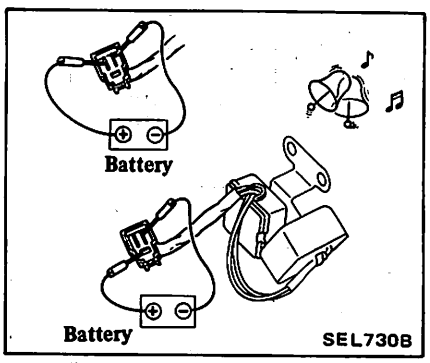
TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause
Light and key	
Warning chime does not sound with ignition key in ignition switch or lighting switch on, when driver side door is open.	Faulty warning chime. Loose connection or open circuit. Faulty door switch. Faulty key warning chime switch. Faulty lighting system. (Clearance lamp does not light.)

Condition	Probable cause
Seat belt	
Chime does not sound and warning lamp does not glow with ignition switch on.	Faulty seat belt switch. Faulty seat belt warning timer. Loose connection or open circuit.
Either chime or warning lamp does not operate with proper condition	Loose connection or open circuit. Burnt bulb. Faulty chime.

WARNING CHIME

Inspection



KEY SWITCH

Location

Key switch is installed in ignition switch.

Inspection

Refer to page EL-6.

SEAT BELT TIMER

Location

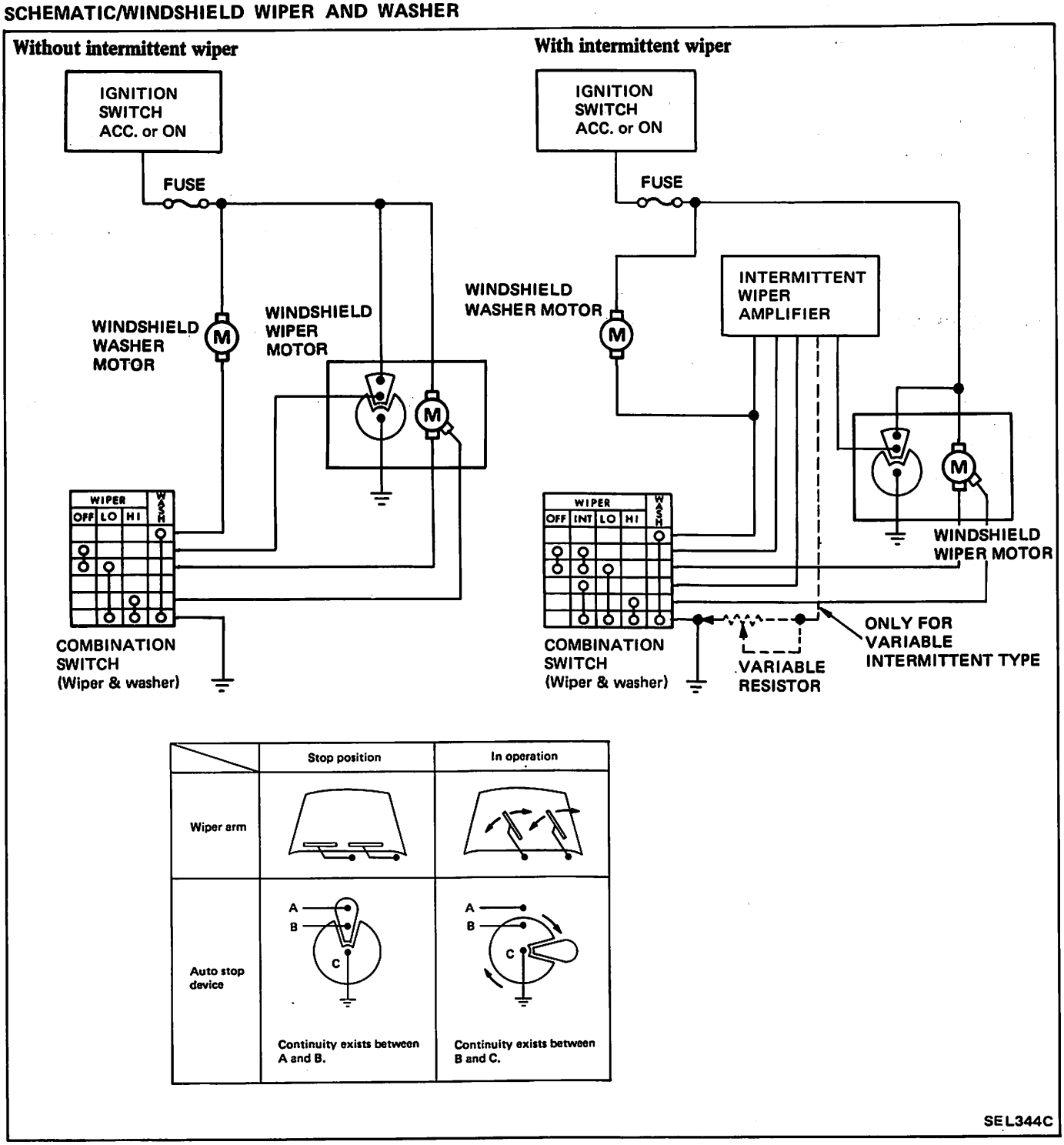
Seat belt timer is installed behind the radio. Refer to page EL-82.

WIPER AND WASHER

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

WINDSHIELD WIPER AND WASHER

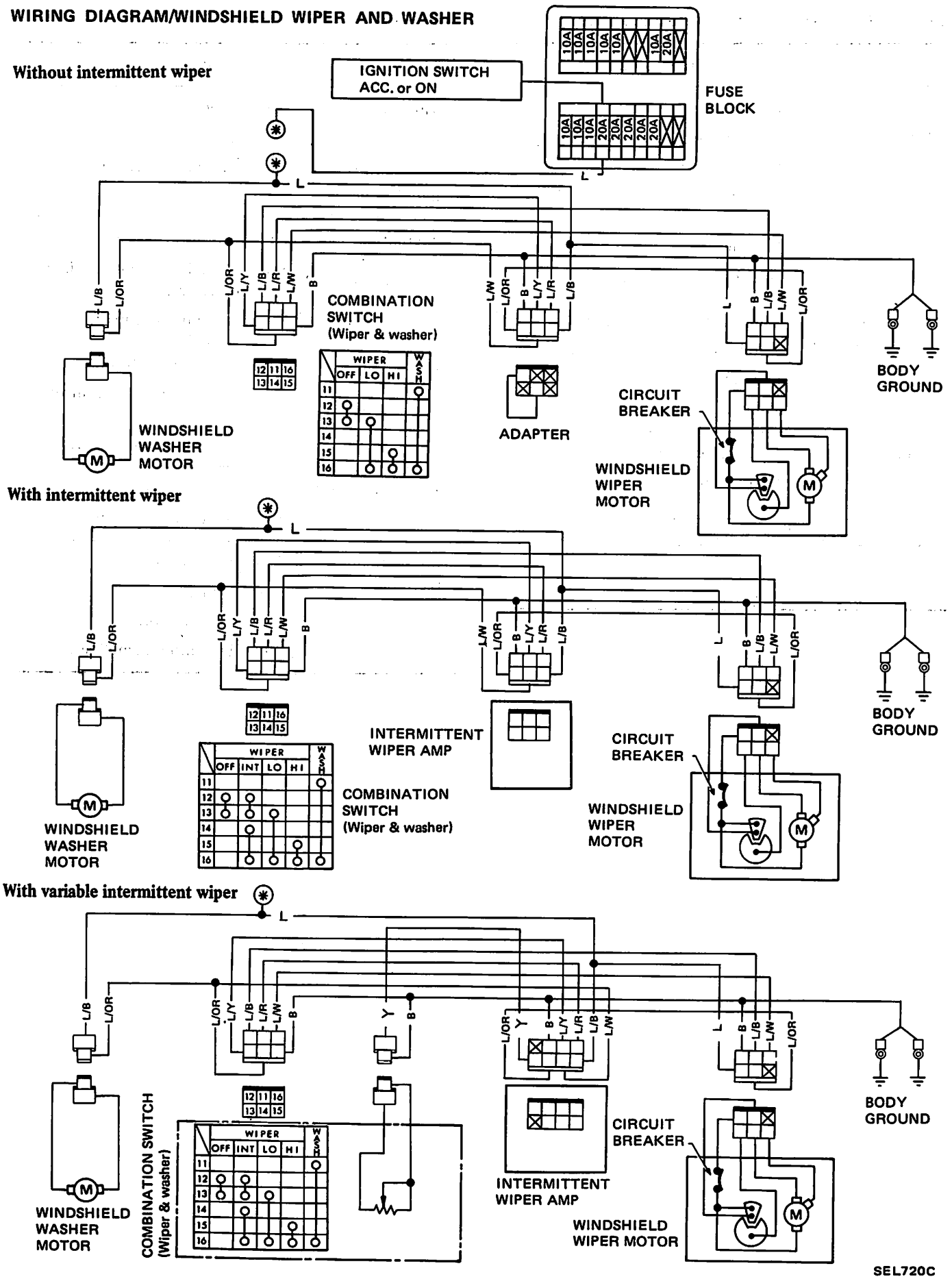
SCHEMATIC/WINDSHIELD WIPER AND WASHER



	Stop position	In operation
Wiper arm		
Auto stop device	Continuity exists between A and B.	Continuity exists between B and C.

SEL344C

WIRING DIAGRAM/WINDSHIELD WIPER AND WASHER



TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause
Windshield wiper does not operate.	Burnt fuse. Loose connection or open circuit. Improper switch contact. Foreign material interrupts link mechanism. Disconnected rod. Seized or rusted arm shaft.
Windshield wiper operating speed is too slow.	Short circuit of motor armature. Worm brushes or seized shaft. Low source voltage. Humming of motor.
Windshield wiper does not stop correctly.	Faulty auto-stop device. Faulty wiper switch.
Washer fluid does not eject (Washer motor operates).	Clogged washer nozzle or hose.

Intermittent windshield wiper

Condition	Probable cause
Wiper does not operate intermittently but operates at low and high speeds.	Faulty wiper switch. Faulty wiring. Faulty intermittent amplifier.
Intermittent speed is too short for proper wiping.	Faulty auto-stop device. Faulty variable intermittent time control rheostat. Faulty intermittent amplifier.
Intermittent speed is too long for proper wiping.	Line voltage below 10 volts. Faulty intermittent time control rheostat. Faulty intermittent amplifier.
Wipers do not shut off.	Faulty wiper motor. Faulty intermittent amplifier.
Intermittent speed is erratic.	Faulty wiper switch. Faulty wiring. Faulty wiper motor. Faulty intermittent amplifier.

INTERMITTENT WIPER AMPLIFIER (IC built-in)

Location

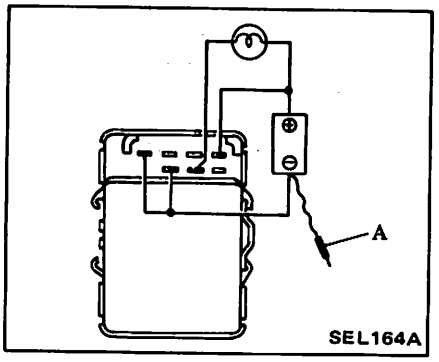
The intermittent wiper amplifier is located on the dash upper. Refer to page EL-81.

Inspection

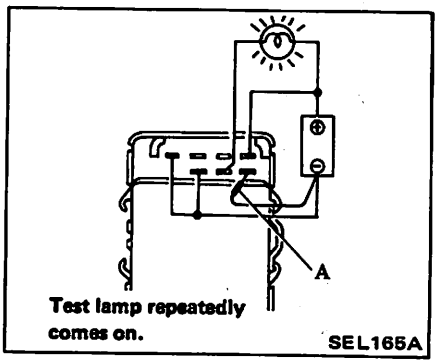
Variable intermittent type

Be careful not to connect lead wires to incorrect terminals.

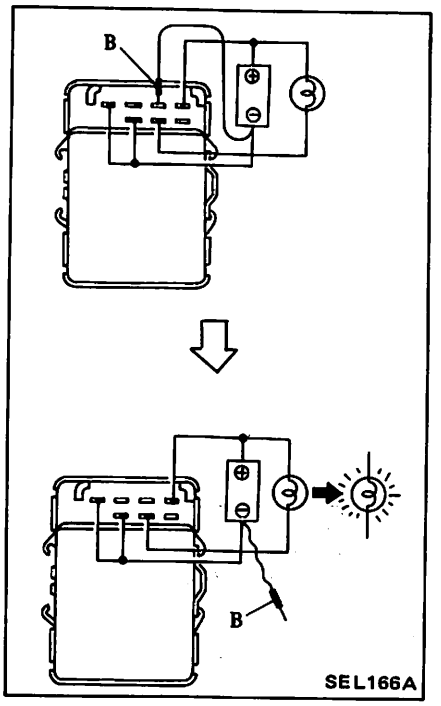
1. Connect test lead wires.



2. Make sure that test lamp comes on when negative lead wire (A) is connected.



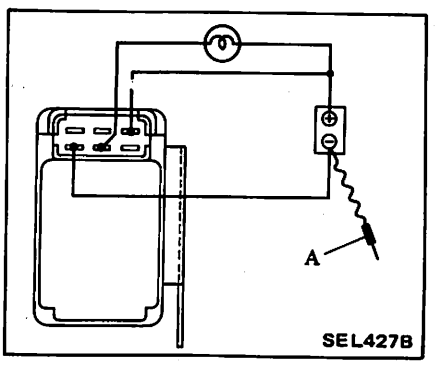
3. Disconnect lead wire (B).
Test lamp should go out and come back on in a few seconds.



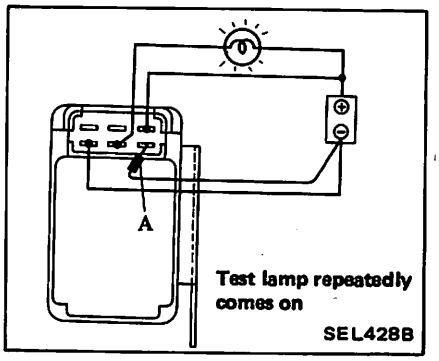
Intermittent type

Be careful not to connect lead wires to incorrect terminals.

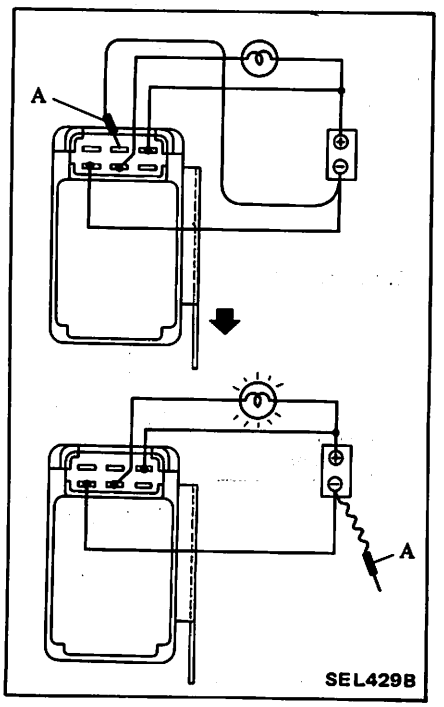
1. Connect test lead wires.



2. Make sure that test lamp comes on when negative lead wire (A) is connected.

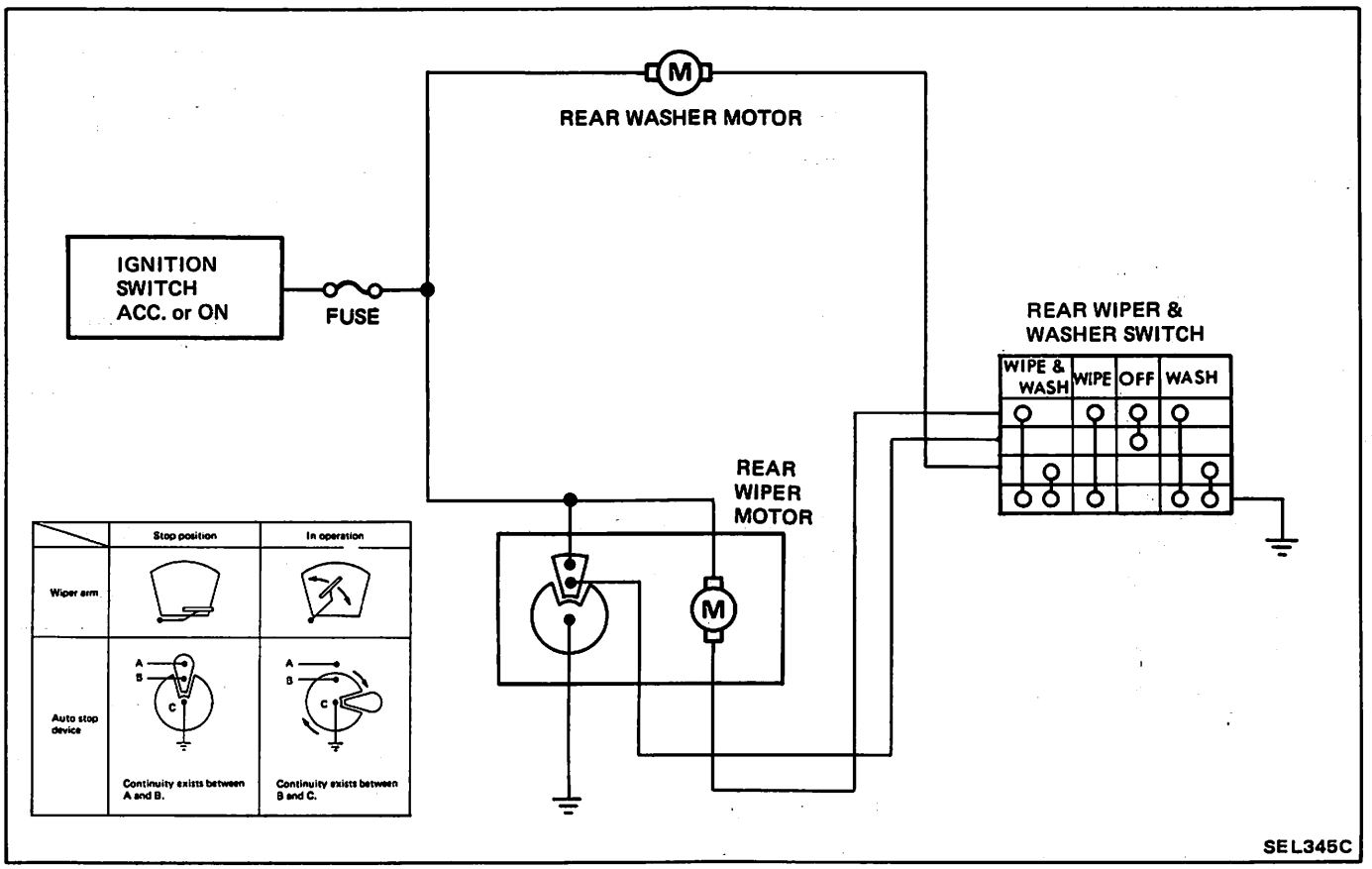


3. Reconnect lead wire (A) and disconnect lead wire (A).
Test lamp comes on in a few seconds.

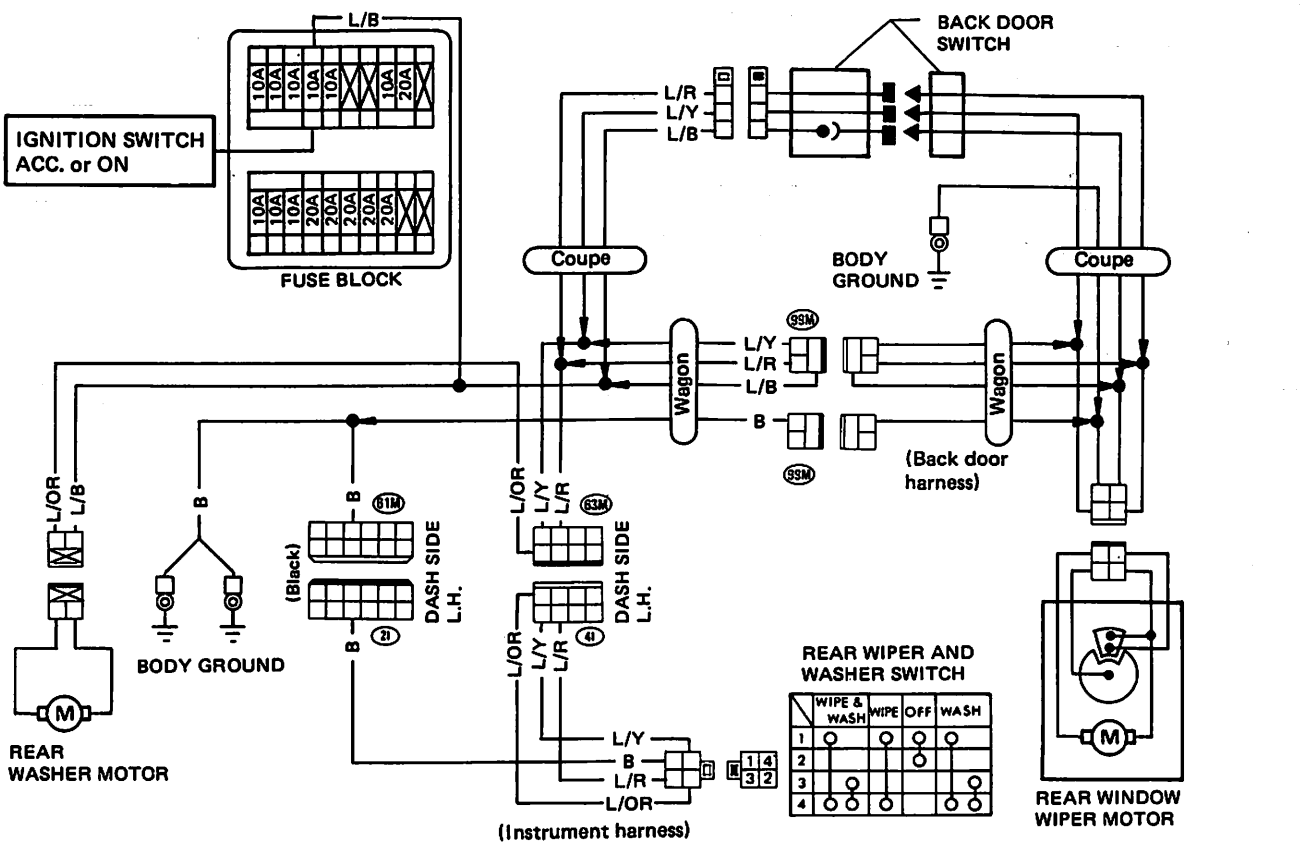


REAR WINDOW WIPER AND WASHER

SCHEMATIC/REAR WINDOW WIPER AND WASHER

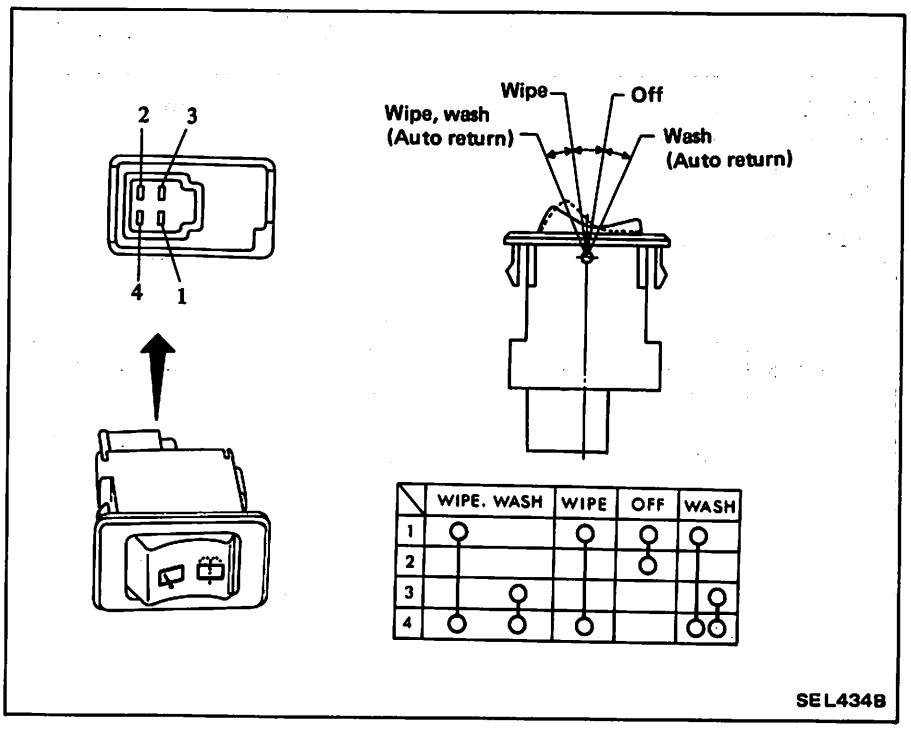


WIRING DIAGRAM/REAR WINDOW WIPER AND WASHER



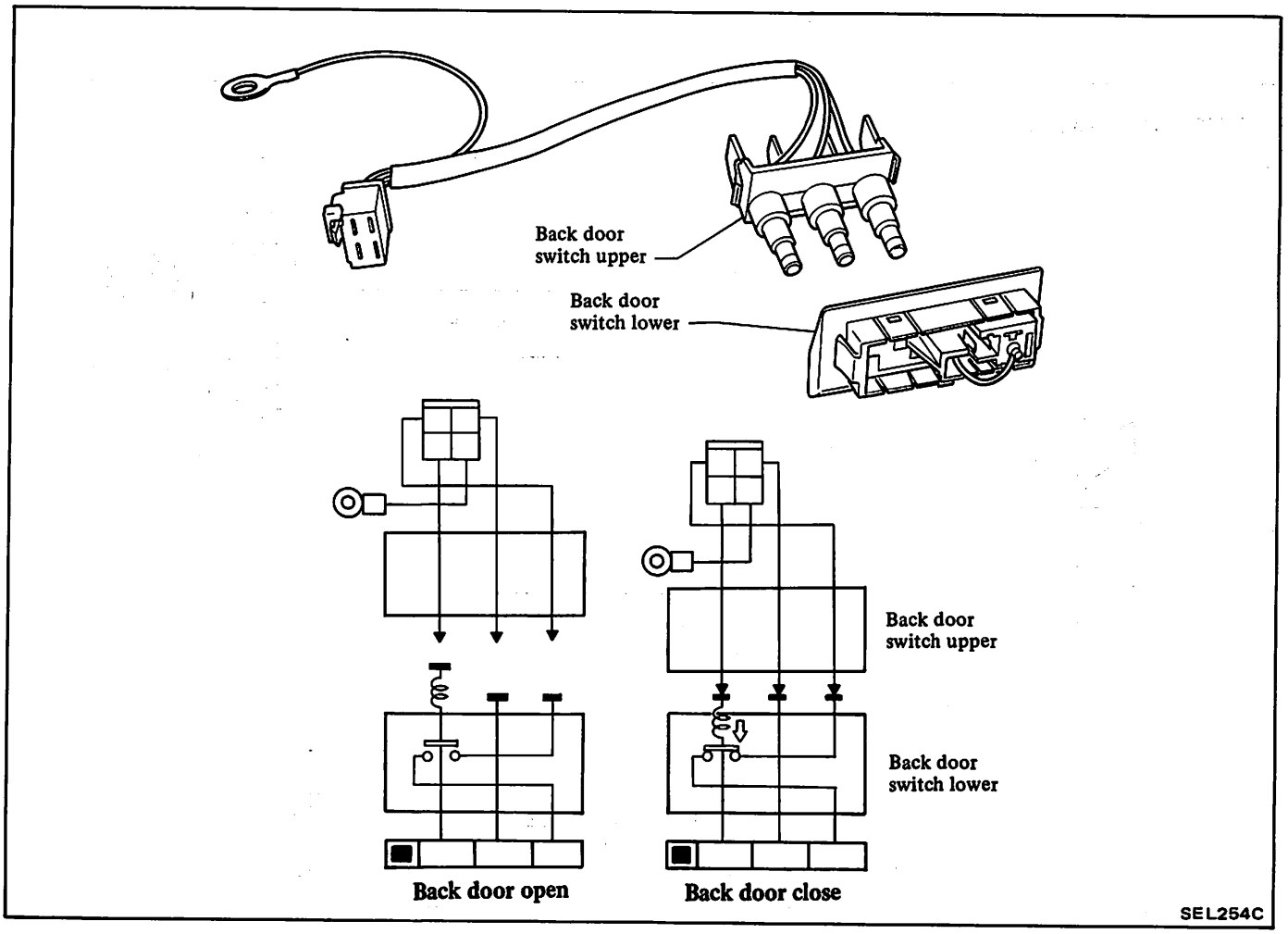
REAR WINDOW WIPER SWITCH

Inspection



BACK DOOR SWITCH (Coupe)

Inspection

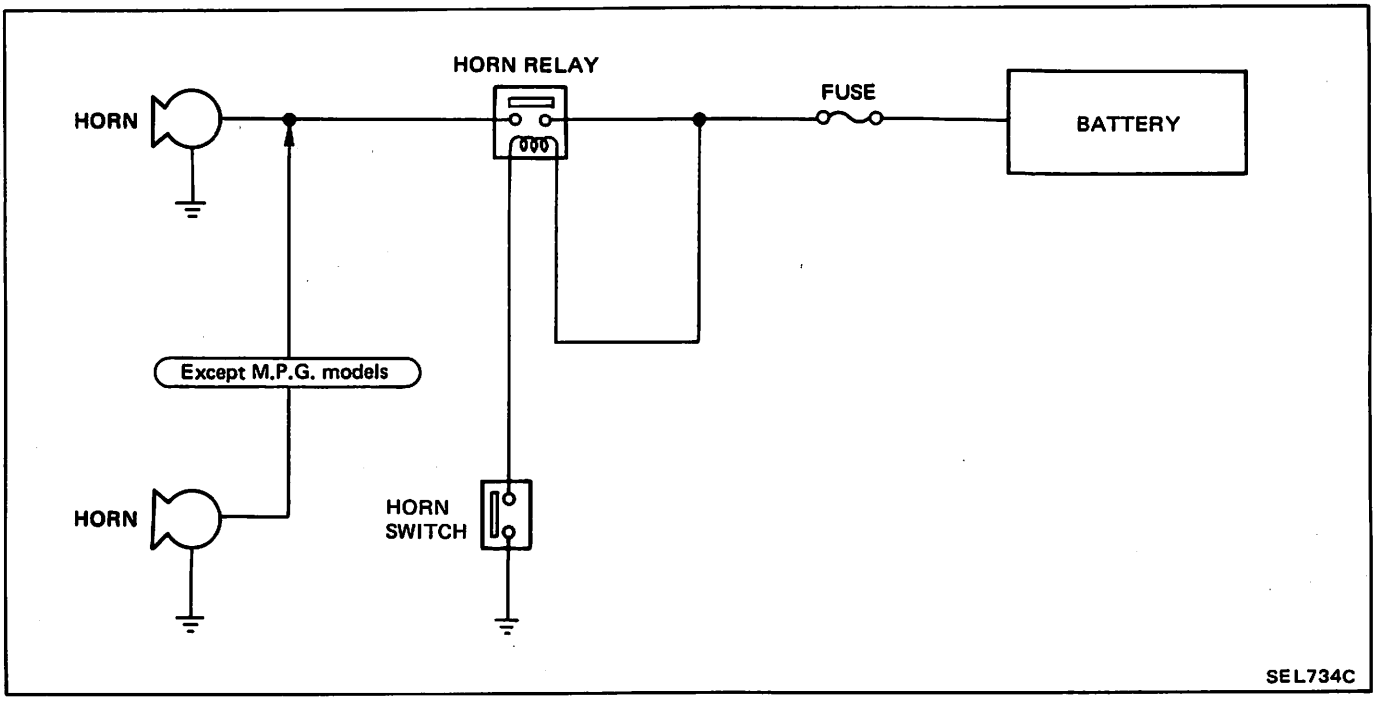


ELECTRICAL ACCESSORIES

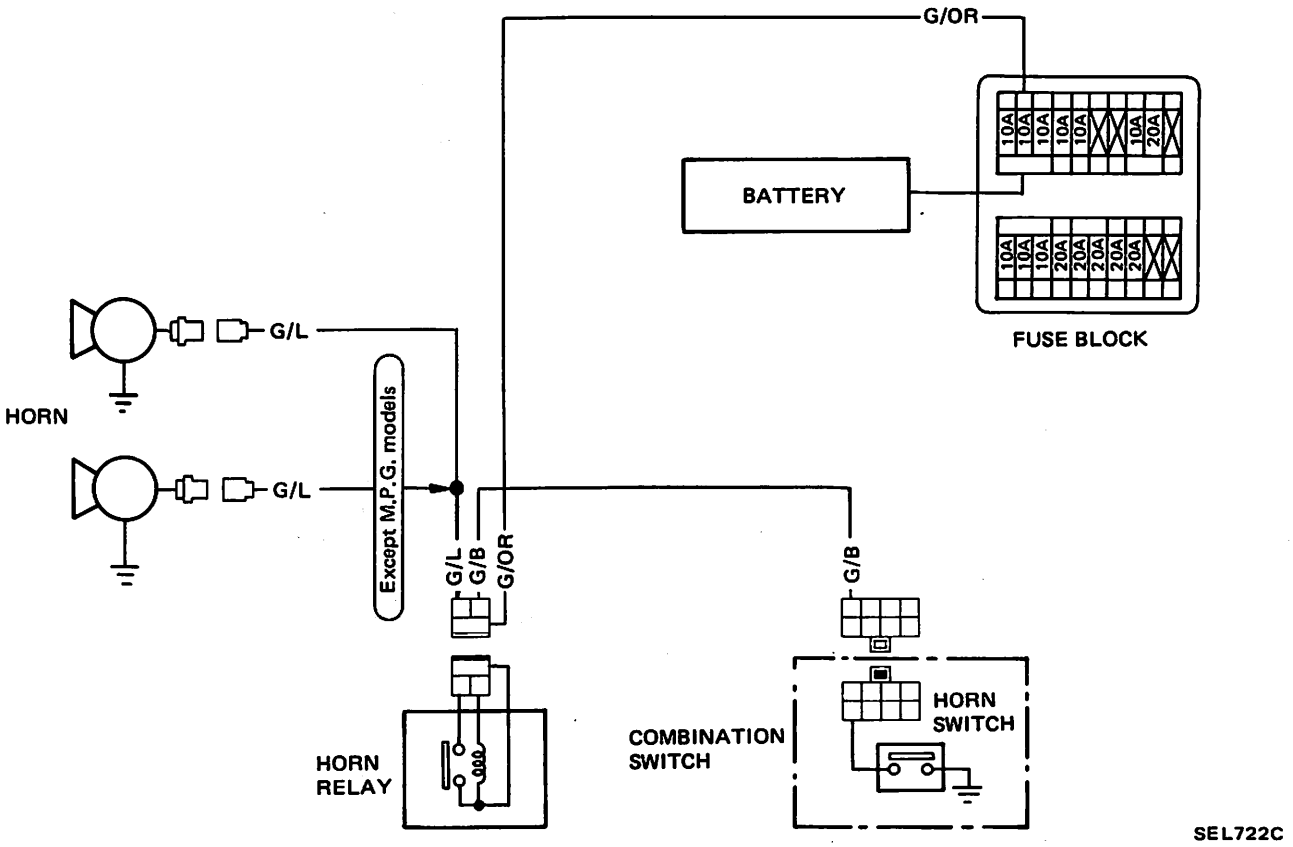
CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

HORN

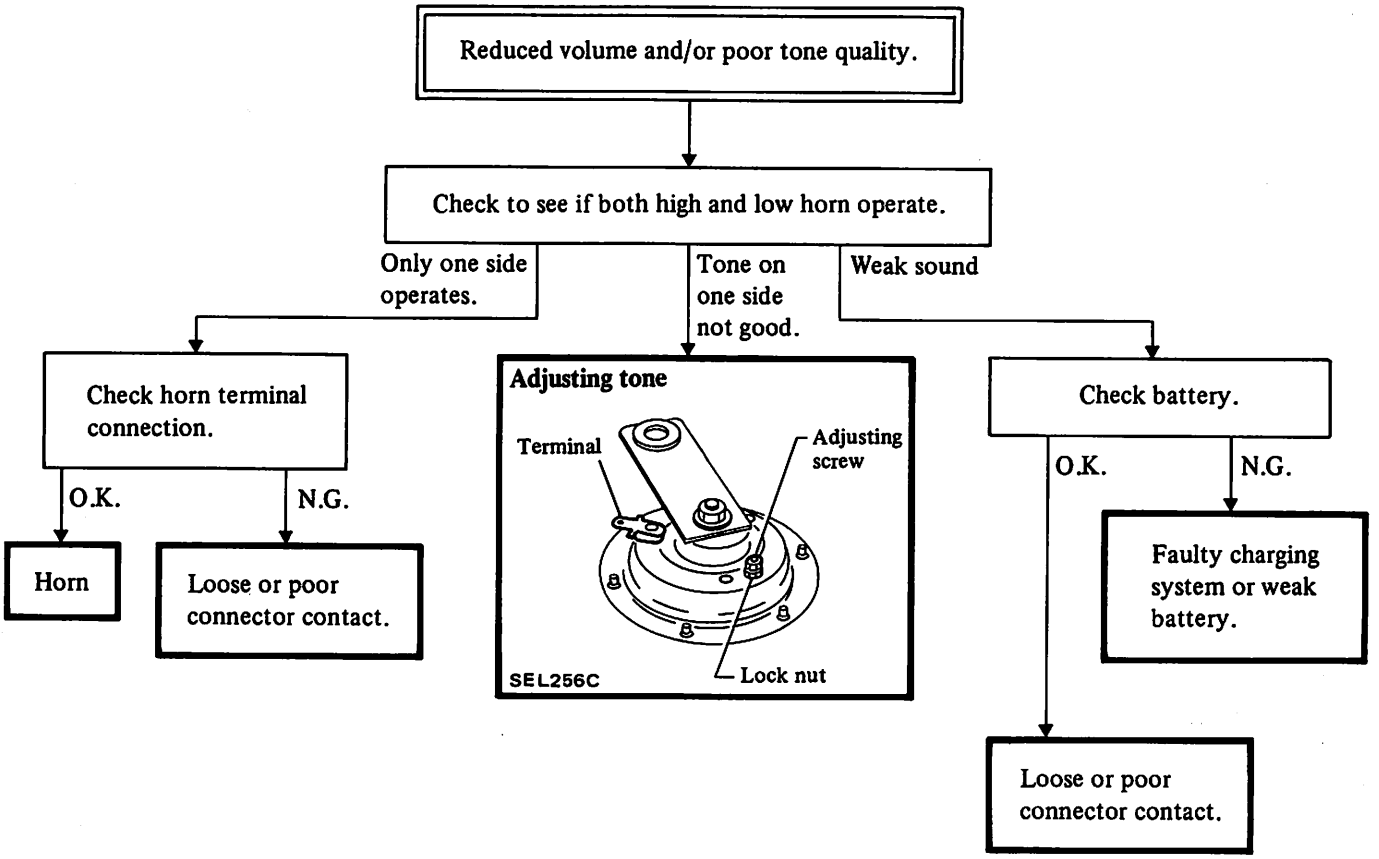
SCHEMATIC/HORN



WIRING DIAGRAM/HORN



TROUBLE DIAGNOSES AND CORRECTIONS



HORN BUTTON

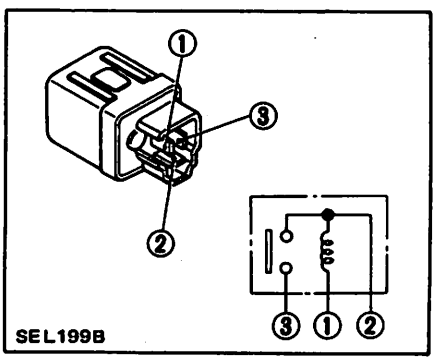
Refer to "COMBINATION SWITCH".

HORN RELAY

Location

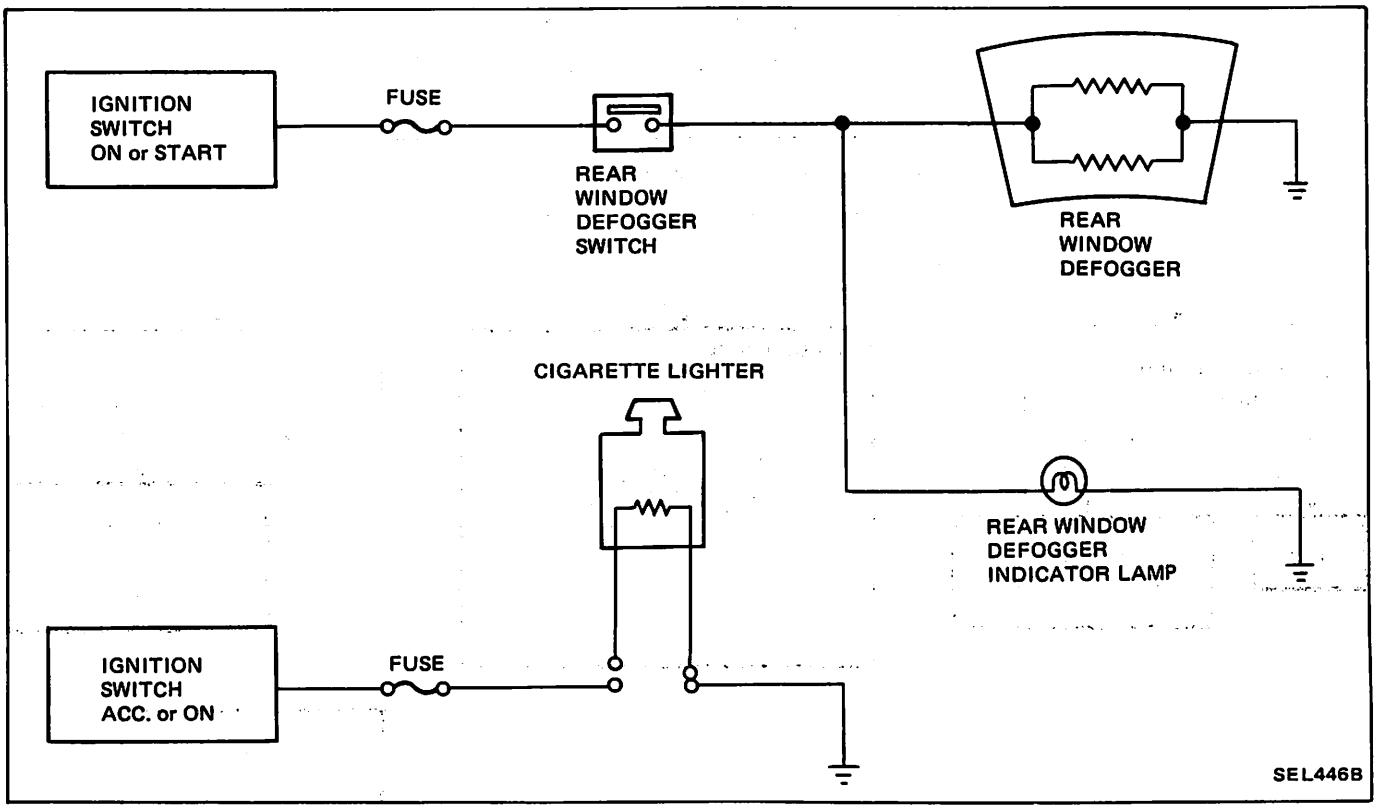
Horn relay is installed on the relay bracket. Refer to page EL-81.

Inspection

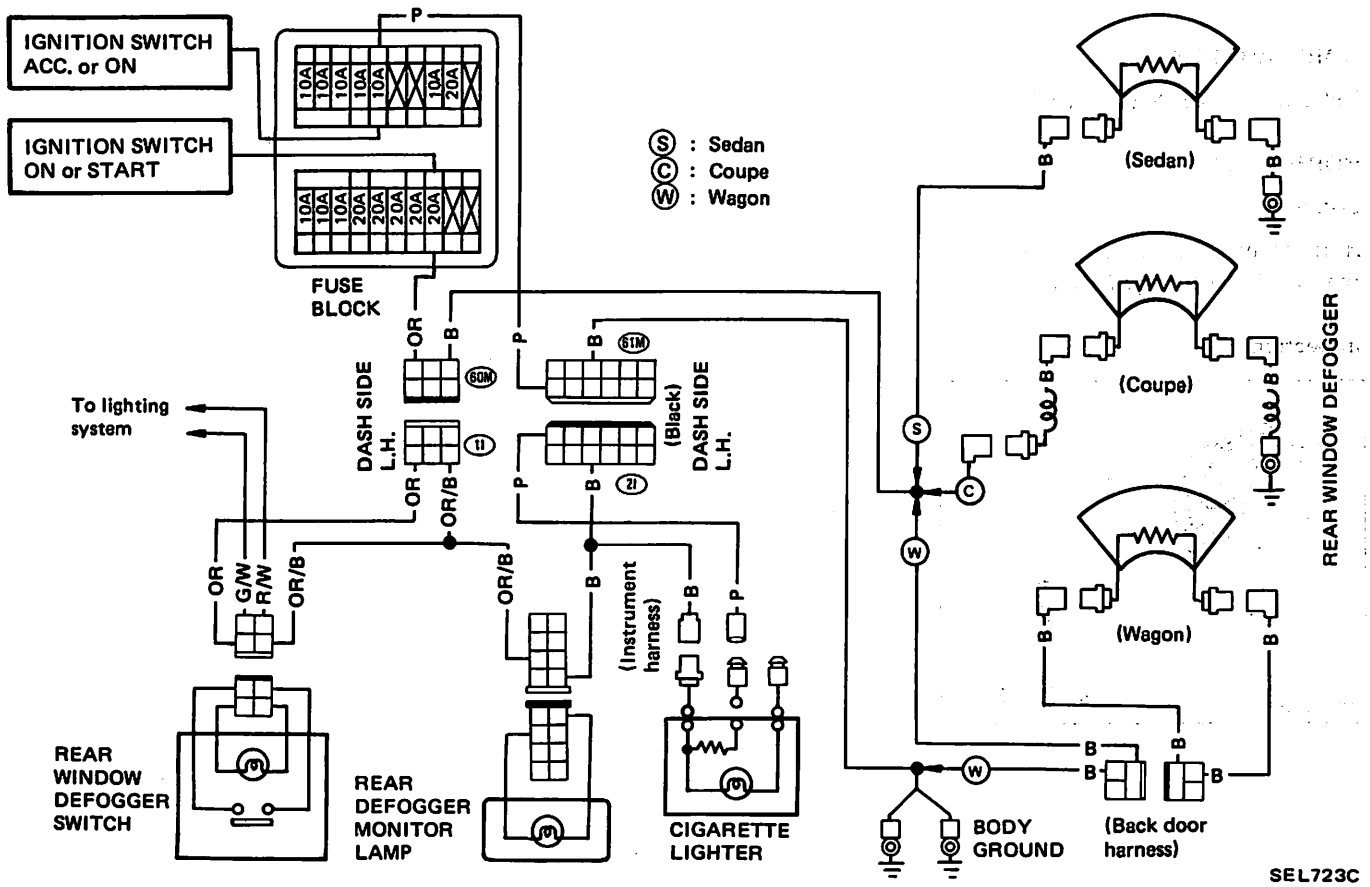


REAR WINDOW DEFOGGER AND CIGARETTE LIGHTER

SCHEMATIC/REAR WINDOW DEFOGGER AND CIGARETTE LIGHTER

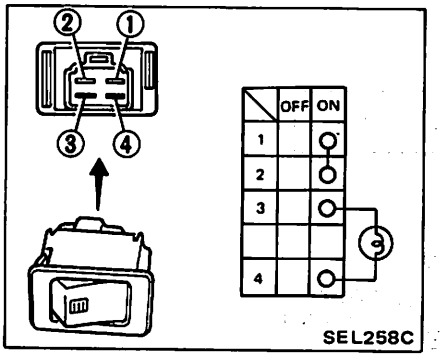


WIRING DIAGRAM/REAR WINDOW DEFOGGER AND CIGARETTE LIGHTER



REAR WINDOW DEFOGGER SWITCH

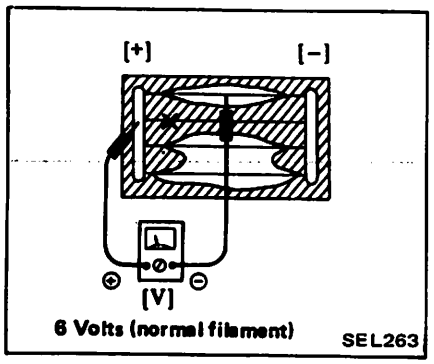
Inspection



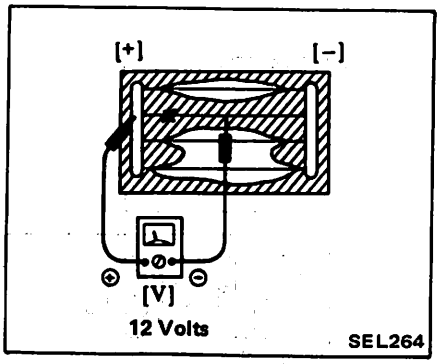
REAR WINDOW DEFOGGER FILAMENTS

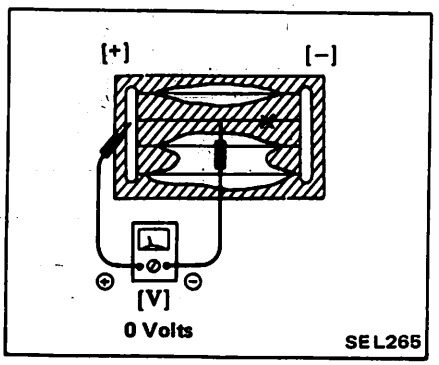
Inspection

1. Attach probe circuit tester (in volt range) to middle portion of each filament.

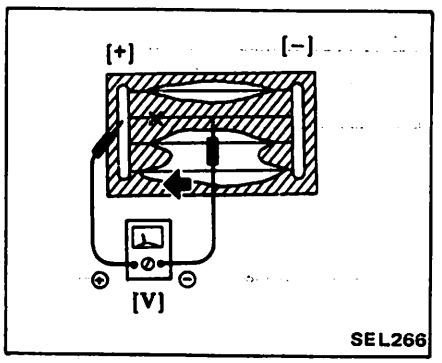


2. If a filament is burned out, circuit tester registers 0 or 12 volts.





3. To locate burned out point, move probe to left and right along filament to determine point where tester needle swings abruptly.



Filament maintenance

Repair equipment

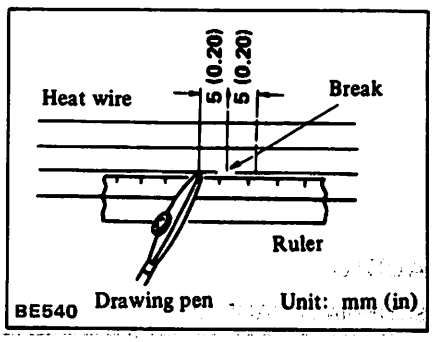
1. Conductive silver composition (Dupont No. 4817 or equivalent)
2. Ruler, 30 cm (11.8 in) long
3. Drawing pen
4. Heat gun
5. Alcohol
6. Cloth

Repair procedure

1. Wipe broken heat wire and its surrounding area clean with a cloth dampened in alcohol.
2. Apply a small amount of conductive silver composition to tip of drawing pen.

Shake silver composition container before use.

3. Place ruler on glass along broken line. Deposit conductive silver composition on break with drawing pen. Slightly overlap existing heat wire on both sides [preferably 5 mm (0.20 in)] of the break.



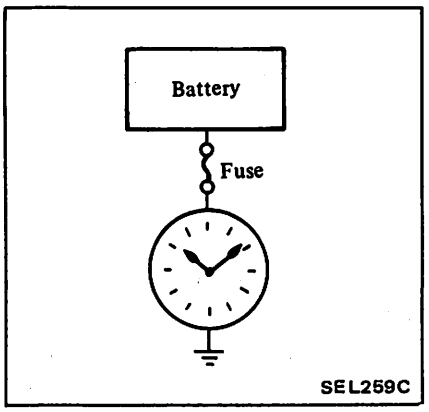
4. Wipe clean silver composition from tip of drawing pen.
5. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

Do not touch repaired area while test is being conducted.

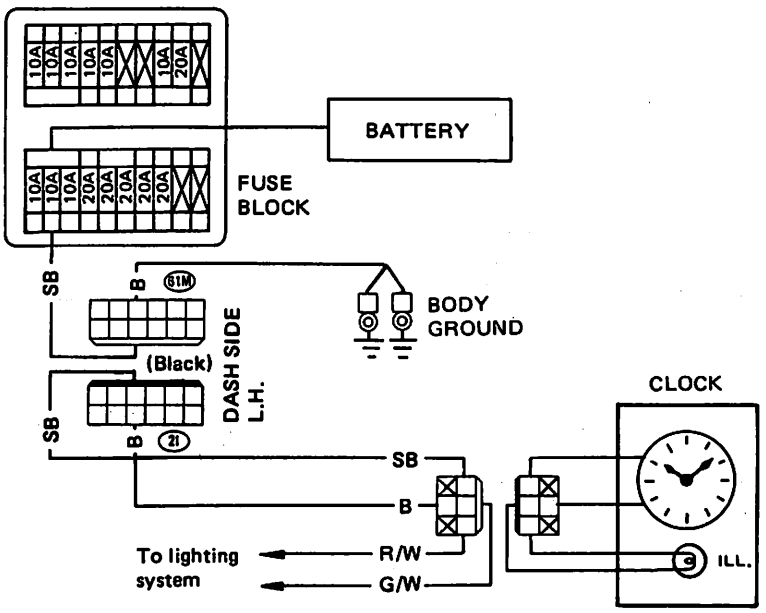
6. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.

CLOCK

SCHEMATIC/CLOCK



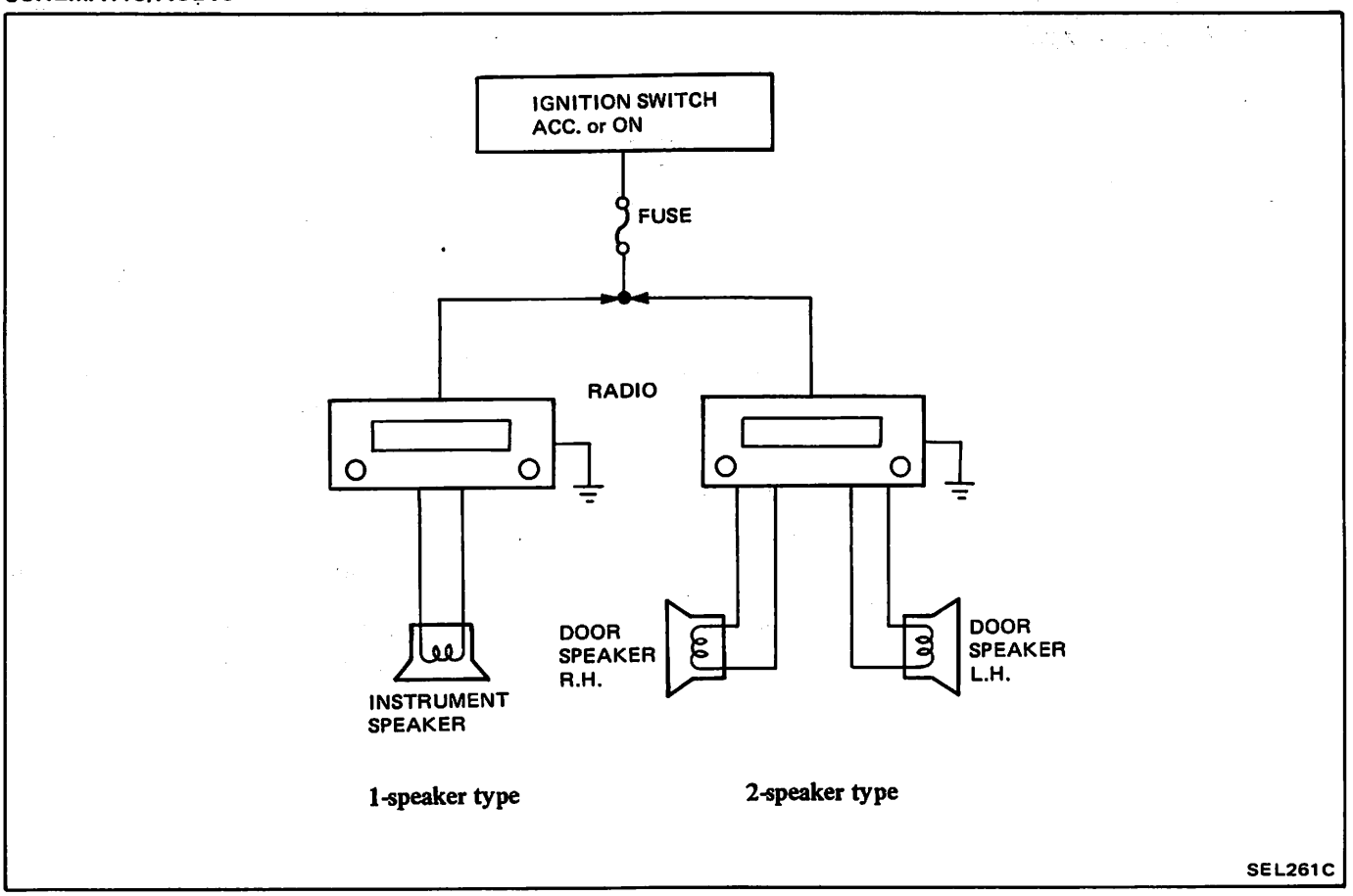
WIRING DIAGRAM/CLOCK



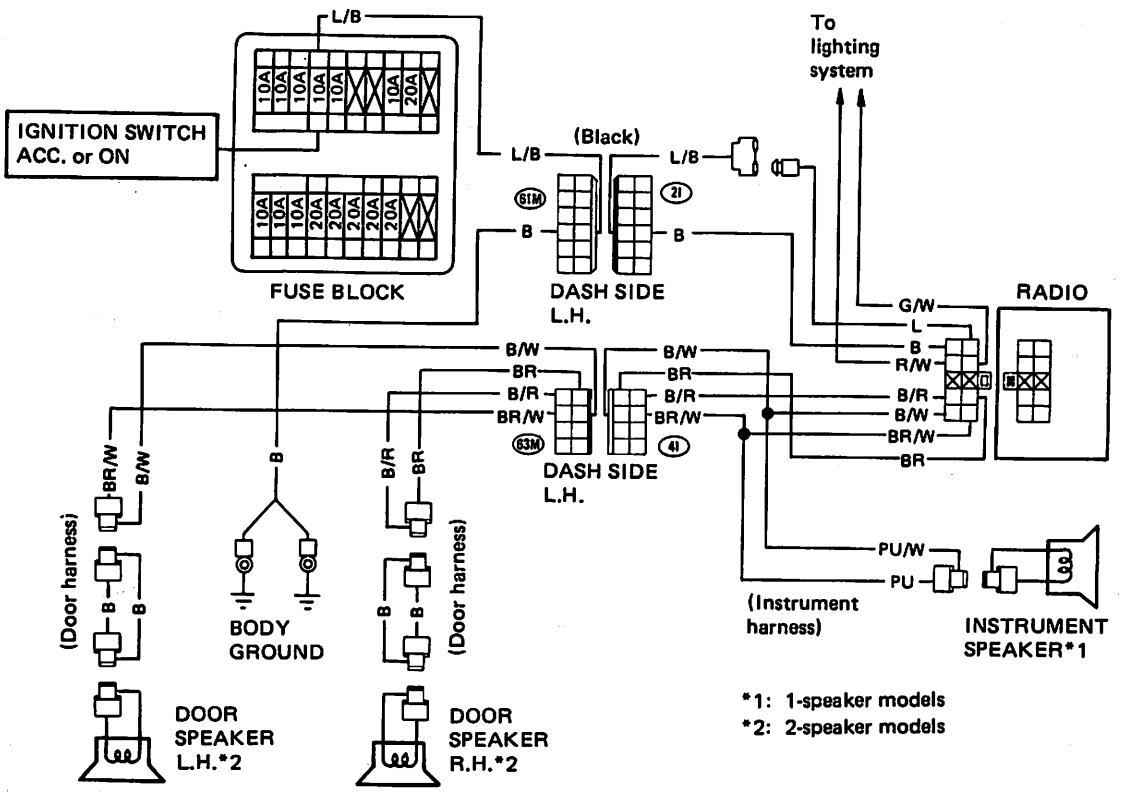
SEL724C

AUDIO

SCHEMATIC/AUDIO

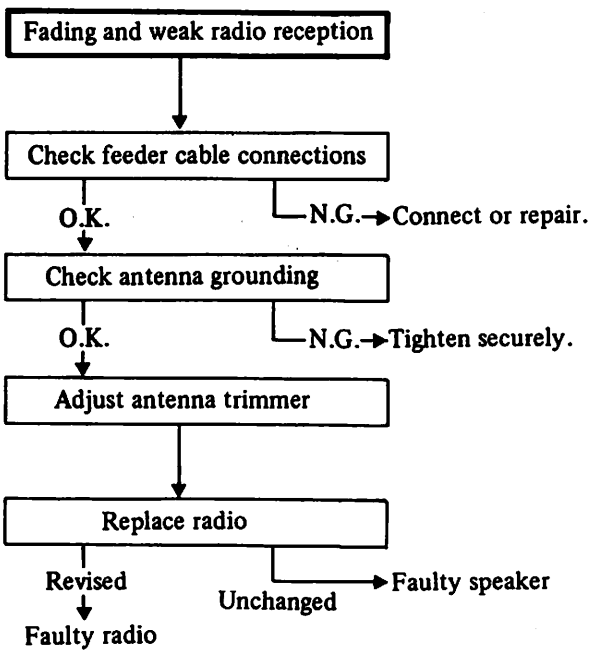


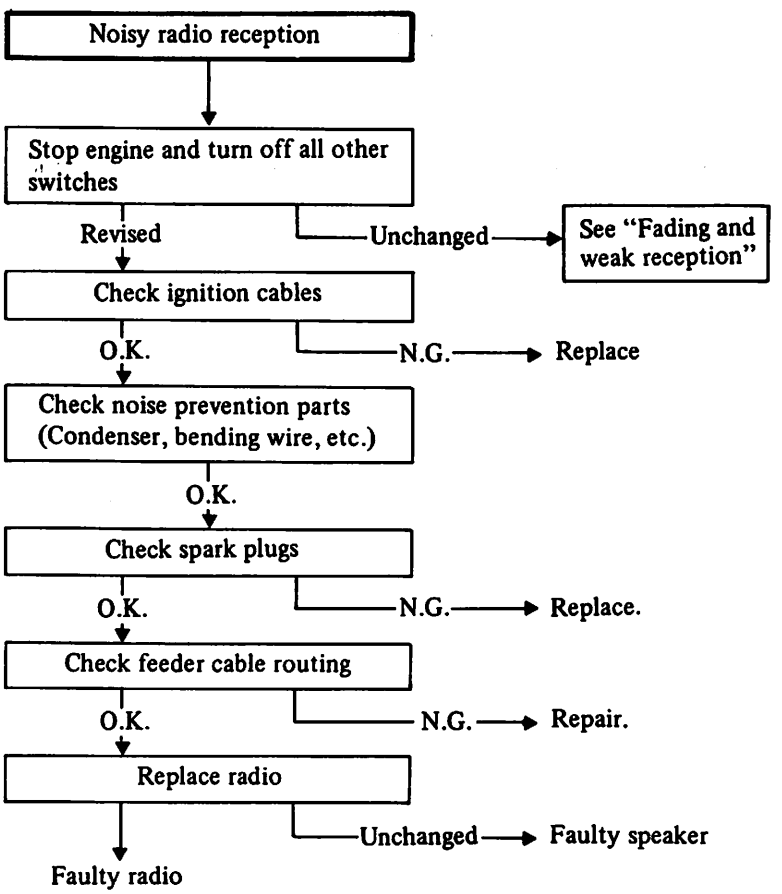
WIRING DIAGRAM/AUDIO



SEL725C

TROUBLE DIAGNOSES AND CORRECTIONS

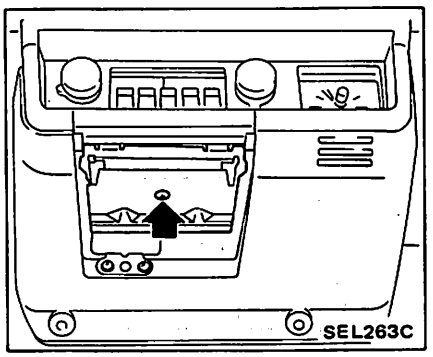




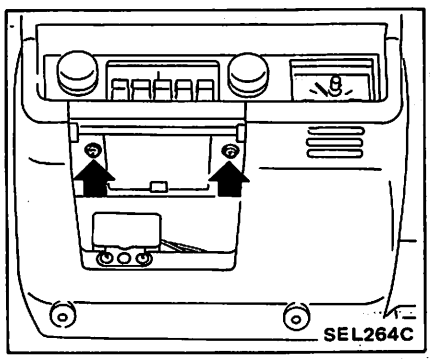
RADIO

Removal and installation

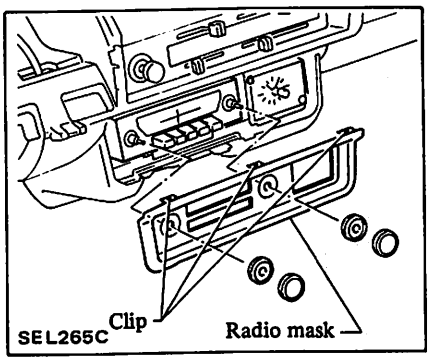
1. Remove ash tray and ash tray bracket.



2. Remove radio mounting bolts.



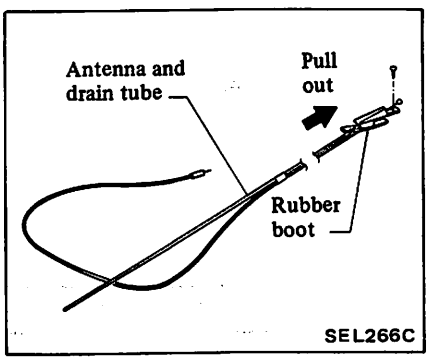
3. Remove radio mask.



4. Installation is in the reverse order of removal.

ANTENNA

Removal and installation



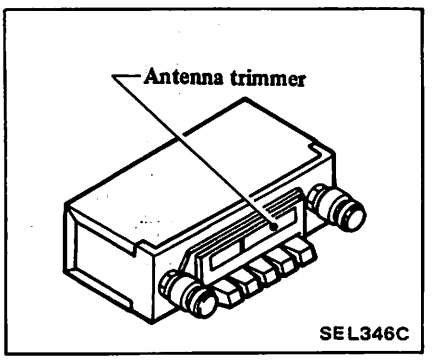
ADJUSTING ANTENNA TRIMMER

The antenna trimmer should be adjusted in the following cases:

- Fading and weak MW (AM) reception.
- After installation of new antenna, feeder cable or radio receiver.

Before adjusting, be sure to check harness and antenna feeder cable connectors for proper connection.

1. Extend antenna completely.
2. Turn radio on, and turn volume control to increase speaker volume.
3. Tune in the weakest station (barely audible) on dial at the range around 14 (1,400 kHz).
4. Turn antenna trimmer to left or right slowly, and set it in the position where reception is strongest.

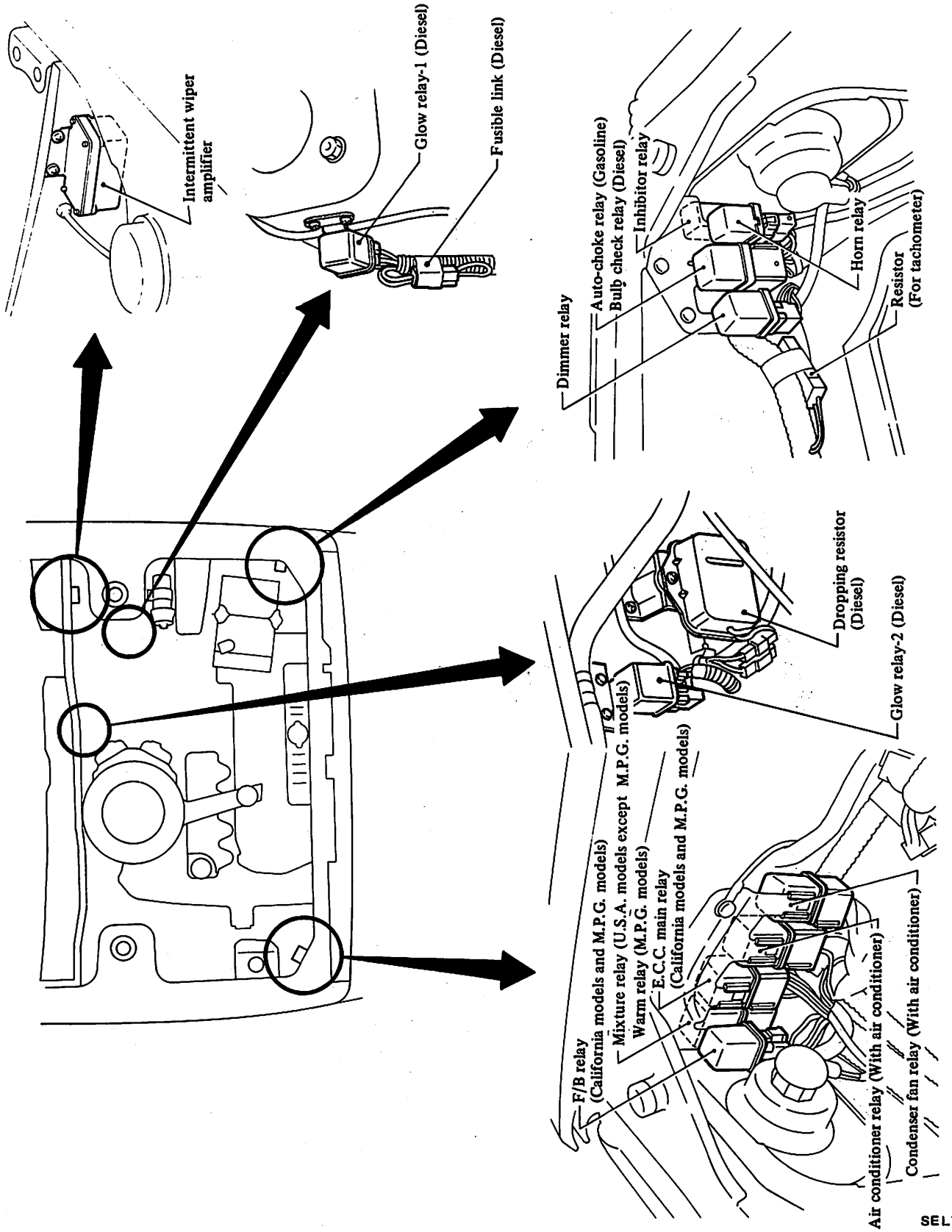


CAUTION:
Do not turn antenna trimmer more than one-half turn.

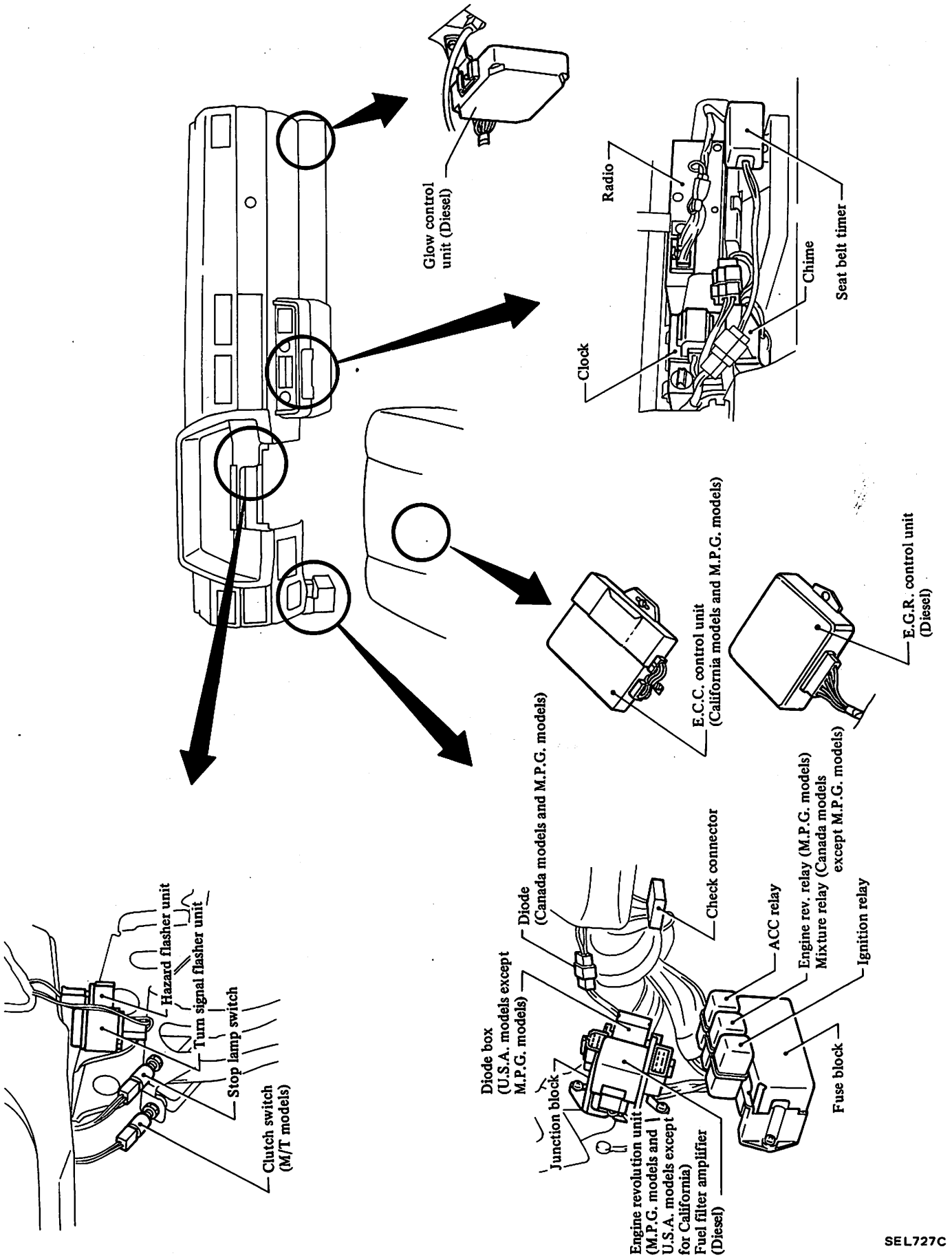
LOCATION OF ELECTRICAL UNITS

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

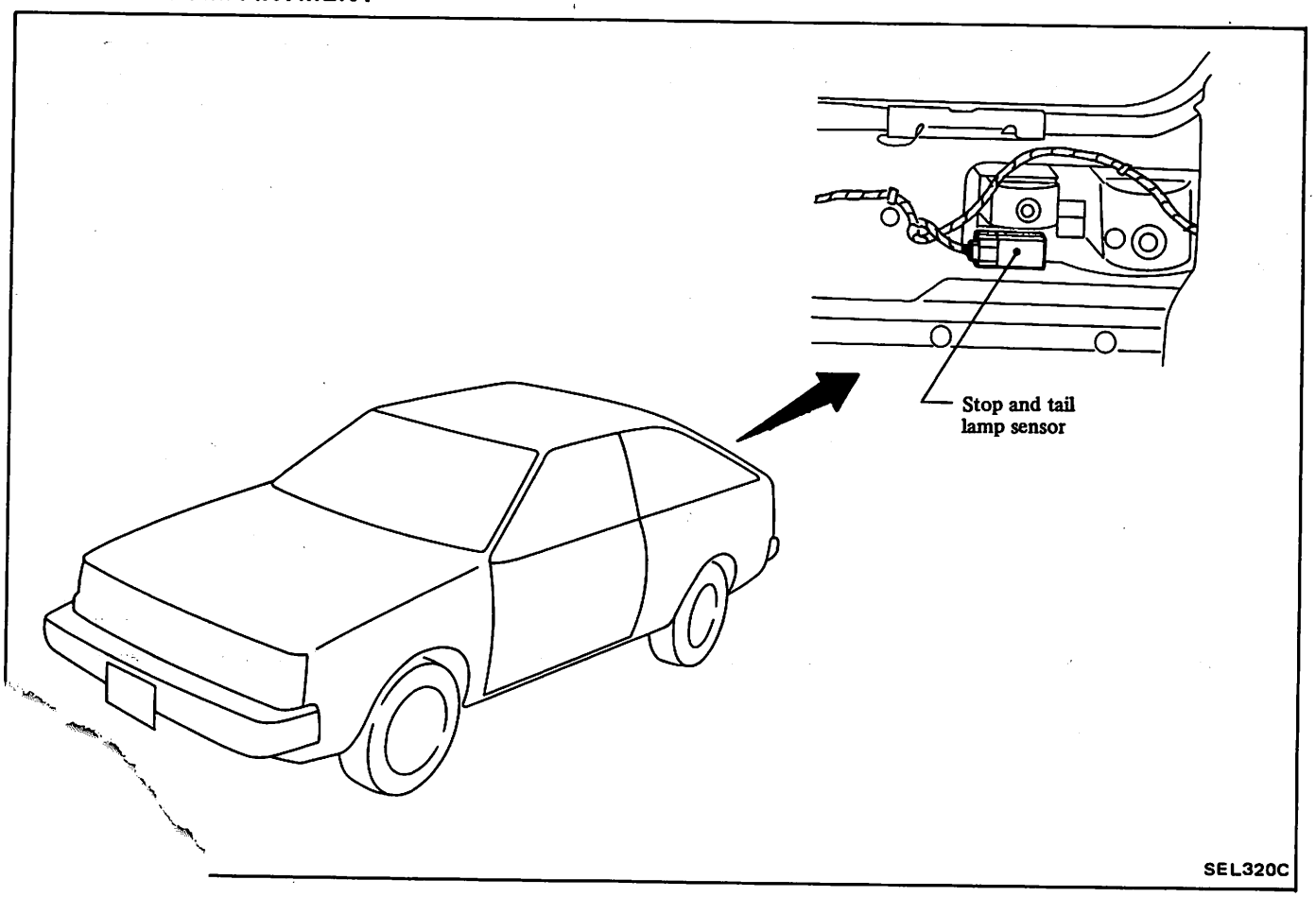
ENGINE COMPARTMENT



PASSENGER COMPARTMENT



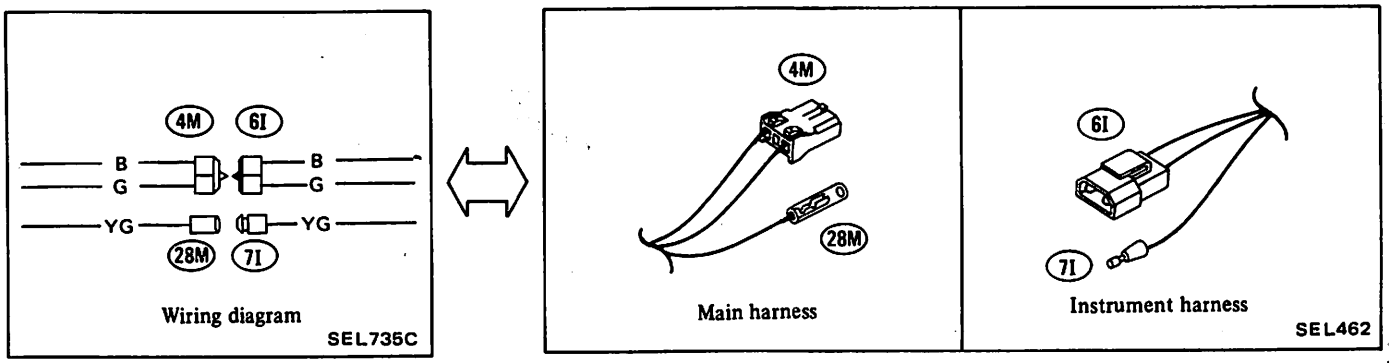
LUGGAGE COMPARTMENT



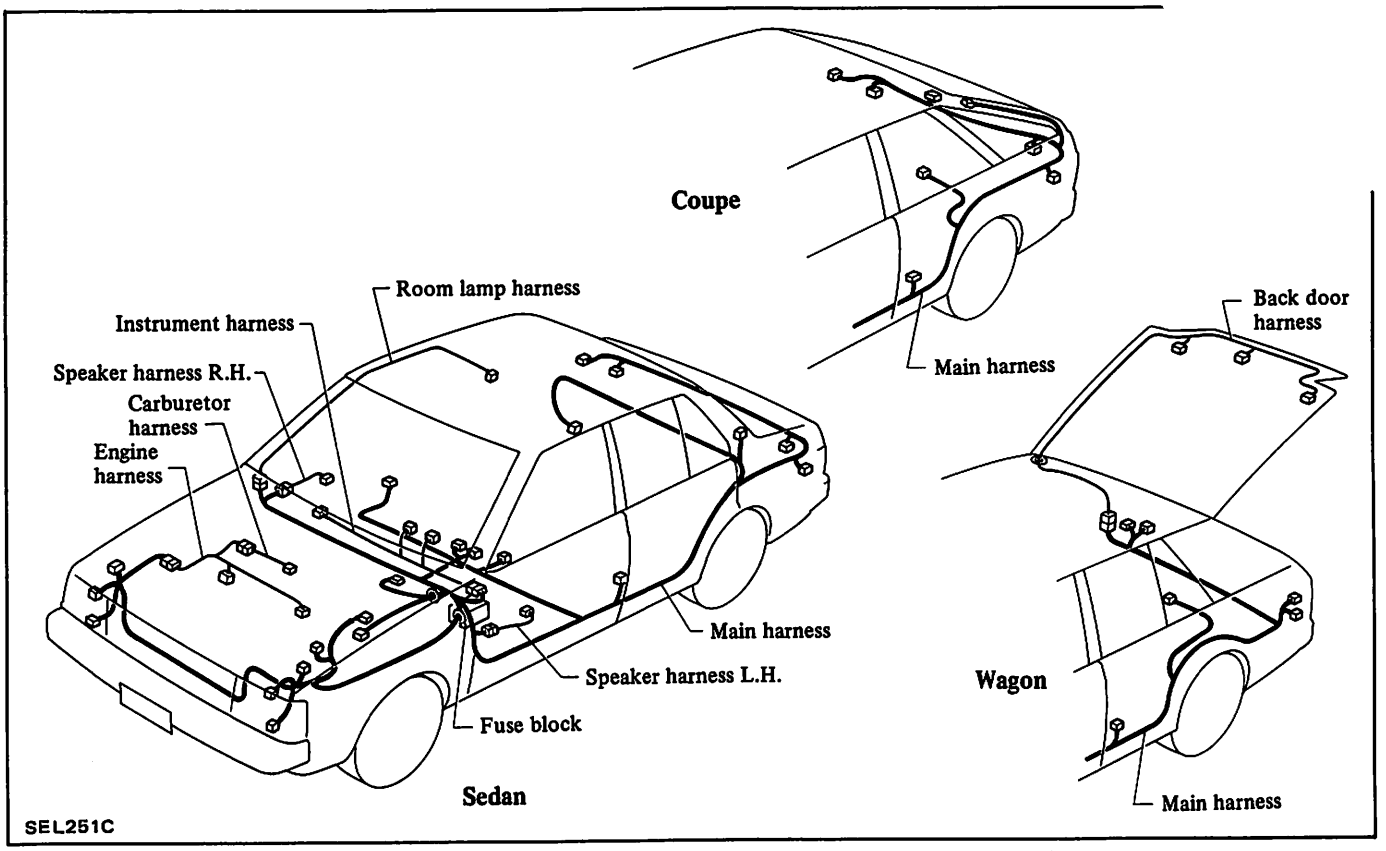
HARNESS LAYOUT

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

For easy identification, connectors indicated in the system wiring diagram have the same numbers as those used in the harness layout schematic.



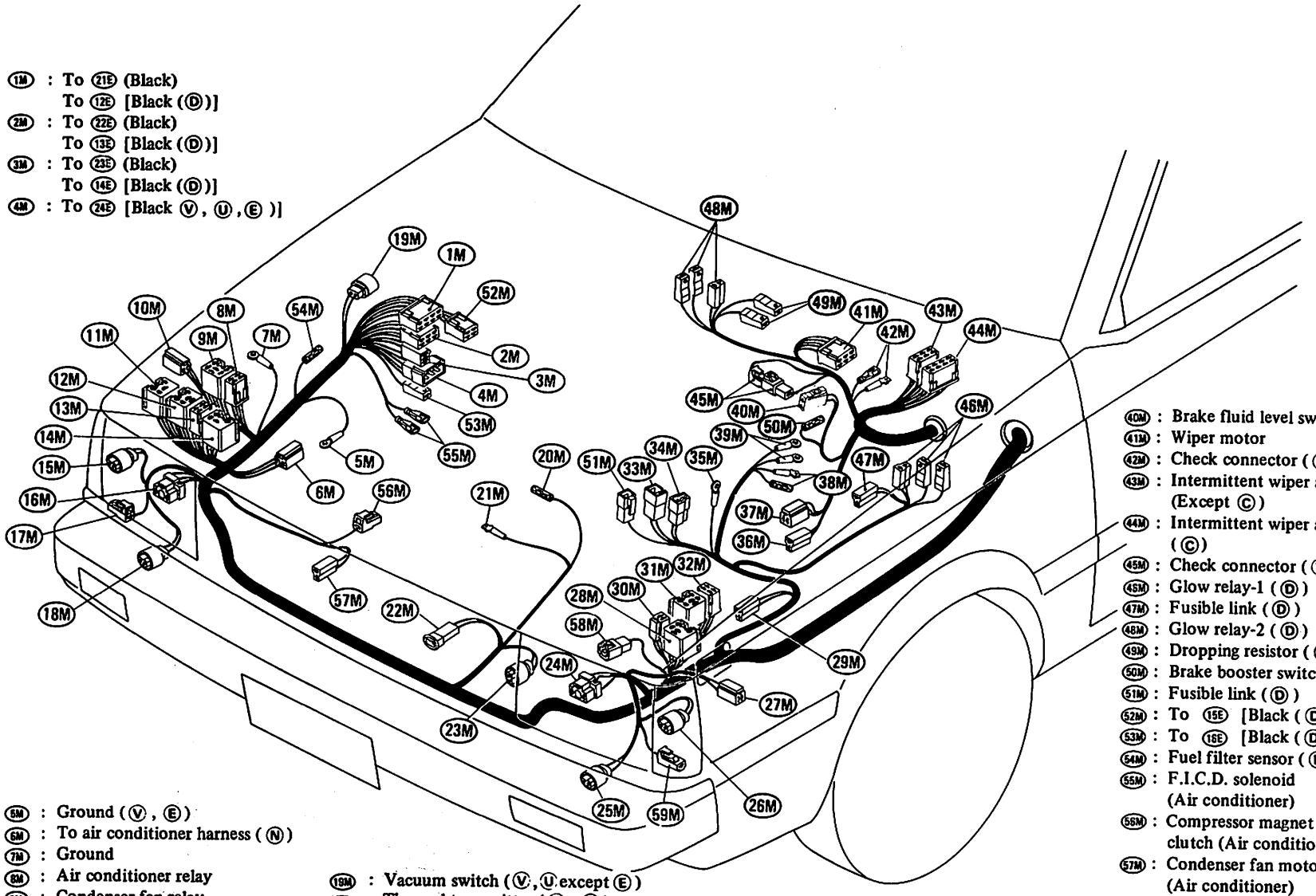
DESCRIPTION



HARNESS DETAILS

MAIN HARNESS

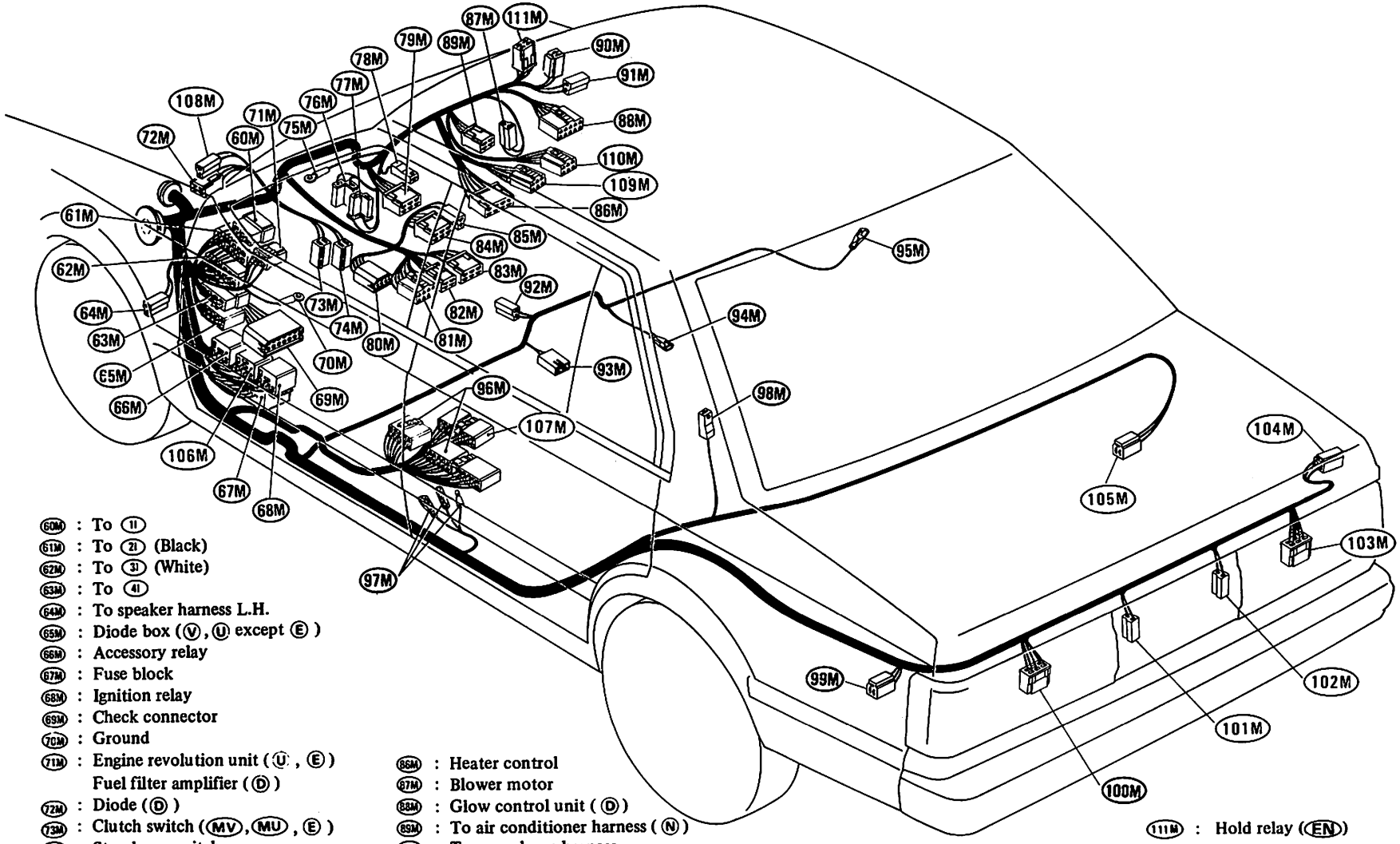
Engine compartment side



- 5M : Ground (V, E)
- 6M : To air conditioner harness (N)
- 7M : Ground
- 8M : Air conditioner relay
- 9M : Condenser fan relay (Air conditioner)
- 10M : Side marker lamp R.H.
- 11M : E.C.C. main relay (V, E)
- 12M : Mixture relay (V, U except E)
- 13M : Warm relay (E)
- 14M : F/B relay (V, E)
- 15M : Clearance lamp R.H.
- 16M : Headlamp R.H.
- 17M : Horn
- 18M : Front turn signal lamp R.H.
- 19M : Vacuum switch (V, U except E)
- 20M : Thermal transmitter (V, E)
- 21M : Exhaust gas sensor (V, E)
- 22M : Radiator fan motor
- 23M : Thermo switch
- 24M : Headlamp L.H.
- 25M : Front turn signal lamp L.H.
- 26M : Clearance lamp L.H.
- 27M : Side marker lamp L.H.
- 28M : Dimmer relay
- 29M : Resistor
- 30M : Horn relay
- 31M : Auto-choke relay (G) Bulb check relay (D)
- 32M : Inhibitior relay (A)
- 33M : Fusible link
- 34M : Fusible link (V, E)
- 35M : Ground
- 36M : Washer motor
- 37M : Rear washer motor (Coupe, Wagon)
- 38M : Condenser
- 39M : Ignition coil
- 40M : Brake fluid level switch
- 41M : Wiper motor
- 42M : Check connector (V, E)
- 43M : Intermittent wiper amplifier (Except C)
- 44M : Intermittent wiper amplifier (C)
- 45M : Check connector (V, E)
- 46M : Glow relay-1 (D)
- 47M : Fusible link (D)
- 48M : Glow relay-2 (D)
- 49M : Dropping resistor (D)
- 50M : Brake booster switch (D)
- 51M : Fusible link (D)
- 52M : To 15E [Black (D)]
- 53M : To 16E [Black (D)]
- 54M : Fuel filter sensor (D)
- 55M : F.I.C.D. solenoid (Air conditioner)
- 56M : Compressor magnet clutch (Air conditioner)
- 57M : Condenser fan motor (Air conditioner)
- 58M : Pressure switch (Air conditioner)
- 59M : Horn
- V : California models
- U : U.S.A. models except for California
- N : Canada models
- E : M.P.G. models
- A : A/T models
- G : Gasoline
- D : Diesel

SEL728C

Passenger compartment side (Sedan)



60M : To (11)
61M : To (21) (Black)
62M : To (31) (White)
63M : To (41)
64M : To speaker harness L.H.
65M : Diode box (Ⓥ, Ⓤ except Ⓔ)
66M : Accessory relay
67M : Fuse block
68M : Ignition relay
69M : Check connector
70M : Ground
71M : Engine revolution unit (Ⓤ, Ⓔ)
Fuel filter amplifier (Ⓓ)
72M : Diode (Ⓓ)
73M : Clutch switch (MV, MU, Ⓔ)
74M : Stop lamp switch
75M : Ground
76M : Hazard flasher unit
77M : Turn signal flasher unit
78M : F.I.C.D. (Ⓔ)
79M : Resistor
80M : Hazard switch
81M : Combination switch (Light)
82M : Combination switch (Turn)
83M : Combination switch (Wiper)
84M : Ignition switch
85M : Steering lock switch

86M : Heater control
87M : Blower motor
88M : Glow control unit (Ⓓ)
89M : To air conditioner harness (Ⓝ)
90M : To room lamp harness
91M : To speaker harness R.H.
92M : A/T indicator lamp (Ⓐ)
93M : Seat belt switch
94M : Parking brake switch
95M : Door switch R.H.
96M : E.C.C. control unit (Ⓥ, Ⓔ)
97M : Door switch L.H.
98M : Rear defogger
99M : Rear side marker lamp L.H.
100M : Rear combination lamp L.H.
101M : License plate lamp L.H.

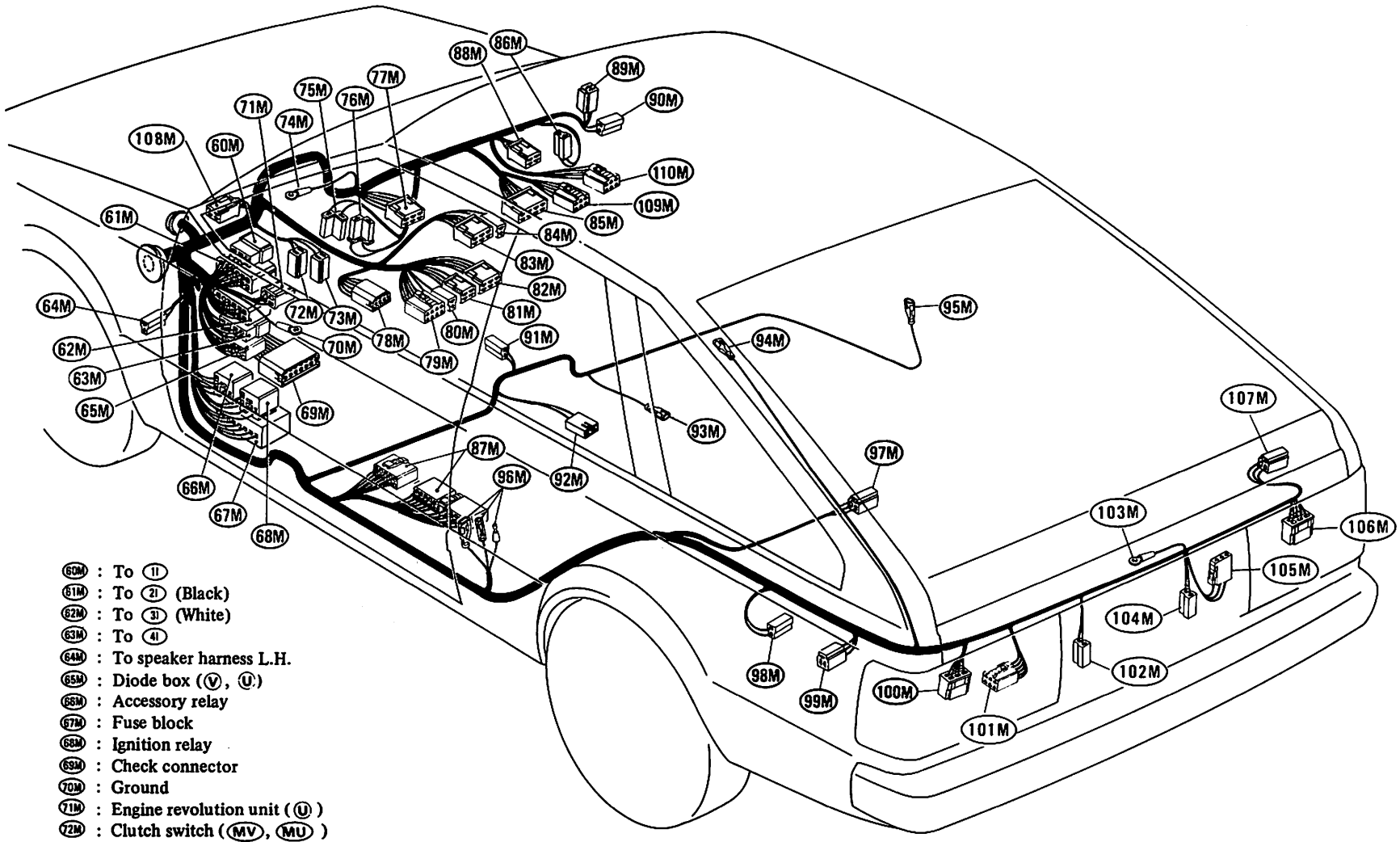
102M : License plate lamp R.H.
103M : Rear combination lamp R.H.
104M : Rear side marker lamp R.H.
105M : Fuel tank gauge unit
106M : Engine revolution relay (Ⓔ)
Mixture relay (Ⓝ except Ⓔ)
107M : E.G.R. control unit (Ⓓ)
108M : Diode (Ⓔ, Ⓝ, Ⓓ)
109M : A/C switch
110M : Thermo control switch (Air conditioner)

111M : Hold relay (EN)

Ⓥ : California models
Ⓤ : U.S.A. models except for California
Ⓝ : Canada models
Ⓔ : M.P.G. models
EN : M.P.G. models for Canada
Ⓐ : A/T models
MV : M/T models for California
MU : M/T models for U.S.A. except for California
Ⓓ : Diesel

SEL729C

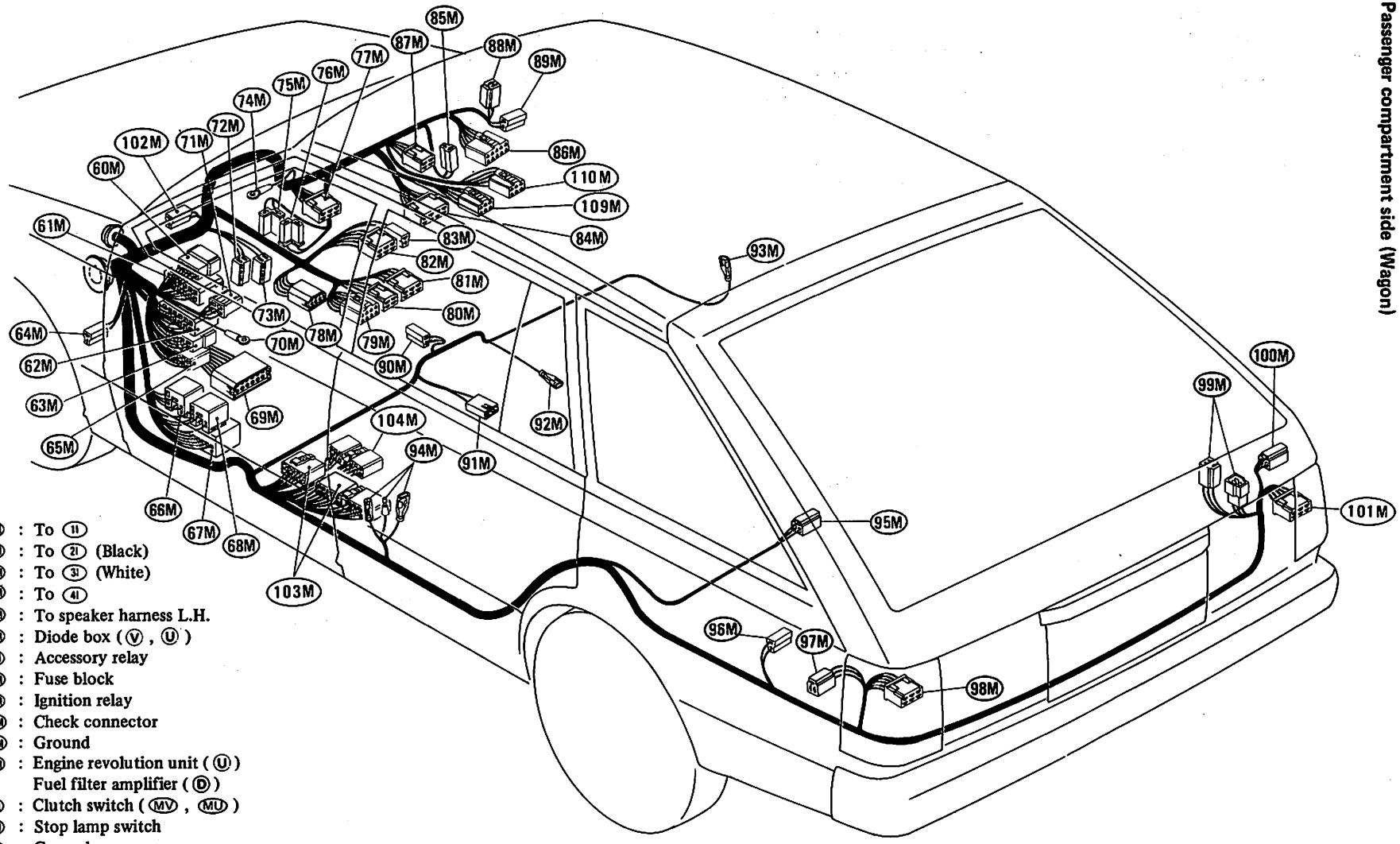
Passenger compartment side (Coupe)



- 60M : To (11)
- 61M : To (21) (Black)
- 62M : To (31) (White)
- 63M : To (41)
- 64M : To speaker harness L.H.
- 65M : Diode box (Ⓥ, Ⓤ)
- 66M : Accessory relay
- 67M : Fuse block
- 68M : Ignition relay
- 69M : Check connector
- 70M : Ground
- 71M : Engine revolution unit (Ⓤ)
- 72M : Clutch switch (MV, MU)
- 73M : Stop lamp switch
- 74M : Ground
- 75M : Hazard flasher unit
- 76M : Turn signal flasher unit
- 77M : Resistor
- 78M : Hazard switch
- 79M : Combination switch (Light)
- 80M : Combination switch (Wiper)
- 81M : Combination switch (Turn)
- 82M : Combination switch (Wiper)
- 83M : Ignition switch
- 84M : Steering lock switch
- 85M : Heater control
- 86M : Blower motor
- 87M : E.C.C. control unit (Ⓥ)
- 88M : To air conditioner harness (Ⓝ)
- 89M : To room lamp harness
- 90M : To speaker harness R.H.
- 91M : A/T indicator lamp (Ⓐ)
- 92M : Seat belt switch
- 93M : Parking brake switch
- 94M : Rear defogger
- 95M : Door switch R.H.
- 96M : Door switch L.H.
- 97M : Fuel tank gauge unit
- 98M : Luggage compartment lamp
- 99M : Rear side marker lamp L.H.
- 100M : Rear combination lamp L.H.
- 101M : Stop and tail lamp sensor
- 102M : License plate lamp L.H.
- 103M : Ground
- 104M : License plate lamp R.H.
- 105M : Back door switch
- 106M : Rear combination lamp R.H.
- 107M : Rear side marker lamp R.H.
- 108M : Diode (Ⓝ)
- 109M : A/C switch
- 110M : Thermo control switch (Air conditioner)

- Ⓥ : California models
- Ⓤ : U.S.A. models except for California
- Ⓝ : Canada models
- Ⓐ : A/T models
- MV : M/T models for California
- MU : M/T models for U.S.A. except for California

Passenger compartment side (Wagon)



60M : To 11
61M : To 21 (Black)
62M : To 31 (White)
63M : To 41
64M : To speaker harness L.H.
65M : Diode box (V, U)
66M : Accessory relay
67M : Fuse block
68M : Ignition relay
69M : Check connector
70M : Ground
71M : Engine revolution unit (U)
Fuel filter amplifier (D)
72M : Clutch switch (MV, MU)
73M : Stop lamp switch
74M : Ground
75M : Hazard flasher unit
76M : Turn signal flasher unit
77M : Resistor
78M : Hazard switch
79M : Combination switch (Light)
80M : Combination switch (Turn)
81M : Combination switch (Wiper)
82M : Ignition switch
83M : Steering lock switch
84M : Heater control
85M : Blower motor

86M : Glow control unit (D)
87M : To air conditioner harness (N)
88M : To room lamp harness
89M : To speaker harness R.H.
90M : A/T indicator lamp
91M : Seat belt switch
92M : Parking brake switch
93M : Door switch R.H.
94M : Door switch L.H.
95M : Fuel tank gauge unit

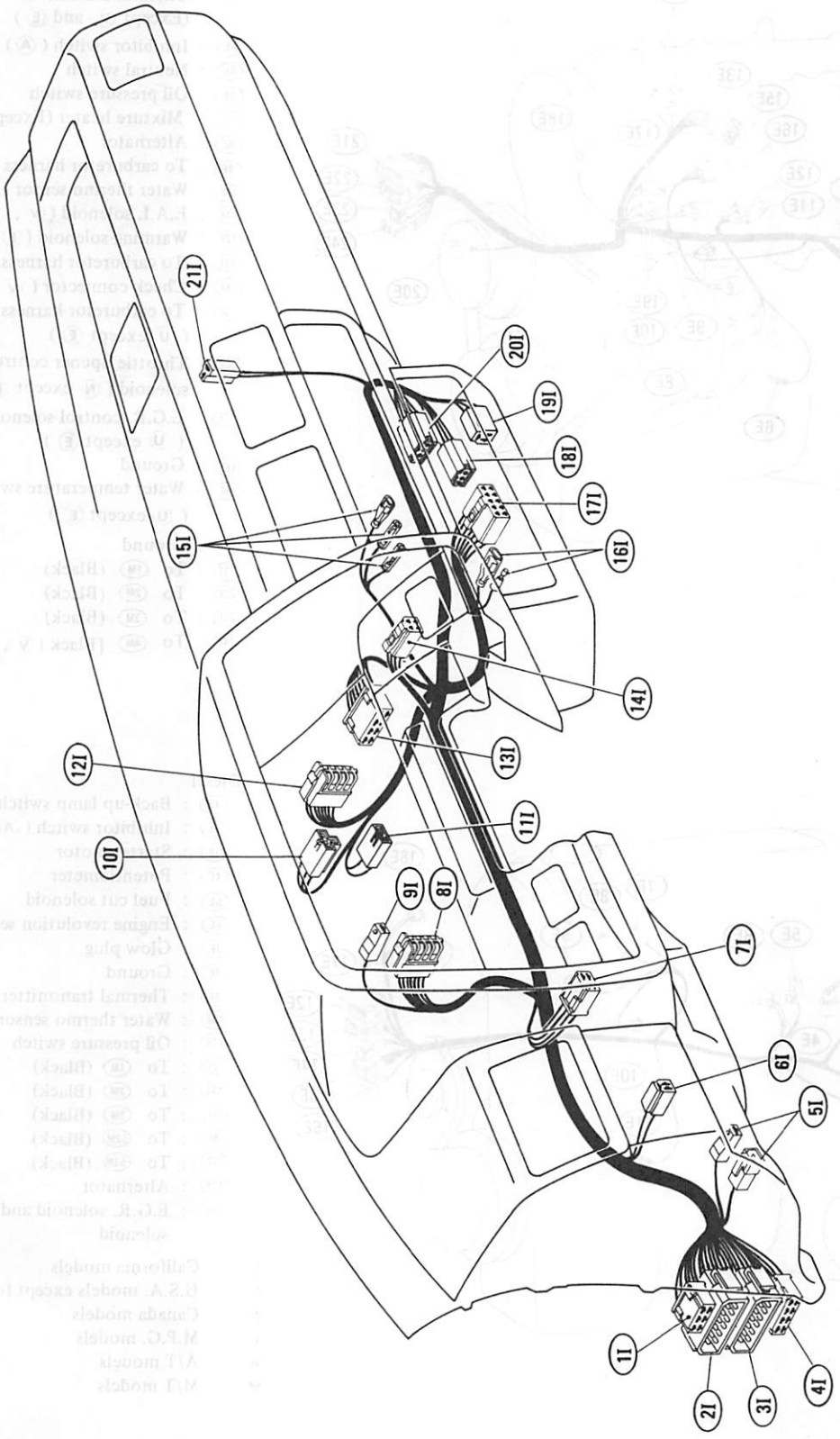
96M : Luggage compartment lamp (Except D)
97M : Rear side marker lamp L.H.
98M : Rear combination lamp L.H.
99M : To back door harness
100M : Rear side marker lamp R.H.
101M : Rear combination lamp R.H.
102M : Diode (N, D)
103M : E.C.C. control unit (V)
104M : E.G.R. control unit (D)
105M : A/C switch

106M : Thermo control switch (Air conditioner)

V : California models
U : U.S.A. models except for California
N : Canada models
MV : M/T models for California
MU : M/T models for U.S.A. except for California
D : Diesel

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INSTRUMENT HARNESS



(1) : To (600)
(2) : To (61M) (Black)
(3) : To (62M) (White)
(4) : To (63M)
(5) : Check joint (Ⓥ, Ⓔ)
(6) : Illumination control rheostat
(7) : Rear defogger switch
(8) : Combination meter
(9) : 30,000 mile switch (Ⓥ, Ⓔ)
(10) : Tachometer (CV, CU)

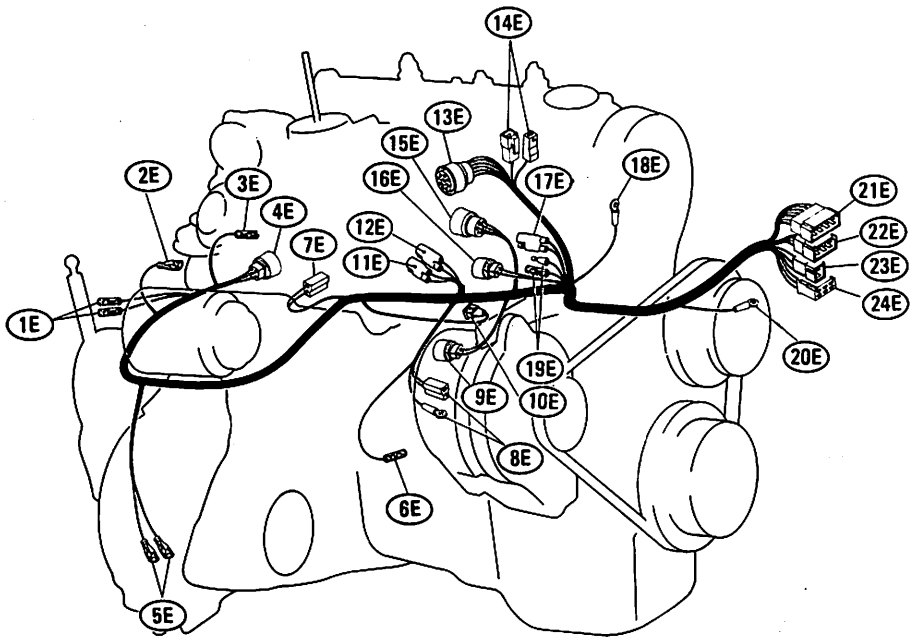
(11) : 10 km/h switch amplifier (Ⓝ)
(12) : Combination meter
(13) : Warning lamp (Except SU and WU)
(14) : Rear wiper and washer switch
(15) : Cigarette lighter
(16) : Stereo
(17) : Radio
(18) : Seat belt timer
(19) : Warning chime
(20) : Clock
(21) : Front speaker

Ⓥ : California models
Ⓝ : Canada models
Ⓔ : M.P.G. models
CV : Coupe for California
CU : Coupe for U.S.A. except for California
SU : Sedan for U.S.A. except for California and M.P.G. models
WU : Wagon for U.S.A. except for California

SEL732C

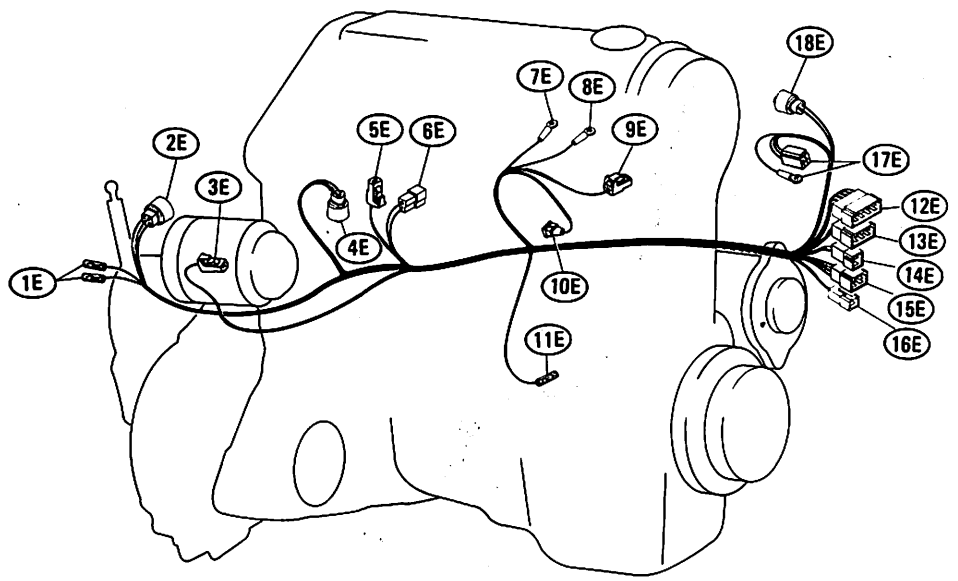
ENGINE HARNESS

Gasoline engine



Gasoline
- 1E : Back-up lamp switch (Ⓜ)
- 2E : Starter motor
- 3E : Thermal transmitter (Except Ⓥ and Ⓔ)
- 4E : Inhibitor switch (Ⓐ)
- 5E : Neutral switch
- 6E : Oil pressure switch
- 7E : Mixture heater (Except Ⓔ)
- 8E : Alternator
- 9E : To carburetor harness (Ⓝ)
- 10E : Water thermo sensor (Ⓥ , Ⓔ)
- 11E : E.A.I. solenoid (Ⓥ , Ⓔ)
- 12E : Warming solenoid (Ⓔ)
- 13E : To carburetor harness (Ⓥ , Ⓔ)
- 14E : Check connector (Ⓥ , Ⓔ)
- 15E : To carburetor harness (Ⓤ except Ⓔ)
- 18E : Throttle opener control solenoid (Ⓝ except Ⓔ)
- 17E : E.G.R. control solenoid (Ⓤ except Ⓔ)
- 18E : Ground
- 19E : Water temperature switch (Ⓤ except Ⓔ)
- 20E : Ground
- 21E : To 1M (Black)
- 22E : To 2M (Black)
- 23E : To 3M (Black)
- 24E : To 4M [Black (Ⓥ , Ⓤ , Ⓔ)]

Diesel engine



Diesel
- 1E : Back-up lamp switch (Ⓜ)
- 2E : Inhibitor switch (Ⓐ)
- 3E : Starter motor
- 4E : Potentiometer
- 5E : Fuel cut solenoid
- 6E : Engine revolution sensor
- 7E : Glow plug
- 8E : Ground
- 9E : Thermal transmitter
- 10E : Water thermo sensor
- 11E : Oil pressure switch
- 12E : To 1M (Black)
- 13E : To 2M (Black)
- 14E : To 3M (Black)
- 15E : To 52M (Black)
- 16E : To 53M (Black)
- 17E : Alternator
- 18E : E.G.R. solenoid and throttle solenoid

- Ⓥ : California models
- Ⓤ : U.S.A. models except for California
- Ⓝ : Canada models
- Ⓔ : M.P.G. models
- Ⓐ : A/T models
- Ⓜ : M/T models

SEL733C

HARNESS DIAGRAM

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

HOW TO READ HARNESS DIAGRAMS

WIRE NUMBER:
For identification, all wires are numbered and generally, numbers are classified by system.

- 100 ~ 199 . . . . Engine electrical system
- 200 ~ 299 . . . . Headlamp system
- 300 ~ 399 . . . . Meter, gauges and Warning system
- 400 ~ 499 . . . . Signal system
- 500 ~ 599 . . . . Accessory system
- 600 ~ 899 . . . . Supplemental numbers
- 900 ~ 999 . . . . Ground wire (Earth)

COLOR:

W . . . . White	LG . . . . Light green
B . . . . . Black	OR . . . Orange
R . . . . . Red	P . . . . . Pink
Y . . . . . Yellow	PU . . . . Purple
G . . . . . Green	GY . . . Gray
L . . . . . Blue	SB . . . . Sky blue
BR . . . . Brown	

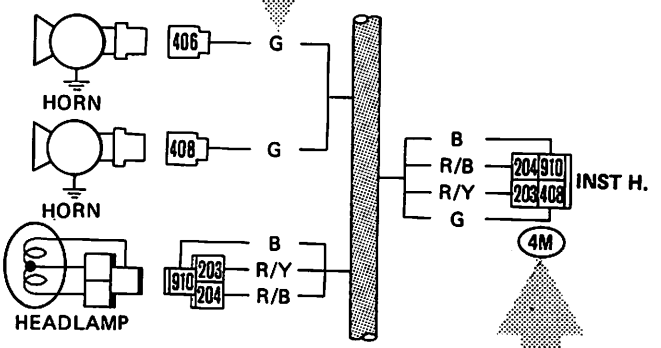
In the case of two-tone color wires, the wire colors are indicated as follows.

- B/R . . . . Black with Red stripe
- L/OR . . . Blue with Orange stripe

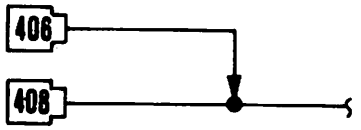
Indicates that No. 406 wire is found only in harness of GL models.

NISSAN
MAIN HARNESS

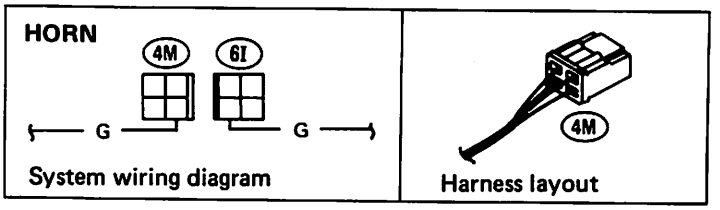
NO.	FROM	TO	REMARKS
203	HEADLAMP	INST H	
204	HEADLAMP	INST H	
406	HORN	408	GL
408	HORN	INST H	
910	HEADLAMP	INST H	



Indicates that No. 406 wire stems from the horn and is connected to No. 408 wire.



For easy identification, connectors indicated in the harness diagrams have the same code numbers as those used in the harness layout and system wiring diagram.



This harness diagram indicates harnesses and connectors to be used with all optional, as well as standard, equipment.

INCH TO METRIC CONVERSION TABLE

(Rounded-off for automotive use)

inches	mm	inches	mm
.100	2.54	.610	15.49
.110	2.79	.620	15.75
.120	3.05	.630	16.00
.130	3.30	.640	16.26
.140	3.56	.650	16.51
.150	3.81	.660	16.76
.160	4.06	.670	17.02
.170	4.32	.680	17.27
.180	4.57	.690	17.53
.190	4.83	.700	17.78
.200	5.08	.710	18.03
.210	5.33	.720	18.29
.220	5.59	.730	18.54
.230	5.84	.740	18.80
.240	6.10	.750	19.05
.250	6.35	.760	19.30
.260	6.60	.770	19.56
.270	6.86	.780	19.81
.280	7.11	.790	20.07
.290	7.37	.800	20.32
.300	7.62	.810	20.57
.310	7.87	.820	20.83
.320	8.13	.830	21.08
.330	8.38	.840	21.34
.340	8.64	.850	21.59
.350	8.89	.860	21.84
.360	9.14	.870	22.10
.370	9.40	.880	22.35
.380	9.65	.890	22.61
.390	9.91	.900	22.86
.400	10.16	.910	23.11
.410	10.41	.920	23.37
.420	10.67	.930	23.62
.430	10.92	.940	23.88
.440	11.18	.950	24.11
.450	11.43	.960	24.38
.460	11.68	.970	24.64
.470	11.94	.980	24.89
.480	12.19	.990	25.15
.490	12.45	1.000	25.40
.500	12.70	2.000	50.80
.510	12.95	3.000	76.20
.520	13.21	4.000	101.60
.530	13.46	5.000	127.00
.540	13.72	6.000	152.40
.550	13.97	7.000	177.80
.560	14.22	8.000	203.20
.570	14.48	9.000	228.60
.580	14.73	10.000	254.00
.590	14.99	20.000	508.00
.600	15.24		

METRIC TO INCH CONVERSION TABLE

(Rounded-off for automotive use)

mm	inches	mm	inches
1	.0394	51	2.008
2	.079	52	2.047
3	.118	53	2.087
4	.157	54	2.126
5	.197	55	2.165
6	.236	56	2.205
7	.276	57	2.244
8	.315	58	2.283
9	.354	59	2.323
10	.394	60	2.362
11	.433	61	2.402
12	472	62	2.441
13	.512	63	2.480
14	.551	64	2.520
15	.591	65	2.559
16	.630	66	2.598
17	.669	67	2.638
18	.709	68	2.677
19	.748	69	2.717
20	.787	70	2.756
21	.827	71	2.795
22	.866	72	2.835
23	.906	73	2.874
24	.945	74	2.913
25	.984	75	2.953
26	1.024	76	2.992
27	1.063	77	3.031
28	1.102	78	3.071
29	1.142	79	3.110
30	1.181	80	3.150
31	1.220	81	3.189
32	1.260	82	3.228
33	1.299	83	3.268
34	1.339	84	3.307
35	1.378	85	3.346
36	1.417	86	3.386
37	1.457	87	3.425
38	1.496	88	3.465
39	1.535	89	3.504
40	1.575	90	3.543
41	1.614	91	3.583
42	1.654	92	3.622
43	1.693	93	3.661
44	1.732	94	3.701
45	1.772	95	3.740
46	1.811	96	3.780
47	1.850	97	3.819
48	1.890	98	3.858
49	1.929	99	3.898
50	1.969	100	3.937

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ENGINE TUNE-UP DATA E15 & E16

	U.S.A.		CANADA		
	Except M.P.G.		M.P.G.	Except M.P.G.	
	Manual Transmission	Automatic Transmission	Manual Transmission	M/T	A/T
Engine model	E16		E15	E16	
Firing order	1-3-4-2				
Ignition timing/Idle speed (A-T.D.C. degree/rpm)	5±2°/750±50*1	5±2°/650±50*1 (in "D" position)	2±2°/700±50*1	5±2°/750±50*1	5±2°/650±50*1 (in "D" position)
"CO" % at idle speed	Idle mixture screw is preset and sealed at factory			2±1	2±1 (in "D" position)
Valve clearance (Hot) mm (in) Intake	0.28 (0.011)				
Valve clearance (Hot) mm (in) Exhaust	0.28 (0.011)				
Drive belt deflection (Cold)	Used*2		New*3		
Alternator mm (in)	13 - 17 (0.51 - 0.67)		10 - 14 (0.39 - 0.55)		
Air conditioner mm (in)	9 - 11 (0.35 - 0.43)		7 - 9 (0.28 - 0.35)		
Power steering mm (in)	7 - 9 (0.28 - 0.35)		6.5 - 8.5 (0.256 - 0.335)		
Pushing force N (kg, lb)	98 (10, 22)				
Engine compression pressure kPa (kg/cm², psi)/rpm Standard	1,245 (12.7, 181)/350				
Engine compression pressure kPa (kg/cm², psi)/rpm Minimum	981 (10.0, 142)/350				
Spark plug Type	BPR5ES-11		BPR5ES		
Spark plug Gap mm (in)	1.0 - 1.1 (0.039 - 0.043)		0.8 - 0.9 (0.031 - 0.035)		
Tightening torque	N-m	kg-m	ft-lb		
Valve rocker adjusting nut	16 - 21	1.6 - 2.1	12 - 15		
Oil pan drain plug	35 - 47	3.6 - 4.8	26 - 35		
Spark plug	20 - 29	2.0 - 3.0	14 - 22		

*1: Measure with distributor vacuum hose disconnected and vacuum hose plugged up.
*2: Adjust deflection of used belt
*3: Set deflection of new belt

ENGINE TUNE-UP DATA CD17

Engine model			CD17	
Firing order			1-3-4-2	
Idle speed rpm		M/T	750 +100 −50	
Idle speed rpm		A/T	750 +100 −50 (in "D" position)	
Plunger lift mm (in)	For low altitudes	M/T	0.94±0.03 (0.0370±0.0012)	
Plunger lift mm (in)	For low altitudes	A/T	0.88±0.03 (0.0346±0.0012)	
Plunger lift mm (in)	For high altitudes	M/T	1.00±0.03 (0.0394±0.0012)	
Plunger lift mm (in)	For high altitudes	A/T	0.94±0.03 (0.0370±0.0012)	
Valve clearance (Hot) mm (in)		Intake	0.20 - 0.30 (0.008 - 0.012)	
Valve clearance (Hot) mm (in)		Exhaust	0.40 - 0.50 (0.016 - 0.020)	
Drive belt deflection (Cold)			Adjust deflection of used belt	Set deflection of new belt
Fan, Alternator mm (in)			9 - 11 (0.35 - 0.43)	11 - 12 (0.43 - 0.47)
Air conditioner compressor mm (in)			11 - 13 (0.43 - 0.51)	12 - 14 (0.47 - 0.55)
Applied pressed force N (kg, lb)			98 (10, 22)	
Radiator cap relief pressure kPa (kg/cm², psi)			88 (0.9, 13)	
Cooling system leakage testing pressure kPa (kg/cm², psi)			157 (1.6, 23)	
Compression pressure kPa (kg/cm², psi)/rpm		Standard	3,138 (32, 455)/200	
Compression pressure kPa (kg/cm², psi)/rpm		Minimum	1,961 (20, 284)/200	
Tightening torque			N-m	kg-m	ft-lb
Cylinder head			99 - 108	10 - 11	72 - 80
Manifold bolt and nut			18 - 22	1.8 - 2.2	13 - 16

BRAKE

Unit: mm (in)

Disc brake Pad minimum thickness	2.0 (0.079)
Rotor repair limit Run out	Less than 0.07 (0.0028)
Parallelism circumferential direction	Less than 0.03 (0.0012)
Minimum thickness	10.0 (0.394)*1 16.0 (0.630)*2
Drum brake Lining minimum thickness	1.5 (0.059)
Drum repair limit Maximum inner diameter	181 (7.13)*1 204.5 (8.05)*2
Radial runout	Less than 0.05 (0.0020)
Out-of-roundness	Less than 0.03 (0.0012)
Taper	Less than 0.04 (0.0016)

*1: Gasoline model
*2: Diesel model

CLUTCH PEDAL

Unit: mm (in)

Height	194 - 204 (7.64 - 8.03)
Free travel	11 - 21 (0.43 - 0.83)

WHEEL ALIGNMENT (Unladen*)

Camber	degree	−35' - 1°05'		
Caster	degree	45' - 2°15'		
Toe-in	mm (in)	3 - 5 (0.12 - 0.20)		
	degree	9' - 15' (On both sides)		
Turning angle	degree	E15 & E16	CD17 M/T	CD17 A/T
Toe-out-turns (Inside/Outside)		20°/17°30'		
Inside		40° - 44°	37° - 41°	33° - 37°
Outside		31° - 35°	29° - 33°	27° - 31°

*: Tankful of fuel, radiator coolant and engine oil full. Spare tire, jack, band tools, mats in designed position.

REAR WHEEL BEARING

Tightening torque	N-m (kg-m, ft-lb)	39 - 44 (4.0 - 4.5, 29 - 33)
Return angle	degree	90°

WHEEL AND TIRE

Tire size	155SR13	175/70SR13	P155/80D13
Inflation pressure*1 psi (kPa)	28 (200)*2, 26 (180)	26 (180)	35 (240)
Wheel nut tightening torque N-m (kg-m, ft-lb)	78 - 98 (8 - 10, 58 - 72)		

*1: Tire pressure should be checked when tires are COLD.
*2: Only front wheels of E15 and CD17 equipped model.

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