

DATSUN 280ZX

Model S130 Series

FOREWORD

This service manual has been prepared primarily for the purpose of assisting service personnel in providing effective service and maintenance of the 1982 DATSUN 280ZX.

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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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 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 L4W2T7
- ▶ 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 Transmission, Automatic Transmission	
- ▶ 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.

FOREWORD

This product bulletin has been prepared to provide information necessary for smooth and efficient service activities on the DATSUN 1982 280ZX models. Please read this bulletin thoroughly in order to gain a proper understanding of the features, specifications and mechanism of this new model.

In this bulletin, emphasis is placed on the description of those points that have been changed or modified from the DATSUN 1981 former models.

The descriptions and specifications contained in this bulletin are based on the vehicle at the time it newly entered production.

Rights for alteration of specifications at any time are reserved.

The new DATSUN 280ZX model entered production starting with the following vehicle identification numbers (VIN):

JN1HZ06S□CX420001 (Non-turbo, 2+2 seater)

JN1HZ04S□CX430001 (Non-turbo, 2 seater)

JN1CZ06S□CX600001 (Turbo, 2+2 seater)

JN1CZ04S□CX620001 (Turbo, 2 seater)

□: Check digit (0 to 9 or X)

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OUTLINE

To enhance the value of the 1982 S130 series, the model variation has been modified, the steering stability has been improved and various equipment/accessories have been substantially increased.

Major features of the new S130 series are summarized below:

For items indicated by an asterisk "*", see the detailed explanations given in this Product Bulletin.

MODEL VARIATION

- The turbocharged L28ET engine family has been expanded by the addition of a 2+2 seater model and a manual transmission model.
- The specifications for the emission systems and vehicles have been consolidated for both California and Federal models.

ENGINE

L28E ENGINE

ENGINE FUEL SYSTEM

- *• To comply with the high altitude regulation, a high altitude compensator circuit has been installed on the Federal model.
- *• To increase performance reliability, the drive system of the fuel pump has been modified.
- To increase fuel economy, the electric power required to activate the fuel injector has been lowered.
- To improve the cold engine starts, the rate of fuel enrichment immediately after engine starts is now controlled in two stages depending upon engine coolant temperature.

ENGINE ELECTRICAL SYSTEM

Distributor

- *• A phase control circuit has been built into the ignitor to simplify the operation of the ignition timing control system and increase performance.

L28ET ENGINE

ELECTRONIC CONCENTRATED ENGINE CONTROL SYSTEM (E.C.C.S.)

- *• A module signal has been utilized to control the fuel pump operation.
- A function to control the current flow through the fuel injector has been added.

Distributor

- *• A crank angle sensor has been built into the distributor to reduce weight and improve servicing.

CHASSIS

MANUAL TRANSMISSION

- *• The 5-speed manual transmission FS5R90A is used with the L28ET turbocharged engine. (This transmission is manufactured by Borg-Warner in the U.S.A. and designated as the T-5 model.)

FRONT AXLE AND SUSPENSION

The basic construction is the same as the McFarson strut suspension design; however, the following modifications have been made to increase the straight-ahead driving stability and steering performance:

- The damping force of the strut has been increased.
- On the turbo model, the spring constant has been increased.
- On the non-turbo model, the diameter of the stabilizer bar has been enlarged.

REAR AXLE AND SUSPENSION

The basic semi-trailing arm suspension design has been retained. To stabilize the steering performance, however, the following modifications have been made:

- The damping force of the shock absorber has been increased.
- The spring constant has been revised.

DRIVE SHAFT

- The 2+2 seater models used constant-speed drive shaft.

BRAKES

- The front and rear disc brakes are now equipped with an audible wear indicator.
- The "fist" rear disc brake design has been adopted. Its basic construction is the same as that used with the 1982 Datsun 200SX series.
- The master cylinder with a single reservoir tank has been unitized. Its basic structure is the same as that used in the Datsun 810 series.

STEERING SYSTEM

The rack and pinion type power steering is standard equipment on all models except Deluxe models.

WHEEL AND TIRE

The P205/70R14 radial tire has been adopted on non-turbo models equipped with T-bar roofs.

REAR ENGINE MOUNT MEMBER

*To accommodate the FS5R90A transmission (manufactured as the T-5 model by Borg-Warner in the U.S.A.), the rear engine mount member has been redesigned.

ENGINE COOLING SYSTEM

To provide sufficient capacity of the reservoir tank under severe operating conditions (such as high speed highway driving), a sub-reservoir tank has been added on turbo models.

BODY

- The side window remote control system is available as optional equipment on the 2+2-seater model. Its basic design is the same as that used in the Datsun 310 series.
- A 4-way head restraint, which can be adjusted both vertically and horizontally, has been used on the GL model. (In the former design, only the vertical adjustment could be made.) Its basic design is the same as that used in the Datsun 200SX series.

BODY ELECTRICAL

- *• Power supply routing, fuse capacity and load distribution have been modified to increase safety.
- The auto-fuse design has been adopted to increase performance reliability and facilitate servicing.
- A voice warning system is available as optional equipment on the GL model. Its basic design is the same as the Datsun 810 series'.
- The battery warning display has been eliminated because of the adoption of a maintenance free battery.
- A door edge warning light has been added.
- *• An illuminated entry system has been adopted on the GL model.
- *• A power door lock system has also been adopted on the GL model.
- The same resume-accelerate function which is utilized in the Datsun 810 series has been added to the A.S.C.D. system.

- On turbo models, a vacuum pump and vacuum tank are used in the A.S.C.D. system as the vacuum pressure source.
- A cassette deck equipped with Dolby noise reduction is available as an option.
- A radio with an ambience control is available as an option.

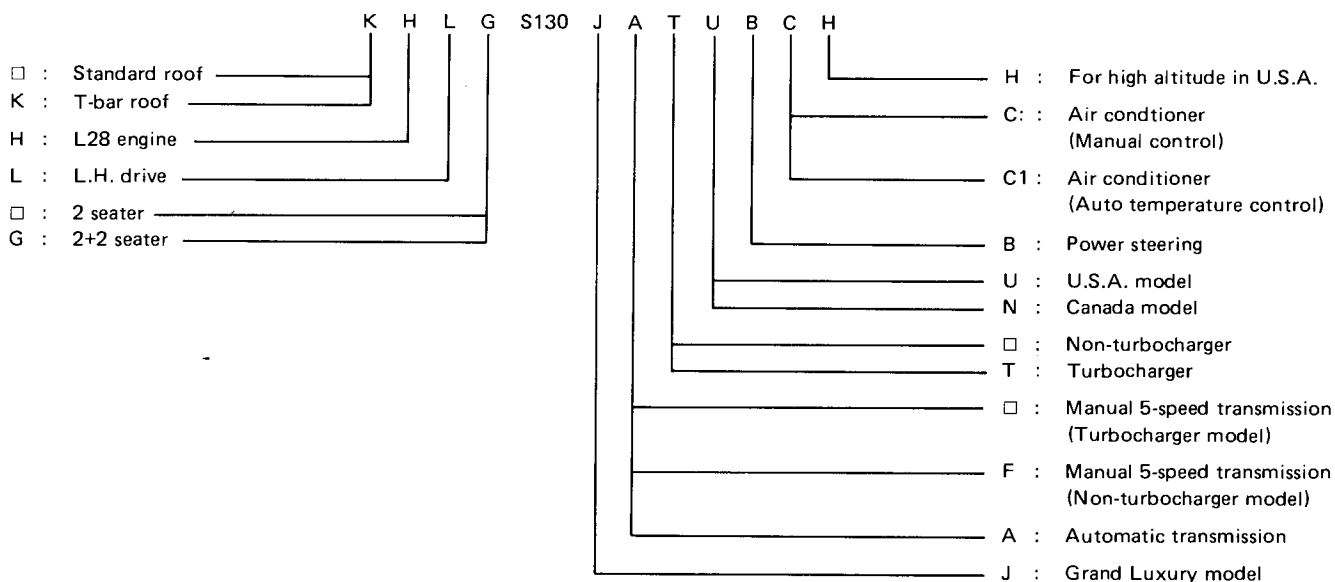
MODEL VARIATION

Desti- nation	Model		Engine	Transmission	Differential carrier	Road wheel size ... offset mm (in)	Tire size	
U.S.A.	2 seater	HLS130FU	L28E	FS5W71B	R180	5-1/2JJ-14 ... 15 (0.59)	195/70HR14	
		HLS130JFU			R200	6JJ-14*2 ... 10 (0.39)		
		HLS130JAU		3N71B	R180			
	T-bar roof	KHLS130JFU		FS5W71B	R200		P205/70R14	
		KHLS130JAU		3N71B	R180			
	Turbo	KHLS130JTU	L28ET	FS5R90A*1	R200	6JJ-15*2 ... 10 (0.39)	P205/60R15	
		KHLS130JATU	L28ET	3N71B				
	2+2 seater	HLGS130JFU	L28E	FS5W71B	R180	6JJ-14*2 ... 10 (0.39)	195/70HR14	
		HLGS130JAU		3N71B				
		T-bar roof		KHLGS130JFU	FS5W71B		R200	P205/70R14
				KHLGS130JAU	3N71B		R180	
		Turbo	KHLGS130JTU	L28ET	FS5R90A*1	R200	6JJ-15*2 ... 10 (0.39)	P205/60R15
	KHLGS130JATU		3N71B					
Canada	2 seater	HLS130FN	L28E	FS5W71B	R180	5-1/2JJ-14 ... 15 (0.59)	195/70HR14	
		T-bar roof			KHLS130FN	R200		6JJ-14*2 ... 10 (0.39)
	KHLS130JFN				R180			
	Turbo			KHLS130JAN	3N71B	R200	6JJ-15*2 ... 10 (0.39)	P205/60R15
		KHLS130JTN	L28ET	FS5R90A*1				
	2+2 seater	T-bar roof	KHLS130JATN	L28ET	3N71B	R180	6JJ-14*2 ... 10 (0.39)	195/70HR14
			KHLGS130JFN	L28E	FS5W71B			
			KHLGS130JAN		3N71B	R200	6JJ-15*2 ... 10 (0.39)	P205/60R15
		Turbo	KHLGS130JTN	L28ET	FS5R90A*1			
			KHLGS130JATN		3N71B			

*1: Borg-Warner T-5 manual transmission

*2: Aluminum wheel (2-piece type)

Prefix and suffix designations



GENERAL SPECIFICATIONS

Item				Car model	2 seater				2+2 seater			
				Engine model	L28E		L28ET		L28E		L28ET	
				Destination	U.S.A.	Canada	U.S.A.	Canada	U.S.A.	Canada	U.S.A.	Canada
Weight	Curb weight *1	M/T	kg (lb)	1,291 (2,846)		1,318 (2,907)		1,339 (2,952)		1,366 (3,013)		
		A/T	kg (lb)	1,282 (2,828)		1,323 (2,917)		1,329 (2,930)		1,370 (3,020)		
Battery	Model			N60MF	N70Z-MF	N60MF	N70Z-MF	N60MF	N70Z-MF	N60MF	N70Z-MF	
	Capacity			V-AH	12-60	12-70	12-60	12-70	12-60	12-70	12-60	12-70
Clutch	Disc model			225CBL		240TBL						
	Cover	Model		C225S		C240S						
		Full load	N (kg, lb)	5,394 (550, 1,213)		5,884 (600, 1,323)		4,904 (500, 1,103)		5,884 (600, 1,323)		
Manual transmission	Model			FS5W71B		FS5R90A (Borg-Warner T-5)		FS5W71B		FS5R90A (Borg-Warner T-5)		
	Gear ratio	1st		3.062		3.500		3.062		3.500		
		2nd		1.858		2.144		1.858		2.144		
		3rd		1.308		1.356		1.308		1.356		
		4th		1.000		1.000		1.000		1.000		
		5th		0.745		0.780		0.745		0.780		
		Rev.		3.026		3.393		3.026		3.393		
Brake system	Type-model	Front	Disc-CL28V									
		Rear	Disc-CL 14H									
	Master cylinder inner diameter mm (in)			23.8 (15/16)								
	Brake booster model			M90								
	Pressure control type			NP-valve								
	Parking brake type			Mechanically operated on rear wheel								
Wheel and tire	Road wheel	Size	6-JJx14 (Aluminum) 5-1/2-JJx14 (Steel)*2		6-JJx15 (Aluminum)		6-JJx14 (Aluminum)		6-JJx15 (Aluminum)			
		Offset mm (in)	10 (0.39) 15 (0.59)*2		10 (0.39)							
	Tire size			195/70HR14 P205/70R14*3	195/70HR14	P205/60R15		195/70HR14 P205/70R14*3	195/70HR14	P205/60R15		

*1: Values are the max. weight in each model variation.

*2: Deluxe models





*3: T-bar roof models

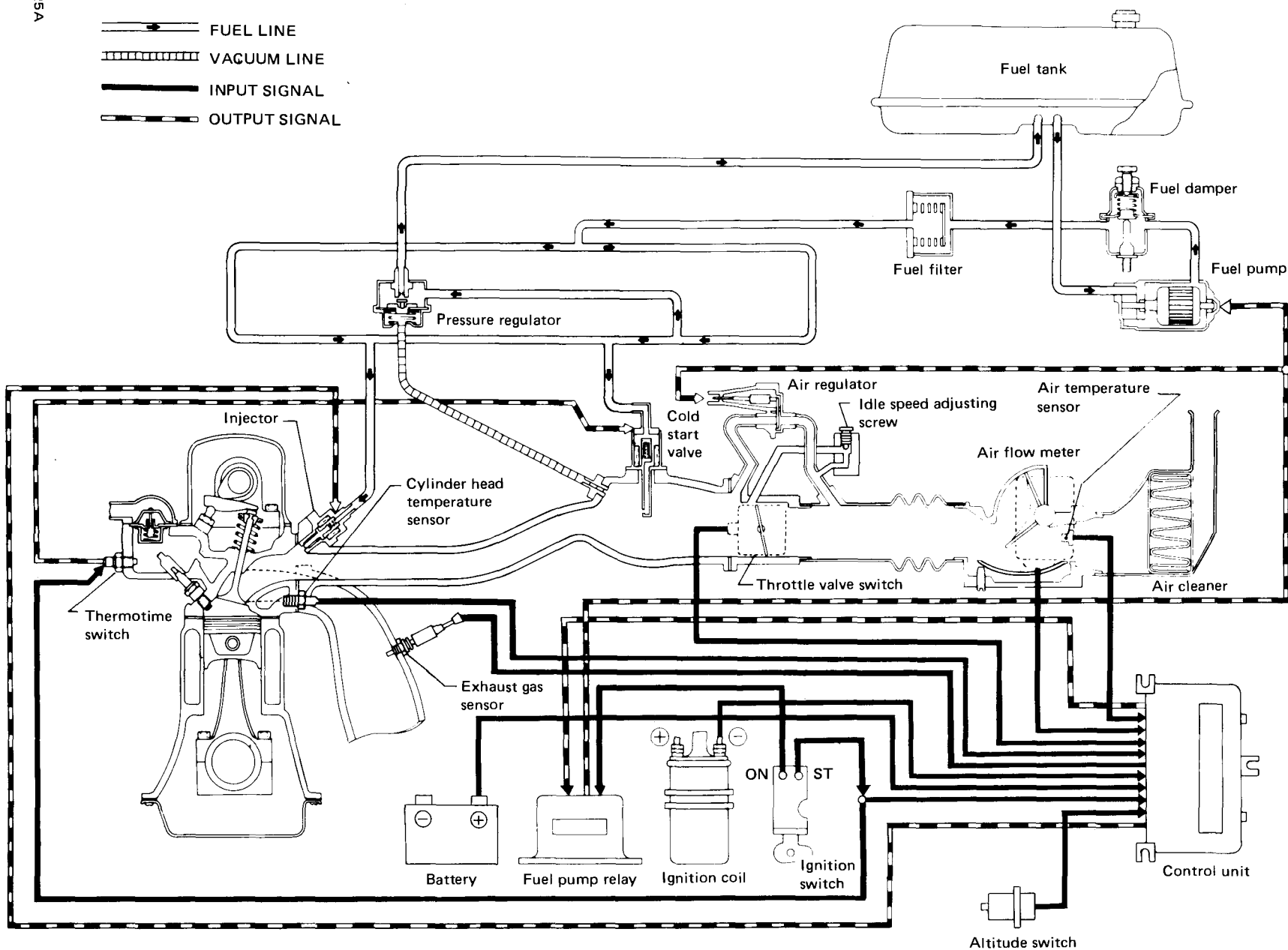
Item		Car model	2 seater				2+2 seater			
		Engine model	L28E		L28ET		L28E		L28ET	
		Destination	U.S.A.	Canada	U.S.A.	Canada	U.S.A.	Canada	U.S.A.	Canada
Steering system	Manual	Type	Rack and pinion		—					
		Model	RP15L		—					
	Power	Type	Rack and pinion, Integral power steering							
		Model	IPRP15L							

L28E ENGINE

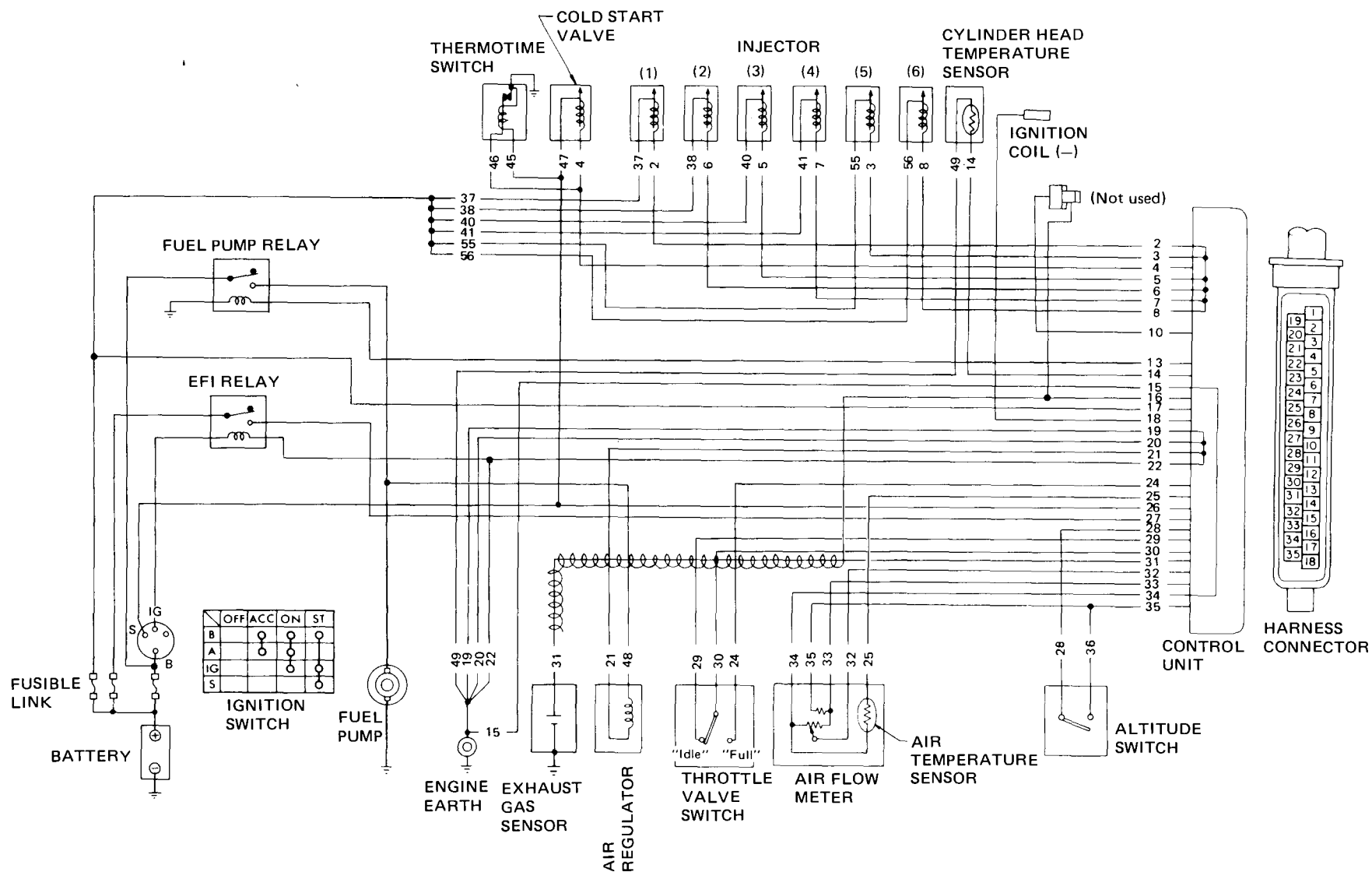
ENGINE FUEL SYSTEM E.F.I. SYSTEM DIAGRAM

SEE 325A

-  FUEL LINE
-  VACUUM LINE
-  INPUT SIGNAL
-  OUTPUT SIGNAL



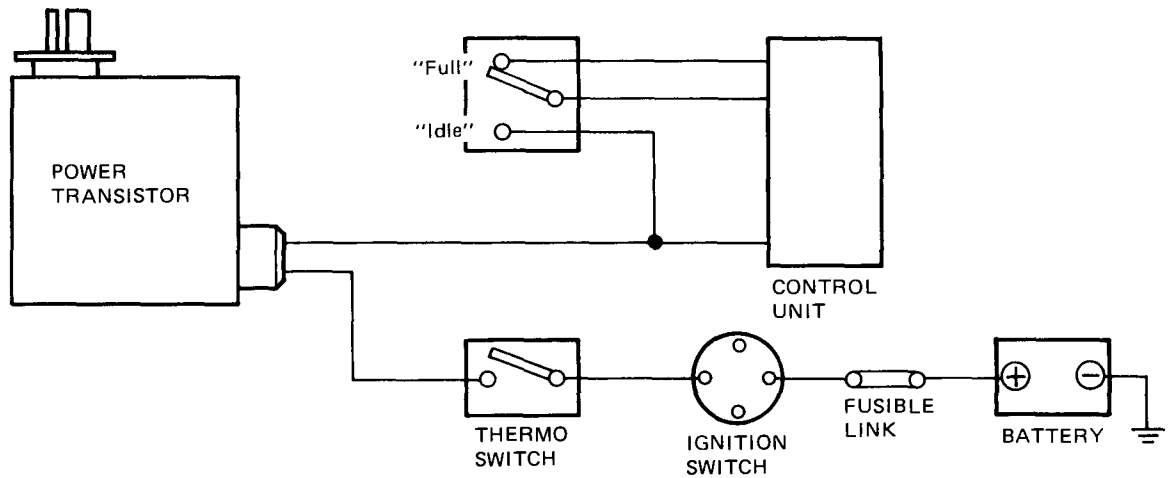
E.F.I. CIRCUIT DIAGRAM



ENGINE ELECTRICAL

DISTRIBUTOR

A phase control circuit, which advances the ignition timing at a definite angle in response to an idle signal or water temperature signal, has been added to the power transistor. The advance characteristics of the vacuum and governor remain unchanged.



Operational modes

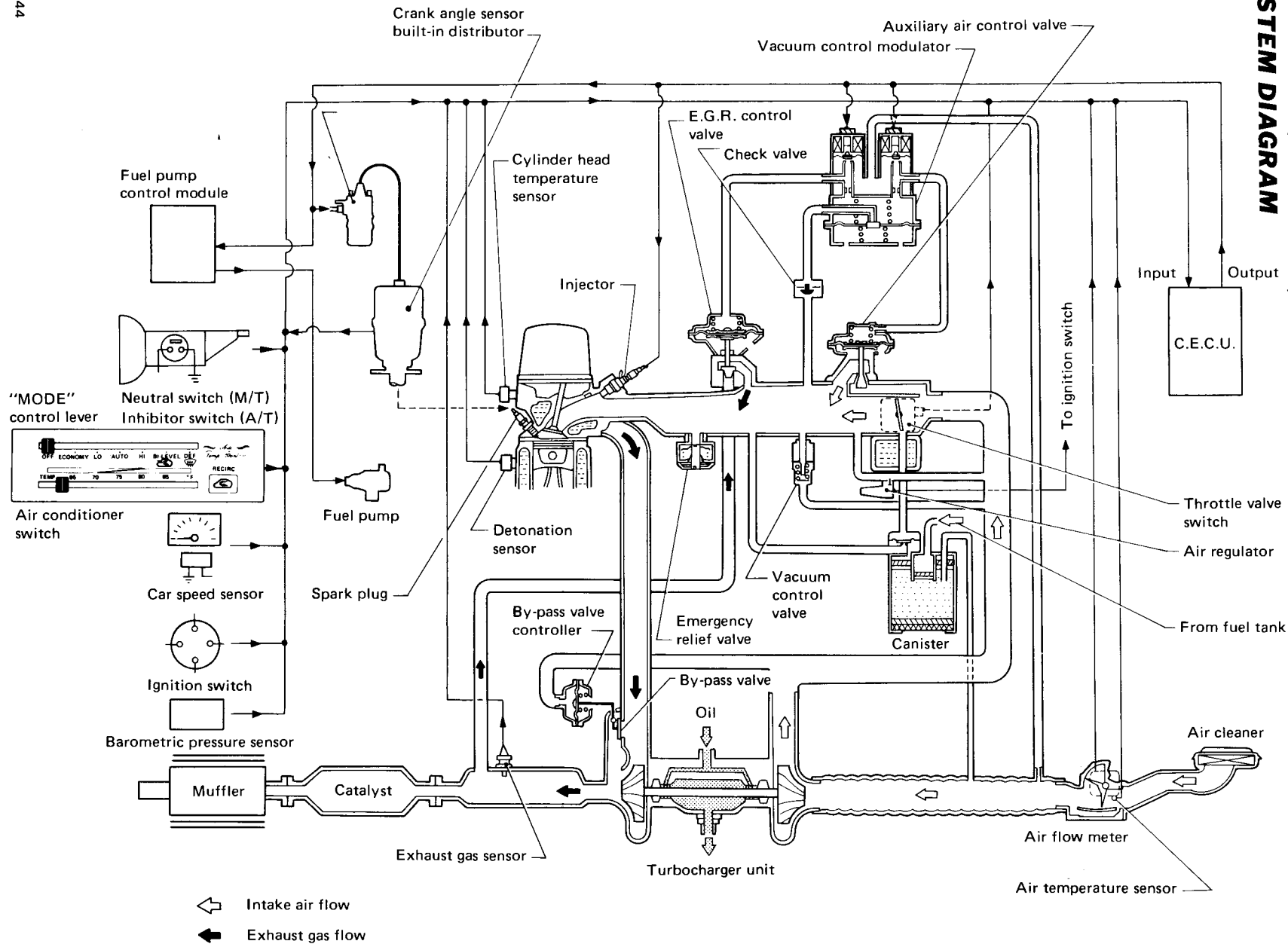
Idle switch	Thermo switch	Advance (distributor) angle
OFF	OFF	0°
OFF	ON	5°
ON	OFF	5°
ON	ON	5°

Idle switch "ON": When engine idles

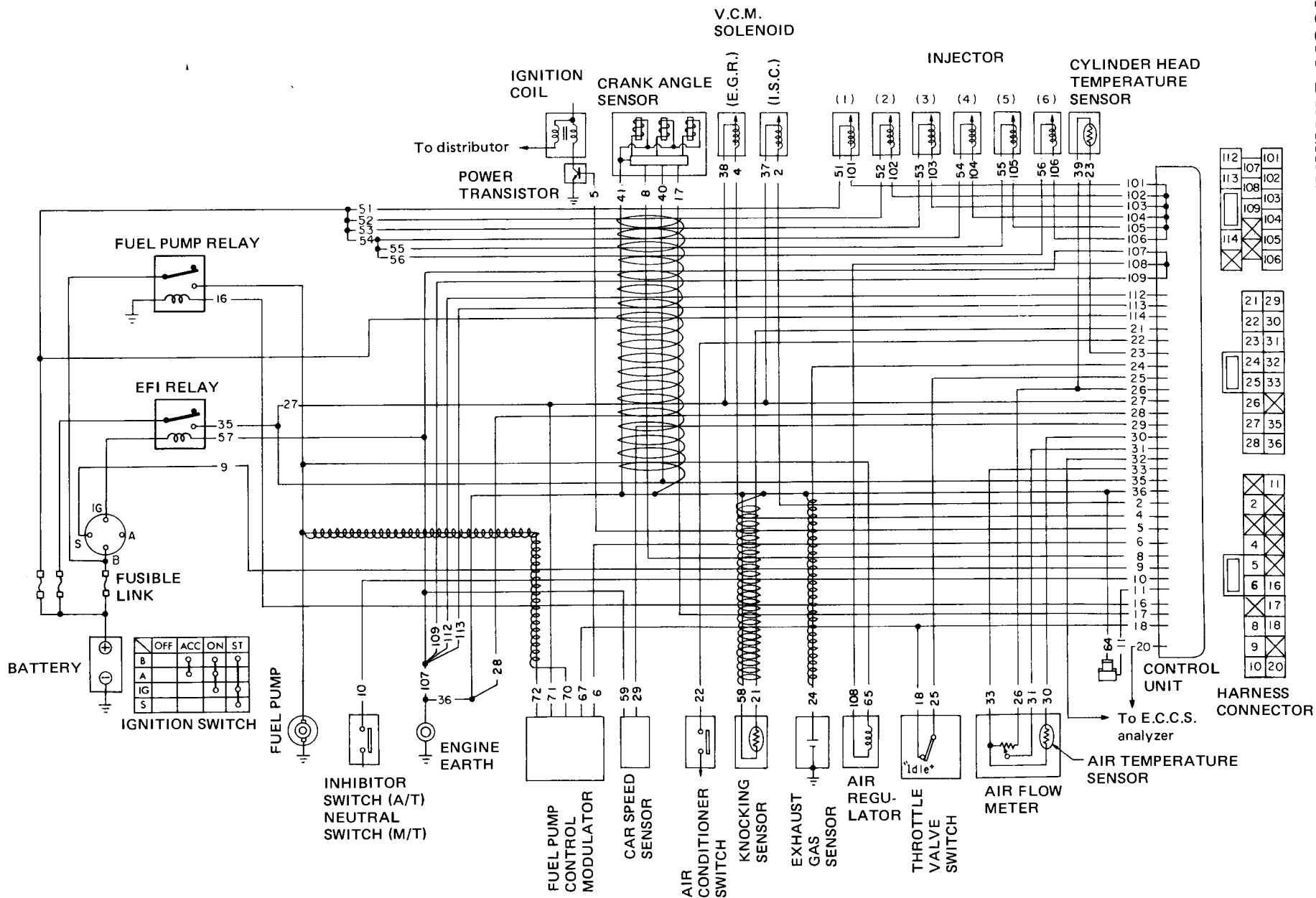
Thermo switch "ON": When engine coolant temperature is below 35° C (95° F)

L28ET ENGINE

ELECTRONIC CONCENTRATED ENGINE CONTROL SYSTEM (E.C.C.S.) SYSTEM DIAGRAM

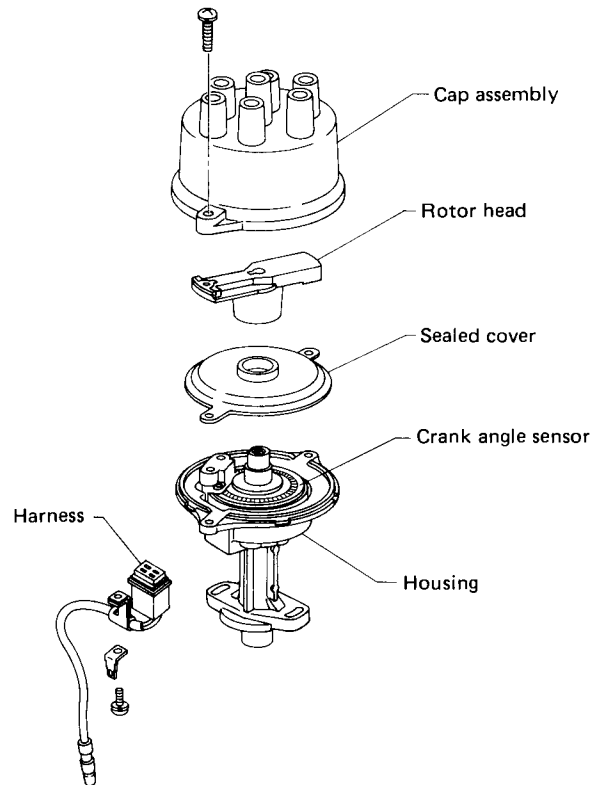


CIRCUIT DIAGRAM



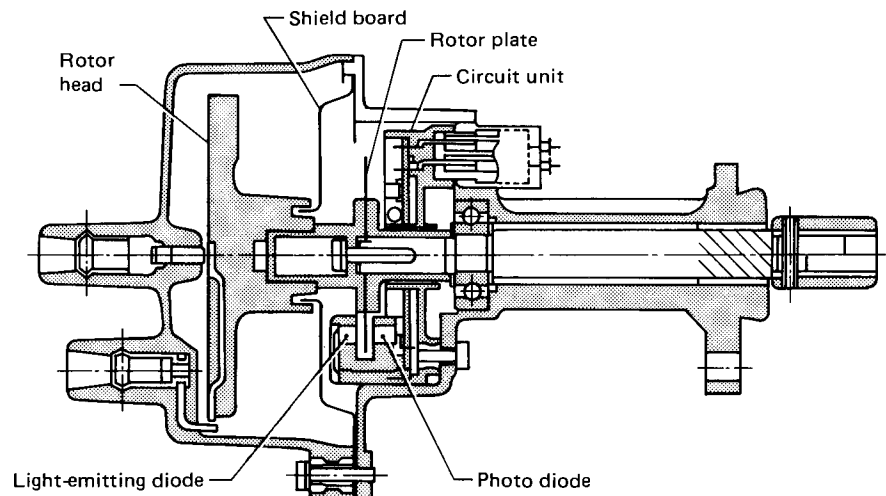
DISTRIBUTOR

- A crank angle sensor has been built into the distributor.
- The engagement method used to rotate the drive shaft has been changed to an involute spline design to reduce the backlash and to increase its accuracy.
- A photo-electric pickup of the crankangle sensor has replaced the electric-magnetic design resulting in a stabilized, highly accurate signal which is not affected by magnetic disturbance.



CRANK ANGLE SENSOR

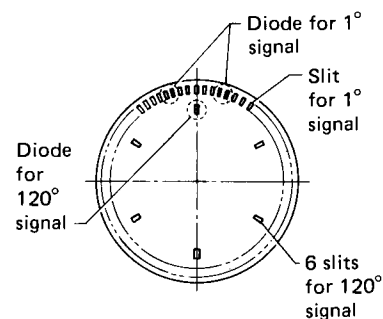
In the signal process circuit, the rotor plate which is fixed to the shaft is placed between a light-emitting diode and a light-receiving diode inside the distributor housing.



Structure of the distributor

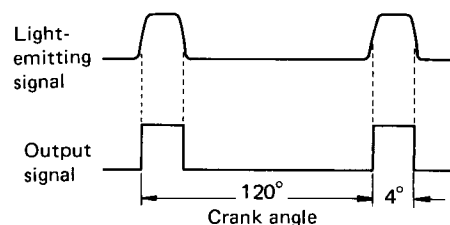
ROTOR PLATE

The rotor plate has six slits used for cylinder detection (120° signal) and three hundred and sixty slits used for crank angle detection (1° signal). The light-emitting diode is located over the plate in which the slits are arranged circumferentially while the light-receiving diode is located on the lower side.



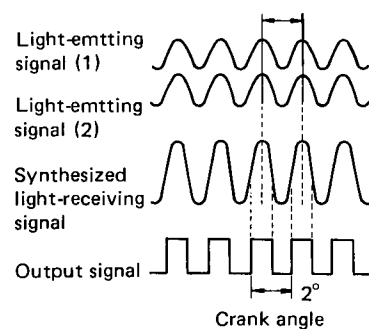
OPERATION

The light-receiving diode is a photo-electric cell which produces an electromotive force when it receives light from the light-emitting diode. When the engine is in operation, the rotor plate continues to rotate. As the light passes through the slits of the rotor plate and hits the light-receiving diode, the electromotive force is produced as an output signal source to the control unit.



Two diodes are used to detect the crank angle. They are activated synchronously to ensure a high degree of accuracy.

Signal used to detect cylinder



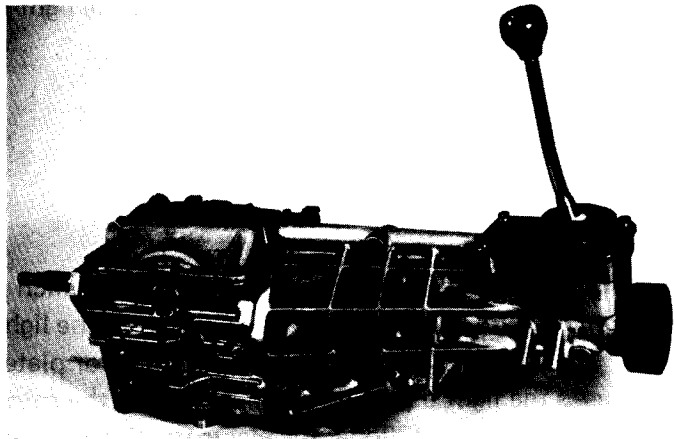
Signal used to detect the crank angle

CHASSIS

FS5R90A (Borg-Warner T-5) MANUAL TRANSMISSION

FS5R90A Transmission

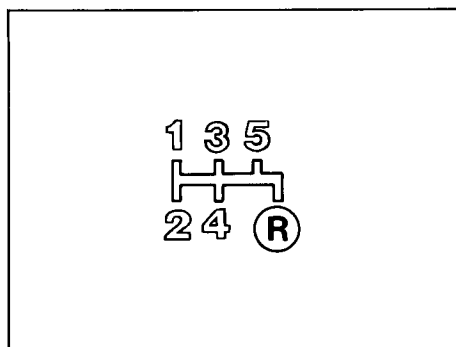
A 5-speed manual transmission has been adopted for Turbocharged 280ZX models.



SPECIFICATIONS AND SERVICE INFORMATION

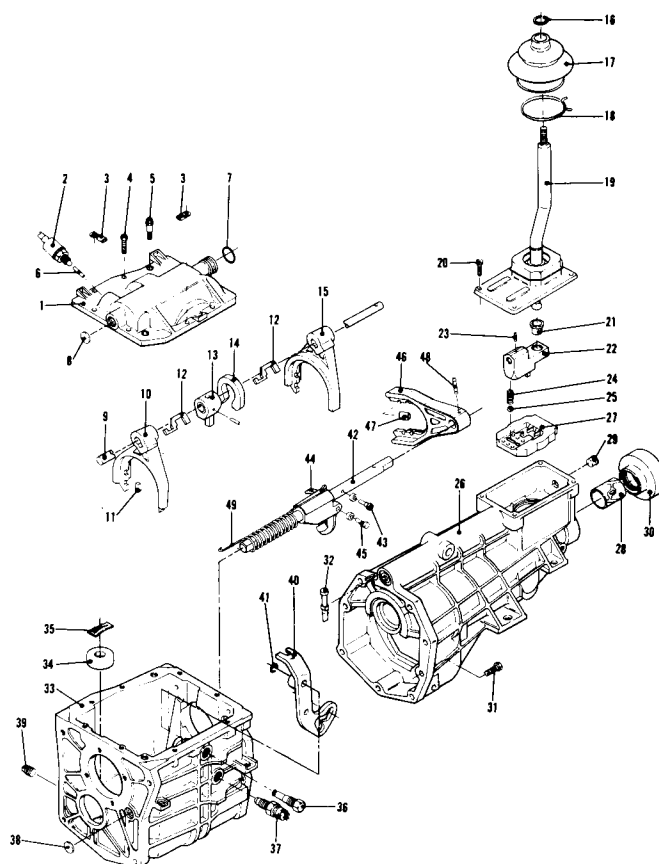
Type of transmission	FS5R90A (Borg-Warner T-5 Transmission made in U.S.A.)
Number of forward speeds	5
Weight (dry)	Approximately 33 kg (72 lbs)
Construction materials	Alloy steel — gears, bearings, shafts Aluminum alloy — case, extension housing, front bearing retainer, shift cover, shift forks (except reverse)
Bearing types	Tapered roller — input and mainshafts Straight roller — countershaft
Synchromesh type	Warner
Rated input torque	313 NM (230 lbs.ft)
Controls	Integral shift lever
Recommended lubricant	“Dexron” type automatic transmission fluid
Oil capacity	1.9 liters (4.5 U.S. pints)
Speedometer gear ratio	17/6

SHIFT PATTERN



COMPONENT PARTS IDENTIFICATION

Case, Shift Cover, Extension Housing



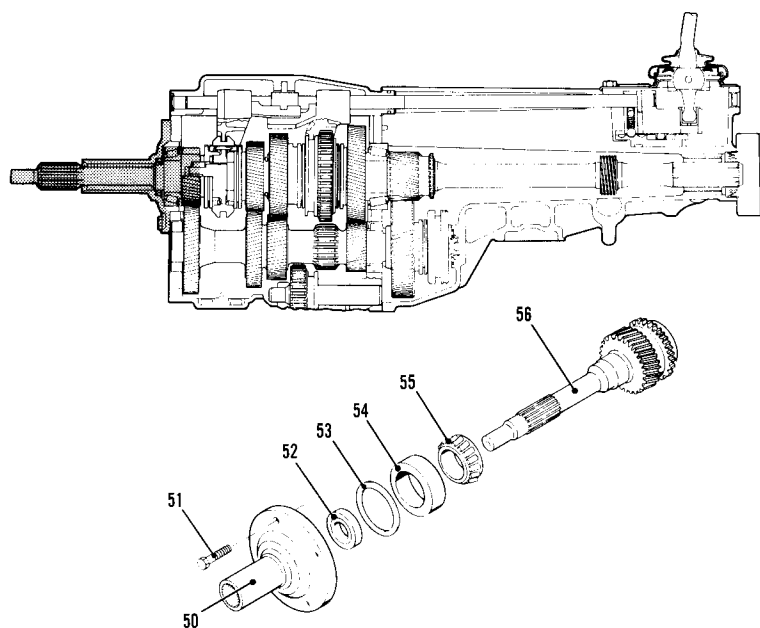
- 1 Case cover
- 2 Neutral switch
- 3 Wiring clip
- 4 Hex head bolt
- 5 Hex head shoulder bolt
- 6 Pin
- 7 "O"-ring
- 8 Welsh plug
- 9 Shifter shaft
- 10 3-4 shift fork
- 11 Shift fork insert
- 12 Selector plate
- 13 Control selector arm
- 14 Interlock plate
- 15 1-2 shift fork
- 16 Boot retainer

- 17 Boot
- 18 Boot retainer
- 19 Control lever/housing assembly
- 20 Control housing screw
- 21 Damper sleeve
- 22 Offset lever
- 23 Spring-pin
- 24 Detent spring
- 25 Ball
- 26 Extension housing
- 27 Detent & guide plate
- 28 Bushing
- 29 Cup plug
- 30 Oil seal
- 31 Hex head flanged bolt
- 32 Breather

- 33 Case
- 34 Magnet
- 35 Clip
- 36 Pivot pin
- 37 Back-up lamp switch
- 38 Welsh plug
- 39 Pipe plug
- 40 5th and reverse relay lever
- 41 Retaining ring
- 42 5th and reverse shift rail
- 43 Roller cam and pin
- 44 Reverse shift fork
- 45 Roller cam and pin
- 46 5th gear shift fork
- 47 Insert
- 48 Spring-pin

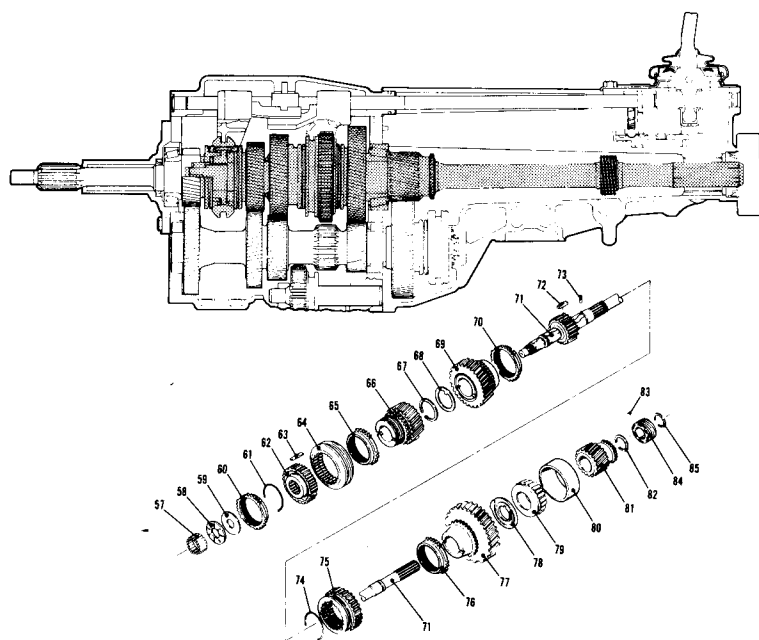
- 49 Spring

INPUT SHAFT ASSEMBLY



- 50 Input shaft bearing retainer
- 51 Hex head bolt
- 52 Seal
- 53 Shim
- 54 Bearing cup
- 55 Bearing cone
- 56 Input shaft (main drive gear)

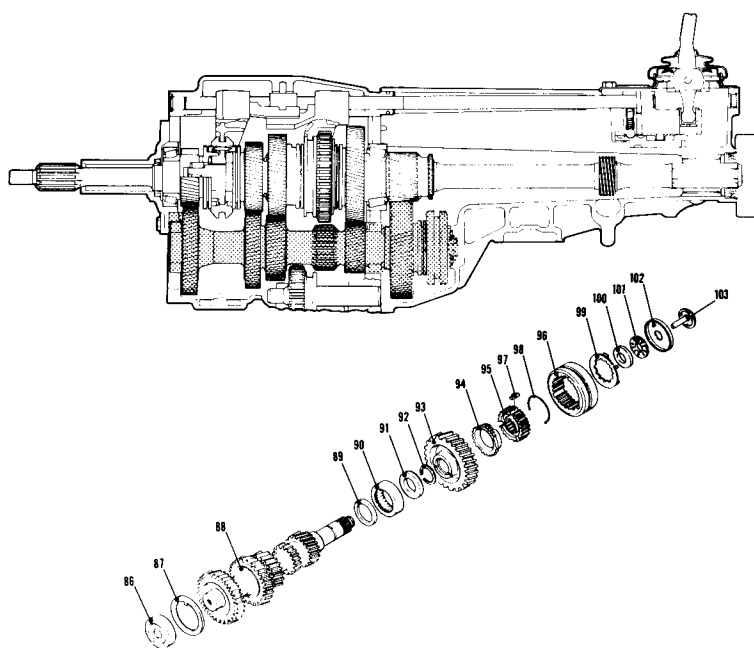
OUTPUT SHAFT ASSEMBLY



- 57 Needle rollers
- 58 Needle thrust bearing
- 59 Thrust bearing race
- 60 Blocking ring
- 61 Spring
- 62 Hub
- 63 Insert
- 64 Sleeve
- 65 Blocking ring
- 66 3rd speed gear
- 67 Snap ring
- 68 2nd speed thrust washer
- 69 2nd speed gear
- 70 Blocking ring
- *71 Output shaft and hub assembly
- 72 Insert
- 73 Pin
- 74 Spring
- *75 Reverse sliding gear
- 76 Blocking ring
- 77 1st speed gear
- 78 Thrust washer
- 79 Bearing cone
- 80 Bearing cup
- 81 5th speed driven gear
- 82 Snap ring
- 83 Ball
- 84 Speedometer gear
- 85 Snap ring

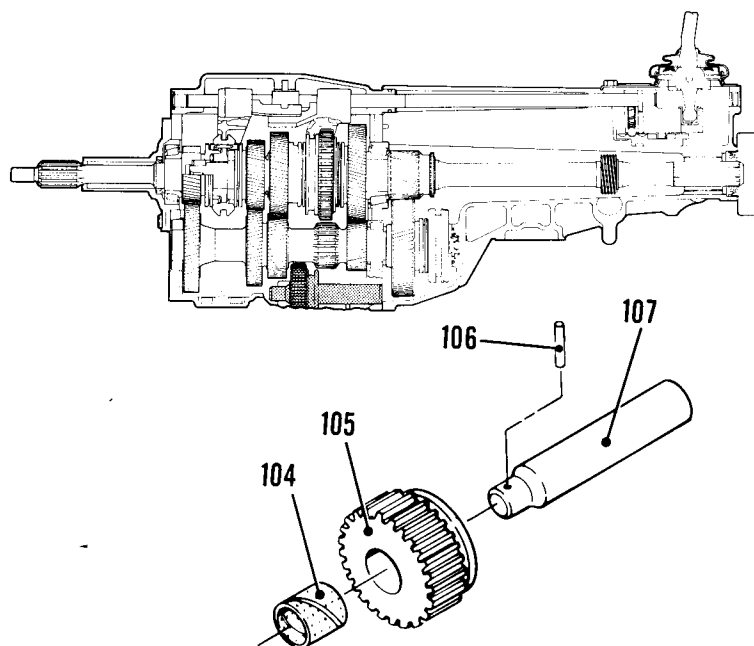
*71, *75 Not serviced separately

COUNTERSHAFT ASSEMBLY



- 86 Roller bearing
 - 87 Thrust washer
 - 88 Countershaft gear
 - 89 Spacer
 - 90 Roller bearing
 - 91 Spacer
 - 92 Snap ring
 - 93 5th speed drive gear
 - 94 Blocking ring
 - 95 Hub
 - 96 Sleeve
 - 97 Insert
 - 98 Spring
 - 99 Insert retainer
 - 100 Thrust race
 - 101 Needle thrust bearing
 - 102 Thrust race
 - 103 Funnel
- } Not serviced
separately

REVERSE IDLER ASSEMBLY



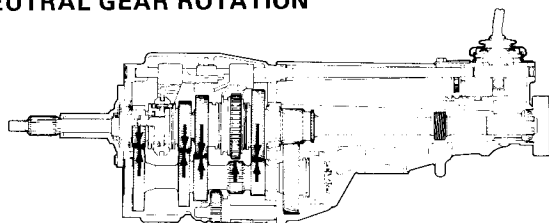
- 104 Reverse idler bushing
 - 105 Reverse idler gear
 - 106 Reverse idler shaft
 - 107 Spring pin
- } Not serviced
separately

GEAR RATIO INFORMATION

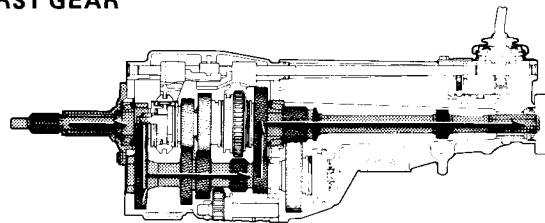
	Gear Ratio	No. of Teeth Mainshaft	No. of Teeth Countershaft	No. of Teeth Reverse Idler
Input		22	35	
1st	3.500	33	15	
2nd	2.144	31	23	
3rd	1.356	29	34	
4th	1.000			
5th	0.780	25	51	
Reverse	3.393	32	15	20

POWER FLOW

NEUTRAL GEAR ROTATION

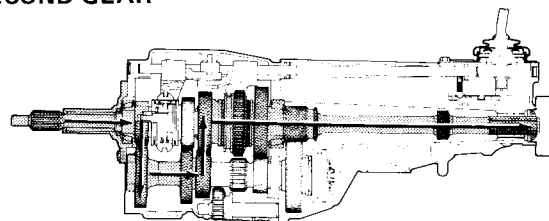


FIRST GEAR



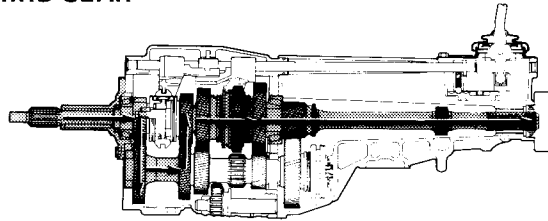
For first gear operation, the 1st and 2nd speed synchronizer sleeve (reverse sliding gear) is moved to the rear, where it engages the clutch teeth of the 1st speed mainshaft gear. The gears under power in 1st speed are input shaft, countershaft drive gear, countershaft 1st gear, 1st mainshaft gear, and output shaft.

SECOND GEAR



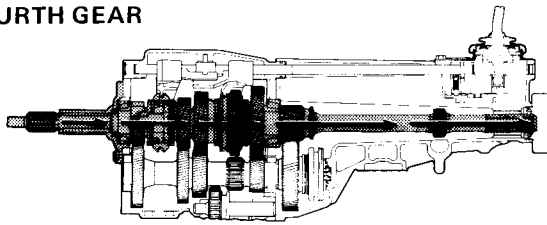
For 2nd gear operation, the 1st and 2nd speed synchronizer sleeve (reverse sliding gear) is moved forward, where it engages the clutch teeth of the 2nd speed mainshaft gear. The gears under power in 2nd speed are input shaft, countershaft drive gear, countershaft 2nd gear, 2nd mainshaft gear, and output shaft.

THIRD GEAR



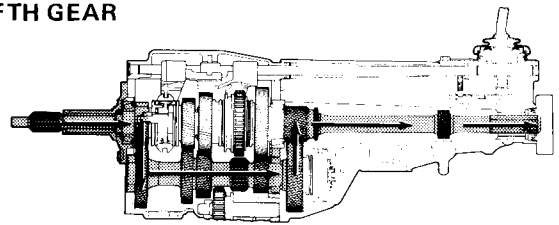
For 3rd gear operation, the 3rd and 4th speed synchronizer sleeve is moved to the rear, where it engages the clutch teeth of the 3rd speed mainshaft gear. The gears under power in 3rd speed are input shaft, countershaft drive gear, countershaft 3rd gear, 3rd mainshaft gear, and output shaft.

FOURTH GEAR



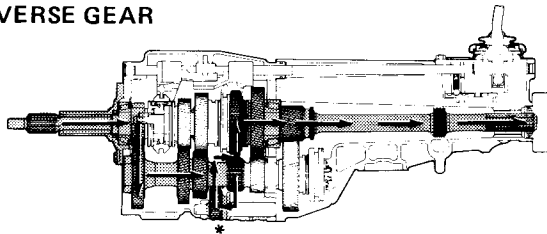
For 4th gear operation, the 3rd and 4th speed synchronizer sleeve is moved forward, where it engages the clutch teeth of the input shaft (main drive gear). The power flow is then transferred straight through the transmission, directly from input shaft to output shaft.

FIFTH GEAR



For 5th gear operation, the 5th speed synchronizer sleeve is moved forward, where it engages the clutch teeth of the 5th speed countershaft gear. The gears under power in 5th speed are input shaft, countershaft drive gear, 5th speed countershaft gear, 5th speed mainshaft gear, and output shaft.

REVERSE GEAR

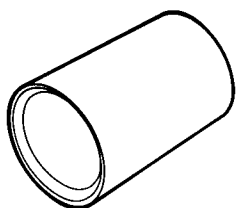


For reverse gear operation the reverse idler gear is moved to the rear, where it engages the reverse countershaft gear and the reverse sliding gear on the output shaft. The gears under power in reverse are input shaft, countershaft drive gear, reverse countershaft gear, reverse idler gear, reverse sliding gear, and output shaft.

* Note: This is not the actual location of the reverse idler gear in the case. It is placed in the drawing in this location for diagrammatic purposes only.

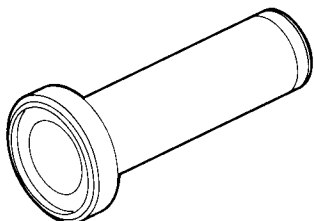
SPECIAL SERVICE TOOLS

J-33032



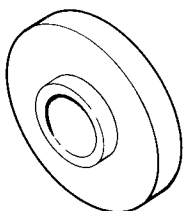
Tapered sleeve —
for installing countershaft rear bearing.

J-29895



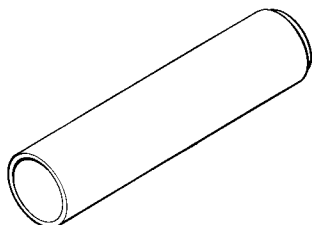
Countershaft rear bearing installer —
for pressing bearing to correct depth.

J-26060-01



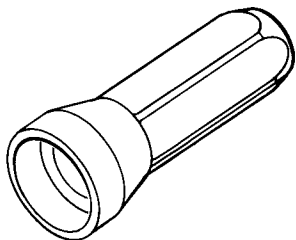
Press tool —
for installing 5th speed gear on output
shaft and for installing roller bearing
on main drive gear.

J-25863-01



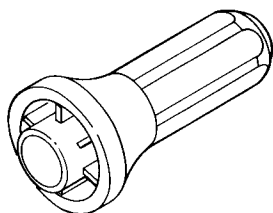
Press tool —
for installing 3rd and 4th synchromesh
on output shaft.

J-23096



Front bearing retainer seal installer.

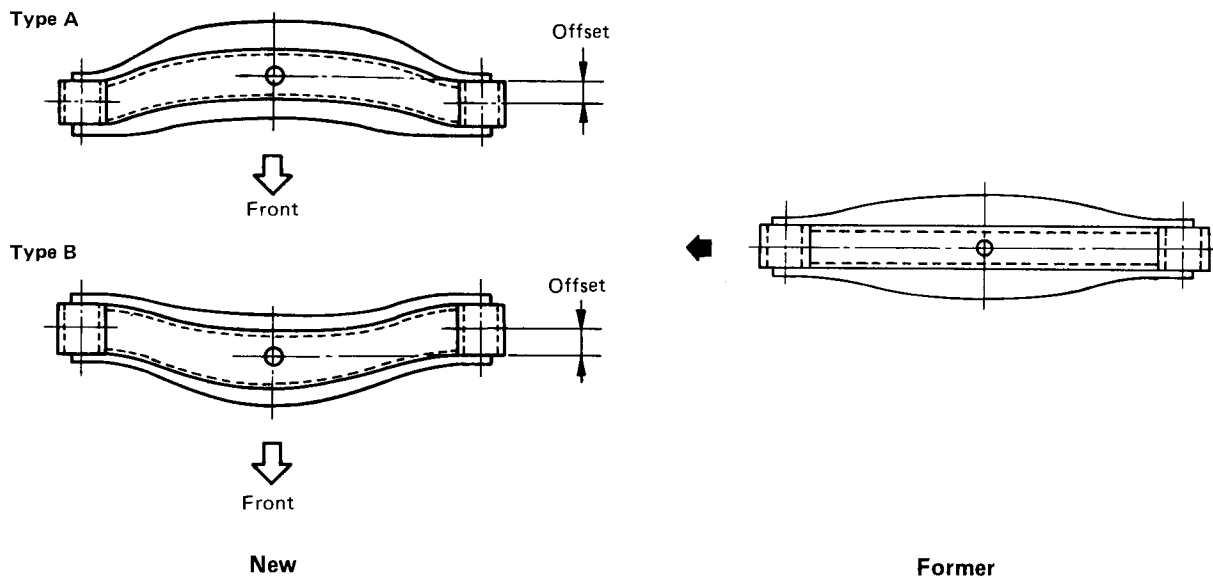
J-28894



Extension housing seal installer.

REAR ENGINE MOUNT MEMBER

To accommodate the different specifications for the transmission, the rear engine mount members have been modified into Types A and B.



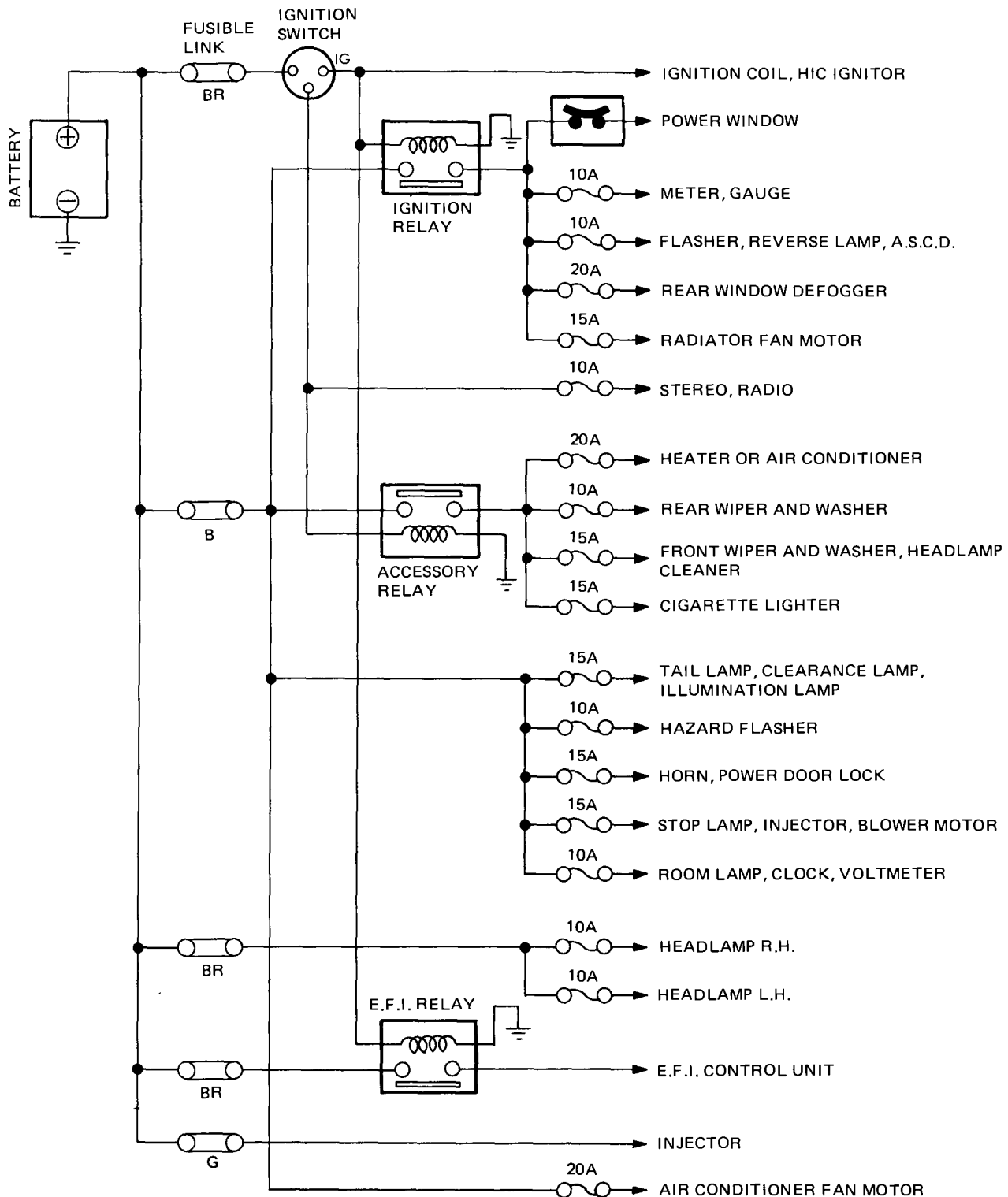
Type A: Models equipped with FS5R90A (Borg-Warner T-5) transmission

Type B: Other models

Note: Types A and B are the same in design except the installation direction

BODY ELECTRICAL

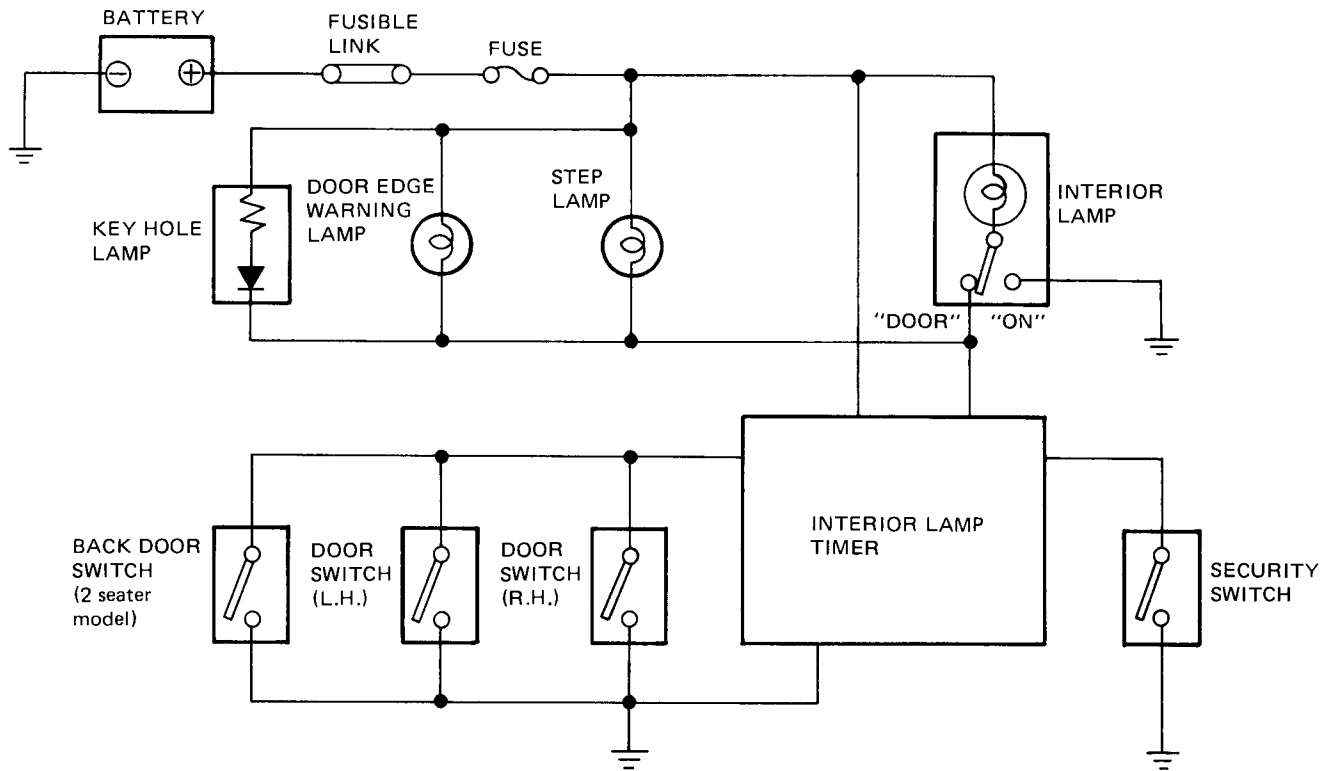
POWER SUPPLY ROUTING



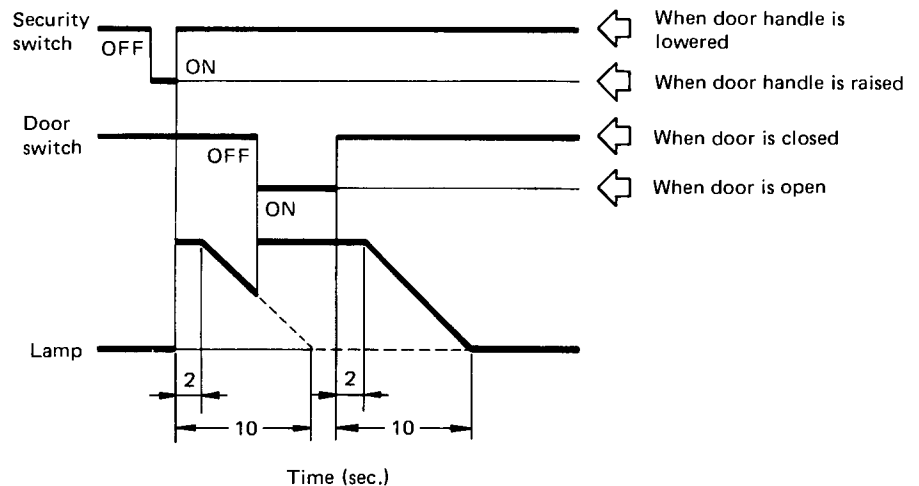
ILLUMINATED ENTRY SYSTEM

The illuminated entry system is designed to enable the driver to check the interior from the outside at night before unlocking the door as well as to facilitate inserting the key into the door lock.

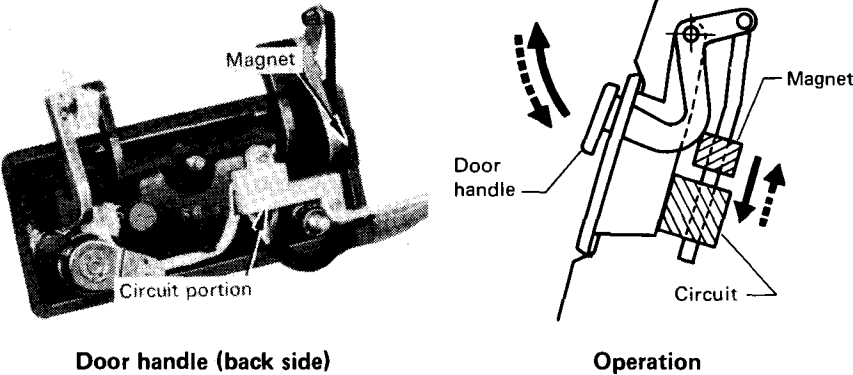
In operation, pulling up the outer handle of the driver's door and returning it to the original position causes the security switch to activate. This then causes the key hole illumination light, the interior light (if the interior light switch is set in the "DOOR" position), step light and door edge warning light to illuminate for a predetermined length of time. The illumination will begin to diminish at a constant rate and go out.



OPERATIONAL MODES



SECURITY SWITCH

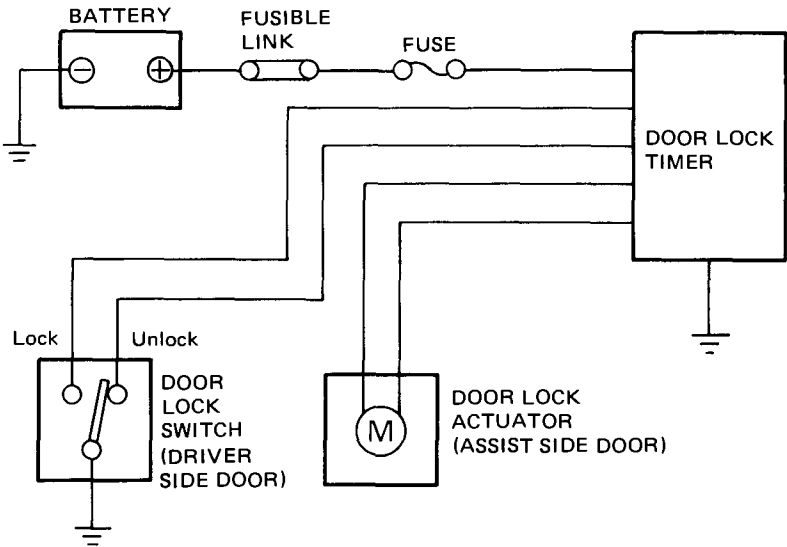


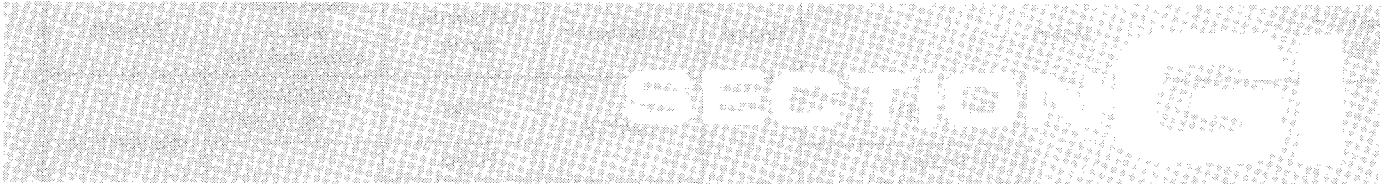
Operation

When the door handle is moved up and down, a magnet moves across the circuit, activating the security switch in the circuit.

POWER DOOR LOCK SYSTEM

A power door lock system has been installed on the GL model. When the door lock knob (inside) on the driver's side or the key cylinder (outside) is locked or unlocked, the front passenger door is also locked or unlocked simultaneously. The front passenger door can also be locked or unlocked by hand independently.





CONTENTS

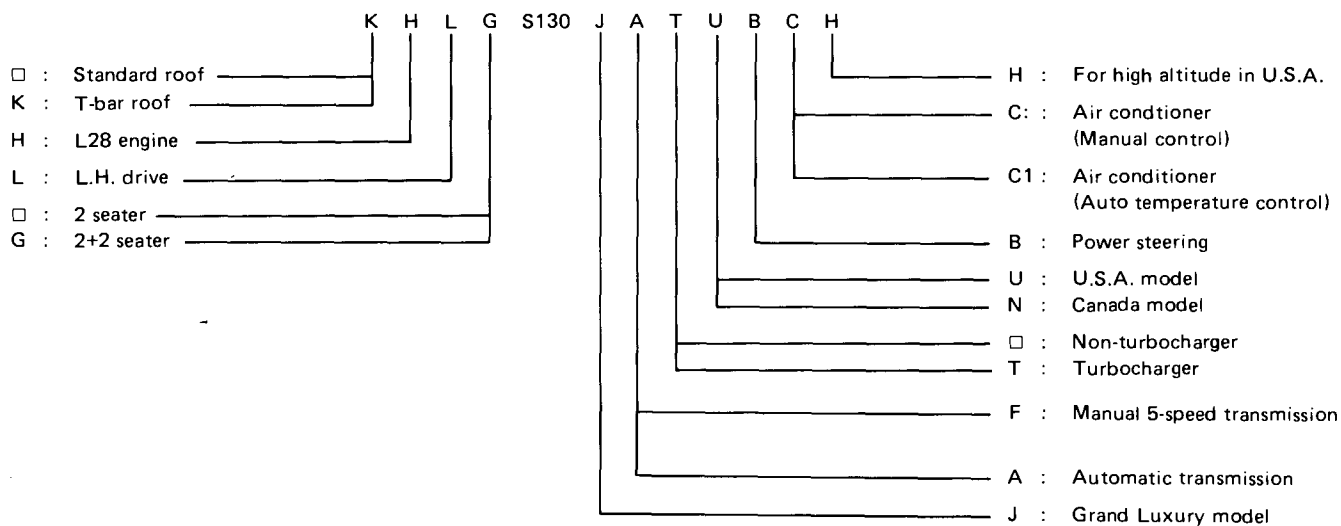
MODEL VARIATION	GI-2	GARAGE JACK AND SAFETY STAND	GI-4
IDENTIFICATION NUMBERS	GI-3	TOWING	GI-4
ENGINE NUMBER	GI-3	TIE-DOWN	GI-5
MANUAL TRANSMISSION NUMBER	GI-3	SPECIAL SERVICE TOOLS	GI-5
AUTOMATIC TRANSMISSION NUMBER	GI-3	TIGHTENING TORQUE OF	
LIFTING POINTS AND TOWING	GI-4	STANDARD BOLT	GI-6
PANTOGRAPH JACK	GI-4		

MODEL VARIATION

Desti- nation	Model		Engine	Transmission	Differential carrier	Road wheel size ... offset mm (in)	Tire size
U.S.A.	2 seater	HLS130FU	L28E	FS5W71B	R180	5-1/2JJ-14 ... 15 (0.59)	195/70HR14
		HLS130JFU			R200	6JJ-14* ... 10 (0.39)	
		HLS130JAU		3N71B	R180		
	T-bar roof	KHLS130JFU		FS5W71B	R200		P205/70R14
		KHLS130JAU		3N71B	R180		
	Turbo	KHLS130JATU	L28ET	3N71B	R200	6JJ-15* ... 10 (0.39)	P205/60R15
		2+2 seater	HLGS130JFU	L28E	FS5W71B	6JJ-14* ... 10 (0.39)	195/70HR14
	HLGS130JAU		3N71B		R180		
	T-bar roof	KHLGS130JFU	FS5W71B		R200		P205/70R14
		KHLGS130JAU	3N71B		R180		
	Turbo	KHLGS130JATU	L28ET	3N71B	R200	6JJ-15* ... 10 (0.39)	P205/60R15
		Canada	2 seater	HLS130FN	L28E	FS5W71B	R180	5-1/2JJ-14 ... 15 (0.59)	195/70HR14
T-bar roof	KHLS130FN			R200			6JJ-14* ... 10 (0.39)
	KHLS130JFN		3N71B					R180
	KHLS130JAN			L28ET		3N71B			R200	6JJ-15* ... 10 (0.39)	P205/60R15
Turbo	KHLS130JATN		L28E		FS5W71B		6JJ-14* ... 10 (0.39)	195/70HR14
	KHLGS130JFN	3N71B		R180			
	2+2 seater	T-bar roof	KHLGS130JAN	L28ET	3N71B	R200	6JJ-15* ... 10 (0.39)	P205/60R15

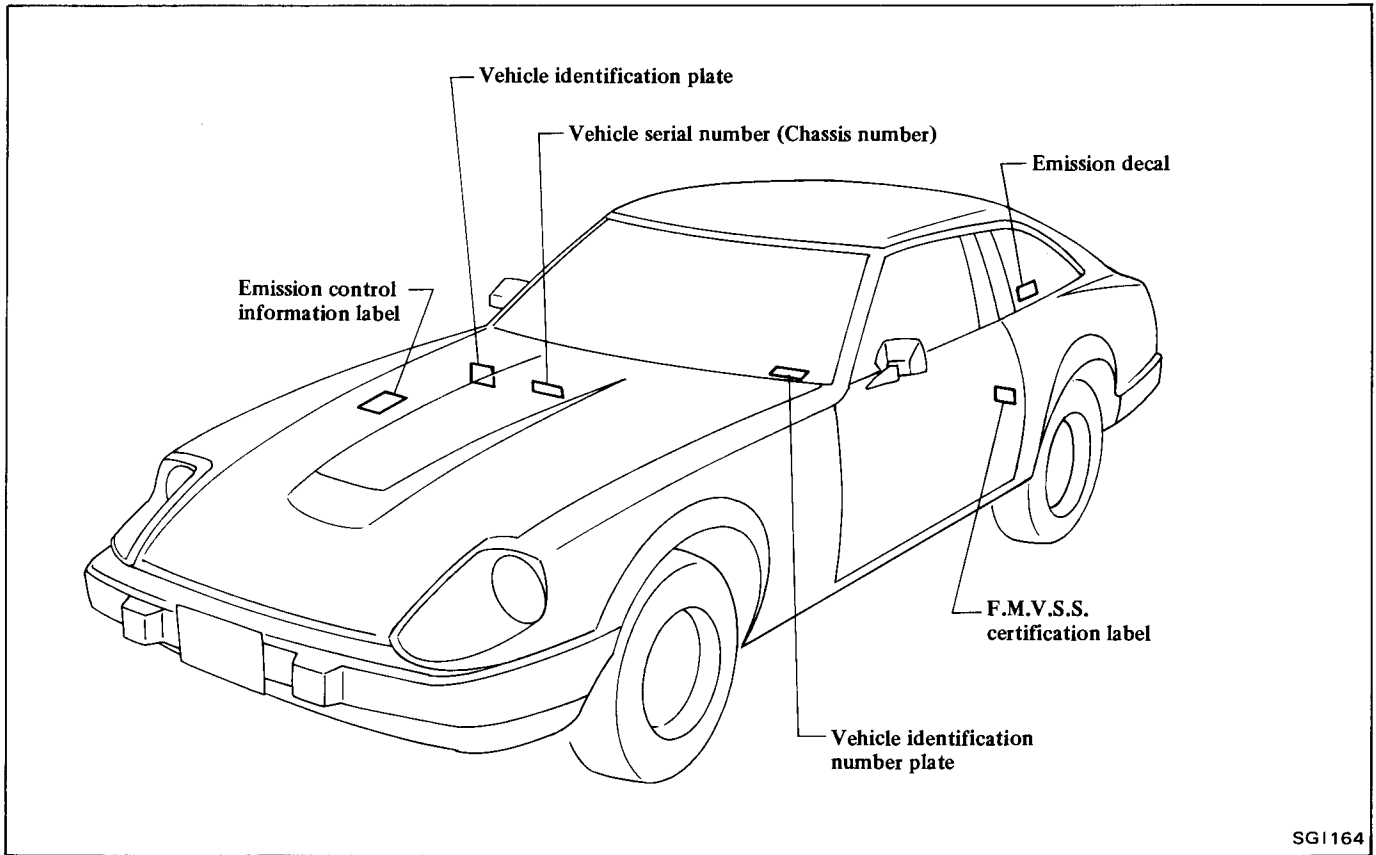
*: Aluminum wheel (2-piece type)

Prefix and suffix designations



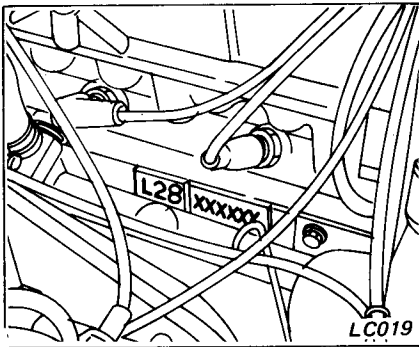
Note: □ means no indication.

IDENTIFICATION NUMBERS



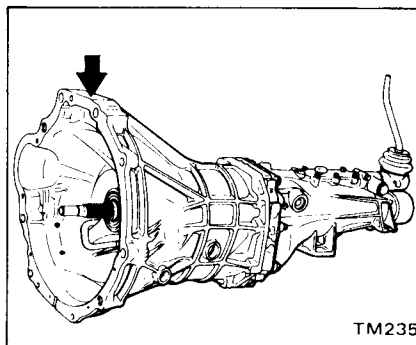
ENGINE NUMBER

The engine serial number is stamped on the right-hand side of the cylinder block.



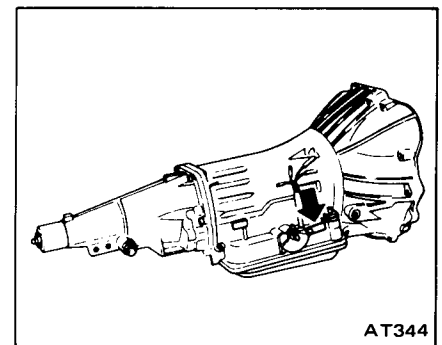
MANUAL TRANSMISSION NUMBER

The transmission serial number is stamped on the upper front face of the transmission case.



AUTOMATIC TRANSMISSION NUMBER

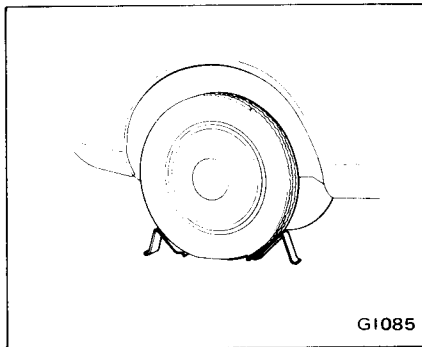
The transmission serial number plate is attached to the right-hand side of the transmission case.



LIFTING POINTS AND TOWING

PANTOGRAPH JACK

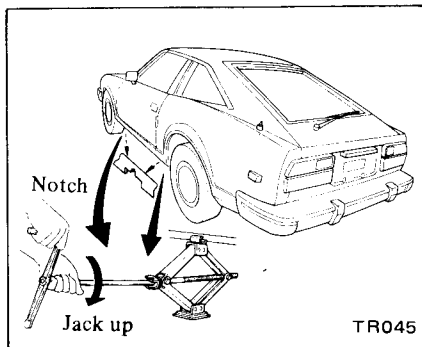
Place wheel chocks at both the front and back of the wheel diagonally opposite the jack position.



Apply the pantograph jack furnished with the car to the position indicated below in a safe manner.

WARNING:

- a. Never get under the car while it is supported only by the jack. Always use safety stands to support frame when you have to get under the car.
- b. Block the wheels diagonally with wheel chocks.



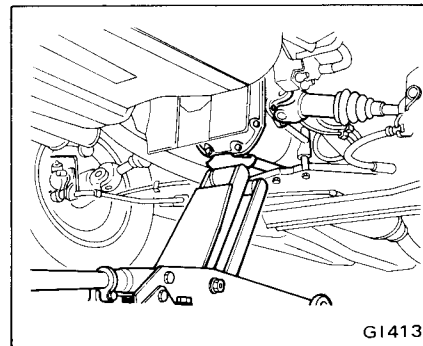
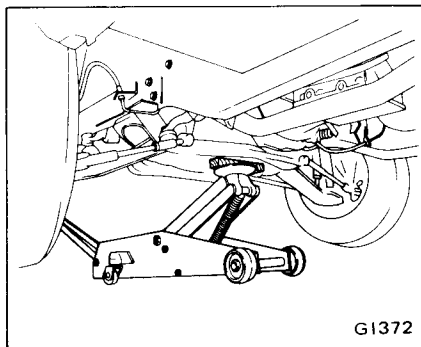
GARAGE JACK AND SAFETY STAND

WARNING:

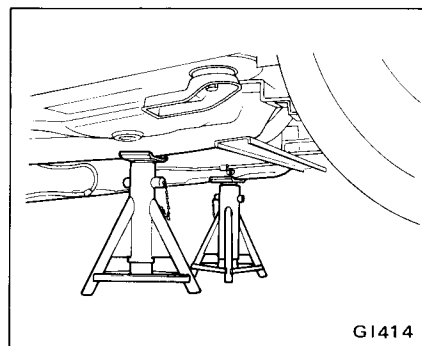
When carrying out operations with the garage jack, be sure to support the car with safety stands.

FRONT SIDE

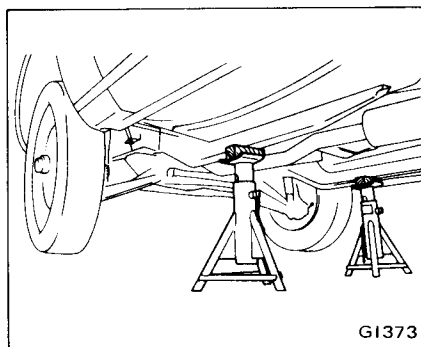
1. When jacking up the front of the car, place the chocks behind the rear wheels to hold them.
2. Apply the garage jack under the front suspension member. Be sure not to lift up the engine oil pan.



3. Jack up the car gently just high enough to place the safety stands under both the side members. Place the stands at the position indicated in Figure.



3. Jack up the car gently just high enough to place the safety stands under both the side members. Place the stands at the position indicated in Figure.



4. Release the jack slowly.

TOWING

CAUTION:

- a. It is necessary to use proper towing equipment, to avoid possible damage to the car 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.

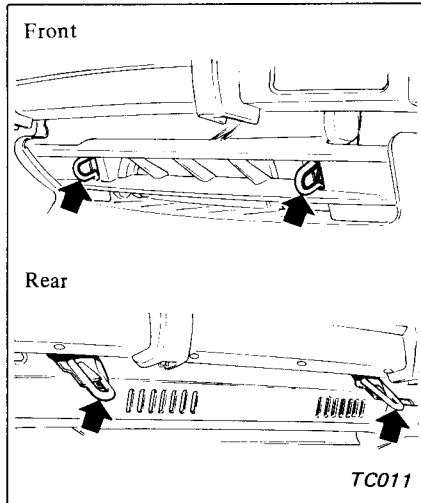
Front towing hooks are provided on both front side members.

Front tow: Not recommended with conventional sling-type equipment.

REAR SIDE

1. When jacking up the rear of the car, place the chocks at the front side of the front wheels to hold them.
2. Apply the garage jack under the differential carrier.

Rear towing hooks are combined with shock absorber for rear bumper.



CAUTION:

- Before towing, make sure that the transmission, axles, steering system and power train are in good order. If any unit is damaged, a dolly must be used.
- If the transmission is inoperative, tow the car with the rear wheels off the ground, or with the propeller shaft removed.
- When the car 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.
- When towing an automatic transmission model, try to restrict towing speed below 30 km/h (20 MPH) and towing distance less than 30 km (20 miles).
With manual transmission model, try to restrict towing speed 80 km/h (50 MPH) and towing distance less than 80 km (50 miles).
If the speed or distance must necessarily be greater, remove the propeller shaft beforehand to prevent damage to the transmission.
- Release the parking brake and set the gearshift lever in "Neutral" position before starting to tow the car.

TIE-DOWN

Use front and rear towing hooks for tie-down at front and rear sides.

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 com-

puted 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	Nominal size	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

MAINTENANCE

SECTION MA

MA

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MAINTENANCE SCHEDULE	MA- 2	MANUAL TRANSMISSION	MA-23
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LUBRICANTS	MA- 5	DIFFERENTIAL CARRIER	MA-23
FUEL	MA- 5	FRONT AXLE AND	
LUBRICANTS	MA- 5	FRONT SUSPENSION	MA-24
SAE VISCOSITY NUMBER	MA- 5	REAR AXLE AND	
APPROXIMATE REFILL		REAR SUSPENSION	MA-27
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AFTER ENGINE WARM-UP	MA-10	BODY	MA-36
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CLUTCH	MA-22	SPECIAL SERVICE TOOLS	MA-42

MAINTENANCE SCHEDULE

The following tables list the periodic maintenance servicing required to ensure good emission control performance, good engine performance and good mechanical condition in DATSUN.

The first 1,600 km (1,000 miles) service is one of the most important services required to ensure the maximum emission control performance and optimum engine condition.

Periodic maintenance beyond the last period shown in the tables requires similar maintenance.

MAINTENANCE OPERATION		MAINTENANCE INTERVAL							Reference page
		Kilometers x 1,000	1.6	12	24	36	48	60	
		(Miles x 1,000)	(1)	(7.5)	(15)	(22.5)	(30)	(37.5)	
		Months	—	6	12	18	24	30	

EMISSION CONTROL MAINTENANCE

Drive belts						I			MA-6
Air cleaner filter	See NOTE: (2)					R			MA-6
* Vapor lines						I			MA-6
* Fuel lines (hoses, piping, connections, etc.)						I			MA-7
* Fuel filter	See NOTE: (3)								MA-8
Engine coolant						R			MA-8
Engine oil (model not equipped with turbocharger)	See NOTE: (1)		R	R	R	R	R	R	MA-9
(model equipped with turbocharger)	See NOTE: (1)		R: every 6,000 km (3,750 miles)						MA-9
Engine oil filter			R	R	R	R	R	R	MA-9
Spark plugs						R			MA-10
* Ignition wires						I			MA-10
Intake & Exhaust valve clearance		A		A		A		A	MA-10
Idle rpm (model not equipped with turbocharger)		I		I*		I*		I*	MA-12
Exhaust gas sensor						I			MA-13

- NOTE: (1)** If vehicle is operated under severe conditions: short distance driving, extensive idling or driving in dusty conditions, change engine oil every 5,000 km (3,000 miles) or 3 months, whichever comes first.
- (2)** More frequent maintenance is required under dusty driving conditions.
- (3)** 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.
- (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, correct, replace if necessary.

MAINTENANCE OPERATION	Kilometers x 1,000 (Miles x 1,000) Months	MAINTENANCE INTERVAL							Reference page
		1.6	12	24	36	48	60	72	
		(1)	(7.5)	(15)	(22.5)	(30)	(37.5)	(45)	
		—	6	12	18	24	30	36	

UNDERHOOD MAINTENANCE

Brake, clutch & automatic transmission fluid or oil level & leaks			I		I		I	MA-22, 23, 28
Brake fluid			R		R		R	MA-28
Brake booster vacuum hoses, connections & check valve					I			MA-29
Air conditioning system hoses, connections & refrigerant leaks					I			MA-38
Power steering fluid & lines			I		I		I	MA-35

UNDER VEHICLE MAINTENANCE

Brake, clutch, fuel & exhaust systems for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.			I		I		I	MA-22, 29
Manual transmission & differential gear oil	See NOTE: (5)		I		I		I	MA-23, 24
Steering gear & linkage, suspension parts & propeller shaft for damaged, loose & missing parts	See NOTE: (6)	I	I		I		I	MA-24, 27, 35
Rear axle drive shaft joints (Except tripod drive shaft)					L			MA-28
Underbody (flush and clean every 12 months)			I		I		I	—

OUTSIDE AND INSIDE MAINTENANCE

Rotate wheel position & inspect wheel balance & wheel alignment			I		I		I	MA-25, 31, 34
Disc brake pads & other brake components for wear, deterioration & leaks	See NOTE: (7)		I		I		I	MA-29
Front wheel bearing grease					I			MA-26
Locks, hinges & hood latch	See NOTE: (7)		L		L		L	MA-36
Seat belts, buckles, retractors, anchors & adjuster			I		I		I	MA-36
Front brake, parking brake & clutch for stroke, free play & operation			I		I		I	MA-22, 29, 30

Abbreviations: R = Replace L = Lubricate
I = Inspect, correct, replace if necessary

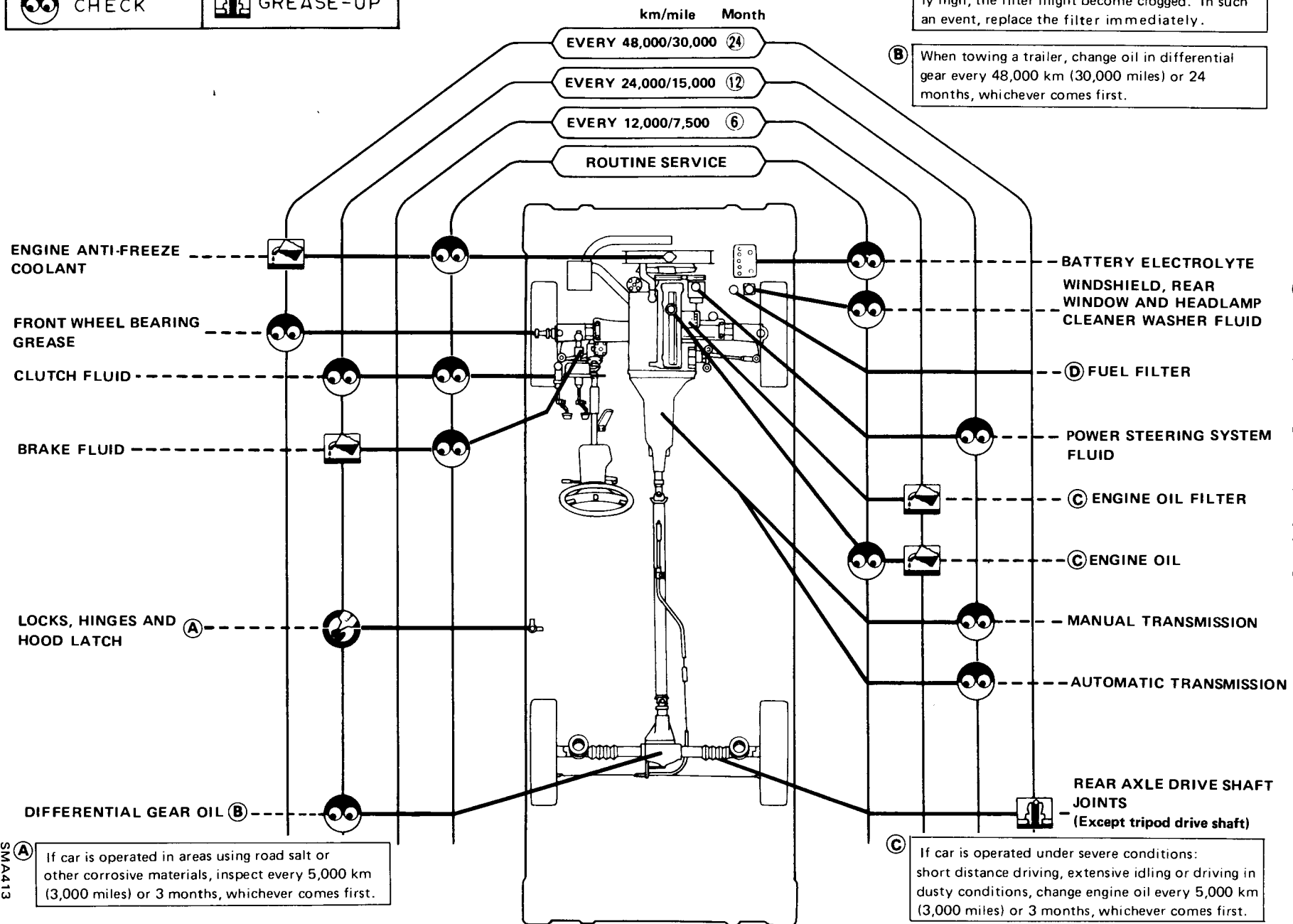
- NOTE:**
- (5) When towing a trailer, change oil in differential gear every 48,000 km (30,000 miles) or 24 months, whichever comes first.
 - (6) Steering linkage & front suspension ball joint inspection should be performed every 96,000 km (60,000 miles) or 4 years, whichever comes first.
 - (7) If vehicle is operated in areas using road salt or other corrosive materials, inspect every 5,000 km (3,000 miles) or 3 months, whichever comes first.

The above charts show the normal maintenance schedule. Depending upon weather and atmospheric conditions, varying road surfaces, individual driving habits and car usage, additional or more frequent maintenance may be required.

 CHANGE	 LUBRICATE
 CHECK	 GREASE-UP

D If car is operated under extreme adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filter might become clogged. In such an event, replace the filter immediately.

B When towing a trailer, change oil in differential gear every 48,000 km (30,000 miles) or 24 months, whichever comes first.



LUBRICATION CHART

RECOMMENDED FUEL AND LUBRICANTS

FUEL

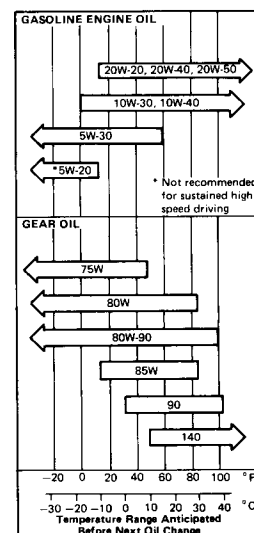
Use an unleaded gasoline only of at least 91 research octane number (Anti-knock index 87).

Under no circumstances should a leaded fuel be used since this will damage the catalytic converter.

LUBRICANTS

Lubricant		Specifications	Remarks
Gasoline engine oil		API SE	Further details, refer to recommended SAE viscosity chart.
Gear oil	Transmission	API GL-4	
	Differential	API GL-5	
Automatic T/M and power steering fluid		Type DEXRON	—
Multi-purpose grease		NLGI No. 2	Lithium soap base
Brake and clutch fluid		DOT 3	US FMVSS No. 116
Anti-freeze		—	Ethylene glycol base

SAE VISCOSITY NUMBER



APPROXIMATE REFILL CAPACITIES

		Liter	US measure	Imp measure
Fuel tank		80	21-1/8 gal	17-5/8 gal
Coolant	With reservoir	10.5	11-1/8 qt	9-1/4 qt
	Without reservoir	9.7	10-1/4 qt	8-1/2 qt
Engine	With oil filter	4.5	4-3/4 qt	4 qt
	Without oil filter	4.0	4-1/4 qt	3-1/2 qt
Transmission	M/T	2.0	4-1/4 pt	3-1/2 pt
	A/T	5.5	5-7/8 qt	4-7/8 qt
Differential carrier	R200	1.3	2-3/4 pt	2-1/4 pt
	R180	1.0	2-1/8 pt	1-3/4 pt
Power steering system		1.1	1-1/8 qt	1 qt
Windshield washer tank		3.0	3-1/8 qt	2-5/8 qt
Headlight cleaner tank		2.0	2-1/8 qt	1-3/4 qt
Air conditioning system	Compressor oil	150 ml	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

BEFORE ENGINE START

CHECKING AND ADJUSTING DRIVE BELTS

1. Visually inspect for cracks or damage.

The belts should not touch the bottom of the pulley groove.

2. Check belt tension by pushing. The belts should deflect by the specified amount.

	Adjust deflection of used belt	Set deflection of new belt
Drive belt deflection mm (in)		
Cooling fan	7 - 10 (0.28 - 0.39)	6 - 9 (0.24 - 0.35)
Air conditioner compressor	5 - 7 (0.20 - 0.28)	4 - 6 (0.16 - 0.24)
Power steering oil pump	11 - 14 (0.43 - 0.55)	9 - 12 (0.35 - 0.47)
Applied pushing force N (kg, lb)	98 (10, 22)	

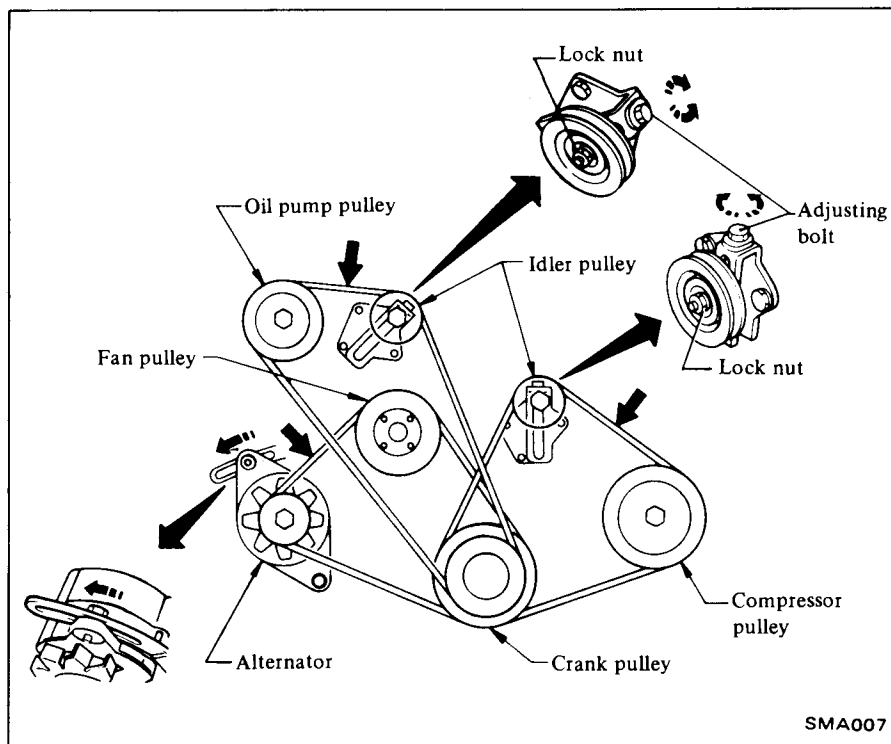
3. Adjust belt tension as follows:

Fan and 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 tension is the specified amount. Then tighten the bolts securely.

Air conditioner compressor and power steering oil pump belts

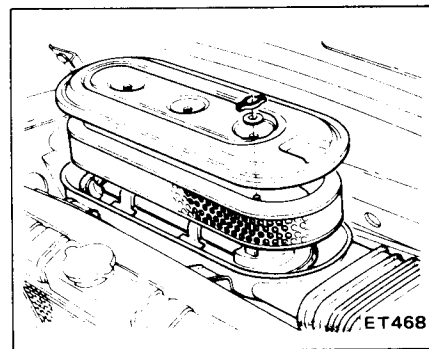
1. Loosen the idler pulley lock nut.
2. Adjust the adjusting bolt until the belt tension is the specified amount.
3. Tighten the idler pulley lock nut securely.



REPLACING AIR CLEANER FILTER

The viscous paper type air cleaner filter does not require any cleaning operation between renewal.

Remove air cleaner cover and remove air cleaner filter.



CHECKING VAPOR LINES

1. Check all hoses and fuel tank filler cap.
2. Disconnect vapor vent line connecting carbon canister to check valve.
3. Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way charge cock) to the end of the vent line.
4. Supply fresh air into the vapor vent line through the cock little by little until pressure becomes 3.923 kPa (400 mmH₂O, 15.75 inH₂O).
5. Shut the cock completely and leave it unattended.
6. After 2.5 minutes, measure the height of the liquid in the manometer.

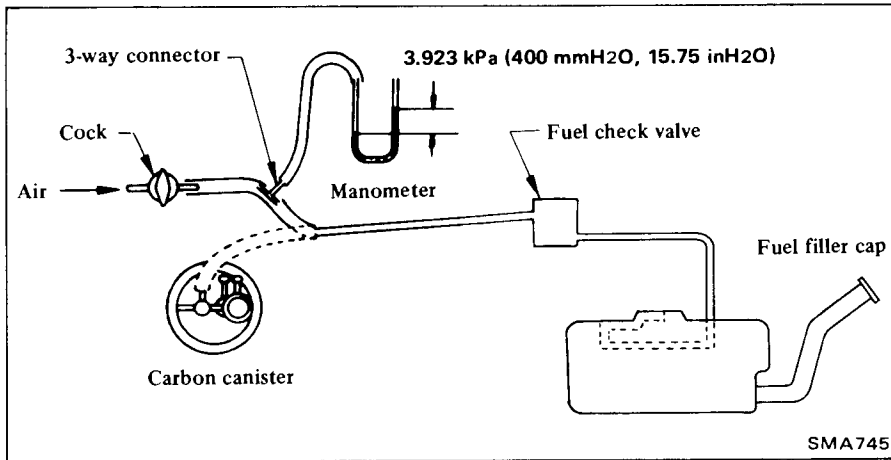
Pressure variation:

Less than 0.245 kPa
(25 mmH₂O, 0.98 inH₂O)

- (1) When filler cap does not close completely, the height should drop to zero in a short time.
- (2) If the height does not drop to zero in a short time when filler cap is removed, it is the cause of a stuffy hose.

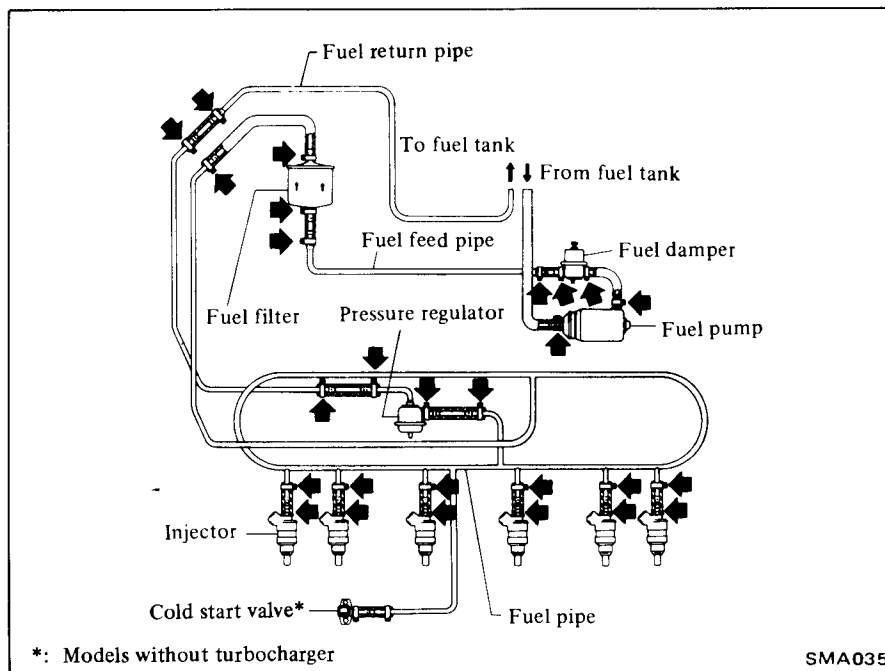
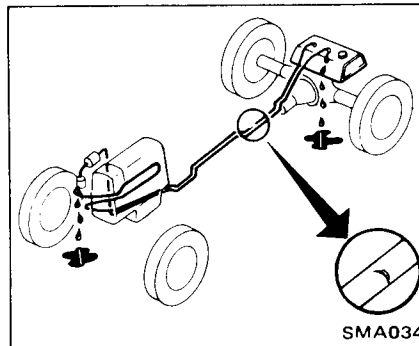
In case the vent line is stuffy, the breathing in fuel tank is not thoroughly made, thus causing insufficient de-

livery of fuel to engine or vapor lock. It must, therefore, be repaired or replaced.



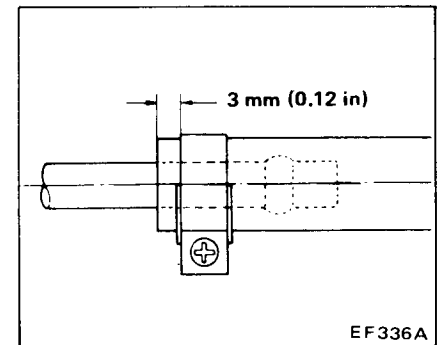
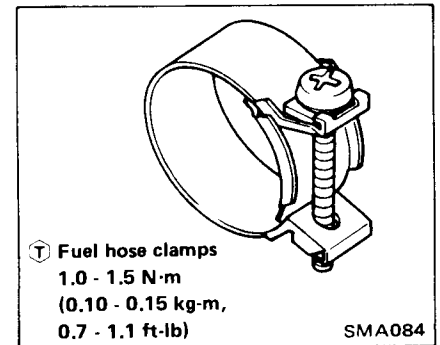
CHECKING FUEL LINES (Hoses, piping, connections, etc.)

1. Check fuel line for leaks, particularly around connection of fuel pipe and fuel hose.
2. Retighten loose connections and replace any damaged or deformed parts.



CAUTION:

- a. Do not reuse fuel hose clamp after loosening.
- b. Tighten high pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end or screw position (wider than other portions of clamp) is flush with hose end. Tightening torque specifications are the same for all rubber hose clamps. When tightening hose clamp, ensure that screw does not come into contact with adjacent parts.



REPLACING FUEL FILTER

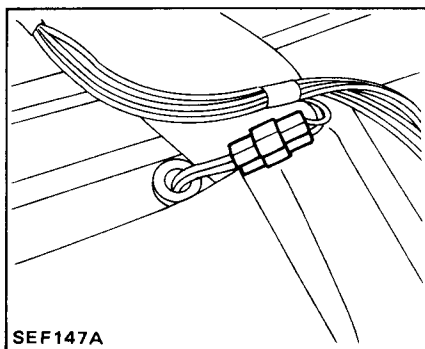
The fuel filter is designed especially for use with the EFI system. It should be replaced as an assembly.

1. Follow the procedure below to reduce fuel pressure to zero.

CAUTION:

Before disconnecting fuel hose, release fuel pressure from fuel line to eliminate danger.

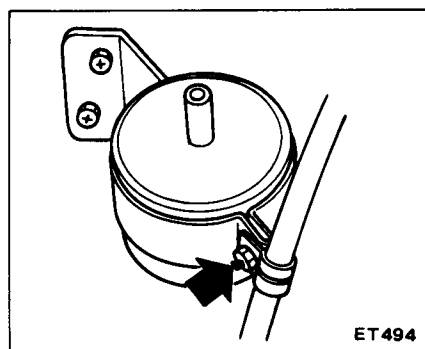
- (1) Start the engine.
- (2) Remove fuel pump connector with engine running.



- (3) After engine stall, crank the engine twice or three times.
- (4) Turn ignition switch off and connect fuel pump connector.
2. Unfasten clamps securing fuel hoses to the outlet and inlet sides of fuel filter, and disconnect fuel hoses.

Be careful not to spill fuel over engine compartment. Place a rag to absorb fuel.

3. Remove fuel filter.



4. To install fuel filter, reverse the order of removal.

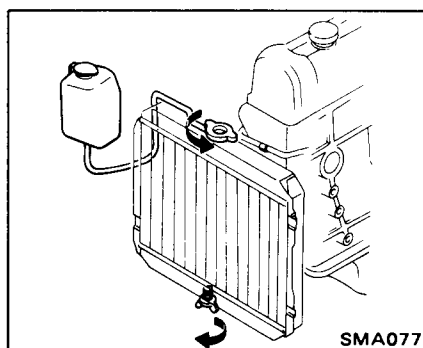
CHANGING ENGINE COOLANT

WARNING:

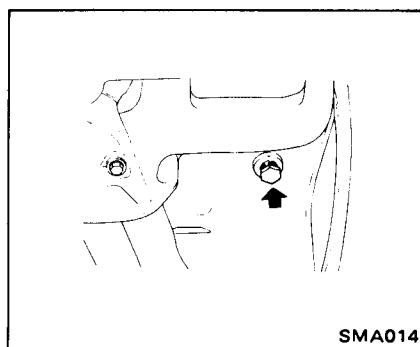
To avoid the danger of being scalded, never attempt to change the coolant when the engine is hot.

When changing engine coolant, set heater "TEMP" control lever at fully "HOT" position.

1. Open drain cock at bottom of radiator, and remove radiator cap.



2. Remove cylinder block drain plug located at left rear of cylinder block.



3. Drain coolant completely. Then flush cooling system.
4. Close drain cock and plug.
5. Fill radiator with coolant, observing instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

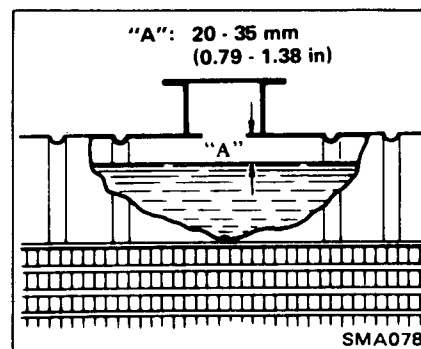
Cooling water capacity:

Unit: liter (US qt, Imp qt)

With coolant reservoir	10.5 (11-1/8, 9-1/4)
Without coolant reservoir	9.7 (10-1/4, 8-1/2)

Without coolant reservoir

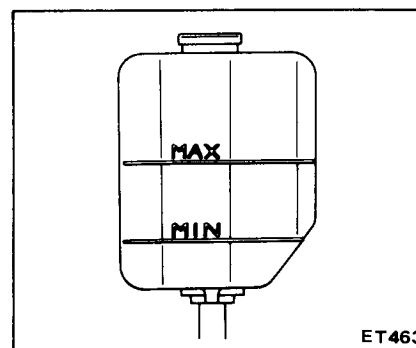
- (1) Fill radiator with coolant at "A" mm (in) below the bottom of the radiator filler neck.



- (2) Run engine for a few minutes. If necessary, add coolant.

With coolant reservoir

- (1) Fill radiator with coolant up to filler opening.
- (2) Run engine for a few minutes. If necessary, add coolant.
- (3) Fill reservoir tank with coolant up to "MAX" level.



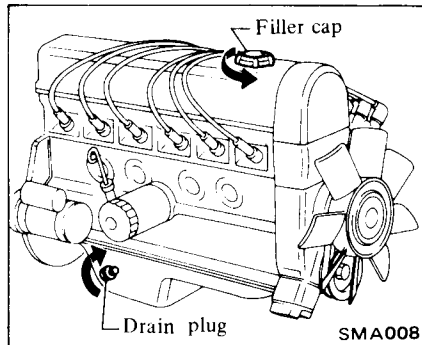
6. Install radiator cap.
Check drain cock and plug for any sign of leakage.

CHANGING ENGINE OIL AND OIL FILTER

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

WARNING:

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

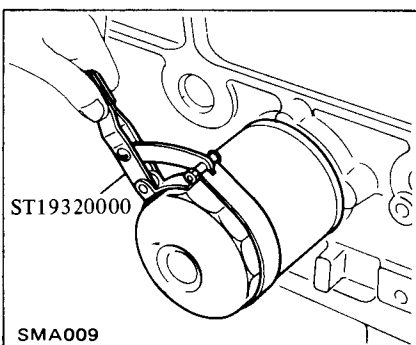


- A milky oil indicates the presence of cooling water. Isolate the cause and take corrective measure.
- An oil with extremely low viscosity indicates dilution with gasoline.

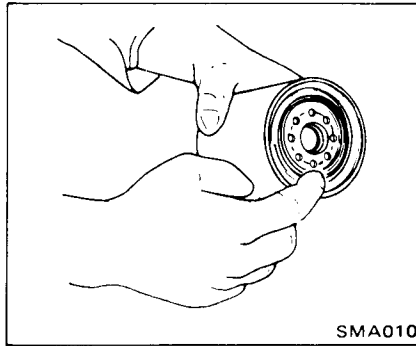
3. Clean and install oil pan drain plug with washer.

ⓘ : Oil pan drain plug
20 - 29 N·m
(2.0 - 3.0 kg·m,
14 - 22 ft·lb)

4. Using Tool, remove oil filter.



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



7. Install new oil filter. Hand-tighten ONLY. DO NOT use a wrench to tighten the filter.

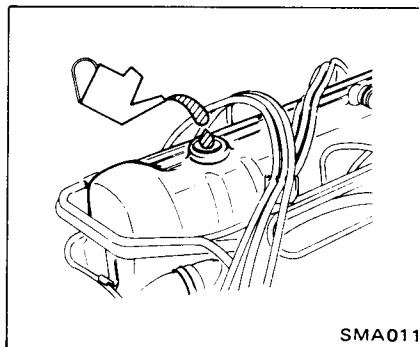
8. Refill engine with new engine oil, referring to RECOMMENDED LUBRICANTS.

Check oil level with dipstick.

Oil capacity:

Unit: liters (US qt, Imp qt)

	Models with turbocharger	Models without turbocharger
With oil filter	5.2 (5-1/2, 4-5/8)	4.5 (4-3/4, 4)
Without oil filter	4.7 (5, 4-1/8)	4.0 (4-1/4, 3-1/2)

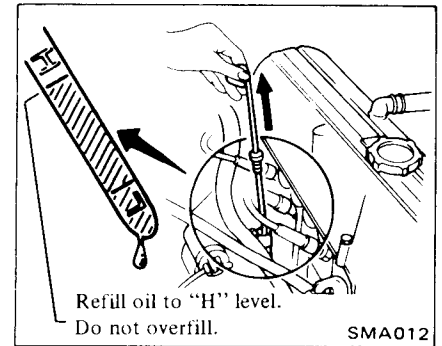


9. Start engine. Check area around drain plug and oil filter for any sign of oil leakage.

If any leakage is evident, these parts have not been properly installed.

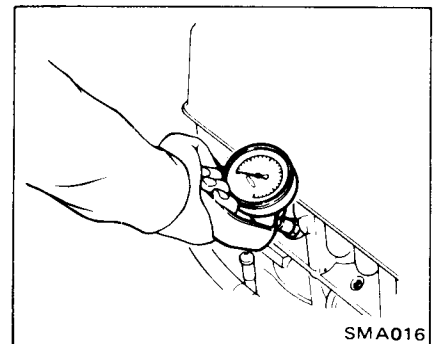
10. Run engine until water temperature indicator points to the middle of gauge. Then stop engine and wait several minutes. Check oil level with dipstick. If necessary, add engine oil.

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



CHECKING ENGINE COMPRESSION PRESSURE

1. Warm up engine until water temperature indicator points to the middle of gauge.
2. Disconnect all spark plugs with spark plug wrench.
3. Disconnect cold start valve and all injector connectors.
4. Properly attach a compression tester to spark plug hole in cylinder being tested.



5. Depress accelerator pedal to open throttle valve fully.
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:

Unit: kPa (kg/cm², psi)/rpm

	Models with turbocharger	Models without turbocharger
Standard	981 (10.0, 142)/350	1,177 (12.0, 171)/350
Minimum	686 (7.0, 100)/350	883 (9.0, 128)/350

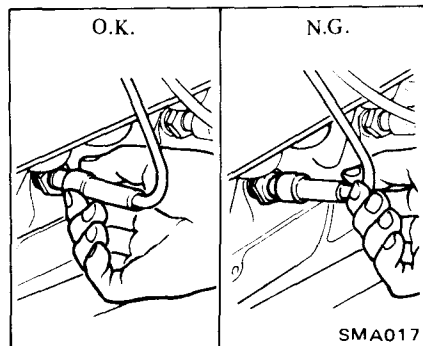
7. Cylinder compression in cylinders should not be less than 80% of the highest reading.

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

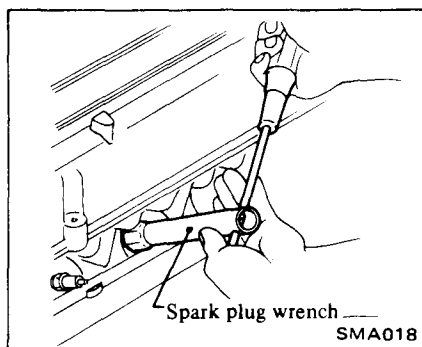
- If adding oil helps the compression pressure, chances are that piston rings are worn or damaged.
- If pressure stays low, valve may be sticking or seating improperly.
- If cylinder compression in any two adjacent cylinders is low, and if adding oil does not help the compression, there is leakage past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

REPLACING SPARK PLUGS

1. Disconnect spark plug wire at boot. Do not pull on the wires.

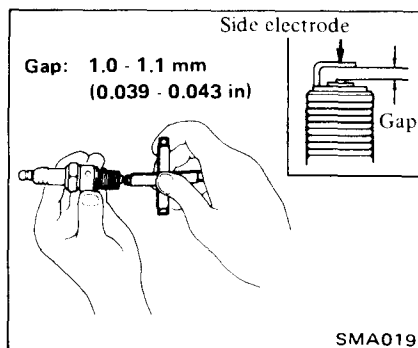


2. Remove spark plugs with spark plug wrench.



3. Using feeler gauge, check new spark plug gap.

If it is not within specified range, set gap by bending side electrode.



Spark plug:

	Models with turbocharger	Models without turbocharger
Standard type	BPR6ES-11	BPR6ES-11
Hot type		BPR5ES-11
Cold type	BPR7ES-11	BPR7ES-11

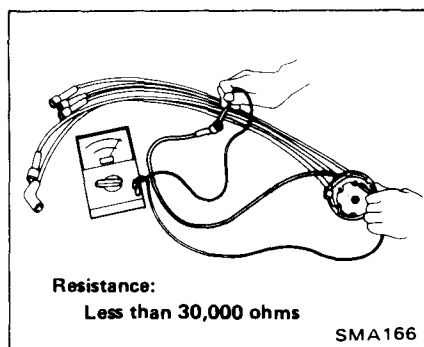
4. Install new spark plugs.

Reconnect high tension cables according to Nos. indicated on them.

ⓘ : Spark plug
15 - 20 N·m
(1.5 - 2.0 kg·m,
11 - 14 ft·lb)

CHECKING IGNITION WIRES

1. Visually check wires for cracks, 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 check for intermittent breaks.

AFTER ENGINE WARM-UP

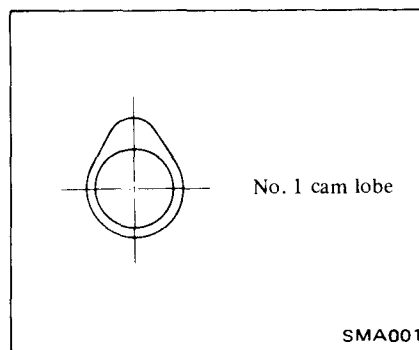
ADJUSTING INTAKE AND EXHAUST VALVE CLEARANCE

Adjustment should be made while engine is hot.

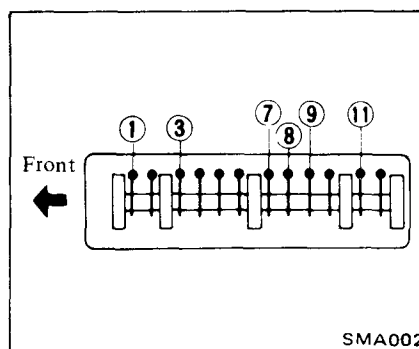
1. Start engine and warm up engine until water temperature indicator points to the middle of gauge, then stop engine.

Adjustment cannot be made while engine is in operation.

2. Remove valve rocker cover.
3. Set so that high point of No. 1 cam lobe points above.



Adjust clearance of half of the valves. Adjust only ①, ③, ⑦, ⑧, ⑨ and ⑪ valves.

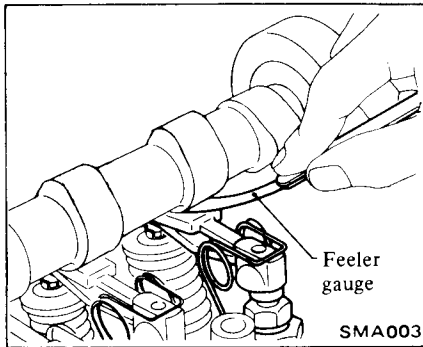


Valve clearance (Hot)

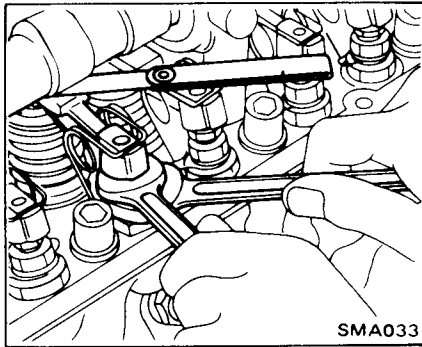
Intake . . ③ ⑧ ⑪ : 0.25 mm
(0.010 in)

Exhaust. . ① ⑦ ⑨ : 0.30 mm
(0.012 in)

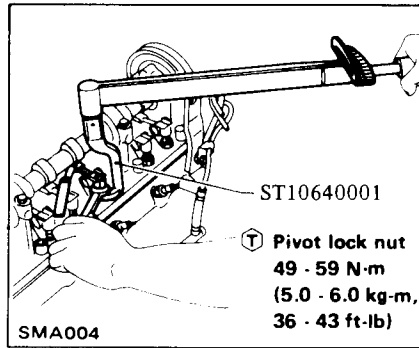
(1) Using feeler gauge, measure clearance between cam lobe and valve rocker.



(2) If the clearance is not specified value, loosen pivot lock nut and turn valve rocker pivot to provide proper clearance.



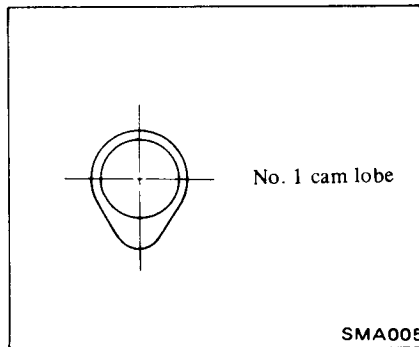
(3) Hold valve rocker pivot and tighten pivot lock nut using Tool.



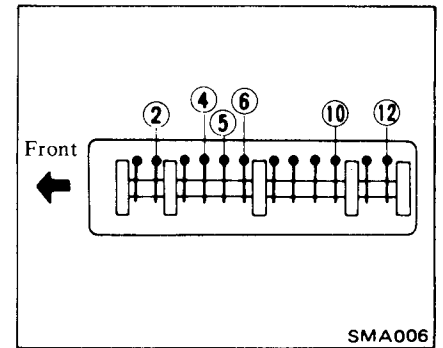
(4) Recheck clearance

Feeler gauge should move with a very slight drag.

4. Turn crankshaft and set so that high point of No. 1 cam lobe points down.



Adjust ②, ④, ⑤, ⑥, ⑩, and ⑫ valves, using same procedure as for Step 3.



Valve clearance (Hot)

Intake . . . ② ⑤ ⑩ : 0.25 mm
(0.010 in)

Exhaust. . ④ ⑥ ⑫ : 0.30 mm
(0.012 in)

5. Install valve rocker cover.

ADJUSTING IDLE RPM (Models without turbocharger)

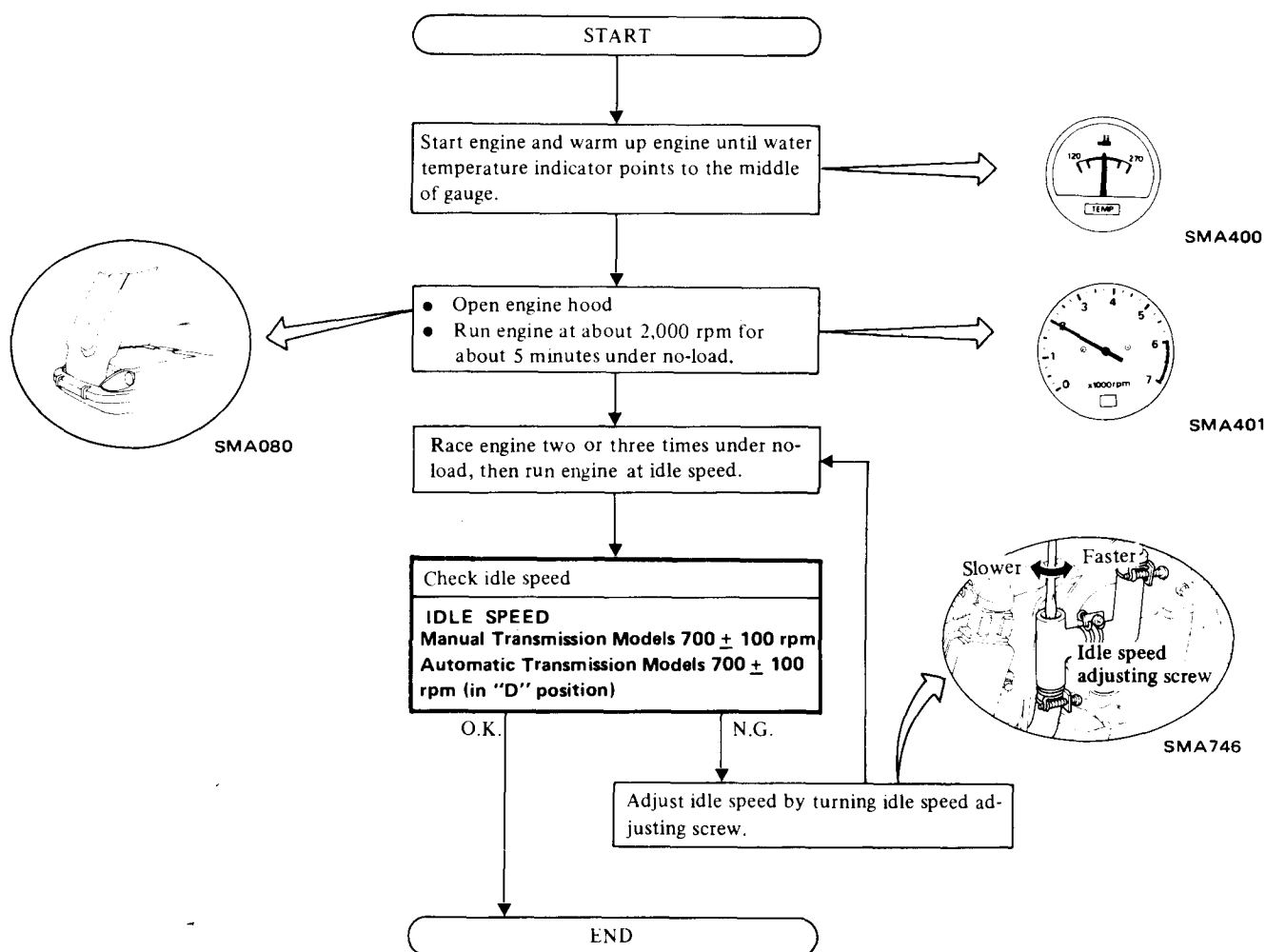
Preparation

1. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
2. On automatic transmission equipped models, checks should be carried out while shift lever is in "D" position.

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 the engine to prevent forward surge of car.
- c. After the adjustment has been made, shift the lever to the "N" or "P" position and remove wheel chocks.

Maintenance procedure



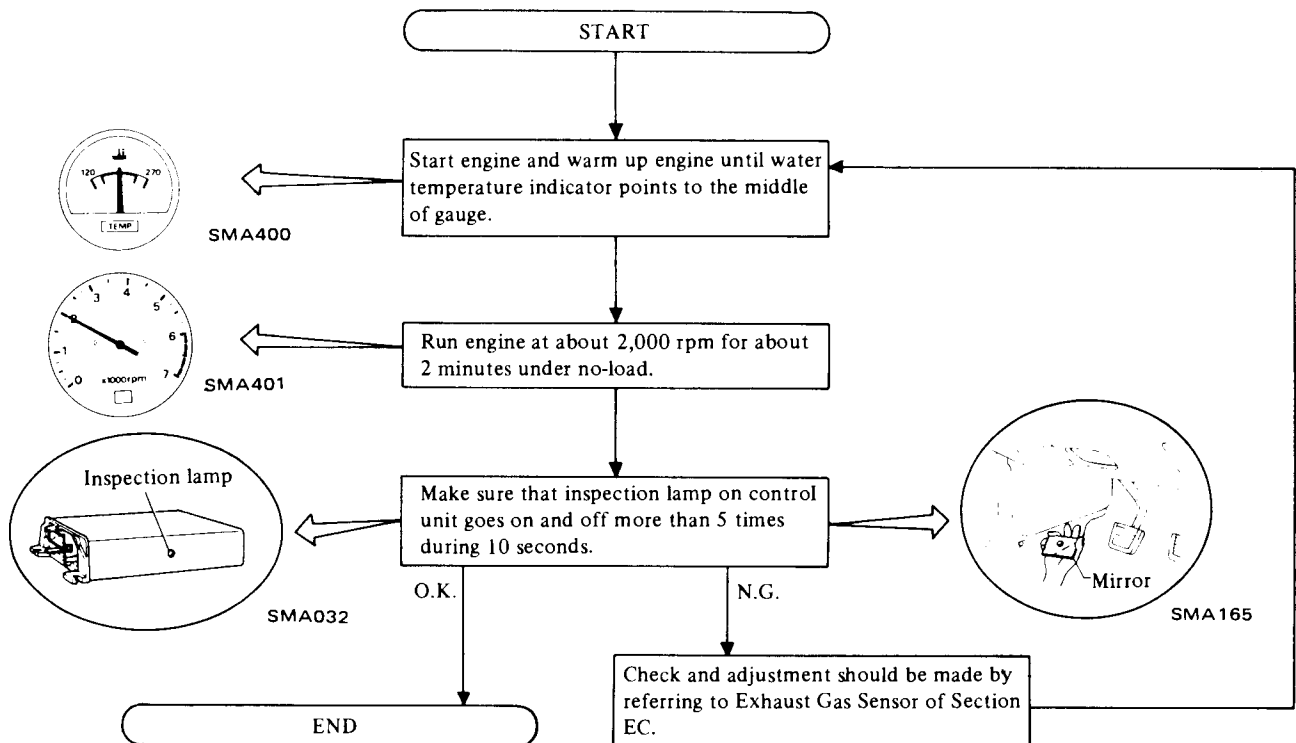
CHECKING EXHAUST GAS SENSOR

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
- EFI component parts
- EFI harness connectors
- Hoses
- Oil filler cap and oil level gauge
- Valve clearance, engine compression

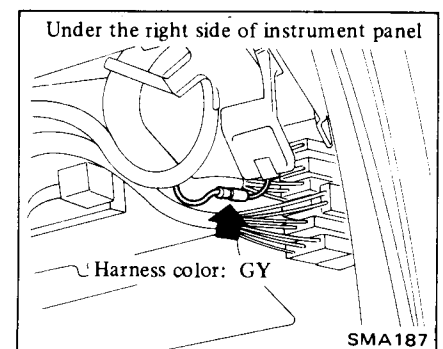
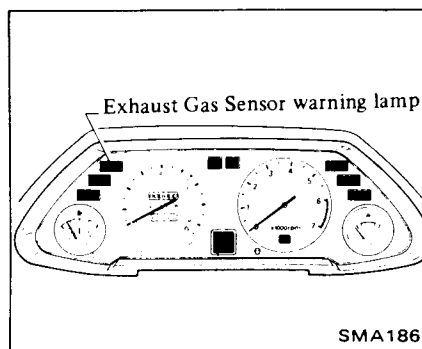
Maintenance procedure



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.



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.

MINOR TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
CANNOT CRANK ENGINE OR SLOW CRANKING	Improper grade oil.	Replace with proper grade oil.
	Partially discharged battery.	Charge battery.
	Malfunctioning battery.	Replace.
	Loose fan belt.	Adjust.
	Trouble in charging system.	Inspect.
	Wiring connection trouble in starting circuit	Correct.
	Malfunctioning ignition switch.	Repair or replace.
	Malfunctioning starting motor.	Repair or replace.

(Trouble-shooting procedures on starting circuit)
Switch on the starting motor with head lights "ON".

When head lights go off or dim considerably,

- a. Check battery.
- b. Check connection and cable.
- c. Check starting motor.

When head lights stay bright,

- a. Check wiring connection between battery and starting motor.
- b. Check ignition switch.
- c. Check starting motor.

ENGINE WILL CRANK NORMALLY BUT WILL NOT START

In this case, the following trouble causes may exist, but in many cases ignition system or fuel system is in trouble.

Ignition system in trouble

Fuel system in trouble

Valve mechanism does not work properly

Low compression

(Trouble-shooting procedure)

Check spark plug first by following procedure.

Disconnect high tension cable from one spark plug and hold it about 10 mm (0.39 in) from the engine metal part and crank the engine.

• Good spark occurs.

- a. Check spark plug.
- b. Check ignition timing.
- c. Check fuel system.
- d. Check revolution trigger signal.
- e. Check cylinder compression.

No spark occurs.

Very high current.

Check the current flow in primary circuit.

Inspect primary circuit for short.

Check distributor pick-up coil operation.

Check ignition system.

Low or no current.

Check for loose terminal or disconnection in primary circuit.

Condition	Probable cause	Corrective action
Ignition system in trouble*	Malfunctioning distributor pick-up coil. Improper air gap. Leak at rotor cap and rotor. Malfunctioning spark plug. Improper ignition timing. Malfunctioning ignition coil. Disconnection of high tension cable. Loose connection or disconnection in primary circuit. Irregular revolution trigger pulse. Malfunctioning IC ignition unit.	Replace. Adjust. Clean or replace. Clean, adjust plug gap or replace. Adjust. Replace. Replace. Repair or replace. Replace IC ignition unit. Replace.
ENGINE CRANKS NORMALLY BUT WILL NOT START Fuel system malfunction*	Lack of fuel. Damaged electronic fuel injection harness or replay. Malfunctioning fuel pump (Listen to operating sound). Damaged control unit. Damaged exhaust gas sensor. Seized injector (Listen to operating sound). Seized cold start valve. Malfunctioning air flow meter. Damaged cylinder head temp. sensor or water temp. sensor. Malfunctioning pressure regulator. Dirty fuel filter. Dirty or clogged fuel pipe. Clogged fuel tank breather pipe.	Supply. Replace. Replace. Replace. Replace. Replace. Replace. Replace. Replace. Replace. Clean. Repair and clean.
Low compression	Incorrect spark plug tightening or damaged gasket. Improper grade engine oil or low viscosity. Incorrect valve clearance. Compression leak from valve seat. Sticky valve stem. Weak or damaged valve springs. Compression leak at cylinder head gasket. Sticking or defective piston ring. Worn piston ring or cylinder.	Tighten to normal torque or replace gasket. Replace with proper grade oil. Adjust. Lap valves. Correct or replace valve and valve guide. Replace valve springs. Replace gasket. Replace piston rings. Overhaul engine.
(Trouble-shooting procedure) Pour the engine oil from plug hole, and then measure cylinder compression.		
Compression increases.		Trouble in cylinder or piston ring.
Compression does not change.		Compression leaks from valve, cylinder head or head gasket.

* Refer to EF section for models with turbocharger.

Condition	Probable cause	Corrective action
UNSTABLE ENGINE IDLING		
Ignition system in trouble*	<p>Incorrect idle speed adjustment.</p> <p>Malfunctioning ignition system (spark plug, high tension cable, distributor, IC ignition unit, ignition coil, etc.)</p> <p>Incorrect basic ignition timing.</p>	<p>Adjust.</p> <p>Replace.</p> <p>Adjust.</p>
Engine mechanical system in trouble	<p>Loose manifold and cylinder head bolts.</p> <p>Incorrect valve clearance.</p>	<p>Retighten bolts.</p> <p>Adjust.</p>
Fuel system malfunction*	<p>Clogged air cleaner filter.</p> <p>Damaged manifold gaskets.</p> <p>Intake air leakage at following points:</p> <ul style="list-style-type: none"> Dipstick Oil filler cap Blow-by hoses Intake air duct—air flow meter to throttle chamber, etc. <p>Damaged electronic fuel injection harness.</p> <p>Seized injector (Listen to operating sound).</p> <p>Malfunctioning air regulator (During warm-up driving only)</p> <p>Damaged control unit.</p> <p>Damaged exhaust gas sensor.</p> <p>Damaged cylinder head temp. sensor or water temp. sensor.</p> <p>Malfunctioning throttle valve switch.</p> <p>Irregular fuel pressure.</p>	<p>Replace filter.</p> <p>Replace gasket.</p> <p>Repair or replace.</p> <p>Replace.</p> <p>Replace.</p> <p>Replace.</p> <p>Replace.</p> <p>Replace.</p> <p>Replace.</p> <p>Replace.</p> <p>Repair or replace.</p> <p>Replace pressure regulator.</p>
Others*	Malfunctioning E.G.R. control system	Clear or replace.
HIGH ENGINE IDLE SPEED	<p>Dragged accelerator linkage.</p> <p>Malfunctioning B.C.D.D. system.</p> <p>Malfunctioning air regulator.</p> <p>Incorrect adjustment of idle speed adjusting screw.</p> <p>Throttle valve is opened excessively at idle.</p> <p>Malfunctioning F.I.C.D.</p>	<p>Check and correct accelerator linkage.</p> <p>If engine idling speed rises above 1,800 to 2,000 rpm, the cause may be malfunctioning B.C.D.D. system.</p> <p>Check B.C.D.D. system.</p> <p>Repair or replace if necessary.</p> <p>Replace.</p> <p>For inspection procedures for air regulator, refer to Engine Fuel Section.</p> <p>Correct.</p> <p>Replace throttle chamber.</p> <p>Replace.</p>

* Refer to EF section for models with turbocharger.

Condition	Probable cause	Corrective action
ENGINE POWER NOT UP TO NORMAL		
Low compression		Previously mentioned.
Ignition system in trouble*	Incorrect ignition timing. Malfunctioning spark plugs. Malfunctioning distributor pick-up coil.	Adjust. Clean, adjust or replace plugs. Replace.
ENGINE POWER BELOW NORMAL		
Fuel system malfunction*	Throttle valve does not open fully. Damaged electronic fuel injection harness. Seized injector (Listen to operating sound). Malfunctioning air flow meter. Malfunctioning throttle valve switch. Irregular fuel pressure. Clogged fuel pipe. Dirty or clogged fuel filter. Fuel pump will not work properly.	Adjust. Replace. Replace. Replace. Repair or replace. } For inspection procedures for electronic fuel injection system components, refer to Engine Fuel Section. Replace pressure regulator if necessary. Replace if necessary. Replace. Replace.
Air intake system malfunction*	Clogged air cleaner filter. Air leaking from manifold gasket. Intake air leakage at following points: Dipstick Oil filler cap Blow-by hoses Intake air duct—air flow meter to throttle chamber etc.	Replace filter. Replace gasket. Repair or replace.
Overheating	Insufficient coolant. Loose fan belt. Worn or damaged fan belt. Malfunctioning thermostat. Malfunctioning water pump. Clogged or leaky radiator. Malfunctioning radiator filler cap. Air in cooling system. Improper engine oil grade. Incorrect ignition timing. Malfunctioning thermal vacuum valve (for E.G.R. system).	Replenish. Adjust fan belt. Replace. Replace. Replace. Flush, repair or replace. Replace. Retighten each part of cooling system. Replace with proper grade oil. Adjust. Replace.
Overcooling	Malfunctioning thermostat.	Replace.

* Refer to EF section for models with turbocharger.

Condition	Probable cause	Corrective action
Others	<p>Improper octane fuel.</p> <p>Improper tire pressure.</p> <p>Dragging brake.</p> <p>Clutch slipping.</p>	<p>Replace with specified octane fuel.</p> <p>Inflate to specified pressure.</p> <p>Adjust.</p> <p>Adjust.</p>
NOISY ENGINE		
Engine knocking	<p>Overloaded engine.</p> <p>Carbon knocking.</p> <p>Timing knocking.</p> <p>Fuel knocking.</p> <p>Preignition (misusing of spark plug).</p>	<p>Use right gear in driving.</p> <p>Disassemble cylinder head and remove carbon.</p> <p>Adjust ignition timing.</p> <p>Use specified octane fuel.</p> <p>Use specified spark plug.</p>
Mechanical knocking		
Crankshaft bearing knocking.	This strong dull noise increases when engine is accelerated. To locate the place, cause a misfire in each cylinder. If the noise stops by the misfire, this cylinder generates the noise.	This is caused by worn or damaged bearings, or unevenly worn crankshaft. Renew bearings and adjust or change crankshaft. Check lubrication system.
Connecting rod bearing knocking.	This is a little higher-pitched noise than the crankshaft knocking, and also increases when engine is accelerated. Cause a misfire in each cylinder and if the noise diminishes almost completely, this crankshaft bearing generates the noise.	Same as the case of crankshaft bearings.
Piston and cylinder noise.	When you hear an overlapping metallic noise which increases its magnitude with the engine revolution and which decreases as engine is warmed up, this noise is caused by piston and cylinder. To locate the place, cause a misfire in each cylinder.	<p>This may cause an abnormal wearing of cylinder and lower compression which in turn will cause a lower out-put power and excessive oil consumption.</p> <p>Overhaul engine.</p>
Piston pin noise.	This noise is heard at each highest and lowest dead end of piston. To locate the place, cause a misfire in each cylinder.	<p>This may cause a wear on piston pin, or piston pin hole.</p> <p>Renew piston and piston pin assembly.</p>
Water pump noise.	This noise may be caused by worn or damaged bearings, or by the uneven surface of sliding parts.	Replace water pump with a new one.
Others.	<p>An improper adjustment of valve clearance.</p> <p>An excessive end-play on crankshaft.</p> <p>This noise will be heard when clutch is disengaged.</p> <p>Wear on clutch pilot bushing.</p> <p>This noise will be heard when clutch is disengaged.</p>	<p>Adjust.</p> <p>Disassemble engine and renew main bearing.</p> <p>Renew bushing and adjust drive shaft.</p>

Condition	Probable cause	Corrective action
ABNORMAL COMBUSTION (backfire, after fire run-on etc.)		
Improper ignition timing*	Improper ignition timing. Improper heat range of spark plugs.	Adjust ignition timing. Use specified spark plugs.
Fuel system malfunction*	Intake air leakage at following points: Dipstick Oil filler cap Blow-by hoses Intake air duct—air flow meter to throttle chamber etc. Damaged electronic fuel injection harness. Damaged control unit. Damaged exhaust gas sensor. Malfunctioning air flow meter. Damaged cylinder head temp. sensor or water temp. sensor.	Repair or replace. Replace. } Replace. } For inspection procedures for Replace. } electronic fuel injection system Replace. } components, refer to Engine Replace. } Fuel Section.
Defective cylinder head, etc.	Improperly adjusted valve clearance. Excess carbon in combustion chamber. Damaged valve spring (backfire, after fire).	Adjust. Remove head and get rid of carbon. Replace it with a new one.
Others*	 Malfunctioning E.G.R. control system.	 Check for loose vacuum hoses. Replace if necessary. Replace.
EXCESSIVE OIL CONSUMPTION		
Oil leakage	Loose oil drain plug. Loose or damaged oil pan gasket. Loose or damaged chain cover gasket. Damaged oil seal in front and rear of crankshaft. Loosen or damaged rocker cover gasket. Improper tightening of oil filter. Loosen or damaged oil pressure switch.	Tighten it. Renew gasket or tighten it. Renew gasket or tighten it. Renew oil seal. Renew gasket or tighten it (but not too much). Renew gasket and tighten it with the proper torque. Renew oil pressure switch or tighten it.
Excessive oil consumption	Cylinder and piston wear. Improper location of piston ring or rerversely assembled piston ring. Damaged piston rings. Worn piston ring groove and ring.	Overhaul cylinder and renew piston. Remount piston rings. Renew rings. Repair or renew piston and cylinder. Renew piston and piston ring.

* Refer to EF section for models with turbocharger.

Condition	Probable cause	Corrective action
Excessive oil consumption	Fatigue of valve oil seal lip. Worn valve stem.	Replace seal lip with a new one. Renew valve or guide.
Others	Inadequate quality of engine oil. Engine overheating.	Use the designated oil. Previously mentioned.
POOR FUEL ECONOMY*		
Ignition system in trouble*		Previously mentioned.
Others*	Excessive idle rpm.	Adjust it to the designated rpm. Repair or tighten the connection of fuel pipes.
Emission control system malfunction*	Malfunctioning E.G.R. control system.	Replace.
Fuel system malfunction*	Fuel leakage. Damaged electronic fuel injection harness. Damaged control unit. Damaged exhaust gas sensor. Malfunctioning air flow meter. Damaged air temperature sensor. Malfunctioning throttle valve switch. Fuel leakage at injector or cold start valve. Fuel leakage at rubber fuel hose. Irregular fuel pressure.	Repair or replace. Replace. } Replace. } For inspection procedures for Replace. } electronic fuel injection system Replace. } components, refer to Engine Replace. } Fuel Section. Replaced damaged part. Repair or replace. Replace pressure regulator if necessary.
TROUBLE IN OTHER FUNCTIONS		
Decreased oil pressure	Inadequate oil quality. Overheating. Malfunctioning oil pump regulator valve. Functional deterioration of oil pump. Blocked oil filter. Increased clearance in various sliding parts. Blocked oil strainer. Malfunctioning oil gauge pressure switch.	Use the designated oil. Previously mentioned. Disassemble oil pump and repair or renew it. Repair or replace it with a new one. Renew it. Disassemble and replace the worn parts with new ones. Clean it. Replace it with a new one.
Excessive wear on the sliding parts	Oil pressure decreases. Damaged quality or contamination of oil.	Previously mentioned. Exchange the oil with proper one and change element.

* Refer to EF section for models with turbocharger.

Condition	Probable cause	Corrective action
Excessive wear on the sliding parts	Air leakage from air intake duct. Damaged air cleaner. Overheating or overcooling. Improper fuel mixture.	Repair or replace. Change element. Previously mentioned. Check the fuel system.
Scuffing of sliding parts	Decrease of oil pressure. Insufficient clearances. Overheating. Improper fuel mixture.	Previously mentioned. Readjust to the designated clearances. Previously mentioned. Check the fuel system.

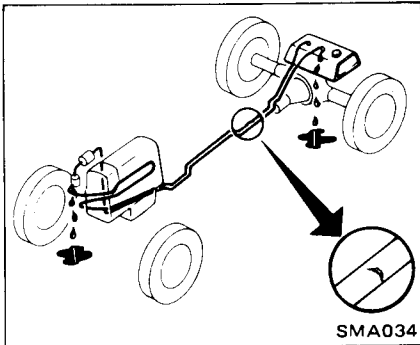
CHASSIS AND BODY MAINTENANCE

ENGINE CONTROL, FUEL AND EXHAUST SYSTEMS

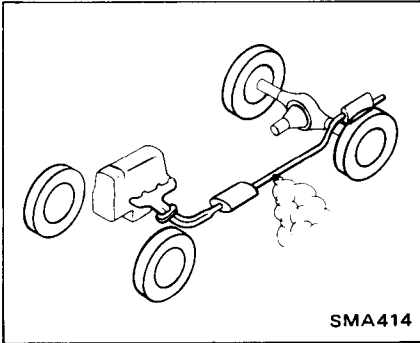
CHECKING FUEL AND EXHAUST SYSTEMS

Check fuel and exhaust systems for condition, connections and leaks.

Fuel system

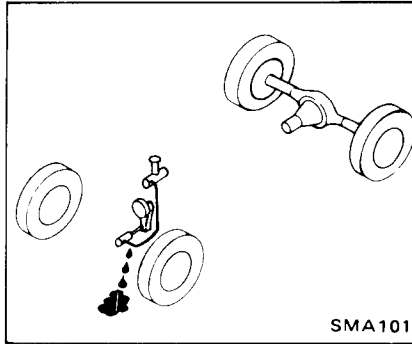


Exhaust system



CHECKING CLUTCH SYSTEM

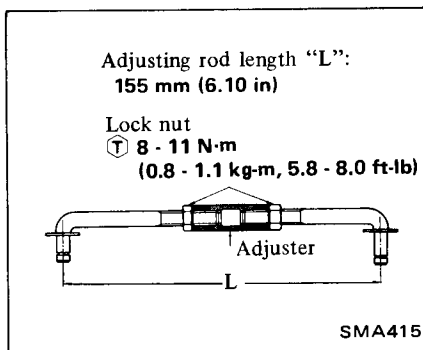
Check clutch system for proper attachment, leaks, chafing, abrasion, deterioration, etc.



CHECKING CLUTCH PEDAL HEIGHT AND FREE PLAY

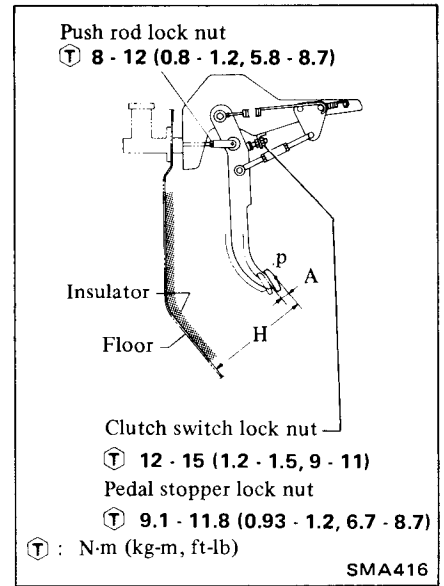
Check clutch pedal height and free play. Adjust if necessary.

1. Make sure that adjusting rod length "L" is adjusted to specified value. If length is not within specified value, loosen lock nut at each end of adjuster and turn adjuster until specified rod length is reached. After rod length adjustment, tighten lock nut securely.



2. Loosen pedal stopper or clutch switch. Loosen push rod lock nut, and turn push rod until distance between center "point P" of pedal pad and floor panel is 206 mm (8.11 in), then tighten lock nut securely.

While adjusting pedal pad-to-floor panel distance, ensure that pedal does not contact stopper or switch.



3. Next, turn switch or stopper until distance between center "point P" of pedal pad and floor panel is adjusted to specified value, and tighten lock nut securely. When pedal height is finally adjusted to the specified value of 203 mm (7.99 in), ensure that clutch pedal is depressed less than 4 mm (0.16 in) and that push rod is not pushed more than free play.

Pedal height "H":

203 mm (7.99 in)

Pedal free play "A":

1 - 5 mm (0.04 - 0.20 in)

Pedal free play means the following total measured at position of pedal pad.

- Play due to clevis pin and clevis pin hole in pedal lever.
- Play due to piston and piston rod.

4. After pedal height adjustment, initial effort to depress pedal should be within specification. If it is not, adjust adjusting rod length "L".

Initial effort to depress pedal
(Reference data):

Models equipped with A.S.C.D.

15.7 N (1.6 kg, 3.5 lb)

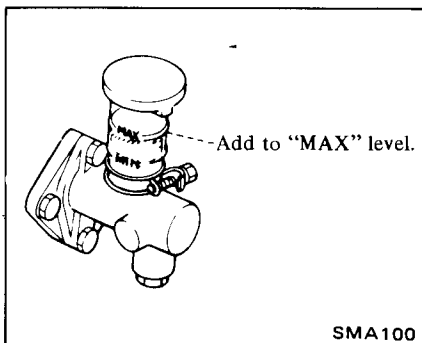
Models not equipped with A.S.C.D.

18.6 N (1.9 kg, 4.2 lb)

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

CLUTCH

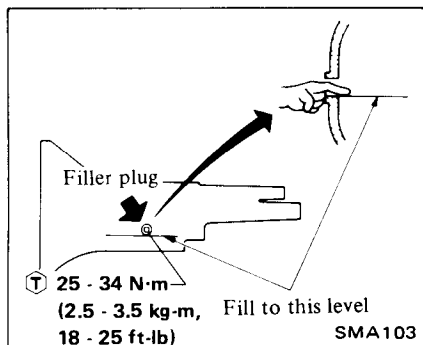
CHECKING CLUTCH FLUID LEVEL AND LEAKS



MANUAL TRANSMISSION

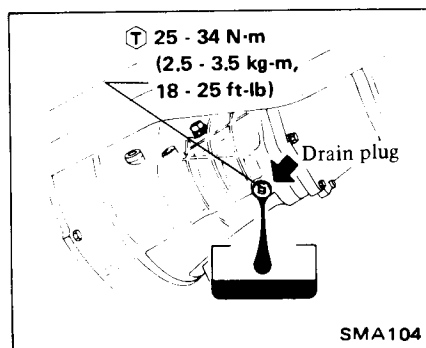
CHECKING MANUAL TRANSMISSION OIL LEVEL

Never start engine while checking oil level.

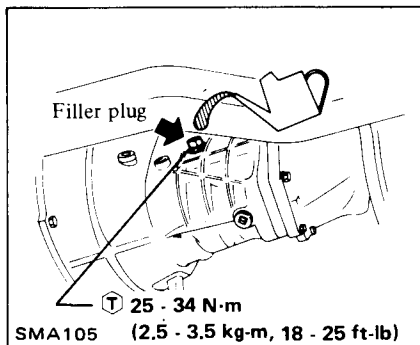


CHANGING MANUAL TRANSMISSION OIL

1. Drain oil completely.



2. Refill transmission and check oil level.



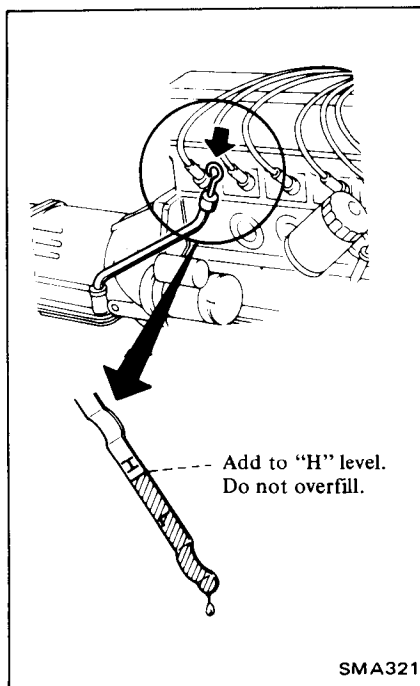
Oil capacity:
FS5W71B
 2.0 liters
 (4-1/4 US pt, 3-1/2 Imp pt)

AUTOMATIC TRANSMISSION

CHECKING AUTOMATIC TRANSMISSION FLUID LEVEL

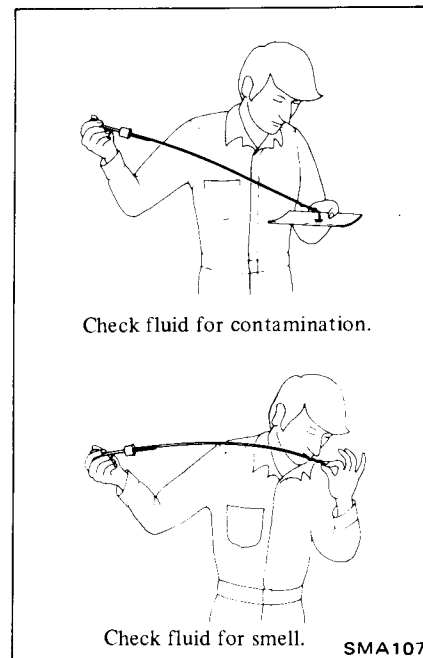
1. Check under following conditions.
 (1) Place selector lever in "P" (PARK) position and idle engine.
 (2) Maintain fluid temperature at 50 to 80°C (122 to 176°F).
2. Add fluid, if necessary.

Use only automatic transmission fluid having "DEXRON" identifications in 3N71B automatic transmission.



CHECKING AUTOMATIC TRANSMISSION FLUID CONDITION

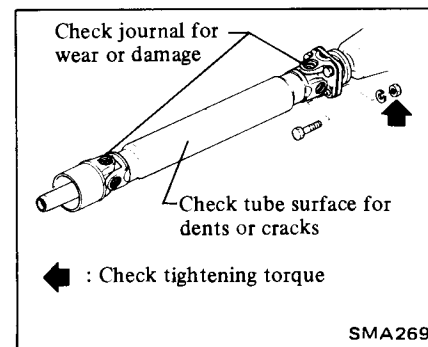
Check fluid for contamination to determine condition of automatic transmission. If fluid is very dark or smells burned, the frictional material (clutches, band, etc.) may need replacement.



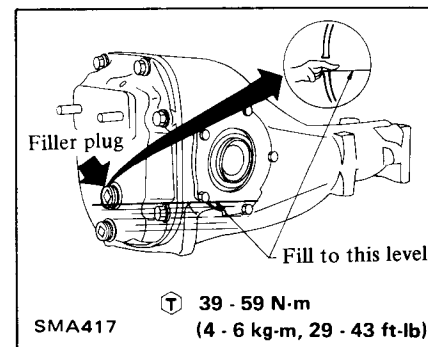
PROPELLER SHAFT AND DIFFERENTIAL CARRIER

CHECKING PROPELLER SHAFT

Check propeller shaft, replace if necessary.

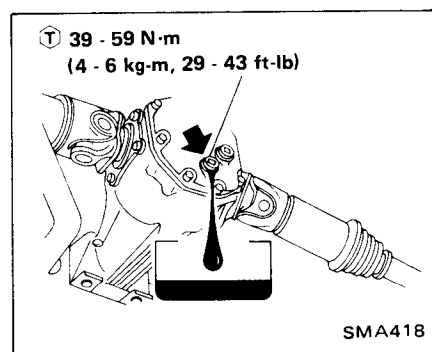


CHECKING DIFFERENTIAL CARRIER OIL LEVEL

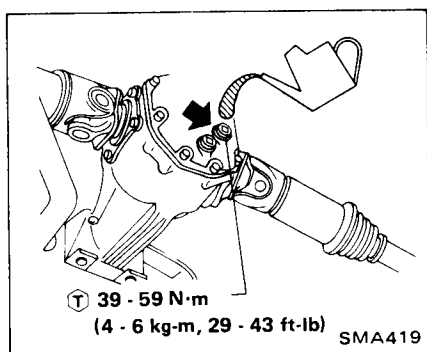


CHANGING DIFFERENTIAL CARRIER OIL

1. Drain oil completely.



2. Refill differential carrier and check oil level.



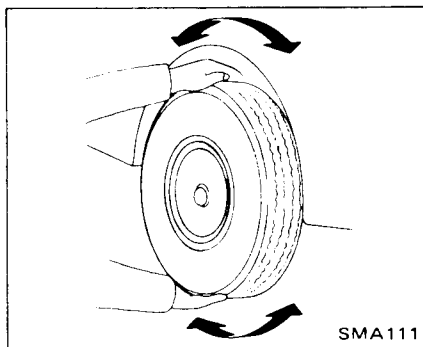
Oil capacity:

R200

1.3 liters (2-3/4 US pt,
2-1/4 Imp pt)

R180

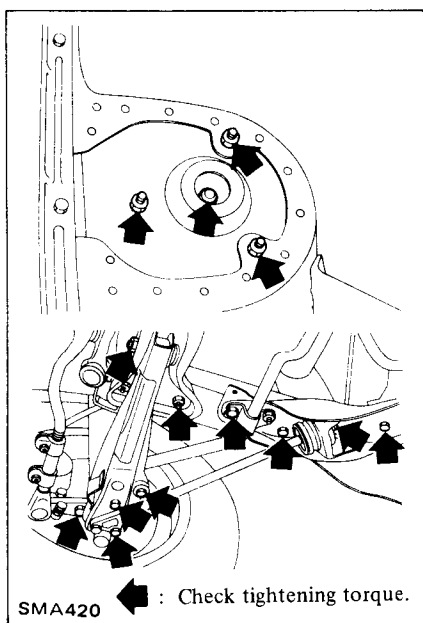
1.0 liter (2-1/8 US pt,
1-3/4 Imp pt)



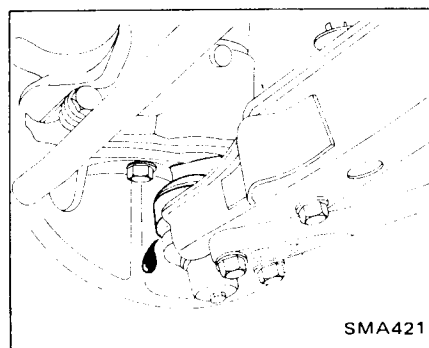
Check suspension parts for looseness, wear, or damage.

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).



4. Check suspension ball joint for grease leakage and ball joint dust cover for damage.



5. Remove wheel and tire assembly.
6. Check front axle parts for crack or damage.

Replace worn parts.

Refer to Front Axle (Section FA).

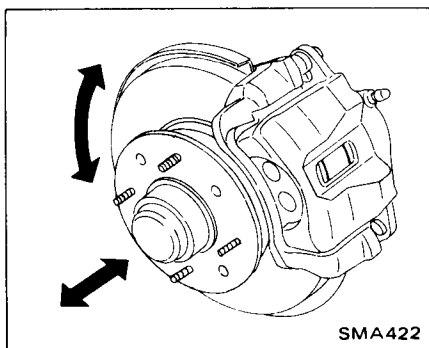
7. Remove brake pads.
- Refer to section BR.

8. 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).

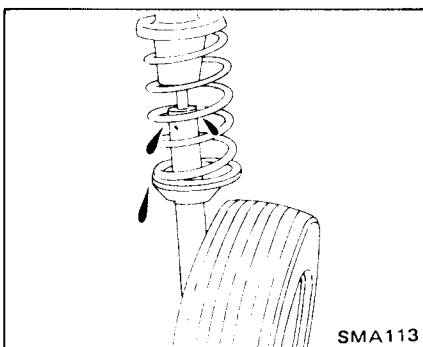


FRONT AXLE AND FRONT SUSPENSION

CHECKING FRONT AXLE AND SUSPENSION PARTS

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

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

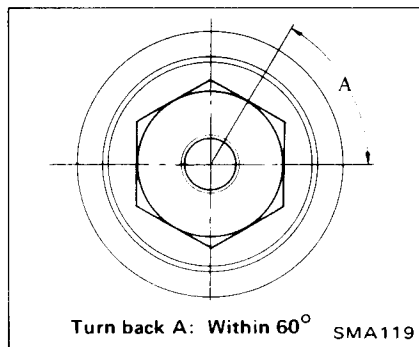
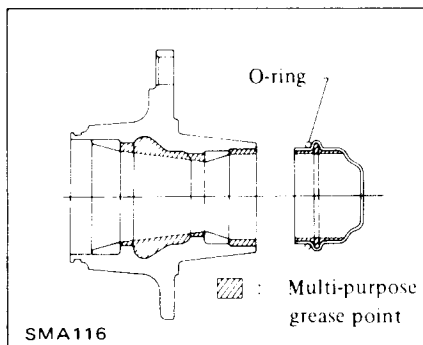


ADJUSTING WHEEL BEARING PRELOAD

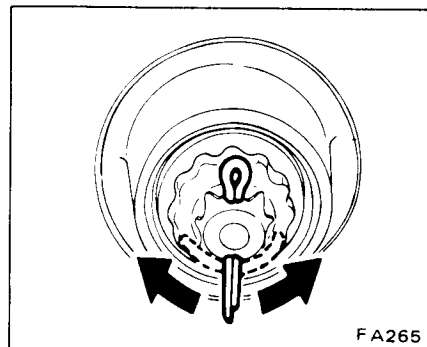
After wheel bearing has been replaced or front axle has been re-assembled be sure to adjust wheel bearing preload as described below.

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, hub cap and O-ring.
- Grease seal lip.



9. Spread cotter pin.



7. Fit adjusting cap and new cotter pin.

If the above procedure fails to align hole and slot together, then tighten lock nut as much as 15° until hole in spindle is aligned with any slot.

10. Install hub cap with new O-ring.

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 car height (Unladen).
- Repair or replace the damaged portion or parts.

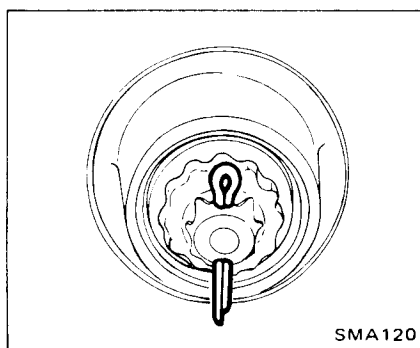
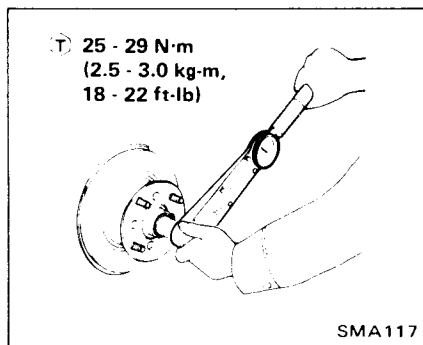
“Unladen”

- 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.

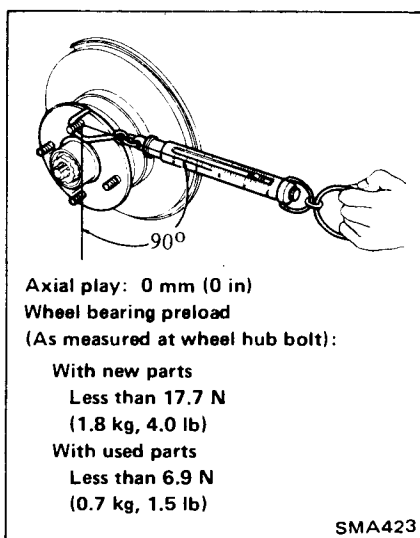
Camber, caster and king-pin inclination

Camber, caster and king-pin inclination are preset at the factory and cannot be adjusted.

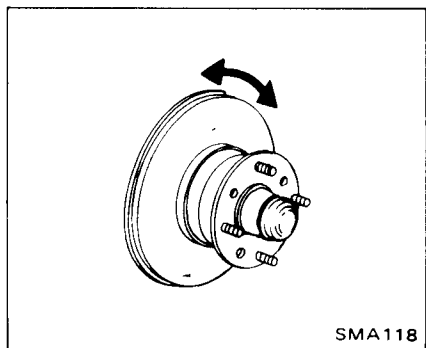
3. Tighten wheel bearing nut.



8. Measure wheel bearing preload and axial play.



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 60°.

Repeat above procedures until correct starting torque is obtained.

If camber, caster or king-pin inclination alignment is not within specifications, check pertinent parts.

Repair or replace as necessary.

Camber:

–35' - 55'

Caster:

4°10' - 5°40'

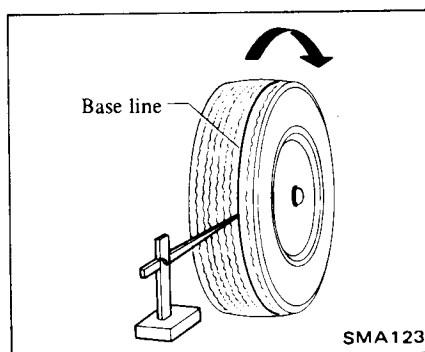
Kingpin inclination:

8°35' - 10°5'

Toe-in

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

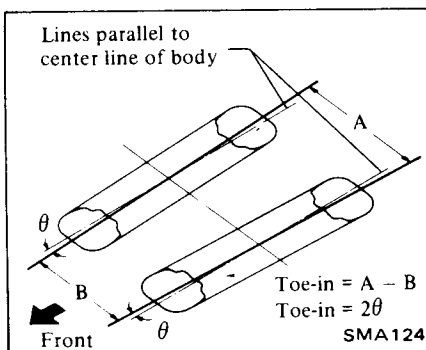
1. Raise front of car and mark a base line across the tread of left and right wheels.



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

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

3. Measure toe-in and make necessary adjustments.



Toe-in (Unladen):

0 - 2 mm (0 - 0.08 in)

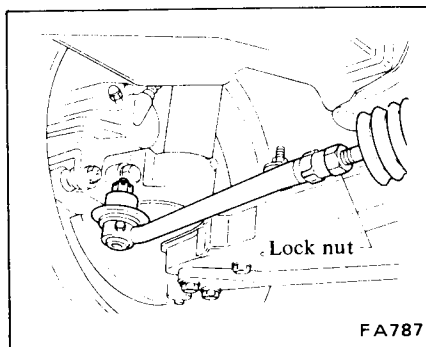
6' - 16' (On both sides)

Side slip (Reference data)

Out 3 mm - In 3 mm/m

(Out 0.036 in - In 0.036 in/ft)

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

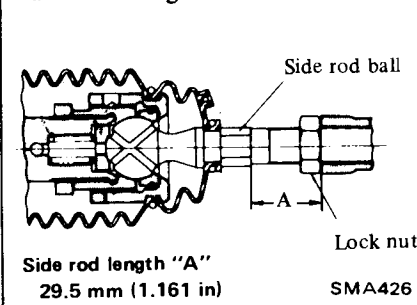


- a. Loosen lock nuts and turn left and right side rod bars equally.

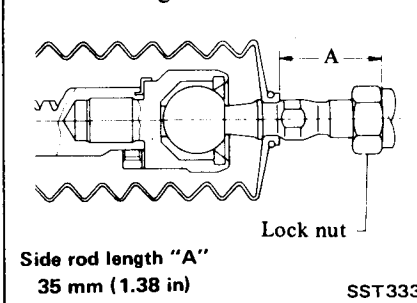
- b. The side rod bars have right-handed threads, and should be turned as viewed from outside, clockwise to increase, or counterclockwise to decrease, toe-in.

- If side rods have been disassembled, set side rod length to specified value "A" before reassembling.
- Make sure that side rod bars are screwed into side rods more than 25 mm (0.98 in).

Manual steering models



Power steering models

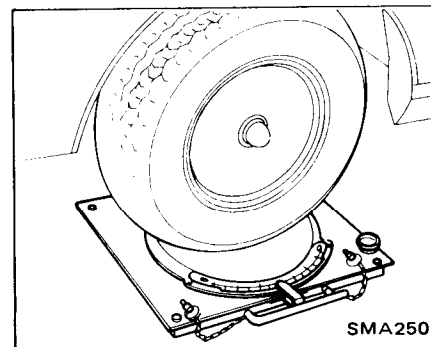


After correct toe-in is obtained, tighten side rod lock nuts.

Ⓣ : 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 car forward until front wheels rest on turning radius gauge properly.



2. Remove stopper pin of turning radius gauge and then rotate steering wheel to the right and left; measure turning angle on wheel.

Front wheel turning angle

- **Toe-out turns**

(When inner wheel is 20°)

Outer wheel

RP15L: 18.7°

IPRP15L: 18.7°

- **Full turns**

RP15L:

Inner wheel 33-1/2° - 37-1/2°

Outer wheel 29° - 33°

IPRP15L:

Inner wheel 33-1/2° - 37-1/2°

Outer wheel 29° - 33°

If turning angle does not satisfy specifications, check rack stroke by referring to Section ST.

Rack stroke (each side)

RP15L: 66.4 mm (2.614 in)

IPRP15L: 66.4 mm (2.614 in)

CHECKING 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 inspecting 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).

REAR AXLE AND REAR SUSPENSION

CHECKING REAR AXLE AND SUSPENSION PARTS

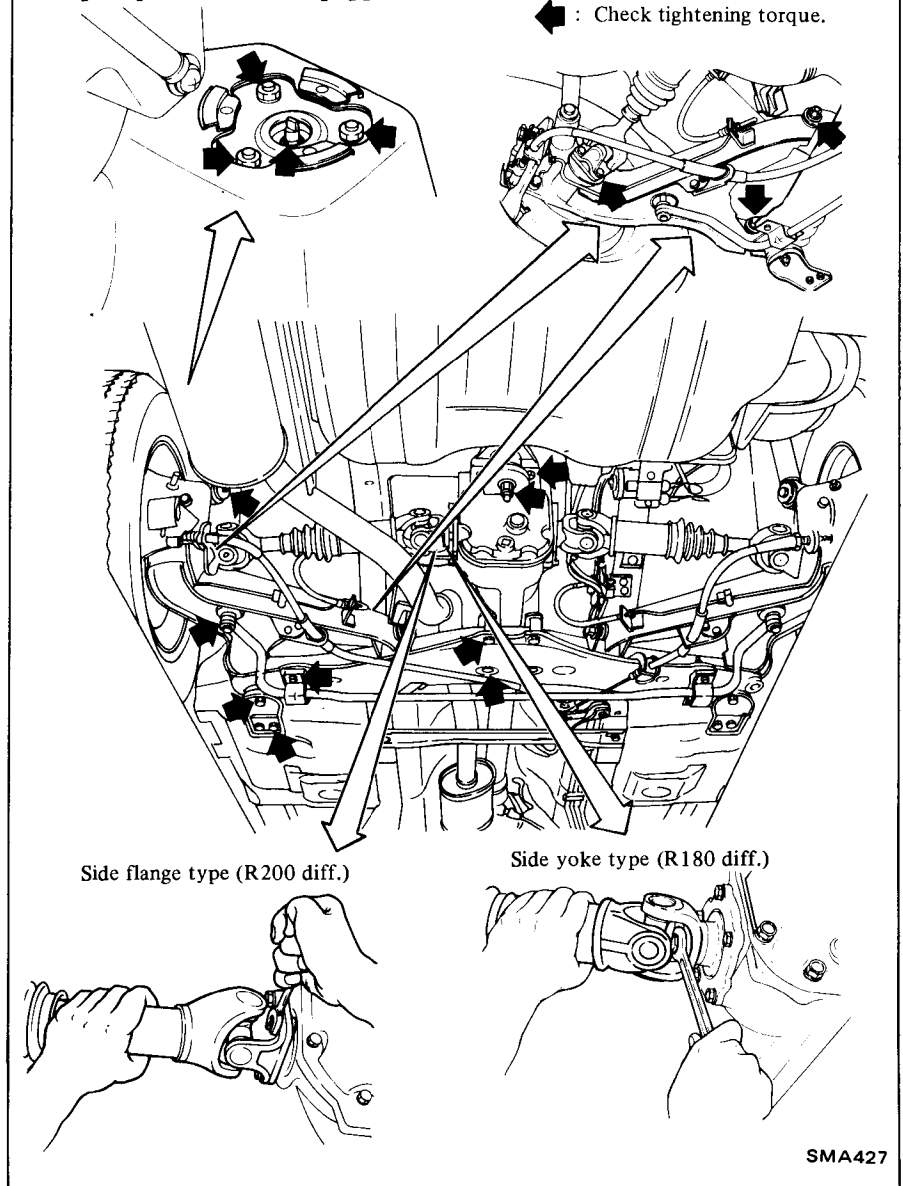
Check rear axle and suspension parts for looseness, wear or damage.

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).

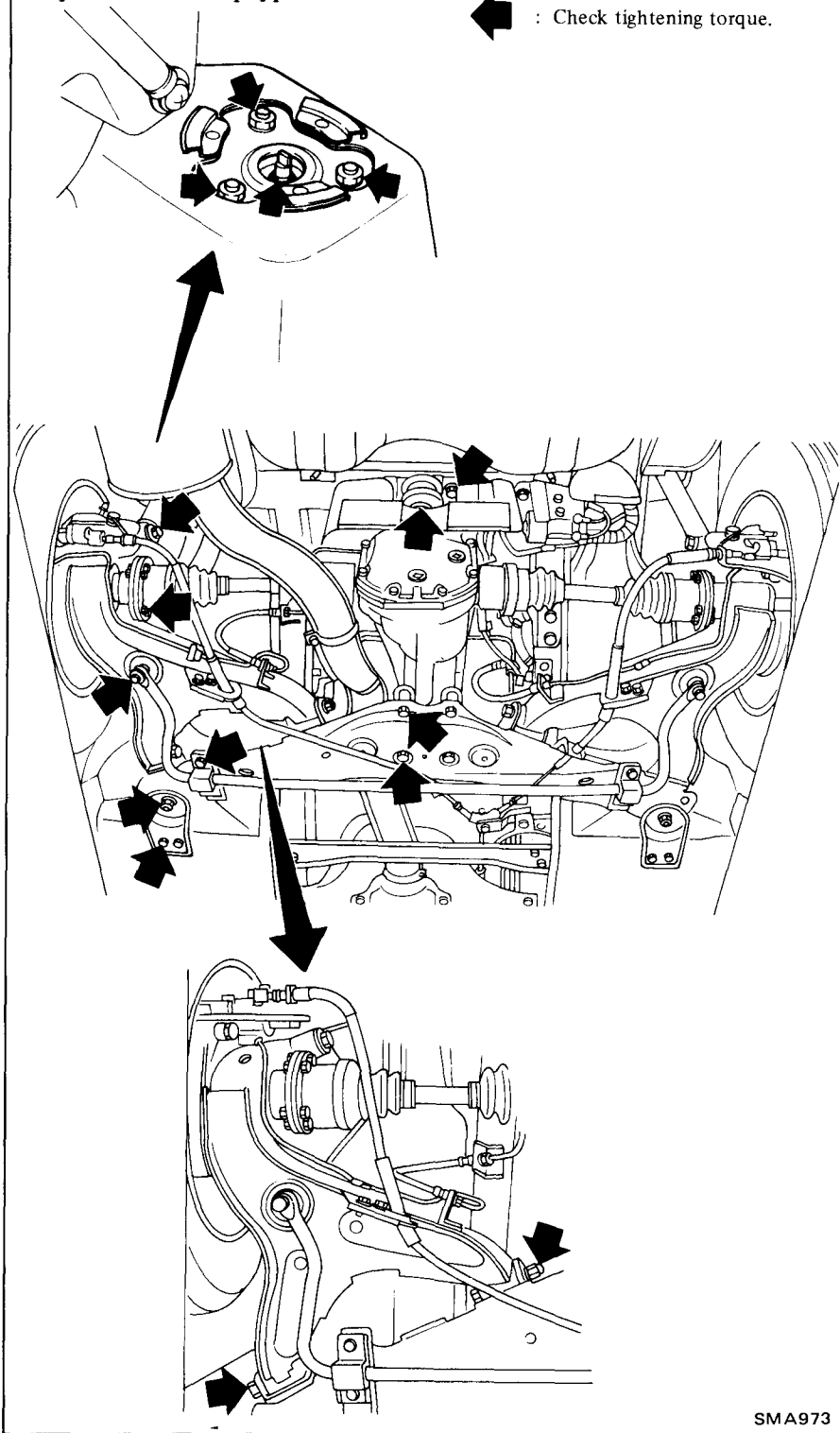
Except tripod drive shaft equipped model

◀ : Check tightening torque.



Tripod drive shaft equipped model

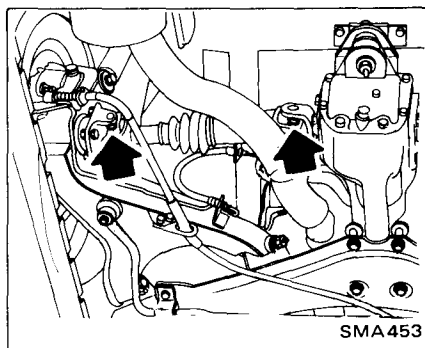
⬅ : Check tightening torque.



GREASING REAR AXLE DRIVE SHAFT JOINTS (Except tripod drive shaft)

Lubricate rear axle drive shaft joints with recommended multi-purpose grease.

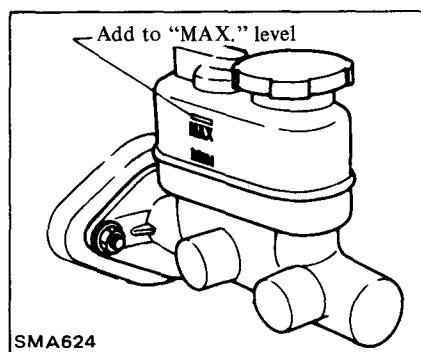
1. Wipe dirt and grease from around plugs.
2. Remove plugs and install grease nipples in their place.
3. Pump grease slowly.
4. Remove grease nipples and install plugs.



Do not over lubricate so that grease leaks from dust seal, as this will destroy weathertight seal.

BRAKE SYSTEM

CHECKING BRAKE FLUID LEVEL AND LEAKS



If fluid level is extremely low, check brake system for leaks.

CHANGING BRAKE FLUID

1. Change brake fluid.

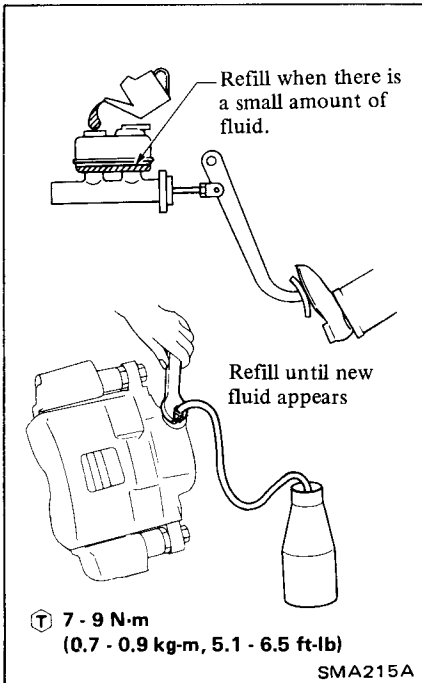
Use same procedure as in air bleeding to change brake fluid in system. This operation should be done for one wheel at a time. Refer to Section BR.

CAUTION:

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

Recommended brake fluid specification:

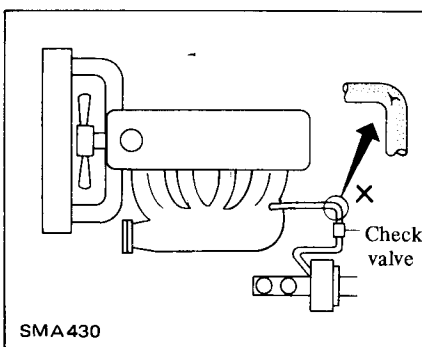
DOT 3 (F.M.V.S.S. No. 116)



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

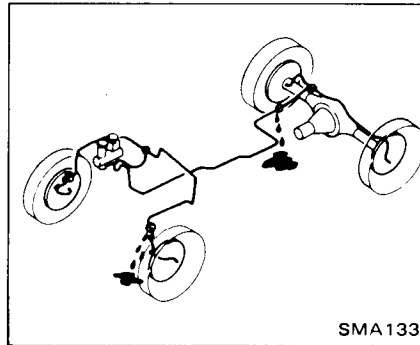
CHECKING BRAKE BOOSTER VACUUM HOSES, CONNECTIONS AND CHECK VALVE

1. Check condition of vacuum hoses and connections.
2. Check vacuum hoses and check valve for air tightness.



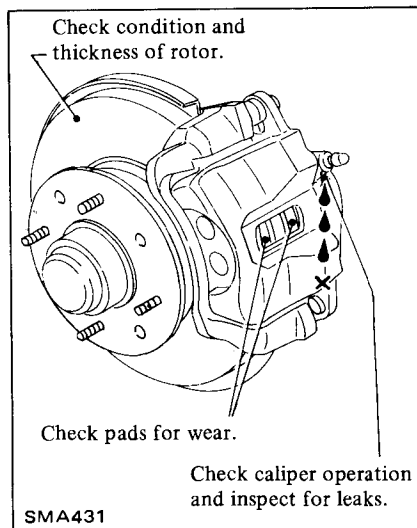
CHECKING BRAKE SYSTEM

1. Check brake system for proper attachment, leaks, chafing, abrasion, deterioration, etc.

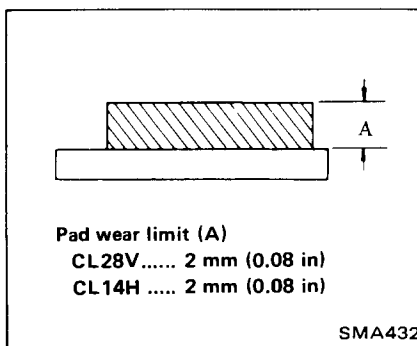


CHECKING DISC BRAKE

1. Check condition of disc brake components.



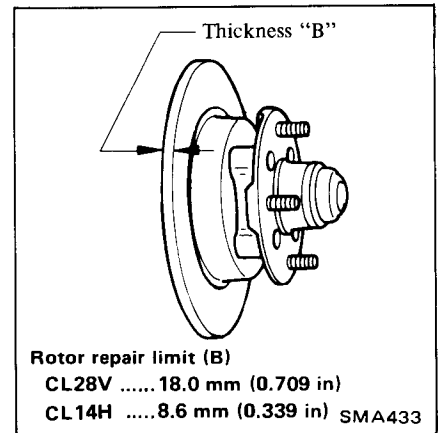
Pad wear limit



Pad wear limit (A)
CL28V 2 mm (0.08 in)
CL14H 2 mm (0.08 in)

Refer to Section BR for pad replacement.

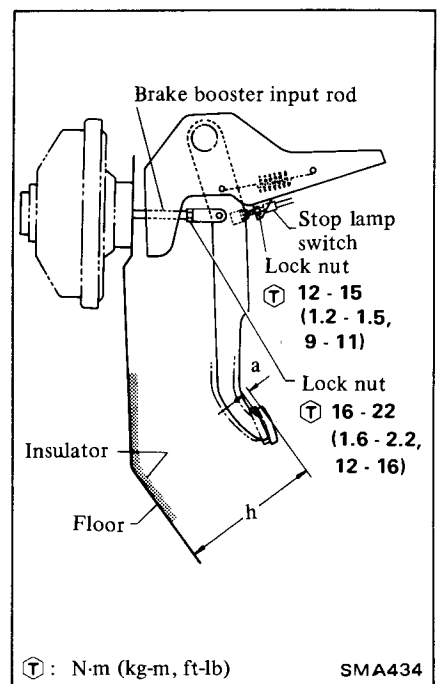
Rotor repair limit



Rotor repair limit (B)
CL28V 18.0 mm (0.709 in)
CL14H 8.6 mm (0.339 in)

CHECKING FOOT BRAKE

1. Check brake pedal free height and free play.
Adjust if necessary.



Pedal height "h":

M/T model
181 - 187 mm
(7.13 - 7.36 in)

A/T model
190 - 196 mm
(7.48 - 7.72 in)

Pedal free play "a":

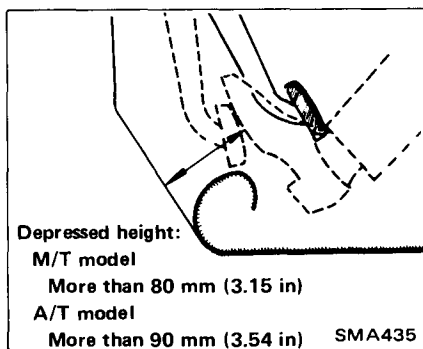
1 - 5 mm (0.04 - 0.20 in)

- (1) Adjust pedal free height with stop lamp switch. Then tighten lock nut.
- (2) Adjust pedal free play with brake booster input rod. Then tighten lock nut.

Pedal free play means the following total measured at position of pedal pad.

- Play due to clevis pin and clevis pin hole in pedal lever.
- Play due to piston and piston rod.

2. Check brake pedal depressed height.

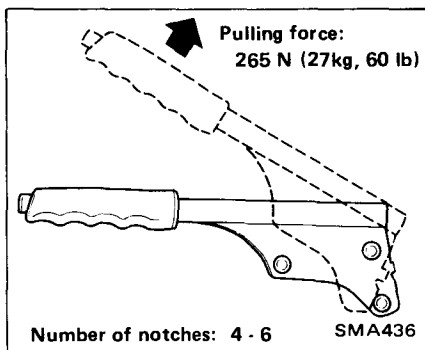


If depressed height is below the specified value, check brake system for leaks, accumulation of air or any abnormality regarding component parts (master cylinder, adjuster, etc.), and make the necessary repairs.

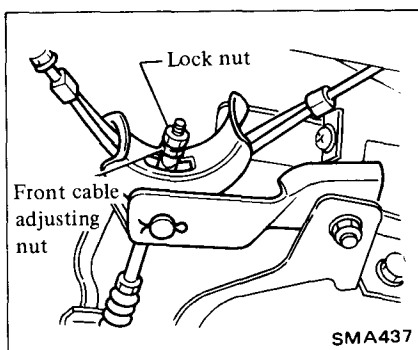
CHECKING PARKING BRAKE

1. Pull lever with specified amount of force.

Measure lever stroke with number of notches.



2. Adjust front cable adjusting nut to adjust lever stroke.



3. After returning parking brake control lever to its position, ensure that:

- All rear brake toggle levers return to their original positions.
- Rear cables are not slack.

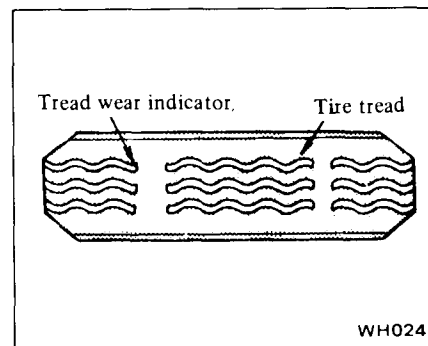
4. Bend parking brake warning lamp switch plate down so that brake warning light comes on when ratchet at parking brake lever is moved back one notch and goes out when returned to its original position.

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

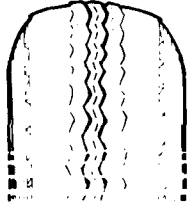
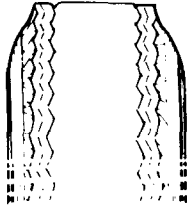
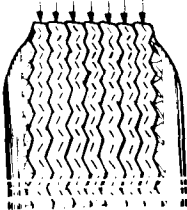
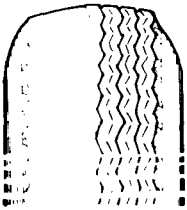
1. Check tire pressure. If necessary, adjust it to the specified value indicated in the label attached to the center console box lid, also found in Owner's Manual or S.D.S.

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

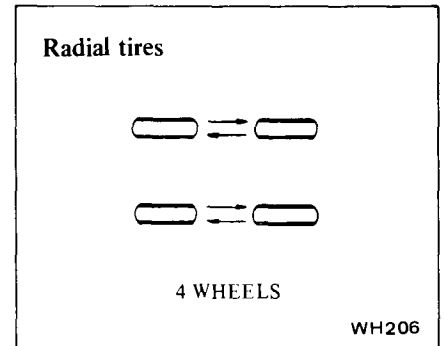
Correct abnormal tire wear according to the chart shown below.

Condition	Probable cause	Corrective action
 Shoulder wear	<ul style="list-style-type: none"> Underinflation (both sides wear) Incorrect wheel camber (one side wear) Hard cornering Lack of rotation 	<ul style="list-style-type: none"> Measure and adjust pressure. Repair, or replace axle and suspension parts. Reduce speed. Rotate tires.
 Center wear	<ul style="list-style-type: none"> Overinflation Lack of rotation 	<ul style="list-style-type: none"> Measure and adjust pressure. Rotate tires.
 Toe-in or toe-out wear	<ul style="list-style-type: none"> Incorrect toe 	<ul style="list-style-type: none"> Adjust toe-in.
 Uneven wear	<ul style="list-style-type: none"> Incorrect camber or caster Malfunctioning suspension Unbalanced wheel Out-of-round brake drum Other mechanical conditions Lack of rotation 	<ul style="list-style-type: none"> 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

- 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.
- 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 car handling and may cause driver to lose control.

- 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.
- Do not use tires and wheels other than those recommended, and do not mix tires of different brands or tread patterns.

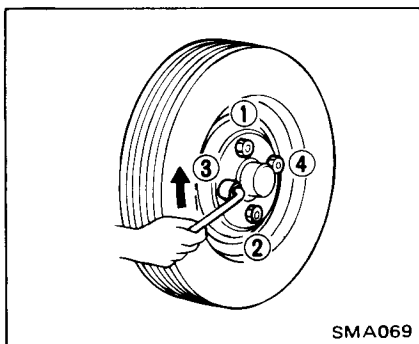
The use of tires and wheels other than those recommended or the mixed use of tires of different brands or tread patterns can adversely affect the ride, braking, handling, ground clearance, body-to-tire clearance, and speedometer calibration.

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

WARNING:

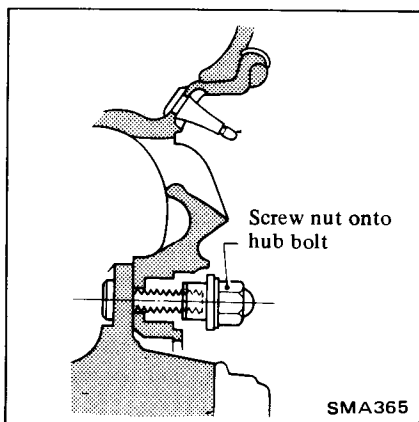
Never get under car while it is supported only by jack.
Always use safety stands to support side member of body construction when you must get beneath car.

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

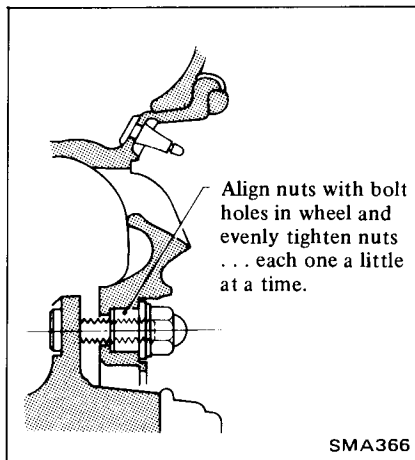

Aluminum wheel

To install an aluminum wheel, proceed as follows:

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



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.

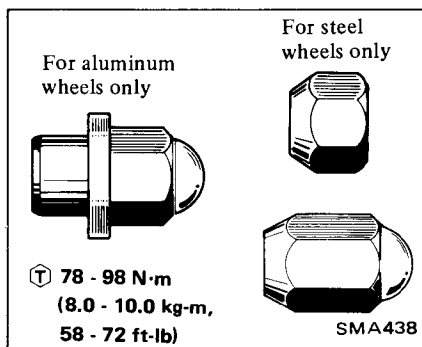


3. Tighten wheel nuts evenly with a wheel wrench in **criss-cross** fashion.

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 cases of repairing flat tires, tire rotation, etc.). Retighten 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.



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

SPARE TIRE

This model is equipped with the Space Saver Spare tire or the Foldable Spare tire.

The spare tire is designed for emergency use only. It is stored in a deflated condition.

An inflator (canister or air pump) has been provided to inflate the spare.

The spare tire can be used repeatedly for emergency situations. However, the canister must be replaced after each inflation.

Be sure to obtain the proper size canister for spare tire size.

CAUTION:

The spare tire is restricted in driving speed up to a maximum of 80 km/h (50 MPH) for short distances and emergency use only.

Inflation with approved inflator

1. Before changing tire, carefully read the caution and directions affixed on both the inflator and the spare tire.
2. Remove the uninflated spare tire and the inflator from rear compartment.

WARNING:

Do not inflate at this point.

3. Jack up front or rear of car as required and remove the damaged tire. Then mount the uninflated spare tire to the axle. (Tighten wheel nuts slightly.)

On aluminum wheels equipped cars, be sure to use spare wheel nuts in the tool bag.

The wheel nuts for aluminum wheels must not be used on the spare tire wheel to avoid the wheel coming off the axle and causing personal injury.

4. Using Canister

- (1) With tire valve at 6 o'clock position, inflate the spare tire with the canister. Place tire canister on the tire inflation valve and push squarely until gas can be heard entering the tire. It takes about 3 minutes.

WARNING:

The metal parts of the canister become extremely cold during inflation and can cause frost bite. Therefore, avoid contact with the metal, use a glove or other means of protection.

(2) To ensure complete emptying of the canister, hold the canister in position for one minute after sound stops.

- a. If temperature is below -10°C (14°F), the canister must be warmed on the windshield defroster for five to ten minutes to provide tire inflation.
- b. In cold weather, the tire may not look fully inflated. Therefore, drive slowly for the first mile, as the tire temperature rises the pressure will increase.

Using Air Compressor

(1) Remove the valve cap from the spare tire and securely connect the air pump hose in its place.

(2) Connect the power cord plug of the air pump to the cigarette lighter socket. The spare tire may be inflated to the recommended pressure 28 psi (200 kPa) in about 6 minutes. Adjust the tire pressure per the tire placard with tire pressure gauge.

If the air pump operation is slow, run the engine while the air pump is operating. In this case, remove jack with the spare tire attached to the axle.

WARNING:

- Do not run the engine in closed space or with the car being jacked up.
- Do not touch the air pump with the bare hands while it is operating for it may become quite hot.

(3) Disconnect the power cord plug from socket.

Check the tire for air leakage, and then securely install and tighten the valve cap.

5. Lower car and fully tighten wheel nuts.

Do not install the wheel cover on the spare tire.

Deflation

1. Deflate tire by depressing button on tire inflation valve or by removing valve core.

WARNING:

To avoid personal injury, do not inhale the gas which is vented while the tire is deflating.

2. Flatten tire. The spare tire becomes folded gradually while deflating.

3. Store tire in rear compartment.

Repair

Only qualified tire experts are authorized to dismount the spare tire from its rim or repair it in any way. Improper service can result in serious personal injury.

Contact authorized B.F. Goodrich dealers (for Space Saver Spare tire) or authorized Bridgestone or DATSUN dealers (for Foldable Spare tire) if service is required.

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.

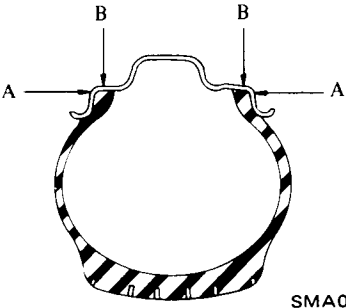
1. Check wheel rim, especially rim flange and bead seat, for rust, distortion, cracks or other faults which might cause air leaks. Function of tubeless tire depends on a good seal between tire bead and wheel rim.

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.



Lateral runout (A) and radial runout (B):

Steel wheel Less than 1.0 mm (0.039 in)

Aluminum wheel Less than 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

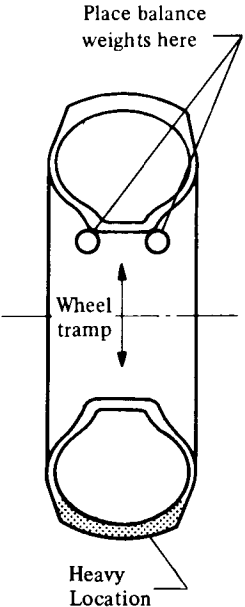
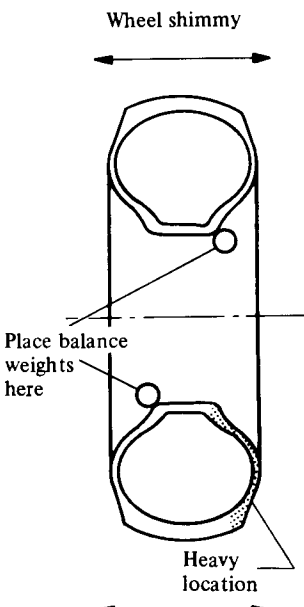
Inspect wheel and tire for wheel balance and correct it if unbalance is present, taking the following points into consideration.

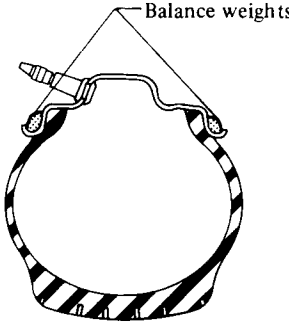
1. Correct unbalance when the symptom of unbalance appears as wheel tramps and wheel shimmy.
2. Balance wheel and tire both statically and dynamically.

Balancing wheels

WARNING:

When balancing wheel and tire on the car, be sure to observe the equipment manufacturers instructions carefully.

Cause	Wheel static unbalance	Wheel dynamic unbalance
Symptom of unbalance	Wheel tramp Wheel shimmy	Wheel shimmy
Corrective action	Balance statically  <p>Place balance weights here</p> <p>Wheel tramp</p> <p>Heavy Location</p>	Balance dynamically  <p>Wheel shimmy</p> <p>Place balance weights here</p> <p>Heavy location</p> <p>Wheel shimmy</p>



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

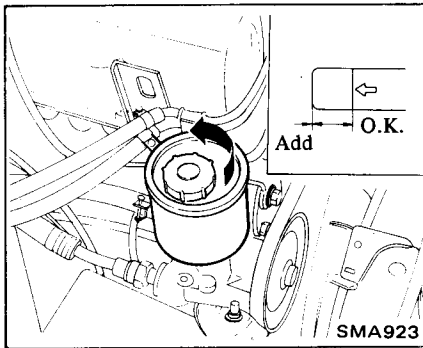
- a. Be sure to place correct balance weights on inner edge of rim.
- b. Do not put more than two weights on each side.
- c. Two types of balance weights are used; one is designed for use with steel wheel and the other for use with aluminum wheel. Do not mix different types of balance weights.
- d. Properly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

STEERING SYSTEM

CHECKING ZF POWER STEERING FLUID AND LINES

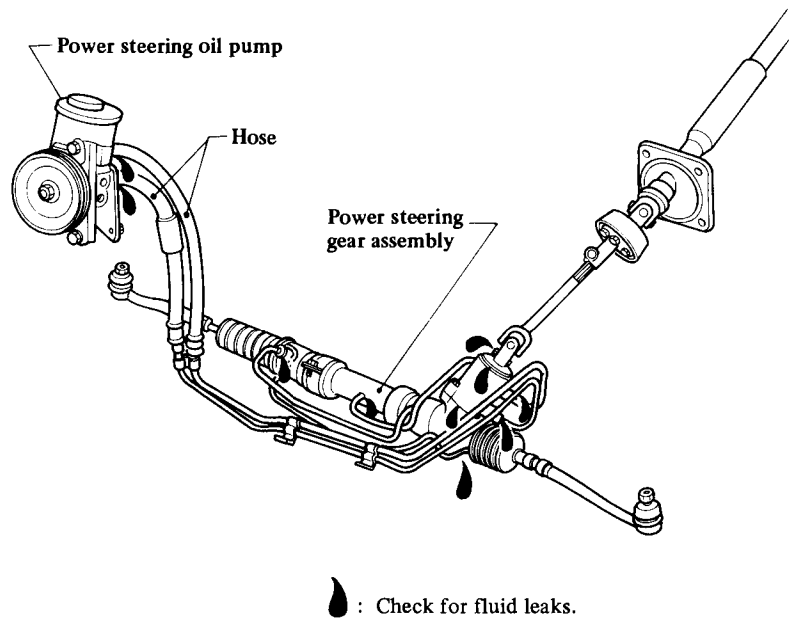
1. Check the fluid level in reservoir by observing the dipstick when the fluid is cold. Add fluid as necessary to bring the level into the proper range on dipstick.

CAUTION:
Do not overfill.



2. Inspect line condition and check for leaks.

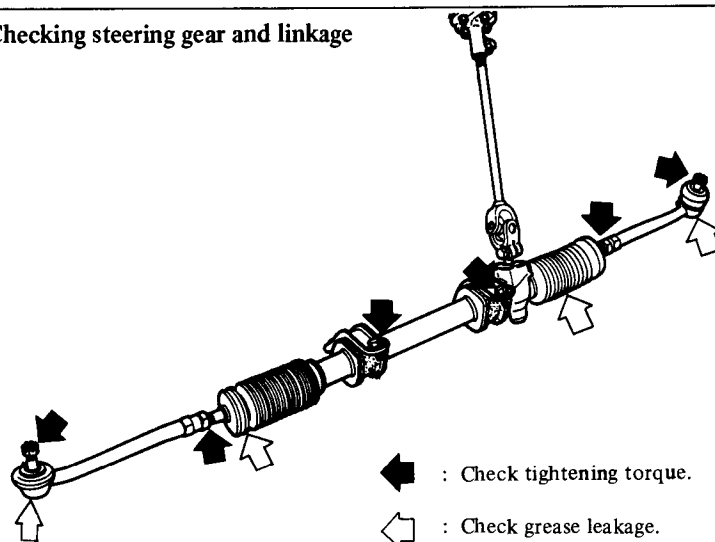
ZF power steering system



CHECKING STEERING GEAR AND LINKAGE

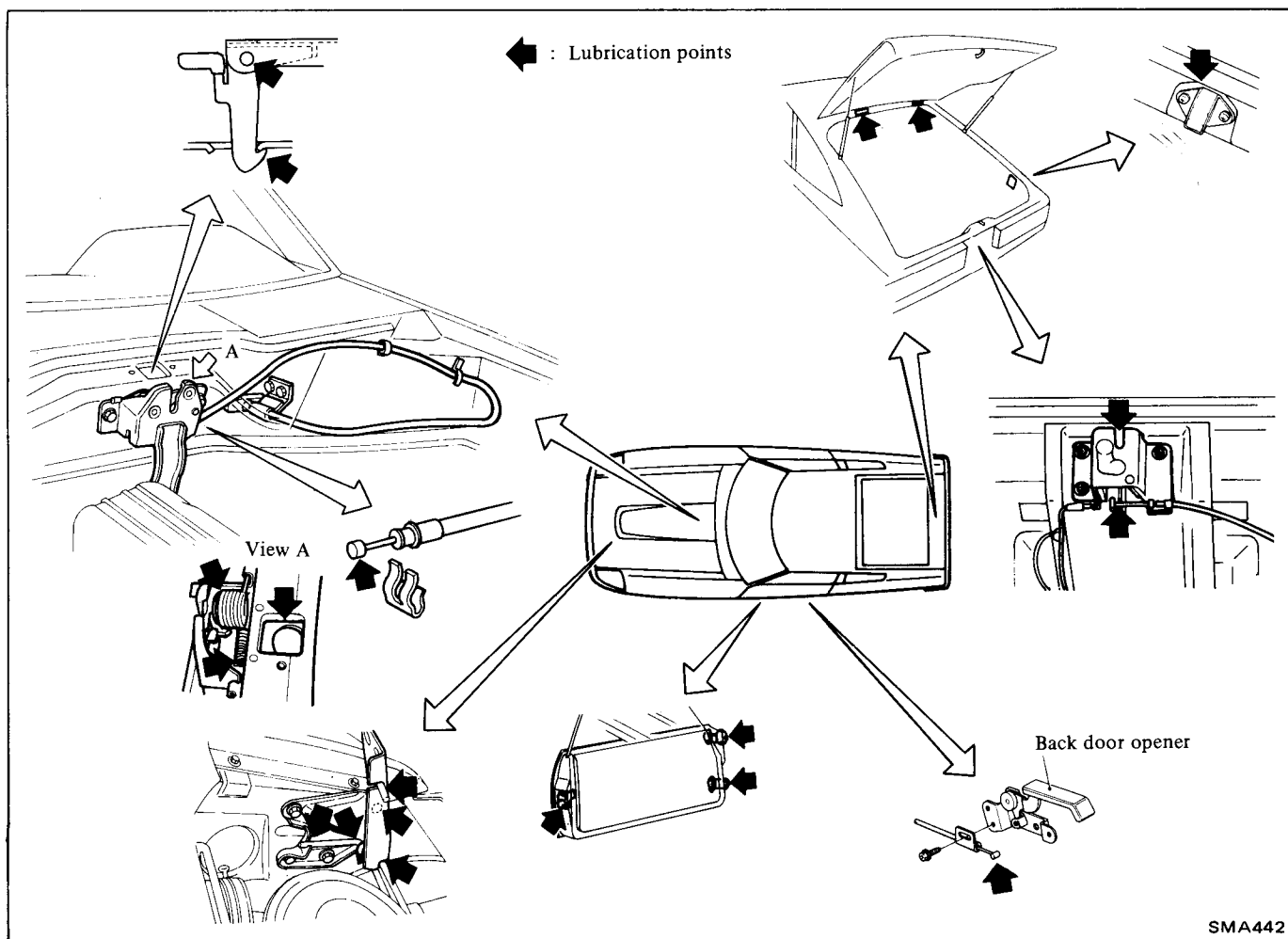
- Check parts for looseness, wear or damage. Retighten if necessary. Refer to Section ST for tightening torque.
- Check ball joints for grease leakage.
- Check for any missing parts (cotter pins, washer, etc.).

Checking steering gear and linkage

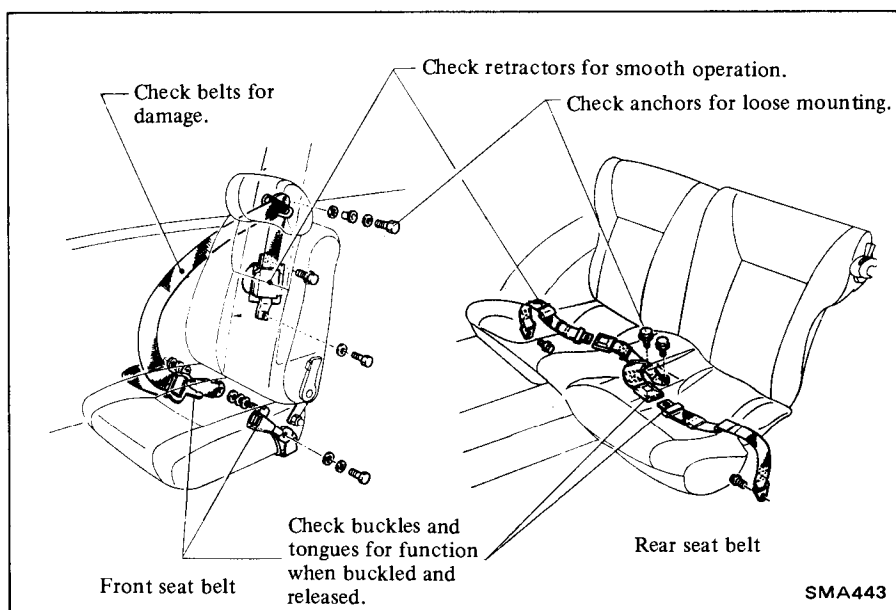


BODY

LUBRICATING LOCKS, HINGES AND HOOD LATCH



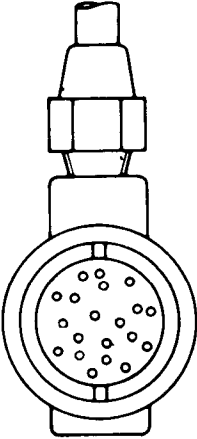
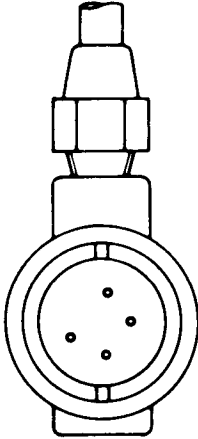
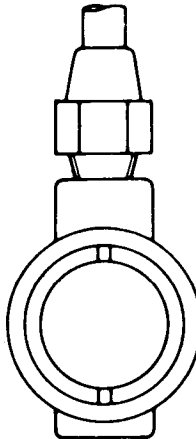
CHECKING SEAT BELTS, BUCKLES, RETRACTORS, ANCHORS AND ADJUSTER



HEATER AND AIR CONDITIONER

CHECKING REFRIGERANT LEVEL

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.	<p>Bubbles flow continuously. Bubbles will disappear and something like mist will flow when refrigerant is nearly gone.</p>  <p>AC256</p>	<p>The bubbles are seen at intervals of 1 - 2 seconds.</p>  <p>AC257</p>	<p>Almost transparent. Bubbles may appear when engine speed is raised and lowered.</p> <p>No clear difference exists between these two conditions.</p>  <p>AC258</p>	<p>No bubbles can be seen.</p>
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.

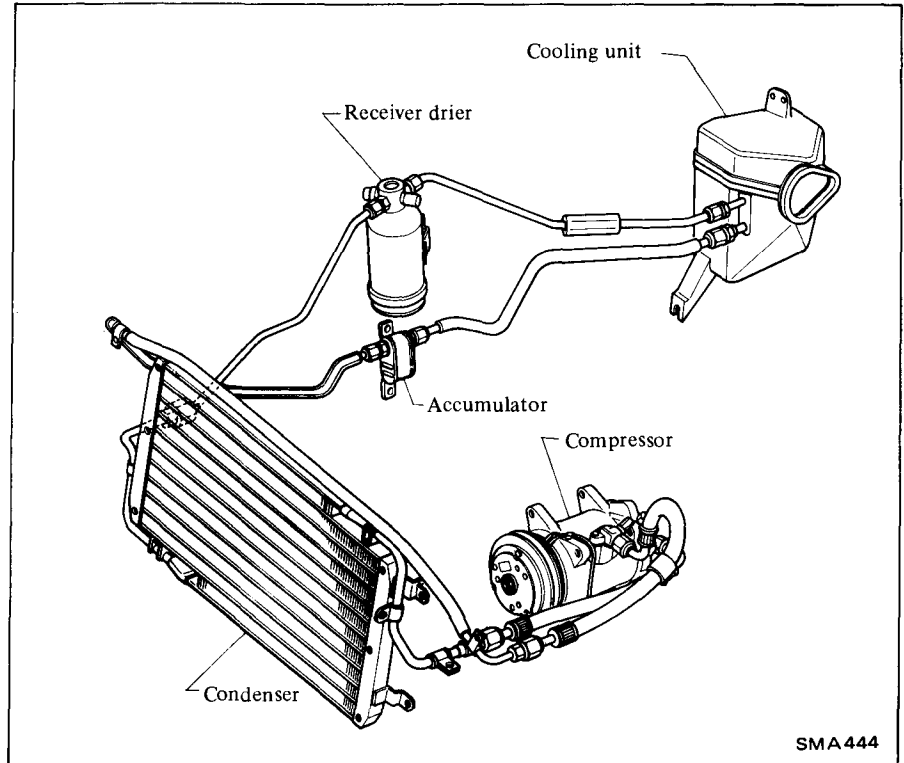
CHECKING COMPRESSOR DRIVE BELT

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.



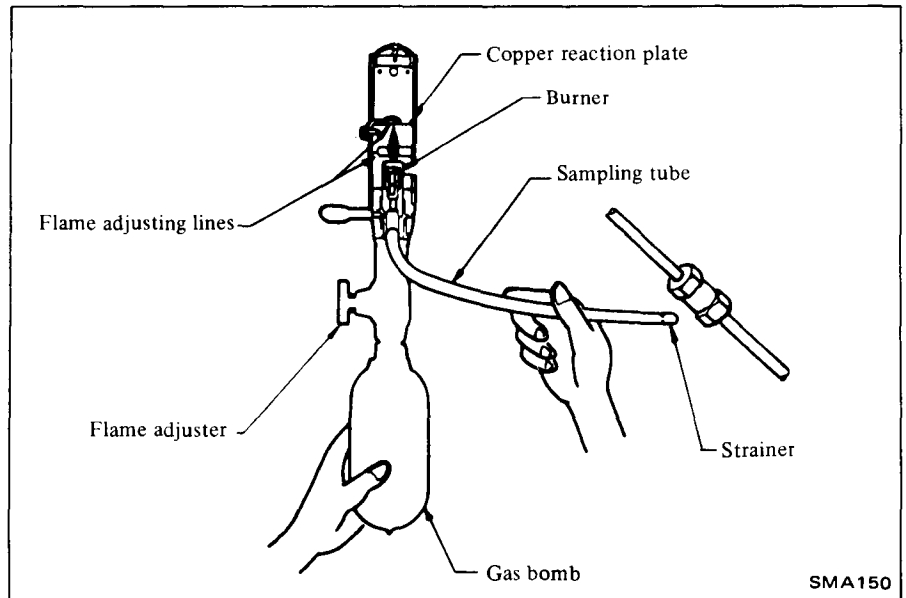
SMA444

CHECKING REFRIGERANT LEAKS

Conduct a leak test with halide or electric leak detector whenever leakage of refrigerant is suspected and when conducting service operations which are accompanied by disassembly or loosening of connection fittings.

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
 - Flared section of high pressure and low pressure flexible hoses.
 - Line connections
- (4) Evaporator housing
 - Inlet and outlet line connections
 - Expansion valve
 - Suction throttle valve



SMA150

The following information and cautions should be kept in mind when checking for leakage.

- If a halide leak detector is used, determine whether or not there is gas leaking by the color of the flame, as indicated in the chart below.

	Propane type	Butane type
NO LEAK	Greenish blue	Pale blue
SMALL LEAK	Yellow	Bright blue
LARGE LEAK	Purple	Vivid green

WARNING:

- Never inhale the fumes produced by combustion of refrigerant gas since they are toxic.
- Never use halide torch in a place where combustible or explosive gas is present.

- Since refrigerant gas is heavier than air, small leaks can be easily detected by placing sampling tube directly below the check point.
- If any trace of oil is noted at and around connection fittings, it is a sure indication that refrigerant is leaking.

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 Section HA for tightening torque. 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.

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

ENGINE MAINTENANCE

INSPECTION AND ADJUSTMENT

Basic mechanical system

Valve clearance mm (in)		Hot	Intake	0.25 (0.010)
			Exhaust	0.30 (0.012)
		Cold*	Intake	0.17 (0.007)
			Exhaust	0.24 (0.009)
		Adjust deflection of used belt		Set deflection of new belt
Drive belt deflection mm (in)		7 - 10 (0.28 - 0.39)		6 - 9 (0.24 - 0.35)
Cooling fan				
Air conditioner compressor		5 - 7 (0.20 - 0.28)		4 - 6 (0.16 - 0.24)
Power steering oil pump		11 - 14 (0.43 - 0.55)		9 - 12 (0.35 - 0.47)
Applied pushing force N (kg, lb)		98 (10, 22)		
		Models with turbocharger		Models without turbocharger
Compression pressure kPa (kg/cm ² , psi)/rpm	Standard	981 (10.0, 142)/350		1,177 (12.0, 171)/350
	Minimum	686 (7.0, 100)/350		883 (9.0, 128)/350

* These values are measured when engine is cold and ambient temperature is 20°C (68°F).

After checking valve clearance while engine is cold, also check them when engine is hot to see if they remain within the specified range. If they do not, readjust them.

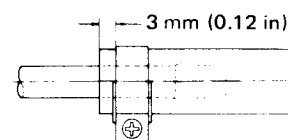
Ignition and fuel system

			Models with turbocharger	Models without turbocharger
Spark plug	Type	Standard	BPR6ES-11	BPR6ES-11
		Hot		BPR5ES-11
		Cold	BPR7ES-11	BPR7ES-11
	Gap mm (in)		1.0 - 1.1 (0.039 - 0.043)	
Ignition timing* and idle speed degree/rpm	Manual transmission models		20±3° B.T.D.C. /700±50	8±2° B.T.D.C. /700±100
	Automatic transmission models (in "D" position)		20±3° B.T.D.C. /650±50	8±2° B.T.D.C. /700±100
"CO" % at idle speed			Idle mixture screw is preset and sealed at factory.	

* On models without turbocharger, ignition timing should be checked with distributor vacuum hose disconnected and plugged up.

TIGHTENING TORQUE

Unit	N·m	kg·m	ft·lb
Pivot lock nut	49 - 59	5.0 - 6.0	36 - 43
Oil pan drain plug	20 - 29	2.0 - 3.0	14 - 22
Spark plug	15 - 20	1.5 - 2.0	11 - 14
Fuel hose clamp	1.0 - 1.5	0.10 - 0.15	0.7 - 1.1



Fuel hose clamping position.

EF336A

CHASSIS AND BODY MAINTENANCE

INSPECTION AND ADJUSTMENT

Clutch

Unit: mm (in)

Pedal height "H"	203 (7.99)
Pedal free play "A"	1 - 5 (0.04 - 0.20)

Front axle and front suspension

Axial play	mm (in)	0 (0)
Wheel bearing preload (As measured at wheel hub bolt)		
With new parts	N (kg, lb)	Less than 17.7 (1.8, 4.0)
With used parts	N (kg, lb)	Less than 6.9 (0.7, 1.5)
Wheel alignment (Unladen)		
Camber		-35' - 55'
Caster		4°10' - 5°40'
Kingpin inclination		8°35' - 10°5'
Toe-in		0 - 2 mm (0 - 0.08 in) 6' - 16' (On both sides)
Side lip (Reference data)		Out 3 mm - In 3 mm/m (Out 0.036 in - In 0.036 in/ft)
	Power steering models	Manual steering models
Standard side rod length "A"	mm (in)	35 (1.38) 29.5 (1.161)
Front wheel turning angle Toe-out turns (When inner wheel is 20°) Outer wheel	18.7°	18.7°
Full turns*		
Inner wheel	33-1/2° - 37-1/2°	33-1/2° - 37-1/2°
Outer wheel	29° - 33°	29° - 33°

* On power steering models, wheel turning force (at circumference of steering wheel) of 98 - 147 N (10 - 15 kg, 22 - 33 lb) with engine at idle.

Brake system

Unit: mm (in)

Pad wear limit	CL28V	2 (0.08)
	CL14H	2 (0.08)
Rotor repair limit	CL28V	18.0 (0.709)
	CL14H	8.6 (0.339)
Pedal height "h"		
M/T model		181 - 187 (7.13 - 7.36)
A/T model		190 - 196 (7.48 - 7.72)
Pedal free play "a"		1 - 5 (0.04 - 0.20)
Pedal depressed height		
M/T model		More than 80 (3.15)
A/T model		More than 90 (3.54)
Parking brake [at pulling force: 265 N (27 kg, 60 lb)]		
Number of notches		4 - 6

Wheel and tire

Unit: psi (kPa)

Recommended cold tire inflation pressure		
Tire size	Car speed	
	Under 160 km/h (100 MPH)	Over 160 km/h (100 MPH)
195/70HR14	28 (200)	32 (230)
P205/70R14	28 (200)	32 (230)
P205/60R15	28 (200)	32 (230)
Spare tire C78-14	Do not use in excess of 80 km/h (50 MPH).	
	28 (200)	

Tire pressure should be checked when tires are COLD.

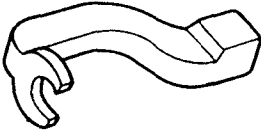

Wheel rim lateral and radial runout	mm (in)	Less than 1.0 (0.039) *1 0.5 (0.020) *2
Difference between right and left lateral runout	mm (in)	Less than 0.5 (0.020) *1 0.2 (0.008) *2
Wheel balance (Maximum allowable unbalance at rim flange)	gr (oz)	10 (0.35)
Tire balancing weight	gr (oz)	10 - 60 (0.35 - 2.12) Spacing 10 (0.35)

*1: Steel wheel *2: Aluminum wheel

TIGHTENING TORQUE

Unit	N-m	kg-m	ft-lb
Clutch			
Pedal stopper lock nut	9.1 - 11.8	0.93 - 1.2	6.7 - 8.7
Clutch switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Master cylinder push rod lock nut	8 - 12	0.8 - 1.2	5.8 - 8.7
Manual transmission			
Drain and filler plugs	25 - 34	2.5 - 3.5	18 - 25
Differential carrier			
Drain and filler plugs	39 - 59	4 - 6	29 - 43
Front axle and front suspension			
Side rod lock nut	14 - 17	1.4 - 1.7	10 - 12
Power steering models			
Manual steering models	78 - 98	8 - 10	58 - 72
Brake			
Air bleed valve	7 - 9	0.7 - 0.9	5.1 - 6.5
Stop lamp switch lock nut	12 - 15	1.2 - 1.5	9 - 11
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
ST10640001 - (J25615-01)	Pivot adjuster 
ST19320000 (J25664)	Oil filter wrench 

ENGINE MECHANICAL

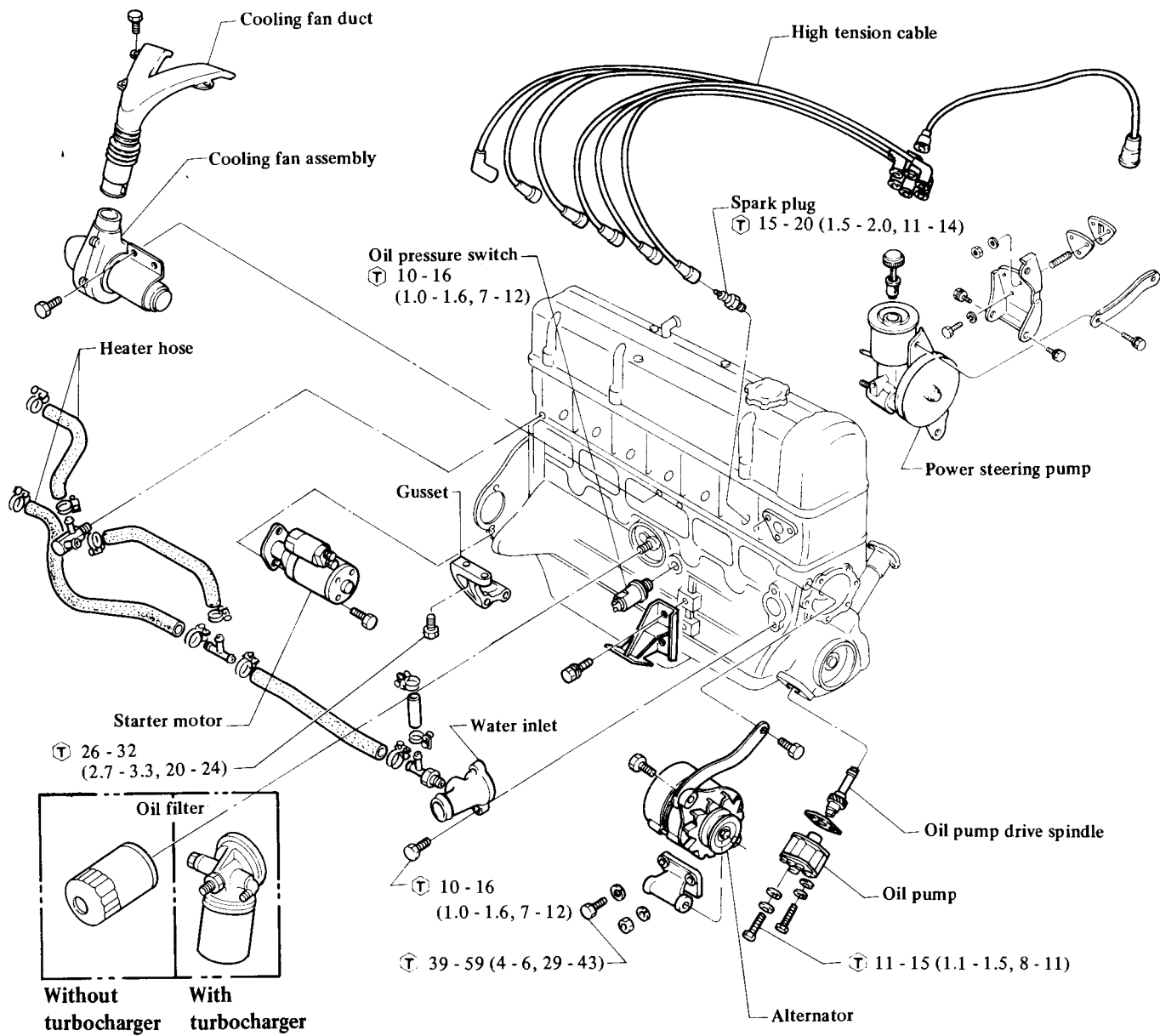
SECTION EM

EM

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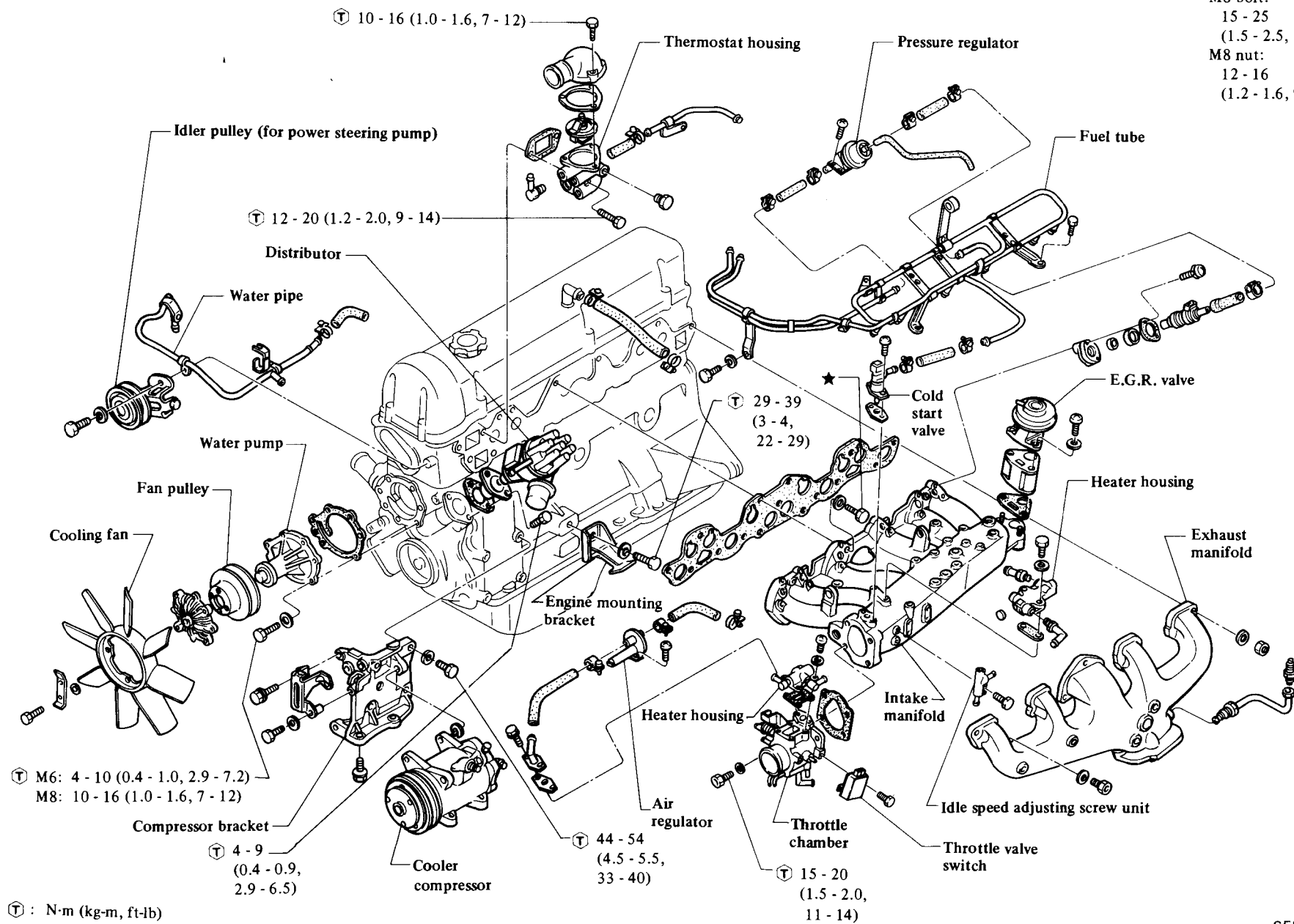
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ENGINE COMPONENTS (Outer parts)



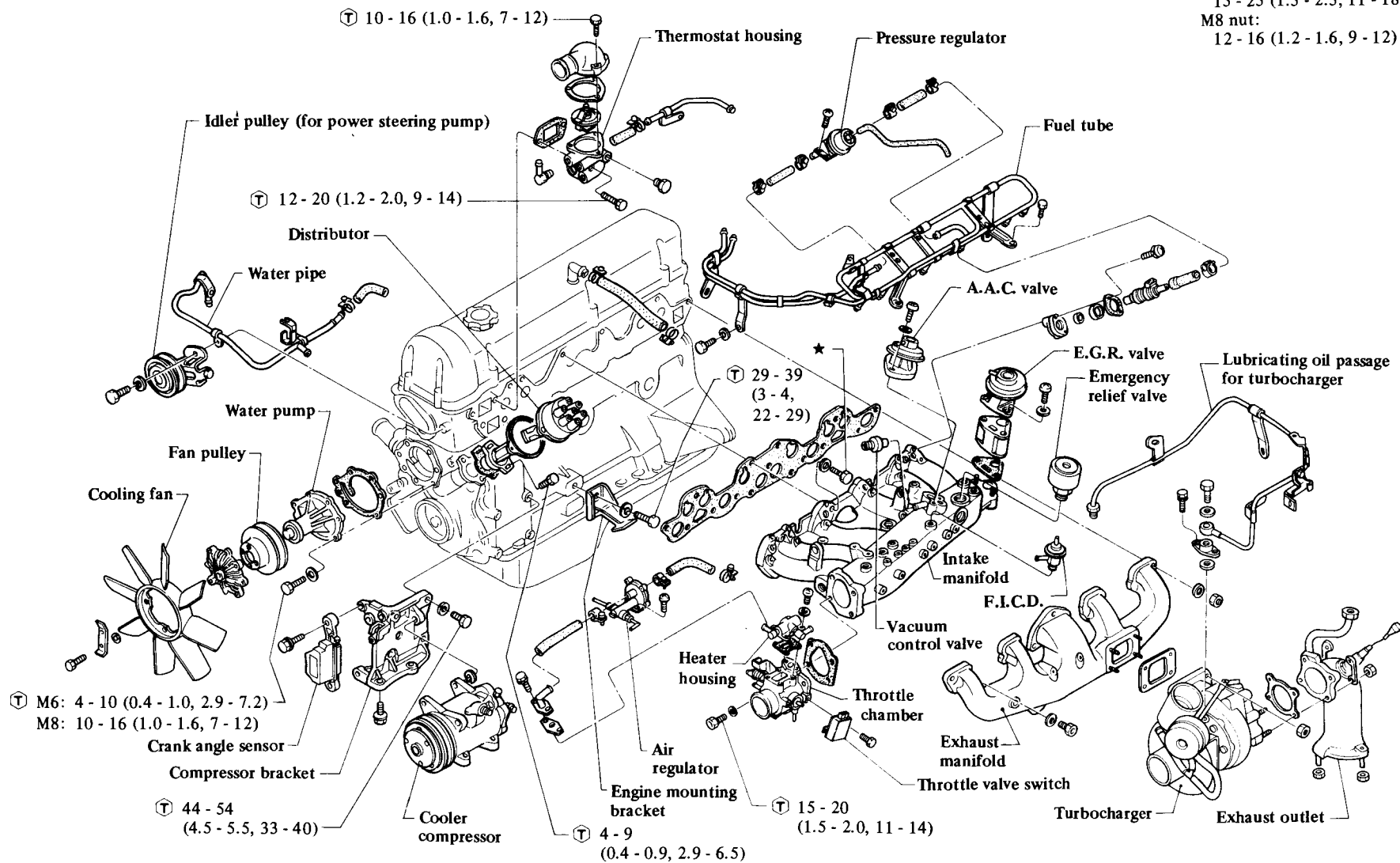
Ⓙ : N·m (kg-m, ft-lb)

Without turbocharger



With turbocharger

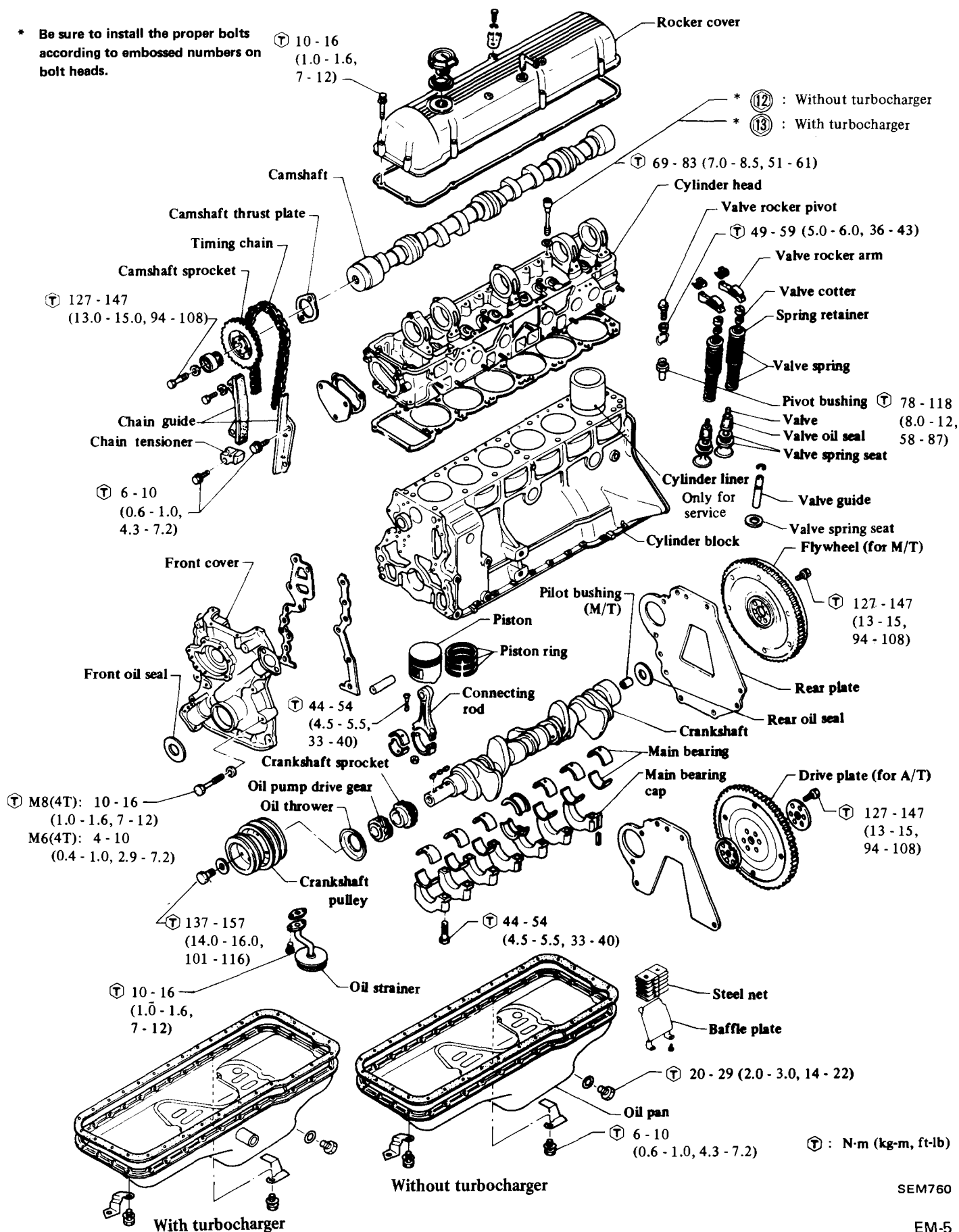
- ★ ① M10:
 34 - 44 (3.5 - 4.5, 25 - 33)
 M8 bolt:
 15 - 25 (1.5 - 2.5, 11 - 18)
 M8 nut:
 12 - 16 (1.2 - 1.6, 9 - 12)



① : N·m (kg-m, ft-lb)

ENGINE COMPONENTS (Internal parts)

* Be sure to install the proper bolts according to embossed numbers on bolt heads.



ENGINE DISASSEMBLY

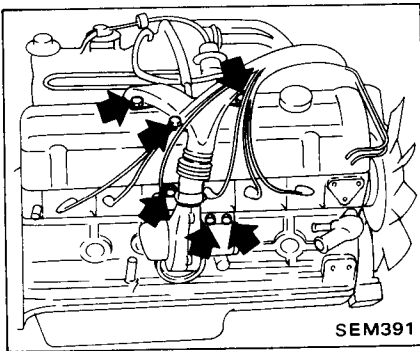
PRECAUTIONS

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.

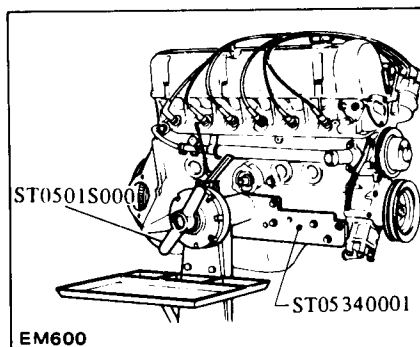
DISASSEMBLY

MOUNTING ENGINE ON ENGINE STAND

1. Remove rear and right side parts.
 - Starter motor
 - Gussets
 - Transmission
 - Clutch cover assembly (M/T)
 - Alternator, alternator drive belt and alternator bracket
 - Engine mounting bracket (R.H.)
 - Oil filter
 - Oil pressure switch
 - Injection auxiliary cooling fan and air duct.



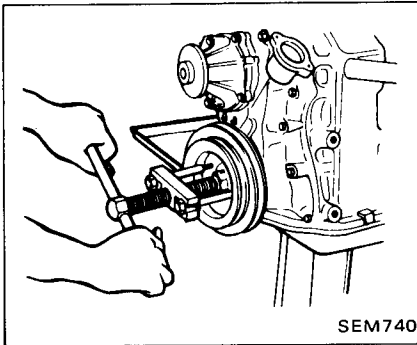
- Lubricating oil passage for turbo-charger
2. Install engine attachment to cylinder block. Then, mount the engine on the engine stand.



3. Drain engine oil and coolant.

REMOVING OUTER PARTS

1. Remove engine front side parts:
 - Fan, fan coupling and fan pulley
 - Alternator adjusting bar
 - Crank pulley using suitable tool



- Pulley bracket with idler pulley for power steering
2. Remove engine left side parts:
 - Distributor cap and high tension cable
 - Distributor assembly
 - Hoses connected to engine
 - Intake manifold

Remove intake manifold as an assembly of fuel pipe, injector, air regulator, etc. as follows:

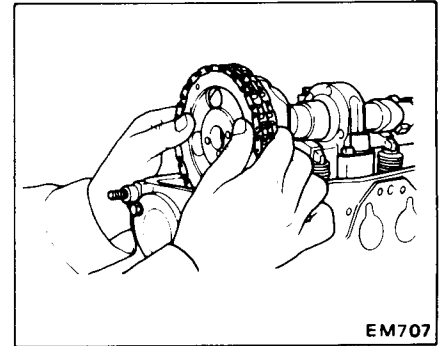
- a. Disconnect hose connecting rocker cover to throttle chamber at rocker cover.
- b. Disconnect water pipe connecting heater housing to water inlet at water inlet.
Remove bolt which secures water pipe and fuel pipe to cylinder head.
- c. Remove tube connecting heater housing to thermostat housing.
- d. Remove bolt which secures intake manifold to cylinder head and remove intake manifold as an assembly.
- e. Remove P.C.V. valve hose, sub heat shield plate and E.G.R. tube (if so equipped).

- Turbocharger assembly with exhaust outlet
- Exhaust manifold
- Thermostat housing
- Cooler compressor bracket
- Engine mounting bracket (L.H.)

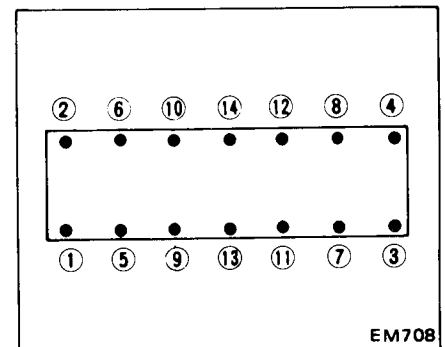
3. Remove engine right side parts:
 - Spark plugs
 - Oil level gauge
 - Water inlet
 - Water hoses and pipes
 - Power steering pump bracket
4. Remove engine bottom side parts:
 - Oil pump and oil pump drive spindle

REMOVING INTERNAL PARTS

1. Remove oil pan and oil strainer.
2. Remove valve rocker cover.
3. Cylinder head assembly.
 - (1) Remove camshaft bolt by locking camshaft.
 - (2) Remove camshaft sprocket, and slowly lower timing chain.



- (3) Remove bolts securing cylinder head to front cover.
- (4) Loosen cylinder head bolts in the sequence as shown.

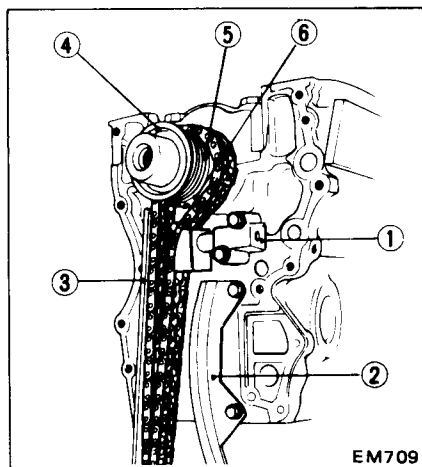
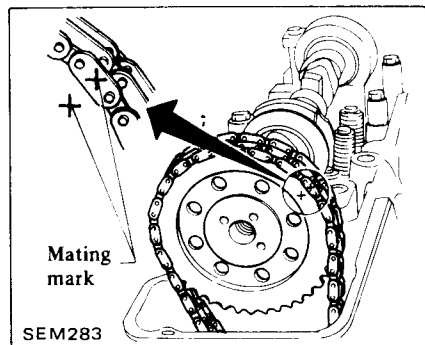


Gradually loosen cylinder head bolts in two or three stages.

(5) Remove cylinder head.

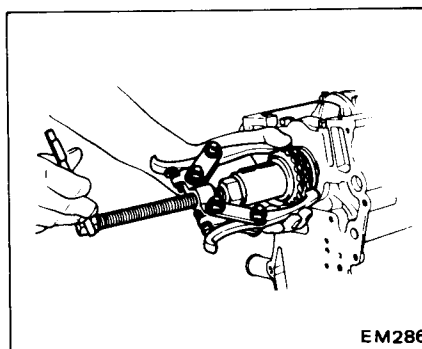
When removing cylinder head from engine installed on car, follow the instructions below.

- a. Turn crankshaft until No. 1 piston is at T.D.C. on its compression stroke.
- b. To facilitate assembling operation, scribe a mark on timing chain and camshaft sprocket before removal.



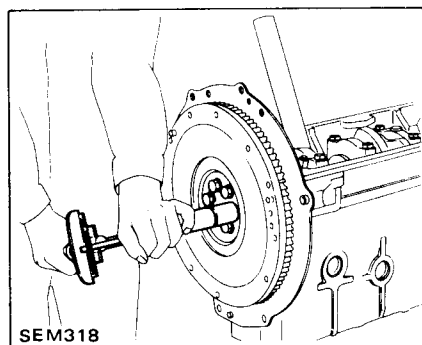
- 1 Chain tensioner
- 2 Slack side chain guide
- 3 Tension side chain guide
- 4 Oil thrower
- 5 Oil pump drive gear
- 6 Crankshaft sprocket

If it is hard to extract crankshaft sprocket, use a suitable puller.



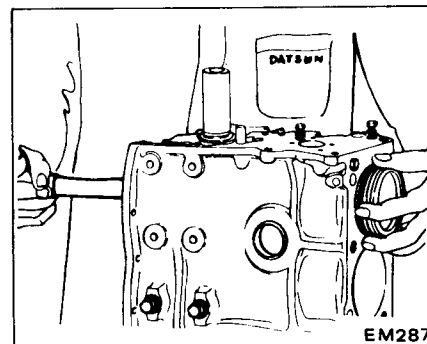
5. Remove flywheel (M/T) or drive plate (A/T) while crankshaft is locked. Then remove rear plate.

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



6. Piston and connecting rod assembly.

- (1) Remove connecting rod bearing cap with bearing.
- (2) Push out piston with connecting rod 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 connecting rod and cap corresponding to each cylinder. Care should be taken to avoid wrong combination including bearing.

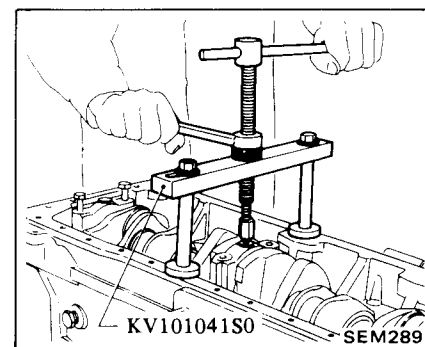
7. Crankshaft.

- (1) Remove main bearing cap with bearing.

- a. When loosening main bearing cap bolts, loosen from outside in sequence.

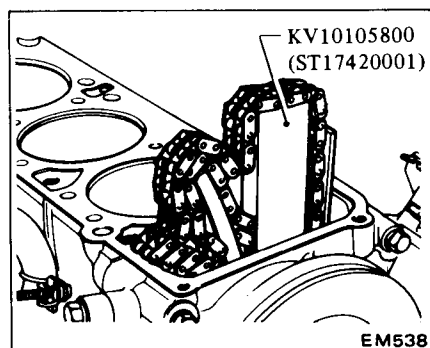
Do not completely loosen bolts in one step. Instead use two or three steps for this procedure.

- b. Remove center and rear main bearing caps using Tool.



- c. Keep them in order.

- c. Support timing chain by placing Tool between timing chains.

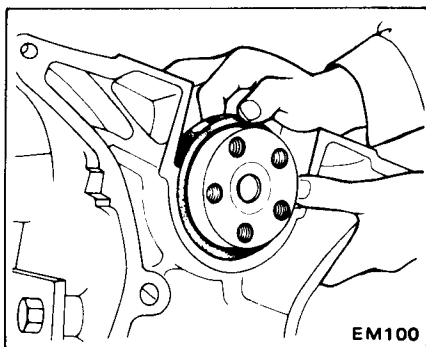


- d. Install cylinder head, and then install camshaft sprocket by aligning marks on it and timing chain.

4. Remove front side parts.

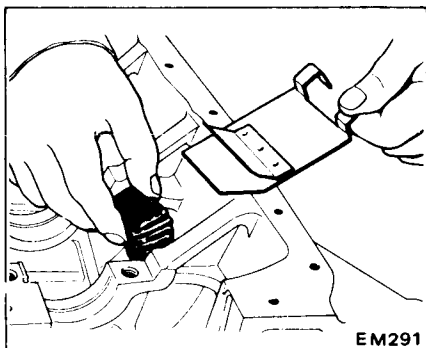
- Water pump
- Front cover
- Timing chain
- Chain tensioner and chain guides
- Oil thrower, oil pump drive gear and crankshaft sprocket.

- (2) Remove rear oil seal.



When removing rear oil seal without removing main bearing cap, pry it off with a screwdriver so as not to damage crankshaft.

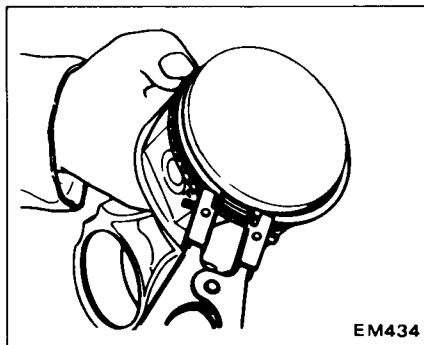
- (3) Remove crankshaft.
(4) Remove main bearing on the side of the block.
8. Remove baffle plate and steel net from cylinder block.



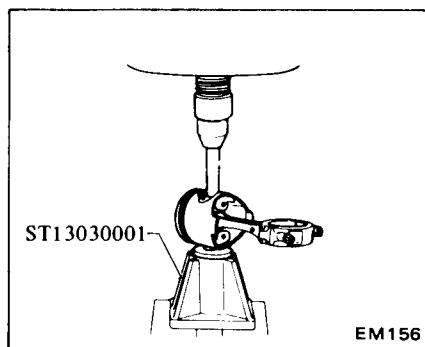
DISASSEMBLING PISTON AND CONNECTING ROD

1. Remove top & second piston rings with a ring remover and remove oil ring expander & rails by hand.

When removing piston rings, be careful not to scratch piston.

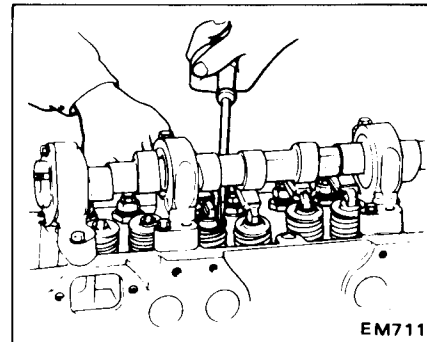


2. Press piston pin out, using press and Tool.

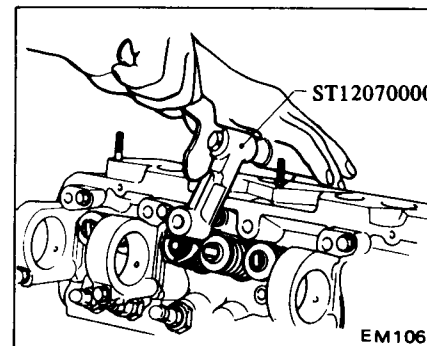


DISASSEMBLING CYLINDER HEAD

1. Remove valve rocker spring.
2. Loosen valve rocker pivot lock nut and set cam nose to upper position, then remove rocker arm by pressing down on valve spring.



3. Remove camshaft.
4. Remove valves, valve springs and relating parts using Tool.



- Keep the disassembled parts in order.
- Do not remove rocker pivot bushing from cylinder head.
- Do not remove camshaft bearing from cylinder head.

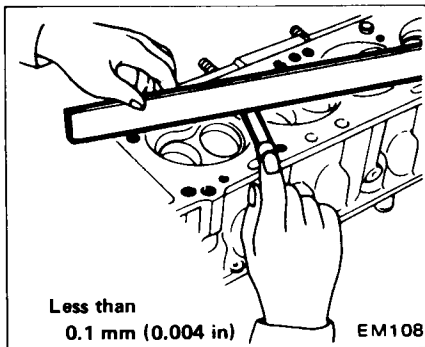
INSPECTION AND REPAIR

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.

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:

$$A + B = 0.2 \text{ mm (0.008 in)}$$

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.

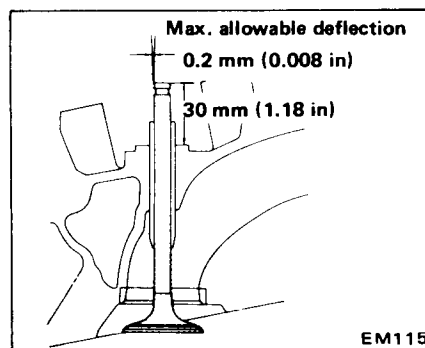
Stem to guide clearance:

Maximum Limit

0.10 mm (0.0039 in)

2. Expedient method

Pry the valve in a lateral direction, and measure the deflection at stem tip with dial gauge.

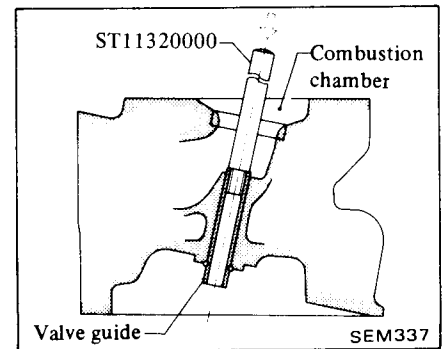


Valve should be moved in parallel with rocker arm. (Generally, a large amount of wear occurs in this direction.)

Replacement of valve guide

To remove old guides, use a press [under a 20 kN (2t, 2.2 US ton, 2.0 Imp ton) pressure] or a hammer, and Tool.

1. Drive them out toward rocker cover side using Tool. Heating the cylinder head will facilitate the operation.

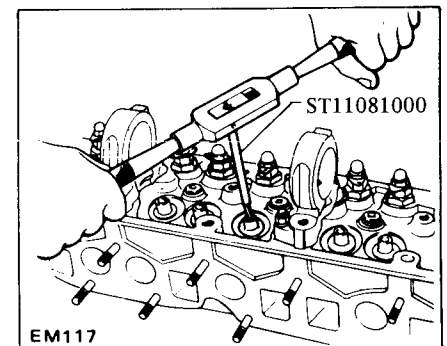


2. Ream cylinder head valve guide hole using Tool at room temperature.

Reaming bore:

12.223 - 12.234 mm

(0.4812 - 0.4817 in)



3. Fit snap ring on new valve guide. Heat cylinder head to 150 to 200°C (302 to 392°F), and press the guide onto cylinder head until the snap ring comes in contact with cylinder head surface.

Valve guide with 0.2 mm (0.008 in) oversize diameter is available for service.

Refer to S.D.S.

4. Ream the bore using Tool ST11032000.

Reaming bore:

8.000 - 8.018 mm

(0.3150 - 0.3157 in)

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

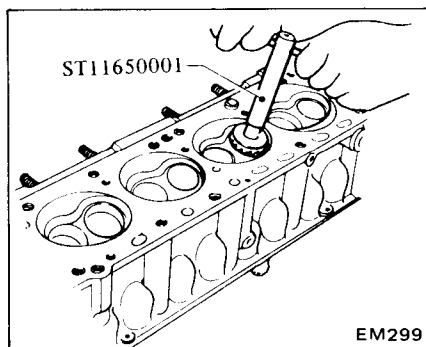
VALVE SEAT INSERTS

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

Correct valve seat surface with Tool ST11650001 and grind with a grinding compound.

Valve seat insert of 0.5 mm (0.020 in) oversize is available for service.

Refer to S.D.S.



- 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.

Replacement

1. Old insert can be removed by boring out until it collapses. The machine stop depth should be set so that boring cannot continue beyond the bottom face of the insert recess in cylinder head.

2. Select a suitable valve seat insert and check its outside diameter.

3. Machine the cylinder head recess in the concentric circles which center on the valve guide.

4. Ream the cylinder head recess at room temperature.

Refer to S.D.S.

5. Heat cylinder head to a temperature of 150 to 200°C (302 to 392°F).

6. Fit insert ensuring that it bends on the bottom face of its recess, and caulk more than 4 points.

7. Newly-fitted valve seats should be cut or ground using Tool ST11650001 at the specified dimensions as shown in S.D.S.

8. 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.

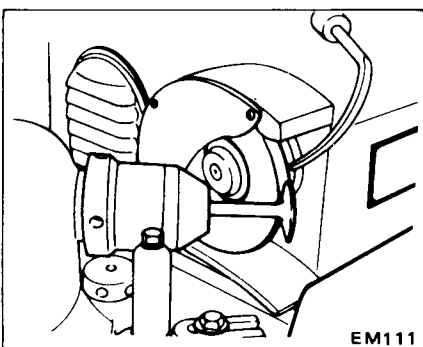
VALVE

1. Check 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 0.5 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 ones.

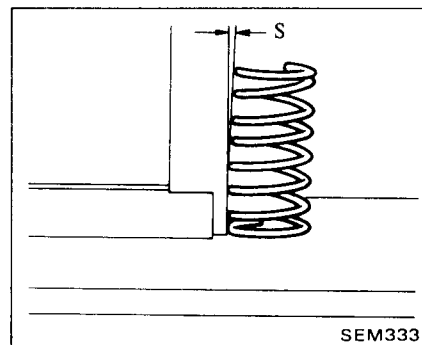
Out of square:

Outer spring

2.2 mm (0.087 in)

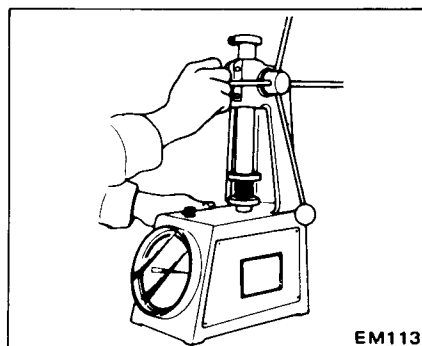
Inner spring

1.2 mm (0.047 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.



ROCKER ARM AND VALVE ROCKER PIVOT

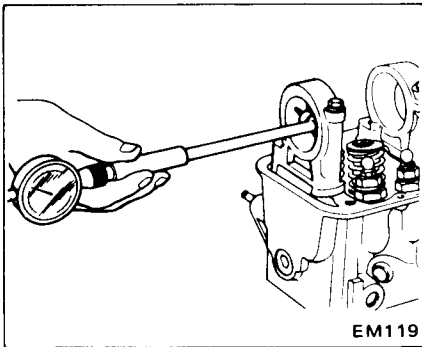
Check pivot head and cam contact and pivot contact surfaces of rocker arm for damage or wear. If faults are found, replace them. A faulty pivot necessitates its replacement together with the corresponding rocker arm.

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.

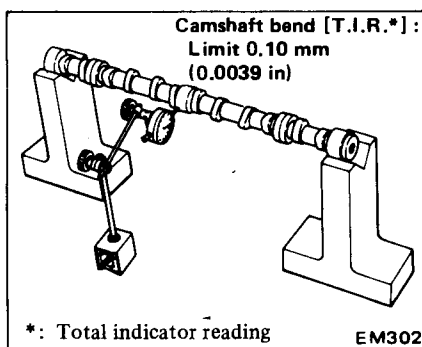
Max. tolerance of camshaft bearing clearance:
0.1 mm (0.004 in)



Do not remove camshaft brackets.
 If camshaft bracket were removed, install them by checking for a smooth rotation with the camshaft.

CAMSHAFT ALIGNMENT

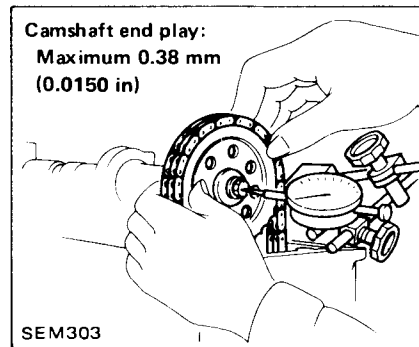
1. Check camshaft, camshaft journal and cam surface for bend, wear or damage. If beyond specified limits, replace them.
2. Camshaft can be checked for bend by placing it on V-blocks and using a dial gauge with its indicating finger resting on center journal.



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

Wear limit of cam height:
0.15 mm (0.0059 in)

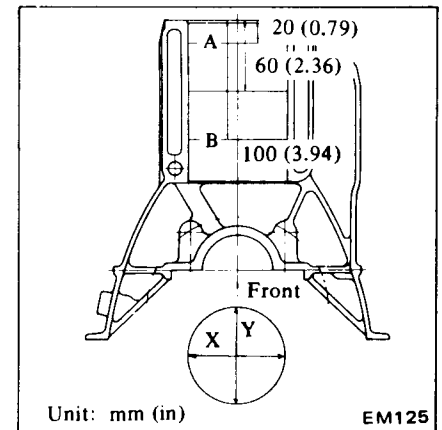
4. Measure camshaft end play. If beyond the specified limit, replace thrust plate.



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.

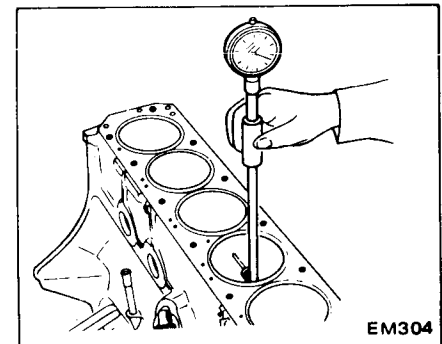
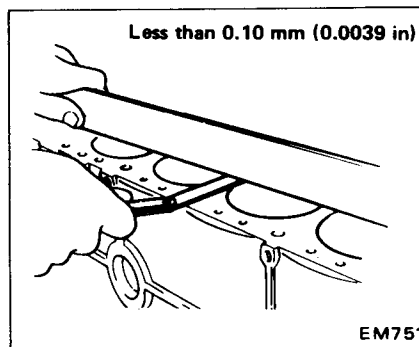
Refer to S.D.S.

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



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.



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.

If cylinder bore has worn beyond the wear limit, use cylinder liner.

Undersize cylinder liners are available for service.

Refer to S.D.S.

Interference fit of cylinder liner in cylinder block should be 0.075 to 0.085 mm (0.0030 to 0.0033 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:

$$A + B = 0.2 \text{ mm (0.008 in)}$$

CYLINDER BORING

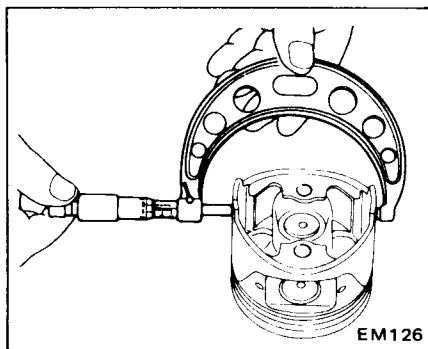
When any cylinder needs boring, all other cylinders must also be bored at the same time.

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.



EM126

Rebored size calculation

$$D = A + B - C = A + [0.005 \text{ to } 0.025 \text{ mm (0.0002 to 0.0010 in)}]$$

where,

- D : Honed diameter
- A : Skirt diameter as measured
- B : Piston-to-wall clearance
- C : Machining 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 1-5-3-6-2-4 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).

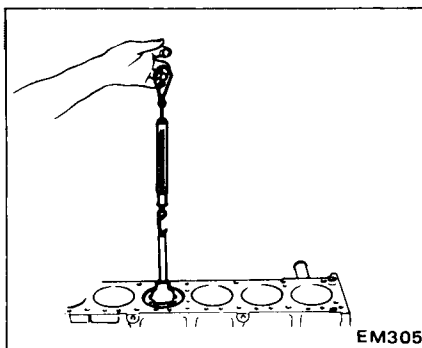
Feeler gauge thickness:

0.04 mm (0.0016 in)

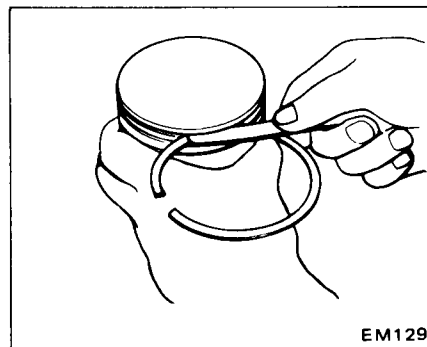
Extracting force:

2.0 - 14.7 N

(0.2 - 1.5 kg, 0.4 - 3.3 lb)



EM305



EM129

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

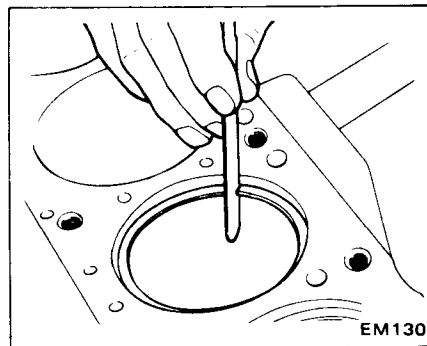
PISTON RING

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)



EM130

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:

0.1 mm (0.004 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.
0.5 mm (0.020 in), 1.0 mm (0.039 in) oversize.

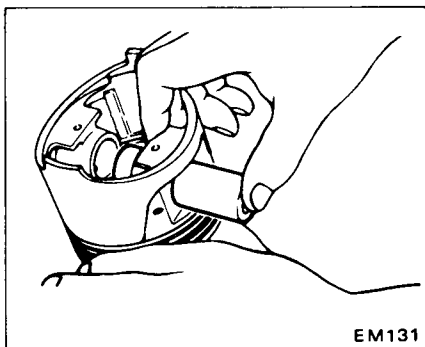
PISTON PIN

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

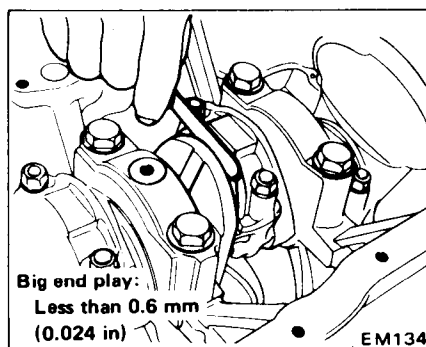
2. Measure piston pin hole in relation to the outer diameter of pin. If wear exceeds the limit, replace such piston pin together with piston on which it is installed.

Piston pin to piston clearance:
0.006 - 0.013 mm
(0.0002 - 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.



and measure the thrust clearance. If the measured value exceeds the limit, replace such connecting rod.

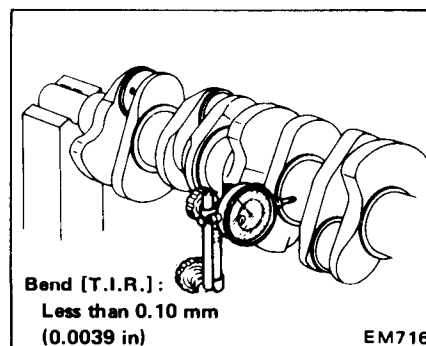


3. After regrinding crankshaft, finish it to the necessary size indicated in the chart under S.D.S. by using an adequate undersize bearing according to the extent of required repair.

BEND AND END PLAY

1. Crankshaft can be checked for bend by placing it on V-blocks and using a dial gauge with its indicating finger resting on the center journal.

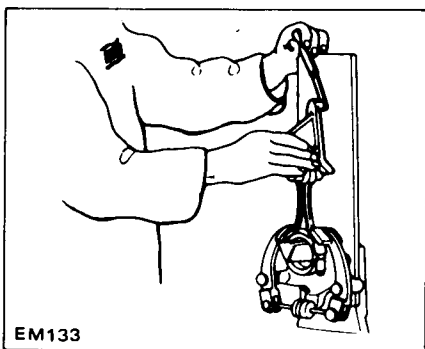
If bend exceeds the specified limit, replace or repair.



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)



CRANKSHAFT

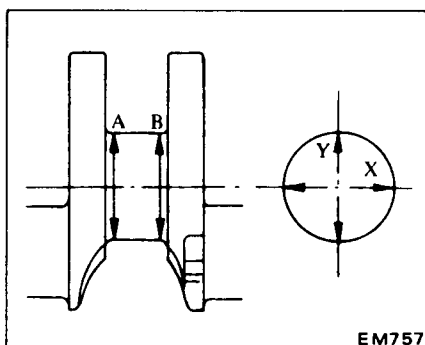
CRANK JOURNAL AND PIN

1. Repair or replace as required. If faults are minor, correct with fine crocus cloth.

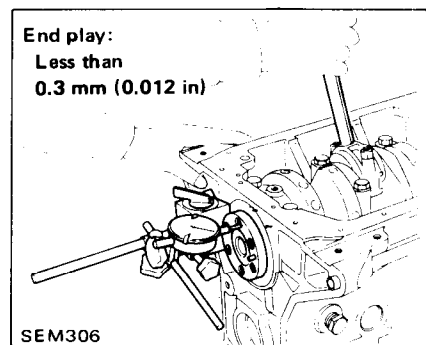
2. Check journals and crank pins with a micrometer for taper and out-of-round. Measurement should be taken along journals for taper and around journals for out-of-round.

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

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



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

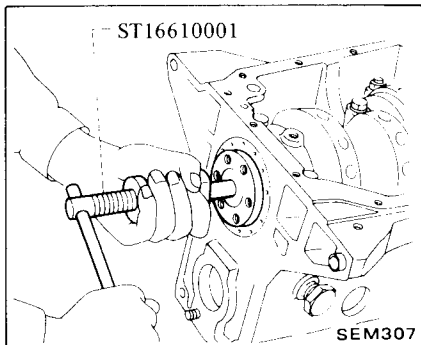


3. Install connecting rods with bearings on to corresponding crank pins

REPLACING PILOT BUSHING

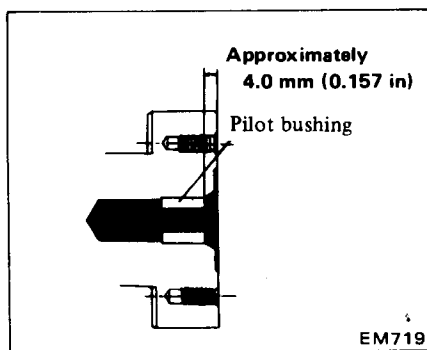
To replace crankshaft rear pilot bushing, proceed as follows:

1. Pull out bushing using Tool.



2. Before installing a new bushing, thoroughly clean bushing hole.
3. Insert pilot bushing until distance between flange end and pilot bushing is the specified distance.

When installing pilot bushing, be careful not to damage edge of pilot bushing and do not insert excessively.



MAIN BEARING AND CONNECTING ROD BEARING

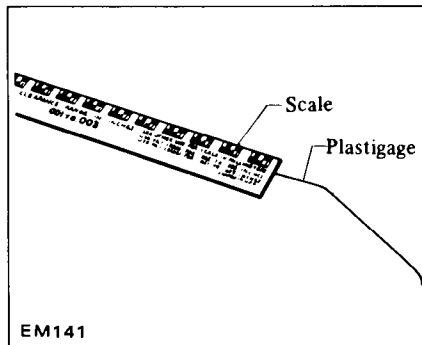
MAIN BEARING

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.

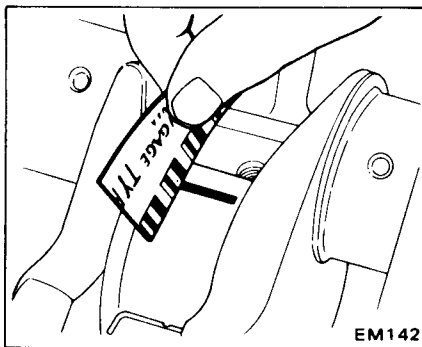
Ⓣ : Main bearing cap:

44 - 54 N·m
(4.5 - 5.5 kg-m,
33 - 40 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:
0.12 mm (0.0047 in)



3. If clearance exceeds the specified value, replace bearing with an under-size 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
44 - 54 N·m
(4.5 - 5.5 kg-m,
33 - 40 ft-lb)

Max. tolerance of connecting rod bearing clearance:
0.12 mm (0.0047 in)

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

Refer to S.D.S.

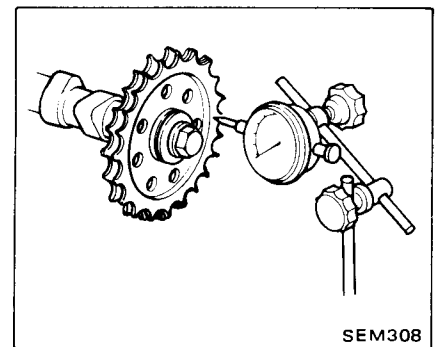
MISCELLANEOUS COMPONENTS

CAMSHAFT SPROCKET

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

If runout exceeds the specified limit, replace camshaft sprocket.

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



CHAIN

Check chain for damage and excessive wear at roller links. Replace if faulty.

CHAIN TENSIONER AND CHAIN GUIDE

Check for wear and breakage. Replace if necessary.

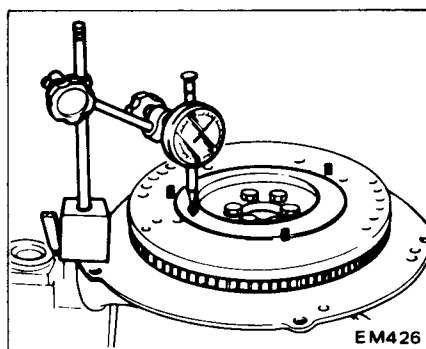
FLYWHEEL (M/T models)

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)

DRIVE PLATE (A/T models)

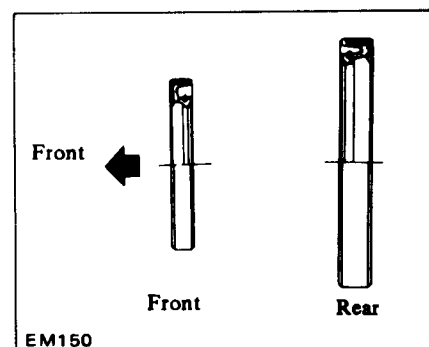
1. Check drive plate for cracks or distortion.
2. Check tooth surfaces of ring gear for flaws or wear.

Replace drive plate assembly if necessary.

FRONT AND REAR 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.



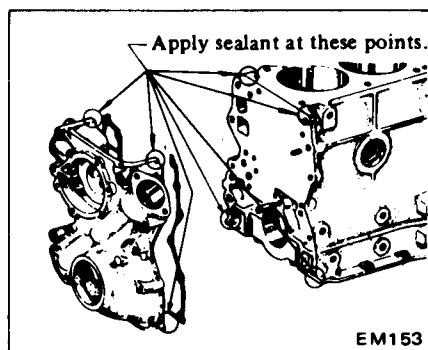
ENGINE ASSEMBLY

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

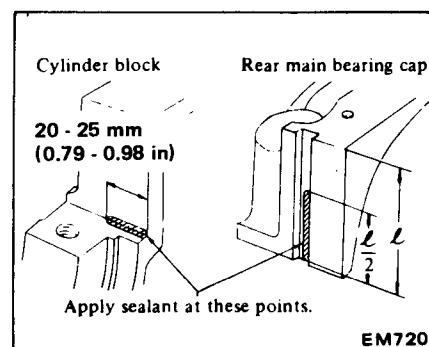
Use sealant to eliminate water and oil leaks. **Do not apply too much sealant.** Parts requiring sealant are:

- (1) Front cover.



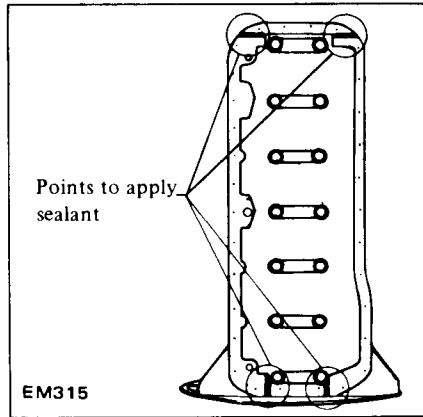
- (2) Main bearing cap and cylinder block:

Each side of rear main bearing cap and each corner of cylinder block.



(3) Cylinder block:

Step portions on the bottom and at the four mating surfaces (cylinder block to front cover and cylinder block to rear main bearing cap).



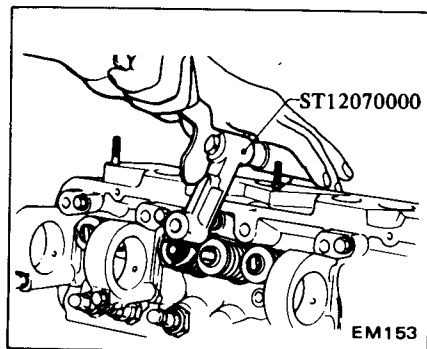
After inserting rear bearing cap side seals, apply sealant to rear main bearing cap.

ASSEMBLING CYLINDER HEAD

1. Install valve and valve spring.

(1) Set valve spring inner and outer seat and install valve oil seal to valve guide.

(2) Install valve, inner and outer valve spring, valve spring retainer and valve spring collet by using Tool.



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

b. Check whether the valve face is free from foreign matter.

c. Outer valve spring is of an uneven pitch type. Install valve spring with its narrow pitch side (painted) at cylinder head side.

2. Install valve rocker pivot assembly.

Screw valve rocker pivots joined with lock nuts into pivot bushing.

Install valve spring retainer.

Fully screw in valve rocker pivot.

3. Install camshaft assembly in cylinder head carefully.

Do not damage the bearing inside.

4. Set thrust plate.

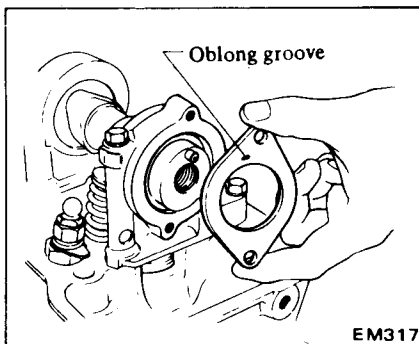
Ⓓ : Camshaft thrust plate

6 - 10 N·m

(0.6 - 1.0 kg-m,

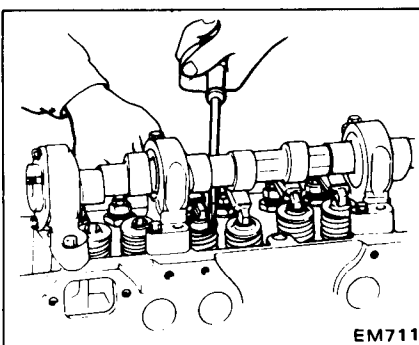
4.3 - 7.2 ft-lb)

The oblong groove must be directed toward the front side of engine.



5. Install valve rocker guides.

6. Install rocker arms by pressing valve springs down with a screwdriver, etc.



7. Install valve rocker springs.

8. After assembling cylinder head, turn camshaft until No. 1 piston is at T.D.C. on its compression stroke.

ASSEMBLING 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.

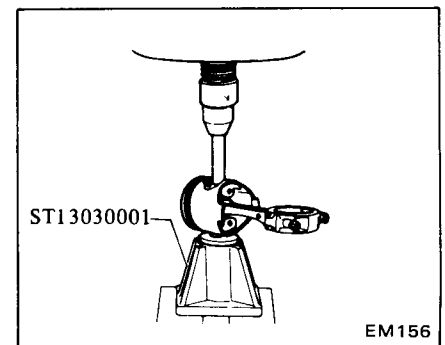
Piston pin fitting force:

4.9 - 14.7 kN

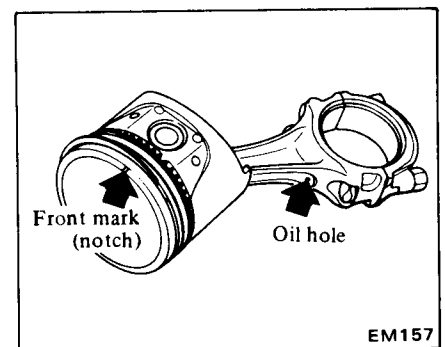
(0.5 - 1.5 t, 0.6 - 1.7 US ton,

0.5 - 1.5 Imp ton)

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



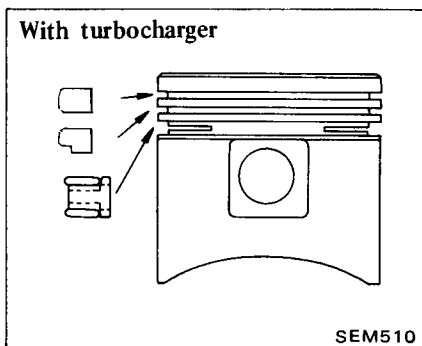
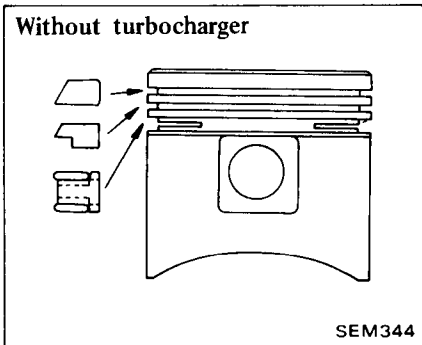
b. Arrange so that oil hole on big end of connecting rod points toward the right side of cylinder block.



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

2. Install piston rings.

Install so that stamped mark on ring faces upward.



ASSEMBLING ENGINE OVERALL

INSTALLING INTERNAL PARTS

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

1. Baffle plate and steel net.

Install them into crankcase and tighten the screws applying Locktite.

2. Crankshaft.

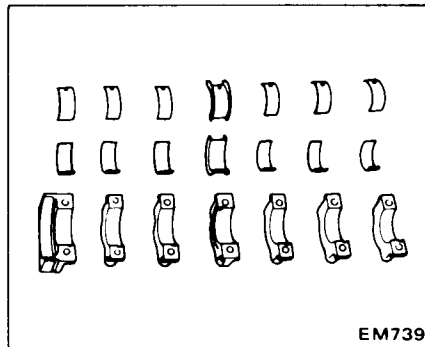
(1) Set upper main bearings at the proper portion of cylinder block.

a. Upper bearings have oil hole and oil groove, however lower bearings do not.

b. Only center bearing (No. 4) is a flange type.

c. Front bearing (No. 1) is also the same type as rear bearing (No. 7).

d. 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:

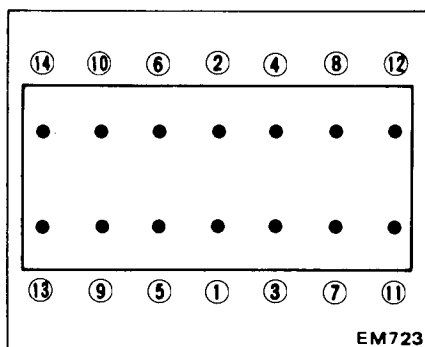
44 - 54 N·m
(4.5 - 5.5 kg-m,
33 - 40 ft-lb)

a. Apply sealant to each side of rear main bearing cap and each corner of cylinder block. Refer to Precautions.

b. Arrange the parts so that the arrow mark on bearing cap faces toward the front of engine.

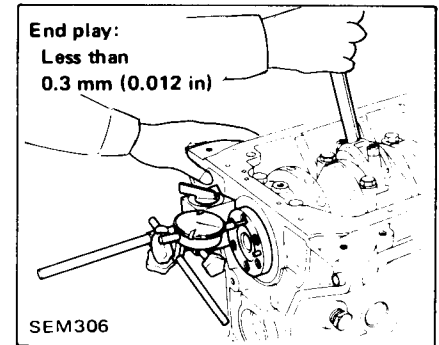
c. Prior to tightening bearing cap bolts, place bearing cap in proper position by shifting crankshaft in the axial direction.

d. Tighten bearing cap bolts gradually in separating two to three stages and in sequence outwardly from center bearing.

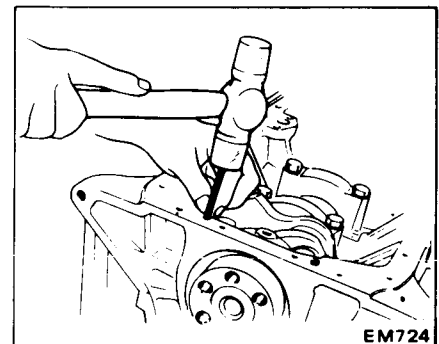


e. After securing bearing cap bolts, ascertain that crankshaft turns smoothly by hand.

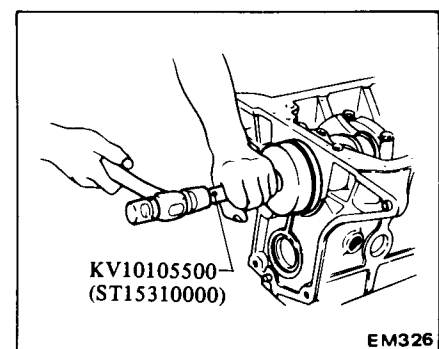
(5) Make sure that there exists proper end play at crankshaft.



3. Side oil seals. Apply sealant to these seals. Then install them into main bearing cap.



4. Rear oil seal. Install rear oil seal by using Tool.

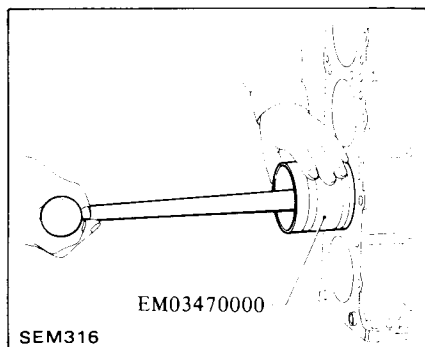


a. When installing oil seal, give coating of engine oil to mating shaft to prevent scratches and folded lip. Also apply coating of oil to periphery of oil seal.

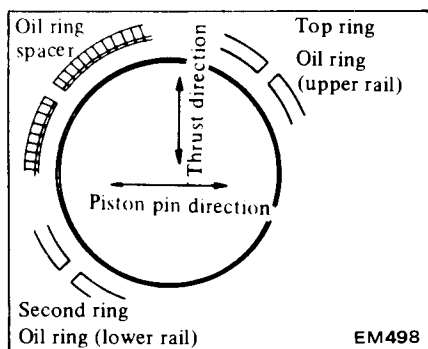
b. Install oil seal in the direction that dust seal lip faces to the outside of crankcase.

5. Piston with connecting rod.

- (1) Install them into corresponding cylinders using Tool.

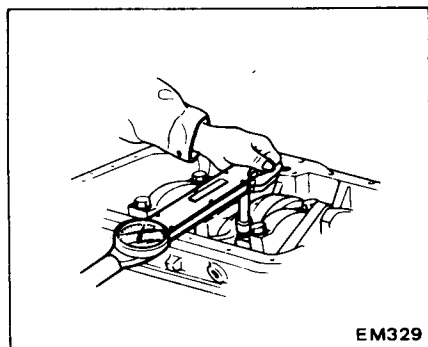


- a. Apply engine oil to sliding parts.
- b. Arrange so that the front mark on piston head faces to the front of engine.
- c. Set piston rings as shown below.



- (2) Install connecting rod caps.

Ⓙ : Connecting rod cap nuts
44 - 54 N·m
(4.5 - 5.5 kg-m,
33 - 40 ft-lb)

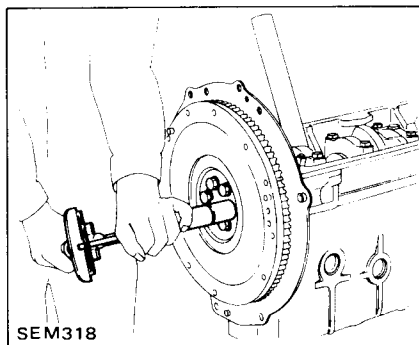


Arrange connecting rods and connecting rod caps so that the cylinder numbers face in the same direction.

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

6. Rear plate and flywheel or drive plate.

Ⓙ : Flywheel or drive plate fixing bolts
127 - 147 N·m
(13.0 - 15.0 kg-m,
94 - 108 ft-lb)



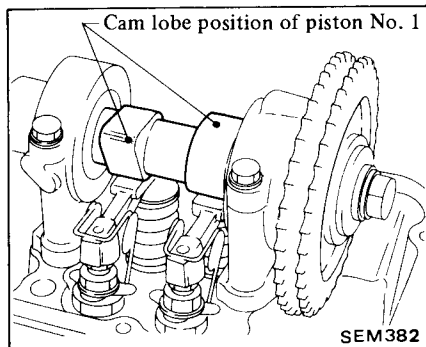
Do not lock at ring gear.

7. 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 until No. 1 piston is at T.D.C. on its compression stroke.
- (3) When installing cylinder head, set intake and exhaust valve for No. 1 piston on its compression stroke by turning camshaft.



- (4) Temporarily tighten two center bolts.

Ⓙ : Cylinder head bolt
20 N·m (2 kg-m, 14 ft-lb)

- a. Final tightening should be carried out after installing chain and front cover.
- b. Do not rotate crankshaft and camshaft separately, because valves will hit piston heads.
- c. Always use new cylinder head gasket.
- d. There are two kinds of cylinder head bolts with different lengths.

INSTALLING TIMING CHAIN

1. Install crankshaft sprocket, oil pump drive gear and oil thrower.

- (1) Make sure that the mating marks of crankshaft sprocket face front.

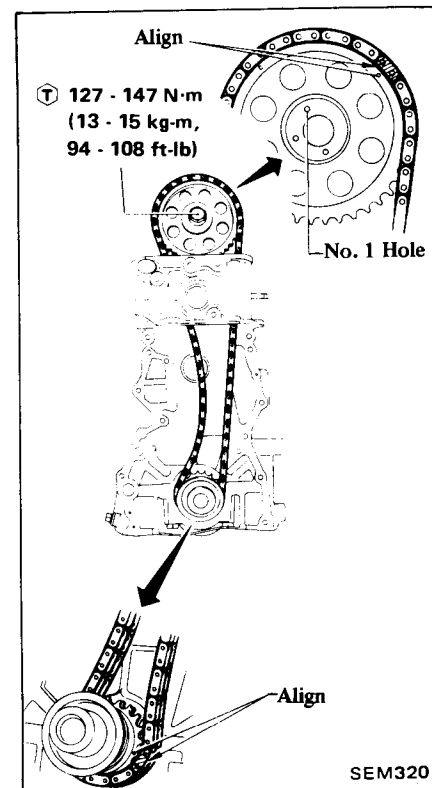
- (2) Install oil pump drive gear so that large chamfered inner side faces rearward.

2. Install timing chain.

- (1) Align timing marks on chain and crankshaft sprocket properly.

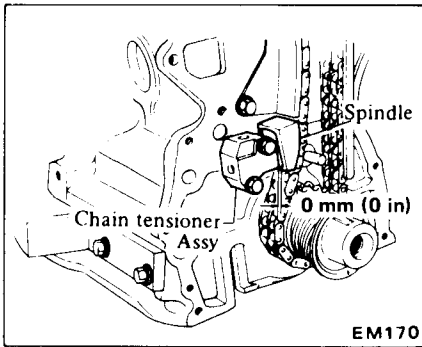
- (2) Align No. 1 mark on camshaft sprocket with timing mark on chain.

- (3) Insert camshaft dowel pin into No. 1 hole in camshaft sprocket, and install camshaft sprocket bolt.



(4) Install chain guide and chain tensioner. Then tighten slack side chain guide mounting bolt so that protrusion of chain tensioner spindle is 0 mm (0 in).

- Ⓙ : Chain guide and chain tensioner mounting bolt
6 - 10 N·m
(0.6 - 1.0 kg·m,
4.3 - 7.2 ft·lb)



INSTALLING FRONT SIDE PARTS

1. Install front cover with gasket in place observing the following:

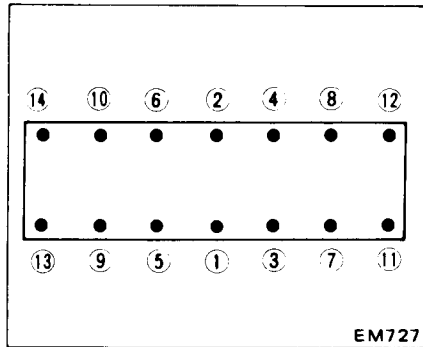
- Before installing front cover, press new oil seal in front cover in the direction that dust seal lip faces to the outside of front cover.
- Apply sealant to gaskets and sealing portions designated. Refer to Precautions.
- Apply coating of engine oil to periphery of oil seal.

2. Tighten temporarily front cover to cylinder block bolts and cylinder head to front cover bolts.

Check the height difference between cylinder block upper face and front cover upper face. Its difference must be less than 0.15 mm (0.0059 in).

3. Tighten cylinder head bolts to the specified torque in several steps in the sequence as follows.

- Ⓙ : Cylinder head bolt
69 - 83 N·m
(7.0 - 8.5 kg·m,
51 - 61 ft·lb)



4. Finally tighten front cover to cylinder block bolts and cylinder head to front cover bolts.

Install water pump assembly with new gasket.

- Ⓙ : Front cover bolts and water pump fixing bolts

	N·m	kg·m	ft·lb
M8	10 - 16	1.0 - 1.6	7 - 12
M6	4 - 10	0.4 - 1.0	2.9 - 7.2

- Ⓙ : Cylinder head to front cover bolts

8 - 14 N·m
(0.8 - 1.4 kg·m,
5.8 - 10.1 ft·lb)

5. Install crankshaft pulley and washer and tighten pulley bolt by locking cranksahft.

- Ⓙ : Crankshaft pulley bolt
137 - 157 N·m
(14 - 16 kg·m,
101 - 116 ft·lb)

6. Install fan pulley, fan coupling and fan.

7. Install idler pulley for power steering (if so equipped).

INSTALLING SIDE PARTS AND OIL PAN

1. Install engine right side parts.

- Spark plugs
- Lubricating oil passage for turbo-charger

- Engine mounting brackets

- Ⓙ : Bracket bolt
29 - 39 N·m
(3.0 - 4.0 kg·m,
22 - 29 ft·lb)

- Oil level dipstick
- Oil pump and oil pump drive spindle

- Ⓙ : Oil pump attaching bolt
11 - 15 N·m
(1.1 - 1.5 kg·m,
8 - 11 ft·lb)

2. Install left side engine parts.

- Intake and exhaust manifold.

Always install a new gasket.

	N·m	kg·m	ft·lb
M10 Bolt	34 - 44	3.5 - 4.5	25 - 33
M8 Bolt	15 - 25	1.5 - 2.5	11 - 18
M8 Nut	12 - 16	1.2 - 1.6	9 - 12

- Turbocharger assembly with exhaust outlet
- Thermostat housing

Always install a new gasket.

- Ⓙ : 12 - 20 N·m
(1.2 - 2.0 kg·m,
9 - 14 ft·lb)

3. Install oil strainer and oil pan with new gasket.

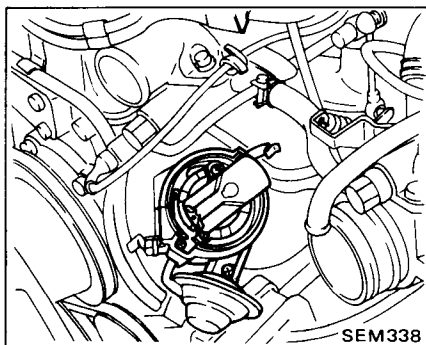
- Ⓙ : Oil strainer bolts
10 - 16 N·m
(1.0 - 1.6 kg·m,
7 - 12 ft·lb)

Oil pan bolts
6 - 10 N·m
(0.6 - 1.0 kg·m,
4.3 - 7.2 ft·lb)

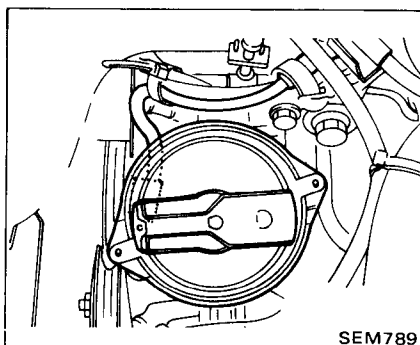
- Apply sealant to the designated portions. Refer to Precautions.
- Oil pan should be tightened in a criss-cross pattern. Do not over-tighten.
- Always use new oil pan gasket.

4. Install distributor assembly.

- Make sure that No. 1 Piston is at T.D.C. on its compression stroke.
- Align oil pump drive spindle with distributor assembly shaft.



- Install distributor gasket.
- Insert distributor into front cover so that crank angle sensor harness connector is on engine front side, then temporarily tighten installing bolts.



T : Alternator bracket

39 - 59 N·m

(4 - 6 kg-m,

29 - 43 ft-lb)

Alternator to adjusting bar bolt

20 - 29 N·m

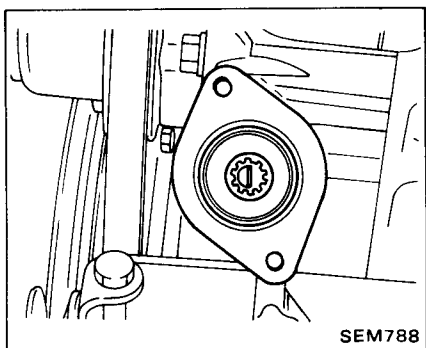
(2.0 - 3.0 kg-m,

14 - 22 ft-lb)

- Water inlet and water hose
- Oil filter
- Oil pressure switch
- Fan belt
- Compressor bracket
- Power steering pump bracket
- Injector auxiliary cooling fan and duct
- Clutch assembly and transmission

Turbocharger model

Install drive shaft after adjusting it on oil pump side.



As described above, install distributor by matching installing angle of drive shaft and distributor body angle. By adjusting rotor shaft slightly, distributor installing flange will fit front cover.

- Install distributor cap and connect high tension cable.
- Dismount engine from work stand and remove engine attachment.
- Install the following parts.
 - Alternator bracket
 - Alternator assembly

For details concerning clutch assembly (torque converter) and transmission, refer to Section MT (AT).

ENGINE TUNE-UP

After installing engine in car, tune-up engine. Refer to Section MA.

- Fill engine oil and coolant to the specified level.
- Adjust fan belt deflection.
- Adjust ignition timing.
- Adjust valve clearance.

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

GENERAL SPECIFICATIONS

Cylinder arrangement		6, in-line	
Displacement	cm ³ (cu in)	2,753 (167.99)	
Bore and Stroke	mm (in)	86.0 × 79.0 (3.386 × 3.110)	
Valve arrangement		O.H.C.	
Firing order		1-5-3-6-2-4	
Number of piston rings	Compression	2	
	Oil	1	
Number of main bearings		7	
Compression ratio		8.8	7.4 *

* With turbocharger

INSPECTION AND ADJUSTMENT

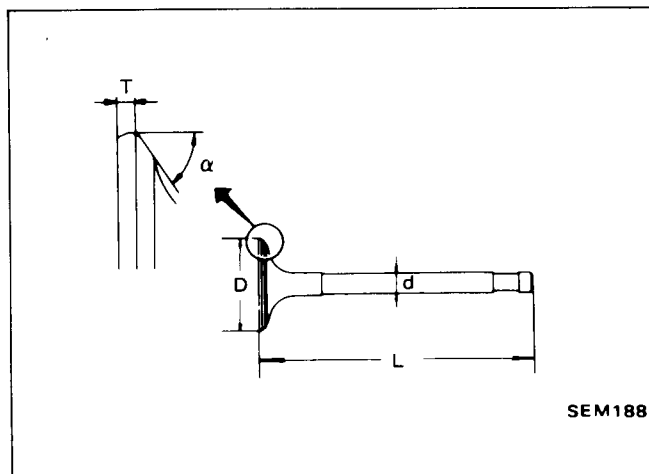
CYLINDER HEAD

Unit: mm (in)

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

VALVE

Unit: mm (in)



Valve head diameter "D"	Intake	44.0 - 44.2 (1.732 - 1.740)
	Exhaust	35.0 - 35.2 (1.378 - 1.386)
Valve length "L"	Intake	112.8 - 113.1 (4.4409 - 4.4527)
	Exhaust	113.6 - 113.9 (4.4724 - 4.4842)
Valve stem diameter "d"	Intake	7.965 - 7.980 (0.3136 - 0.3142)
	Exhaust	7.945 - 7.960 (0.3128 - 0.3134)
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 clearance Hot [*Cold]	Intake	0.25 (0.010) [0.20 (0.008)]
	Exhaust	0.30 (0.012) [0.25 (0.010)]

*Cold: Used as approximate values during engine assembly, clearances should ultimately be adjusted to the above hot values; refer to Section MA for procedures.

Valve spring

Free height mm (in)	Outer	49.98 (1.9677)
	Inner	44.85 (1.7657)
Pressure height mm/N (mm/kg, in/lb)	Outer	29.5/480.5 (29.5/49.0, 1.161/108.0)
	Inner	24.5/250.1 (24.5/25.5, 0.965/56.2)
Assembled height mm/N (mm/kg, in/lb)	Outer	40.0/208.9 (40.0/21.3, 1.575/47.0)
	Inner	35.0/120.6 (35.0/12.3, 1.378/27.1)
Out of square "S" mm (in)	Outer	2.2 (0.087)
	Inner	1.2 (0.047)

Valve guide

Unit: mm (in)

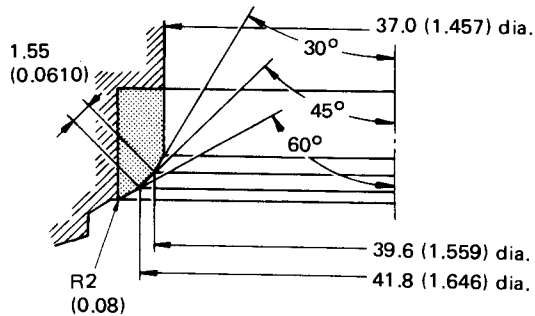
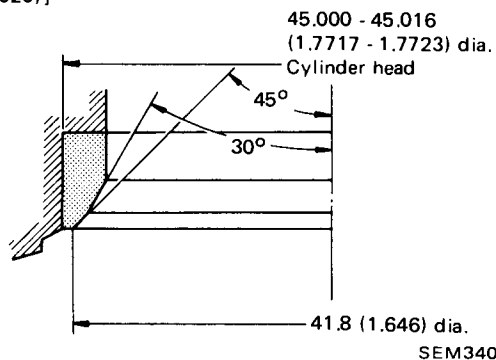
		Standard	Service
Valve guide Outer diameter		12.023 - 12.034 (0.4733 - 0.4738)	12.223 - 12.234 (0.4812 - 0.4817)
Valve guide Inner diameter [Finished size]		8.000 - 8.018 (0.3150 - 0.3157)	
Cylinder head valve guide hole diameter		11.985 - 11.996 (0.4718 - 0.4723)	12.185 - 12.196 (0.4797 - 0.4802)
Interference fit of valve guide		0.027 - 0.049 (0.0011 - 0.0019)	
		Standard	Max. tolerance
Stem to guide clearance	Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.1 (0.004)
	Exhaust	0.040 - 0.073 (0.0016 - 0.0029)	
Valve deflection limit		0.2 (0.008)	

Valve seat

Unit: mm (in)

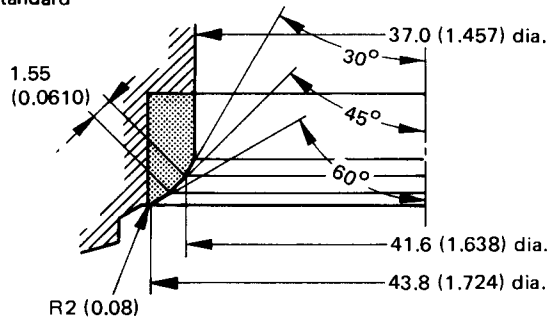
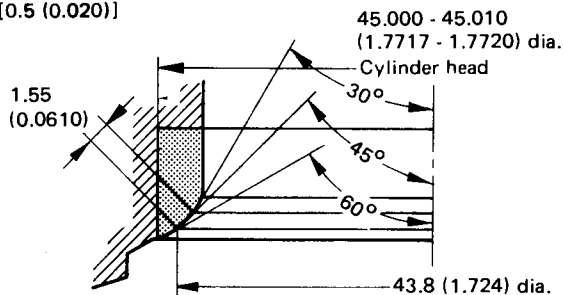
INTAKE

Standard


Oversize
[0.5 (0.020)]


EXHAUST

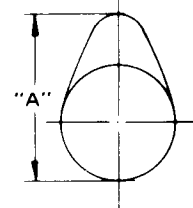
Standard


Oversize
[0.5 (0.020)]


CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

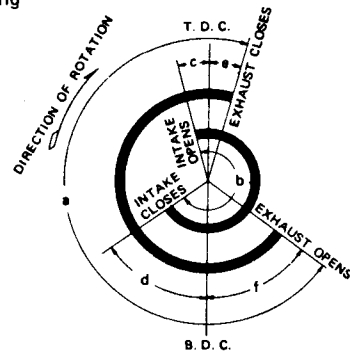
	Standard	Max. tolerance
Camshaft journal to bearing clearance	0.038 - 0.067 (0.0015 - 0.0026)	0.1 (0.004)
Inner diameter of camshaft bearing	48.000 - 48.016 (1.8898 - 1.8904)	—
Outer diameter of camshaft journal	47.949 - 47.962 (1.8878 - 1.8883)	—
Camshaft bend [T.I.R.*]	Less than 0.02 (0.0008)	0.05 (0.0020)
Camshaft end play	0.08 - 0.38 (0.0031 - 0.0150)	



EM671

Cam height "A"	For U.S.A.	Intake	39.95 - 40.00 (1.5728 - 1.5748)
		Exhaust	40.30 - 40.35 (1.5866 - 1.5886)
	For Canada	Intake & Exhaust	40.30 - 40.35 (1.5866 - 1.5886)
Wear limit of cam height	0.15 (0.0059)		

Valve timing



EM120

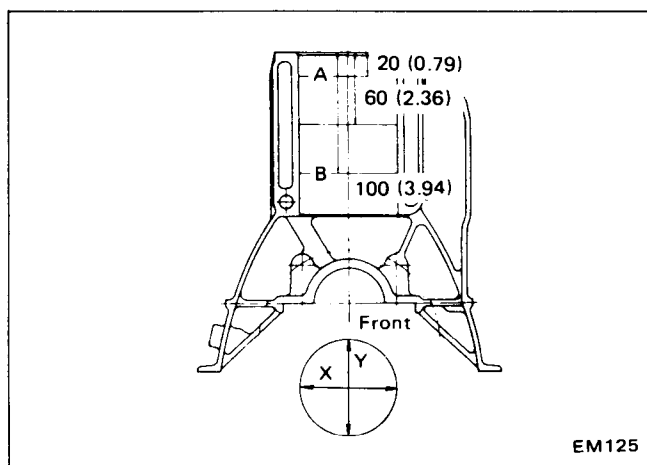
Unit: degree

	a	b	c	d	e	f
For U.S.A.	248	240	16	44	10	58
For Canada	248	248	16	52	14	54

*: Total indicator reading

CYLINDER BLOCK

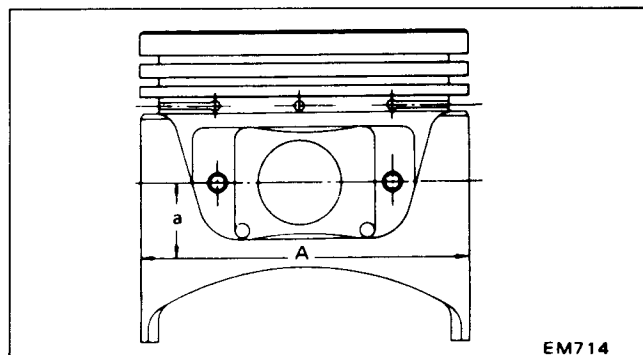
Unit: mm (in)



		Standard	Wear limit
Surface flatness		Less than 0.05 (0.0020)	0.10 (0.0039)
Cylinder bore	Inner diameter	86.000 - 86.050 (3.3858 - 3.3878)	—
	Out-of-round (X-Y)	Less than 0.02 (0.0008)	—
	Taper (A-B)	Less than 0.02 (0.0008)	—
Difference in inner diameter between cylinders		Less than 0.05 (0.0020)	—
Piston to cylinder clearance		0.025 - 0.045 (0.0010 - 0.0018)	—
		Outer diameter	Remarks
Outer diameter of cylinder liner for service	4.0 (0.157) Undersize	90.000 - 90.050 (3.5433 - 3.5453)	Interference fit cylinder liner to cylinder block 0.075 - 0.085 (0.0030 - 0.0033)
	4.5 (0.177) Undersize	90.50 - 90.55 (3.5630 - 3.5650)	
	5.0 (0.197) Undersize	91.00 - 91.05 (3.5827 - 3.5846)	

PISTON, PISTON RING AND PISTON PIN**Piston**

Unit: mm (in)



Piston skirt diameter "A"	Standard		85.965 - 86.015 (3.3844 - 3.3864)
	Oversize for service	0.5 (0.020)	86.465 - 86.515 (3.4041 - 3.4061)
		1.0 (0.039)	86.965 - 87.015 (3.4238 - 3.4258)
"a" dimension			About 20 (0.79)
Piston pin hole diameter			21.001 - 21.008 (0.8268 - 0.8271)
Piston clearance to cylinder block			0.025 - 0.045 (0.0010 - 0.0018)

Piston ring

Unit: mm (in)

		Standard	Limit
Side clearance	Top	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.004)
	2nd	0.030 - 0.063 (0.0012 - 0.0025)	
	Oil	0.023 - 0.070 (0.0009 - 0.0028)	—
Ring gap	Top	0.25 - 0.40 (0.0098 - 0.0157)	1.0 (0.039)
		0.19 - 0.33* (0.0075 - 0.0130)	
	2nd	0.15 - 0.30 (0.0059 - 0.0118)	
	Oil (rail ring)	0.3 - 0.9 (0.012 - 0.035)	

* With turbocharger

Piston pin

Unit: mm (in)

Piston pin outer diameter	20.993 - 20.998 (0.8265 - 0.8267)
Piston pin to piston clearance	0.006 - 0.013 (0.0002 - 0.0005)
Interference fit of piston pin to connecting rod	0.015 - 0.033 (0.0006 - 0.0013)

CONNECTING ROD

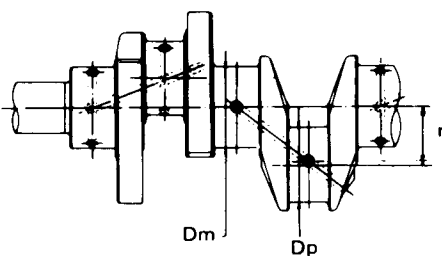
Unit: mm (in)

Center distance		130.35 (5.13)
Bend, torsion [per 100 mm (3.94 in)]	Standard	Less than 0.025 (0.0010)
	Limit	0.05 (0.0020)
Piston pin bore dia.		20.965 - 20.978 (0.8254 - 0.8259)
Big end play	Standard	0.2 - 0.3 (0.008 - 0.012)
	Limit	0.6 (0.024)

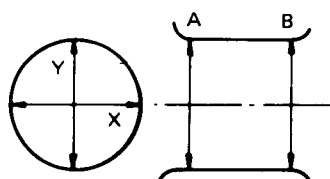
CRANKSHAFT

Unit: mm (in)

Main journal dia. "Dm"		54.942 - 54.955 (2.1631 - 2.1636)
Pin journal dia. "Dp"		49.961 - 49.974 (1.9670 - 1.9675)
Center distance "r"		39.50 (1.5551)
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)
Pilot bushing insert distance		Approximately 4.0 (0.157)



EM737

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


EM715

BEARING

Bearing clearance

Unit: mm (in)

	Standard	Limit
Main bearing clearance	0.020 - 0.066 (0.0008 - 0.0026)	0.12 (0.0047)
Connecting rod bearing clearance	0.024 - 0.066 (0.0009 - 0.0026)	0.12 (0.0047)

Main bearing undersize

Unit: mm (in)

	Crank journal diameter
Standard	54.942 - 54.955 (2.1631 - 2.1636)
0.25 (0.0098) Undersize	54.692 - 54.705 (2.1532 - 2.1537)
0.50 (0.0197) Undersize	54.442 - 54.455 (2.1434 - 2.1439)
0.75 (0.0295) Undersize	54.192 - 54.205 (2.1335 - 2.1341)
1.00 (0.0394) Undersize	53.942 - 53.955 (2.1237 - 2.1242)

Connecting rod bearing undersize

Unit: mm (in)

	Crank journal diameter
Standard	49.961 - 49.974 (1.9670 - 1.9675)
0.06 (0.0024) Undersize	49.901 - 49.914 (1.9646 - 1.9651)
0.12 (0.0047) Undersize	49.841 - 49.854 (1.9622 - 1.9628)
0.25 (0.0098) Undersize	49.711 - 49.724 (1.9571 - 1.9576)
0.50 (0.0197) Undersize	49.461 - 49.474 (1.9473 - 1.9478)
0.75 (0.0295) Undersize	49.211 - 49.224 (1.9374 - 1.9379)
1.00 (0.0394) Undersize	48.961 - 48.974 (1.9276 - 1.9281)

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
Alternator bracket bolt		39 - 59	4.0 - 6.0	29 - 43
Alternator to adjusting bar bolt		20 - 29	2.0 - 3.0	14 - 22
Compressor bracket bolt		44 - 54	4.5 - 5.5	33 - 40
Distributor support bolt		4 - 8	0.4 - 0.8	2.9 - 5.8
Engine mounting bracket		29 - 39	3.0 - 4.0	22 - 29
Gusset attaching bolt		26 - 32	2.7 - 3.3	20 - 24
Manifold bolt and nut	M10	34 - 44	3.5 - 4.5	25 - 33
	M8 bolt	15 - 25	1.5 - 2.5	11 - 18
	M8 nut	12 - 16	1.2 - 1.6	9 - 12
Oil pressure sending unit		10 - 16	1.0 - 1.6	7 - 12
Oil pump bolt		11 - 15	1.1 - 1.5	8 - 11
Spark plug		15 - 20	1.5 - 2.0	11 - 14
Thermostat housing		12 - 20	1.2 - 2.0	9 - 14
Water inlet bolt		10 - 16	1.0 - 1.6	7 - 12
Water outlet bolt		10 - 16	1.0 - 1.6	7 - 12
Water pump bolt	M6	4 - 10	0.4 - 1.0	2.9 - 7.2
	M8	10 - 16	1.0 - 1.6	7 - 12
Water pump pulley stud		6 - 10	0.6 - 1.0	4.3 - 7.2

Engine body parts

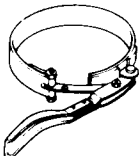
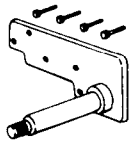
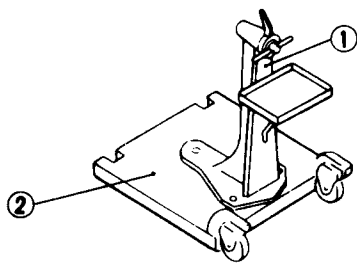
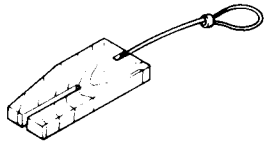
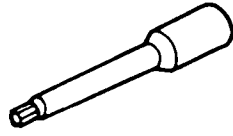
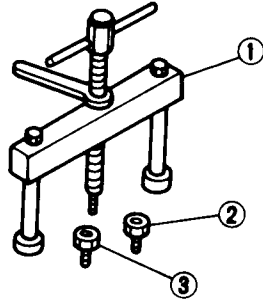
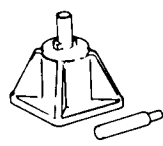
Unit		N·m	kg·m	ft·lb
Camshaft locating plate bolt		6 - 10	0.6 - 1.0	4.3 - 7.2
Camshaft sprocket bolt		127 - 147	13.0 - 15.0	94 - 108
Chain guide bolt		6 - 10	0.6 - 1.0	4.3 - 7.2
Chain tensioner bolt		6 - 10	0.6 - 1.0	4.3 - 7.2
Clutch cover bolt		20 - 29	2.0 - 3.0	14 - 22
Connecting rod big end nut		44 - 54	4.5 - 5.5	33 - 40
Crank pulley bolt		137 - 157	14.0 - 16.0	101 - 116
Cylinder head bolt		69 - 83	7.0 - 8.5	51 - 61
Cylinder head to front cover bolt		8 - 14	0.8 - 1.4	5.8 - 10.1
Drive plate bolt (A/T)		127 - 147	13.0 - 15.0	94 - 108
Flywheel bolt (M/T)		127 - 147	13.0 - 15.0	94 - 108
Front cover bolt	M6	4 - 10	0.4 - 1.0	2.9 - 7.2
	M8	10 - 16	1.0 - 1.6	7 - 12
Main bearing cap bolt		44 - 54	4.5 - 5.5	33 - 40
Oil pan bolt		6 - 10	0.6 - 1.0	4.3 - 7.2
Oil pan drain plug		20 - 29	2.0 - 3.0	14 - 22
Oil strainer bolt		10 - 16	1.0 - 1.6	7 - 12
Pivot bushing bolt		78 - 118	8.0 - 12.0	58 - 87
Pivot lock nut		49 - 59	5.0 - 6.0	36 - 43
Rocker cover bolt		10 - 16	1.0 - 1.6	7 - 12

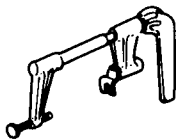
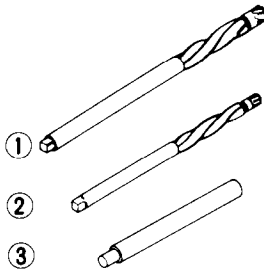
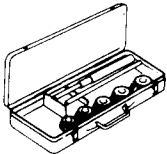
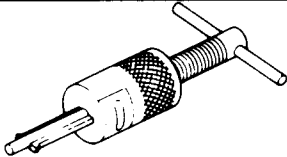
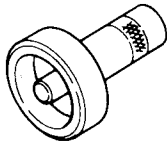
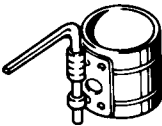
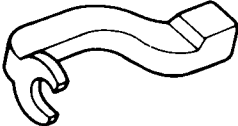

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
I. Noisy engine		
Piston and connecting rod knocking.	Seized piston pin. Seized piston in cylinder. Broken piston ring. Improper connecting rod alignment. Seized or loose connecting rod bearing.	Replace piston with pin. Recondition cylinder and replace piston with pin. Replace ring and/or recondition cylinder. Realign or replace connecting rod. Replace.
Knocking of crankshaft and bearing.	Seized or loose main bearing Bent crankshaft. Uneven wear of journal. Excessive crankshaft end play.	Replace. Repair or replace. Correct Replace center bearing.
Timing chain noise.	Improper chain tension. Worn and/or damaged chain. Worn sprocket. Worn and/or broken chain guide and/or tensioner adjusting mechanism.	Adjust. Replace. Replace. Replace.
Camshaft and valve mechanism knocking.	Improper valve clearance. Worn rocker pivot. Worn rocker face. Loose valve stem in guide. Weakened valve spring. Seized valve.	Adjust Replace. Replace Replace guide. Replace. Replace.
Camshaft knocking.	Excessive camshaft clearance. Excessive axial play. Worn cam gear.	Replace. Replace thrust plate. Replace.
Water pump knocking.	Improper shaft end play. Broken impeller.	Replace water pump assembly. Replace water pump assembly.
II. Other mechanical troubles		
Stuck valve.	Improper valve clearance. Insufficient clearance between valve stem and guide. Weakened or broken valve spring. Seized or damaged valve stem. Poor quality fuel.	Adjust. Clean stem or ream guide. Replace. Replace or clean. Use good fuel.

Condition	Probable cause	Corrective action
Seized valve seat.	Improper valve clearance. Weakened valve spring. Thin valve head edge. Narrow valve seat. Overheating. Over speeding. Stuck valve guide.	Adjust. Replace. Replace valve. Reface. Repair or replace. Drive at proper speed. Repair or replace
Excessively worn cylinder and piston.	Shortage of engine oil. Dirty engine oil. Poor quality of oil. Overheating Wrong assembly of piston with connecting rod. Improper piston ring clearance. Broken piston ring. Dirty air cleaner. Mixture too lean. Engine over run.	Add or replace oil. Clean crankcase, replace oil and oil filter. Use proper oil. Repair or replace. Repair or replace. Adjust. Replace. Replace. Adjust carburetor mixture ratio and check intake air leakage. Drive at proper speeds.
Faulty connecting rod.	Shortage of engine oil. Low oil pressure. Poor quality engine oil. Rough surface of crankshaft. Clogged oil passage. Bearing worn or eccentric. Bearing improperly assembled. Loose bearing. Incorrect connecting rod alignment.	Add oil. Correct. Use proper oil. Repair crankshaft and replace bearing. Clean. Replace. Correct. Replace. Repair or replace.
Faulty crankshaft bearing.	Shortage of engine oil. Low oil pressure. Poor quality engine oil. Crankshaft journal worn or out-of-round. Clogged oil passage in crankshaft. Bearing worn or eccentric. Bearing improperly assembled. Eccentric crankshaft or bearing.	Add or replace. Correct. Use specified oil. Repair. Clean. Replace. Correct. Replace.

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
ST19320000 (J25664)	Oil filter wrench 
ST05340001 (J26032)	Engine attachment 
ST0501S000 (J26023) ① ST05011000 (J26023-2) ② ST05012000 (J26023-1)	Engine stand assembly Engine stand Base 
KV10105800 (J25660-B)	Chain stopper 
ST10120000 (J25613)	Cylinder head bolt wrench 
KV101041S0 (J25647) ① KV10104110 (-) ② ST16512001 (-) ③ ST16701001 (-)	Crankshaft main bearing cap puller Crankshaft main bearing puller Adapter Adapter 
ST13030001 (J26365)	Piston pin press stand 

Tool number (Kent-Moore No.)	Tool name
ST12070000 (J25631)	Valve lifter 
KV101039S0 (J25618) ① ST11081000 (J25618-3) ② ST11032000 (J25618-2) ③ ST11320000 (J25618-1)	Valve guide reamer set Reamer [12.2 mm (0.480 in) dia.] Reamer [8.0 mm (0.31 in) dia.] Drift 
ST11650001 (-)	Valve seat cutter set 
ST16610001 (J23907)	Pilot bushing puller 
KV10105500 (J25640-01)	Crankshaft rear oil seal drift 
EM03470000 (-)	Piston ring compressor 
ST10640001 (J25615-01)	Pivot adjuster 
KV30100100 (-)	Clutch aligning bar 

ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

CONTENTS

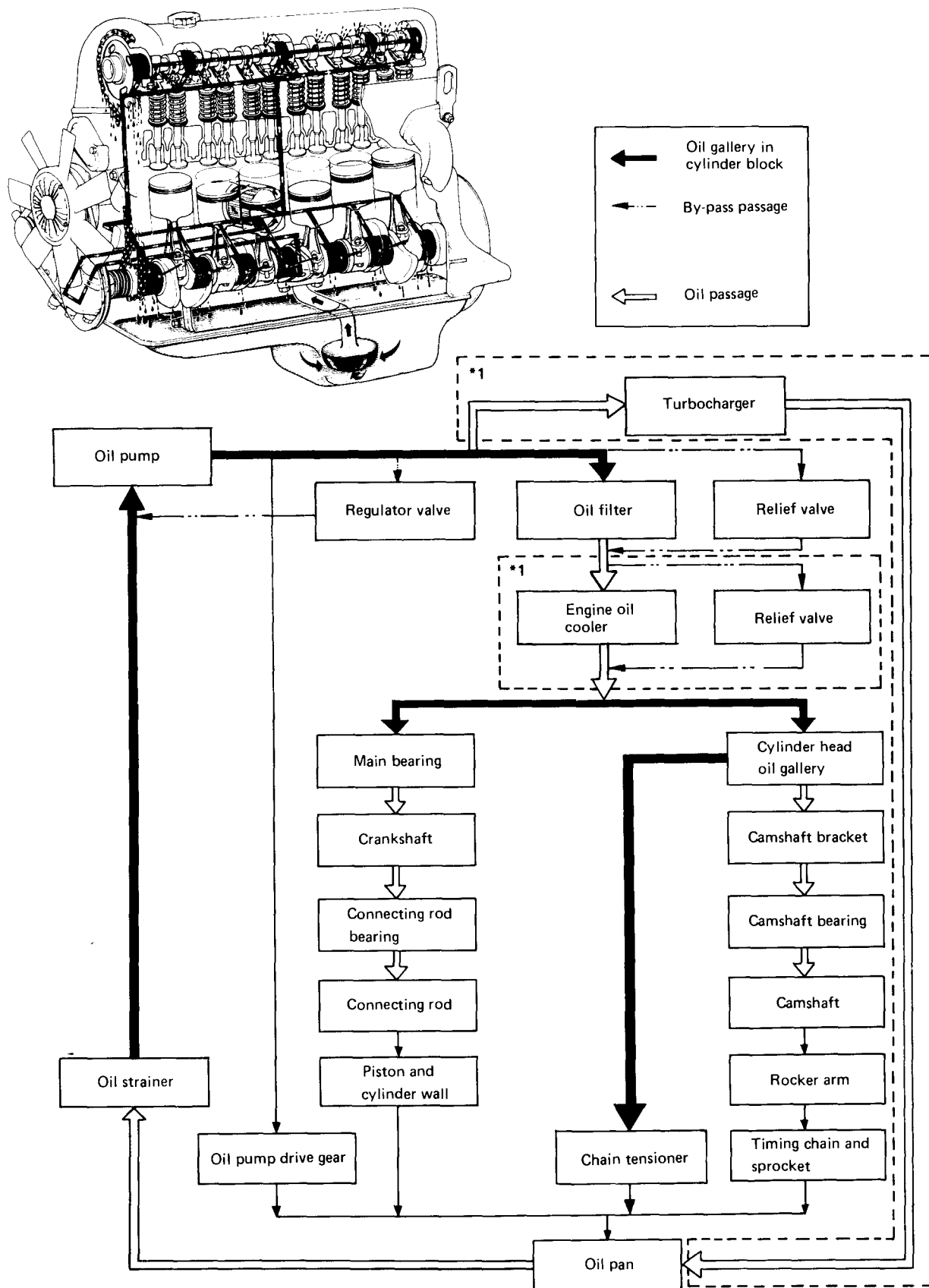
LC

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ENGINE LUBRICATION SYSTEM

LUBRICATION CIRCUIT



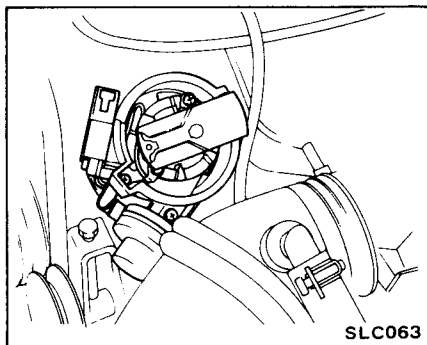
*1 Additional lubrication circuit for turbocharger model

OIL PUMP

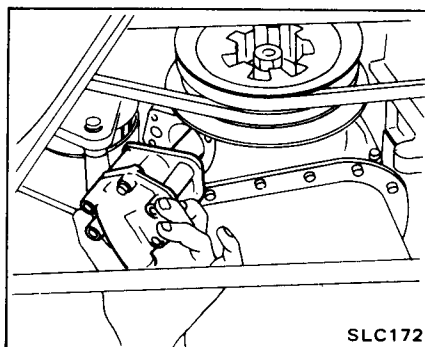
REMOVAL

1. Before removing oil pump, turn crankshaft so that No. 1 piston is at T.D.C.

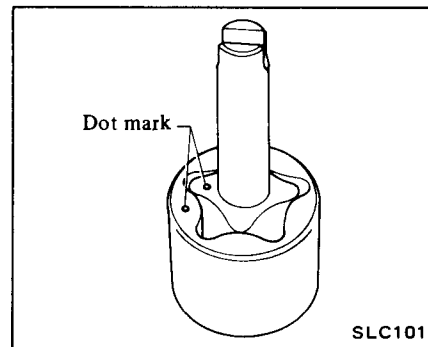
Under this condition, remove distributor cap and ascertain position of rotor head.



2. Remove under cover.
3. Remove oil pump and drive spindle as an assembly.



The dot on outer and inner rotor should face toward oil pump body.



INSPECTION

1. Using a feeler gauge, check the following clearance.

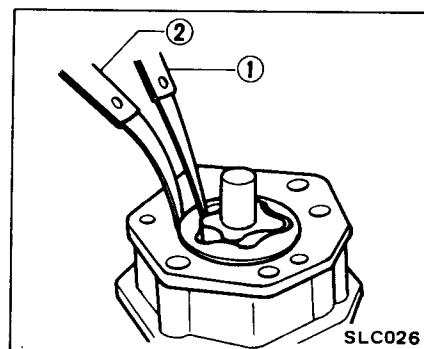
If it exceeds limit, replace rotor set or entire oil pump assembly.

Rotor tip clearance ①:

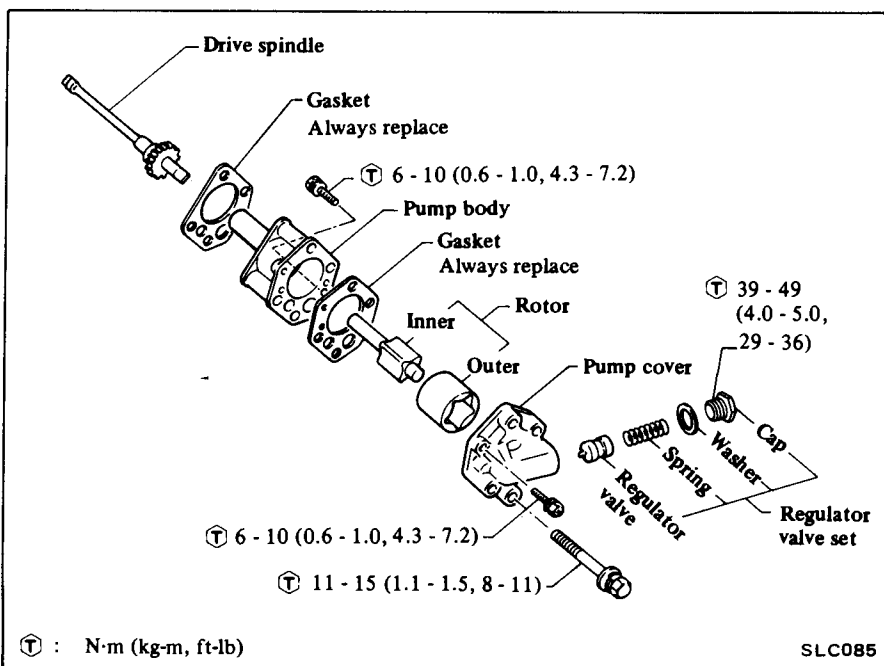
Less than 0.20 mm (0.0079 in)

Outer rotor to body clearance ②:

Less than 0.50 mm (0.0197 in)



DISASSEMBLY AND ASSEMBLY

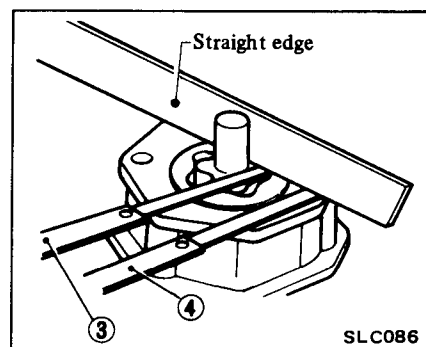


Rotor to straight edge ③:

Less than 0.06 mm (0.0024 in)

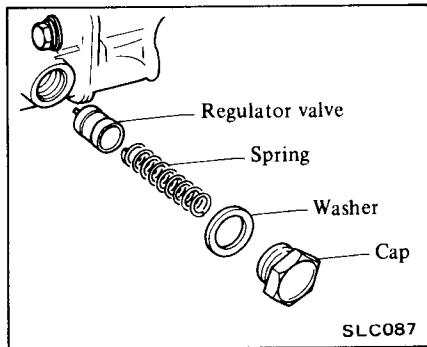
Oil pump body to straight edge ④:

Less than 0.03 mm (0.0012 in)



2. Check oil pressure regulator valve sliding surface and valve spring.

If damaged, replace valve set or pump assembly.



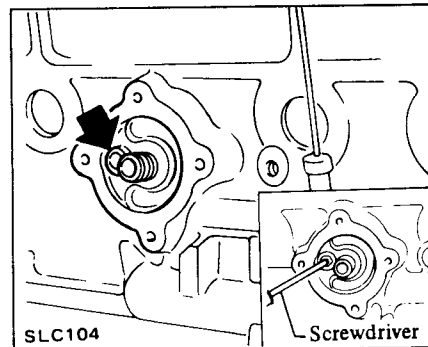
3. Using a new gasket, install oil pump and drive spindle assembly.

Make sure that tip of drive spindle assembly fits distributor fitting hole securely.

Ⓣ : Oil pump mounting bolts
11 - 15 N·m
(1.1 - 1.5 kg-m,
8 - 11 ft-lb)

4. Refill engine with oil.

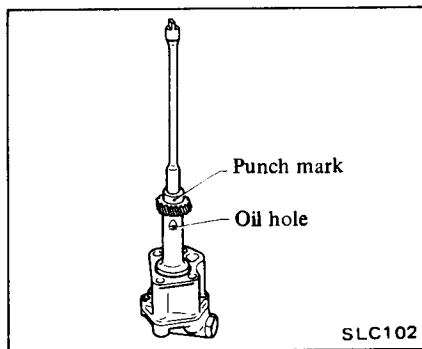
After installing, run engine for a few minutes, and check for leaks.



INSTALLATION

1. Make sure that distributor rotor is in the same position as it was before removal.

2. Fill pump housing with engine oil, then align punch mark of drive spindle with hole in oil pump.



OIL PRESSURE RELIEF VALVE

INSPECTION

When removing oil filter, check oil pressure relief valve for a cracked or broken valve.

If necessary, remove valve by prying it out with a screwdriver.

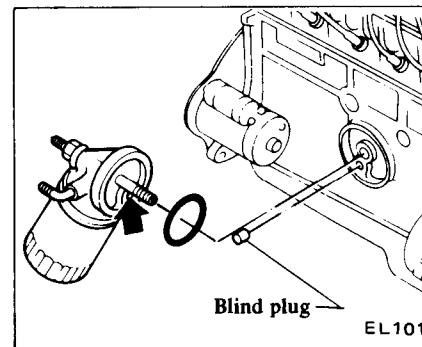
Install a new valve by tapping it in place.

Equipped with oil cooler
(With turbocharger)

1. Loosen oil filter stud and remove oil filter bracket.

2. Check oil pressure relief valve.

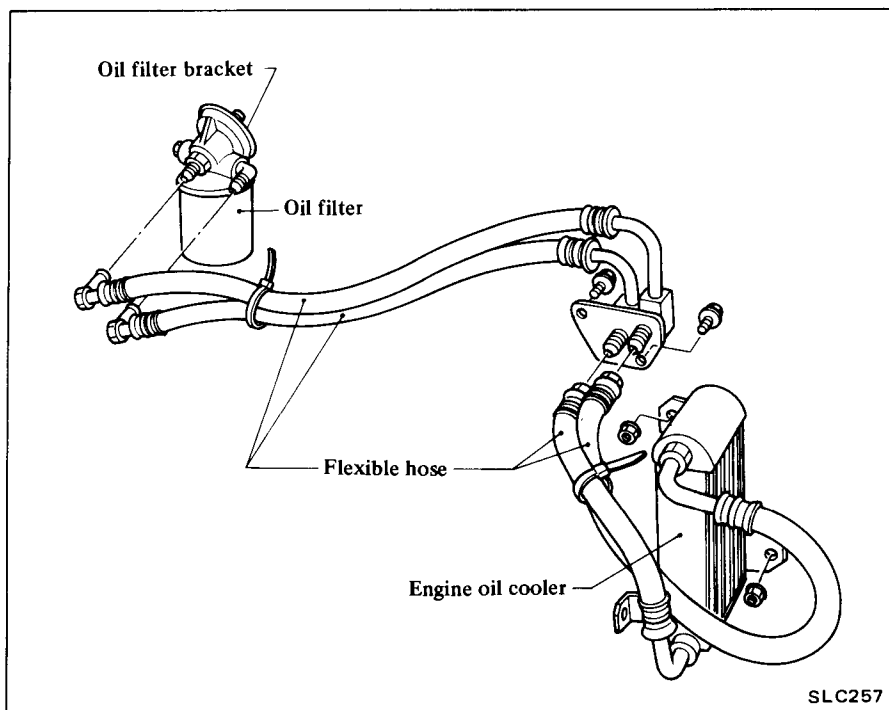
If necessary, replace it as an oil filter bracket assembly.



ENGINE OIL COOLER (For turbocharger)

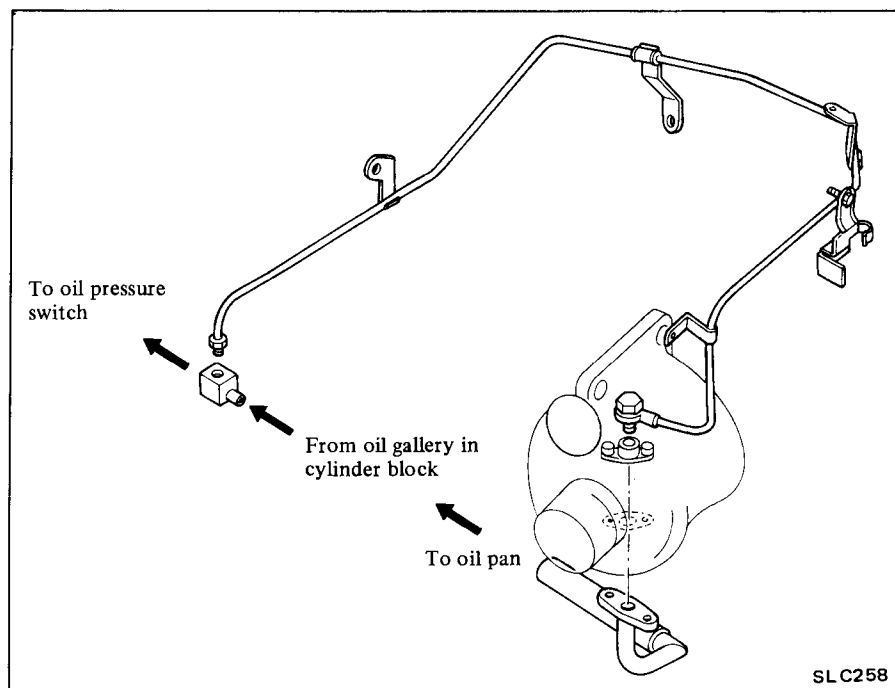
REMOVAL AND INSTALLATION

- When related parts of oil cooler are removed and installed, start engine after installing all parts and make sure that there are no oil leaks in oil passage.
- Check engine oil cooler relief valve in oil filter bracket. If necessary, replace it as an oil filter bracket assembly.



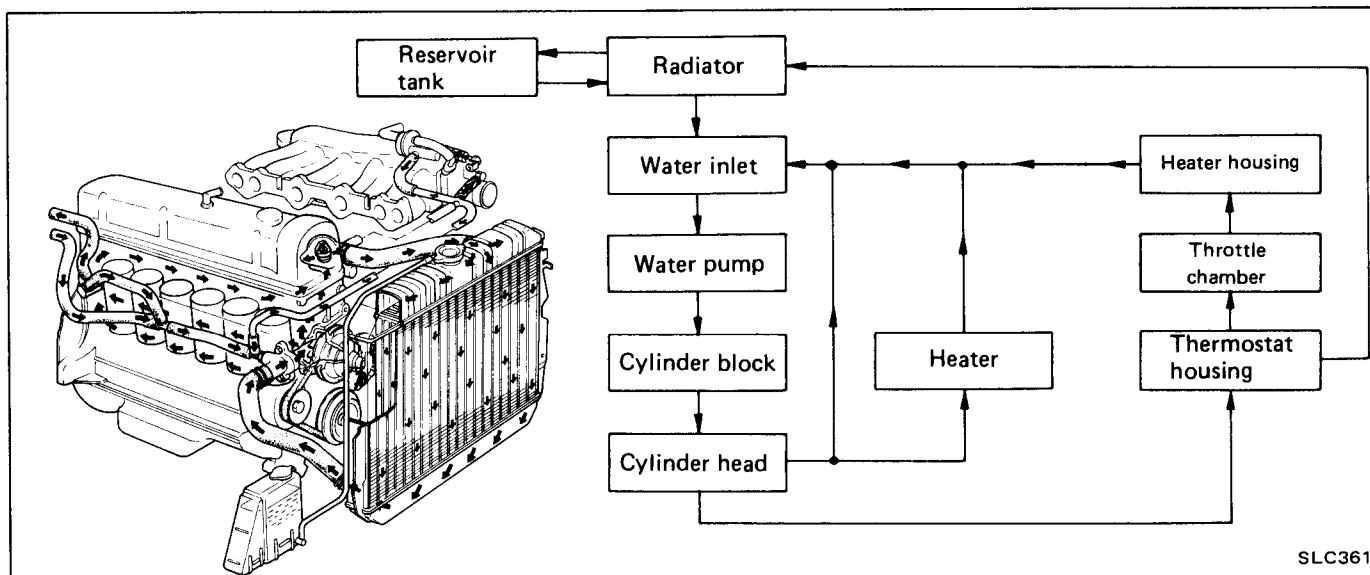
LUBRICATING OIL PASSAGE FOR TURBOCHARGER

- Before removing oil passage, remove auxiliary cooling fan. Refer to Section EF.
- When related parts of oil passage are removed and installed, start engine after installing all parts and make sure that there are no oil leaks in oil passage.

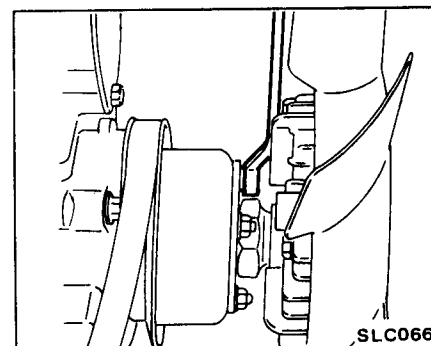
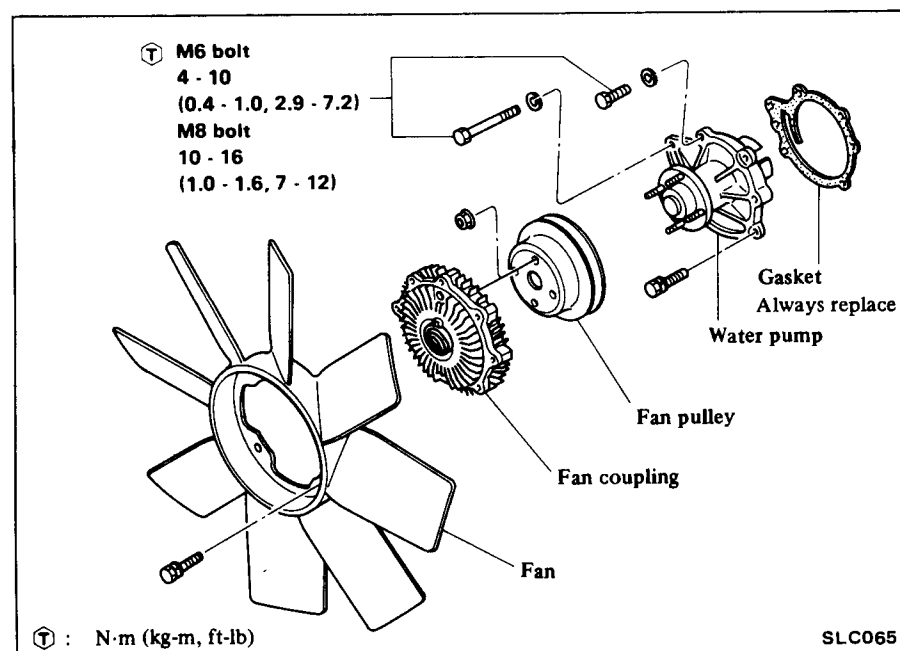


ENGINE COOLING SYSTEM

COOLING CIRCUIT



WATER PUMP



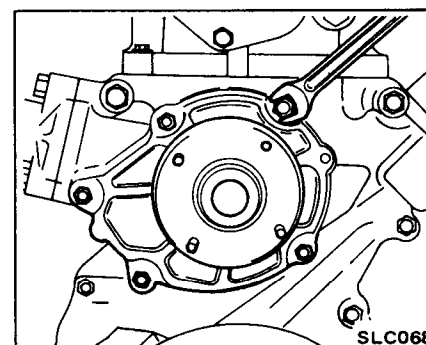
REMOVAL

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

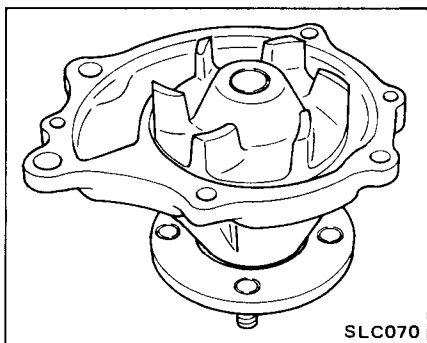
2. Remove radiator shroud.
3. Loosen fan pulley nuts.



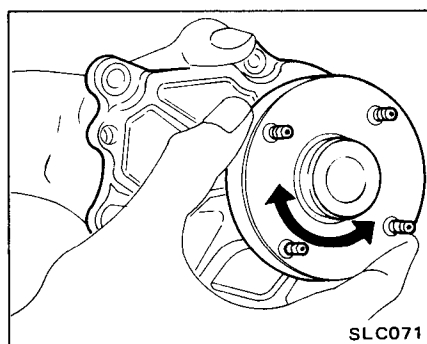
INSPECTION

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

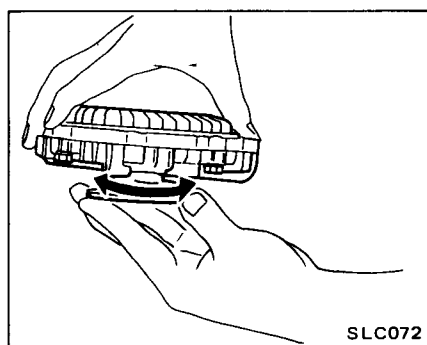
1. Inspect water pump body and vane for rust or corrosion.



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



3. Inspect fan coupling.
Check the coupling for oil leakage or bent bimetal.



INSTALLATION

1. Install water pump in the reverse order of removal.

Always use new gasket.

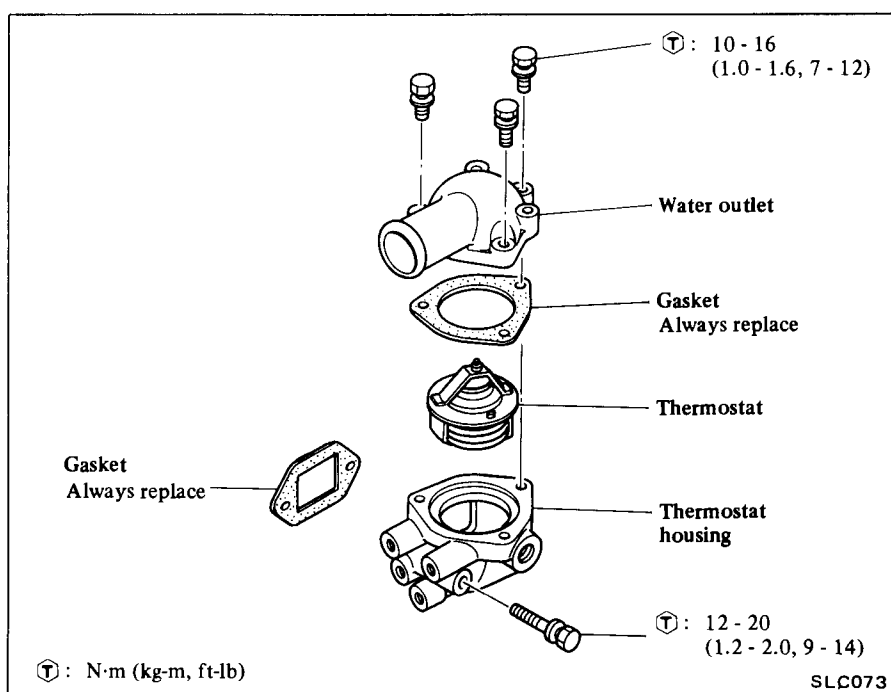
2. Adjust fan belt tension.

Refer to section MA.

3. Fill radiator with coolant.

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

THERMOSTAT



REMOVAL

1. Drain a small amount of coolant partially and disconnect radiator upper hose at water outlet.

WARNING:

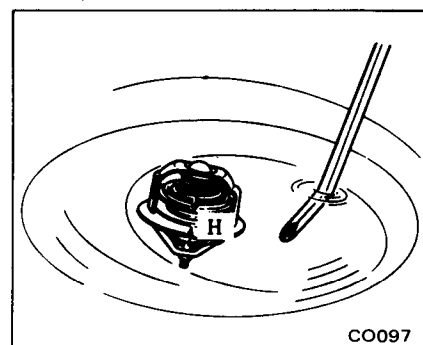
To avoid the danger of being scalded, never attempt to drain the coolant when the engine is hot.

2. Remove water outlet and then remove thermostat.

INSPECTION

Inspect thermostat for the following and replace if necessary.

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

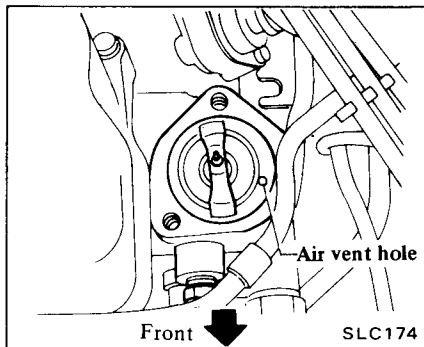


3. Then check if valve closes at 5°C (9°F) below valve opening temperature.

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

INSTALLATION

1. Position thermostat on thermostat housing with its air vent hole facing the left side of the engine.



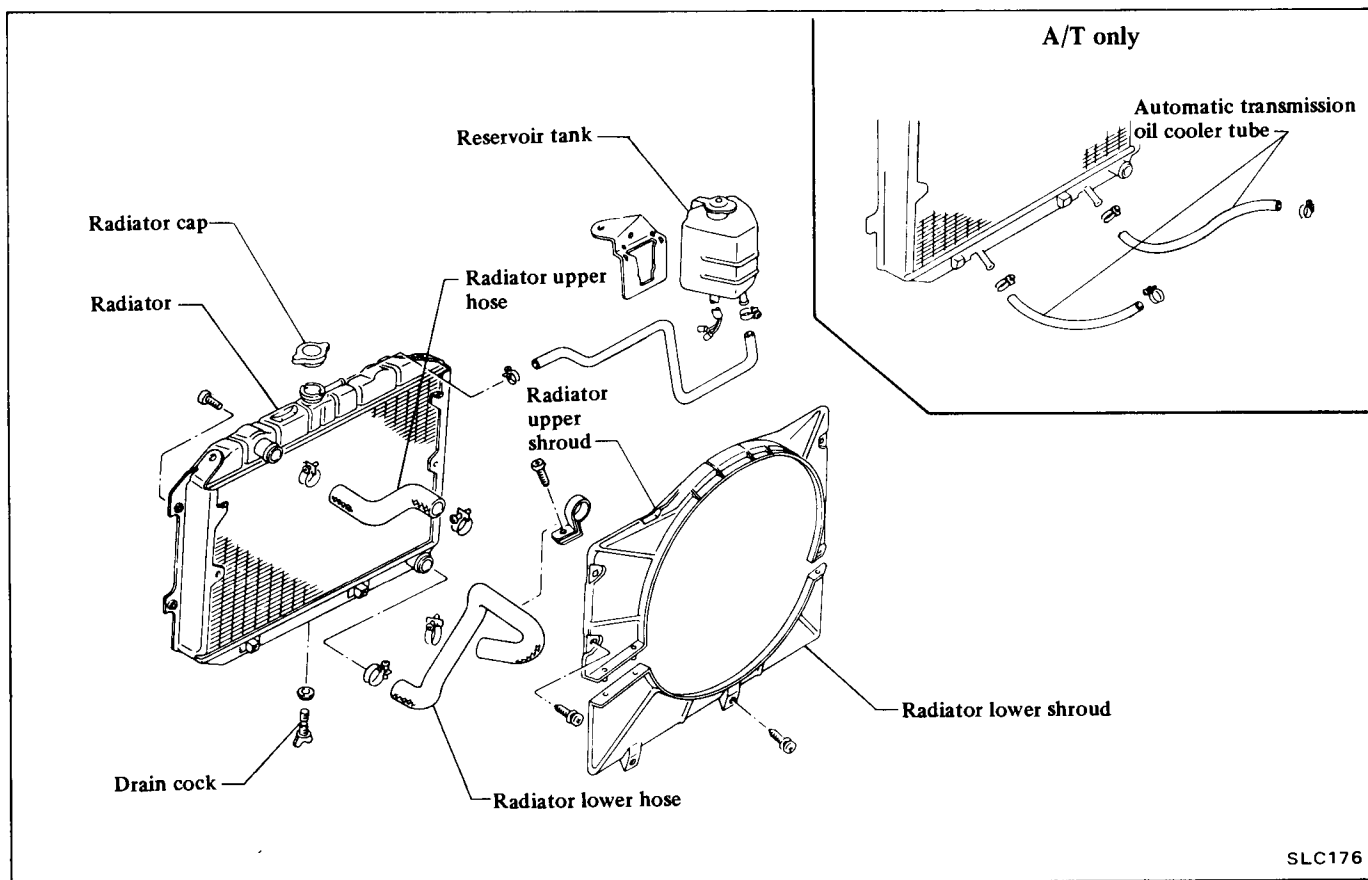
2. Install water outlet with new gasket.

Ⓣ : Attaching bolt
10 - 16 N·m
(1.0 - 1.6 kg·m,
7 - 12 ft·lb)

3. Connect radiator upper hose and fill radiator with coolant.

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

RADIATOR



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.

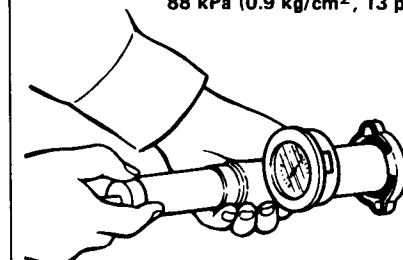
INSPECTION

Checking radiator cap

Using cap tester, check the radiator cap relief pressure.

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

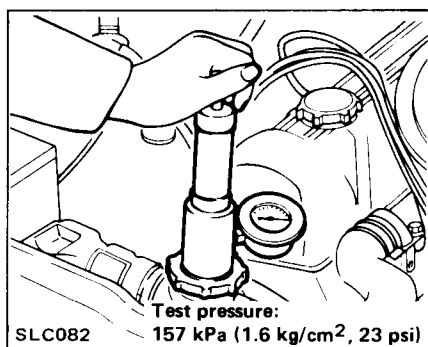
Cap relief pressure
88 kPa (0.9 kg/cm², 13 psi)



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.

REMOVAL AND INSTALLATION

1. Open radiator drain cock and allow to drain into a suitable container.

WARNING:

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

2. Remove undercover.

3. Remove radiator shroud attaching screws.

4. Disconnect radiator upper hoses at engine side, and disconnect reservoir tank hose.

5. Disconnect radiator lower hose on radiator side.

6. On a car with automatic transmission, disconnect cooler inlet and outlet lines from radiator.

7. Disconnect air cleaner duct hose.

8. Remove air conditioner pipe clip screw (with turbocharger).

9. Remove radiator attaching bolts.

10. Install radiator in the reverse order of removal.

11. Fill radiator with coolant to specified quantity.

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

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

ENGINE LUBRICATION SYSTEM

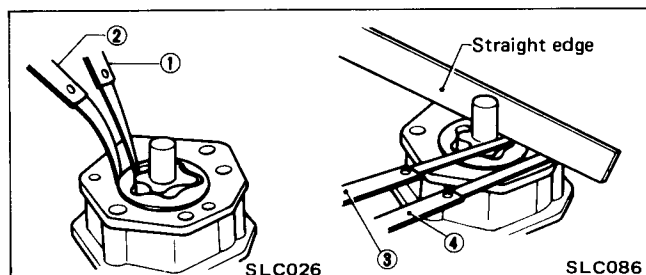
GENERAL SPECIFICATIONS

Lubrication method	Pressed feed flow
Oil pump type	Trochoid type
Oil filter type	Full flow and cartridge type

INSPECTION AND ADJUSTMENT

Oil pump

Unit: mm (in)



Rotor tip clearance ①	Less than 0.20 (0.0079)
Outer rotor to body clearance ②	Less than 0.50 (0.0197)
Rotor to straight edge ③	Less than 0.06 (0.0024)
Oil pump body to straight edge ④	Less than 0.03 (0.0012)

TIGHTENING TORQUE

Unit	N·m	kg·m	ft·lb
Oil pump mounting bolts	11 - 15	1.1 - 1.5	8 - 11
Oil pump cover bolt	7 - 10	0.7 - 1.0	5.1 - 7.2
Regulator valve cap	39 - 49	4.0 - 5.0	29 - 36
Oil pan drain plug	20 - 29	2.0 - 3.0	14 - 22

ENGINE COOLING SYSTEM

GENERAL SPECIFICATIONS

Cooling method	Water cooling, forced circulation
Water pump type	Centrifugal
Thermostat type	Wax-pellet
Radiator type	Corrugated fin and tube
Fan coupling Fan speed (at water pump speed 4,000 rpm)	2,450/65 - 70 (149 - 158) Less than 1,100/below 50 (122)
Without turbo-charger	
With turbo-charger	2,550 - 2,850/60 - 70 (140 - 158) Less than 1,100/below 50 (122)

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/cm ² , psi)	88 (0.9, 13)
Leakage test pressure	kPa (kg/cm ² , psi)	157 (1.6, 23)

TIGHTENING TORQUE

Unit	N·m	kg·m	ft·lb
Water pump bolt	M6	4 - 10	0.4 - 1.0
	M8	10 - 16	1.0 - 1.6
Water pump pulley stud	6 - 10	0.6 - 1.0	4.3 - 7.2
Water outlet bolt	10 - 16	1.0 - 1.6	7 - 12
Thermostat housing	12 - 20	1.2 - 2.0	9 - 14

TROUBLE DIAGNOSES AND CORRECTIONS

LUBRICATION SYSTEM

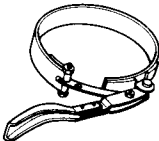
Condition	Probable cause	Corrective action
Oil leakage	Damaged or cracked pump body cover. Oil leakage from gasket and oil seal. Oil leakage from regulator valve. Oil leakage from blind plug. Oil leakage from oil cooler.	Replace. Replace. Tighten or replace. Replace. Tighten or repair.
Decreased oil pressure	Lack of oil in engine oil pan. Dirty oil strainer. Damaged or worn pump rotors. Malfunctioning regulator. Use of poor quality engine oil.	Replenish or add. Clean or replace. Replace. Replace. Replace.
Warning light remains "on" when engine running	Decreased oil pressure. Oil pressure switch unserviceable. Electrical fault.	Previously mentioned. Replace. Check circuit.
Noise	Excessive backlash in pump rotors.	Replace.

COOLING SYSTEM

Condition	Probable cause	Corrective action
Water leakage	Damaged radiator seams. Leaks from heater connections or plugs. Leak from water pump shaft seal. Leak from water temperature gauge. Leaks from gaskets or small cracks. Loose joints. Damaged cylinder head gasket. Cracked cylinder block. Cracked cylinder head. Loose cylinder head bolts.	Repair. Repair. Replace as pump assembly. Tighten. Tighten or use Nissan Cooling System Sealer or equivalent. Tighten. Replace. Check engine oil for contamination and refill as necessary. Replace. Check engine oil in crankcase for mixing with water by pulling oil level gauge. Replace. Tighten.

Condition	Probable cause	Corrective action
Poor circulation	Restriction in system. Insufficient coolant. Inoperative water pump. Loose fan belt. Inoperative thermostat.	Check hoses for crimps, and clear the system of rust and sludge by flushing radiator. Replenish. Replace. Adjust. Replace.
Corrosion	Excessive impurity in water. Infrequent flushing and draining of system.	Use soft, clean water. (rain water is satisfactory). Cooling system should be drained and flushed thoroughly at least twice a year. Permanent antifreeze (Ethylene glycol base) can be used throughout the seasons of a year.
Overheating	Malfunctioning thermostat, radiator cap and fan coupling. Radiator fin choked with mud, chaff, etc. Incorrect ignition and valve timing. Dirty oil and sludge in engine. Inoperative water pump. Loose fan belt. Restricted radiator. Inaccurate temperature gauge. Impurity in water.	Replace. Clean out air passage thoroughly by using air pressure from engine side of radiator. Adjust. Refill. Replace. Adjust. Flush radiator. Replace. Use soft, clean water.
Overcooling	Malfunctioning thermostat. Inaccurate temperature gauge.	Replace. Replace.
Noise	Squeak at water pump mechanical seal. Damaged or worn water pump bearing.	Replace pump assembly. Replace pump assembly.

SPECIAL SERVICE TOOL

Tool number (Kent-Moore No.)	Tool name
ST19320000 (J25664)	Oil filter wrench 

SLC036

ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

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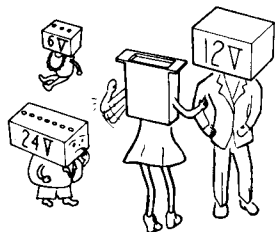
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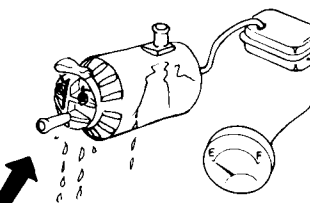
PRECAUTIONS FOR AN E.F.I. AND THE E.C.C.S. ENGINE

Pay close attention to the following points when inspecting or servicing an E.F.I. or E.C.C.S. vehicle.

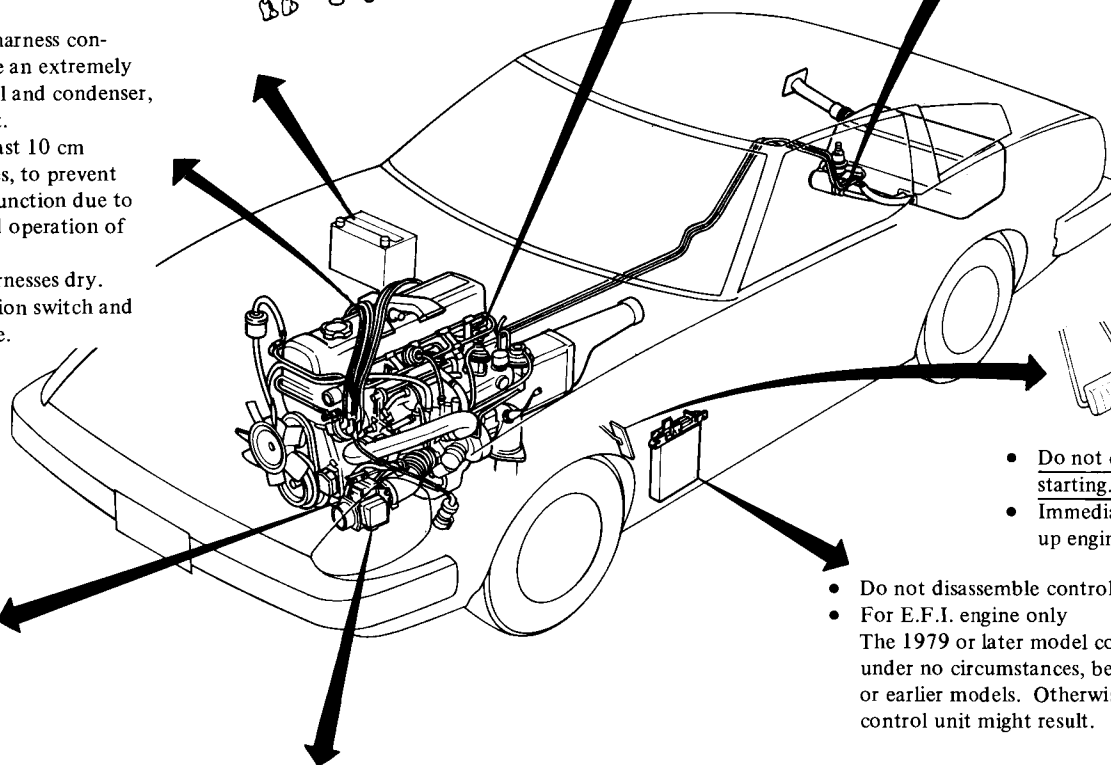
- Always use 12-volt batteries as power source.
- Do not attempt to disconnect battery cables while engine is operating.
- If a receiver-transmitter is installed, route antenna feeder cable along opposite side from E.F.I. or E.C.C.S. harness and control unit. Make sure that there is no interference while engine is idling.



- Do not apply battery power directly to injectors.



- Securely connect E.F.I. or E.C.C.S. harness connector. A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to IC circuit.
- Keep E.F.I. or E.C.C.S. harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an E.F.I. or an E.C.C.S. system malfunction due to reception of external noise, degraded operation of IC circuit, etc.
- Keep E.F.I. or E.C.C.S. parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.



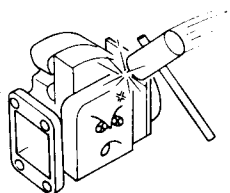
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.



- Do not disassemble V.C.M. (For E.C.C.S. engine only.)

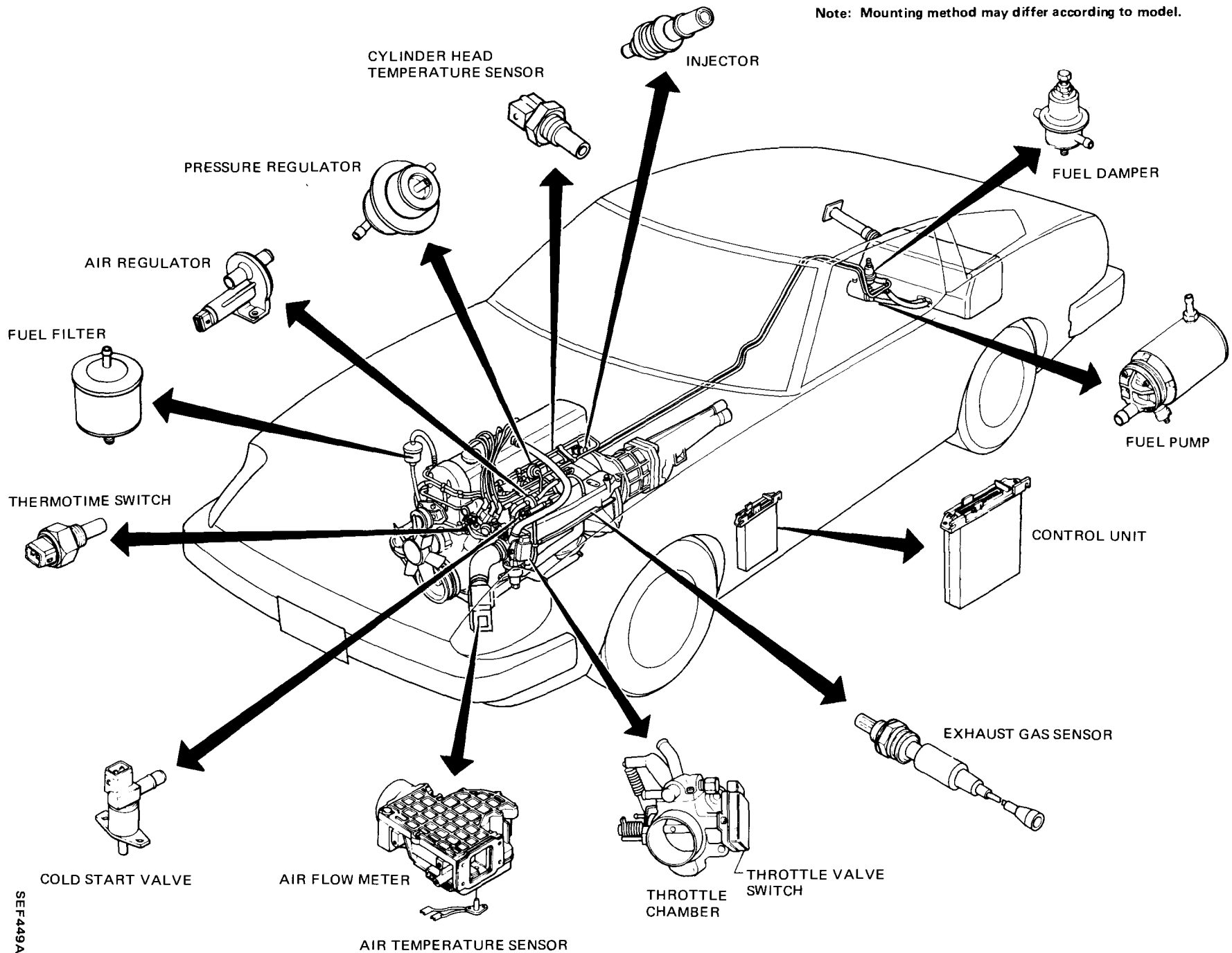
- Do not disassemble control unit.
- For E.F.I. engine only
The 1979 or later model control unit should, under no circumstances, be installed on 1978 or earlier models. Otherwise damage to the control unit might result.

- Handle air flow meter carefully to avoid damage.
- There should not occur even a slight leak in air intake system.

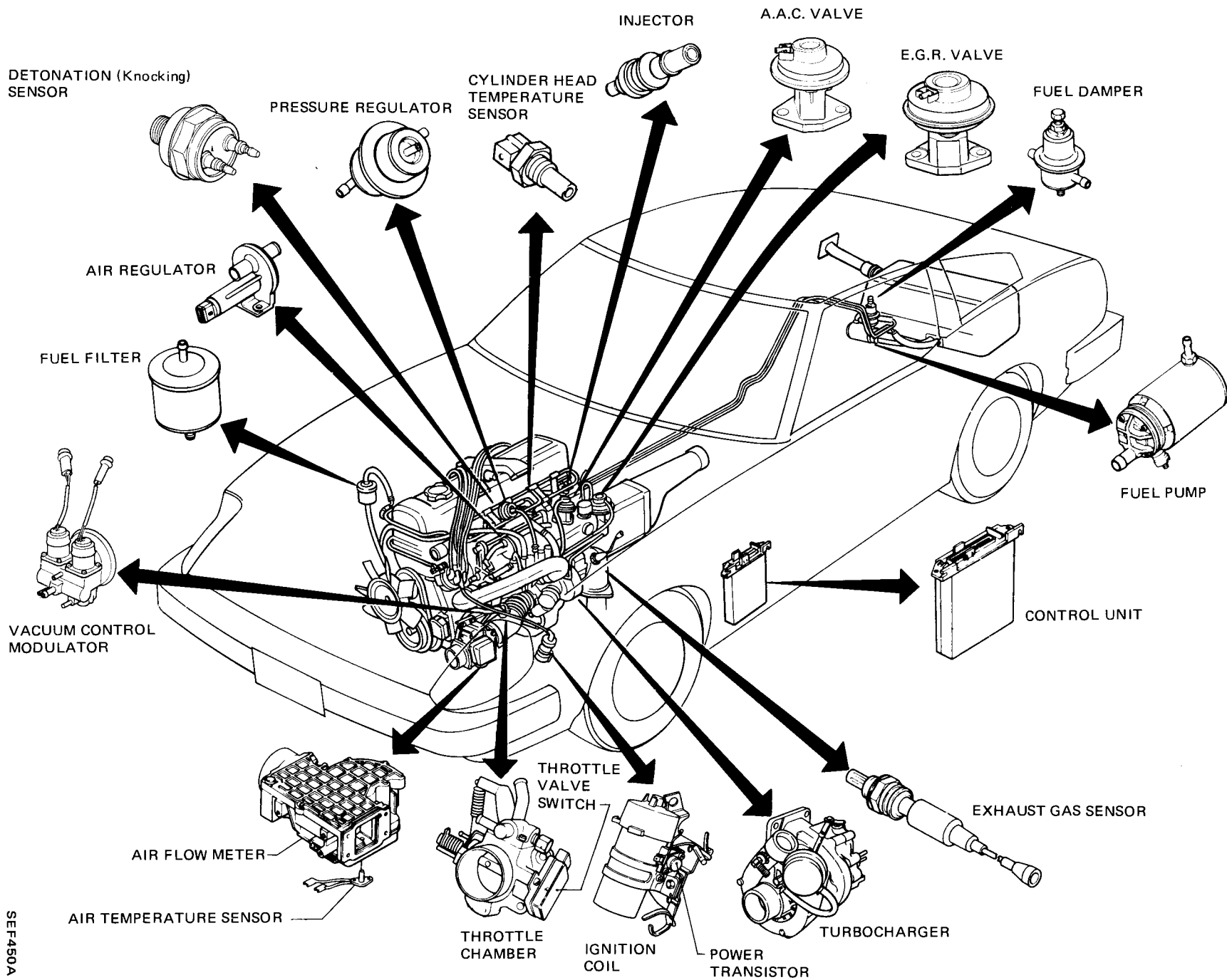


COMPONENT PARTS LOCATION FOR E.F.I. ENGINE

Note: Mounting method may differ according to model.



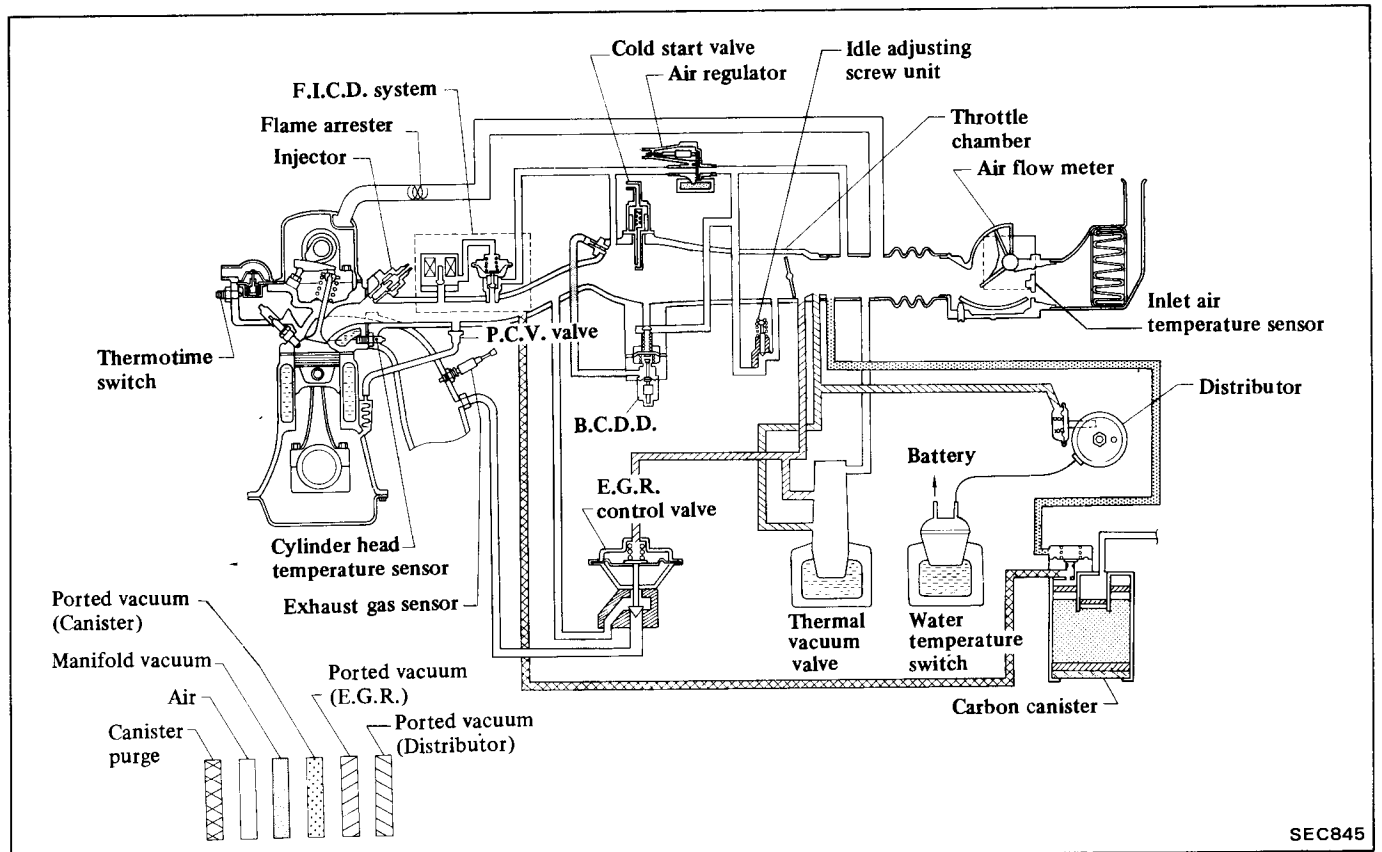
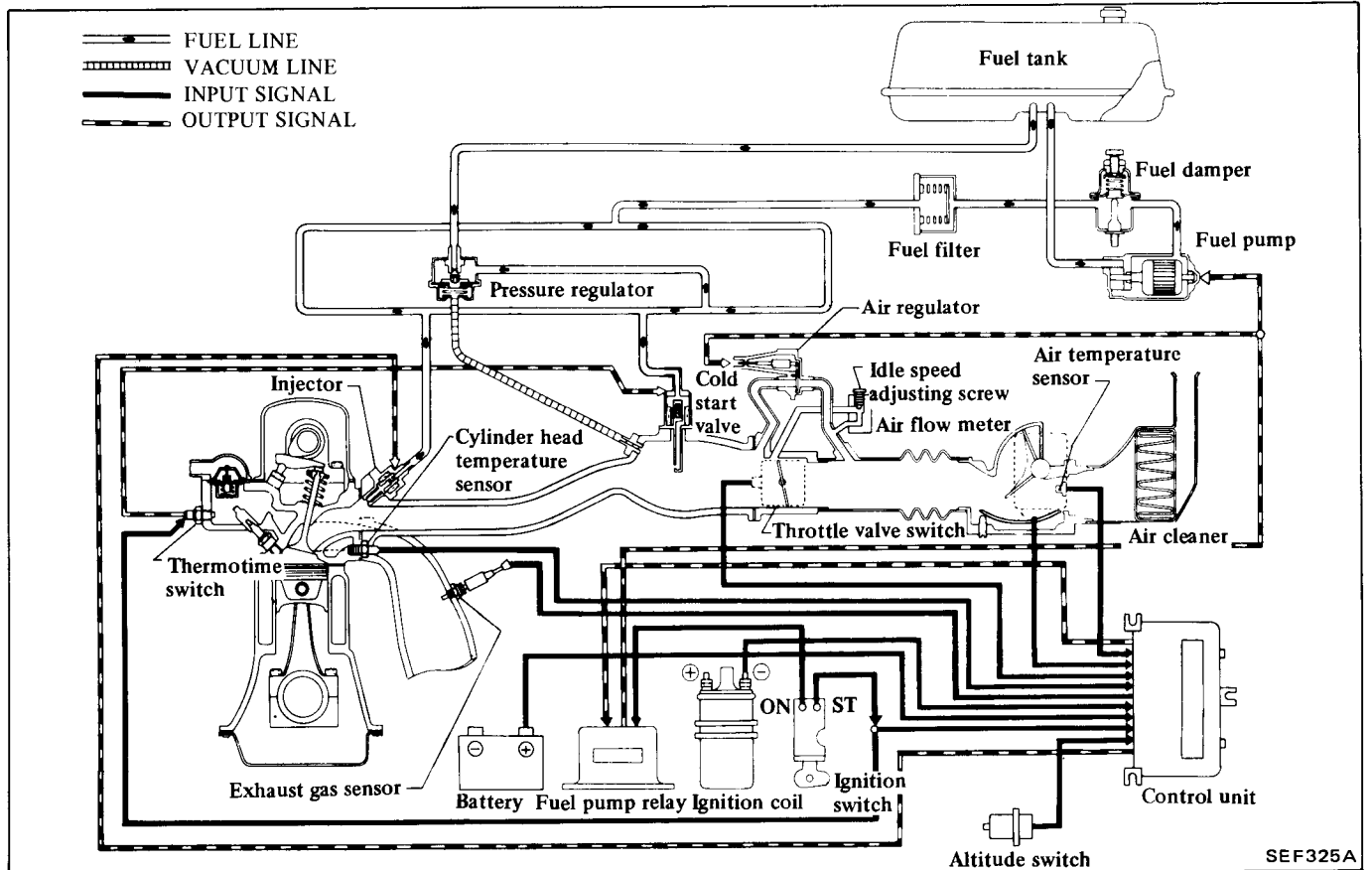
COMPONENT PARTS LOCATION FOR E.C.C.S. ENGINE



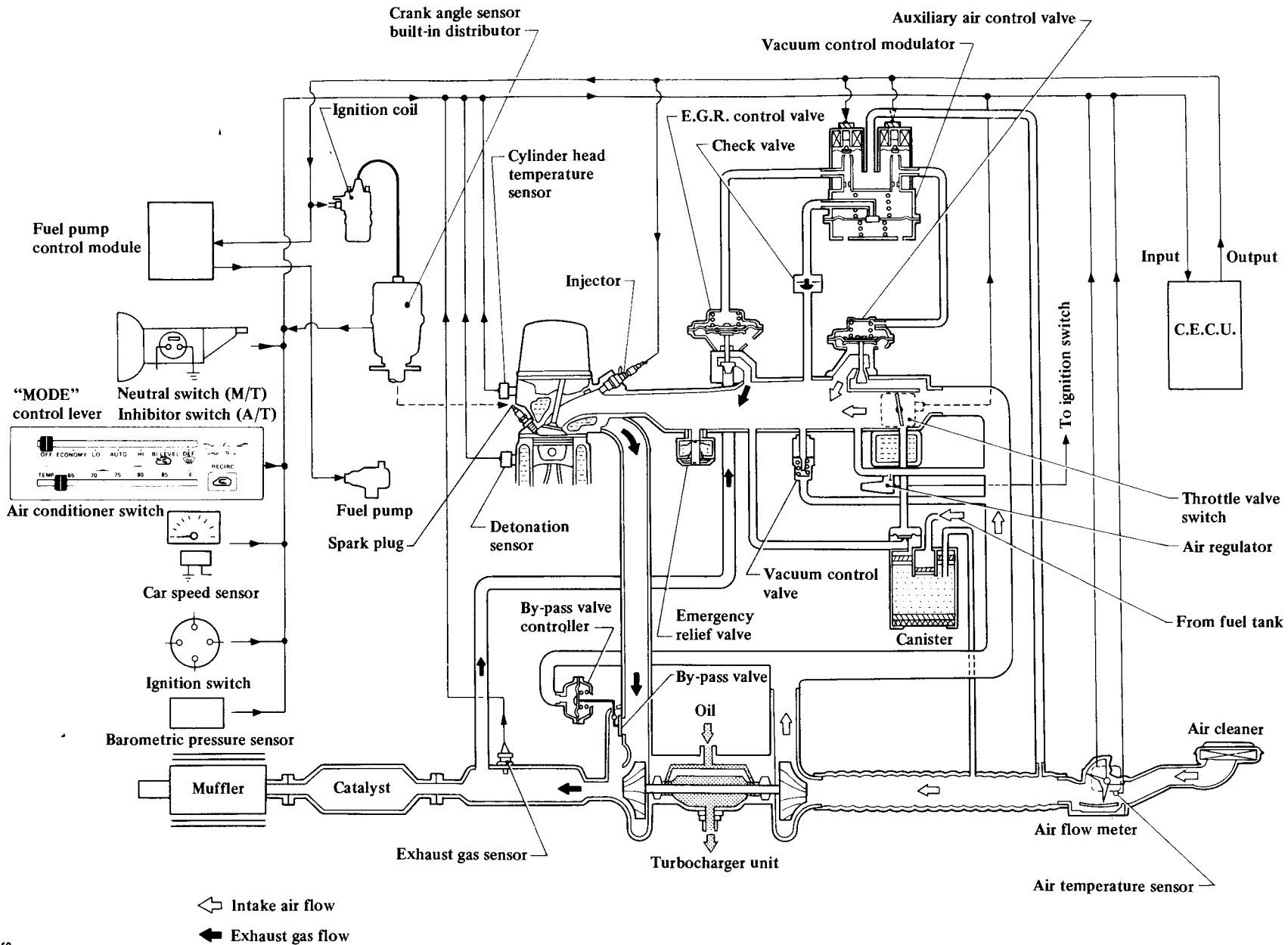
SEF450A

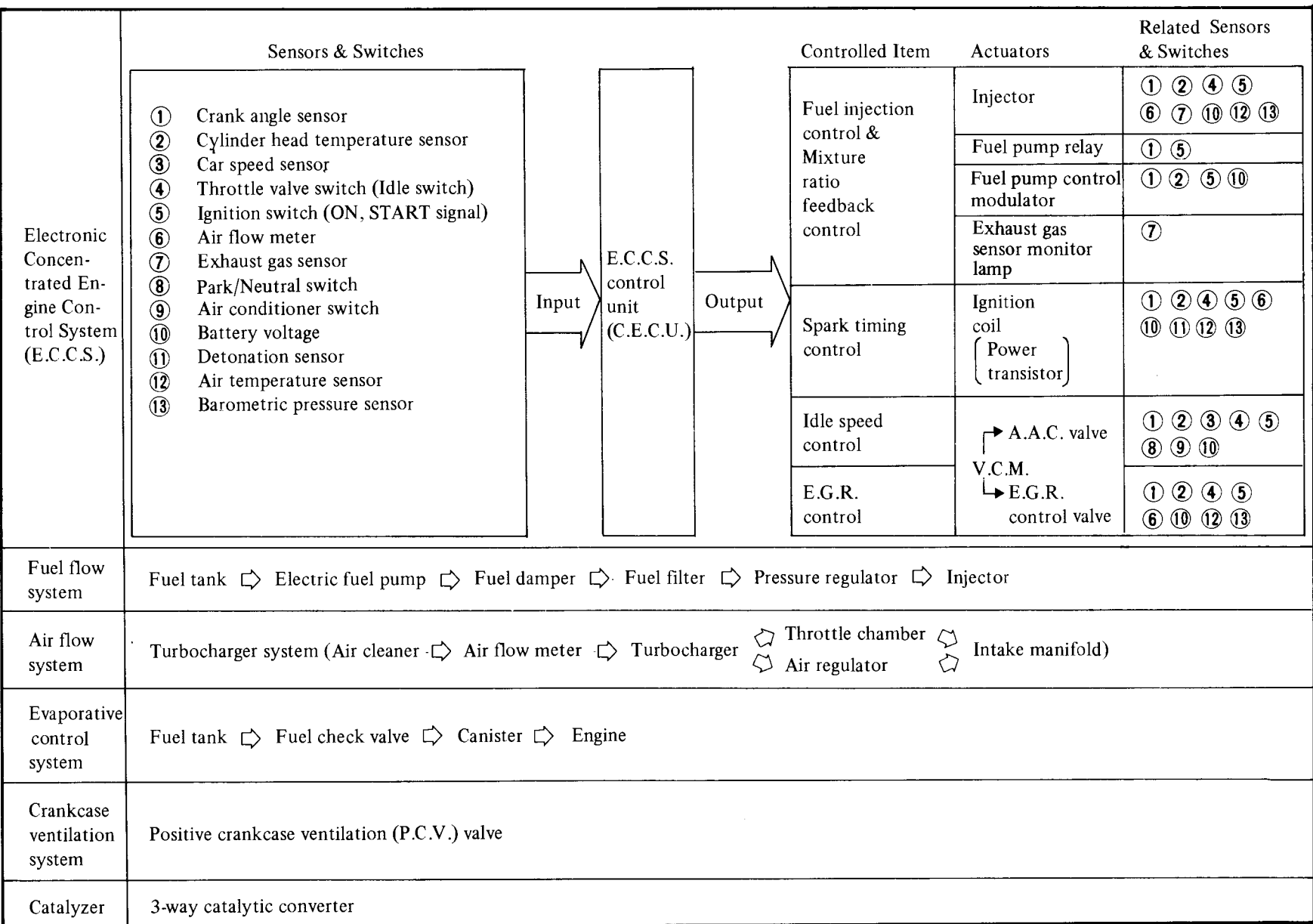
EF & EC-5

ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM FOR E.F.I. ENGINE



ENGINE AND EMISSION CONTROL SYSTEM DIAGRAM FOR E.C.C.S. ENGINE



ENGINE AND EMISSION CONTROL SYSTEM CHART
FOR E.C.C.S. ENGINE

DIAGNOSTIC PROCEDURE FOR PROBLEMS

DIAGNOSIS

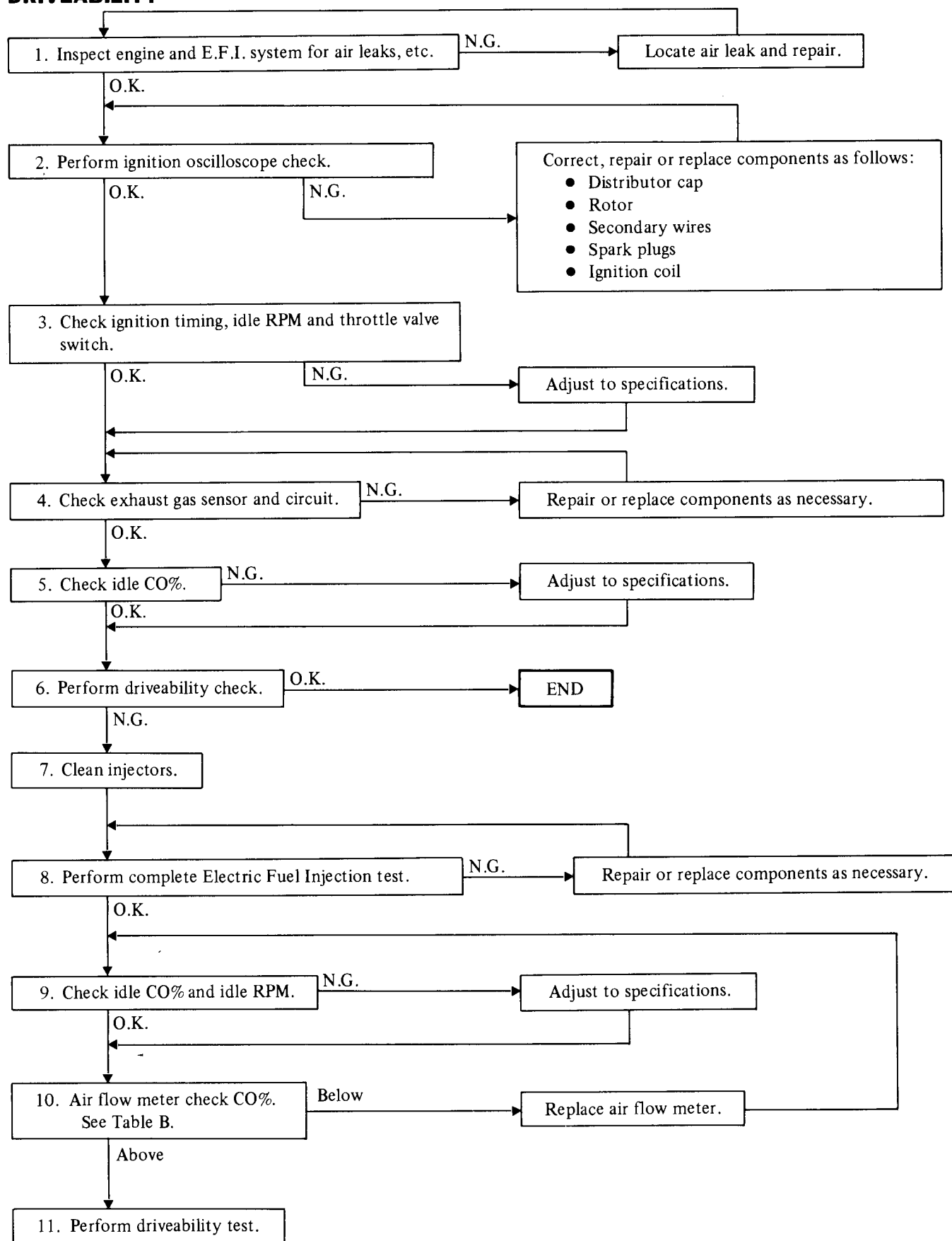
INTERMITTENT PROBLEM

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 replace-

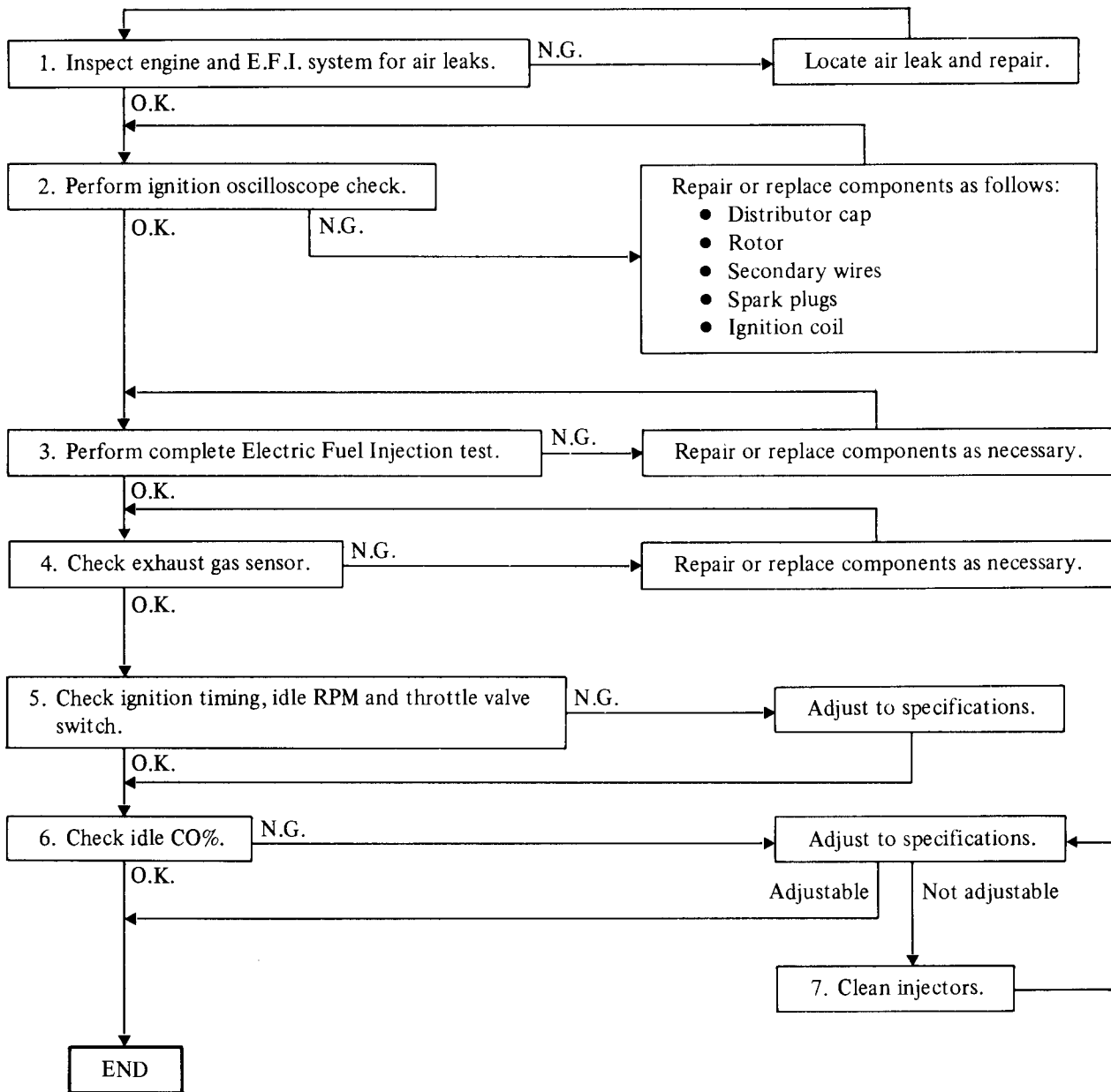
ment will be indicated and the problems may remain. Therefore, DIAGNOSIS OF INTERMITTENT PROBLEMS SHOULD START WITH A VISUAL AND PHYSICAL INSPECTION OF THE CONNECTORS involved in the circuit, especially control unit, air flow meter, cylinder head temperature sensor and exhaust gas sensor connectors.

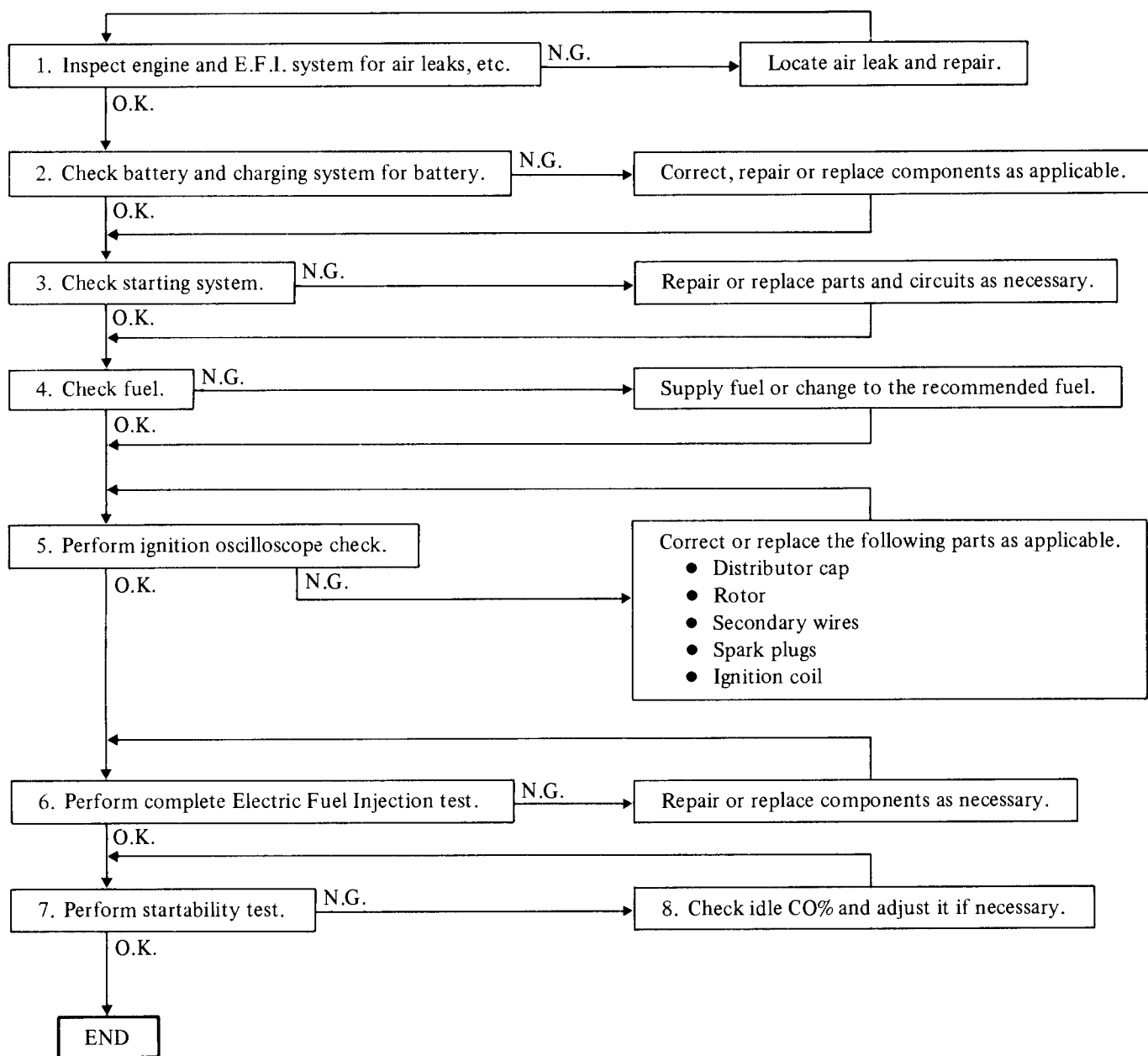
CAUTION:

When connecting or disconnecting E.F.I. or E.C.C.S. harness connector to or from any E.F.I. or E.C.C.S. 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.

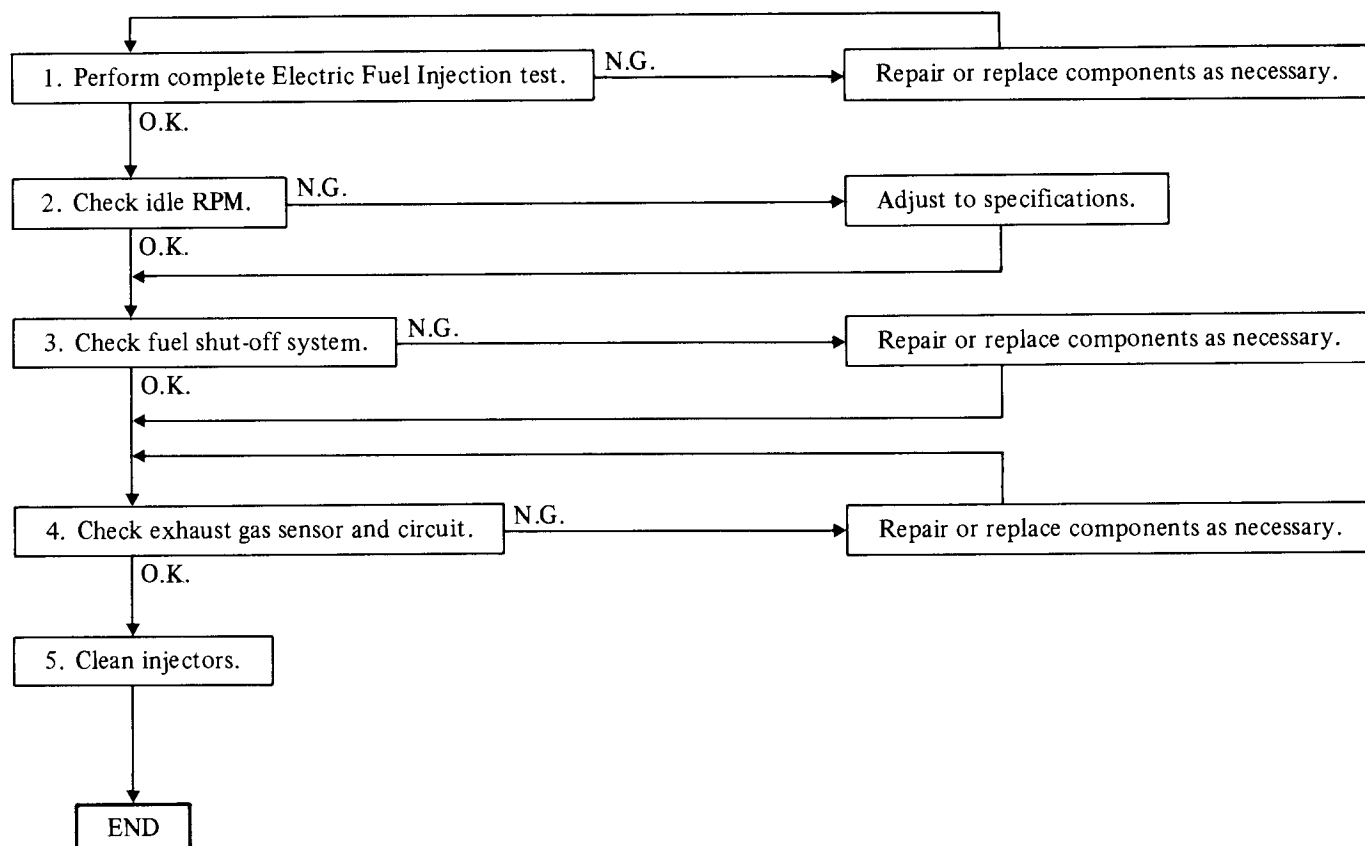
DIAGNOSTIC PROCEDURE FOR E.F.I. ENGINE**DRIVEABILITY**

IMPROPER IDLING



ENGINE STARTABILITY

ENGINE STALL



DIAGNOSTIC STEPS FOR DRIVEABILITY

1. Inspect engine and E.F.I. 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
- Intake manifold gasket
- Valve rocker cover
- E.G.R. valve gasket
- Oil filler cap
- Air intake hoses and duct

(5) Check E.G.R. valve seat and operation.

(6) Check air regulator operation.

2. 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.

3. Check ignition timing, idle rpm and throttle valve switch.

(1) Checking and adjusting ignition timing.

Checks and adjustments are made with the air conditioning compressor "OFF".

a) Verify that the engine is still at operating temperature.

b) Rev the engine to 4,000 rpm two or three times under no-load, then allow it to run at idle speed for one minute.

c) Check idle speed

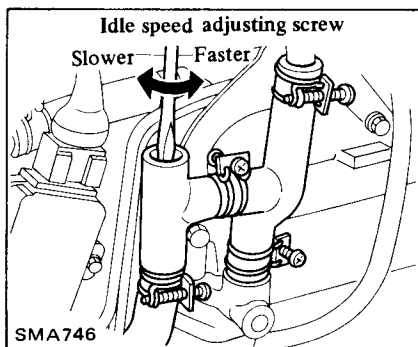
M/T:

700±100 rpm

A/T:

700±100 (in "D" position)

If necessary, adjust to the specified rpm by turning the idle speed adjusting screw.



d) Disconnect distributor vacuum hose from distributor vacuum controller, and plug hose with proper plug. Then, check ignition timing with a timing light.

8°±2° B.T.D.C.

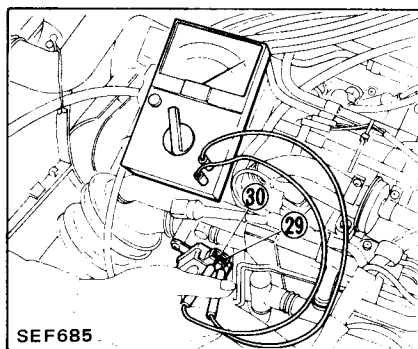
Adjust as necessary.

(2) Check throttle valve switch adjustment.

a) Disconnect the throttle valve switch harness connector from the throttle switch body.

b) Connect an ohmmeter between terminals 29 and 30, make sure continuity exists.

c) Increase engine speed. The ohmmeter should show continuity until 900 rpm ±20 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 900 rpm by manually opening the throttle.

Important: Do not use the idle speed screw.

2) Loosen the throttle switch mounting screws and turn the switch body until the ohmmeter shows a closed circuit.

3) Slowly rotate the switch counter-clockwise until the ohmmeter indicates an open circuit; at that exact point, tighten the mounting screws.

4) Recheck the adjustment.

5) Reset idle speed if necessary.

4. Check exhaust gas sensor. (Refer to page 42).

(1) Verify that the engine is still at operating temperature.

(2) Run engine at about 2,000 rpm for about 2 minutes under no-load.

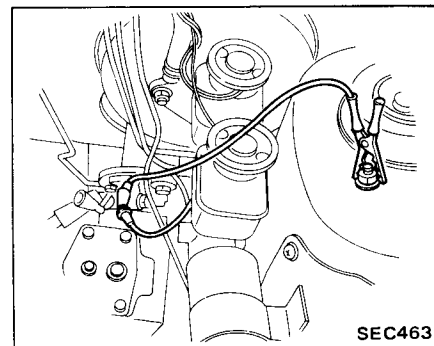
(3) Make sure that inspection lamp on control unit goes on and off more than 5 times during 10 seconds. If not, perform the following test.

(4) Check exhaust gas sensor harness.

a) Turn off engine and disconnect battery ground cable.

b) Disconnect E.F.I. 35-pin connector from control unit.

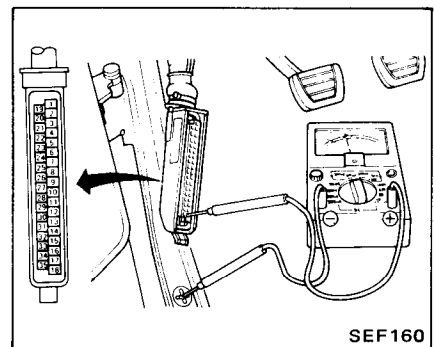
c) Disconnect exhaust gas sensor harness connector and connect terminal for exhaust gas sensor to ground with a jumper wire.



d) Check for continuity between terminal NO. 31 of E.F.I. 35-pin connector and ground metal on car body.

Continuity exists O.K.

Continuity does not exist . . . N.G.



If N.G., correct or replace E.F.I. harness.

(5) Check E.F.I. control unit.
Start engine and check inspection

lamp on control unit for the following conditions.

Harness connector of exhaust gas sensor	Inspection lamp
① Disconnected	Does not glow
② Grounded	Glow

SEC464

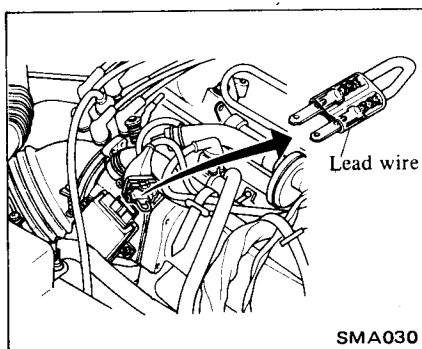
SEC463

If O.K., replace exhaust gas sensor.
If N.G., replace control unit.

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) Verify that the engine is at operating temperature.
- (2) With the hood open, run the engine at 2,000 rpm for 2 minutes at no-load, to stabilize its condition.
- (3) Turn the ignition switch to the "OFF" position.
- (4) Disconnect the throttle valve switch harness connector.
- (5) Connect a lead wire, as shown between terminals No. 24 and No. 30 of the throttle valve harness connector.



- (6) Disconnect exhaust gas sensor harness connector.
- (7) Rev. the engine to 4,000 rpm 2 or 3 times under no-load, finally, allow it to run at idle speed for one minute.
- (8) Reset idle speed to the specified speed.
- (9) Check CO% at the applicable altitude as per Table A, Column 1 and

if necessary, adjust to the specified point at the applicable altitude as per Table A, Column 2. The CO% adjustment is made by turning the air bypass screw on the air-flow meter. (Refer to EC section.)

On models equipped with altitude switch, disconnect altitude switch connector before checking idle CO%.

Table A

Altitude m (ft)	Check idle CO% (full enrichment) Column 1	Adjust idle CO% (full enrichment) Column 2	Check idle CO% (W/O full enrichment) Column 3
0 - 600 (0 - 2,000)	0.2 - 5.0	1.0	2.7 or lower
600 - 1,200 (2,000 - 4,000)	1.5 - 6.4	2.4	4.1 or lower
1,200 - 1,800 (4,000 - 6,000)	2.5 - 7.3	3.5	0.2 - 5.0
Above 1,800 (6,000)	3.5 - 8.3	4.7	1.2 - 6.0

- (10) Stop engine, remove the lead wire and reconnect the throttle valve switch harness to the throttle valve switch.

- (11) Check the idle speed. Readjust to the specified speed.
- (12) Recheck to verify that CO% is still within specifications (See Table A, Column 3).

After rechecking CO%, reconnect exhaust gas sensor harness connector.

6. Perform driveability test.
 - (1) Evaluate effectiveness of adjustments by driving vehicle.
 - (2) If unsatisfactory, proceed to step 7.
7. Clean injectors.
8. Perform complete Electronic Fuel Injection Test.
 - (1) Use the Kent-Moore J-25400 E.F.I. Analyzer and J-25400-36 Adapter.
 - (2) Follow procedure in the Datsun Electronic Fuel Injection Manual, beginning on page 101.
 - (3) Repair system as necessary.
9. Check idle CO% and idle rpm.
 - (1) Follow the procedure from step 4, operations (1) through (9).
 - (2) Proceed to step 10.
10. Air flow meter check – confirm engine temperature – warm up if necessary.
 - (1) Check idle CO% and idle rpm. Follow procedure in step 5.
 - (2) Raise engine speed to 2,000 rpm under no-load and check CO% as per Table B.

Table B

Altitude m (ft)	Minimum CO%
0 - 600 (0 - 2,000)	0.8
600 - 1,200 (2,000 - 4,000)	2.3
1,200 - 1,800 (4,000 - 6,000)	3.4
Above 1,800 (6,000)	4.4

- (3) If CO% is above the specified point, go to operation.
- (4) If CO% is below the specified point, replace the air flow meter and adjust idle CO% and rpm per step 5.

- (5) Stop engine, remove the lead wire and reconnect the throttle valve switch harness to the throttle valve switch.
- (6) Recheck the idle speed, adjust to the specified speed.
- (7) Recheck to verify that CO% is still within specifications (see Table A, Column 3).

After rechecking CO%, reconnect exhaust gas sensor harness connector.

11. Perform driveability test.
 - Re-evaluate vehicle performance.

DIAGNOSTIC STEPS FOR IMPROPER IDLING

1. Inspect engine and E.F.I. system for leaks.
2. Perform ignition oscilloscope test.
3. Perform complete Electric Fuel Injection Test.
4. Check exhaust gas sensor.
5. Check ignition timing, idle rpm and throttle valve switch.
6. Check idle CO%.
7. Clean injectors.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY on the inspection procedure of each item.

ENGINE STARTABILITY

1. Inspect engine and E.F.I. 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.

- (1) Check fuel level.

If low or empty, add fuel.

- (2) Check fuel octane rating.

If not proper, change to the recommended gasoline.

5. Perform ignition oscilloscope test.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

6. Perform complete Electric Fuel Injection test.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

7. Perform startability test.

- (1) Start engine with the recommended starting procedure.

- (2) If engine does not start, proceed to step 8.

8. Check and adjust idle CO%.

Check idle CO%. Follow the procedure from step 5, operations (1) through (9) in DIAGNOSTIC STEP FOR DRIVEABILITY.

ENGINE STALL

1. Perform complete Electric Fuel Injection test.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

2. Check idle rpm.

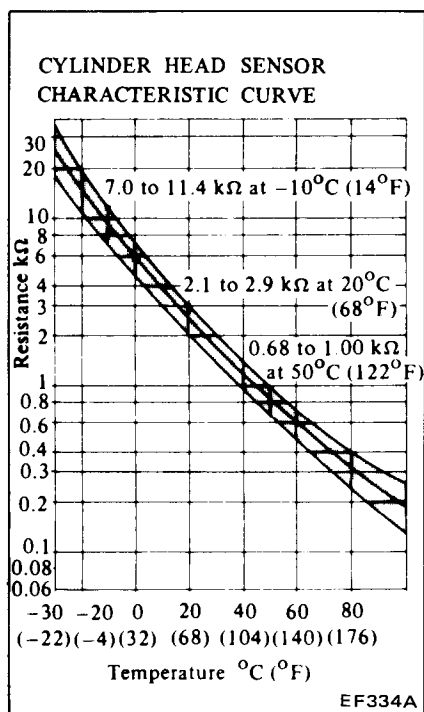
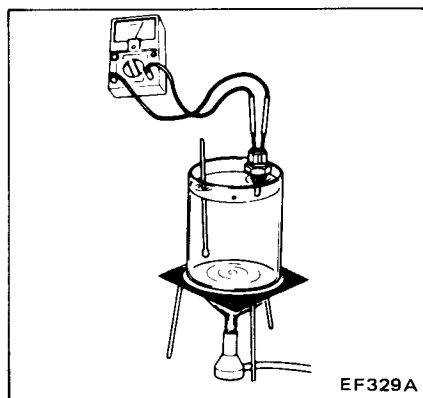
Check idle rpm. Follow the procedure from step 3-(1), operations a) through c) in DIAGNOSTIC STEP FOR DRIVEABILITY.

3. Check fuel shut-off system.

- (1) Check engine speed signal (ignition coil-trigger input transmitted to E.C.U. from ignition coil.

(2) Check cylinder head temperature sensor.

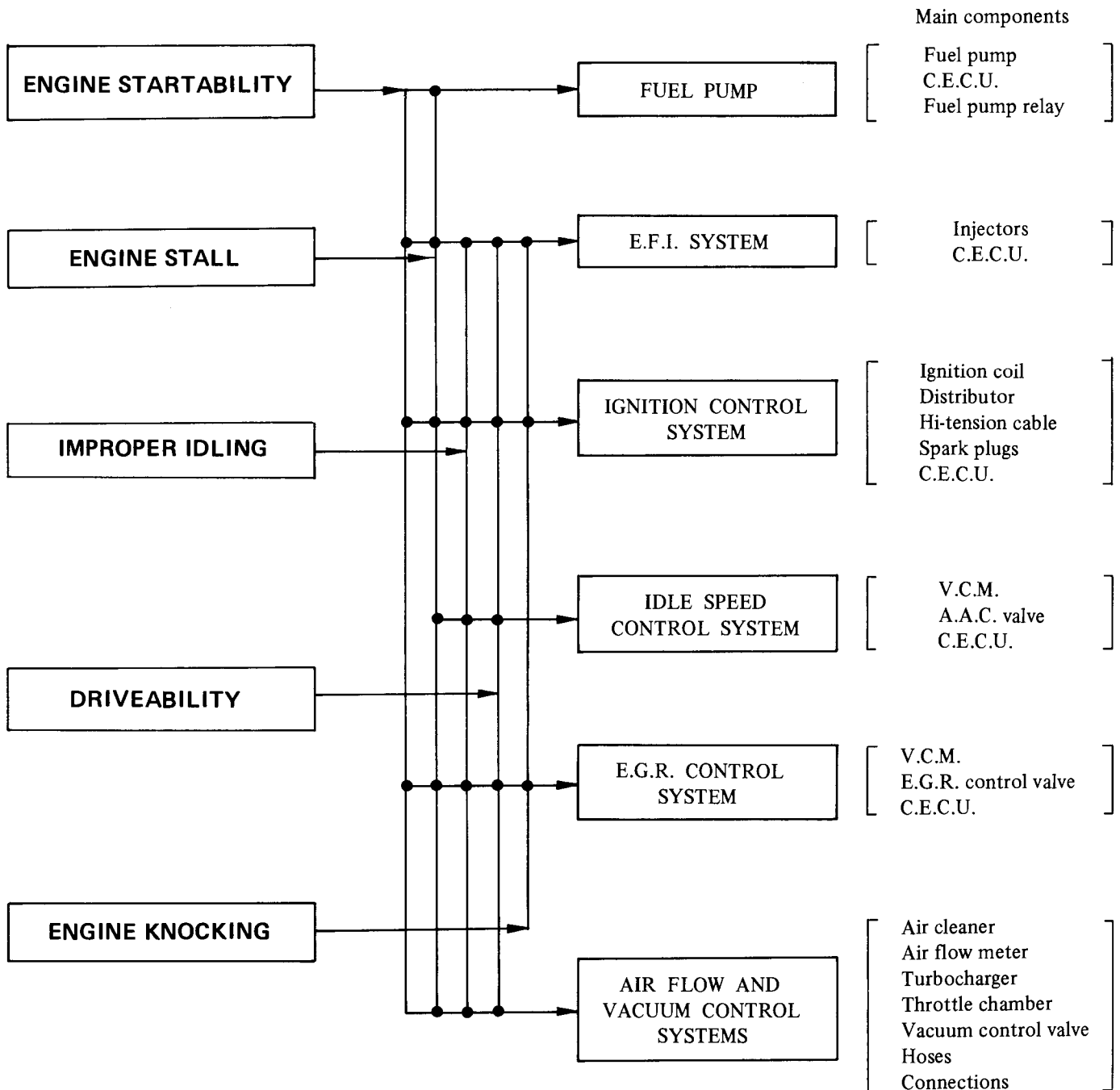
- Check circuits and system with the Kent-Moore J-25400 E.F.I. Analyzer and J-25400-36 Adapters. (Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.)
- Check component as follows:



4. Check exhaust gas sensor and circuit.

Refer to DIAGNOSTIC STEPS FOR DRIVEABILITY.

5. Clean injectors.

TROUBLE-SHOOTING CHART FOR E.C.C.S. ENGINE

Use the above chart to easily determine in what portion the malfunction is taking place, what is malfunctioning, what to check and how to cope with the problems.

Then, use E.C.C.S. analyzer when checking each component and other parts of E.C.C.S. using the above chart.

E.C.C.S. ANALYZER INSPECTION

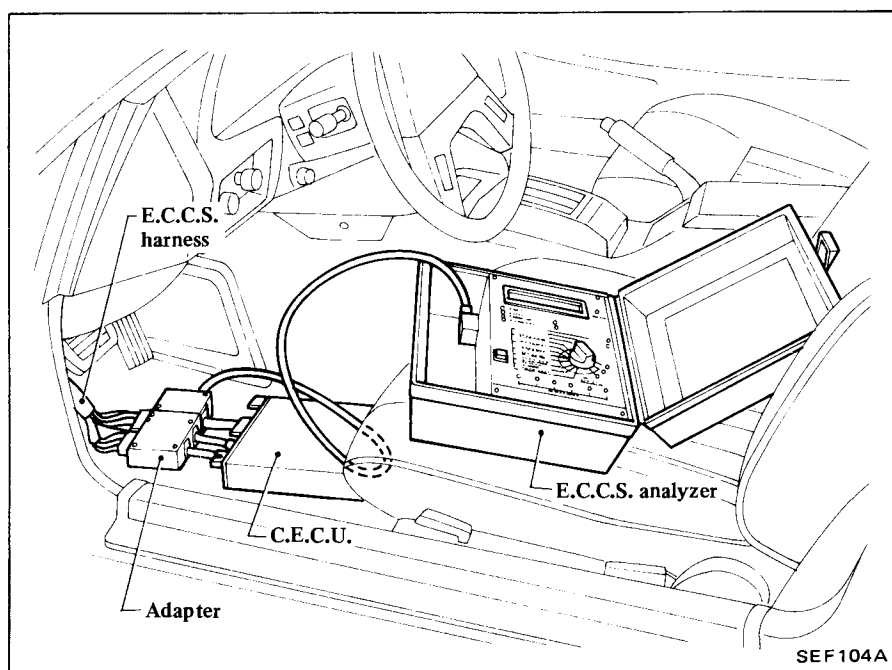
Electronic Concentrated engine Control System (E.C.C.S.) controls the engine operating conditions (Fuel injection, Idle rpm, Ignition timing, E.G.R., etc.) with the Central Electronic Control Unit (C.E.C.U.), Sensors, Switches and so forth.

Therefore, when engine malfunctions occur, the causes cannot be found by a visual inspection, etc. Then, use an E.C.C.S. analyzer to diagnose of the problem.

E.C.C.S. ANALYZER (J-28835)

The E.C.C.S. analyzer monitors

several input and output signals that are emitted in response to various engine operating conditions and when the engine stops. Input signals are compared to computerized signal values stored in the C.E.C.U. (Central Electronic Control Unit) while output signals are monitored to ensure they are properly attuned before they are emitted from the C.E.C.U. unit to actuators. In other words, this analyzer analyzes all electrical signals that are transmitted to and emitted from the C.E.C.U. unit. For this reason, if system or unit abnormalities which are not related to these signals are discovered, reference to the "Trouble-shooting" chart must be made for remedial action.



Operation

1. Make sure ignition switch is "OFF".
2. Remove C.E.C.U. unit and connect both adapter and analyzer.

CAUTION:

Make sure parking brake has been applied and selector lever is in "Neutral" (M/T) or in "P" or "N" (A/T).

3. Turn ignition switch "ON", and check the following:

(1) Switches

- Idle switch (Throttle valve switch)
Check idle switch while depressing and releasing accelerator pedal repeatedly.
- Neutral switch (Transmission switch)
Check neutral switch while repeatedly shifting selector lever to "Neutral" or "N" (or: "P") from other positions.

- Air conditioner switch
Check air conditioner switch by turning/moving it on and off repeatedly.

- Starter switch
Turn ignition switch to "START". In these cases, make sure each monitor lamp illuminates.

(2) Actuators and sensors

Use rotary switch to check.

During the following checks, turn rotary switch to the next position after the previous check.

- IGN. (Ignition system)
Depress CHECK button and make sure monitor lamp illuminates.

After checking ignition system, be sure to return ignition switch from "ON" to "ACC" or "OFF".

- Fuel pump
Before checking, return ignition switch to "ON".
Depress CHECK button and make sure monitor lamp turns on and off alternately. Also check fuel pump relay's operating sound when monitor lamp illuminates.

Fuel pump always operates for five seconds after ignition switch has been turned to "ON".

- E.G.R.
Depress CHECK button and make sure monitor lamp brightens and dims alternately. At this point, make sure V.C.M. solenoid valve is functioning properly.
- Idle speed control
Follow same procedure used for E.G.R. checks above.
- Battery and air flow meter
Depress CHECK button and make sure O.K. monitor lamp illuminates.

(3) Turn rotary switch to “E.G.R.” position. Start engine, warm it up sufficiently, and then check the following:

When turning rotary switch for the following checks, accelerator pedal may be depressed slightly to avoid engine stall.

- **E.G.R.**
Slightly depress accelerator pedal before CHECK button is depressed. Monitor lamp should brighten and dim alternately and engine speed should vary.
- **Idle speed control**
Follow same procedure used for E.G.R. checks above.
- **Battery**
Depress CHECK button and make sure O.K. monitor lamp illuminates.
- **Air flow meter**
Depress CHECK button, then gradually increase engine speed. In this case, O.K. monitor lamp should illuminate and then go out. Also make sure that O.K. monitor lamp illuminates and goes out as engine speed decreases.
- **Air temperature, altitude and cylinder head temperature sensors**

Depress CHECK button and make sure O.K. monitor lamp illuminates.

- **Knocking sensor**
Depress CHECK button and then depress accelerator pedal forcibly so engine knocks. In this case, O.K. monitor lamp should illuminate. If engine does not knock, repeat above procedure until it does.

CAUTION:

Be sure parking brake has been applied firmly before conducting above tests.

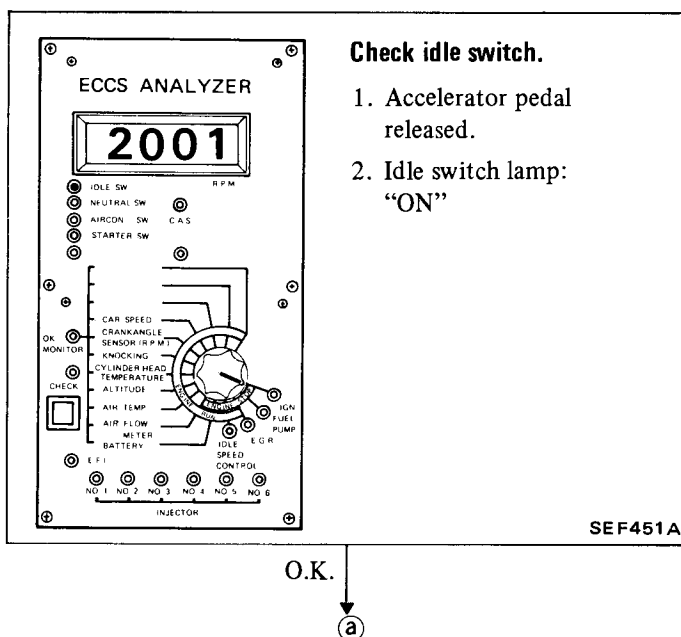
- **Crank angle sensor**
Depress CHECK button, and gradually increase engine speed. When engine speed reaches approximately 1,800 rpm, O.K. monitor lamp will illuminate; when engine speed reaches approximately 2,200 rpm, O.K. monitor lamp will extinguish. O.K. monitor lamp will remain off while engine speed exceeds approximately 2,200 rpm. Decreasing engine speed will cause O.K. monitor lamp to activate completely differently from the above sequence.
- **Car speed sensor**
Conduct this test by one of the

following two methods:

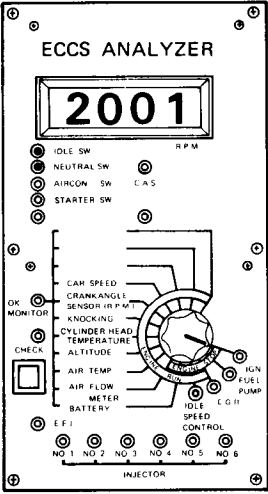
- a. Raise the rear wheels clear of the floor. Block front wheels securely. Use floor stands to support the side member.
 - b. Chassis dynamometer test.
Depress CHECK button and increase vehicle speed. As vehicle speed reaches approximately 10 km/h (6 MPH), O.K. monitor lamp will illuminate. The lamp will extinguish when car speed reaches approximately 30 km/h (19 MPH).
- **C.A.S. (Crank angle sensor)**
O.K. monitor lamp remains on as long as the crank angle sensor emits a signal (engine continues to run).
 - **E.F.I. and injectors**
When fuel is being supplied (engine is operating), E.F.I. monitor lamp brightens and dims alternately and all injector monitor lamps are “ON”. If an injector monitor lamp fails to illuminate, it means that particular injector is malfunctioning. These monitor lamps are also used to check the fuel shut-off system operating condition.

Inspection

While engine is not running:



a

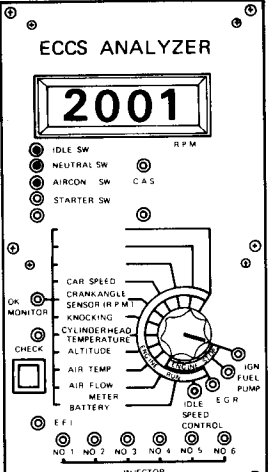


Check neutral switch.

1. Put in "Neutral position."
2. Neutral switch lamp: "ON"

N.G. → **B** (See page 30.)

O.K.

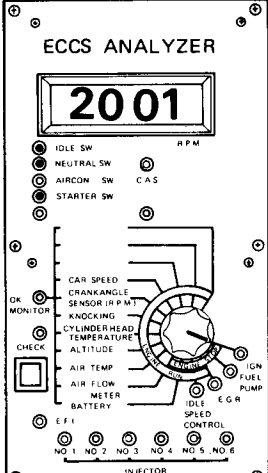


Check air conditioner switch.

1. Switch air conditioner "ON"
2. Air conditioner switch lamp: "ON"

N.G. → **C** (See page 30.)

O.K.



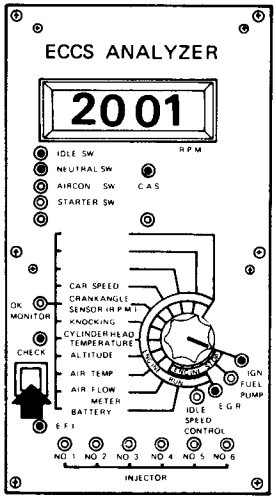
Check starter switch.

1. Turn ignition switch to "START".
2. Starter switch lamp: "ON"

N.G. → **D** (See page 31.)

O.K.

②



Check ignition system.

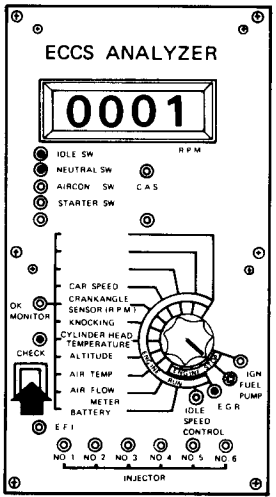
1. Push check button.
2. IGN. monitor lamp: "ON"

After checking ignition system, return ignition switch to "ACC" or "OFF".

N.G. → ⑤ (See page 32.)

SEF455A

O.K.



Check fuel pump control system.

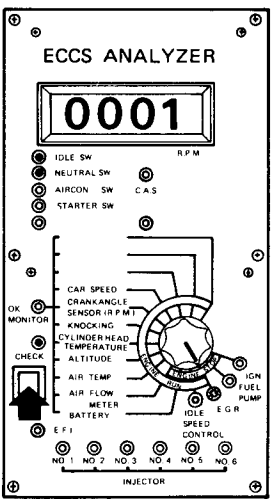
1. Push check button.
2. Fuel pump lamp: goes on and off alternately.

Before checking, return ignition switch to "ON".

N.G. → ⑥ (See page 33.)

SEF456A

O.K.



Check E.G.R. control system.

1. Push check button.
2. E.G.R. lamp: brightens and dims alternately.
3. At the same time check operating sound of V.C.M. solenoid valve.

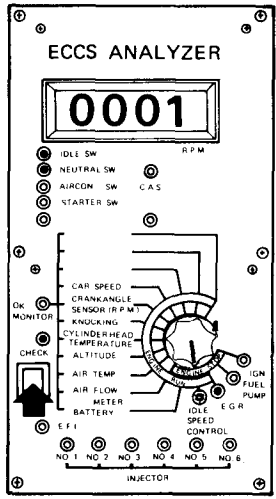
N.G. → ⑦ (See page 34.)

SEF457A

O.K.

③

C



ECCS ANALYZER

0001

SWITCHES: IDLE SW, NEUTRAL SW, AIRCON SW, STARTER SW, C.A.S.

METERS: CAR SPEED, CRANKANGLE SENSOR (R.P.M.), KNOCKING, CYLINDER HEAD TEMPERATURE, ALTITUDE, AIR TEMP, AIR FLOW METER, BATTERY, E.F.I.

INJECTOR: NO. 1, NO. 2, NO. 3, NO. 4, NO. 5, NO. 6

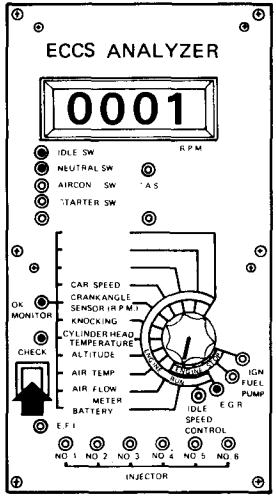
SEF458A

Check idle speed control system.

1. Push check button.
2. Idle speed control lamp: brightens and dims alternately.
3. At the same time check operating sound of V.C.M. solenoid valve.

N.G. → **H** (See page 35.)

O.K.



ECCS ANALYZER

0001

SWITCHES: IDLE SW, NEUTRAL SW, AIRCON SW, STARTER SW, C.A.S.

METERS: CAR SPEED, CRANKANGLE SENSOR (R.P.M.), KNOCKING, CYLINDER HEAD TEMPERATURE, ALTITUDE, AIR TEMP, AIR FLOW METER, BATTERY, E.F.I.

INJECTOR: NO. 1, NO. 2, NO. 3, NO. 4, NO. 5, NO. 6

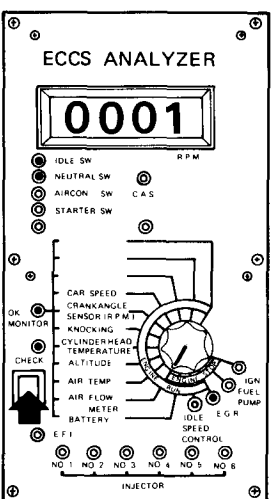
SEF459A

Check Battery voltage.

1. Push check button.
2. O.K. monitor lamp: "ON"

N.G. → **J** (See page 36.)

O.K.



ECCS ANALYZER

0001

SWITCHES: IDLE SW, NEUTRAL SW, AIRCON SW, STARTER SW, C.A.S.

METERS: CAR SPEED, CRANKANGLE SENSOR (R.P.M.), KNOCKING, CYLINDER HEAD TEMPERATURE, ALTITUDE, AIR TEMP, AIR FLOW METER, BATTERY, E.F.I.

INJECTOR: NO. 1, NO. 2, NO. 3, NO. 4, NO. 5, NO. 6

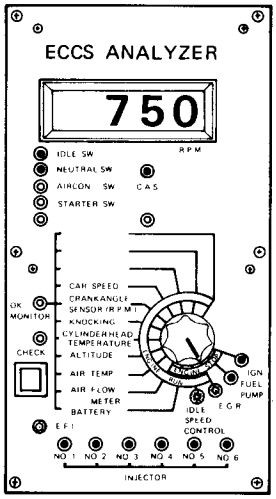
SEF460A

Check air flow meter.

1. Push check button.
2. O.K. monitor lamp: "ON"

N.G. → **K** (See page 36.)

After engine start:



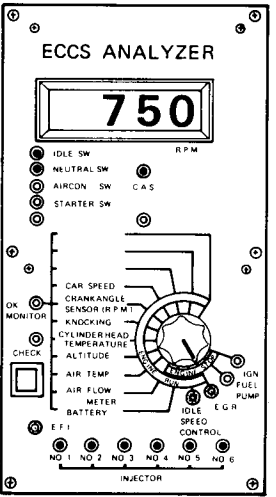
Check C.A.S. signal.

1. Start engine.
2. C.A.S. lamp: "ON"

Before starting engine, return rotary switch to "E.G.R." position.

N.G. → **L** (See page 37.)

O.K. ↓



Check E.F.I. and injectors.

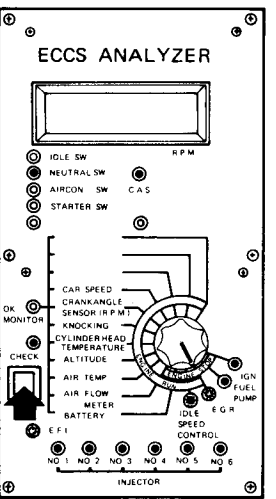
1. Start engine.
2. E.F.I. lamp: brightens and dims alternately.

Injector lamps: "ON"

N.G. → **M** (See page 37.)

O.K. ↓

After warming up and still running:



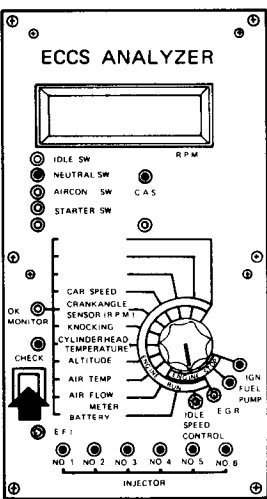
Check E.G.R. control system.

1. Depress accelerator pedal slightly.
2. Push check button.
3. Engine speed should vary.
4. E.G.R. lamp: brightens and dims alternately (during engine speed change).

N.G. → **G** (See page 34.)

O.K. ↓

d



ECCS ANALYZER

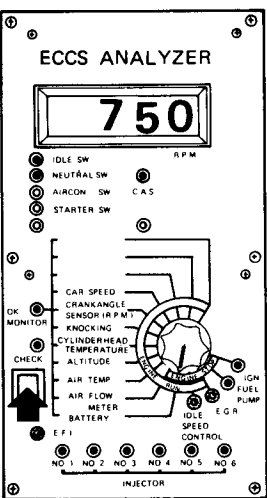
SEF464A

Check idle speed control system.

1. Depress accelerator pedal slightly.
2. Push check button.
3. Engine speed should vary.
4. Idle speed control lamp: brightens and dims alternately (during engine speed change).

N.G. → **H** (See page 35.)

O.K.



ECCS ANALYZER

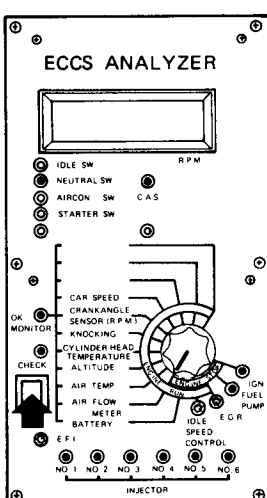
SEF465A

Check battery voltage.

1. Push check button.
2. O.K. monitor lamp: "ON"

N.G. → **J** (See page 36.)

O.K.



ECCS ANALYZER

SEF466A

Check air flow meter.

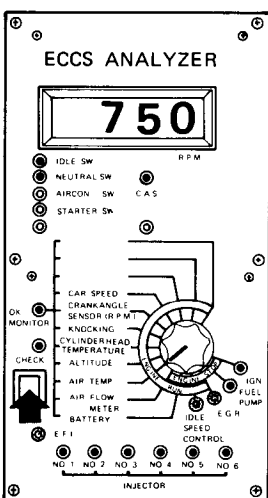
1. Push check button and increase engine speed.
2. O.K. monitor lamp: "OFF" → "ON" → "OFF"

N.G. → **K** (See page 36.)

O.K.

e

(e)



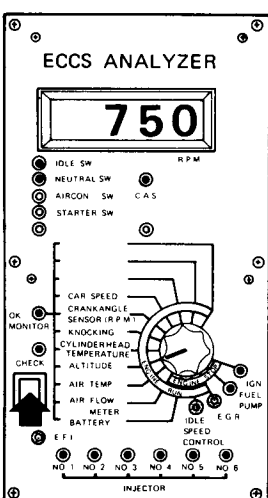
Check air temperature sensor.

1. Push check button.
2. O.K. monitor lamp: "ON"

N.G. → (N) (See page 38.)

SEF467A

O.K.



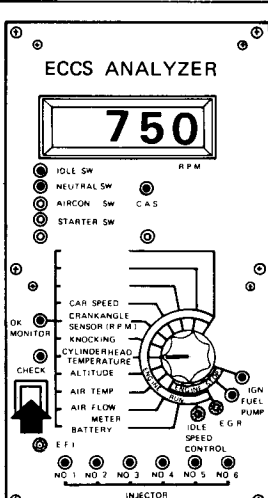
Check altitude sensor (barometric pressure sensor).

1. Push check button.
2. O.K. monitor lamp: "ON"

N.G. → (P) (See page 39.)

SEF468A

O.K.



Check cylinder head temperature sensor.

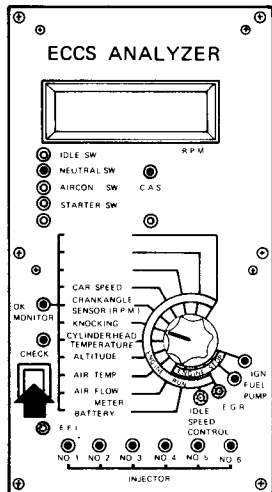
1. Push check button.
2. O.K. monitor lamp: "ON"

N.G. → (Q) (See page 39.)

SEF469A

O.K. → (f)

f



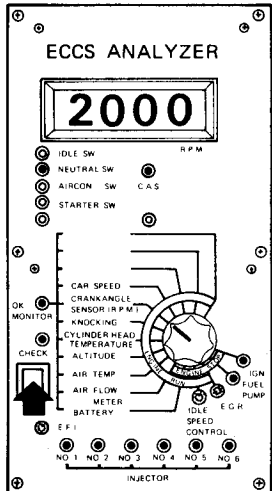
SEF470A

Check knocking sensor.

1. Push check button.
2. Depress accelerator pedal forcibly until engine knocks.
3. O.K. monitor lamp: "ON" (after knocking)

N.G. → **®** (See page 40.)

O.K.



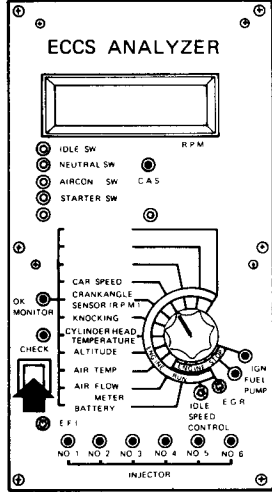
SEF471A

Check crank angle sensor.

1. Push check button and increase engine speed.
2. O.K. monitor lamp: "OFF" → "ON" → "OFF" ("ON": 1,800 to 2,200 rpm)

N.G. → **ℒ** (See page 37.)

O.K.



SEF472A

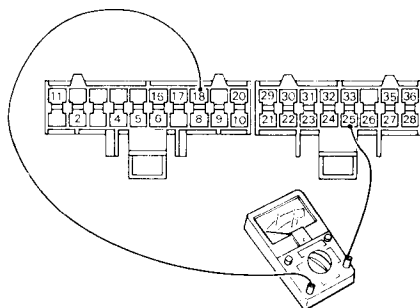
Check car speed sensor.

1. Push check button.
2. Increase car speed.
3. O.K. monitor lamp: "ON" [car speed 10 km/h (6 MPH) to 30 km/h (19 MPH)]

N.G. → **§** (See page 40.)

TROUBLE-SHOOTING DIAGNOSIS**Electronic control system inspection****Ⓐ Idle switch (Throttle valve switch)**

Disconnect 20-pin and 16-pin connectors and measure the resistance between ⑮ and ⑳.

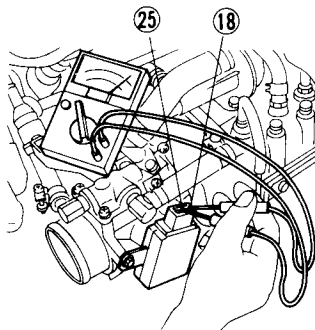


Throttle	Resistance
released	0Ω
depressed	$\infty\Omega$

SEF473A

N.G.

Measure the throttle valve switch resistance between ⑮ and ⑳.

R = 0Ω

SEF116A

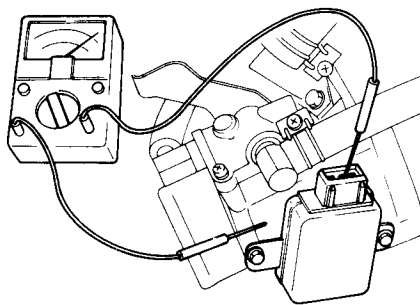
N.G.

Adjust idle switch.

N.G.

O.K.

Measure the resistance between ⑮, ⑳ and body ground.

R: $\infty\Omega$

SEF087A

Check harness and correct or repair it as necessary.

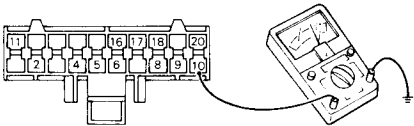
O.K.

N.G.

Replace idle switch.

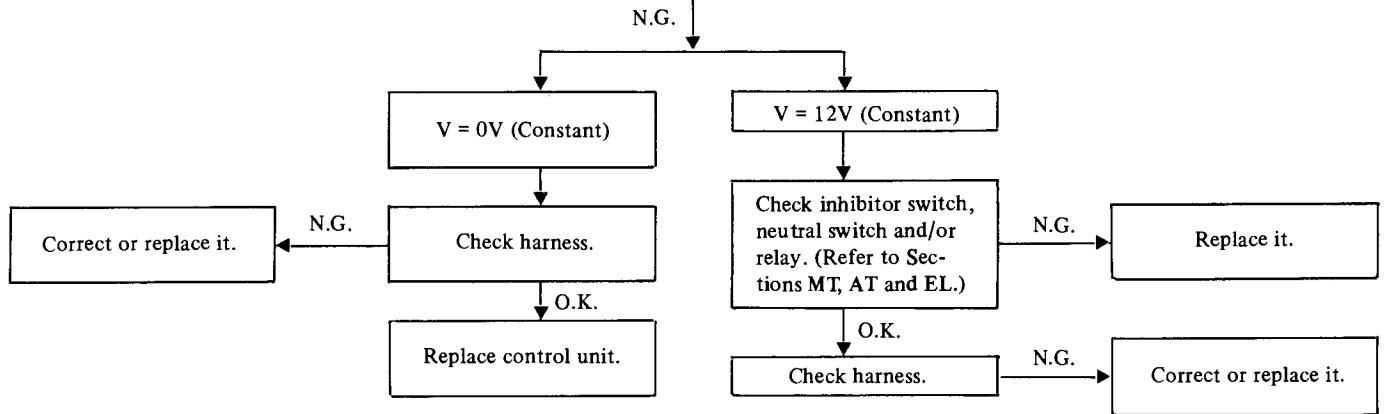
Ⓑ Neutral/Parking switch

Disconnect 20-pin connector and measure the voltage between ⑩ and body voltage ground.



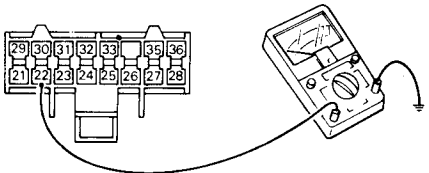
T/M position	Voltage
“N” or “P”	0V
Others	12V

SEF474A



Ⓒ Air conditioner switch

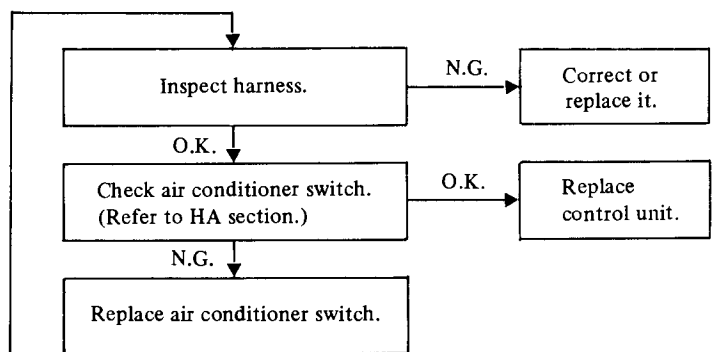
Disconnect 16-pin connector and measure the resistance between ② and body ground.



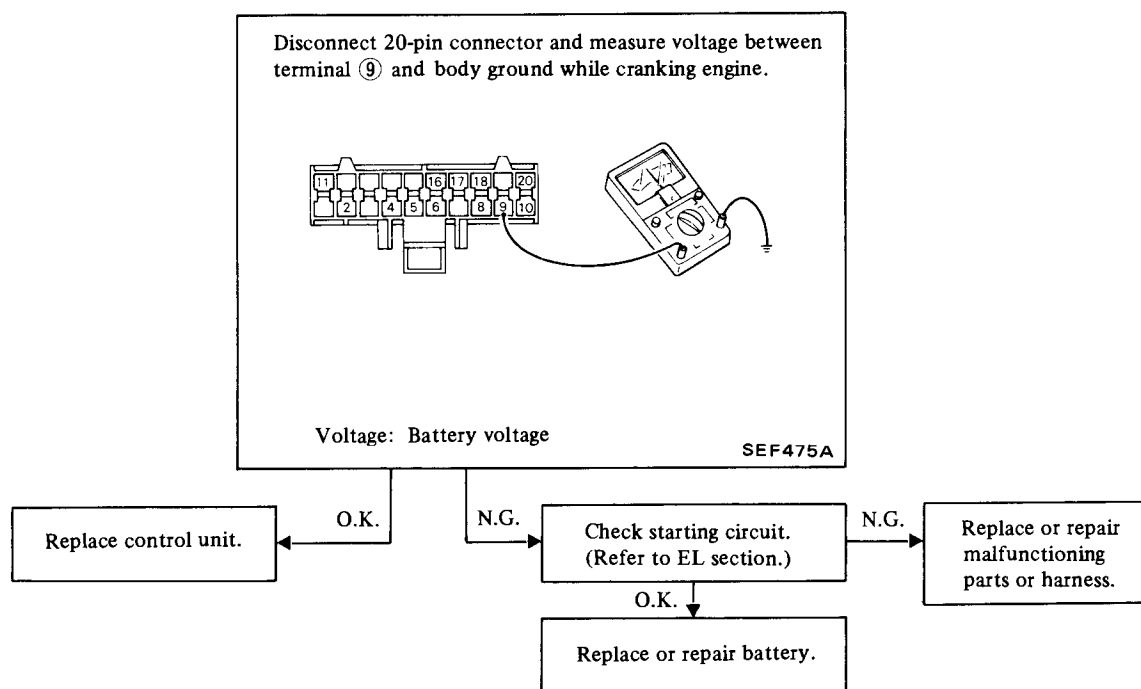
Air conditioner switch	Resistance
ON	12V
OFF	0V

SEF089A

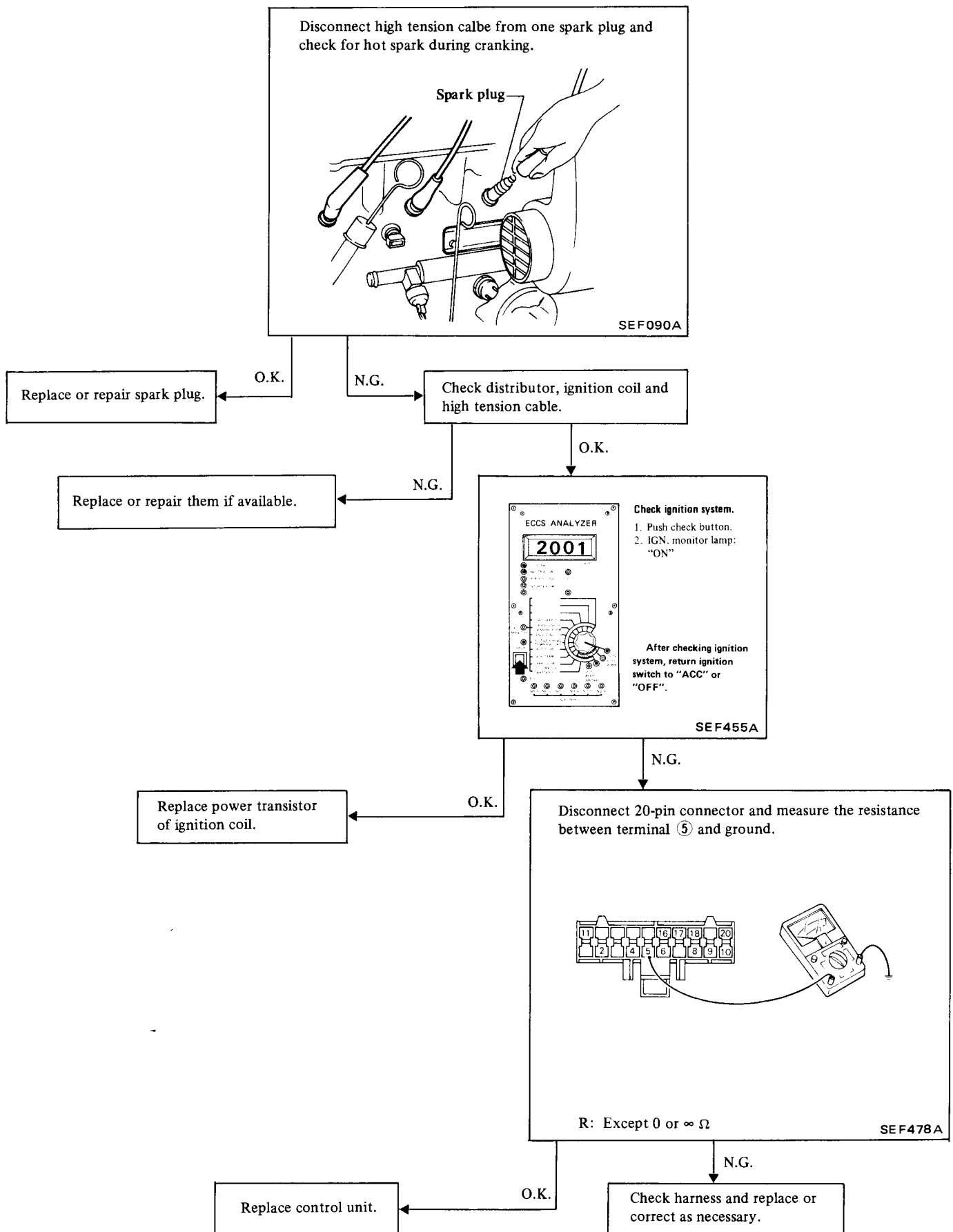
N.G.



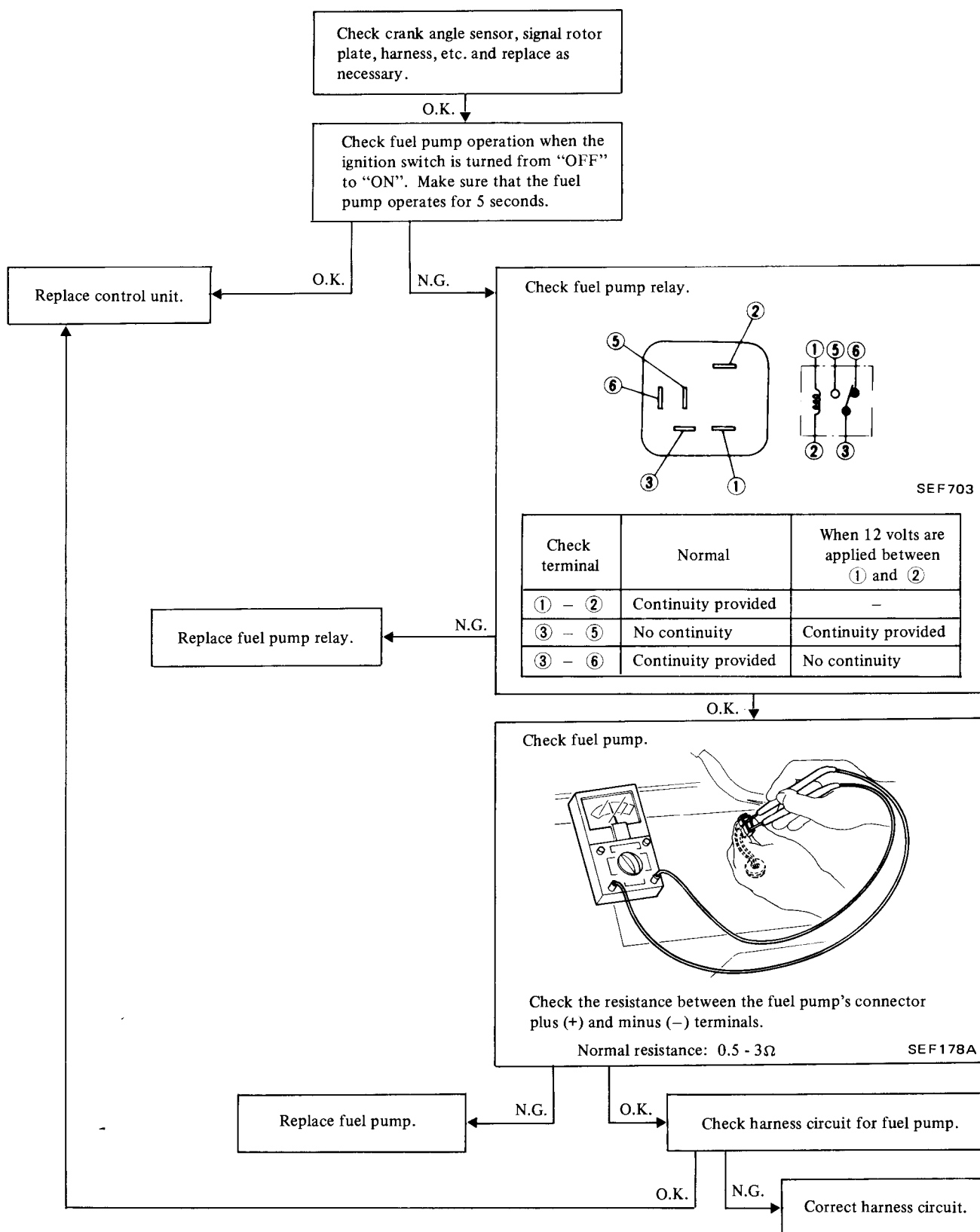
④ Starter switch



⑤ IGN. (Ignition system)



F Fuel pump



③ E.G.R.

With engine stopped, inspect E.G.R. control valve for any indication of finding or sticking by moving valve diaphragm.

N.G.

Clean, correct or replace it as necessary.

O.K.

With engine running after being warmed up, inspect E.G.R. control valve operation by placing a finger on the valve diaphragm while engine speed is increased from idle to 2,000 to 3,000 rpm.

N.G.

Make a thorough visual check of vacuum hoses for E.G.R. control system.

N.G.

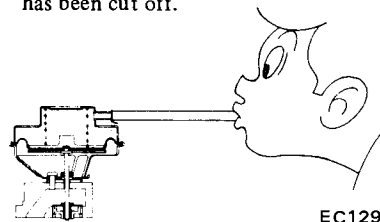
Replace or correct them as necessary.

O.K.

Replace E.G.R. control valve.

N.G.

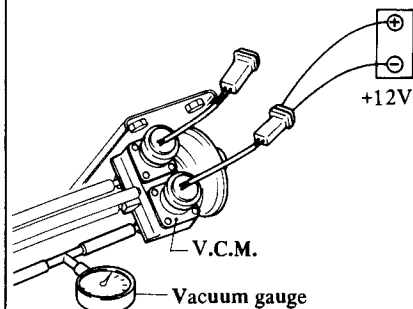
Check E.G.R. control valve. Apply vacuum to it and check that it moves to full position. Then, plug hose with applied vacuum and check that it will remain open for more than 30 seconds after vacuum has been cut off.



EC129A

O.K.

Disconnect a connector of E.G.R. solenoid valve and remove a vacuum hose from V.C.M. to E.G.R. control valve. Check the pressure by using a vacuum gauge when DC12V is applied to the connector.



SEF094A

DC12V	Vacuum gauge
ON	-1.3 - -2.7 kPa (-10 - -20 mmHg, -0.39 - -0.79 inHg)
OFF	-16.0 kPa (-120 mmHg, -4.72 inHg) and increases gradually.

O.K.

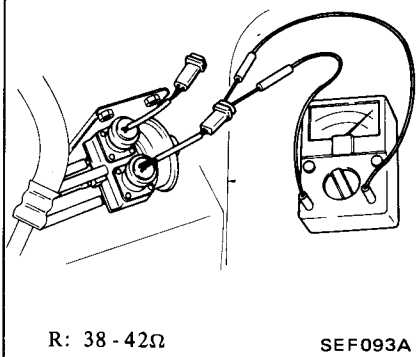
N.G.

Replace V.C.M.

Replace V.C.M.

N.G.

Disconnect a connector of V.C.M. solenoid valve for E.G.R. control and check the resistance between each terminal of the connector.



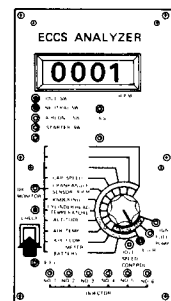
R: 38 - 42Ω

SEF093A

O.K.

Check harness and correct or replace it as necessary.

O.K.



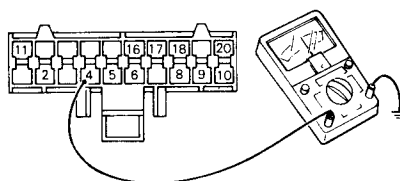
Check E.G.R. control system.

1. Push check button.
2. E.G.R. lamp: brightens and dims alternately.
3. At the same time check operating sound of V.C.M. solenoid valve.

SEF457A

N.G.

Disconnect 20-pin connector and measure the resistance between terminal ④ and ground.



R: 38 - 42Ω

SEF480A

N.G.

O.K.

Replace control unit.

H Idle speed control

After warming up sufficiently, make a thorough visual check of vacuum hoses for idle speed control system.

N.G.

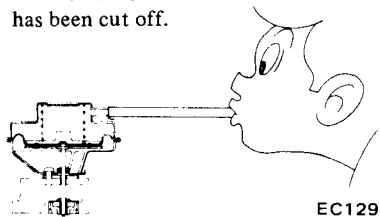
Replace or correct them as necessary.

O.K.

Check A.A.C. valve. Apply vacuum to it and check that it moves to full position. Then, plug hose with applied vacuum and check that it will remain open for more than 30 seconds after vacuum has been cut off.

N.G.

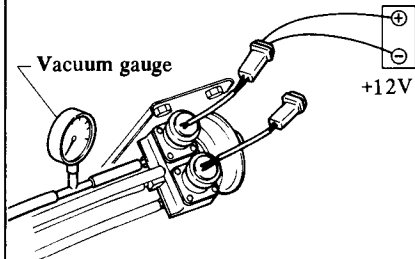
Replace A.A.C. valve.



EC129A

O.K.

Disconnect a connector of I.S.C. solenoid valve and remove a vacuum hose from V.C.M. to A.A.C. valve. Check the pressure by using a vacuum gauge when DC12V is applied to the connector.



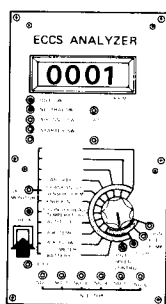
SEF173A

DC12V	Vacuum gauge
ON	-1.3 - -2.7 kPa (-10 - -20 mmHg, -0.39 - -0.79 inHg)
OFF	-16.0 kPa (-120 mmHg, -4.72 inHg) and increases gradually.

Replace V.C.M.

N.G.

O.K.



Check idle speed control system.

1. Push check button.
2. Idle speed control lamp: brightens and dims alternately.
3. At the same time check operating sound of V.C.M. solenoid valve.

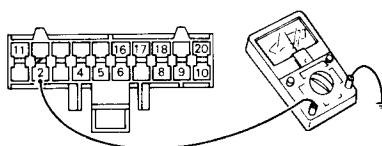
SEF458A

N.G.

Disconnect 20-pin connector and measure the resistance between terminal ② and ground.

O.K.

Replace control unit.



R: 38 - 42Ω

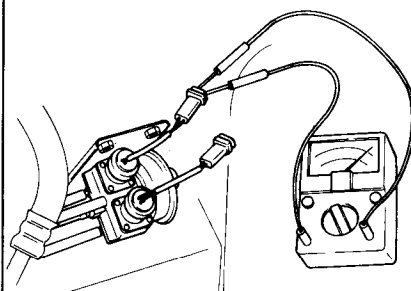
SEF482A

N.G.

Disconnect a connector of V.C.M. solenoid valve for I.S.C. control and check the resistance between each terminal of the connector.

N.G.

Replace V.C.M.



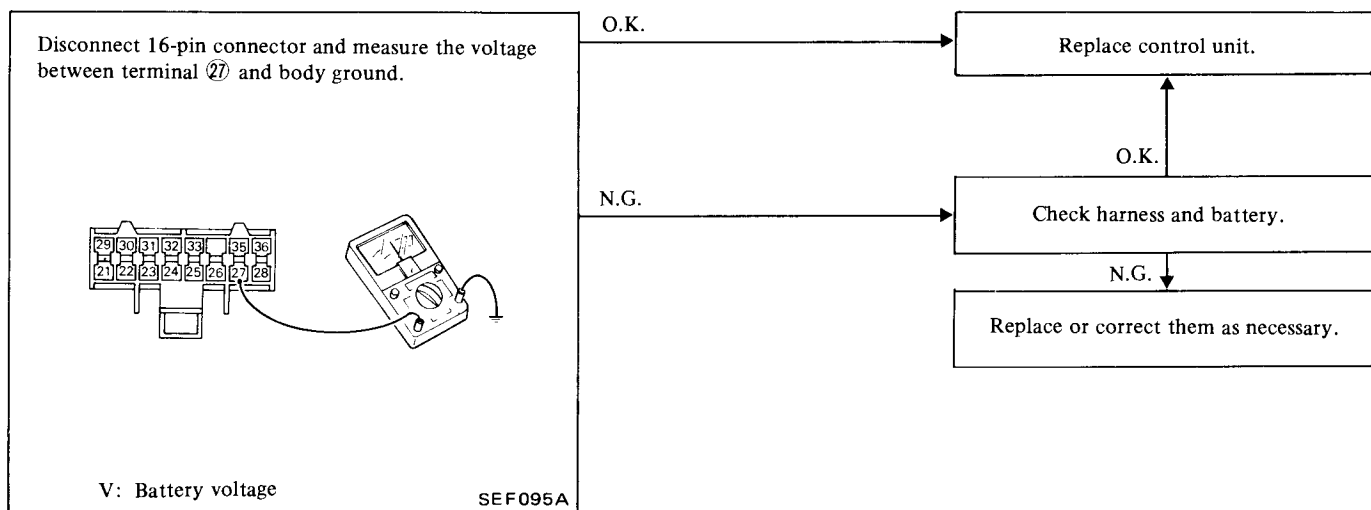
R: 38 - 42Ω

SEF180A

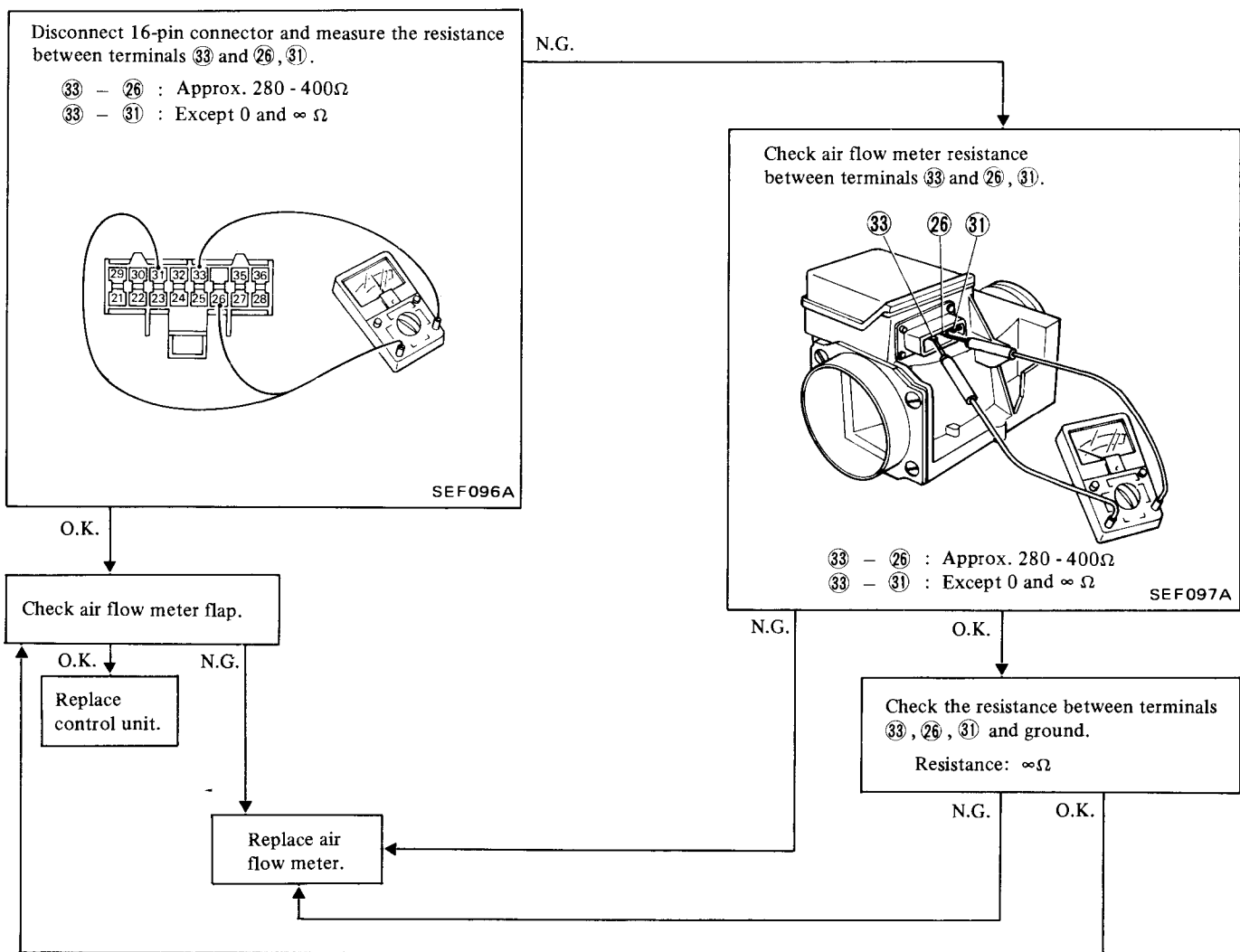
O.K.

Check harness and correct or replace it as necessary.

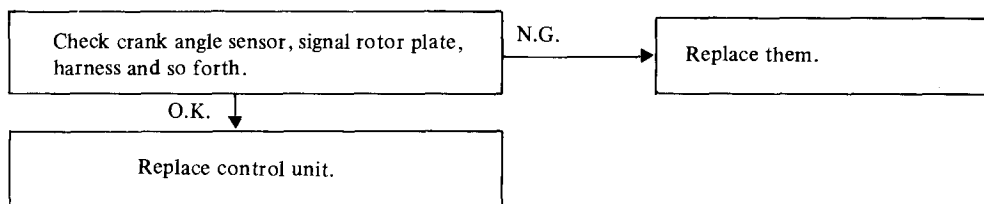
ⓐ Battery



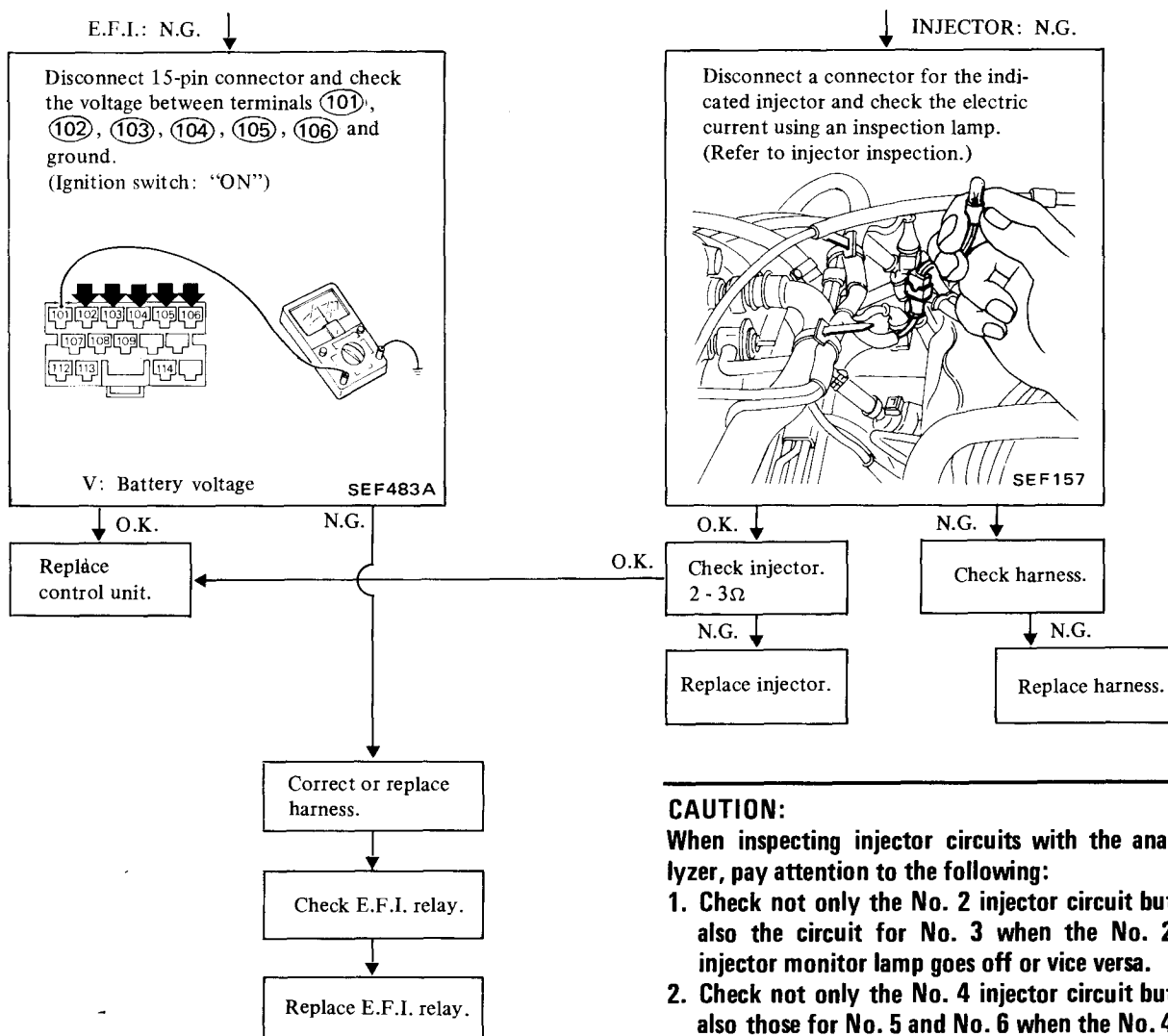
ⓑ Air flow meter



Ⓐ C.A.S. (Crank angle sensor)



Ⓜ E.F.I. & Injector

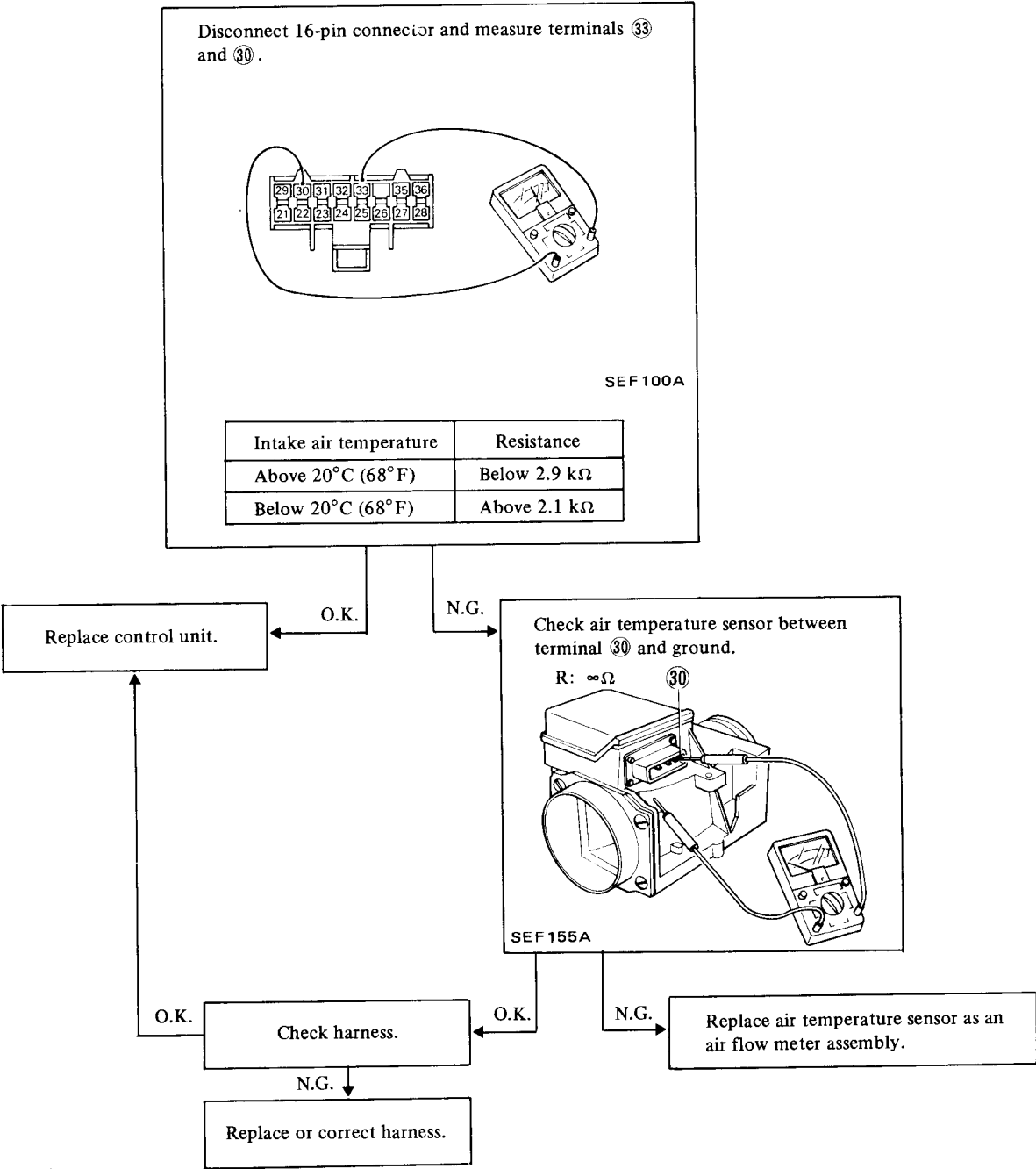


CAUTION:

When inspecting injector circuits with the analyzer, pay attention to the following:

1. Check not only the No. 2 injector circuit but also the circuit for No. 3 when the No. 2 injector monitor lamp goes off or vice versa.
2. Check not only the No. 4 injector circuit but also those for No. 5 and No. 6 when the No. 4 injector monitor lamp goes off. In addition, perform the same inspection if the No. 5 or No. 6 monitor lamp goes off.

N Air temperature

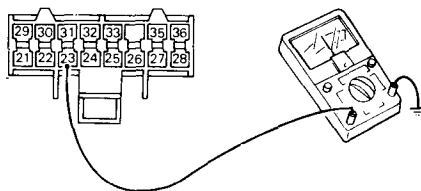


Ⓟ Altitude (Barometric pressure sensor)

If O.K. monitor lamp does not come on, replace control unit.

ⓐ Cylinder head temperature sensor

Disconnect 16-pin connector and measure the resistance between terminal 23 and body ground.



SEF101A

Cylinder head temperature	Resistance
Above 20°C (68°F)	Below 2.9 kΩ
Below 20°C (68°F)	Above 2.1 kΩ

N.G.

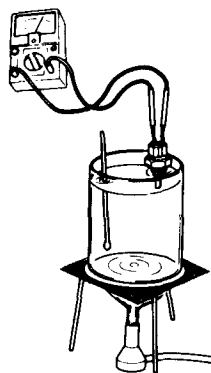
O.K.

Check harness.

O.K.

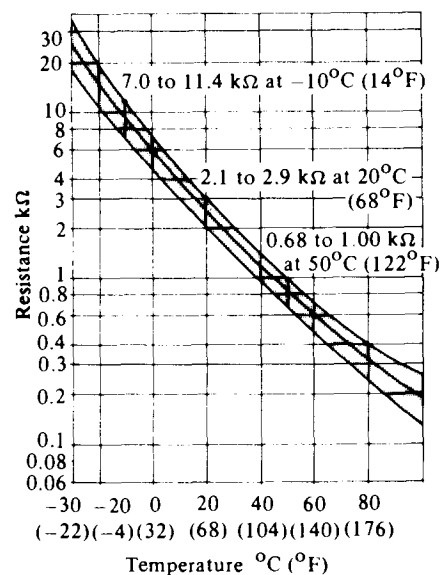
Replace control unit.

Dip the sensor into water maintained at a temperature of 20°C (68°F), 80°C (176°F), etc., and read its resistance.



EF329A

CHARACTERISTIC CURVE



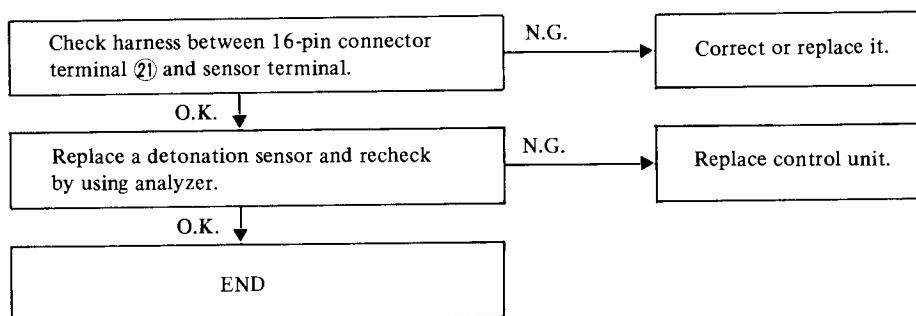
EF334A

O.K.

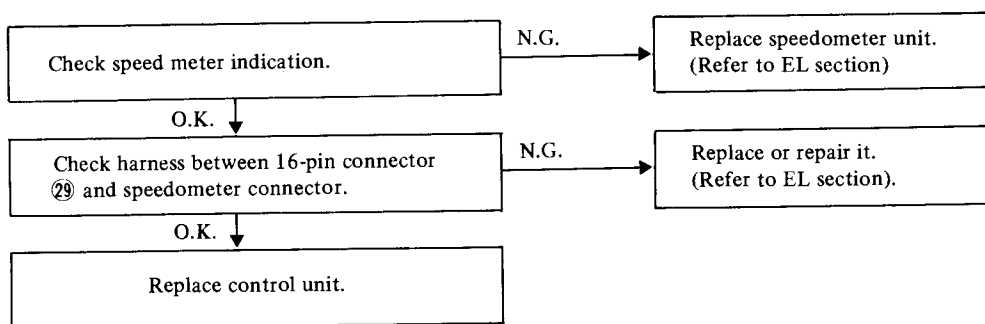
N.G.

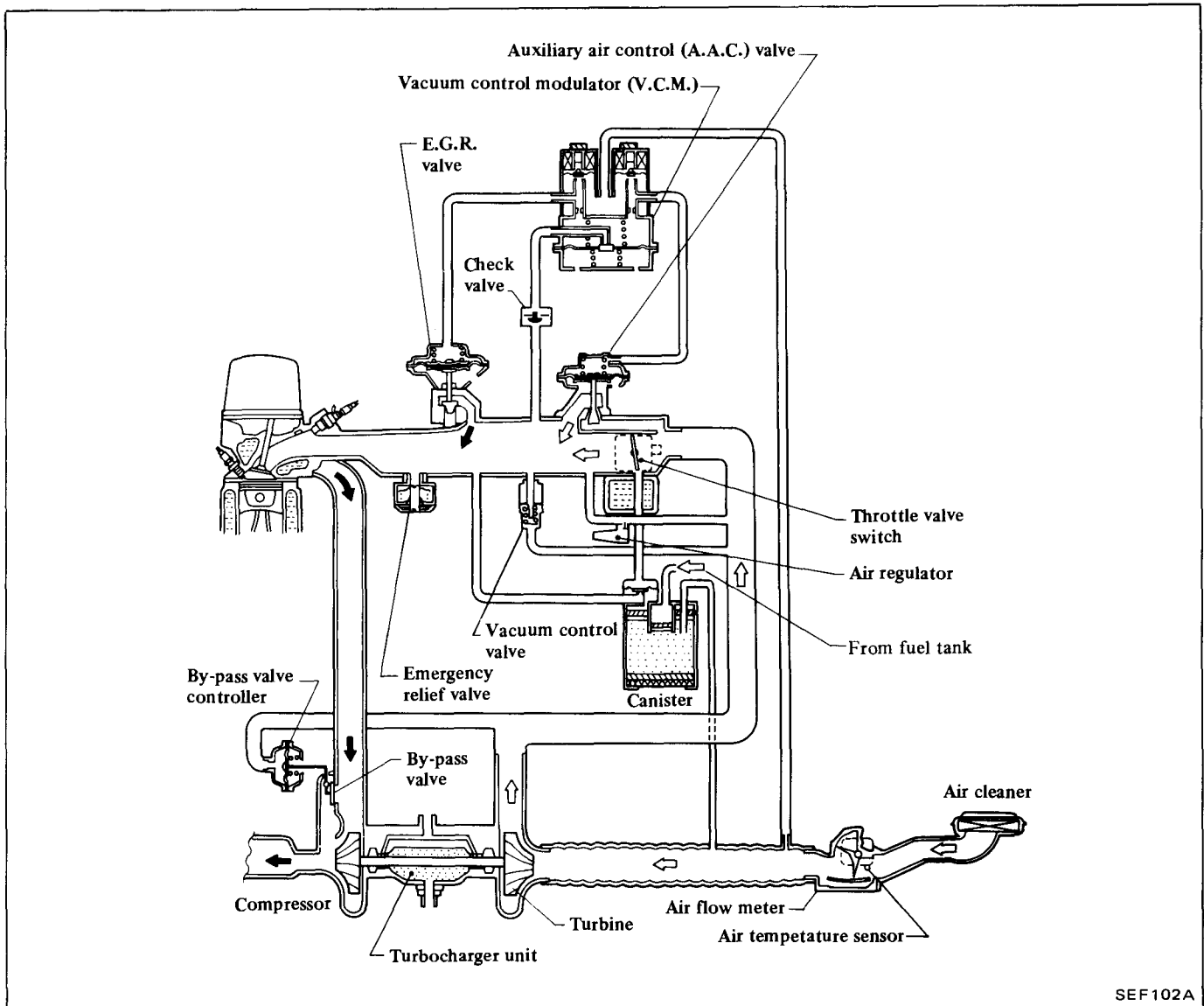
Replace cylinder head temperature sensor.

Ⓜ Knocking (Detonation sensor)



Ⓢ Car speed sensor



AIR FLOW AND VACUUM CONTROL SYSTEM INSPECTION

SEF102A

Check hoses, pipes, connections, etc. depending on the problem using air flow and vacuum control systems.

1) Engine starting malfunction or inability to start

- Intake air leakage ...
P.C.V. valve and hoses (Refer to page 110.)
Air flow meter hoses and connections
V.C.M. hoses -
Canister purge and control hoses
Vacuum control valve hose
Vacuum control valve (V.C.V.) operation
Oil filler cap seals and dipstick
- A.A.C. valve ...
V.C.M. hose and connection
A.A.C. valve hose and connection
A.A.C. valve operation

2) Engine stall

- Air regulator ...
Air regulator hoses and connections
Air regulator operation
- Intake air leakage ...
V.C.V. hose and connection
V.C.V. operation
Canister hose
- E.G.R. control valve ...
V.C.M. hose and connection
Check valve
E.G.R. valve hose
E.G.R. valve operation

3) Improper idle

- Intake air leakage (Refer to the item above.)
- Air regulator (Refer to the item above.)
- E.G.R. control valve (Refer to the item above.)

- V.C.M. hoses
- A.A.C. valve hose
- etc.
- 4) Driving malfunction
 - Throttle chamber operation
 - Air flow meter operation
 - Air cleaner filter (Refer to MA section.)
 - Air regulator and hoses
 - Intake air leakage (Refer to the item above.)
 - Turbocharger (Refer to TURBOCHARGER.) ...
By-pass valve controller
By-pass valve
Emergency relief valve, etc.

When malfunctions are found in hoses and connections, they should be replaced with new ones.

Mixture ratio feedback system inspection

Preparation

1. Make sure that the following parts are in good order.

- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.F.I. harness connectors
- E.C.C.S. harness connectors
- Vacuum hoses
- Air intake system
(oil filler cap, oil level gauge, etc.)
- Valve clearance, engine compression

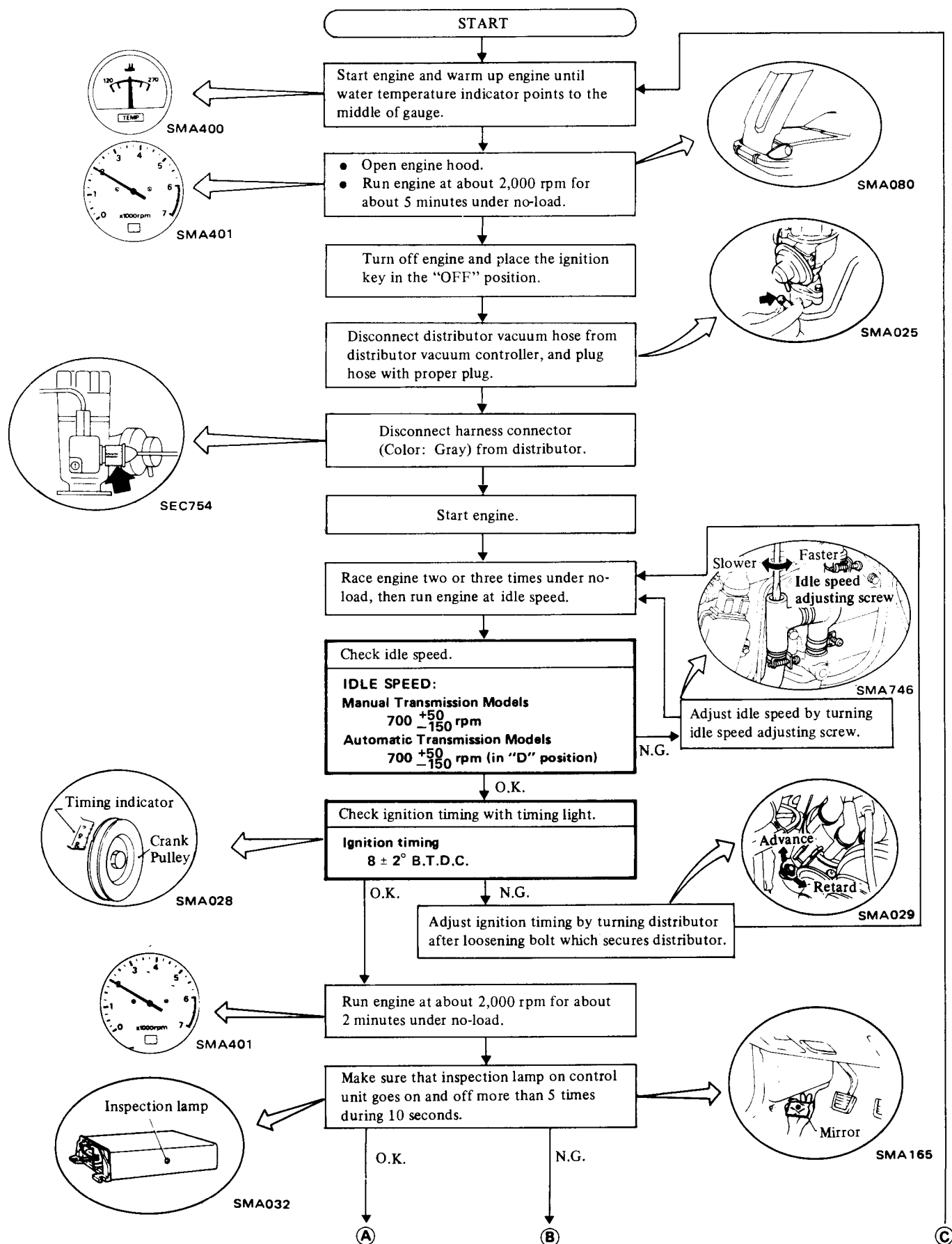
2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".

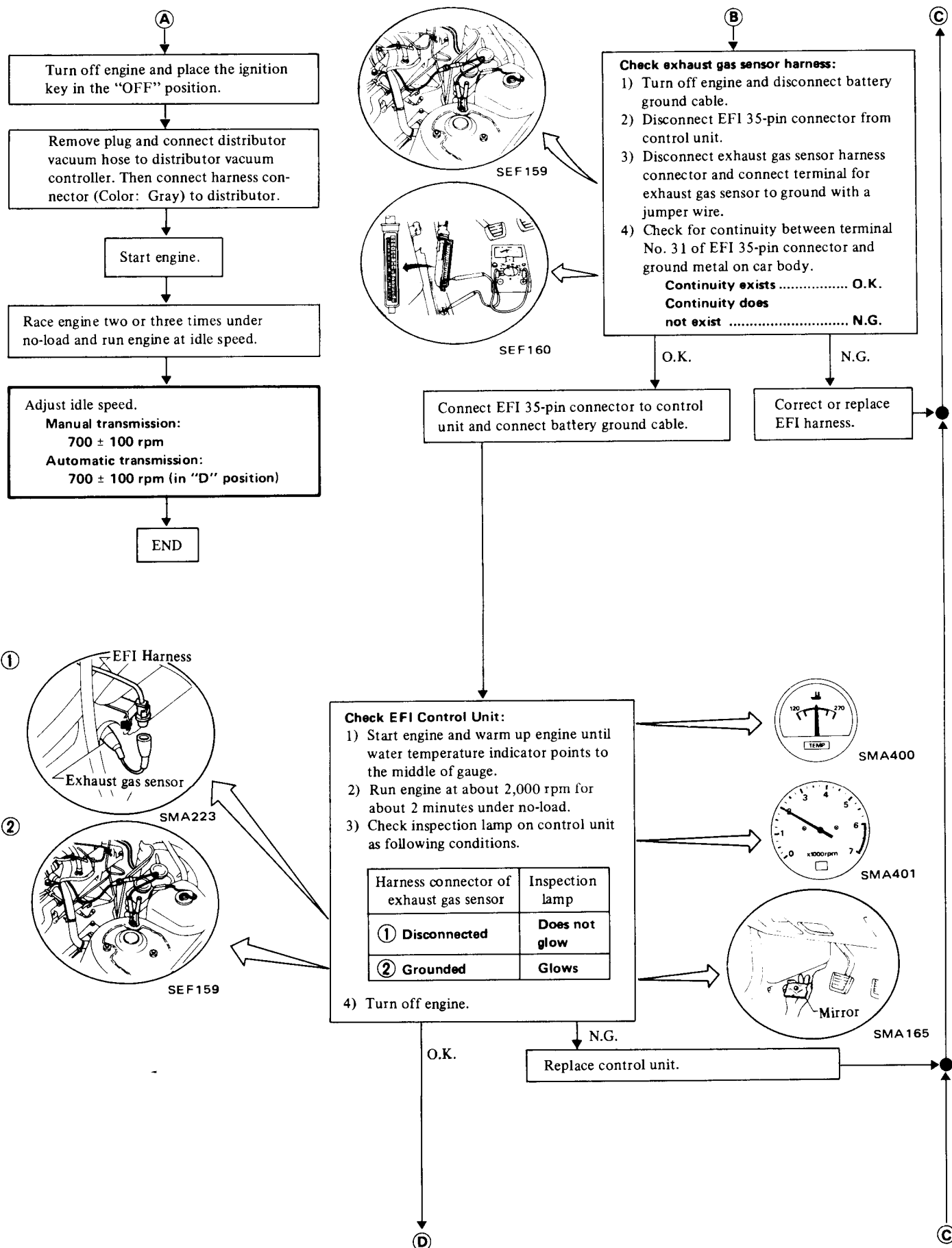
3. On automatic transmission equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in "D" position.

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 the engine to prevent forward surge of car.
- c. After the adjustment has been made, shift the lever to the "N" or "P" position and remove wheel chocks.

Inspection procedure for E.F.I. engine





Note:

Keep throttle valve switch harness connector at least 10 cm (3.9 in) away from high tension cable, to prevent malfunction due to reception of external noise.

Note:

- The idle mixture ratio of EFI car is set so lean that "CO"% remains almost unchanged when adjustment is made under normal condition. Therefore, when adjusting idle mixture ratio, to distinguish variation in "CO"% , a full enrichment must be temporarily given to idle mixture setting to make it richer.
- Make lead wire as follows:
Use flat plate terminals 3 mm (0.12 in) wide, 0.8 mm (0.031 in) thick as male terminals. Place flat plate terminals parallel with each other and keep distance between inside faces 2 mm (0.08 in). Solder lead wire to each terminal and wrap insulation tape around soldered portion.

Note:

- When measuring "CO"% , insert probe into tail pipe more than 0.4 m (16 in).
- Use "CO"-meter after it is fully warmed up.

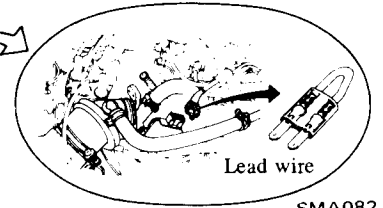
Note:

The air by-pass screw which has been preset at the factory should be adjusted to lower exhaust emission as directed by official inspections.
The seal plug which seals air by-pass screw should not be removed during routine maintenance.
Adjusting mixture using other than the following method may violate Federal or other State and Provincial laws.

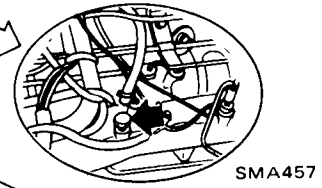
Note:

After drilling, be sure to remove shavings and dust.

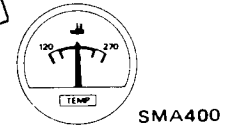
Disconnect throttle valve switch harness connector and connect a lead wire between terminals No. 24 and No. 30 of throttle valve switch harness connector.



Disconnect canister purge hose from intake manifold, and install proper cap on connector.



Start engine and warm up engine until water temperature indicator points to the middle of gauge.



Race engine two or three times under no-load, then run engine at idle speed.

Check "CO"% with "CO"-meter

Idle "CO"%
[With full enrichment and exhaust gas sensor harness connector disconnected]
Less than 5%

O.K.

N.G.

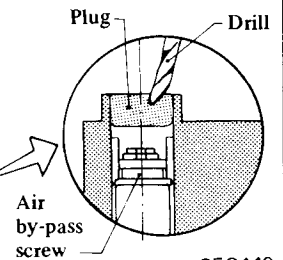
Does engine run smoothly?

Yes

No

Turn off engine and remove air flow meter from car.

Drill a hole in seal plug which seals air by-pass screw and remove seal plug.



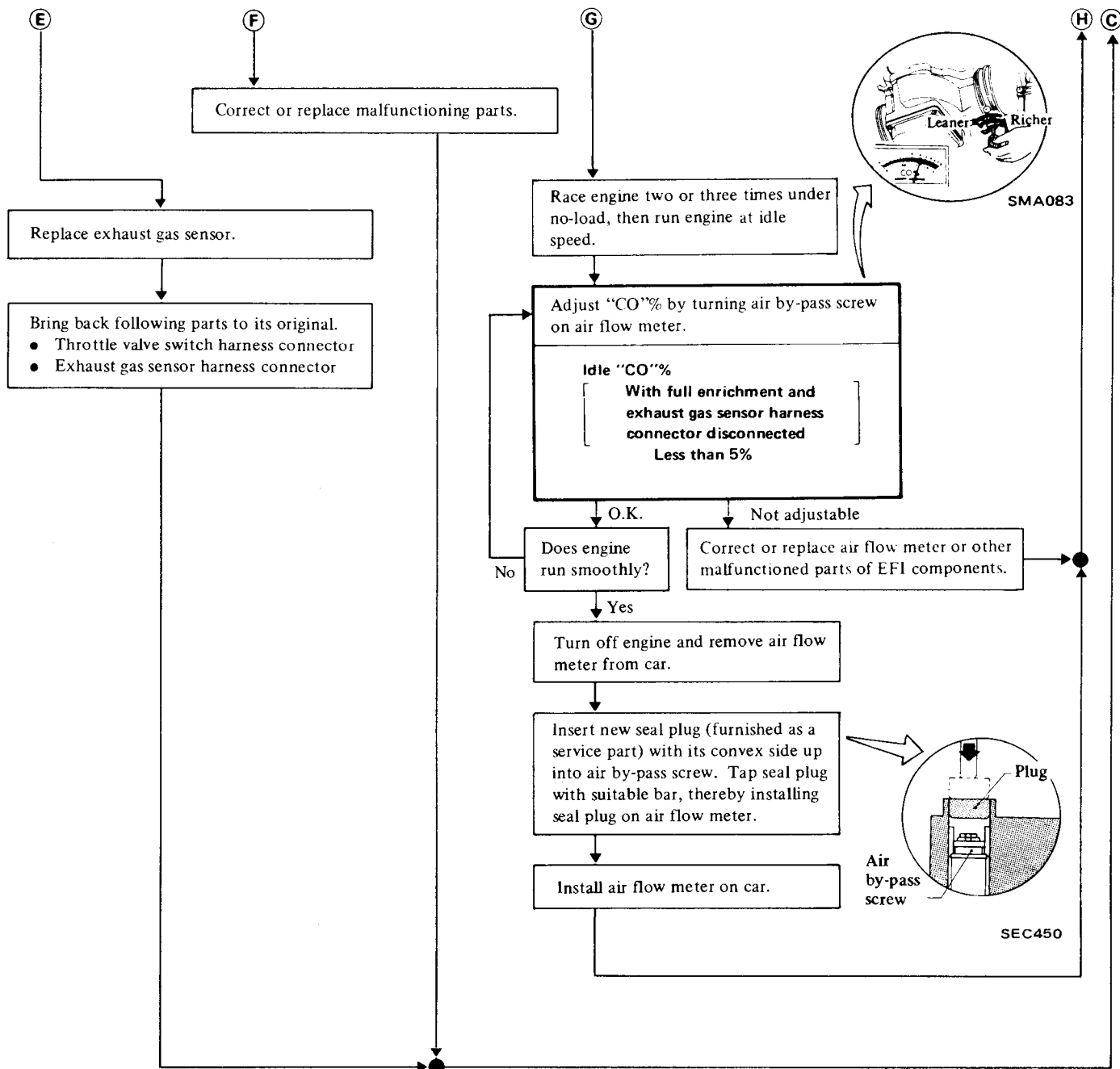
Install air flow meter on car. Start engine and warm up engine until water temperature indicator points to the middle of gauge.

Check the following:

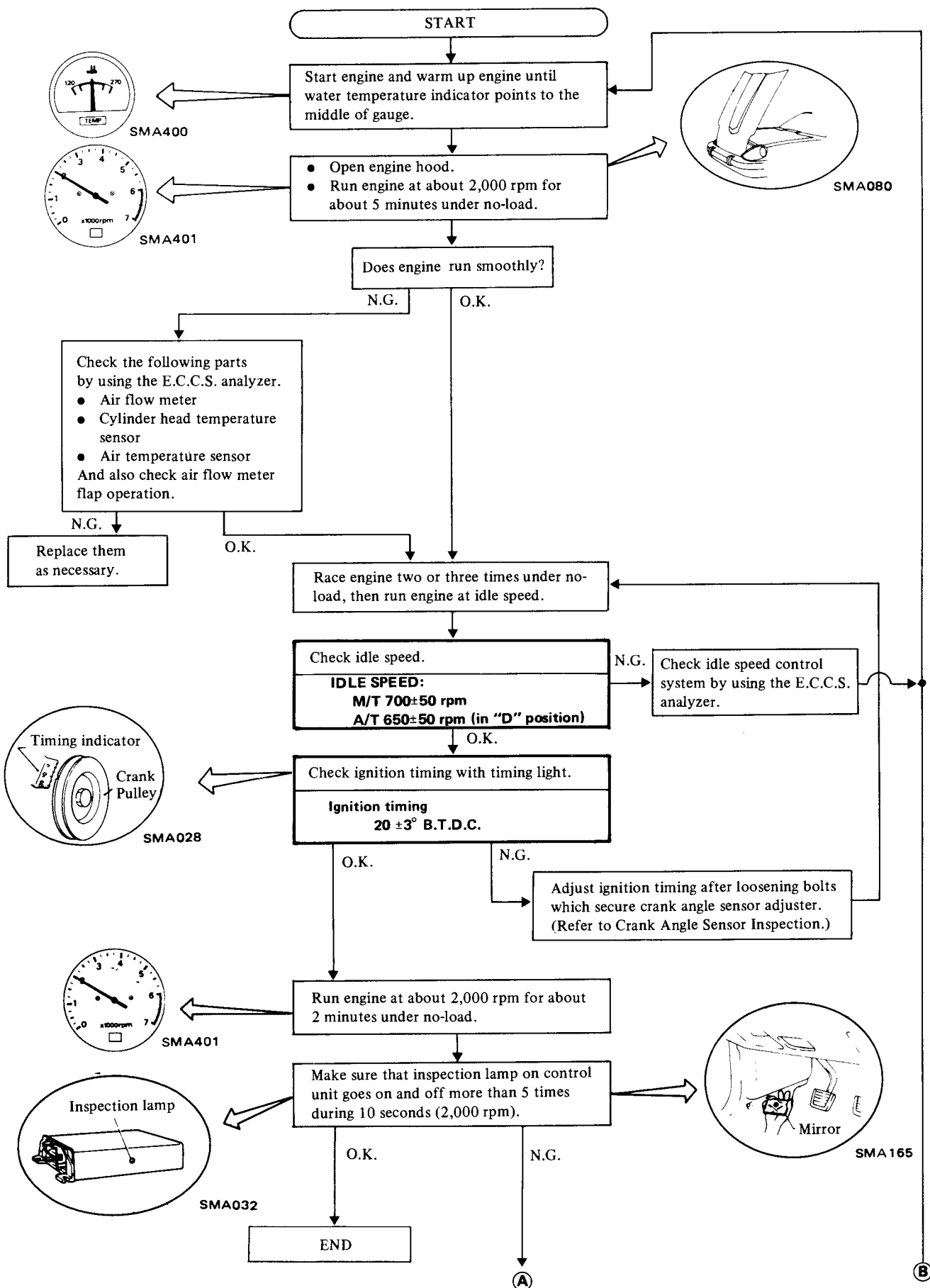
- Following hoses for proper connections.
Vacuum hoses
Blow-by hoses
Air regulator hoses
Airt duct hoses
Canister purge hoses
- Air leaks at throttle chamber mounting and intake manifold.

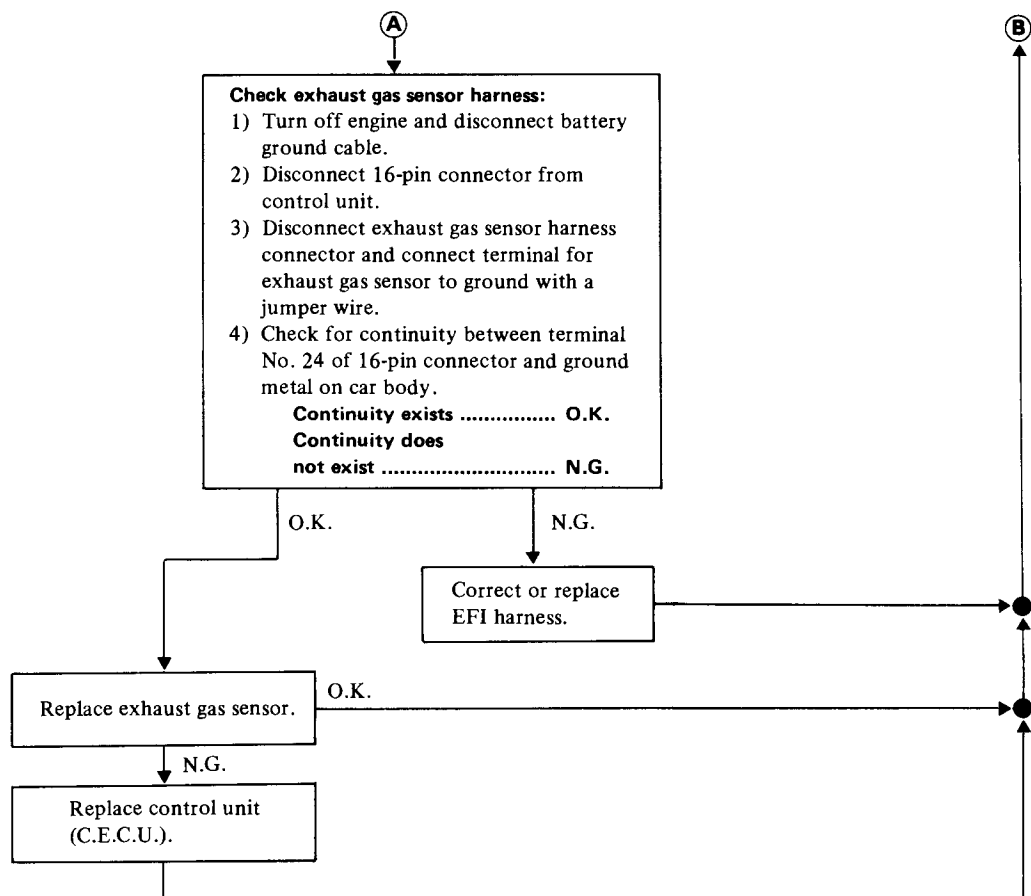
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N.G.



Inspection procedure for E.C.C.S. engine





E.F.I. SYSTEM OPERATION

FUEL INJECTION CONTROL

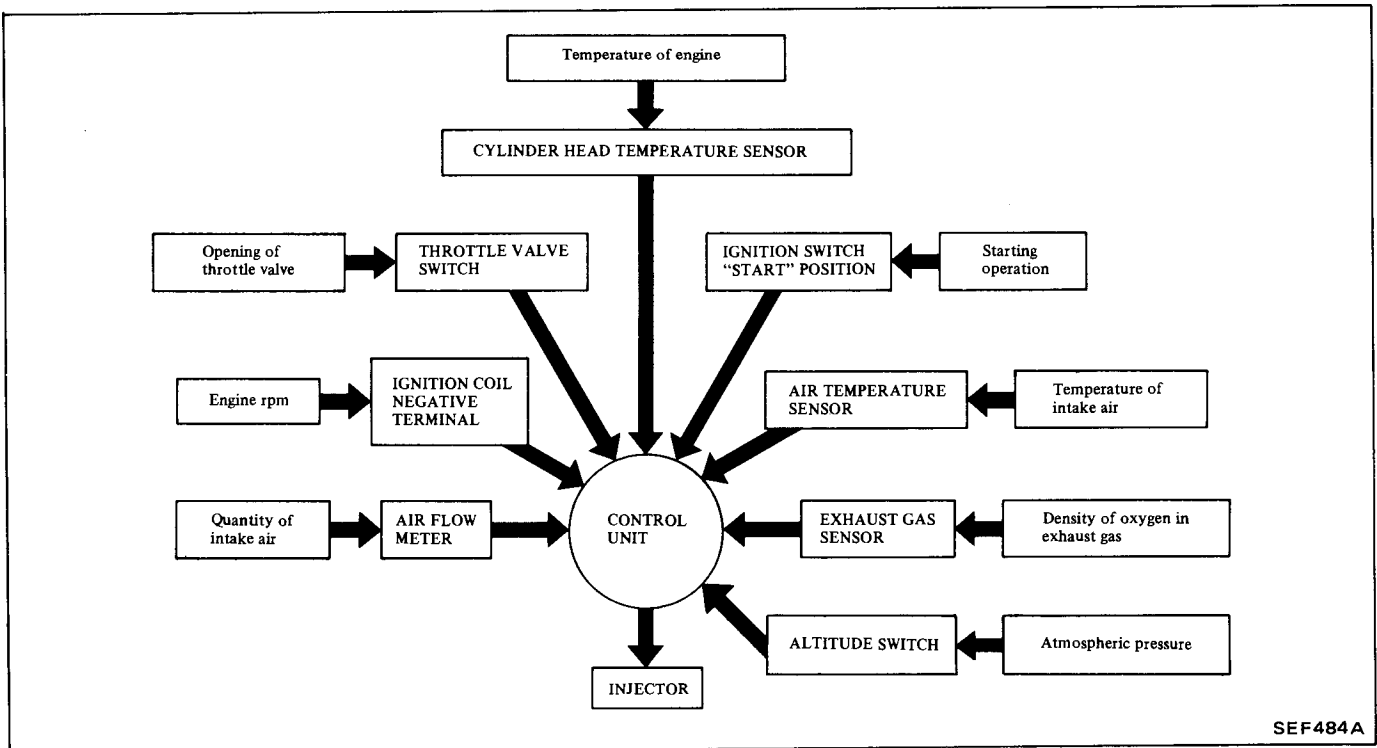
The fuel injectors are electrically connected, in parallel, in the control unit. All injectors receive the injection signal from the control unit at the same time. Therefore, injection is made independently of the engine stroke cycle (intake, combustion, and exhaust). In the six-cylinder engine,

injection is made once every revolution of the engine, triggered by the ignition coil.

Fuel in this E.F.I. system is not injected directly into the cylinder, but is injected into the intake port. Therefore, the air-fuel mixture is drawn into the cylinder when the intake valve opens to start the intake stroke.

SIGNALS FOR CONTROL UNIT

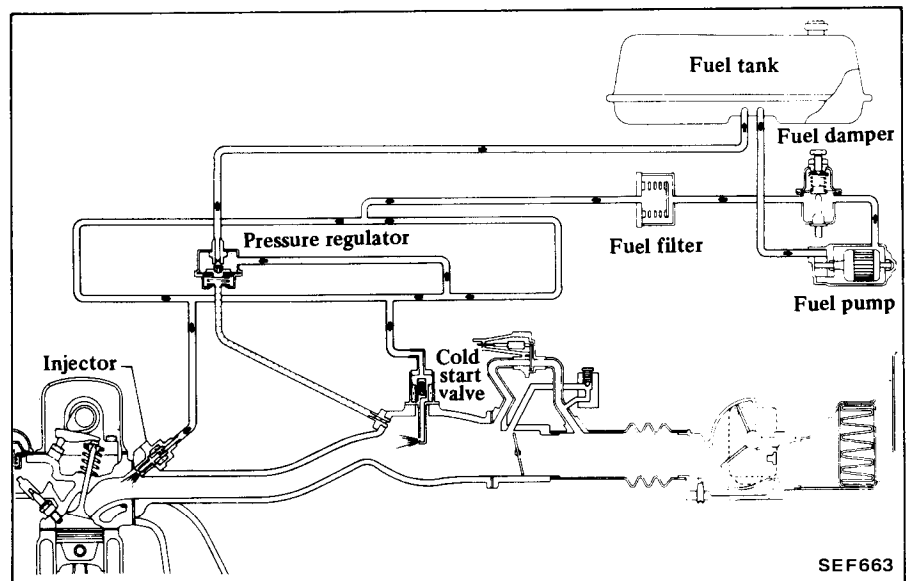
An electrical signal from each sensor is introduced into the control unit for computation. The open-valve time period of the injector is controlled by the duration of the pulse computed in the control unit.



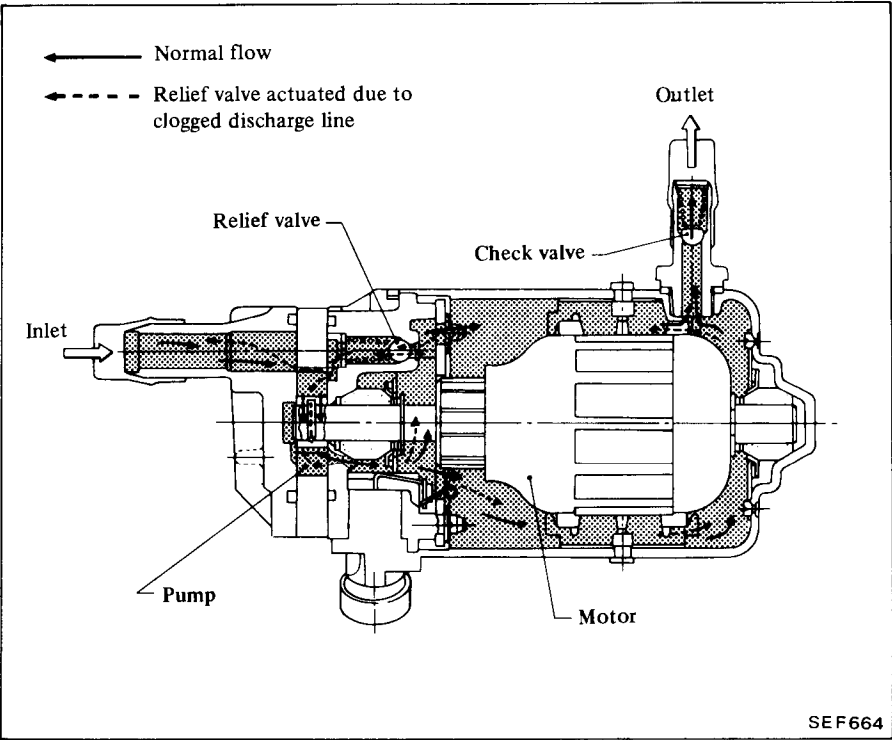
FUEL FLOW SYSTEM

Fuel is drawn from the fuel tank into the fuel pump, from which it is discharged under pressure. As it flows through the mechanical fuel damper, pulsation in the fuel flow is damped. Then, the fuel is filtered in the fuel filter, goes through the fuel line, and is injected into the intake port.

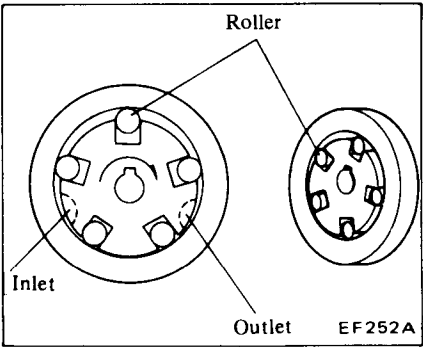
Surplus fuel is led through the pressure regulator and is returned to the fuel tank. The pressure regulator controls the injection pressure in such a manner that the pressure difference between the fuel pressure and the intake manifold vacuum is always 250.1 kPa (2.55 kg/cm², 36.3 psi).



FUEL PUMP

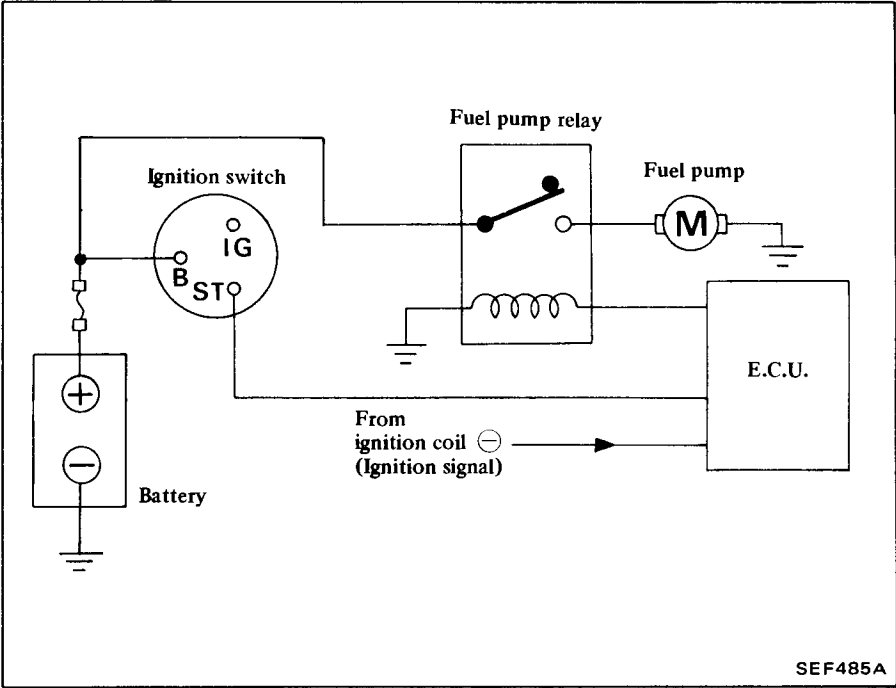


The fuel pump is a wet type pump where the vane rollers are directly coupled to a motor which is filled with fuel.



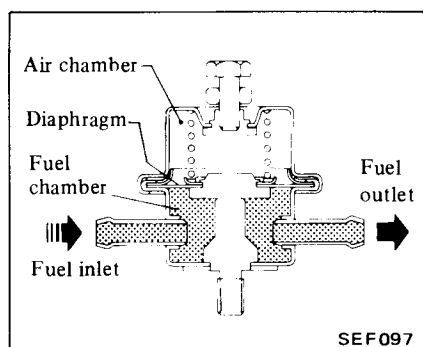
A relief valve in the pump is designed to open when the pressure in the fuel line rises over 294 to 441 kPa (3.0 to 4.5 kg/cm², 43 to 64 psi) due to malfunction in the pressure system. The check valve prevents abrupt drop of pressure in the fuel pipe when stopping the engine.

Fuel pump circuit



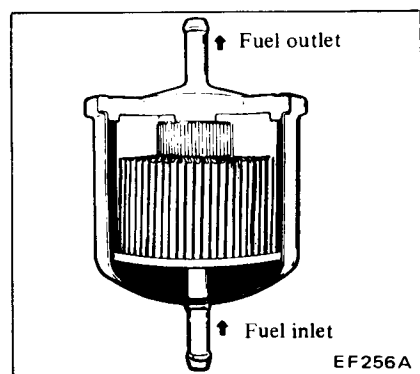
Fuel pump operation

Ignition switch position	Fuel pump operation	Engine speed	Fuel pump relay state
ON	Operates for a few seconds	Stops	ON for a few seconds
START	Operates	Cranking speed	ON
ON	Stops	Below 50 rpm	OFF
	Operates	Above 50 rpm	ON

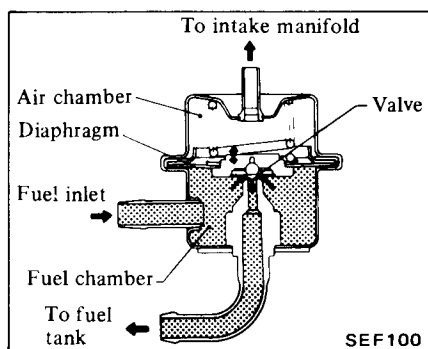
FUEL DAMPER

The fuel damper acts like a shock absorber in fuel flow discharged from the fuel pump. There are not adjustments on this damper.

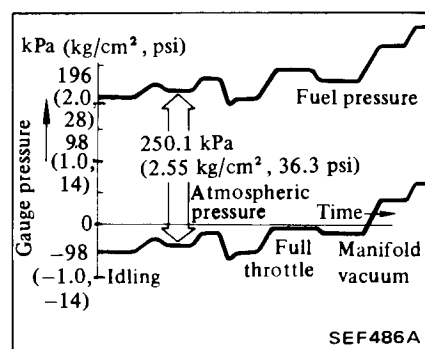
Change in the pump discharge pressure is monitored by the diaphragm and spring, which vary the volume of the fuel chamber.

FUEL FILTER

The fuel filter is placed between the fuel damper and the injector, and is used to remove foreign matter in the fuel. Water in the fuel is collected at the bottom of the filter casing.

PRESSURE REGULATOR

The pressure regulator controls the pressure of fuel so that a pressure difference of 250.1 kPa (2.55 kg/cm², 36.3 psi) can be maintained between the fuel pressure and intake manifold vacuum. The pressure regulator is divided into the air chamber and fuel chamber by the diaphragm. Intake manifold vacuum is introduced into the air chamber, thereby keeping differential pressure constant causing excessive fuel to return to the fuel tank through the return side port. This constant differential pressure provides optimum fuel injection in every mode of engine operation.

**Inspection**

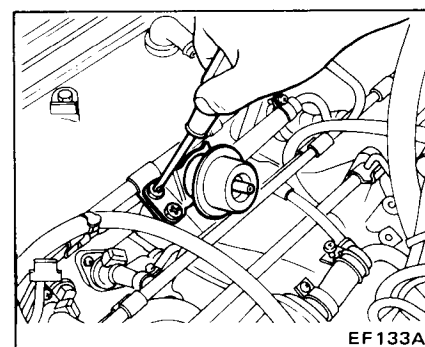
If the fuel pressure is other than that specified, first check the fuel pump and then check the following items:

If fuel pressure is too high:

Vacuum hose connected to pressure regulator poorly, clogged fuel return piping, or faulty pressure regulator.

If fuel pressure is too low:

Clogged fuel pump, fuel filter, or fuel tank; leak in the fuel system, or faulty pressure regulator.

Replacement

1. Reduce fuel line pressure to zero.
2. Disengage vacuum tube connecting regulator to intake manifold from pressure regulator.
3. Remove screws securing pressure regulator.
4. Unfasten hose clamps, and disconnect pressure regulator from fuel hose.

Place a rag under pressure regulator to prevent splashing of fuel.

5. To install pressure regulator, reverse the order of removal.
6. For installation of fuel hose, refer to Fuel Hose.

FUEL HOSE

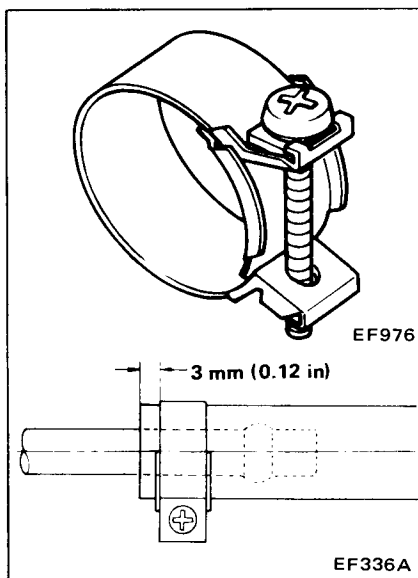
Make sure that all low pressure fuel hoses are fully inserted and are free from undue strain before clamping.

When removing or installing high pressure fuel hose, observe the following.

CAUTION:

- Do not reuse fuel hose clamps after loosening.
- Clean dust and dirt from parts with compressed air when assembling.
- Tighten high pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end or screw position (wider than other portions of clamp) is flush with hose end.

Ⓙ : Fuel hose clamps
 1.0 - 1.5 N·m
 (0.10 - 0.15 kg·m,
 0.7 - 1.1 ft·lb)



- When tightening hose clamp, ensure that screw does not come into contact with adjacent parts.

Insert high pressure fuel hoses into their proper positions as instructed below.

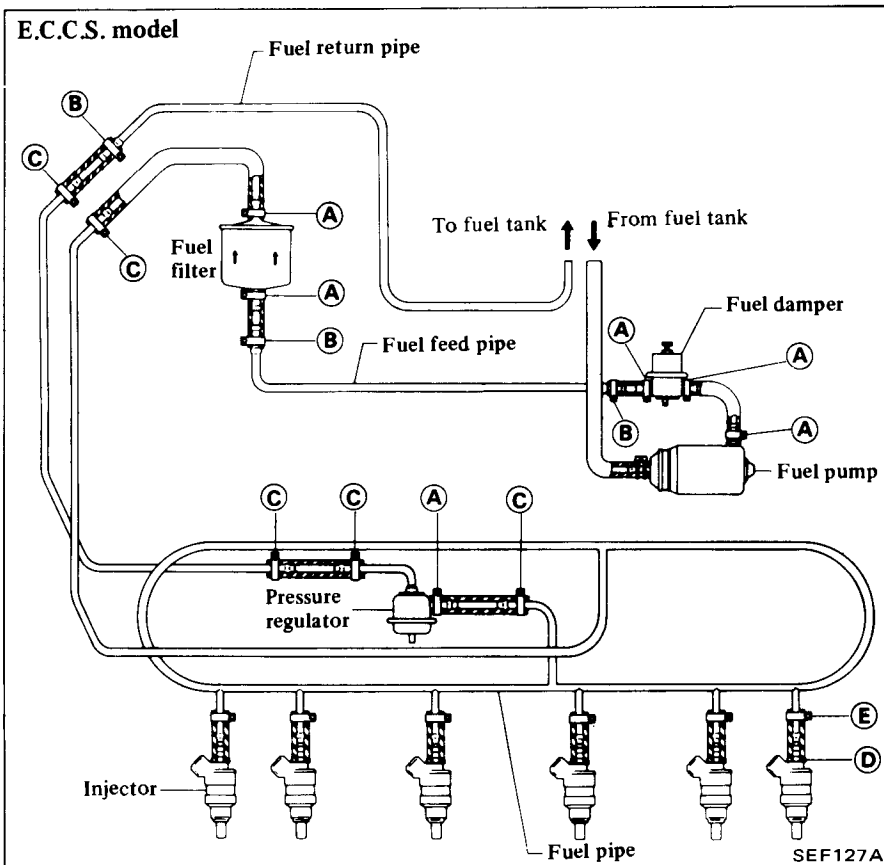
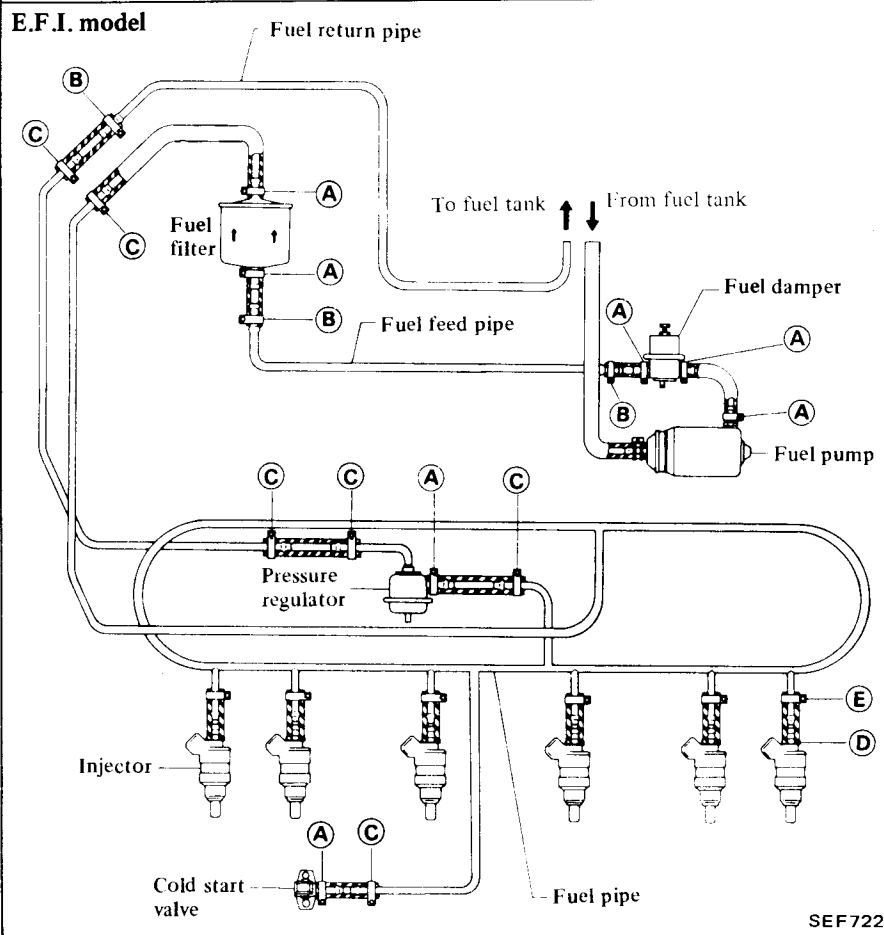
Type Ⓐ: Insert rubber hose until its end contacts unit.

Type Ⓑ: Push end of rubber hose onto fuel pipe until it contacts inner bulge.

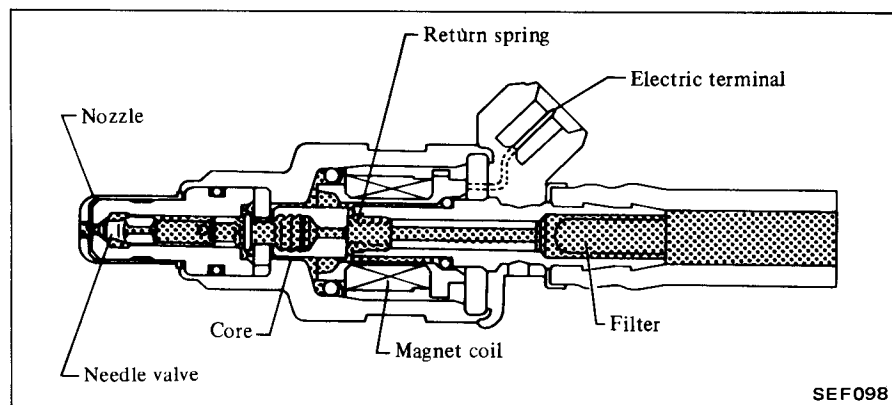
Type Ⓒ: Push end of rubber hose onto fuel pipe until it is 33 mm (1.30 in) from end of pipe.

Type Ⓓ: Push end of rubber hose with hose socket onto unit by hand as far as they will go. Clamp is not necessary at this connection.

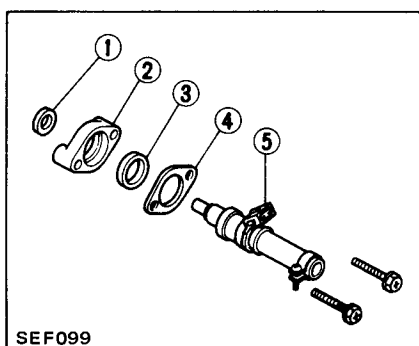
Type Ⓔ: Push end of injector rubber hose onto fuel pipe until it is 28 mm (1.10 in) from end of pipe.



INJECTOR



The injector operates on the solenoid valve principle. When an electric signal is applied to the coil built into the injector, the plunger is pulled into the solenoid, thereby opening the needle valve for fuel injection. The quantity of injected fuel is in proportion to the duration of the pulse applied from the control unit.

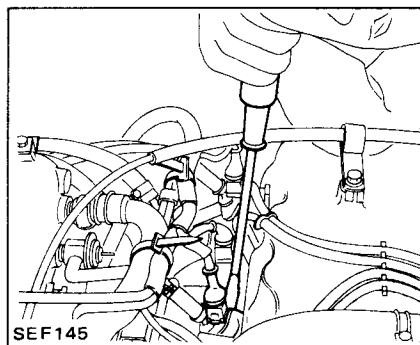


- 1 Injector lower rubber insulator
- 2 Injector lower holder
- 3 Injector upper rubber insulator
- 4 Injector upper holder
- 5 Injector

Inspection

When engine rotates

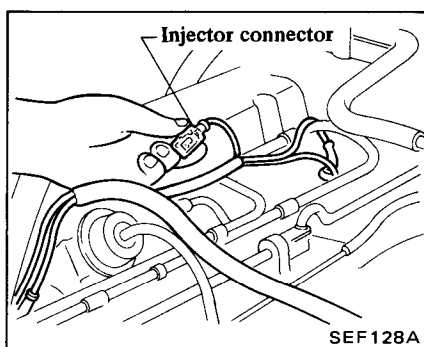
1. Start the engine and, using a screwdriver, determine whether operating noises can be heard from each injector.



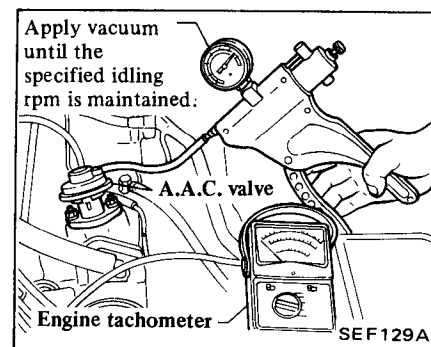
2. Release the idle and air-fuel ratio feedback controls. While the engine is idling, disconnect the injector wiring connectors one by one, beginning with No. 1, to determine whether any changes occur in idling speed or stability.

(1) The injection can be considered faulty if the idle does not change when the connector is disconnected.

(2) If the changes in the idle are even for each cylinder, the injector's operation can be considered normal.

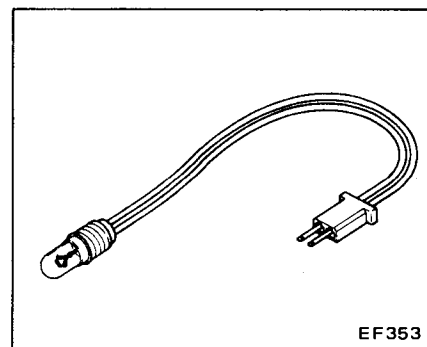


- a. Disconnect the exhaust gas sensor's harness to release the air-fuel ratio feedback control.
- b. To release the idle control, attach a vacuum handy pump to the A.A.C. valve hose, and adjust until the specified idle speed is reached. (E.C.C.S. model only)



Engine will not start

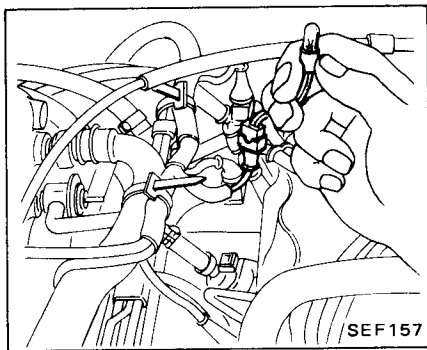
1. Inspection lamp, as shown in figure below, is required for this test.



Make inspection lamp as follows:

- 1) Prepare 12V-3W lamp.
 - 2) Prepare socket and set lamp in it.
 - 3) Use flat plate terminals 3 mm (0.12 in) wide, 0.8 mm (0.031 in) thick as male terminals. Place flat plate terminals parallel with each other and keep distance between inside faces 2 mm (0.08 in). Then secure terminals by wrapping insulation tape or with suitable terminal body.
2. Disconnect injector harness connector.

3. Connect inspection lamp to injector harness connector.

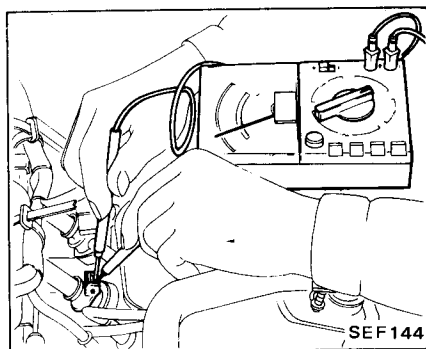


4. After starting engine or cranking engine, check inspection lamp to see if it flashes at regular intervals. If so, electric signals are being properly transmitted to injectors.

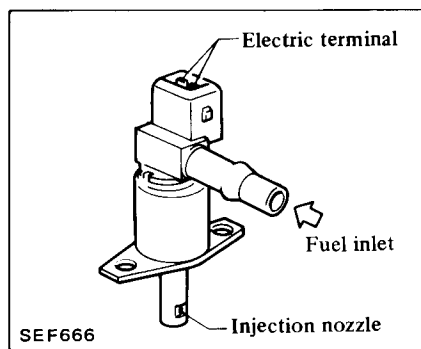
- a. The engine should be cranked at a speed of more than 80 rpm.
- b. The control unit may fail to generate a correct pulse signal at an excessively low battery voltage. It is recommended, therefore, that a battery voltage of more than 9 volts be applied during the cranking operation.

5. If the inspection light illuminates, determine whether the electrical resistance between the injector terminals is normal.

Normal value: 2 - 3 ohms



COLD START VALVE



The cold start valve causes fuel to be injected into the intake manifold independently of the injector operation so that the engine can be started smoothly during cold weather.

The cold start valve operates on the electromagnetic principle.

To improve fuel-air mixing at lower temperatures, the cold start valve employs a swirl type nozzle.

AIR FLOW SYSTEM

AIR FLOW METER

The air flow meter measures the quantity of intake air, and sends a signal to the control unit so that the base pulse width can be determined for correct fuel injection by the injector. The air flow meter is provided with a flap in the air passage. As the air flows through the passage, the flap rotates and its angle of rotation electronically signals the control unit.

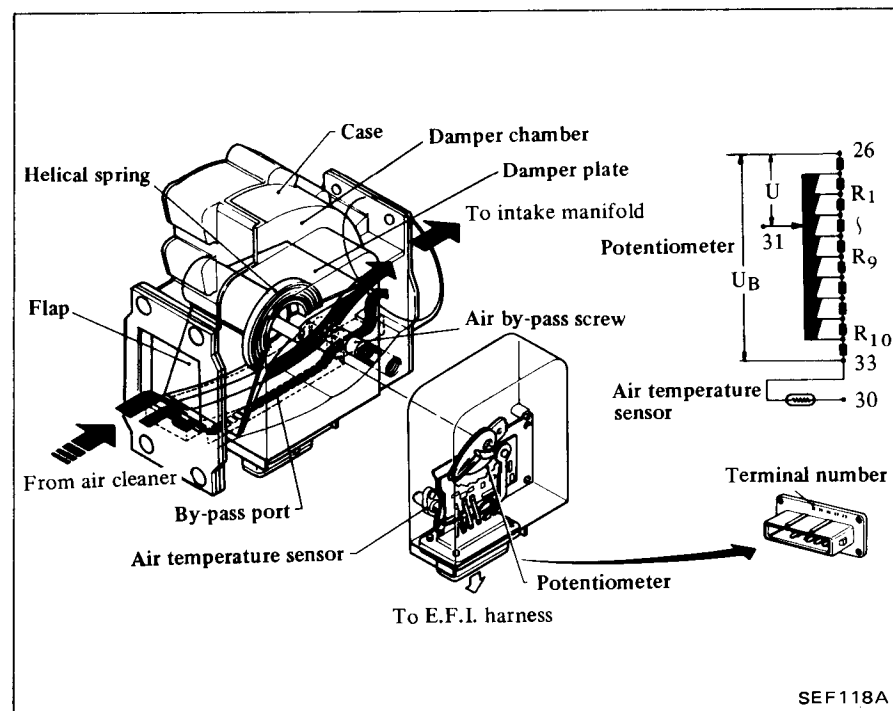
During idling operation when the amount of intake air is extremely small, the air flows parallel with the flap through the by-pass port so that the specified intake air flow can be provided correctly.

An air temperature sensor is installed in the air passage.

The by-pass port has the air by-pass screw which regulates the idle mixture ratio.

Adjusting the idle mixture should be performed only when it is necessary.

Refer to adjusting the idle mixture.



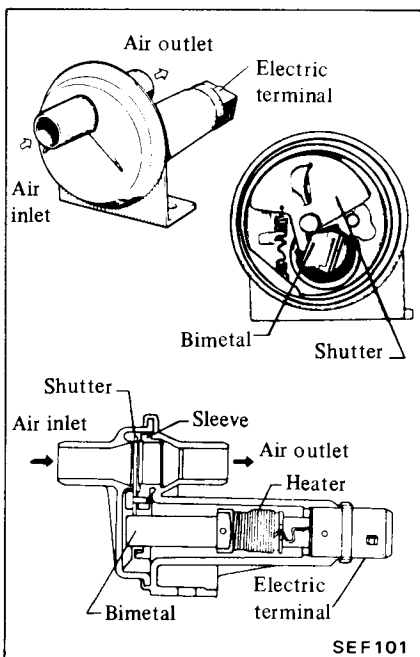
6. If the resistance value is abnormal, replace the injector.

AIR REGULATOR

The air regulator by-passes the throttle valve to control the quantity of air for increasing the engine idling speed when starting the engine at a bimetal temperature of below the specified value.

E.F.I. models 80°C (176°F)

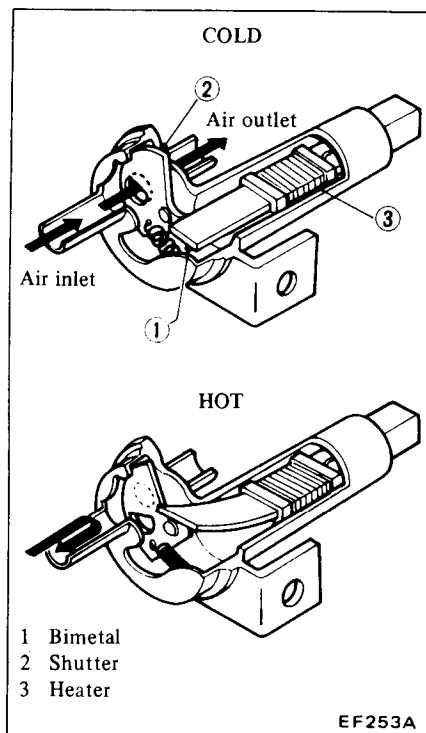
E.C.C.S. models 65°C (149°F)



A bimetal and a heater are built into the air regulator. When the ignition switch is turned to the "START" position or engine running, electric current flows through the heater, and the bimetal, as it is heated by the heater, begins to move and closes the air passage in a few minutes. The air passage remains closed until the engine is stopped and the bimetal temperature drops to below the specified value.

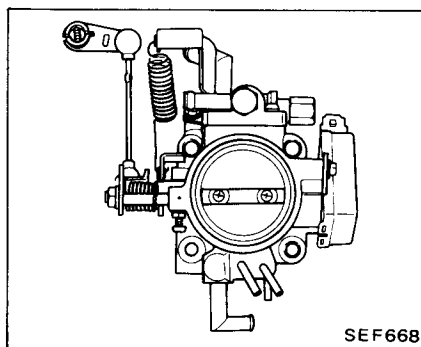
E.F.I. models 80°C (176°F)

E.C.C.S. models 65°C (149°F)

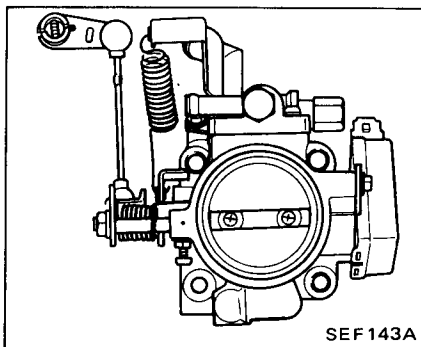


THROTTLE CHAMBER

E.F.I. Models



E.C.C.S. Models



The throttle chamber, located between the air flow meter or the turbo-charger and the intake manifold, is equipped with a valve. This valve controls the intake air flow in response to accelerator pedal movement. The rotary shaft of this valve is connected to the throttle valve switch.

ELECTRICAL SIGNAL SYSTEM

CYLINDER HEAD TEMPERATURE SENSOR

The cylinder head temperature sensor, built into the cylinder head, monitors change in cylinder head temperature and transmits a signal to increase the pulse duration during the warm-up period.

The temperature sensing unit employs a thermistor which is very sensitive in the low temperature range.

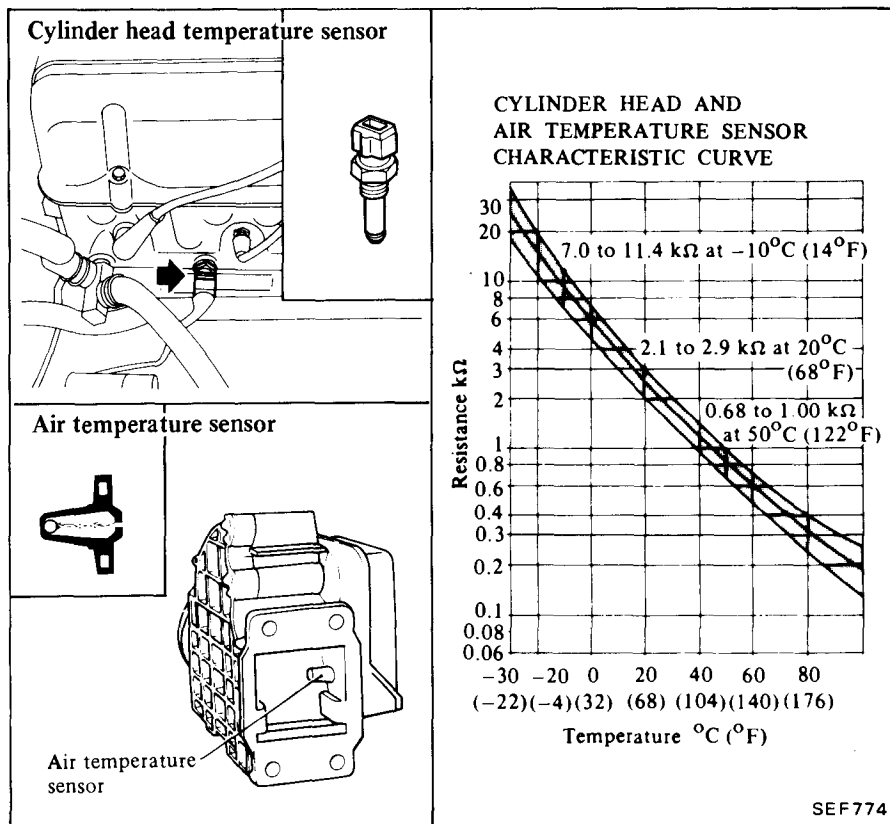
The electrical resistance of the thermistor decreases in response to the temperature rise.

AIR TEMPERATURE SENSOR

The air temperature sensor, built into the air flow meter, monitors change in the intake air temperature and transmits a signal for the fuel enrichment to change the pulse duration.

The temperature sensing unit employs a thermistor which is very sensitive in the low temperature range.

The electrical resistance of the thermistor decreases in response to air temperature rise.

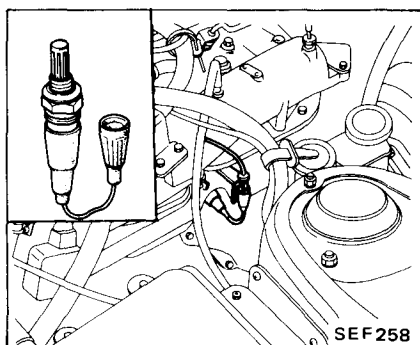


EXHAUST GAS SENSOR

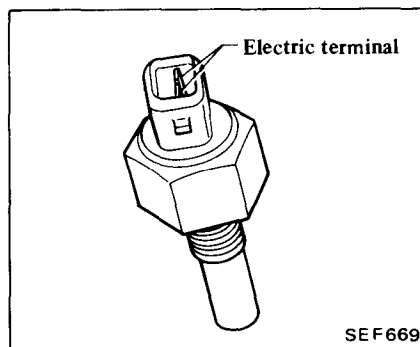
The exhaust gas sensor produces an electromotive force depending on air-fuel mixture ratio.

The electromotive force varies directly with the density of oxygen in exhaust gases which is burned at the theoretically determined air-fuel ratio of the mixture; electromotive force increases when there is a richer mixture, and electromotive force decreases when there is a lean mixture.

The electromotive force is transmitted to the control unit by means of a signal which activates the control unit in order to provide the optimum amount of fuel injection.



THERMOTIME SWITCH

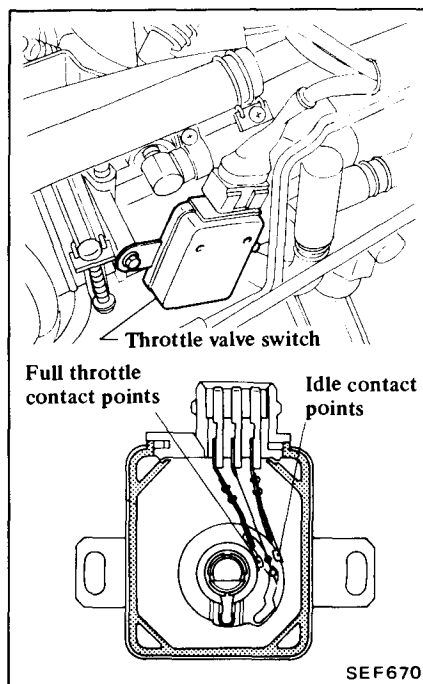


The thermotime switch is built into the thermostat housing.

A harness is connected in series to the cold start valve from the thermotime switch. The bimetal contact in the thermotime switch opens or closes depending on the cooling water temperature, and sends a signal to the cold start valve so that an additional amount of fuel can be injected for starting operation of the engine.

THROTTLE VALVE SWITCH

The throttle valve switch is attached to the throttle chamber and actuates in response to accelerator pedal movement. This switch has two sets of contact points. One set monitors the idle position and the other set monitors full throttle position.



Idle contact

The idle contact closes when the throttle valve is positioned at idle and opens when it is at any other position. The idle contact compensates for after idle enrichment, and sends the fuel shut-off signal.

Full throttle contact

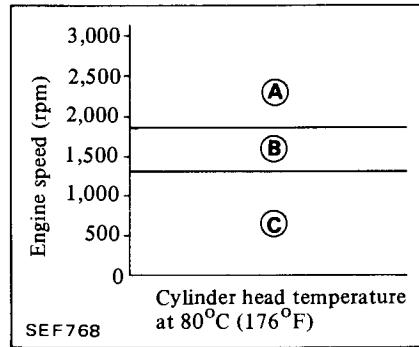
The full throttle contact closes only when the throttle valve is positioned at full throttle (more than 35 degree opening of the throttle valve). The contact is open while the throttle valve is at any other position.

The full contact compensates for enrichment in full throttle.

FUEL SHUT-OFF

Fuel shut-off is accomplished during deceleration when the engine does not require fuel.

The graph below shows the fuel shut off range.

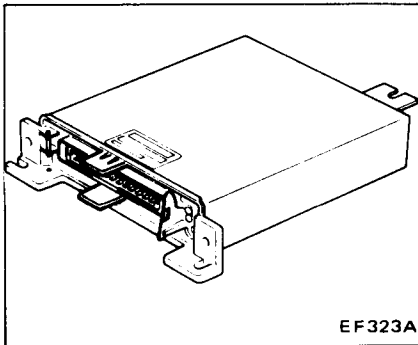


Deceleration from zone "A"	Fuel is shut off; and fuel is injected again in zone "C".
Deceleration from zone "B"	Fuel is shut off; and fuel is injected again in zone "C".
Deceleration from zone "C"	Fuel is not shut off.
Engine rpm increased in order of "C", "B", and "A". (Idle switch ON, downhill driving, etc.)	Fuel is not shut off in zones "C" and "B"; in zone "A", fuel is shut off.

The control unit consists mainly of three integrated circuits formed on the printed circuit board. This construction provides superior control unit reliability.

WARNING:

If your car is equipped with electronic controls, use of a transmitter, such as a radio transmitter (but not a receiver, such as a radio) may interfere with unshielded electronic controls and cause them to malfunction. Car manufacturers do not necessarily use electronic controls in the same ways or for the same operations. Examples of vehicle functions which may involve electronic controls include fuel delivery systems, engine timing, brakes, emission control and cruise control. Definite information regarding the type of electronic controls in your car can only be obtained from the manufacturer. Consult your NISSAN/DATSUN dealer regarding the need for modifications to your car's electronic controls before installation or use of a transmitter.

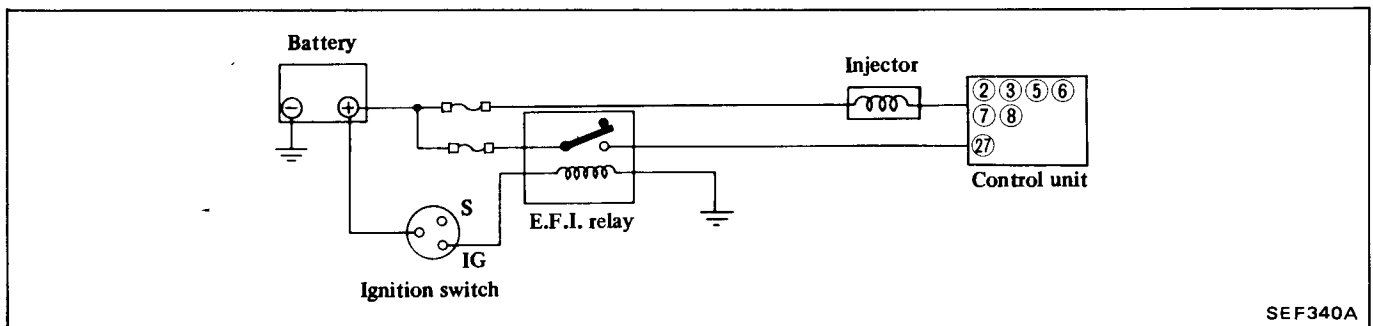
CONTROL UNIT

The control unit is connected to the E.F.I. harness by means of a multi-connector, and the E.F.I. harness is connected to other sensors.

The essential role of the control unit is to generate a pulse. Upon receiving an electrical signal from each sensor, the control unit generates a pulse whose duration (injector open-valve time period) is controlled to provide an optimum quantity of fuel according to the engine characteristics.

RELAY**E.F.I. relay**

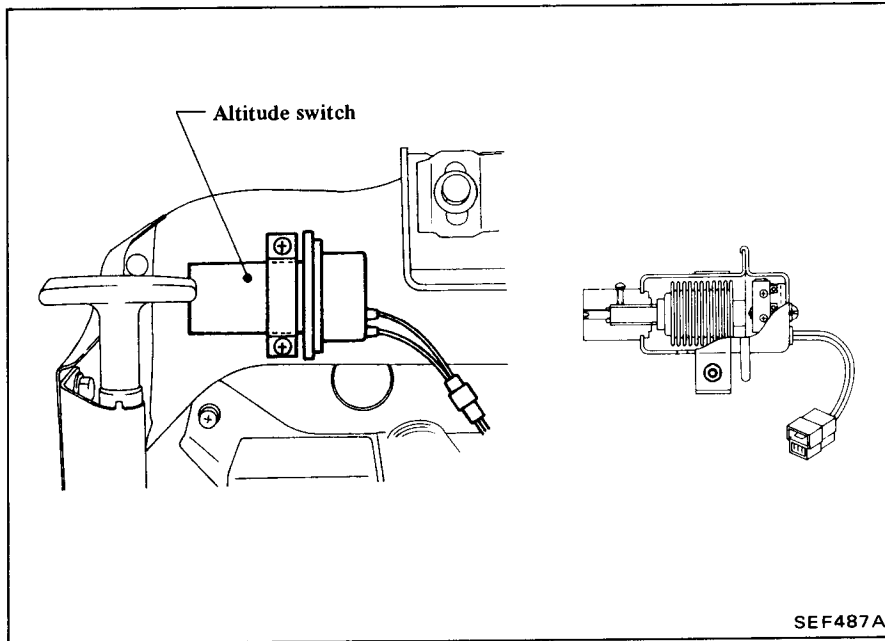
The E.F.I. relay serves to activate the electronic fuel injection system through the ignition switch.



ALTITUDE SWITCH

This switch is attached to the stay on the left side of the instrument panel in the driver's compartment.

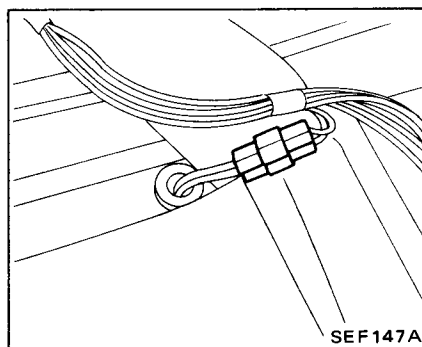
Consisting of a bellows and a micro-switch, the switch transmits an ON or OFF signal to the control unit according to change in atmospheric pressure.



Classification	Atmospheric pressure	Altitude switch
"Low altitude [Approx. 1,370 m (4,500 ft) or lower]	Approx. 86.6 kPa (650 mmHg, 25.59 inHg) or above	OFF
"High" altitude [Approx. 1,370 m (4,500 ft) or higher]	Approx. 86.6 kPa (650 mmHg, 25.59 inHg) or below	ON

FUEL SYSTEM PRESSURE CHECK

Before disconnecting fuel hose, release fuel pressure from fuel line for safety reasons.



RELEASING FUEL PRESSURE

1. Start the engine.
2. Open back door and remove center tonneau cover.
3. Disconnect fuel pump connector.

4. After the engine stalls, crank the engine two or three times.

5. Turn the ignition switch "OFF".

6. Connect fuel pump connector.

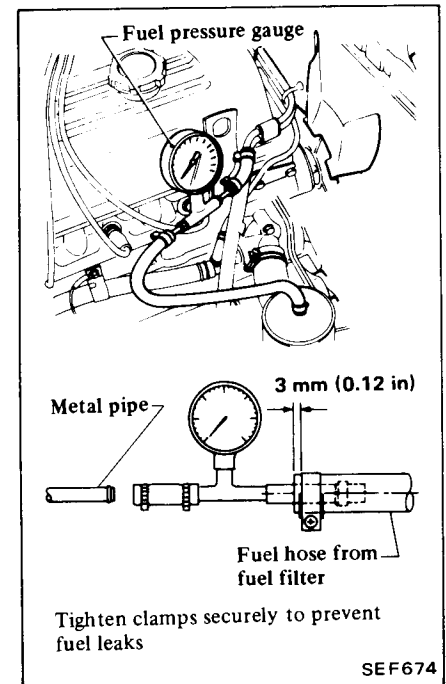
If engine does not start, remove fuel pump connector and crank the engine for about 5 seconds.

FUEL PRESSURE CHECK

When reconnecting the lines, always use new clamps and be sure to position them correctly.

Use a torque driver to tighten clamps.

1. Install Pressure Gauge (J 25400-34) between fuel filter hose and metal pipe at point shown. For convenience in later tests, position gauge so that it can be read from driver's seat.



2. Start engine and read fuel pressure gauge.

At idling:

Approximately 206 kPa (2.1 kg/cm², 30 psi)

The moment accelerator pedal is fully depressed:

Approximately 255 kPa (2.6 kg/cm², 37 psi)

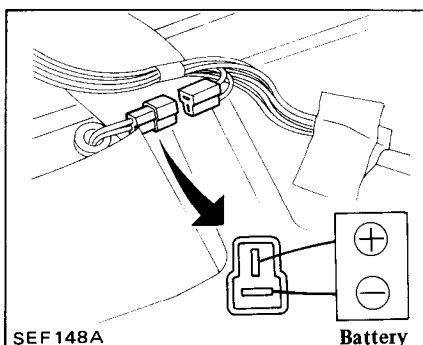
3. If fuel pressure is not as specified, replace pressure regulator, and repeat fuel pressure check.

If below the specified value, check for clogged or deformed fuel lines, and if necessary, replace fuel pump as an assembly or check valve.

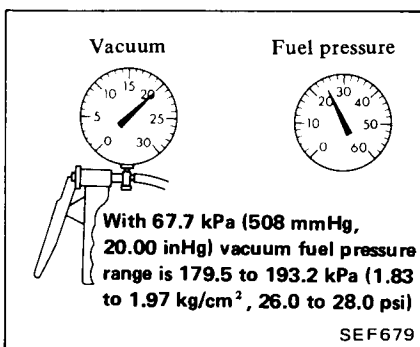
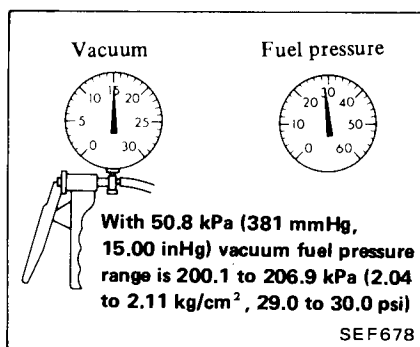
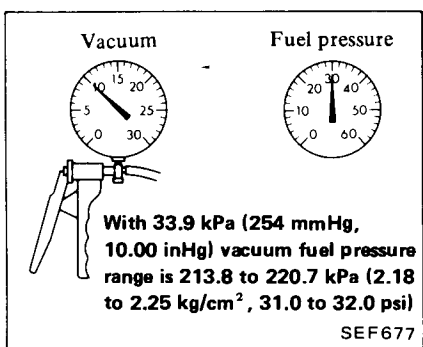
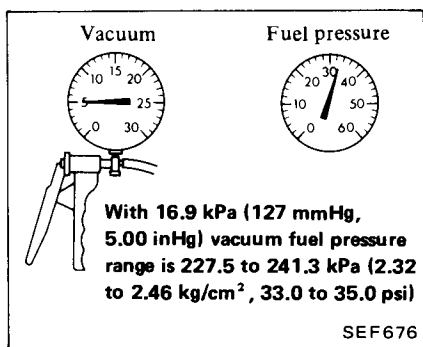
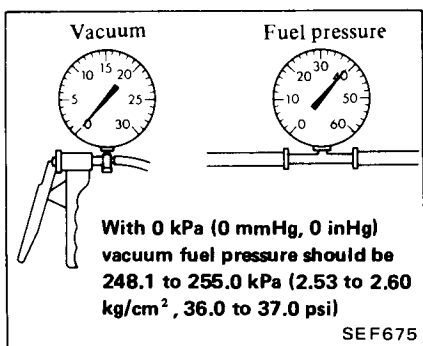
4. Connect variable vacuum source, J 23738 or equivalent to fuel regulator. Disconnect fuel pressure regulator

vacuum hose from intake manifold and attach hose to variable vacuum source.

5. Disconnect fuel pump connector and apply battery voltage when checking the following.



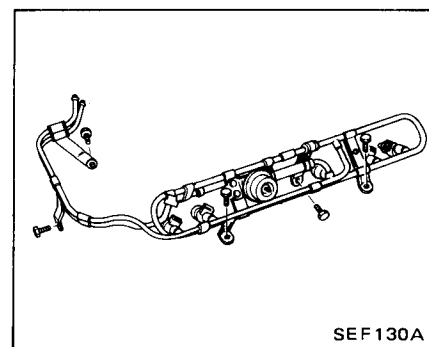
6. Observe fuel pressure readings as vacuum is changed.



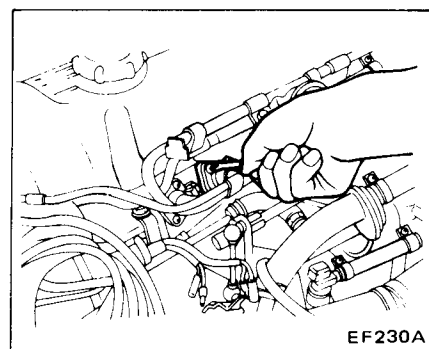
Fuel pressure must decrease as vacuum increases. If results are unsatisfactory, replace pressure regulator.

7. Reconnect fuel pump connector.
8. Disconnect variable vacuum source and connect fuel pressure regulator vacuum hose to intake manifold.

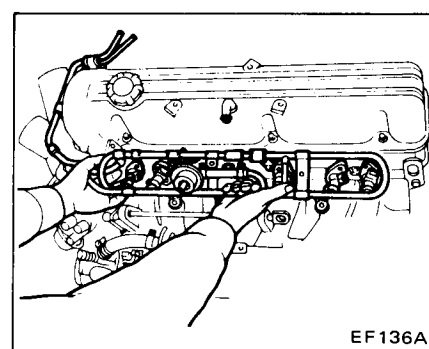
8. Remove bolts securing fuel pipe.



9. Remove screws securing fuel injectors.



10. Remove fuel pipe assembly by pulling out fuel pipe, injector and pressure regulator as an assembly.



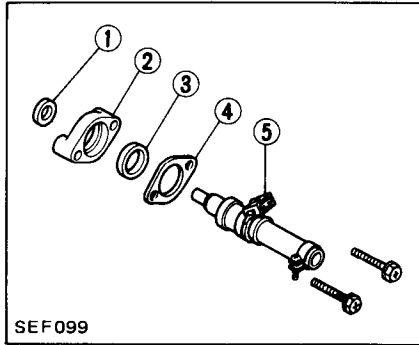
REPLACEMENT

1. Lower fuel pressure.
Refer to FUEL PRESSURE CHECK.
2. Disconnect electric connector from injector.
3. Disengage harness from fuel pipe wire clamp.
4. Disconnect blow-by hose at rocker cover side.
5. Disconnect vacuum tube (connecting pressure regulator to intake manifold) from pressure regulator.
6. Remove air regulator pipe.
7. Disconnect fuel feed hose and fuel return hose from fuel pipe.

Place a rag under fuel pipe to prevent splashing of fuel.

11. Unfasten hose clamp on fuel injector and remove fuel injector from fuel pipe.

Place a rag under injector when disconnecting fuel pipe to prevent splashing of fuel.

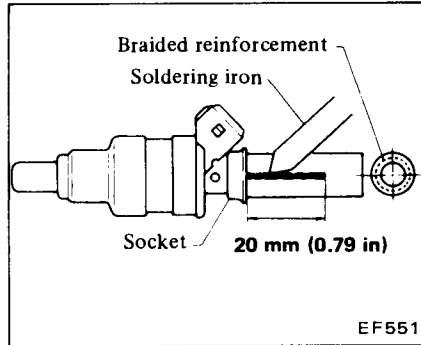


- 1 Injector lower rubber insulator
- 2 Injector lower holder
- 3 Injector upper rubber insulator
- 4 Injector upper holder
- 5 Injector

INJECTOR RUBBER HOSE

If necessary, replace injector rubber hose. Proceed as follows:

Removal



1. On injector rubber hose, measure off a point approx. 20 mm (0.79 in) from socket end.
2. Heat soldering iron (150 watt) for 15 minutes. Cut hose into braided reinforcement from mark to socket end.

Do not feed soldering iron until it touches injector tail piece.

CAUTION:

- a. Be careful not to damage socket, plastic connector, etc. with soldering iron.
- b. Never place injector in a vise when disconnecting rubber hose.

3. Then pull rubber hose out with hand.

Installation

1. Clean exterior of injector tail piece.
2. Wet inside of new rubber hose with fuel.
3. Push end of rubber hose with hose socket onto injector tail piece by hand as far as they will go.

Clamp is not necessary at this connection.

CAUTION:

After properly connecting fuel hose to injector, check connection for fuel leakage.

12. To install injector and fuel pipe, reverse the order of removal.

When installing injector, check that there are no scratches or abrasion at lower rubber insulator, and securely install it, making sure it is air-tight.

13. For installation of fuel hose, refer to Fuel Hose.

ELECTRONIC CONCENTRATED ENGINE CONTROL SYSTEM (E.C.C.S.)

OUTLINE

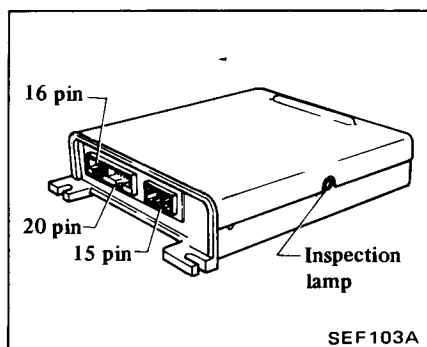
In the Electronic Concentrated Engine Control System (E.C.C.S.), the control unit employs a micro-computer. This micro-computer controls fuel injection, spark timing, exhaust gas recirculation (E.G.R.), idle speed, fuel pump operation and mixture ratio feedback.

It is unnecessary to adjust idle CO%, idle rpm and ignition timing.

Electrical signals from each sensor are fed into the micro-computer and each actuator is controlled by an electrical pulse with a duration that is computed in the micro-computer.

E.C.C.S. CONTROL UNIT

The E.C.C.S. control unit consists of a micro-computer, connectors for signal input and output and power supply, and an exhaust gas sensor monitor lamp. The control unit controls the quantity of fuel that is injected, ignition timing, idle speed, E.G.R. quantity, fuel pump operation, and feedback of the mixture ratio.

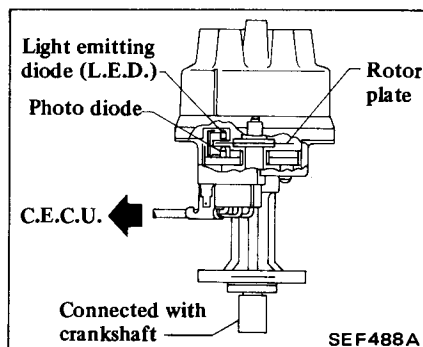


WARNING:

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CRANK ANGLE SENSOR

The crank angle sensor detects engine rpms and the crank angle (piston position). It also sends a signal to the control unit to control various operations. This sensor is built into the distributor.

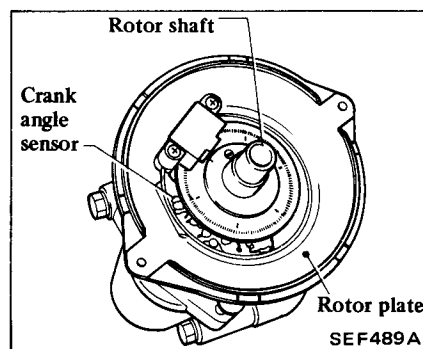


Use care when installing, the crank sensor built in to the distributor as the position of matching mark is different from former model. (Refer to Section EM.)

SIGNAL ROTOR PLATE

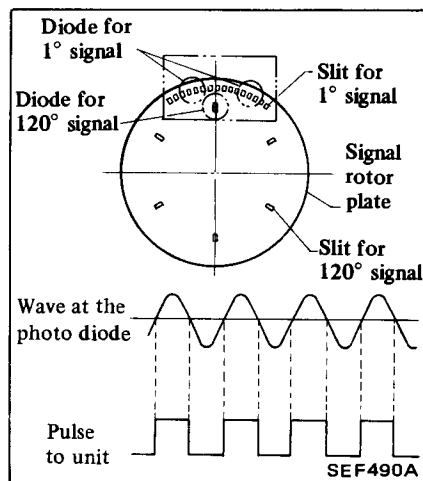
The signal rotor plate has 360 slits at 1° intervals on its outer periphery. It also has six slits at 60° intervals.

These six slits are used to detect the crank angle, that is, the position of each piston. The teeth are used to provide the 1° signal that is necessary to control engine rpms and ignition timing.



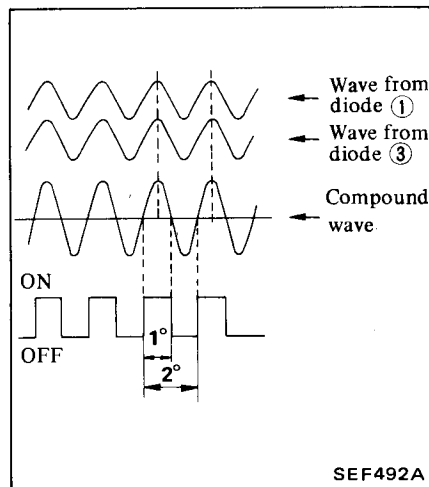
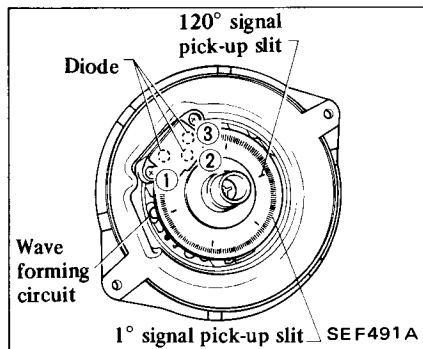
CRANK ANGLE SENSOR OPERATION

The crank angle sensor has two diodes and a wave forming circuit. When a signal rotor plate passes the space between the Light Emitting Diode (L.E.D.) and Photo Diode, the slit of the signal rotor plate alternately cuts the light which is sent to the photo diode from the L.E.D. This causes an alternative voltage and it is then converted into an on-off pulse by the wave forming circuit, which is sent to the control unit.



Detection of 1° signal (For detecting of engine rpms and ignition timing control)

Diodes ① and ③ are used to detect the 1° signal which is created by 360 slits on the rotor plate. When a slit reaches the space between the L.E.D. and photo diode, the photo diode receives the light from the L.E.D. and this causes an alternative voltage. Thus, each wave from each diode is compounded. Then, the compound wave is converted into an on-off pulse. This 1° on-off signal is sent to the control unit.



Detection of 120° signal (For detecting piston T.D.C.)

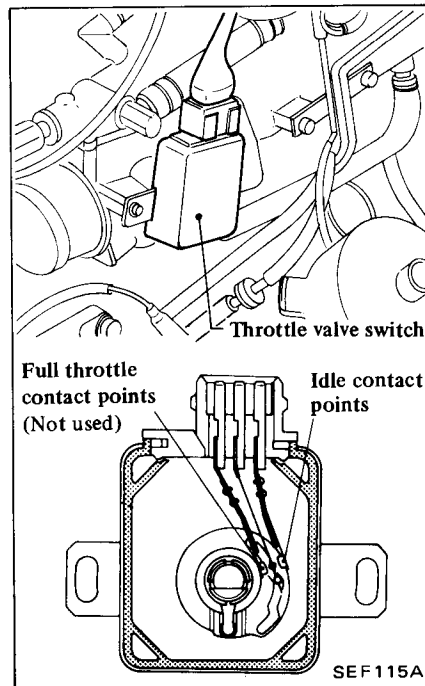
Diode ② is used to detect the 120° signal which is created by 60° slits on the rotor plate. When a slit reaches the space between the L.E.D. and photo diode, the photo diode catches the light from the L.E.D. and this causes an alternative voltage. At this time, a signal on-off pulse is generated. Since engine rpm is twice that of the distributor, the rotor plate has six dits at 60° intervals.

THROTTLE VALVE SWITCH

The throttle valve switch is attached to the throttle chamber and actuates in response to accelerator pedal movement.

This switch has the idle contact.

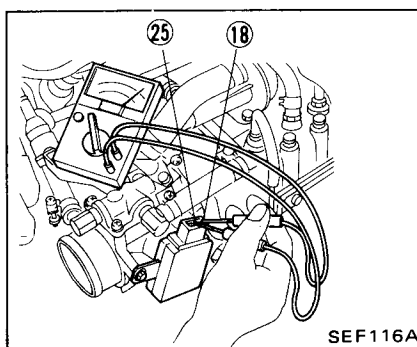
The idle contact closes when the throttle valve is positioned at idle and opens when it is at any other position.



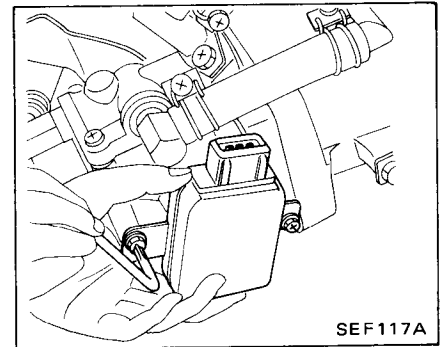
ADJUSTMENT

Ohmmeter method

1. Disconnect throttle valve switch connector.
2. Connect ohmmeter between terminals ⑱ and ㉕, and make sure continuity exists.



3. Adjust throttle valve switch position, with retaining screw, so that idle switch may be changed from "ON" to "OFF" when engine speed is about 750 rpm under no load.



AIR FLOW METER

Refer to E.F.I. system operation.

CYLINDER HEAD TEMPERATURE SENSOR

Refer to E.F.I. system operation.

AIR TEMPERATURE SENSOR

Refer to E.F.I. system operation.

BAROMETRIC PRESSURE SENSOR

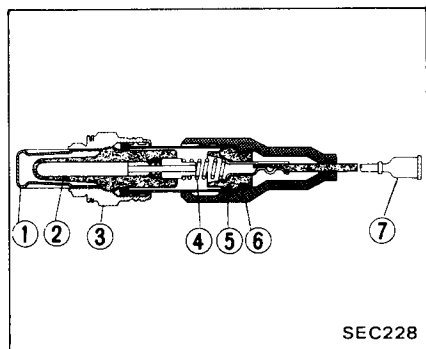
This sensor is built into the control unit and senses the barometric pressure in order to compensate for the density of the intake air.

This sensor cannot be replaced, adjusted or checked as a single unit.

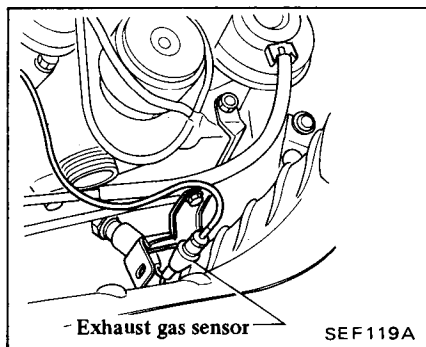
If it malfunctions, replace control unit.

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.

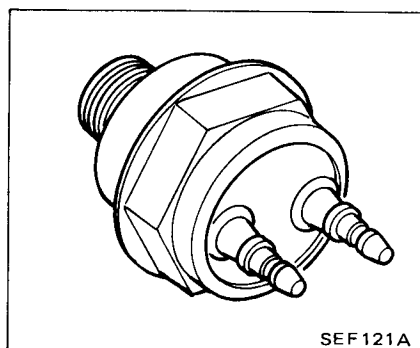
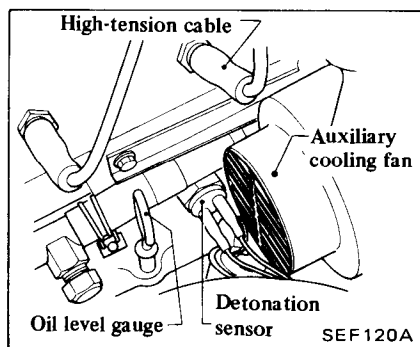


- | | |
|-----------------|--------------------|
| 1 Louver | 5 Terminal support |
| 2 Zirconia tube | 6 Boots |
| 3 Holder | 7 Connector |
| 4 Spring | |



DETONATION SENSOR

The detonation sensor is attached to the cylinder block and senses engine knocking conditions. The sensor monitors the knocking from each combustion chamber and sends an electric signal to the control unit where it is changed to a knocking signal.



PARK/NEUTRAL SWITCH

The park/neutral switch detects the transmission gear selector's position and transmits an electric signal to the control unit.

CAR SPEED SENSOR

The car speed sensor provides a car speed signal to the control unit.

The speed sensor consists of a reed switch, which is installed in the speed meter unit and transforms car speed into a pulse signal.

BATTERY VOLTAGE

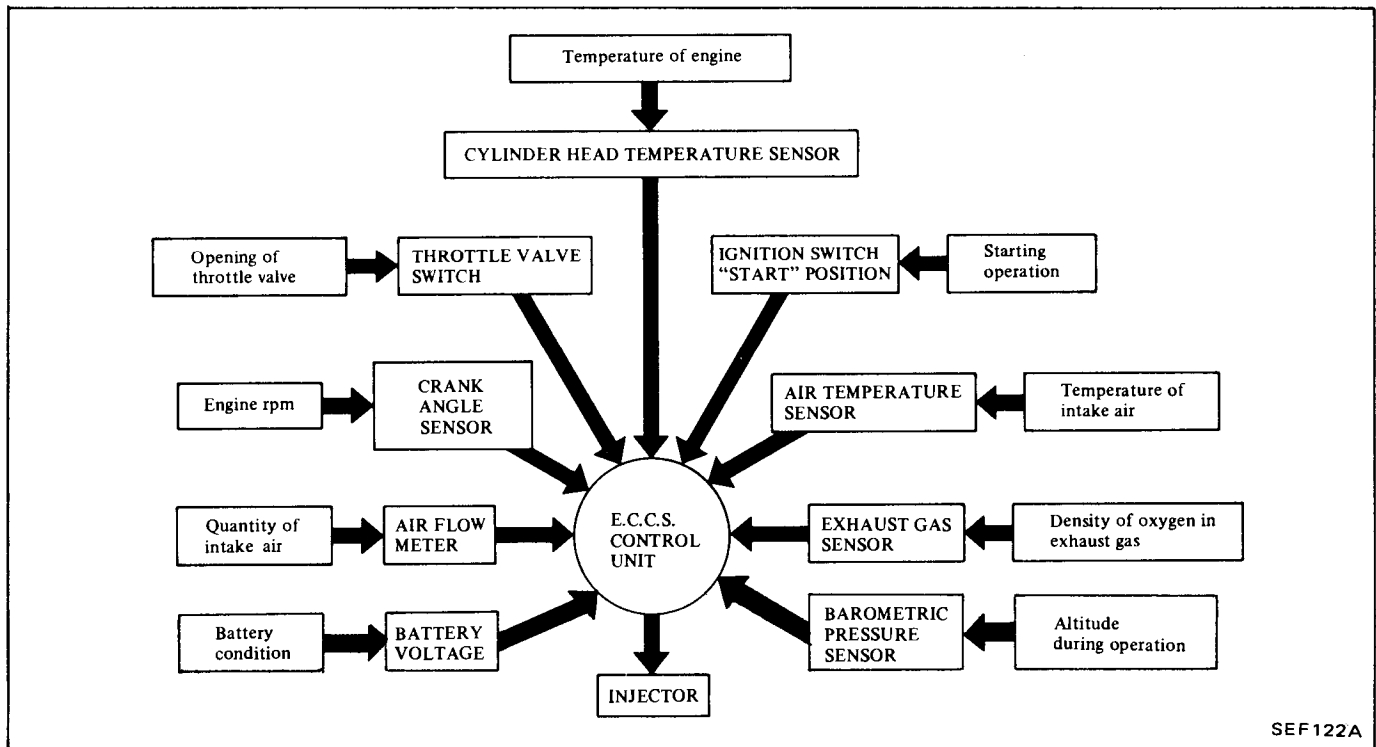
Battery voltage is sent to the control unit, which then function to compensate the variability in it.

FUEL INJECTION CONTROL

There are two ways to control fuel injection: open-loop control and

closed-loop control. Which one is used depends on the cylinder head tempera-

ture, engine rpm, engine load, exhaust gas sensor signal and so forth.



The control unit determines the proper quantity of fuel to be injected from each signal input and then operates the injector. Injections are timed for each rotation of the engine by the crank angle sensor signal and are made simultaneously in every cylinder.

OPEN-LOOP CONTROL

For improved driveability, fuel injection is controlled by open-loop control when the engine is cold, when driving at high speeds or under heavy load and when the fuel shut-off system is in operation. With open-loop control, the mixture ratio is determined by the Central Electronic Control Unit (C.E.C.U.) to correspond to the engine rpm, engine load and engine warm-up conditions.

Open-loop control will activate under the following conditions:

In the following instances, the control unit emits a signal that will return mixture ratio to the best point which will keep a good driving condition.

Starting engine

When starting engine.

Cold engine

Cylinder head temperature is below 40°C (104°F).

Driving condition

When driving at high speeds (about 3,600 rpm) or under heavy load.

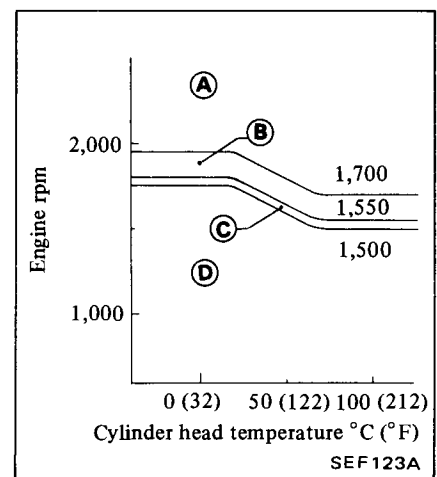
Exhaust gas sensor time monitor

- When an exhaust gas sensor monitors a too rich condition for more than 6.4 seconds.
- When an exhaust gas sensor monitors a too lean condition for more than 10 seconds.

Fuel shut-off operation

Fuel shut-off is accomplished during deceleration when the engine does not require fuel.

The graph below shows the fuel shut off range.



When a transmission gear is in "N" or "P" (A/T) and "Neutral" (M/T) position, or a clutch is depressed, this system does not operate.

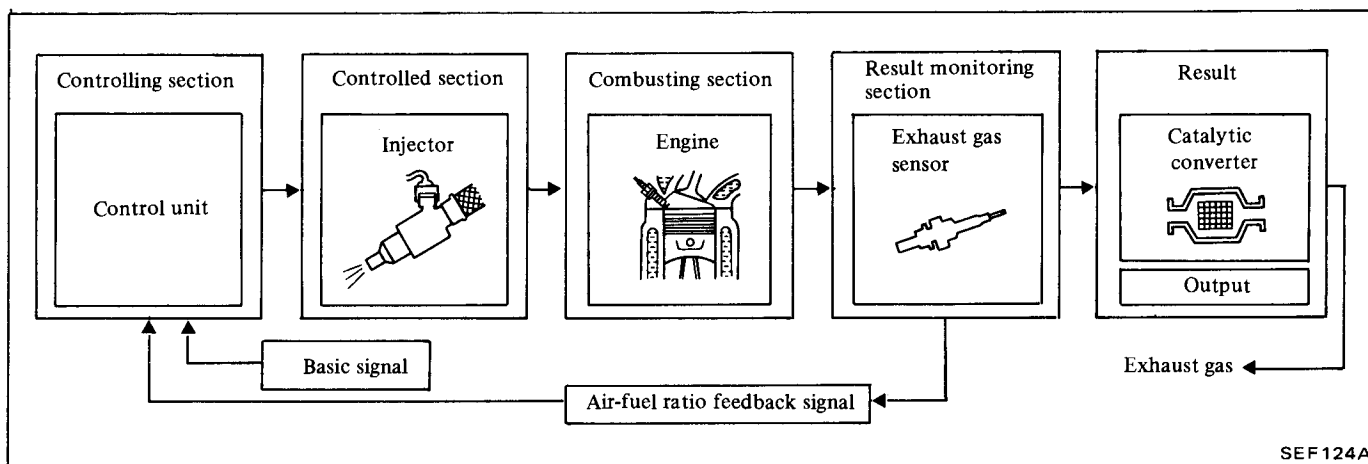
Deceleration from zone “(A)”	Fuel is shut off; and fuel is injected again in zone “(D)”.
Deceleration from zone “(B)”	Fuel is shut off; and fuel is injected again in zone “(D)”.
Deceleration from zone “(C)” and “(D)”	Fuel is not shut off.
Engine rpm increased in the order of “(D)”, “(C)”, “(B)” and “(A)”. (Idle switch ON, downhill driving, etc.)	Fuel is not shut off in zones “(D)”, “(C)” and “(B)”; in zone “(A)”, fuel is shut off.

neously. The system uses the oxygen sensor located in the exhaust manifold to give an indication of whether the inlet mixture ratio is richer or leaner than the stoichiometric point. The sensor transmits a nonlinear voltage to the electronic control unit. The control unit adjusts the injection 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.

MIXTURE RATIO FEEDBACK CONTROL (Closed-loop control)

This system is designed to control

the mixture ratio precisely to the stoichiometric point so that the three-way catalyst can minimize CO, HC and NO_x emissions simulta-



FUEL PUMP CONTROL

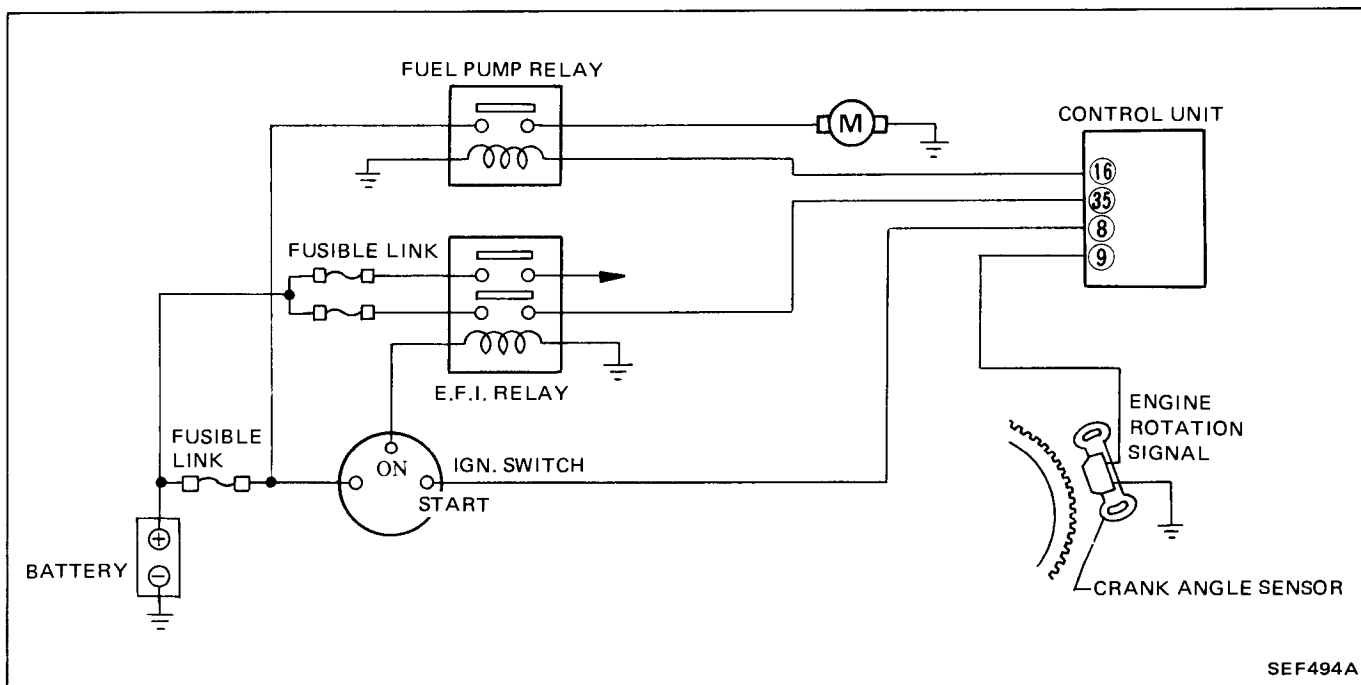
The fuel pump is controlled by the central electronic control unit adjusting to the engine conditions. The signals from engine crank angle and ignition switch are used for the fuel pump operation.

FUEL PUMP

A relief valve in the pump is designed to open when the pressure in the fuel line rises over 422 to 490 kPa (4.3 to 5.0 kg/cm², 61 to 71 psi) due to malfunction in the pressure system.

The check valve prevents abrupt drop of pressure in the fuel pipe when stopping the engine.

FUEL PUMP ELECTRICAL CIRCUIT

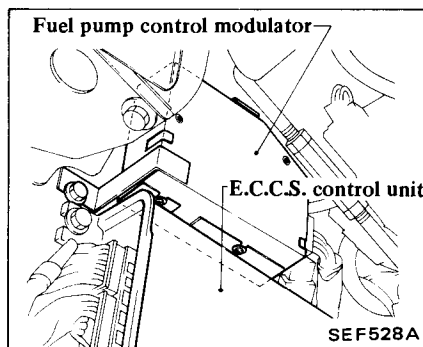


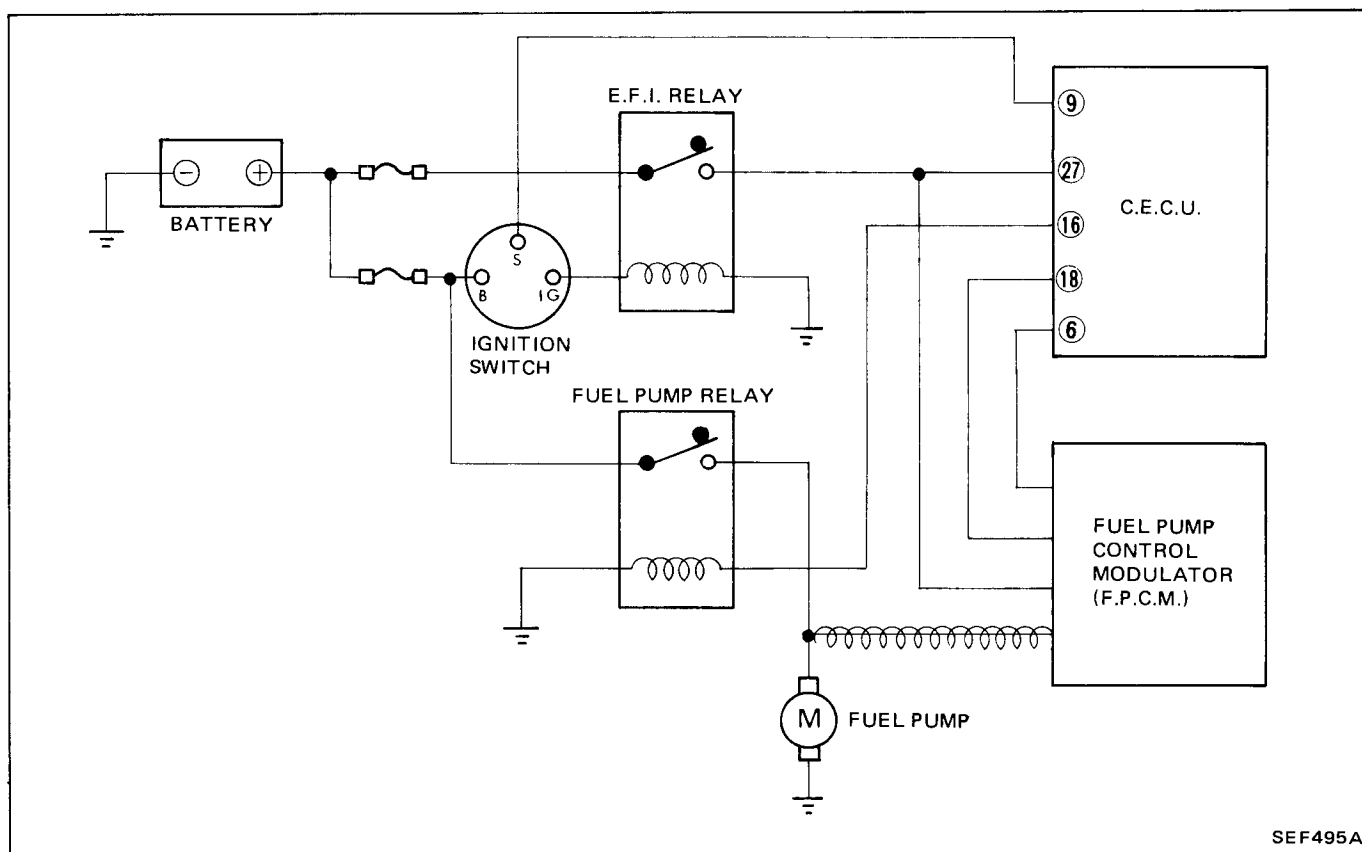
Fuel pump operation

Ignition switch position	Fuel pump operation	Engine speed	Crank angle sensor signal (received by control unit)	Fuel pump relay state
ON	Operates for 5 seconds	Stops	120° signal: None	ON for 5 seconds
START	Stops	Below 20 rpm	120° signal: None for 1 second	OFF
	Operates	Above 20 rpm	120° signal: Provided in 1 second	ON
ON	Stops	Below 20 rpm	120° signal: None for 1 second	OFF
	Operates	Above 20 rpm	120° signal: Provided in 1 second	ON

FUEL PUMP CONTROL MODULATOR

This modulator monitors engine conditions (engine rpm, cylinder head temperature, injector operating pulse width, etc.) and controls the voltage supplied to fuel pump. As a result of this operation, the fuel pump operation is controlled in order to reduce fuel pump noise and the power consumption of the fuel pump.



Operating circuit**Operation**

Engine operating condition	Voltage supplied to fuel pump
Engine cranking	Battery voltage
Above engine speed of 3,200 rpm	
Above injector operating pulse width of 3.5 m sec	
Above cylinder head temperature of 100°C (212°F)	
Below battery voltage of 9.8V	
Except the above conditions	9.8 V

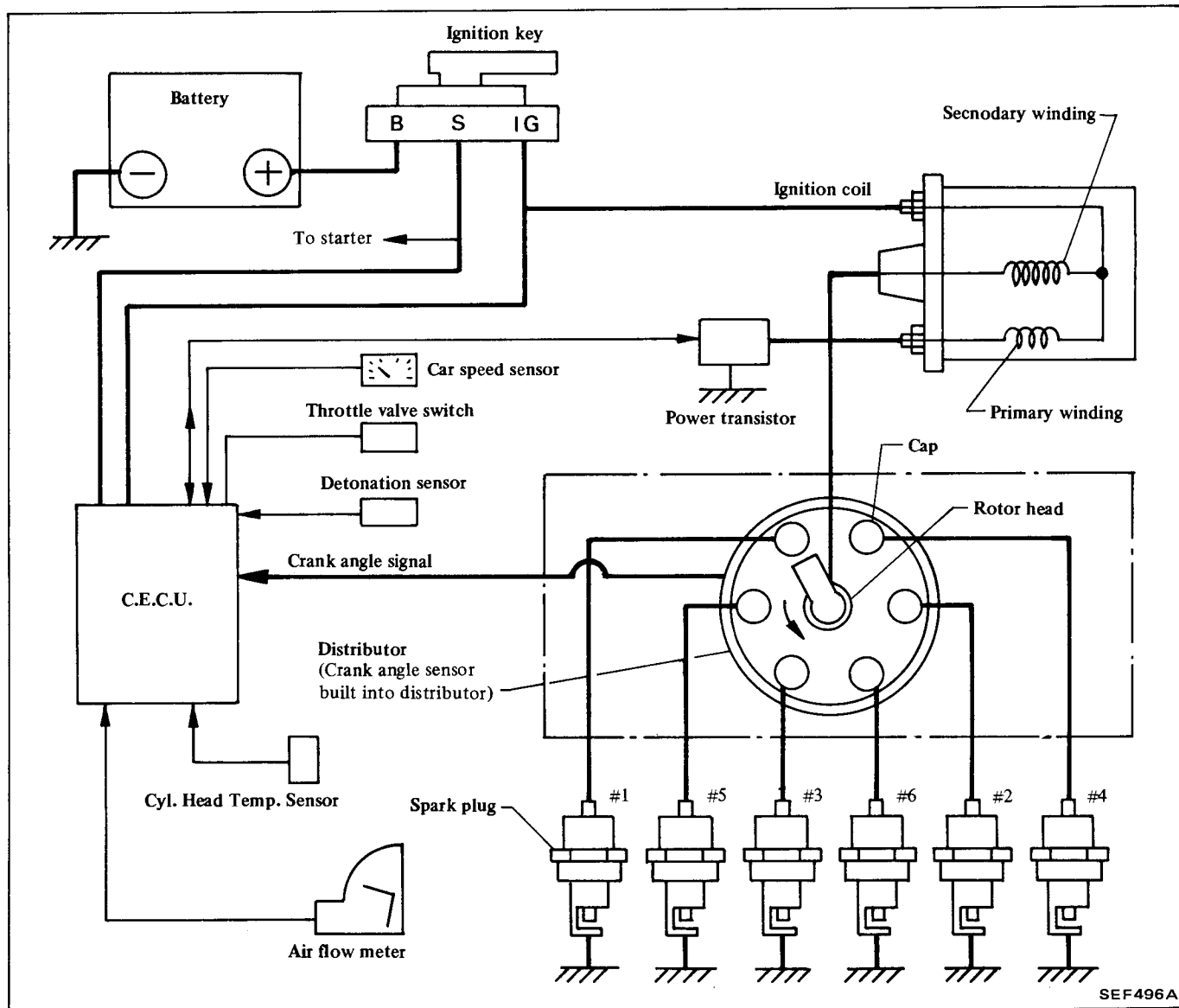
For other part descriptions and inspections, and fuel pressure check for Fuel Flow System, see E.F.I. System Operation. -

ELECTRONIC IGNITION TIMING CONTROL

The ignition timing is controlled by the central electronic control unit adjusting to the engine operating conditions: that is, as the best ignition timing in each driving condition has been memorized in the unit, the ignition timing is determined by the electric signal calculated in the unit.

The signals used for the determination of ignition timing are cylinder head temperature, engine rpm, engine load, engine crank angle, detonation sensor and so forth.

Then, the signal from the central electronic control unit is transmitted to the power transistor of the ignition coil, and controls the ignition timing. If there is engine knocking, a detonation sensor monitors its condition and the signal is transmitted to the central electronic control unit. After receiving it, the control unit controls the ignition timing to avoid the knocking condition.



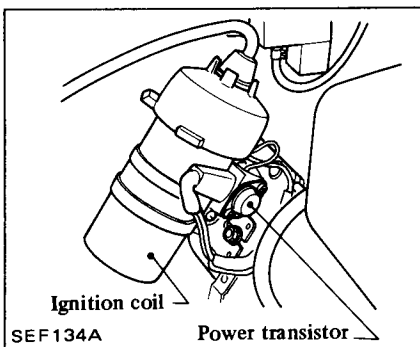
ADJUSTMENT

Ignition timing is automatically controlled by the control unit, and it is usually unnecessary to adjust it. However, the ignition timing can go wrong if the crank angle sensor mounting position gets out of alignment. When this happens, the crank angle sensor must be adjusted.

IGNITION COIL

The ignition coil has a built-in power transistor. The signal from the control unit is amplified by the power transistor. This amplified signal is used to connect and disconnect the ignition coil's primary current to generate high voltage across the secondary coil, and

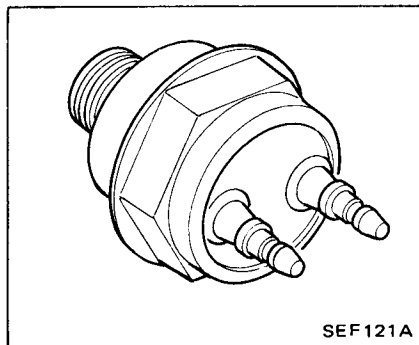
thereby create a spark in the spark plug.



DETONATION SENSOR

The detonation sensor is installed in the side face of the cylinder block. It converts the vibrations caused by

pressure in the combustion chamber into electrical signals. If the engine knocks while operating, the abnormal vibration will be detected by the detonation sensor. This signal is then sent to the control unit to retard the ignition timing to prevent further knocking.

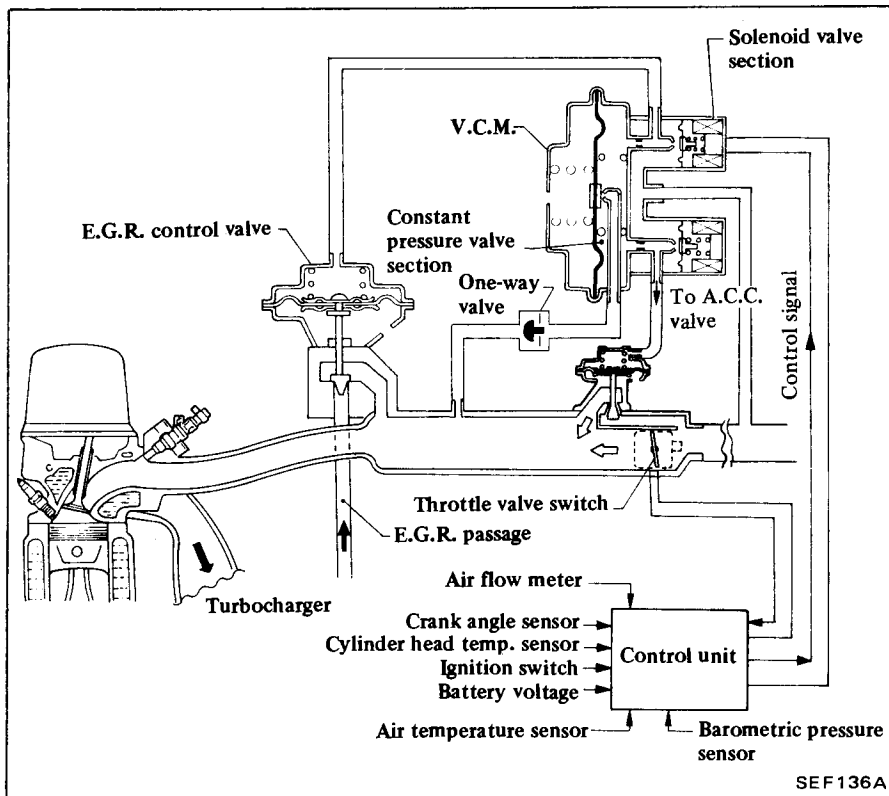


EXHAUST GAS RECIRCULATION (E.G.R.) CONTROL

E.G.R. is controlled by the central electronic control unit adjusting to the

engine operating conditions.

Cylinder head temperature, engine rpm, engine load, air temperature and barometric pressure are used for the determination of the E.G.R. amount.



These signals are transmitted to the control unit where optimum E.G.R. quantities are recorded. To obtain the optimum E.G.R. quantity that corresponds to the engine operating conditions at the time, an electric signal is

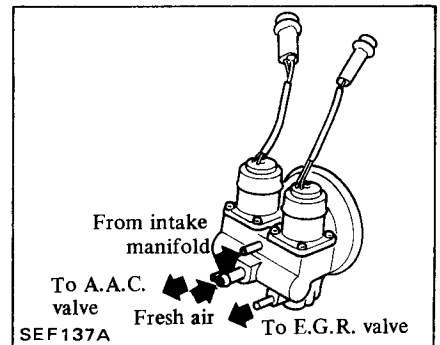
sent to the vacuum control modulator (V.C.M.). The vacuum control modulator transforms the electric signal to a vacuum signal, which in turn controls the E.G.R. valve.

OPERATION

Cylinder head temperature °C (°F)	Throttle valve switch	Starter switch	V.C.M. valve solenoid valve	E.G.R. control valve	E.G.R.
Below 57 (135)	ON	ON	ON	Closed	Not actuated
	OFF	OFF			
57 - 115 (135 - 239)	ON	ON	ON	Closed	Not actuated
	OFF	OFF	ON-OFF (control vacuum)	Open	Actuated
Above 115 (239)	ON	ON	ON	Closed	Not actuated
	OFF	OFF			

VACUUM CONTROL MODULATOR (V.C.M.)

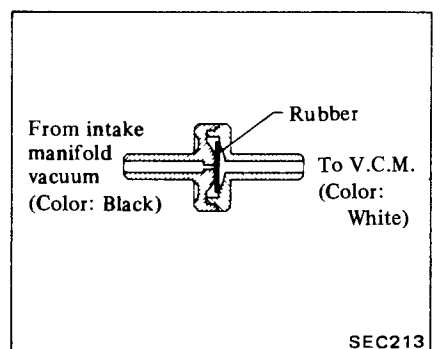
The vacuum control modulator is composed of a pressure regulator and solenoid valve. Intake manifold vacuum is used as the vacuum source for the pressure regulator. The passage leading to the atmosphere is controlled by solenoid valves. Using these components, the vacuum control modulator provides vacuum to the E.G.R. valve and A.A.C. valve (for idle speed control) following the electric signal from the control unit.



ONE-WAY VALVE

The one-way valve is utilized for the purpose of preventing the V.C.M. from applying positive pressure in high speed conditions.

This valve is installed in the vacuum line leading to V.C.M.



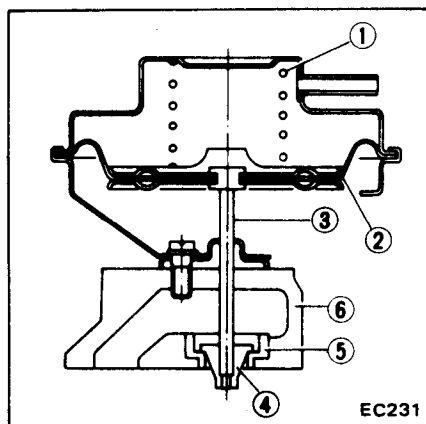
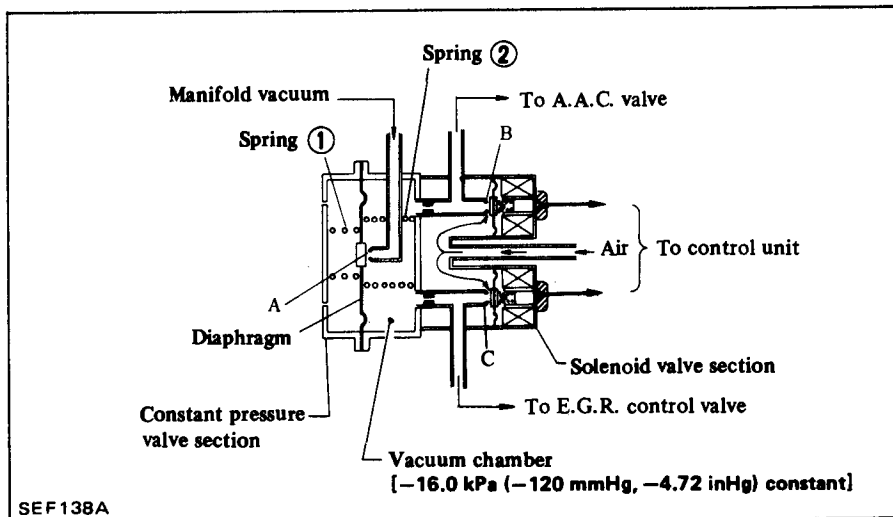
Operation

If the intake manifold vacuum exceeds -16.0 kPa (-120 mmHg, -4.72 inHg), portion A of the vacuum chamber is closed, and the vacuum in the chamber is kept at a constant -16.0 kPa (-120 mmHg, -4.72 inHg). As the solenoid valve is turned on or off

by the signal from the control unit, portion B or C opens or closes to allow a controlled amount of air to enter the -16.0 kPa (-120 mmHg, -4.72 inHg) vacuum passage. A properly controlled vacuum is thus sent to the E.G.R. or A.A.C. valves and controls the E.G.R. or A.A.C. valve operation.

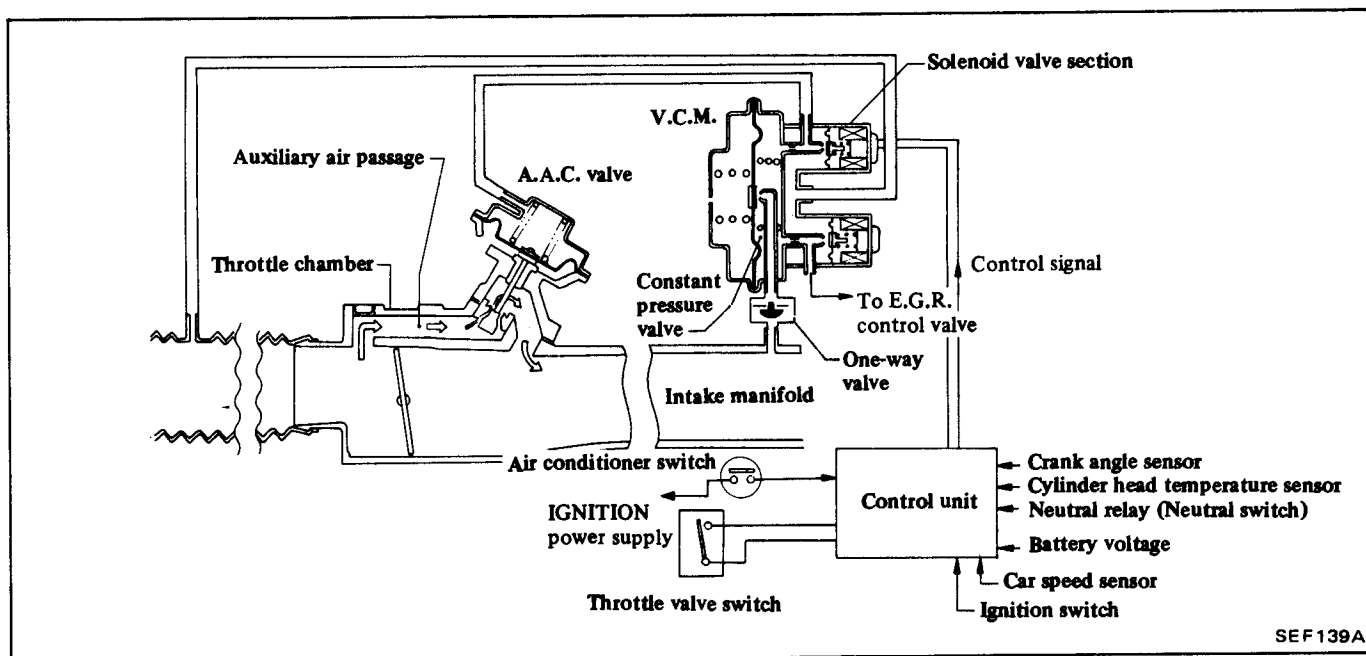
E.G.R. CONTROL VALVE

The E.G.R. control valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the throttle valve.



- | | |
|--------------------|-----------------|
| 1 Diaphragm spring | 4 Valve |
| 2 Diaphragm | 5 Valve seat |
| 3 Valve shaft | 6 Valve chamber |

IDLE SPEED CONTROL



The idle speed is controlled by the central electronic control unit adjusting to the engine operating conditions.

Cylinder head temperature, engine rpm, engine load, throttle valve and gear positions are used for the determination of idle speed.

The central electronic control unit

senses the idle conditions, and determines the appropriate idle speed at each gear position and cylinder head temperature, and sends the electric signal corresponding to the difference of the best idle speed and actual idle speed to the vacuum control modulator.

The vacuum control modulator

transforms the electric signal into a vacuum signal and transmits it to the A.A.C. valve

The A.A.C. valve has a feedback control system which controls the idle speed by the vacuum signal.

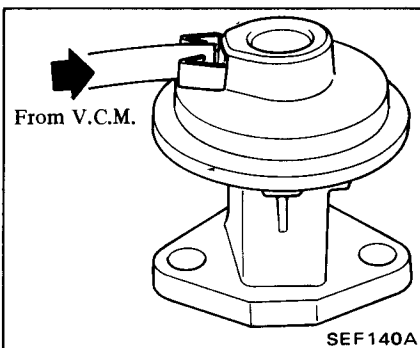
It is unnecessary to adjust the idle speed because of the idle speed feedback control.

Operation

Input		V.C.M. valve open period	A.A.C. valve open angle	Idle rpm
Cylinder head temperature sensor	Hot	Decreases	Decreases	Decreases
	Cold	Increases	Increases	Increases
Air conditioner switch	ON	Increases	Increases	Increases
	OFF	Decreases	Decreases	Decreases
Crank angle sensor (Engine rpm)	High	Decreases	Decreases	Decreases
	Low	Increases	Increases	Increases
Throttle valve switch (Idle switch)	OFF → ON	Increases	Increases	Decreases gradually
Neutral relay	N → D position	Increases	Increases	Constant
	D → N position	Decreases	Decreases	Constant

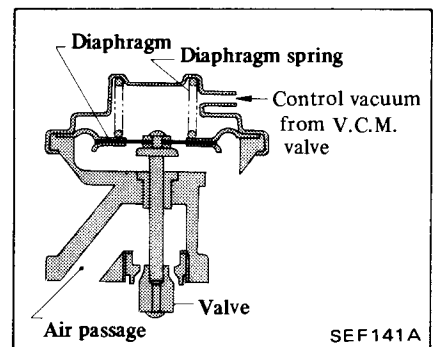
A.A.C. VALVE

The A.A.C. valve is attached to the intake manifold. It controls the quantity of air that flows through the bypass port of the throttle chamber in response to the control vacuum from the V.C.M. valve.



Operation

Control vacuum from V.C.M. valve kPa (mmHg, inHg)	Opening of A.A.C. valve's air passage
0 (0, 0)	Fully open
0 (0, 0) → -16.0 (-120, -4.72)	Open to close
-16.0 (-120, -4.72)	Fully closed



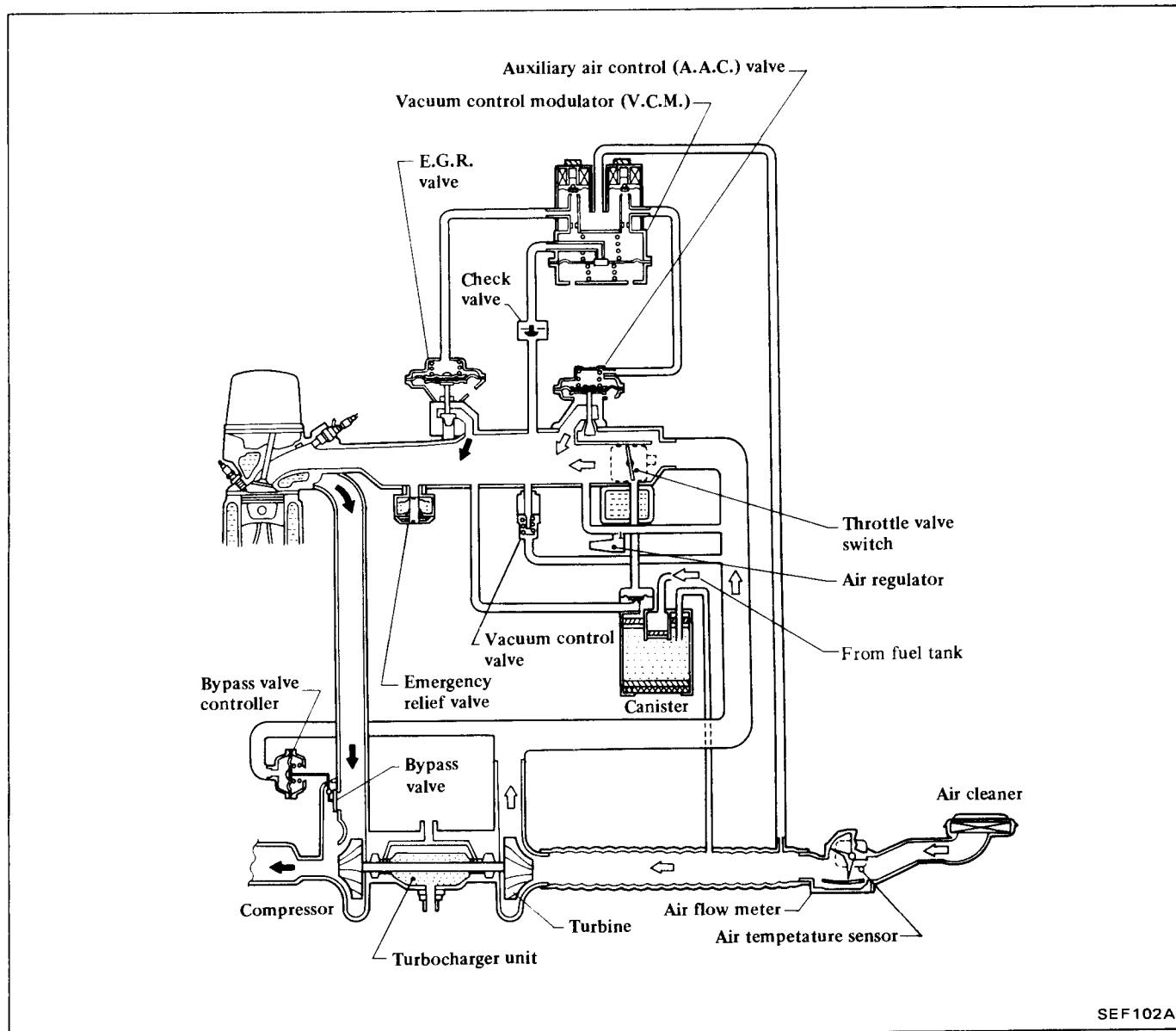
VACUUM CONTROL MODULATOR

Refer to E.G.R. CONTROL.

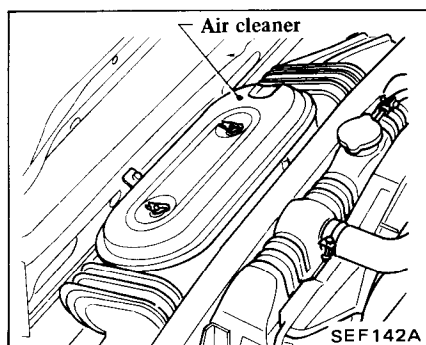
ONE-WAY VALVE

Refer to E.G.R. CONTROL.

AIR FLOW SYSTEM



AIR CLEANER



Inspection

Replace filter more frequently under dusty driving conditions.

AIR FLOW METER

Refer to FUEL INJECTION CONTROL.

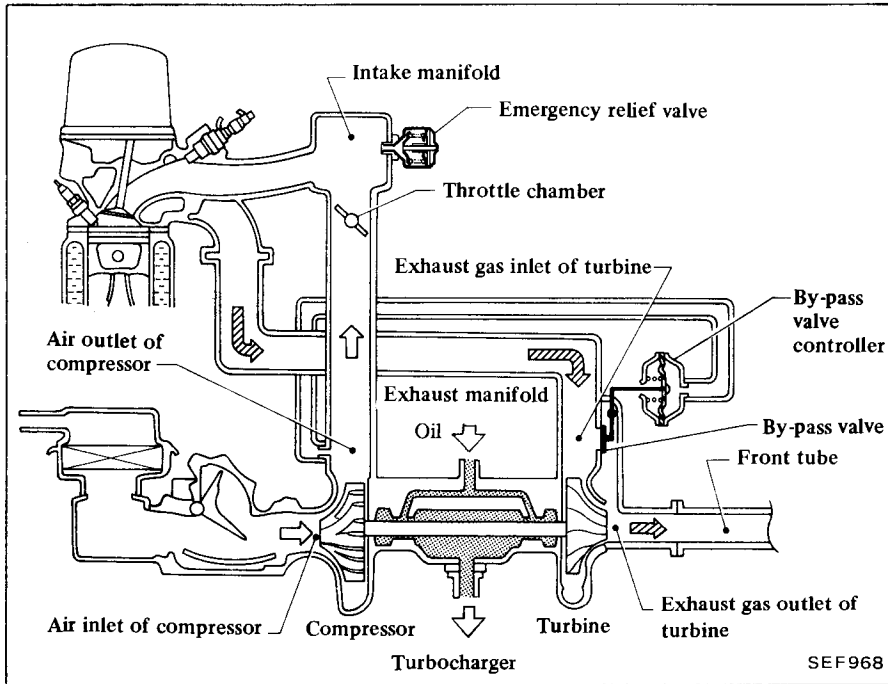
TURBOCHARGER

The turbocharger is installed on the exhaust manifold. This system utilizes exhaust gas energy to rotate the turbine wheel which drives the compressor turbine installed on the other end of the turbine wheel shaft. The compressor supplies compressed air to the engine to increase the charging efficiency so as to improve engine output and torque.

To prevent an excessive rise in the supercharging pressure, a system is adopted which maintains the turbine

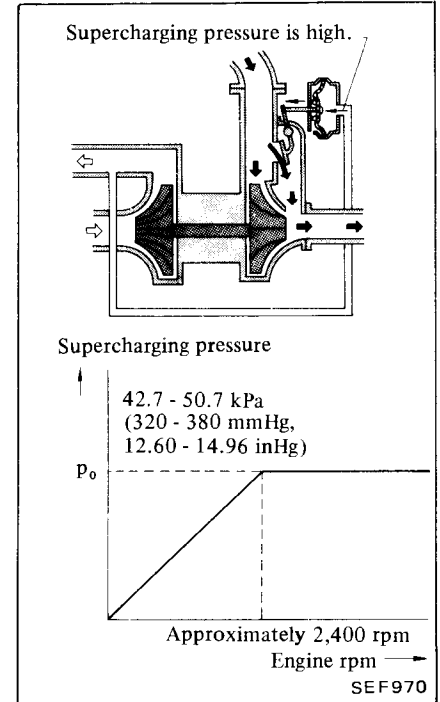
speed within a certain range by controlling the quantity of exhaust gas that passes through the turbine. This system consists of a by-pass valve controller which detects the supercharged pressure and activates a by-pass valve that allows a part of exhaust gas to be discharged without passing through the turbine.

To prevent an abnormal rise in supercharging pressure and possible engine damage in case of a malfunction, an emergency relief valve is provided as a safety device in the intake manifold.



As the engine speed increases and the supercharging pressure approaches the specified pressure value P_0 , it exerts a force on the diaphragm of the by-pass valve controller, thereby opening the by-pass valve.

As the valve opens, part of the exhaust gas by-passes the turbine and goes directly to the exhaust tube. As a result, the turbine speed is kept constant and the supercharging pressure maintained at the specified pressure level.



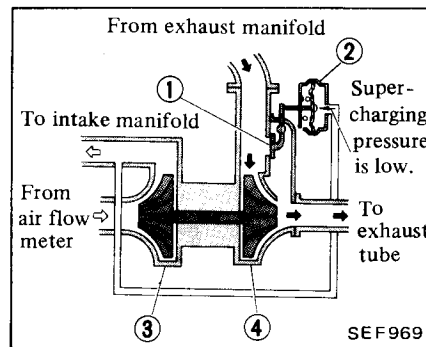
Operation

The by-pass valve controller normally detects the supercharging pressure at the outlet of the compressor housing. All exhaust gas flows through the turbine when the supercharging pressure is below the specified pressure P_0 .

Specified supercharging pressure

P_0 :

42.7 - 50.7 kPa
(320 - 380 mmHg,
12.60 - 14.96 inHg)



- 1 By-pass valve
- 2 By-pass valve controller
- 3 Compressor
- 4 Turbine

The emergency relief valve operates as follows:

When the pressure in the intake manifold exceeds P_{max} , it exerts a force on diaphragm. Then the upper cover, connected to the diaphragm by a shaft, is pushed open, and the excess pressure in the intake manifold is released into the atmosphere.

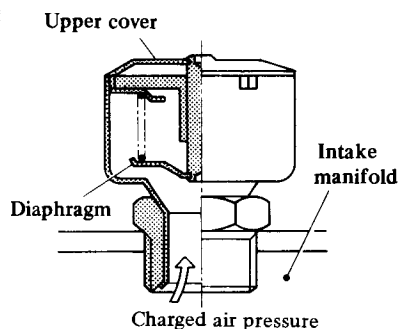
P_{max} :

50.7 - 53.3 kPa

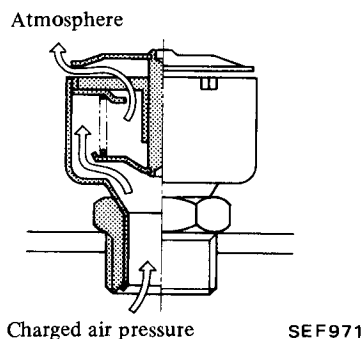
(380 - 400 mmHg,

14.96 - 15.75 inHg)

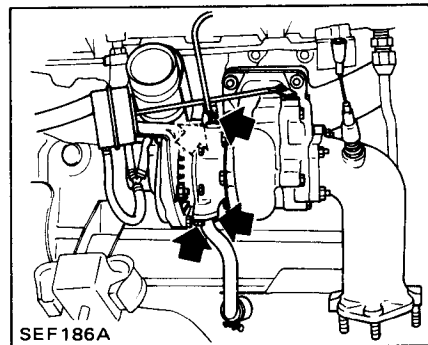
When the pressure in the intake manifold is below P_{max} .



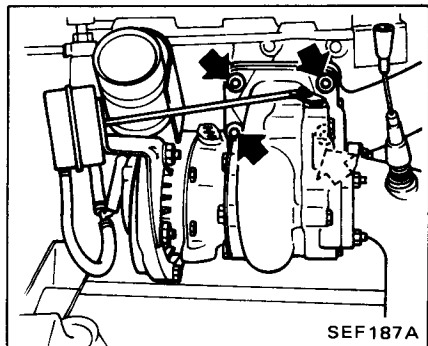
When the pressure in the intake manifold is above P_{max} .



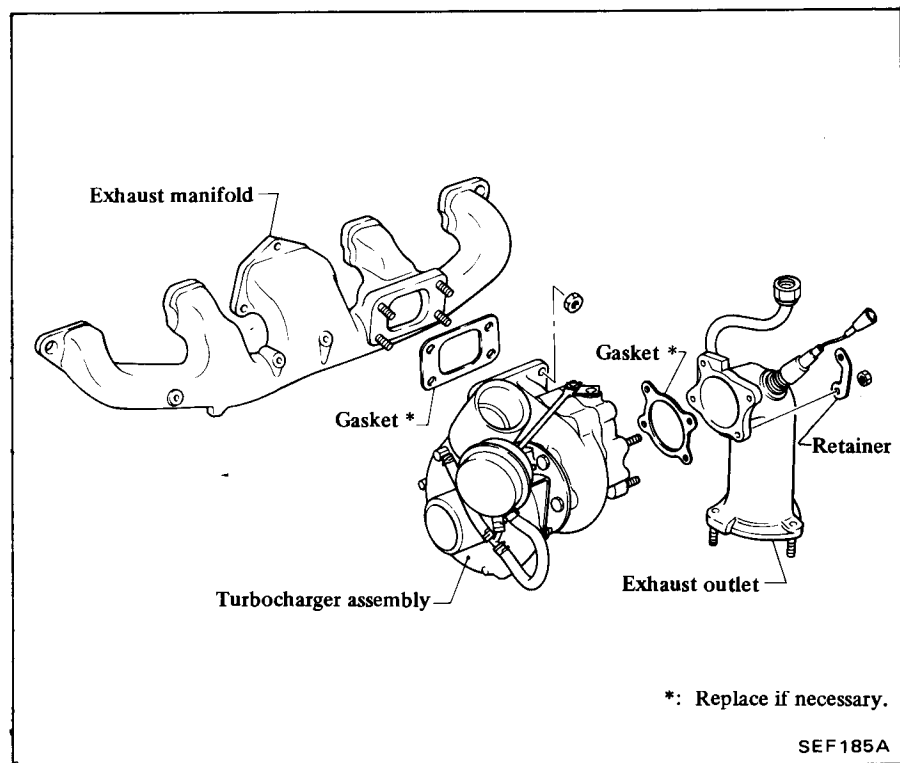
1. Remove heat insulator, inlet tube, air duct hose and suction air pipe.
2. Disconnect exhaust gas sensor harness connector, front tube, oil delivery tube and oil drain pipe.



3. Loosen nuts fixing turbocharger to exhaust manifold, and then remove turbocharger.



Removal and installation



4. Install in the reverse order of removal.

Disassembly and assembly

Turbocharger should not be disassembled.

Inspection

1. Inspect turbine and compressor wheels for cracks, clogging, deformity or other damage.
2. Revolve wheels to make sure that they turn freely without any abnormal noise.
3. Measure play in axial direction.

Play (Axial direction):

0.013 - 0.091 mm

(0.0005 - 0.0036 in)

Do not allow wheels to turn when axial play is being measured.

4. Check operation of by-pass valve controller.

Do not apply more than 66.7 kPa (500 mmHg, 19.69 inHg) pressure to controller diaphragm.

By-pass valve controller stroke/pressure:

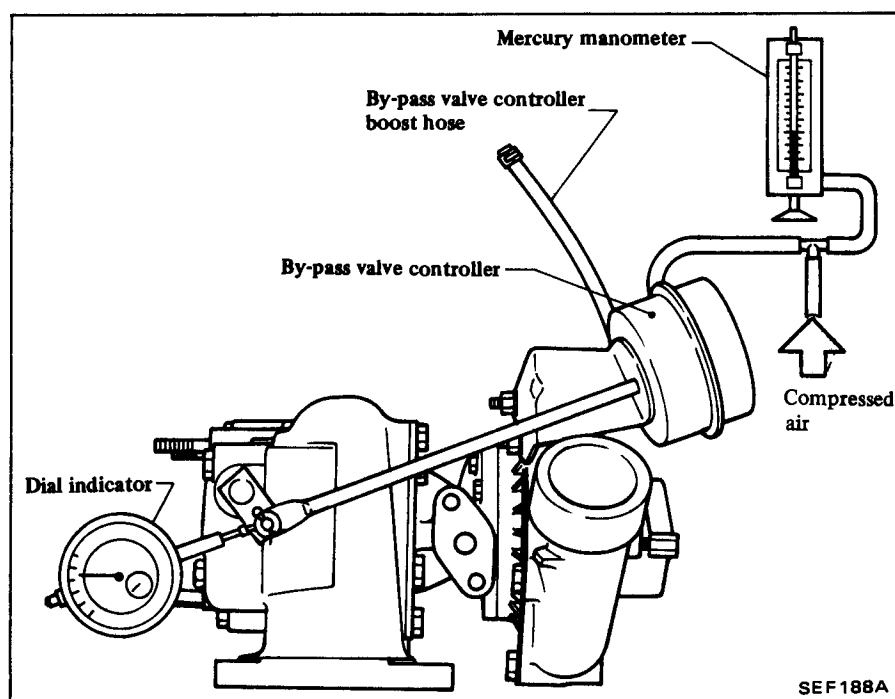
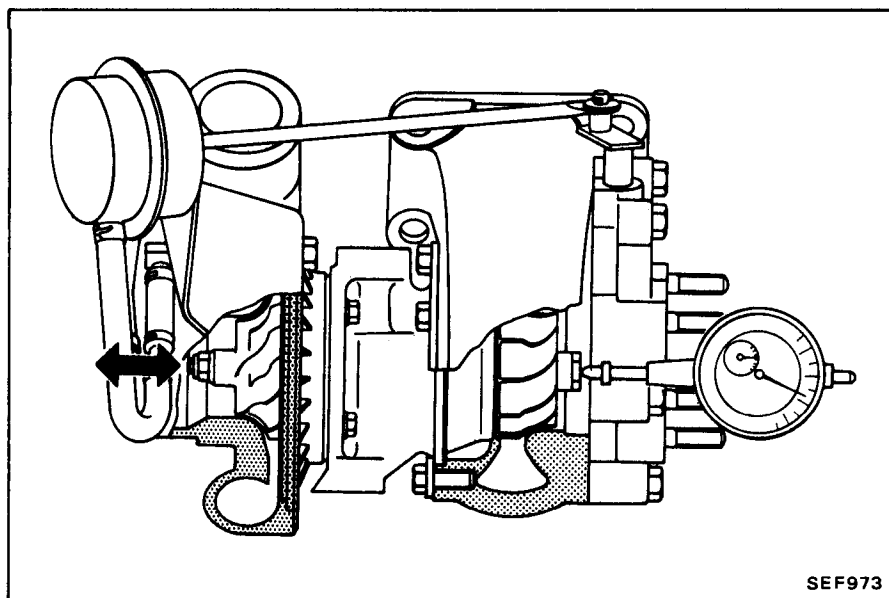
0.38 mm (0.0150 in)/

41.9 - 47.2 kPa

(314 - 354 mmHg,

12.36 - 13.94 inHg)

5. Move by-pass valve to make sure that it is not stuck or scratched.
6. Always replace turbocharger as an assembly if any of the above items shows abnormalities.



Trouble diagnoses and corrections

Before using this chart, check the following items.

- Vacuum hoses and connections
- Wires and connections
- Engine fuel system
- Emission control system

Condition 1: Low engine power

Probable cause

Air leak at the connection of compressor housing and suction hose/inlet tube, or inlet tube and intake manifold.

Corrective action

Correct the connection.

Exhaust gas leak at the connection of turbine housing and exhaust manifold, or exhaust outlet

Correct the connection or replace gasket.

By-pass valve is stuck open.

Stuck or worn journal or bearing

Broken shaft

Sludge on back of turbine wheel

Broken turbine wheel

Replace turbocharger assembly.

Condition 2: Excessively high engine power

Probable cause

Disconnected or cracked rubber hose

Corrective action

Correct or replace rubber hose.

By-pass valve is stuck closed.

Controller diaphragm is broken.

Replace turbocharger assembly.

Condition 3: Excessively high oil consumption or exhaust shows pale blue smoke

Probable cause	Corrective action
Oil leak at the connection of lubricating oil passage	Correct the connection.
Oil leak at oil seal of turbine	Replace turbocharger assembly.
Oil leak at oil seal of compressor	
Worn journal or bearing	

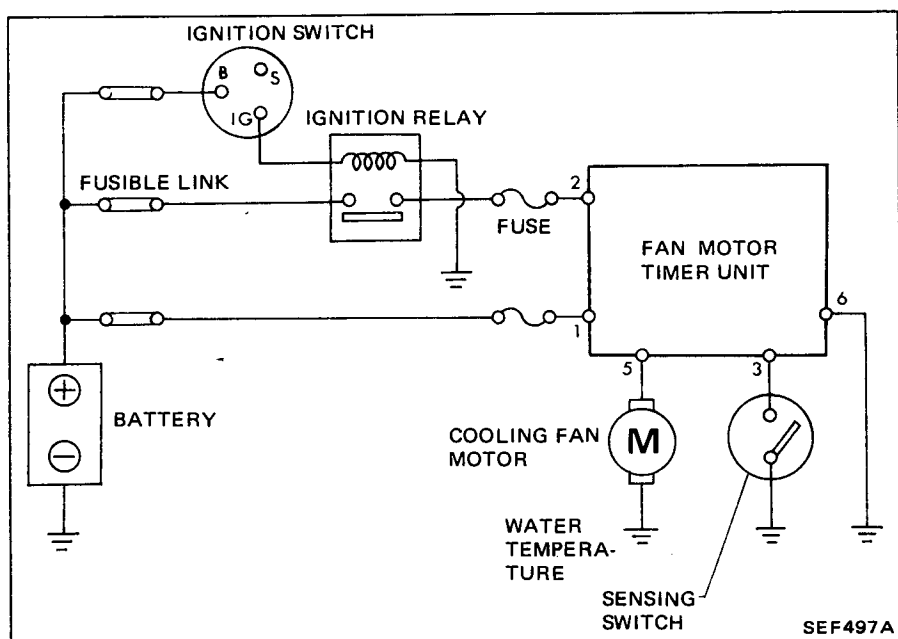
AUXILIARY COOLING FAN

DESCRIPTION

The auxiliary cooling fan is located in the engine compartment.

The cooling fan operates after igni-

tion switch is turned off, and thereby cooling down the temperature of fuel inside the injector and fuel hoses in the engine compartment.



OPERATION

- As soon as the ignition switch is turned off at an engine coolant temperature of above about the specified value, the cooling fan operates.
 - When the ignition switch is turned off at an engine coolant temperature of below about the specified value, the cooling fan operates when the engine coolant temperature rises above about the specified value.
- a. The cooling fan operates for about 17 minutes after the ignition switch is turned off.
 - b. When the ignition switch is turned to the "ON" or "START" position, the cooling fan will stop even though it is in operation.

Auxiliary cooling fan operation chart

Cooling water temperature °C (°F)		Water temperature sensing switch	Ignition switch	Auxiliary cooling fan
E.F.I.	above about 102 (216)	ON	"OFF" "ACC"	Operates
E.C.C.S.	above about 100 (212)			
E.F.I.	above about 102 (216)	OFF	"ON" "START"	Does not operate
E.C.C.S.	below about 100 (212)			
—		—	—	—

INSPECTION

ENTIRE CHECK

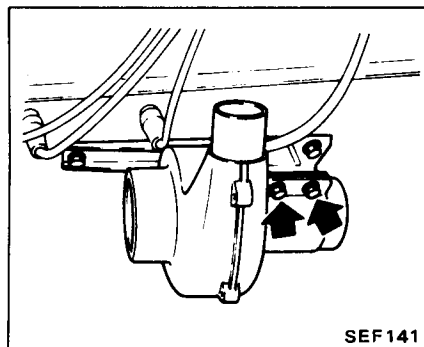
This check can be made at water temperatures below the specified value.

1. After turning ignition switch "ON", set it at "OFF" position and operate timer.

2. Disconnect harness connector of water temperature sensing switch and make a signal which indicates that water temperature has exceeded the specified value, by grounding connector terminal at harness side.

- Cooling fan operatesO.K.
- Cooling fan does not operate N.G.

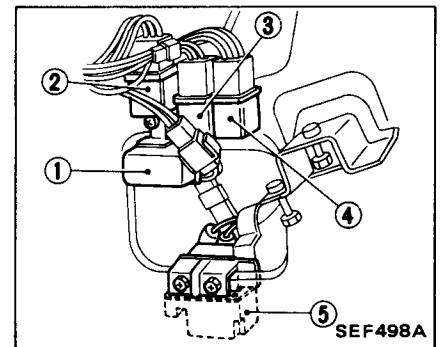
3. If cooling fan does not operate, check fan motor timer unit and fan motor as a part.



SEF141

1. Make sure continuity exists between connector terminals (A) and (B).
2. Then securely connect positive terminal of a 12-volt d.c. power supply to terminal (A), and ground terminal (B).

Fan motor should run. If not running, the motor is out of order.



SEF498A

- 1 Seat belt warning timer unit
- 2 Fuel pump relay
- 3 Ignition relay
- 4 Accessory relay
- 5 Fan motor timer unit

Test timer unit with a power source of 12-volt DC and test lamp following the procedure below.

Prepare 12V-3W lamp.

1. Connect terminal (6) to negative terminal of power source, terminal (5) to test lamp terminal and the other test lamp terminal to negative terminal of the power source.

2. Connect terminal (1) to positive terminal of power source.

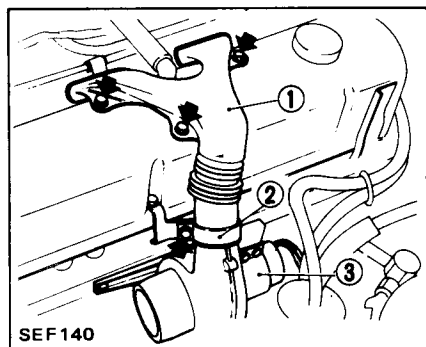
- Test lamp does not glowO.K.
- Test lamp glows N.G.

3. Connect terminal (2) to positive terminal of power source and disconnect it. (Operate timer)

4. Connect terminal (3) to negative terminal of power source.

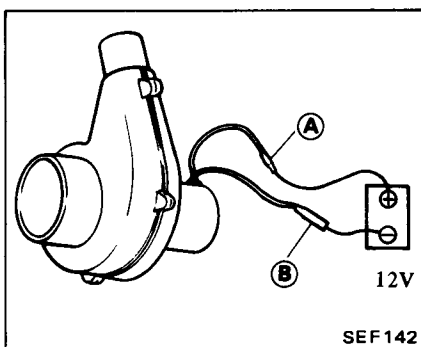
- Test lamp glowsO.K.
- Test lamp does not glow N.G.

FAN MOTOR



SEF140

- 1 Air duct
- 2 Clamp
- 3 Cooling fan



SEF142

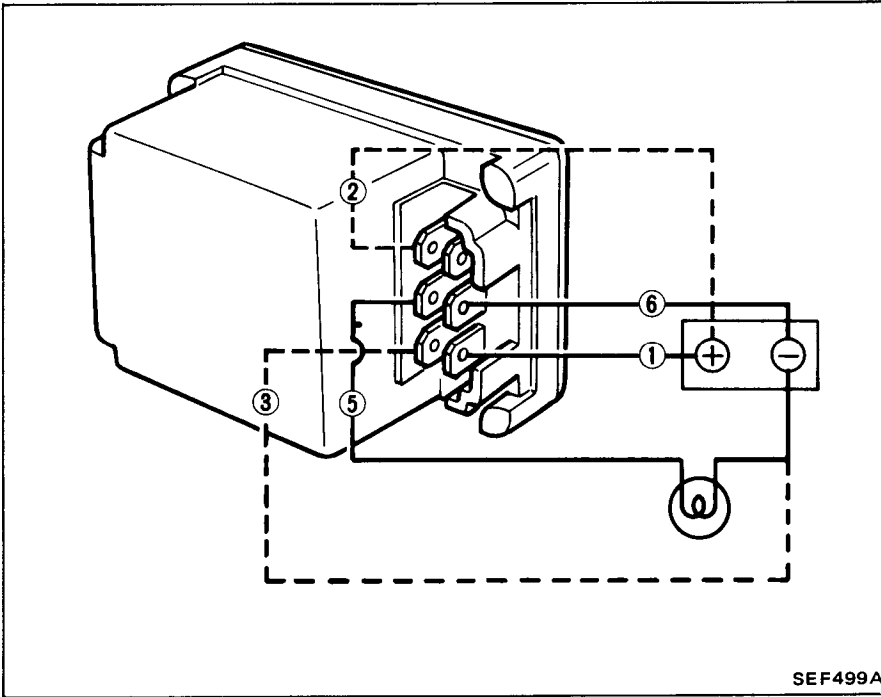
FAN MOTOR TIMER UNIT

The fan motor timer unit is located inside the R.H. dash side panel.

5. Make sure that test lamp should remain on for about 17 minutes after step 3 is performed, and then go out.
6. While test lamp is on, connect

terminal ② to positive terminal of power source.

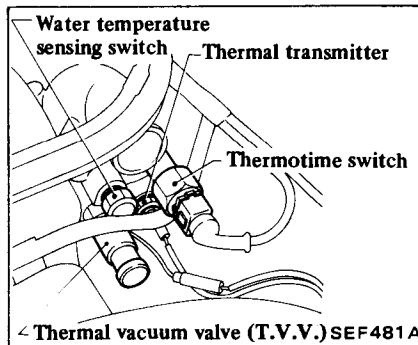
- Test lamp goes out O.K.
- Test lamp does not go out N.G.



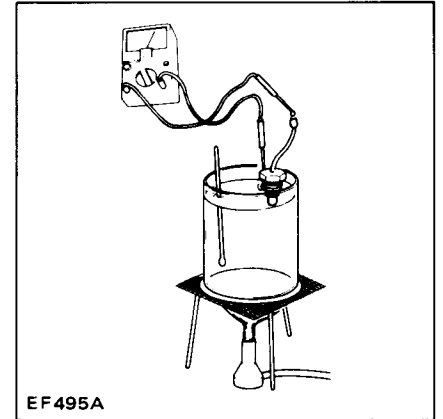
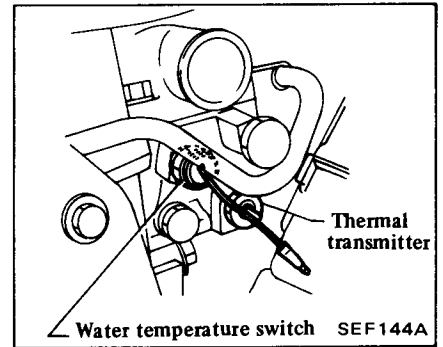
WATER TEMPERATURE SENSING SWITCH

The water temperature sensing switch is located in the thermostat housing.

E.F.I. models



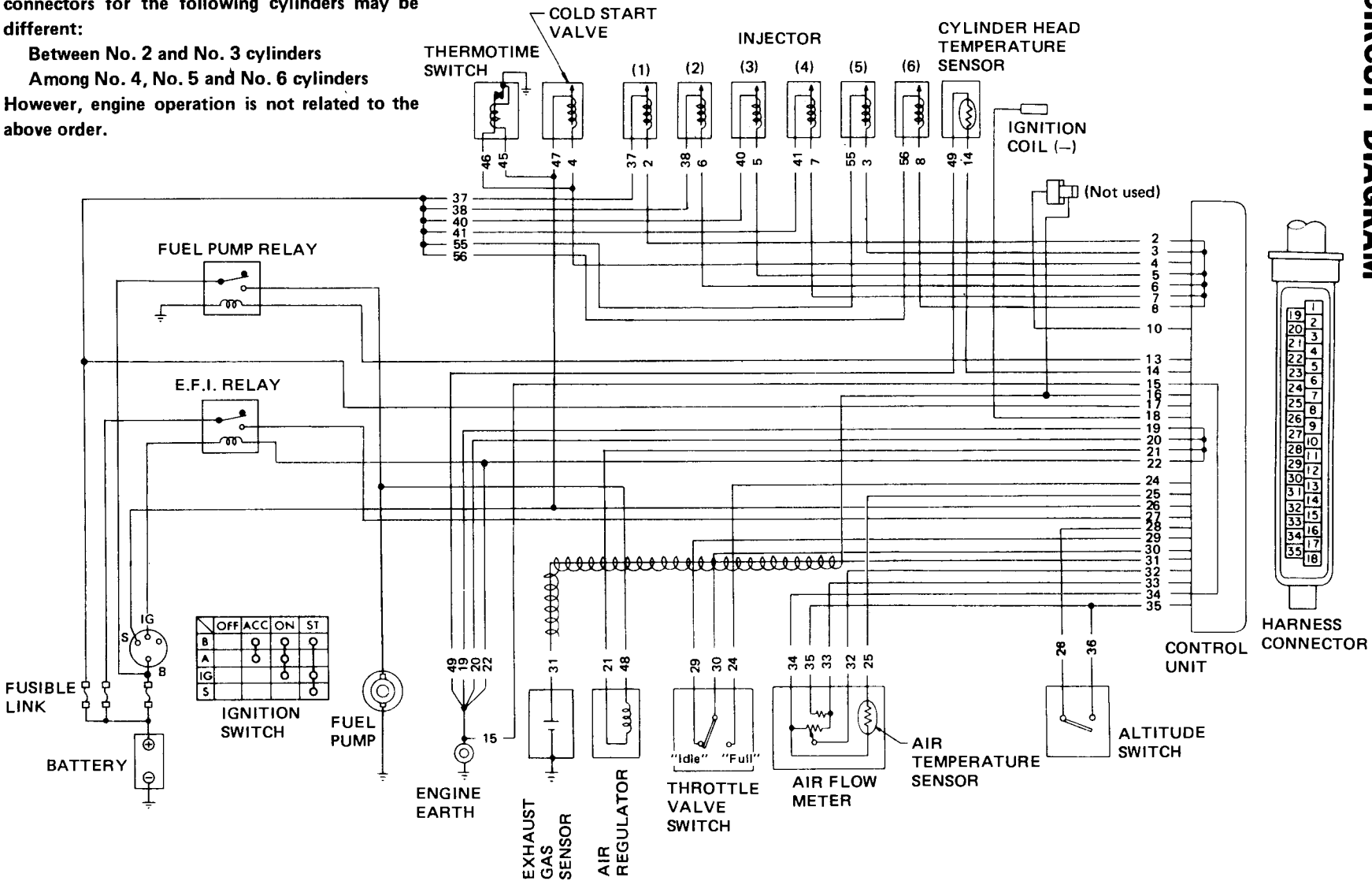
E.C.C.S. models



1. Dip sensing portion of water temperature sensing switch into proper solution maintained at 80°C (176°F).
 2. Measure resistance between terminal of lead wire and switch body.
 - Resistance is infinite O.K.
 3. Increase solution temperature, then check continuity between terminal of lead wire and switch body.
 - Resistance varies to zero at a temperature about the specified value O.K.
- If not, replace switch with a new one.

ELECTRICAL SYSTEM INSPECTION

E.F.I. CIRCUIT DIAGRAM



DESCRIPTION

Electrical system inspection can be performed by using the E.F.I. ANALYZER (J-25400).

CAUTION:

When checking the electrical system with E.F.I. ANALYZER, be sure to use the proper adapter harness.

If the analyzer is not available, use the following procedures.

PREPARATIONS FOR INSPECTION

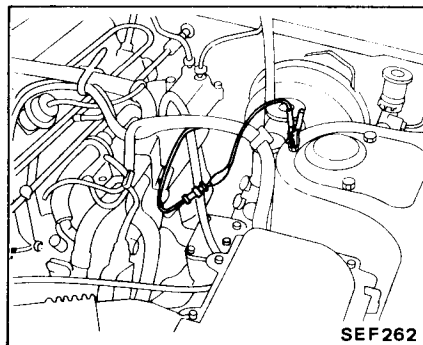
VEHICLE PREPARATIONS

1. Turn ignition switch to "OFF" position.

CAUTION:

Before disconnecting and connecting electrical connectors, ensure that ignition switch is in the "OFF" position.

2. Disconnect battery ground cable.
3. Disconnect lead wire from "S" terminal of starter motor.
4. Disconnect cold start valve harness connector.
5. Arrange so that air flow meter flap can be pushed manually from air cleaner side.
6. Disconnect exhaust gas sensor harness connector.
7. Connect E.F.I. harness terminal for exhaust gas sensor to ground with a jumper wire.



8. Disconnect 35-pin E.F.I. harness connector from control unit.

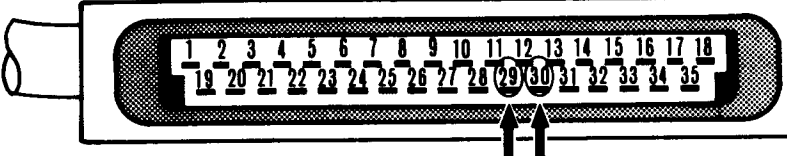
CAUTION:

- a. Before disconnecting E.F.I. harness at 35-pin connector, ensure that ignition switch is in the "OFF" position.
- b. Be extremely careful not to break or bend 35-pin when disconnecting terminal.
Do not touch the circuit tester probe to any unnecessary pin on the 35-pin connector. Doing so could cause damage to the circuit tester.
- c. After inspection or replacement, securely connect E.F.I. harness connector with control unit, and then test it to make sure.

THROTTLE VALVE SWITCH TESTS

Test No. 1 Idle contacts

Tester	Leads to Pins		Notes	Should Read
	(+)	(-)		
Ohmmeter			Throttle released	Continuity
	29	30	Throttle depressed	No continuity




SEF681

If test is O.K., go to Test No. 2.
If test is not O.K., go to Throttle Valve Switch Adjustment.

Test No. 2 Full throttle contacts

Tester	Leads to Pins		Notes	Should Read
	(+)	(-)		
Ohmmeter			Throttle released	No continuity
	24	30	Full throttle	Continuity

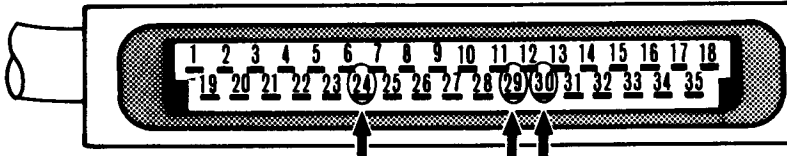


SEF682

If test is O.K., go to Test No. 3.
If test is not O.K., go to Full Throttle Contact Check.

Test No. 3 Insulation test

Tester	Leads to Pins		Notes	Should Read
	(+)	(-)		
Ohmmeter	24	Body ground		$\infty \Omega$
	29			
	30			

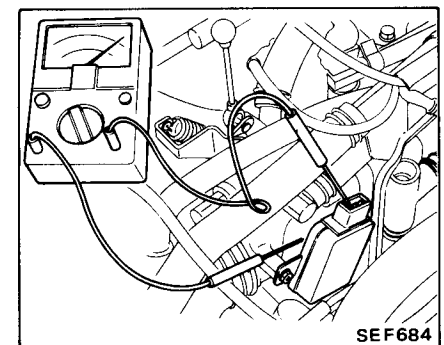


SEF683

If test is O.K., go to Throttle Valve Switch Adjustment.

If test is not O.K., go to Component Check.

Component check



SEF684

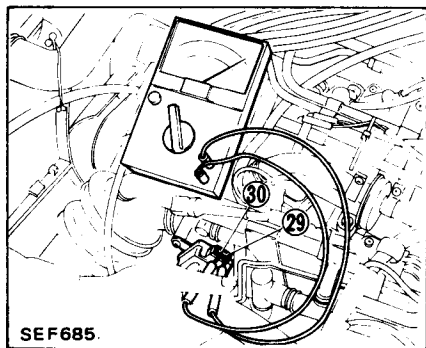
Connect ohmmeter between engine and terminals 24, 29 and 30. Ohmmeter reading should be infinite.

If test is O.K., check harness.

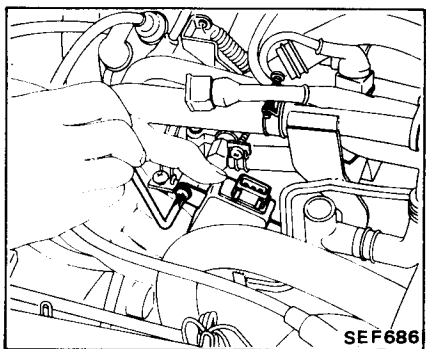
If test is not O.K., replace component and retest.

**THROTTLE VALVE SWITCH
ADJUSTMENT****Ohmmeter method**

1. Disconnect throttle valve switch connector.
2. Connect ohmmeter between terminals ②⑨ and ③⑩, and make sure continuity exists.



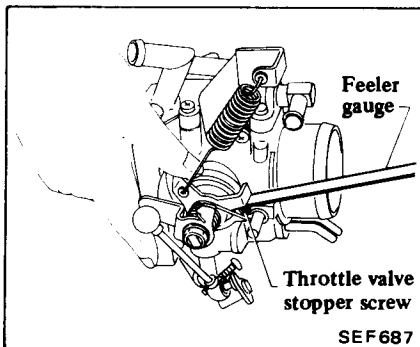
3. Adjust throttle valve switch position, with retaining screw, so that idle switch may be changed from "ON" to "OFF" when engine speed is about 900 rpm under no load.

**Feeler gauge method**

To adjust position of throttle valve switch with engine off, proceed as follows:

When clearance "A" between throttle valve stopper screw and throttle valve shaft lever is 0.3 mm (0.012 in), adjust throttle valve switch position so that idle switch is changed from "ON" to "OFF".

If clearance between throttle valve stopper screw and throttle valve shaft lever is 0.3 mm (0.012 in), engine speed will become about 900 rpm.

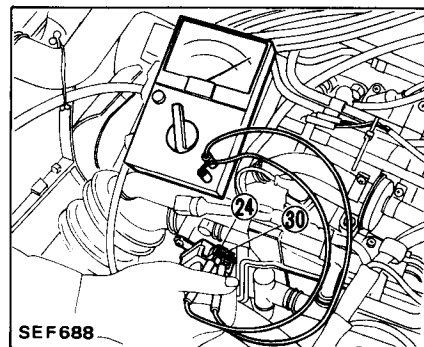


Changing idle switch from "ON" to "OFF" corresponds to change from 0 to ∞ (infinite) ohms in resistance between terminals ②⑨ and ③⑩.

After the adjustment is complete, proceed to Full Throttle Contact Check.

**FULL THROTTLE CONTACT
CHECK**

1. Disconnect ground cable from battery.
2. Remove throttle valve switch connector.
3. Connect ohmmeter between terminals ②④ and ③⑩, and make sure continuity does not exist.



4. Depress accelerator pedal to floor. If continuity exists between terminals ②④ and ③⑩, full throttle contact is functioning properly.

If test is O.K., go to Insulation Test.

AIR FLOW METER TESTS

Test No. 1 Air flow meter resistance

Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		100 to 400Ω
	33	34		

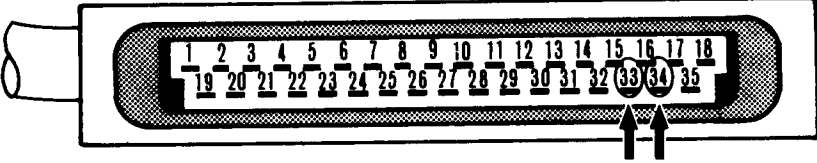


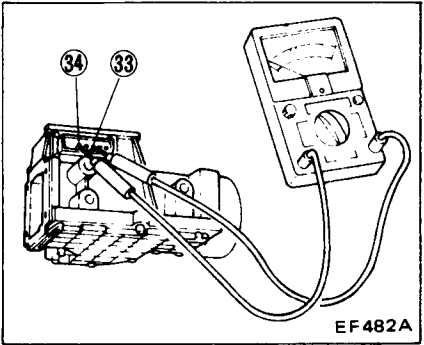
Diagram of an air flow meter with 35 pins. Pins 33 and 34 are circled and indicated by arrows.

SEF689

If test is O.K., go to Test No. 2.

If test is not O.K., perform component check.

Component check



Measure the resistance between terminals 33 and 34. The standard resistance is 100 to 400 ohms.

If test is O.K., check harness.

If test is not O.K., replace component.

Test No. 2 Air flow meter resistance

Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		200 to 500Ω
	34	35		

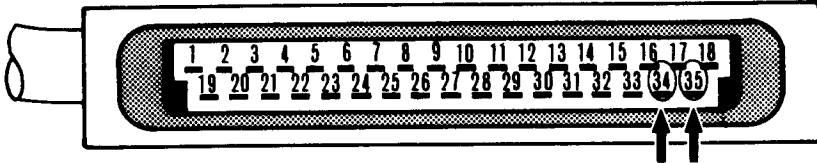


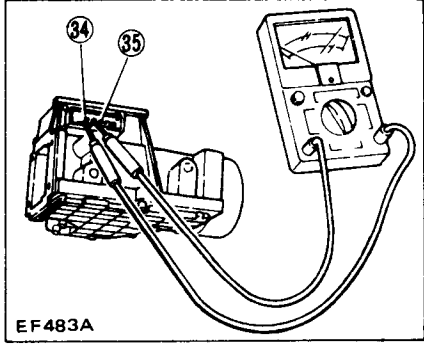
Diagram of an air flow meter with 35 pins. Pins 34 and 35 are circled and indicated by arrows.

SEF690

If test is O.K., go to Test No. 3.

If test is not O.K., perform component check.

Component check



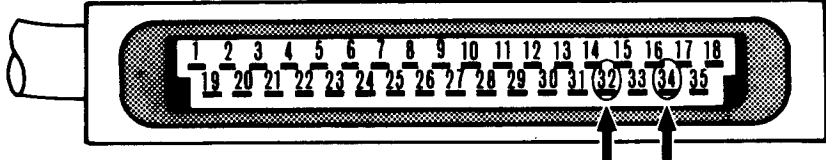
Measure the resistance between terminals 34 and 35. The standard resistance is 200 to 500 ohms.

If test is O.K., check harness.

If test is not O.K., replace component.

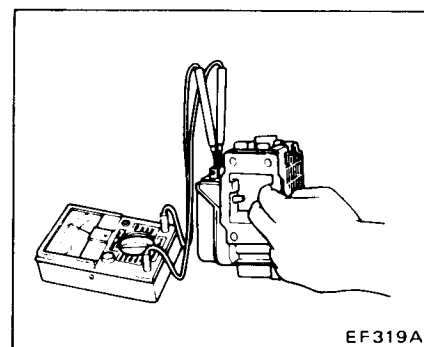
Test No. 3 Air flow meter resistance

Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		Except 0 and $\infty \Omega$
	32	34		



SEF691

Component check



EF319A

While sliding flap, measure resistance between terminals 32 and 34. If resistance is at any value other than 0 and ∞ ohm, air flow meter is normal.

If test is O.K., check harness.

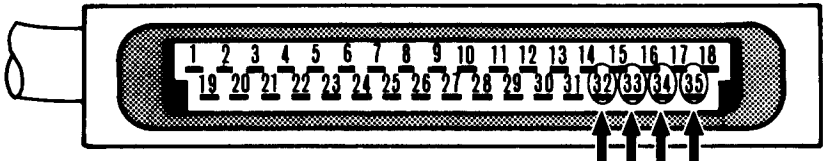
If test is not O.K., replace component.

If test is O.K., go to Test No. 4.

If test is not O.K., perform component check.

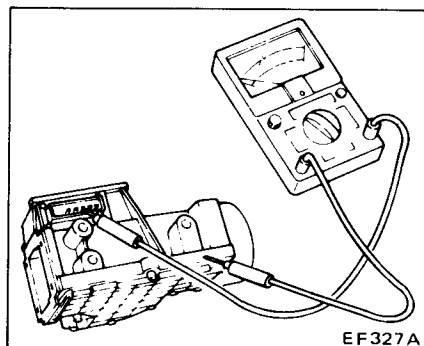
Test No. 4 Insulation resistance

Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		$\infty \Omega$
	32 33 34 35	Body ground		



SEF692

Component check



EF327A

Check insulation resistance between the air flow meter body and any one of the terminals 32, 33, 34 and 35. If continuity exists, the air flow meter is out of order.

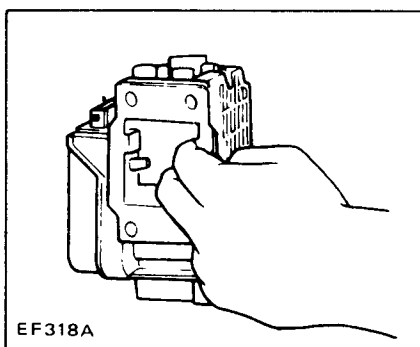
If test is O.K., check harness.

If test is not O.K., replace component.

If test is O.K., go to Test No. 5.

If test is not O.K., perform component check.

Test No. 5 air flow meter flap.



EF318A

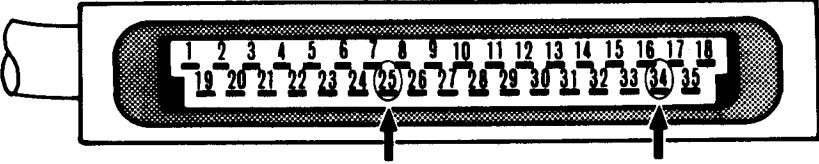
Fully open the flap by hand to check that it opens smoothly without binding. If it doesn't, it is out of order.

If test is O.K., air flow meter is O.K.

If test is not O.K., replace air flow meter.

AIR TEMPERATURE SENSOR TESTS

Test No. 1 Air Temperature Sensor				
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)	Intake air temperature	
	25	34	20°C (68°F) or above	Below 2.9 kΩ
			Below 20°C (68°F)	2.1 kΩ or above

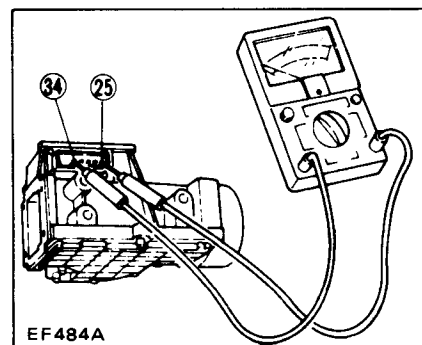


SEF772

If test is O.K., go to Test No. 2.

If test is not O.K., perform component check.

Component check

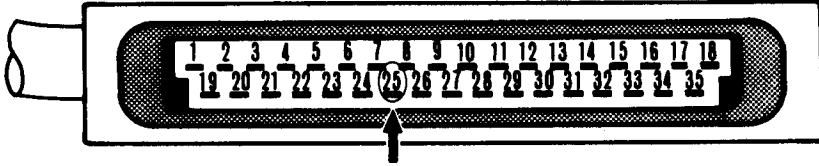


1. Measure the outside air temperature.
2. Measure resistance between terminals 25 and 34 of the air flow meter connector.

If test is O.K., check harness.

If test is not O.K., replace component.

Test No. 2 Insulation Resistance				
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		
	25	Body ground		$\infty \Omega$

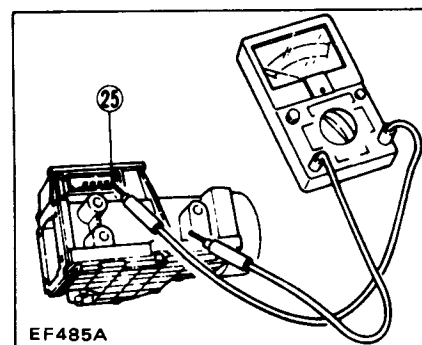


SEF773

If test is O.K., air temperature sensor is O.K.

If test is not O.K., perform component check.

Component check



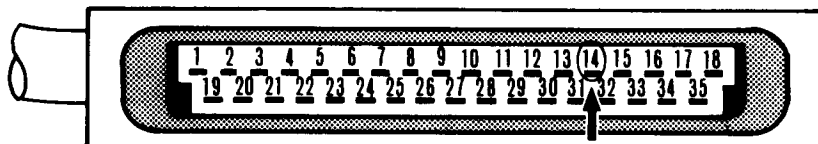
Check insulation resistance between terminal 25 and air flow meter body.

If test is O.K., check harness.

If test is not O.K., replace component.

CYLINDER HEAD TEMPERATURE SENSOR TEST

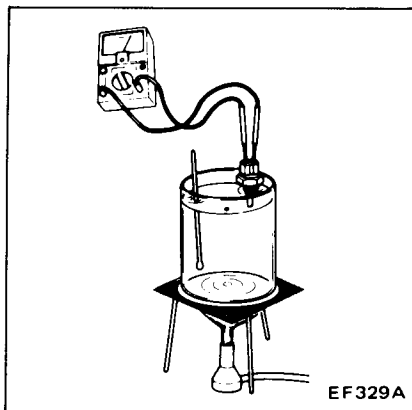
Cylinder head temperature sensor test				
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)	20°C (68°F) or above	Below 2.9 kΩ
	14	Body ground	Below 20°C (68°F)	2.1 kΩ or above



SEF693

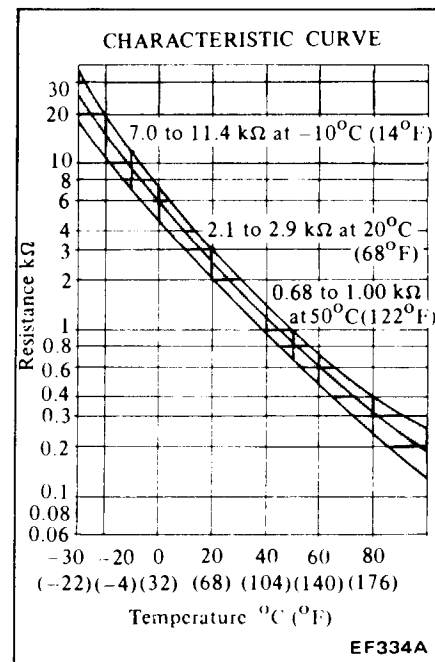
If test is O.K., test is complete.
If test is not O.K., perform component check.

Component check



EF329A

Dip the sensor into water maintained at a temperature of 20°C (68°F), 80°C (176°F), etc., and read its resistance.

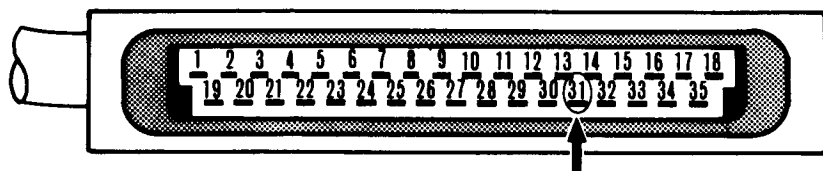


If test matches curve, sensor is O.K.
Check harness.

If test does not match curve, replace sensor.

EXHAUST GAS SENSOR CIRCUIT TEST

Exhaust gas sensor circuit test				
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)	Disconnect exhaust gas sensor harness connector, and connect E.F.I. harness terminal for exhaust gas sensor to ground with a jumper wire.	0Ω
	31	Body ground		



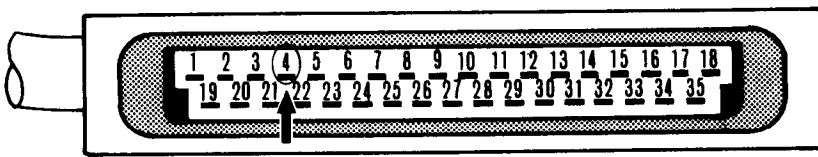
SEF694

If test is O.K., exhaust gas sensor circuit is O.K. For performing component check, refer to Section EC.

THERMOTIME SWITCH TESTS

Disconnect cold start valve harness connector.

Test No. 1 Thermotime switch contact point				
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)	Water temperature	$\infty \Omega$
			25°C (77°F) or above	
	4	Body ground	14 to 25°C (57 to 77°F)	0 or $\infty \Omega$
			Below 14°C (57°F)	0 Ω

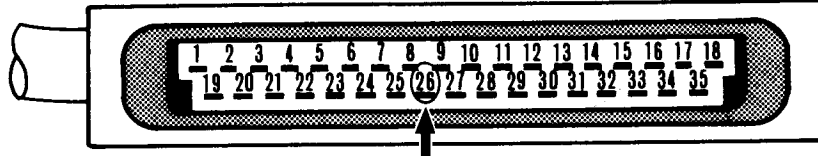


SEF695

If test is O.K., go to Test No. 2.

If test is not O.K., perform component check.

Test No. 2 Heater coil of thermotime switch bimetal				
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		40 to 70 Ω
	26	Body ground		

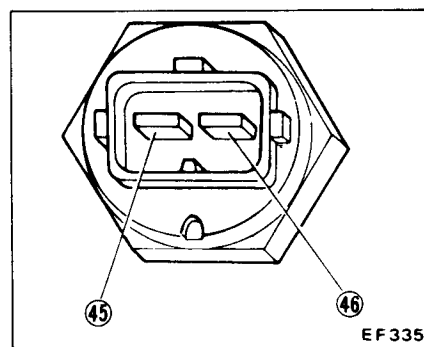


SEF696

If test is O.K., thermotime switch is O.K.

If test is not O.K., perform component check.

Component check



Measure the resistance between terminal ④⑥ and switch body.

- The resistance is zero when the cooling water temperature is less than 14°C (57°F). . . . O.K.
- The resistance is infinite when the cooling water temperature is more than 25°C (77°F). . . . O.K.

The resistance is zero or infinite when the cooling water temperature is between 14 to 25°C (57 to 77°F).

Measure the resistance between terminal ④⑤ and switch body.

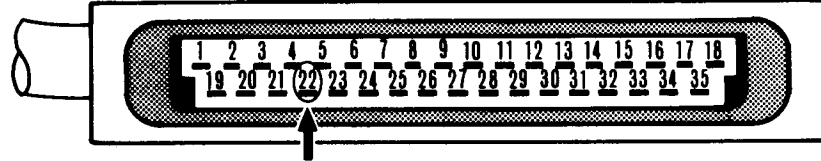
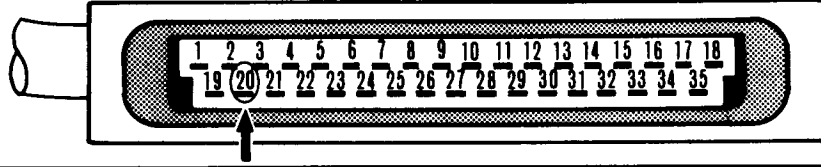
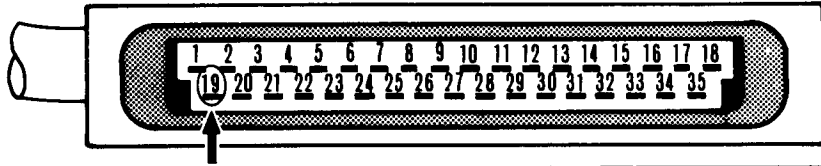
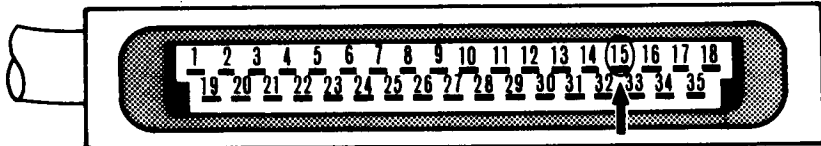
The ohmmeter reading is 40 to 70 ohms O.K.

If test is O.K., check harness.

If test is not O.K., replace component.

CONTROL UNIT GROUND CIRCUIT TESTS

Control unit ground circuit tests				
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		Continuity
	15	Body ground		
	19			
	20			
	22			



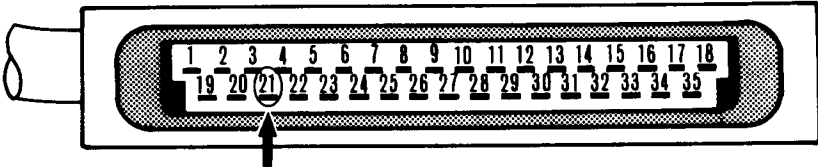
SEF697

If tests are O.K., ground circuits are O.K.

If tests are not O.K., check wiring diagram and harness.

AIR REGULATOR CIRCUIT TESTS

Test No. 1 Air regulator resistance				
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		25 to 90Ω
	21	Body ground		

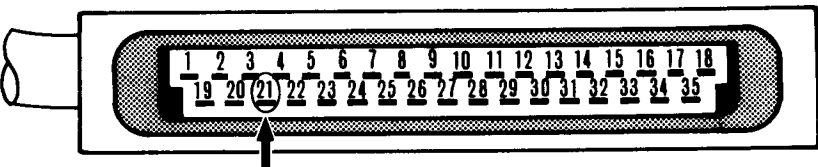


SEF698

If test is O.K., go to Test No. 2.

If test is not O.K., check air regulator.

Test No. 2 Air regulator power circuit				
Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	1. Disconnect starter motor "S" terminal. 2. Connect battery ground cable. 3. Ignition "START"	Battery voltage
	21	Body ground		

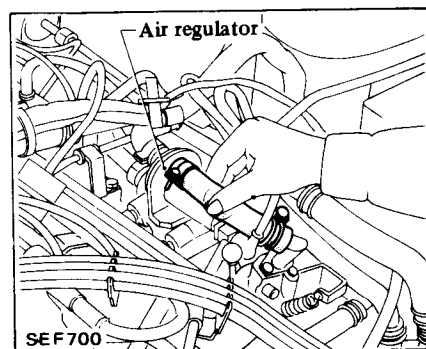


SEF699

If test is O.K., air regulator power circuit is O.K.

If test is not O.K., check fuel pump relay.

CHECKING AIR REGULATOR

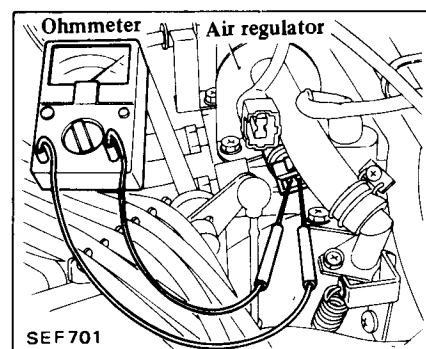


1. Starting engine, and pinch rubber hose between throttle chamber and air regulator.

- Engine speed decreases during warm-up. O.K.
- Engine speed remains unchanged after warm-up. O.K.

2. Disconnect hoses from both ends of air regulator, and visually check to see if air regulator shutter opens.

3. Disconnect electric connector of air regulator, and check continuity. Continuity should exist. If not, air regulator is faulty.



4. Pry air regulator shutter to open with a flat-blade screwdriver, then close. If shutter opens and closes smoothly, it is operating properly.

If test is O.K., check harness.

If test is not O.K., replace component and retest.

COLD START VALVE TEST

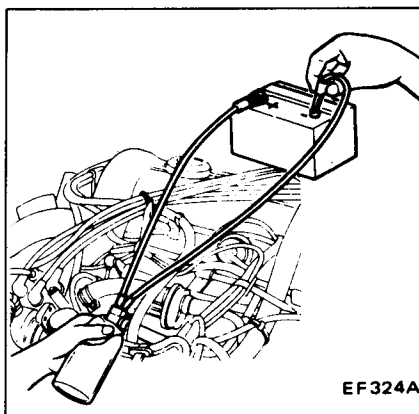
Cold start valve circuit test			
Tester	Leads to Pins		Notes
Voltmeter	(+)	(-)	1. Disconnect starter motor "S" terminal and thermotime switch harness connector. 2. Connect cold start valve harness connector and battery ground cable. 3. Ignition "START".
	4	Body ground	

SEF704

If test is O.K., cold start valve is O.K.

If test is not O.K., perform component check.

Component check



EF324A

1. Disconnect ground cable from battery.
2. Remove two screws securing cold start valve to intake manifold, and extract cold start valve.
3. Put cold start valve into a transparent glass container, plug the transparent glass container opening with a clean rag.
4. Using two jumper wires, connect each terminal to cold start valve connector.
5. Connect other terminals of jumper wire to battery positive and negative terminals.

- Fuel is injected. O.K.
- Fuel is not injected. N.G.

CAUTION:

Be careful to keep both terminals separate in order to avoid short circuit.

If test is O.K., check harness.

If test is not O.K., replace component and retest.

IGNITION COIL TRIGGER INPUT TEST

Ignition coil trigger input test			
Tester	Leads to Pins		Notes
Voltmeter	(+)	(-)	1. Connect starter motor "S" terminal and battery ground cable. 2. Ignition "START".
	18	Body ground	

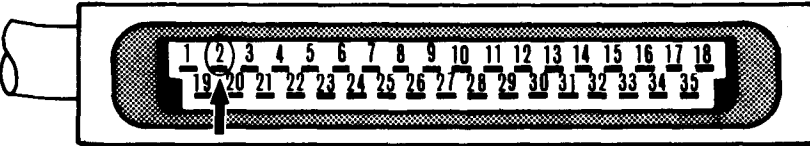
SEF705

If test is O.K., trigger input to control unit is O.K.

If test is not O.K., check ignition coil and wire harness.

INJECTOR CIRCUIT TESTS

Test No. 1 Cylinder No. 1				
Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	1. Connect battery ground cable. 2. Ignition "ON".	Battery voltage
	2	Body ground		

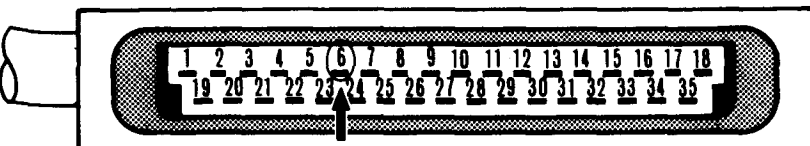


SEF706

If test is O.K., go to Test No. 2.

If test is not O.K., go to Component Check.

Test No. 2 Cylinder No. 2 or No. 3				
Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	Ignition "ON".	Battery voltage
	6	Body ground		

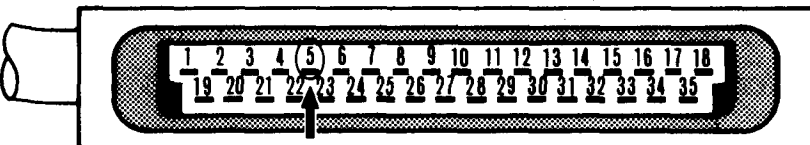


SEF707

If test is O.K., go to Test No. 3.

If test is not O.K., perform component check.

Test No. 3 Cylinder No. 3 or No. 2				
Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	Ignition "ON"	Battery voltage
	5	Body ground		

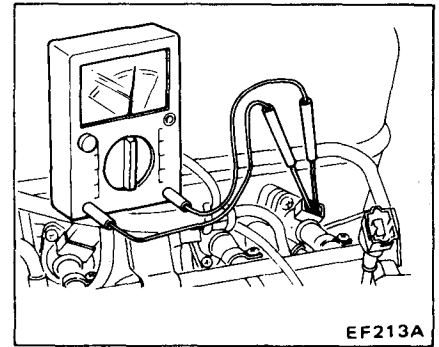


SEF708

If test is O.K., go to Test No. 4.

If test is not O.K., go to Component Check.

Component check

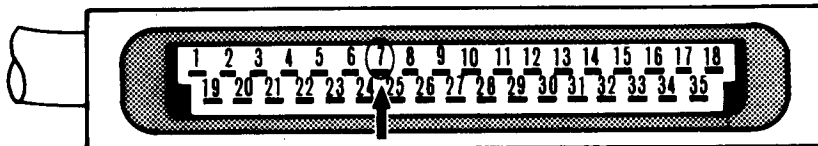


EF213A

1. Disconnect ground cable from battery.
2. Disconnect electric connectors from injectors.
3. Check continuity between the two terminals. Continuity should exist. If not, injector(s) are faulty.

Test No. 4 Cylinder No. 4, No. 5 or No. 6

Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	Ignition "ON".	Battery voltage
	7	Body ground		



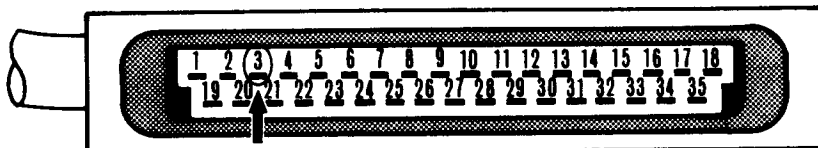
SEF709

If test is O.K., go to Test No. 5.

If test is not O.K., go to Component Check.

Test No. 5 Cylinder No. 5, No. 4 or No. 6

Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	Ignition "ON".	Battery voltage
	3	Body ground		



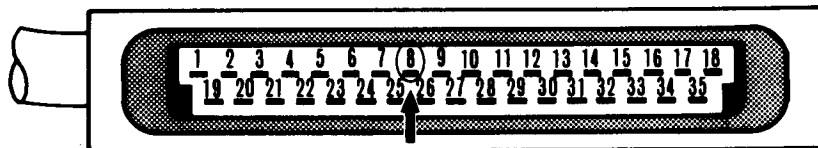
SEF710

If test is O.K., go to Test No. 6.

If test is not O.K., go to Component Check.

Test No. 6 Cylinder No. 6, No. 4 or No. 5

Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	Ignition "ON".	Battery voltage
	8	Body ground		



SEF712

If test is O.K., all injectors are O.K.

If test is not O.K., perform Component Check.

E.F.I. RELAY AND FUEL PUMP RELAY TESTS

Test No. 1 E.F.I. relay test (Control unit power input circuit test)				
Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	1. Connect battery ground cable. 2. Ignition "ON".	Battery voltage
	27	Body ground		

SEF713

If test is O.K., E.F.I. relay is O.K. If test is not O.K., check E.F.I. relay.
Go to Test No. 2.

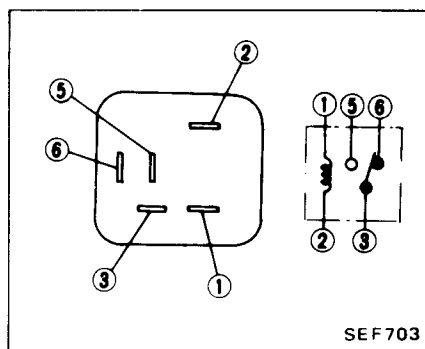
Test No. 2 fuel pump relay If no sound is heard, go to test No. 3.

1. Disconnect starter motor "S" terminal.
2. Ignition "START".
3. Listen for fuel pump operating sound.

Test No. 3 Fuel pump relay test				
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		Except 0 and $\infty\Omega$
	13	Body ground		

SEF343A

If test No. 3 is O.K., check fuel pump and circuit. ponent check.
If fuel pump is O.K., check component check.
If test No. 3 is not O.K., go to component check.

CHECKING E.F.I. RELAY AND FUEL PUMP RELAY

Check terminals	Normal condition	12V direct current is applied between terminals ① and ②
① - ②	Continuity	—
③ - ⑤	No continuity	Continuity
③ - ⑥	Continuity	No continuity

If E.F.I. relay and fuel pump relay are O.K., check harness.

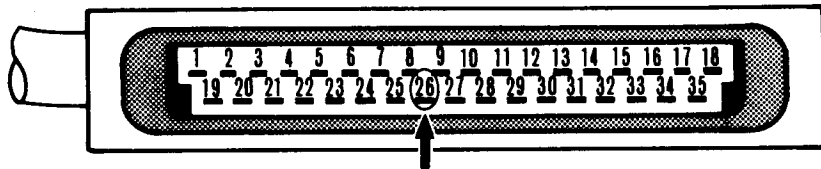
If fuel pump and harness are O.K., replace control unit.

IGNITION START SIGNAL TEST

Ignition start signal test				
Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	1. Disconnect starter motor "S" terminal. 2. Connect battery ground cable. 3. Ignition "START".	Battery voltage
	26	Body ground		

If test is O.K., ignition start signal is O.K.

If test is not O.K., inspect ignition coil and harness.



SEF715

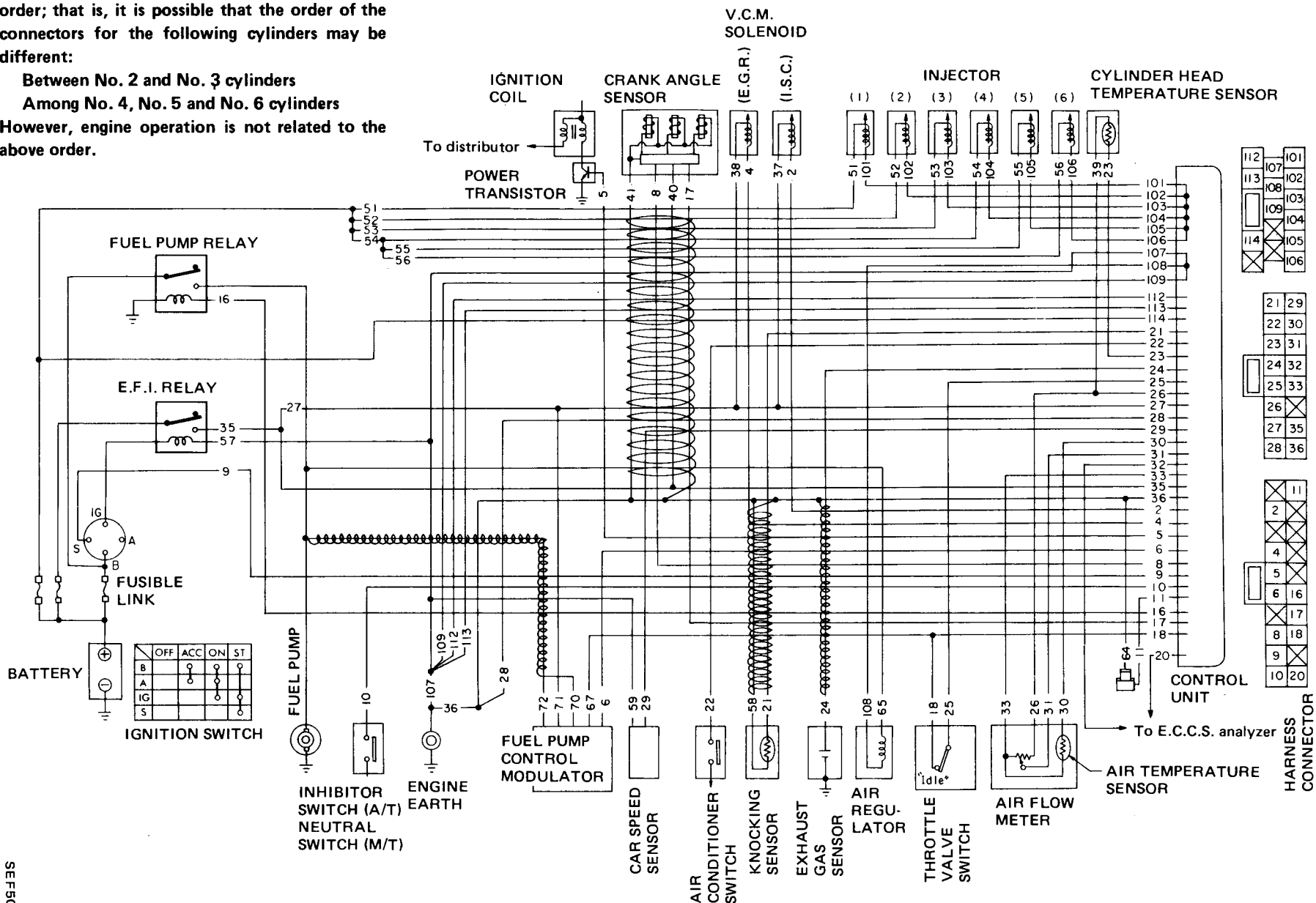
E.C.C.S. CIRCUIT DIAGRAM

Note:
When inspecting injector circuits, pay attention to the injector connectors which may not be in order; that is, it is possible that the order of the connectors for the following cylinders may be different:

Between No. 2 and No. 3 cylinders

Among No. 4, No. 5 and No. 6 cylinders

However, engine operation is not related to the above order.



DESCRIPTION

Electrical system inspection should be performed by using the E.C.C.S. ANALYZER (J28835).

If the analyzer is not available, some components can be inspected by using the following procedures.

PREPARATIONS FOR INSPECTION

VEHICLE PREPARATIONS

1. Turn ignition switch to "OFF" position.

CAUTION:

Before disconnecting and connecting electrical connectors, ensure that ignition switch is in the "OFF" position.

2. Disconnect battery ground cable.
3. Disconnect lead wire from "S" terminal of starter motor.
4. Arrange so that air flow meter flap can be pushed manually from air cleaner side.
5. Disconnect 15-pin, 20-pin and 16-pin E.C.C.S. harness connectors from control unit.

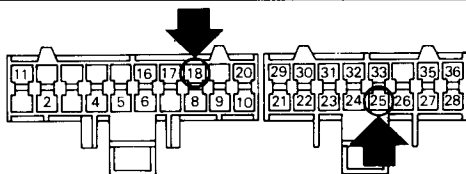
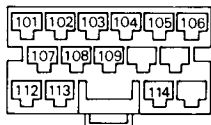
CAUTION:

- a. Before disconnecting ECCS harness at 15-pin, 20-pin and 16-pin connectors, ensure that ignition switch is in the "OFF" position.
- b. Be extremely careful not to break or bend 15-pin, 20-pin and 16-pin when disconnecting terminal. Do not touch the circuit tester probe to any unnecessary pin on the 15-pin, 20-pin and 16-pin connectors. Doing so could cause damage to the circuit tester.
- c. After inspection or replacement, connect E.C.C.S. harness connectors with control unit securely and make sure that connectors are secured properly. (At this time, a click may be heard.)

THROTTLE VALVE SWITCH TESTS

Test No. 1 Idle contacts

Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)	Throttle depressed	No continuity
	18	25	Throttle released	Continuity

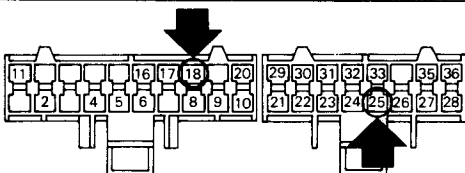
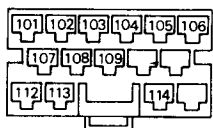


SEF502A

If test is O.K., go to Test No. 2.
If test is not O.K., go to Throttle Valve Switch Adjustment.

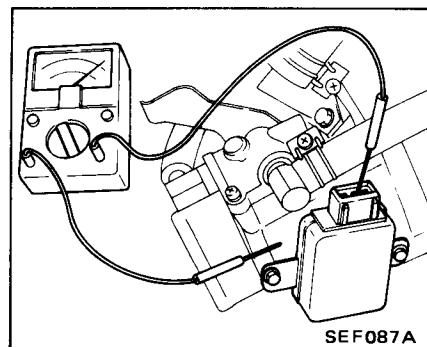
Test No. 2 Insulation test

Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		
	18	Body ground		$\infty \Omega$



SEF502A

Component check



SEF087A

Connect ohmmeter between engine and terminals ⑱ and ㉔. Ohmmeter reading should be infinite.

If test is O.K., check harness.

If test is not O.K., replace component and retest.

If test is O.K., go to Throttle Valve Switch Adjustment.

If test is not O.K., go to Component Check.

ADJUSTMENT

Refer to THROTTLE VALVE SWITCH.

AIR FLOW METER TESTS

Test No. 1 Air flow meter resistance

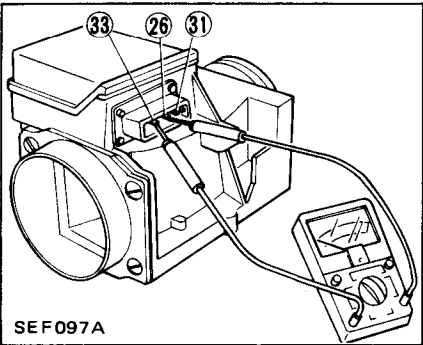
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		Approx. 280 to 400Ω
	33	26		

SEF504A

If test is O.K., go to Test No. 2.

If test is not O.K., perform component check.

Component check



Measure the resistance between terminals 26 and 33. The standard resistance is approximately 280 to 400 ohm.

If test is O.K., check harness.

If test is not O.K., replace component.

Test No. 2 Air flow meter resistance

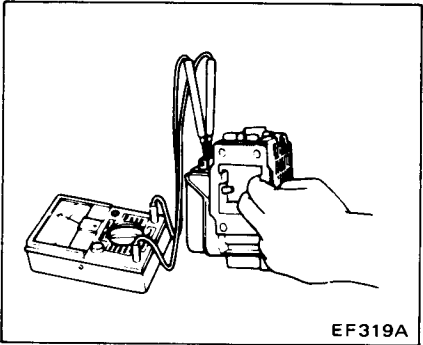
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		Except 0 and ∞Ω
	33	31		

SEF505A

If test is O.K., go to Test No. 3.

If test is not O.K., perform component check.

Component check



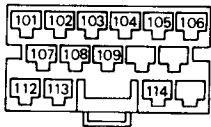
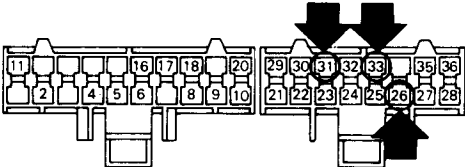
While sliding flap, measure resistance between terminals 33 and 31. If resistance is at any value other than 0 and ∞ ohm, air flow meter is normal.

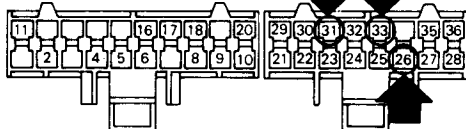
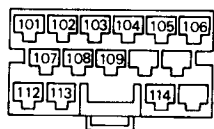
If test is O.K., check harness.

If test is not O.K., replace component.

Test No. 3 Insulation resistance

Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		$\infty \Omega$
	26	Body ground		
	31 33			

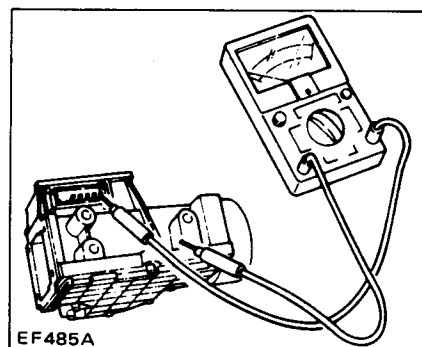


SEF506A

If test is O.K., go to Test No. 4.

If test is not O.K., perform component check.

Component check

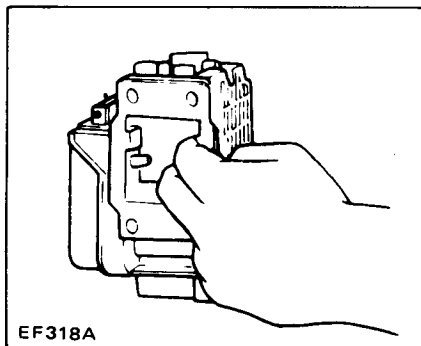


Check insulation resistance between the air flow meter body and any one of the terminals 26, 31 and 33. If continuity exists, the air flow meter is out of order.

If test is O.K., check harness.

If test is not O.K., replace component.

Test No. 4 air flow meter flap



EF318A

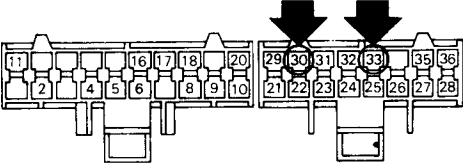
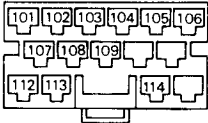
Fully open the flap by hand to check that it opens smoothly without binding. If it doesn't, it is out of order.

If test is O.K., air flow meter is O.K.

If test is not O.K., replace air flow meter.

AIR TEMPERATURE SENSOR TESTS

Test No. 1 Air Temperature Sensor				
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)	Intake air temperature	Below 2.9 kΩ
	33	30	20°C (68°F) or above	
			Below 20°C (68°F)	2.1 kΩ or above

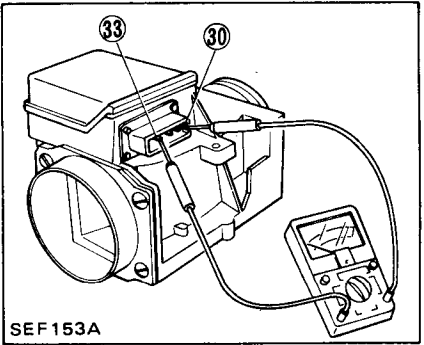


SEF507A

If test is O.K., go to Test No. 2.

If test is not O.K., perform component check.

Component check

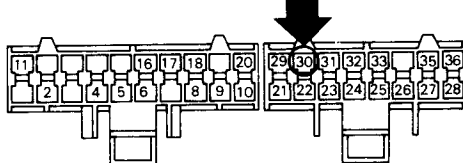
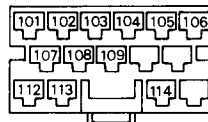


SEF153A

- 1. Measure the outside air temperature.
- 2. Measure resistance between terminals 33 and 30 of the air flow meter connector.

If test is O.K., check harness.
If test is not O.K., replace component.

Test No. 2 Insulation Resistance				
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		∞Ω
	30	Body ground		

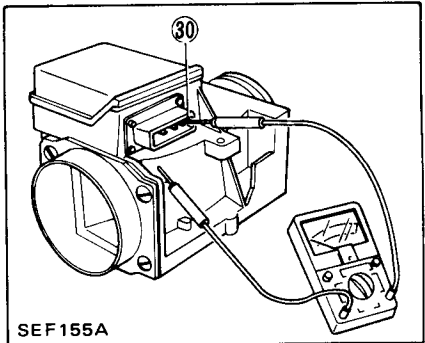


SEF508A

If test is O.K., air temperature sensor is O.K.

If test is not O.K., perform component check.

Component check



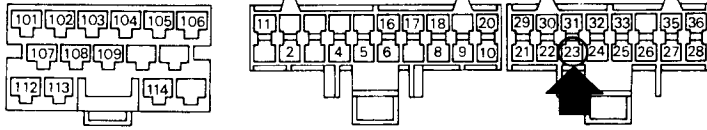
SEF155A

Check insulation resistance between terminal 30 and air flow meter body.

If test is O.K., check harness.
If test is not O.K., replace component.

CYLINDER HEAD TEMPERATURE SENSOR TEST

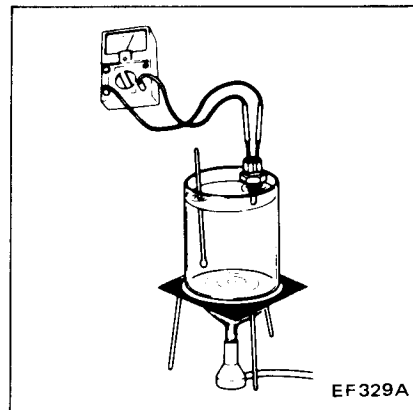
Cylinder head temperature sensor test				
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)	20°C (68°F) or above	Below 2.9 kΩ
	23	Body ground	Below 20°C (68°F)	2.1 kΩ or above



SEF509A

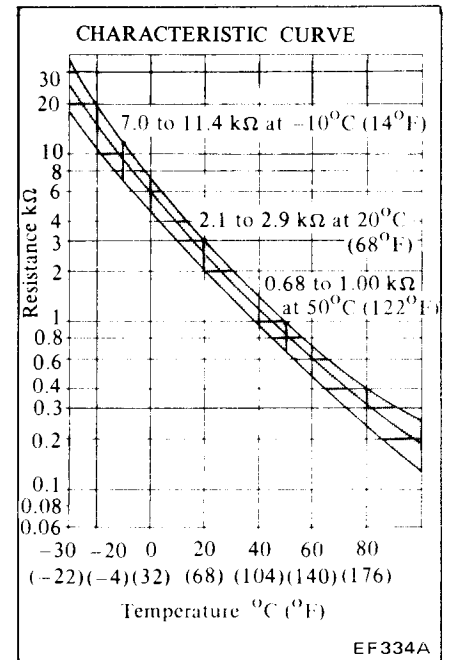
If test is O.K., test is complete.
If test is not O.K., perform component check.

Component check



EF329A

Dip the sensor into water maintained at a temperature of 20°C (68°F), 80°C (176°F), etc., and read its resistance.



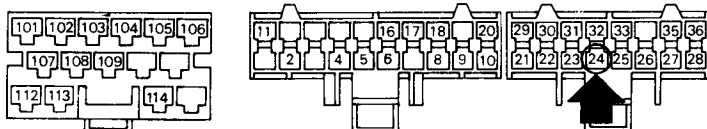
EF334A

If test matches curve, sensor is O.K.
Check harness.

If test does not match curve, replace sensor.

EXHAUST GAS SENSOR CIRCUIT TEST

Exhaust gas sensor circuit test				
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)	Disconnect exhaust gas sensor harness connector, and connect E.F.I. harness terminal for exhaust gas sensor to ground with a jumper wire.	0Ω
	24	Body ground		



SEF510A

If test is O.K., exhaust gas sensor circuit is O.K.

CONTROL UNIT GROUND CIRCUIT TESTS

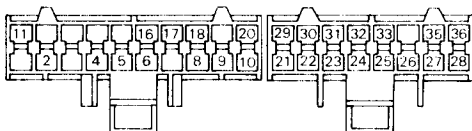
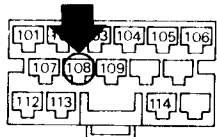
Control unit ground circuit tests				
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(-)		Continuity
	28	109		
	36	112		
	107	113		
	108		Body ground	

SEF511A

If tests are O.K., ground circuits are O.K.
If tests are not O.K., check wiring diagram and harness.

AIR REGULATOR AND FUEL PUMP RELAY TESTS

Test No. 1 Air regulator resistance				
Tester	Leads to Pins		Notes	Should Read
Ohmmeter	(+)	(–)		25 to 90Ω
	108	Body ground		

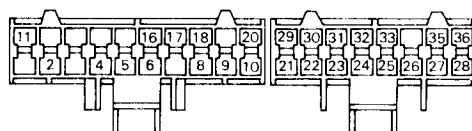
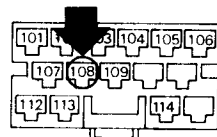


SEF512A

If test is O.K., go to Test No. 2.

If test is not O.K., check air regulator.

Test No. 2 Air regulator power circuit				
Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(–)	1. Disconnect starter motor "S" terminal. 2. Connect battery ground cable. 3. Ignition "START"	Battery voltage
	108	Body ground		



SEF512A

If test is O.K., air regulator is O.K.

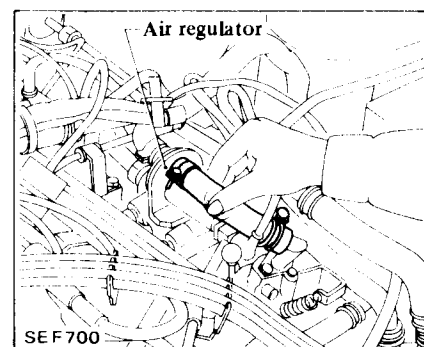
If test is not O.K., listen for operating sound of fuel pump.

If no sound is heard with ignition "ON", check fuel pump relay.

If fuel pump operates with ignition "ON", check air regulator.

Fuel pump operates for 5 seconds with ignition "ON" when engine is not running.

CHECKING AIR REGULATOR



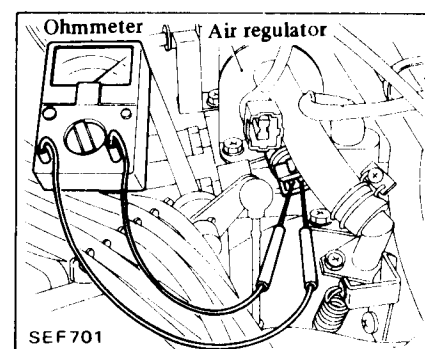
SEF700

1. Starting engine, and pinch rubber hose between throttle chamber and air regulator.

- Engine speed decreases during warm-up. O.K.
- Engine speed remains unchanged after warm-up. O.K.

2. Disconnect hoses from both ends of air regulator, and visually check to see if air regulator shutter opens.

3. Disconnect electric connector of air regulator, and check continuity. Continuity should exist. If not, air regulator is faulty.



SEF701

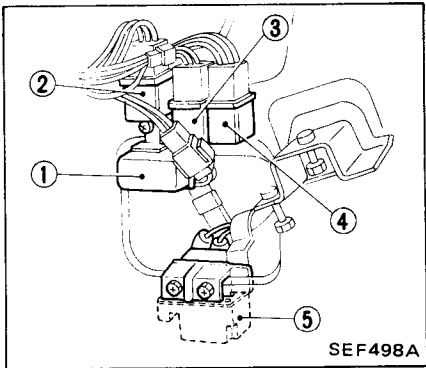
4. Pry air regulator shutter to open with a flat-blade screwdriver, then close. If shutter opens and closes smoothly, it is operating properly.

If test is O.K., check harness.

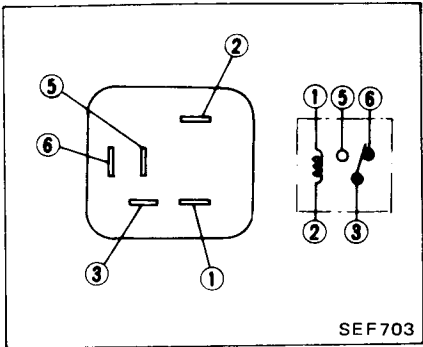
If test is not O.K., replace component and retest.

CHECKING FUEL PUMP RELAY

The fuel pump relay is installed on the dash right side.



- 1 Seat belt warning timer unit
- 2 Fuel pump relay
- 3 Ignition relay
- 4 Accessory relay
- 5 Fan motor timer unit

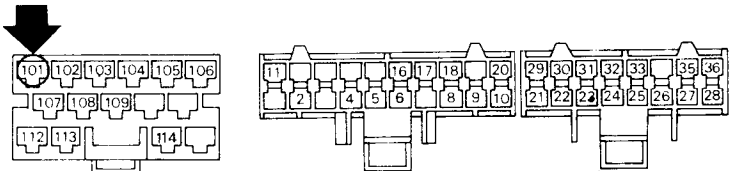


Check terminals	Normal condition	12V direct current is applied between terminals ① and ②
① - ②	Continuity	—
③ - ⑤	No continuity	Continuity
③ - ⑥	Continuity	No continuity

If test is O.K., check harness.
If test is not O.K., replace relay and retest.

INJECTOR CIRCUIT TESTS

Test No. 1 Cylinder No. 1				
Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	1. Connect battery ground cable. 2. Ignition "ON".	Battery voltage
	101	Body ground		

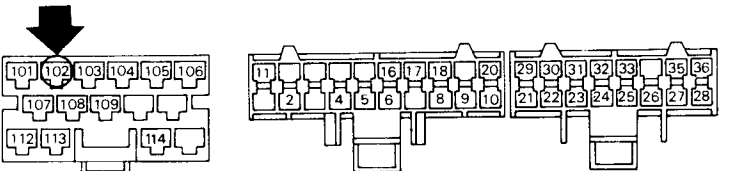


SEF515A

If test is O.K., go to Test No. 2.

If test is not O.K., go to Component Check.

Test No. 2 Cylinder No. 2 or No. 3				
Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	Ignition "ON".	Battery voltage
	102	Body ground		

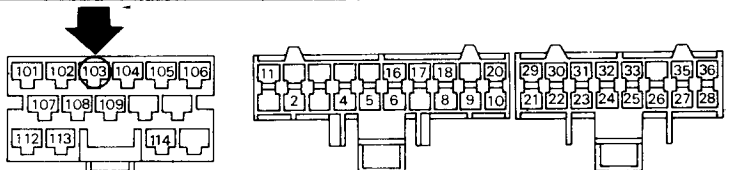


SEF516A

If test is O.K., go to Test No. 3.

If test is not O.K., perform component check.

Test No. 3 Cylinder No. 3 or No. 2				
Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	Ignition "ON"	Battery voltage
	103	Body ground		

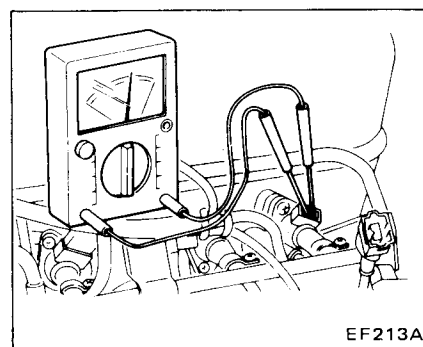


SEF517A

If test is O.K., go to Test No. 4.

If test is not O.K., go to Component Check.

Component check



EF213A

1. Disconnect ground cable from battery.
2. Disconnect electric connectors from injectors.
3. Check continuity between the two terminals. Continuity should exist. If not, injector(s) are faulty.

If test is O.K., go to E.C.C.S. harness Check.

If test is not O.K., replace injection.

Test No. 4 Cylinder No. 4, No. 5 or No. 6				
Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	Ignition "ON".	Battery voltage
	104	Body ground		

SEF518A

If test is O.K., go to Test No. 5.

If test is not O.K., go to Component Check.

Test No. 5 Cylinder No. 5, No. 4 or No. 6				
Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	Ignition "ON".	Battery voltage
	105	Body ground		

SEF519A

If test is O.K., go to Test No. 6.

If test is not O.K., go to Component Check.

Test No. 6 Cylinder No. 6, No. 4 or No. 5				
Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	Ignition "ON".	Battery voltage
	106	Body ground		

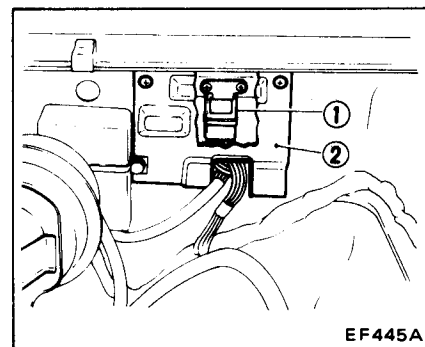
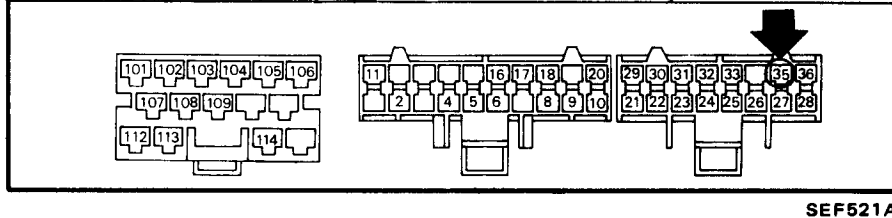
SEF520A

If test is O.K., all injectors are O.K.

If test is not O.K., perform E.C.C.S. harness check.

E.F.I. RELAY**Component check**

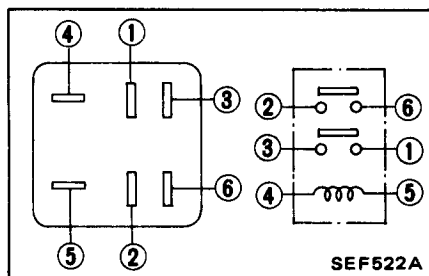
E.F.I. relay test (Control unit power input circuit test)			
Tester	Leads to Pins		Notes
Voltmeter	(+)	(-)	1. Connect battery ground cable. 2. Ignition "ON".
	35	Body ground	



- 1 E.F.I. relay
2 Relay cover

If test is O.K., E.F.I. relay is O.K.

If test is not O.K., perform component check.



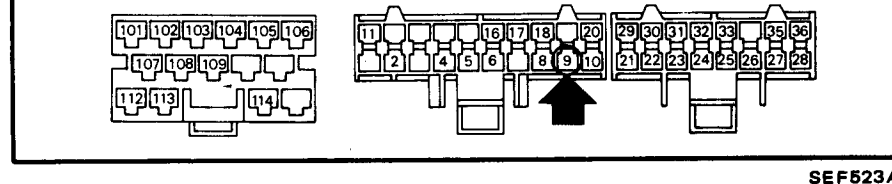
Check terminals	Normal condition	12V direct current is applied between terminals ④ and ⑤
④ - ⑤	Continuity	—
① - ③	No continuity	Continuity
② - ⑥	No continuity	Continuity

If test is O.K., check harness.

If test is not O.K., replace relay and retest.

IGNITION START SIGNAL TEST

Ignition start signal test			
Tester	Leads to Pins		Notes
Voltmeter	(+)	(-)	1. Disconnect starter motor "S" terminal. 2. Connect battery ground cable. 3. Ignition "START".
	9	Body ground	

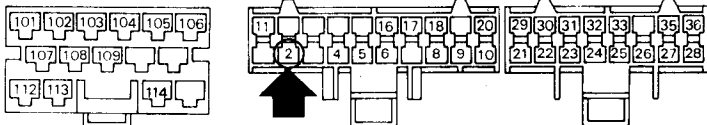


If test is O.K., ignition start signal is O.K.

If test is not O.K., inspect ignition coil and harness.

VACUUM CONTROL MODULATOR (V.C.M.) TEST**Test No. 1 Solenoid valve for I.S.C.**

Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	1. Connect battery ground cable. 2. Ignition "ON".	Battery voltage
	2	Body ground		



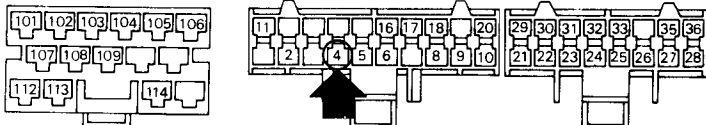
SEF524A

If test is O.K., go to Test No. 2.

If test is not O.K., check solenoid valve for I.S.C.

Test No. 2 Solenoid valve for E.G.R.

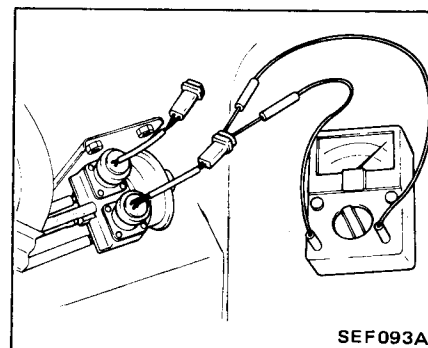
Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	1. Connect battery ground cable. 2. Ignition "ON".	Battery voltage
	4	Body ground		



SEF525A

If test is O.K., solenoid valves of V.C.M. are O.K.

If test is not O.K., go to Component Check and Harness Check.

Component check

SEF093A

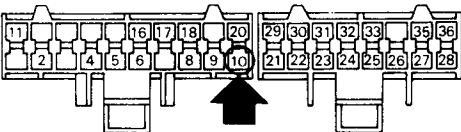
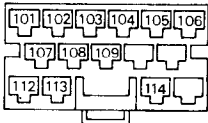
1. Disconnect two electric connectors from V.C.M.
2. Check resistance between two terminals. Resistance should be approximately 40 ohms. ... O.K.

If test is O.K., go to Harness Check.

If test is not O.K., replace V.C.M. assembly.

PARK/NEUTRAL SWITCH

Park/neutral switch test				
Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	1. Connect battery ground cable. 2. Ignition "ON". 3. Transmission gear position "N" or "P".	0V
	10	Body ground		



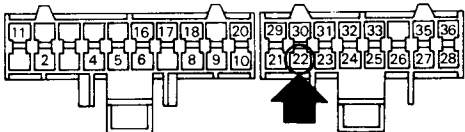
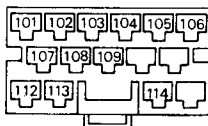
SEF526A

If test is O.K., the park/neutral switch is O.K.

If test is not O.K., check harness and/or inhibitor switch. (Refer to AT section.)

AIR CONDITIONER SWITCH

Air conditioner switch				
Tester	Leads to Pins		Notes	Should Read
Voltmeter	(+)	(-)	Air conditioner switch "ON" "OFF"	12V 0V
	22	Body ground		



SEF527A

If test is O.K., the air conditioner switch is O.K.

If test is not O.K., check harness and/or air conditioner switch. (Refer to HA section.)

CRANKCASE EMISSION CONTROL SYSTEM

DESCRIPTION

MODEL NOT EQUIPPED WITH TURBOCHARGER

This system returns blow-by gas to both the intake manifold and air duct.

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 air duct, through the tube connecting air duct to the 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 tube connection in the reverse direction.

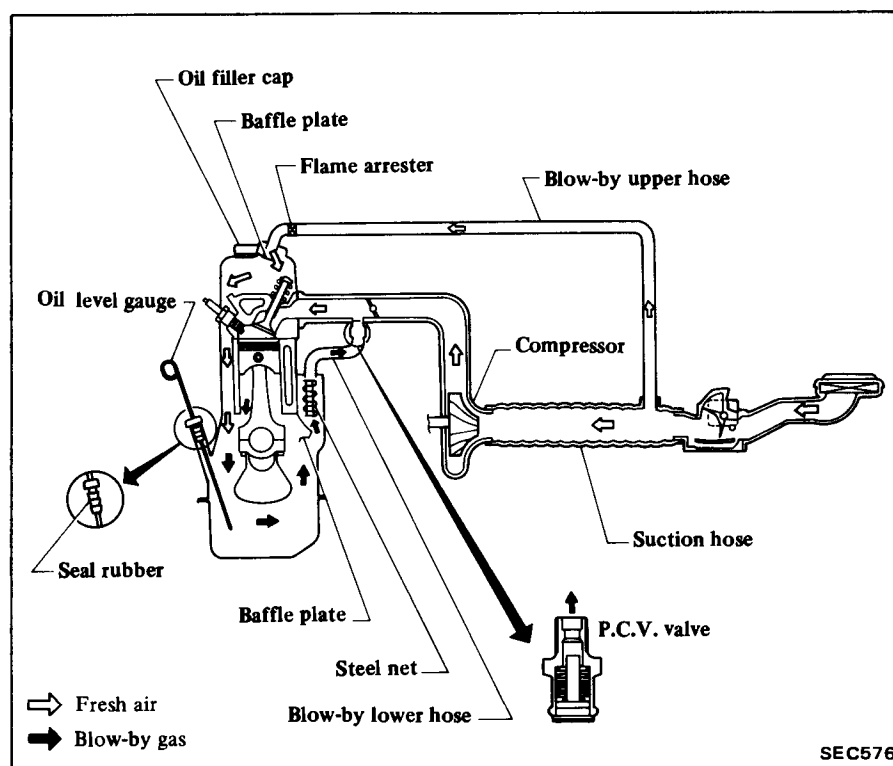
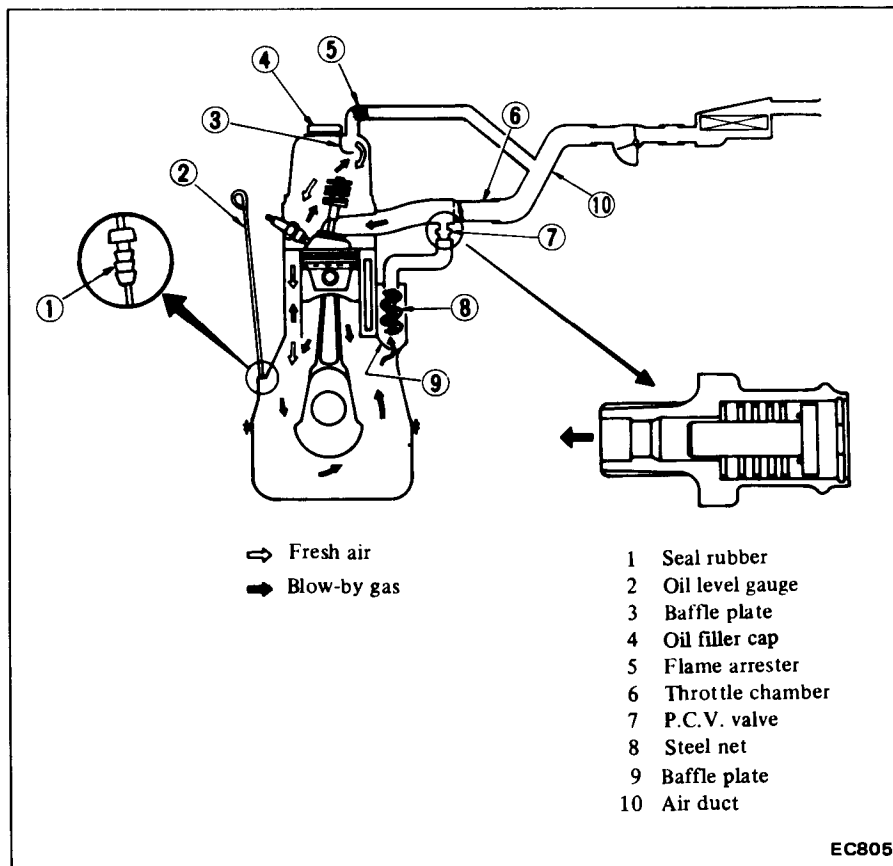
On cars with an excessively high blow-by, some of the flow will go through the tube connection to air duct under all conditions.

MODEL EQUIPPED WITH TURBOCHARGER

This system returns blow-by gas to both the suction hose and the intake manifold.

Since a vacuum is normally kept in the portion between the air cleaner and suction hose, blow-by gas in the rocker cover is sucked into the turbocharger from the suction hose, and is then sent into the intake manifold through the throttle chamber where it is burnt in the engine.

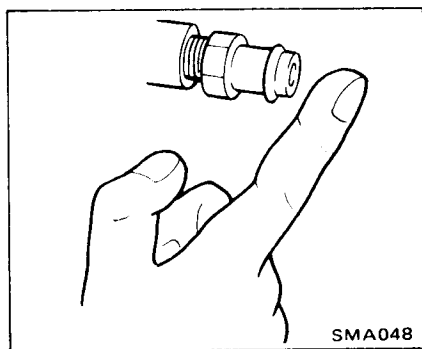
Blow-by gas located in the crankcase flows into the intake manifold through the positive crankcase ventilation (P.C.V.) valve in the blow-by lower hose when vacuum is maintained in the intake manifold. If positive pressure exists in the intake manifold, any blow-by gas in the crankcase is led to the blow-by upper hose, which prevents an abnormal rise in crankcase pressure.



INSPECTION

P.C.V. VALVE

With engine running at idle, remove the ventilation 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.

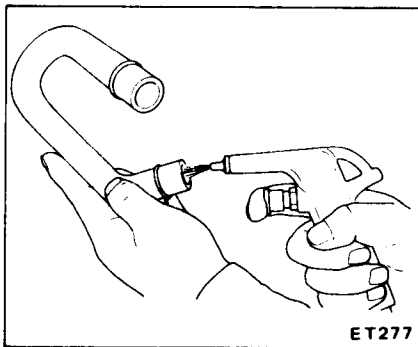


VENTILATION HOSES

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.

Ensure that flame arrester is surely inserted in hose between air duct and rocker cover.



EXHAUST EMISSION CONTROL SYSTEM

EXHAUST GAS RECIRCULATION (E.G.R.) SYSTEM

OPERATION

In the exhaust gas recirculation system, some of the exhaust gas is returned to the combustion chamber to lower the spark flame temperature

during combustion. This results in a reduction of the nitrogen oxide content in the exhaust gas.

When the E.G.R. control valve is open, some of the exhaust gas is led from the exhaust manifold to the chamber.

The exhaust gas is then regulated by E.G.R. valve, and is introduced into the intake manifold.

Water temperature °C (°F)	Thermal vacuum valve	E.G.R. Control system
Below 55 (131)	Open	Not actuated
55 - 95 (131 - 203)	Closed	Actuated
Above 95 (203)	Open	Not actuated

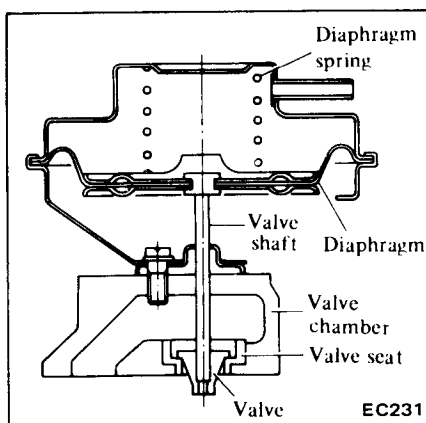
With the engine at idle or at full throttle, the E.G.R. control valve closes to deactivate the E.G.R. system regardless of water temperature.

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 taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the throttle valve.

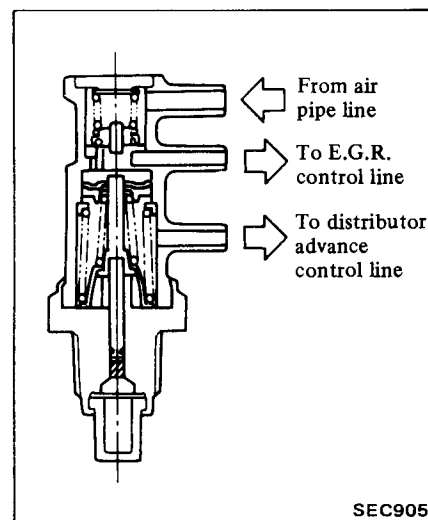
When replacing the E.G.R. valve with a new one, verify that the type

number on the new part is the same as that on the former one.



Thermal vacuum valve (3-port wax type)

The thermal vacuum valve, which is attached to the thermostat housing, monitors the temperature of the engine cooling water. The valve shaft is propelled by the thermal expansion force of wax which depends on the temperature. This action opens and closes the valve, which causes the E.G.R. control vacuum line to be exposed or closed to the atmosphere. When the valve opens, air from the air pipe line is introduced, and because the venturi vacuum transducer (V.V.T.) valve and E.G.R. valve diaphragm are exposed to the atmosphere the E.G.R. operation will not function.



- Be sure to apply sealer to threads of the valve prior to installing a new valve.
- When installing a new thermal vacuum valve, be sure that color and shape are correct.

INSPECTION

Entire system

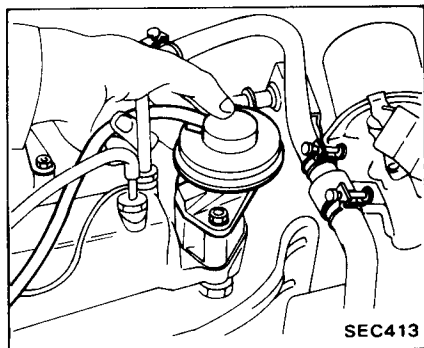
1. Make a thorough visual check of E.G.R. control system. If necessary, wipe away oil to facilitate inspection.

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 finger.

3. With engine running, inspect E.G.R. control valve. Place a finger on the diaphragm of E.G.R. control valve to check for valve operation.

Check operation of E.G.R. valve, using the following chart as a guide. Engine speed should always be increased from idle to 3,000 to 3,500 rpm.



Engine coolant temperature °C (°F)	E.G.R. control valve operation
Below 55 (131) or above 95 (203)	Not actuated
55 - 95 (131 - 203)	Actuated

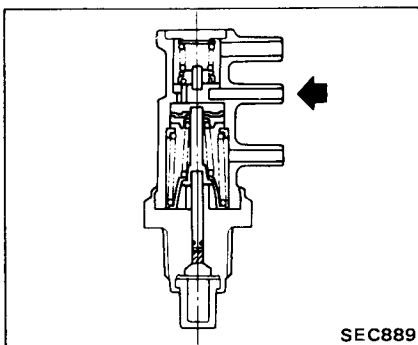
4. If E.G.R. control valve does not operate as indicated above, check as follows:

- Engine coolant temperature is between 55 and 95°C (131 and 203°F)
- Increase engine speed from idle to 3,000 to 3,500 rpm.

(1) Thermal vacuum valve.

- Disconnect one end of vacuum gallery.

- Make sure that thermal vacuum valve is closed, and that throttle chamber vacuum is not present at end of vacuum tube.
- If vacuum is present, check thermal vacuum valve itself.



(2) E.G.R. control valve.

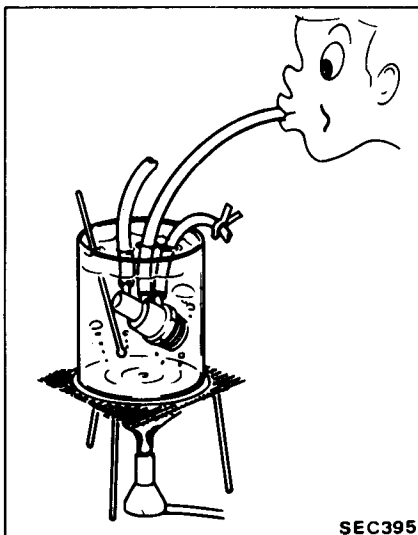
Check E.G.R. control valve itself.

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.

Thermal vacuum valve operating temperature:

Operating temperature °C (°F)	
Open	Closed
Below 55 (131) Above 95 (203)	55 - 95 (131 - 203)



CAUTION:

Do not allow water to get inside the thermal vacuum valve.

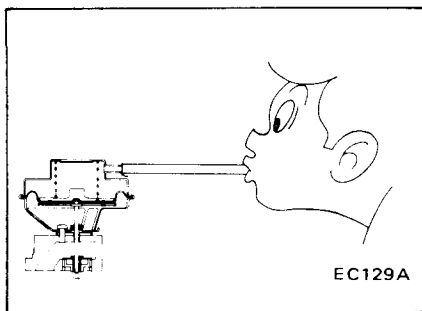
E.G.R. control valve

Dismount E.G.R. control valve from engine.

1. Apply vacuum to E.G.R. control valve, referring to the following figure. If the valve moves to full position, it is normal.

Plug hose with vacuum applied.

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.

SPARK TIMING CONTROL SYSTEM

VACUUM ADVANCE MECHANISM

Description

The spark timing is controlled in two stages, WARM-UP and NORMAL DRIVING to obtain good fuel economy and quick warm-up of the catalyst.

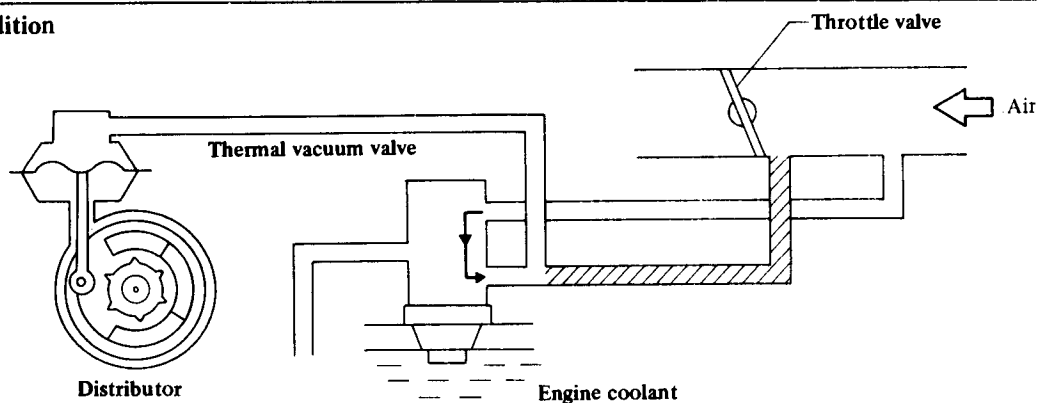
This system is designed so that the engine coolant temperature is monitored by the T.V.V. to control the distributor vacuum and provide correct advance timing.

Operation

This system is controlled as follows:

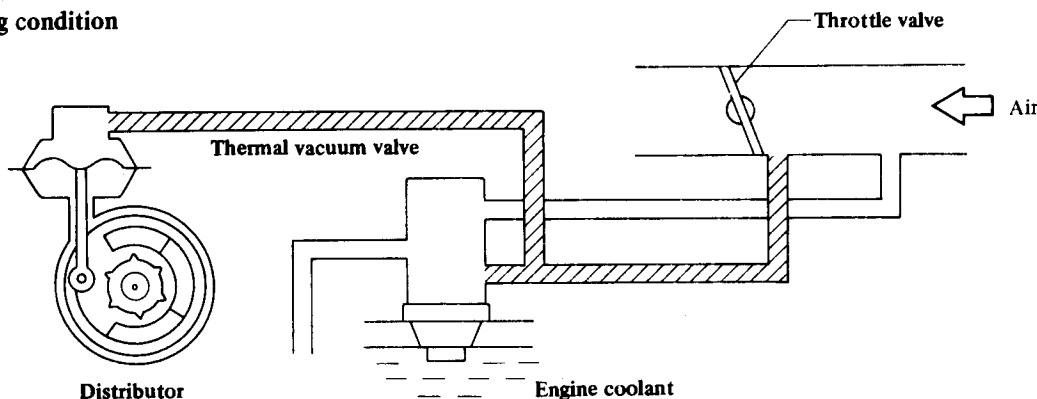
	Warm-up	Normal driving
Water temperature °C (°F)	Below 55 (131)	Above 55 (131)
Spark timing control system	Not actuated	Actuated

Warm-up condition



SEC890

Normal driving condition

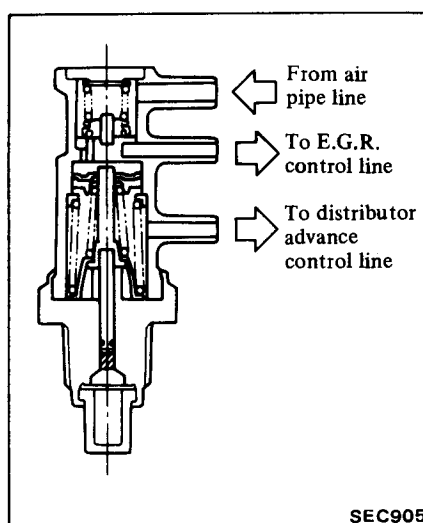


SEC891

Thermal vacuum valve

The thermal vacuum valve designs are exactly the same as those used in the E.G.R. control system. This action opens and closes the valve, which causes the spark timing control vacuum line to be exposed or closed to the atmosphere.

The thermal valve opens and closes to either permit or obstruct external air passing to the distributor vacuum line. When the valve opens, the vacuum signal line will allow external air to enter, thereby stopping the distributor vacuum from advancing.

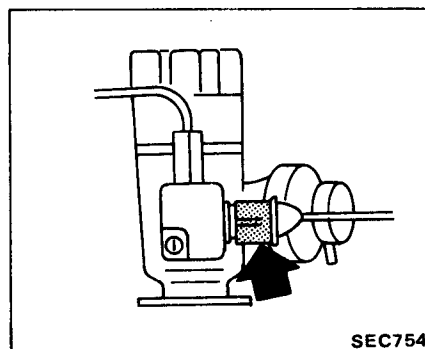


SEC905

Inspection

Entire system

1. Disconnect harness connector (Color: Gray) from distributor.

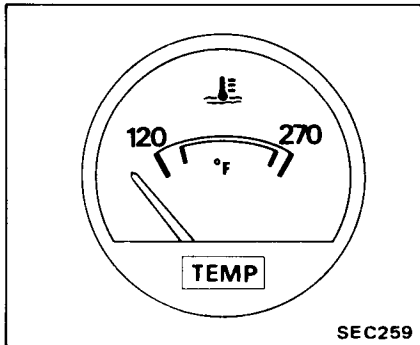


SEC754

2. Ensure that vacuum hoses are properly connected to their positions.
3. Ensure that distributor vacuum controller properly functions.
4. Set timing light.
5. Check thermal vacuum valve as follows:

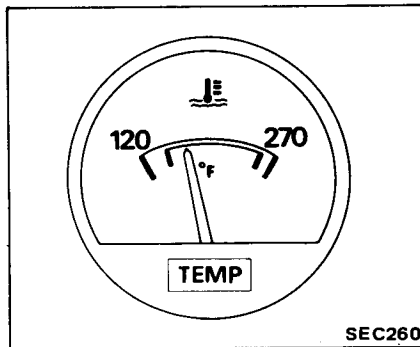
Start the engine from the cold condition.

- (1) Using timing light, check the spark timing when the temperature gauge is in the C-position.



- (2) Warm up the engine to the middle position of temperature gauge.

Ensure that the spark timing advances from the former condition.



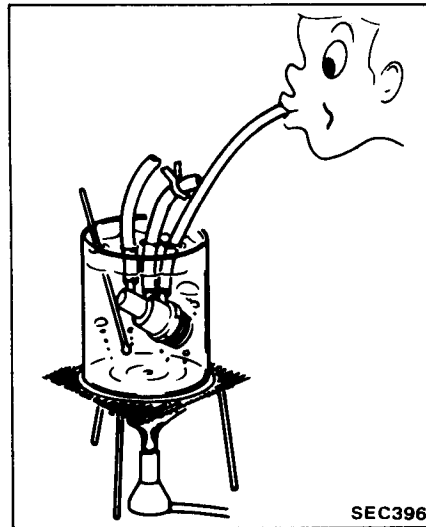
If the spark timing does not change, check thermal vacuum valve.

Check proper operation of thermal vacuum valve as follows:

Thermal vacuum valve

Thermal vacuum valve operating temperature:

Operating temperature °C (°F)	
Open	Closed
Below 55 (131)	Above 55 (131)



CAUTION:

Do not allow water to get inside the thermal vacuum valve.

ELECTRIC ADVANCE SYSTEM

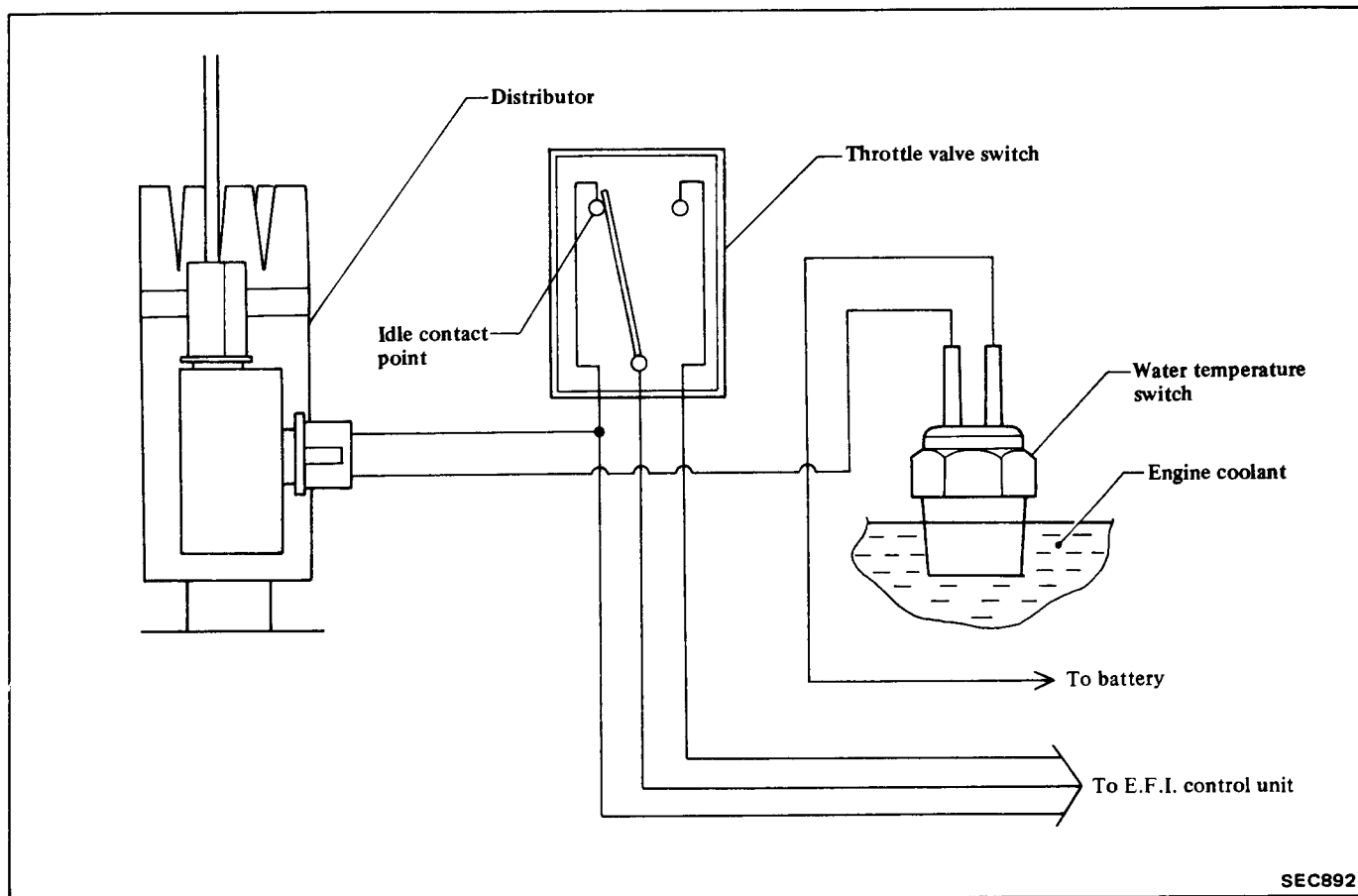
Description

The spark timing is controlled by means of electric method, only when the engine condition is either "Cold" (the coolant is below certain temperature) or "Idle" (the throttle valve is closed), the spark timing is advanced.

Operation

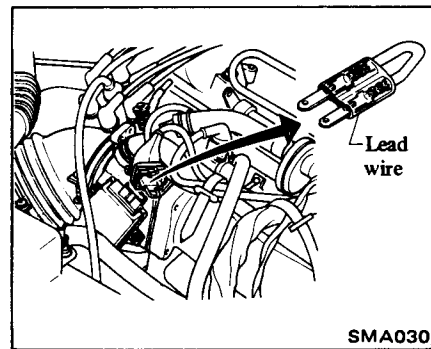
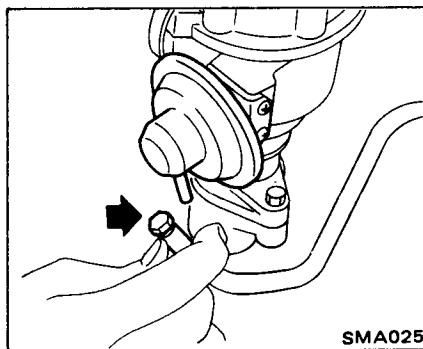
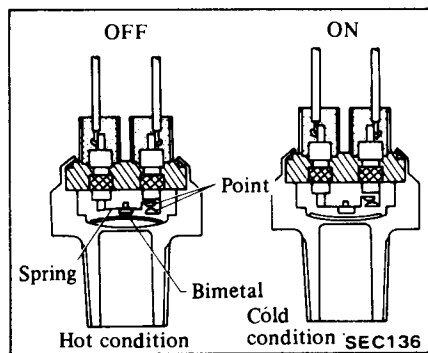
This system is controlled as follows:

	Idle condition (Idle switch: ON)	Other condition (Idle switch: OFF)
Cold condition (Water temperature switch: ON)	Advanced	Advanced
Normal condition (Water temperature switch: OFF)	Advanced	Not advanced



Water temperature switch

Water temperature switch is operated by coolant temperature as shown below.



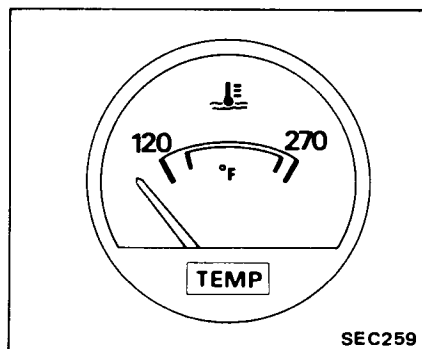
- (1) Start the engine from the cold condition.
- (2) Using timing light, check the spark timing when the temperature gauge is in the C-position.

Inspection

Entire system

1. Disconnect distributor vacuum hose from distributor vacuum controller, and plug hose with proper plug.

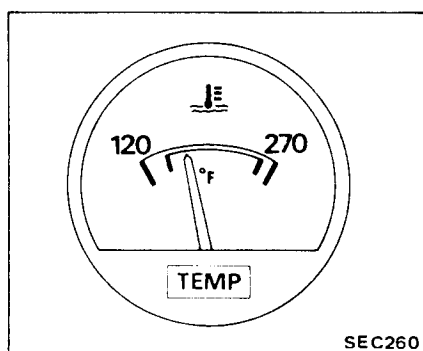
2. Ensure that harness connectors are properly connected to their positions.
3. Set timing light.
4. Check the system operation as follows:



(3) Stop the engine and disconnect the lead wire between terminals No. 24 and No. 30 of throttle valve switch harness connector.

(4) Using timing light, recheck the spark timing when the temperature gauge is in the C-position. Make sure that it indicates the same spark timing as that shown in step (2).

(5) Using timing light, ensure that the spark timing retards from the former condition when the temperature gauge changes from the C-position to the middle position.

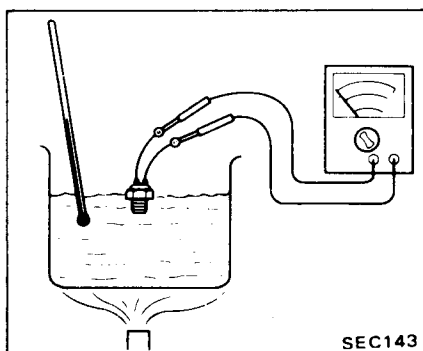


(6) Stop the engine and connect throttle valve switch harness connector.

(7) Ensure that the spark timing advances from the former condition.

(8) If the spark timing shows abnormalities in the above steps, check throttle valve switch and water temperature switch.

Check proper operation of water temperature switch as follows.



Water temperature °C (°F)	Continuity
Below 35 (95)	Yes
Above 35 (95)	No

There are two diaphragms in the device unit. Diaphragm I detects the manifold vacuum and makes the Vacuum Control Valve open when the vacuum exceeds the operating pressure. Diaphragm II operates the Air Control Valve according to the vacuum transmitted through the Vacuum Control Valve. The Air Control Valve regulates the amount of additional air so that the manifold vacuum can be kept at the proper operating pressure. The operating pressure changes depending on altitude; thus, diaphragm I and control valve operations are adjusted automatically in coincidence with the altitude at which the vehicle is driven. The table indicates change in operating pressure for changes in atmospheric pressure and altitude.

OPERATION

B. C. D. D.

Diaphragm I ⑤ monitors the manifold vacuum; when the vacuum exceeds a pre-determined value, it acts so as to open the vacuum control valve ④. This causes the manifold vacuum to be introduced into vacuum chamber II ⑬ and actuates diaphragm II ⑦.

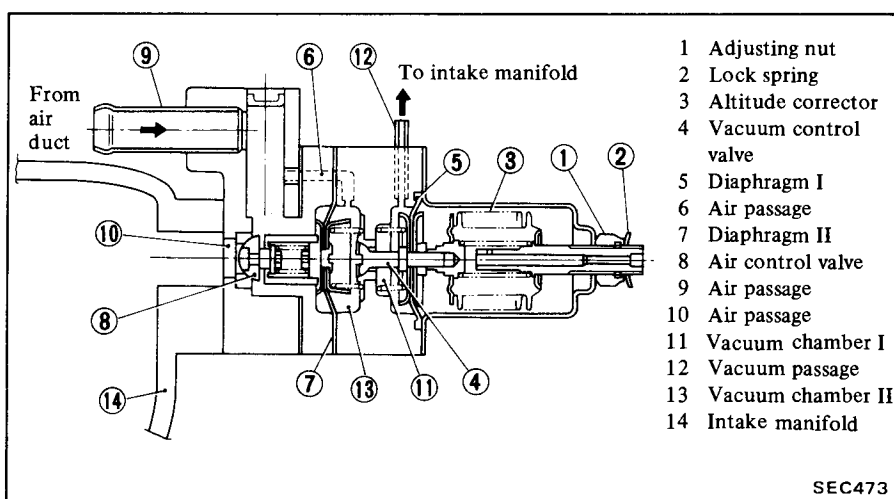
When diaphragm II operates, the air control valve ⑧ opens the air passage and introduces the additional air into the manifold.

The amount of air is controlled by the servo-action of the air control valve ⑧ and vacuum control valve ④ so that the manifold vacuum may be kept at the pre-determined value.

BOOST CONTROLLED DECELERATION DEVICE (B.C.D.D.)

DESCRIPTION

The Boost Controlled Deceleration Device (B.C.D.D.) is employed to reduce HC emissions emitted during coasting. The B.C.D.D., installed under the intake manifold supplies additional air to the intake manifold during coasting to maintain the manifold vacuum at the proper operating pressure.



Water temperature switch

1. Drain about one liter (1-1/8 US qt, 7/8 Imp qt) of engine coolant.
2. Disconnect wiring. Do not attach tool to the plastic portion of switch, because that could break the switch.
3. Dip the switch in a pan of water, and check its responses to changes in water temperature.

SEC473

INSPECTION

Entire system

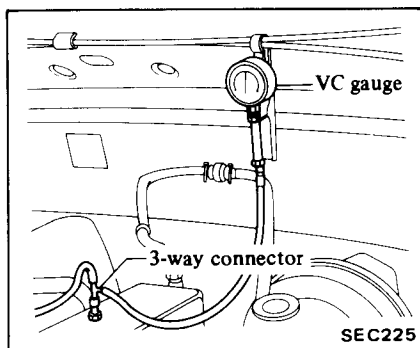
Generally, it is unnecessary to adjust the boost control valve. If it should become necessary to adjust it, the procedure is as follows:

This adjustment should be carried out with the automatic transmission lever in the "N" position.

Prepare the following tools

- (1) Tachometer to measure the engine speed while idling.
- (2) A vacuum gauge and connecting pipe.

1. Connect rubber hose between vacuum gauge and intake manifold as shown.



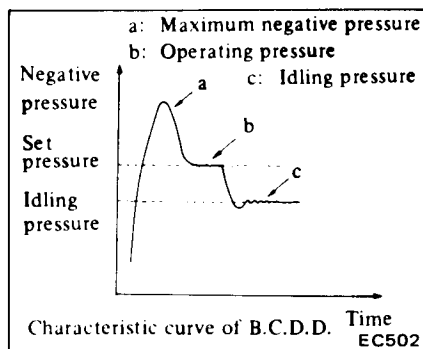
2. Warm up the engine until it is heated to operating temperature.

Then adjust the engine at normal idle setting. (Refer to the item "Idle Adjustment").

3. Run the engine under no load. Increase engine speed to 3,000 to 3,500 rpm, then quickly close throttle valve.

4. At that time, the manifold vacuum pressure will change as follows:

- 1) It will abruptly rise up to -80.0 kPa (-600 mmHg, -23.62 inHg) or above.
- 2) It will decrease gradually to a certain level and stay there for a while. This is so called operating pressure.
- 3) In most cases, it will drop to idling pressure.



5. Check that the B.C.D.D. operating pressure is within the specified range.

Unit: kPa (mmHg, inHg)

At atmospheric pressure	Operating pressure
101.3 (760, 29.92)	-76.0 ± 2.7 (-570 ± 20 , -22.44 ± 0.79)
80.0 (600, 23.62)	-58.7 ± 2.7 (-440 ± 20 , -17.32 ± 0.79)

6. If it is lower or higher than the specified level, turn the adjusting screw in the following direction until correct adjustment is made.

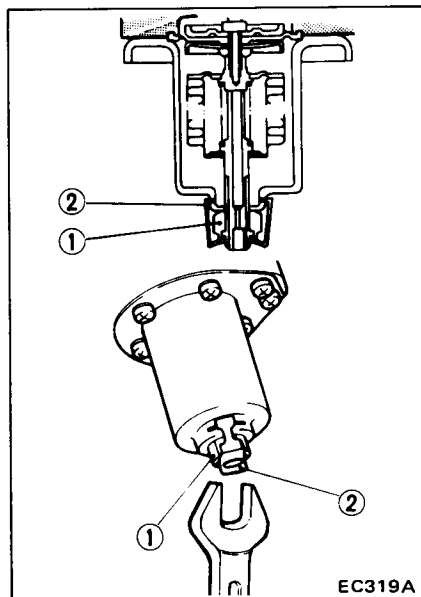
Adjusting screw:

Lower condition

Counterclockwise

Higher condition

Clockwise



- 1 Adjusting nut
- 2 Lock spring

8. If it is lower than the set level, turn the adjusting screw until correct adjustment is made.

9. Race the engine and check for adjustment.

If engine speed cannot be decreased to idling when checking B.C.D.D. operating pressure, proceed as follows.

10.

(1) Turn adjusting screw counterclockwise so that B.C.D.D. operating pressure is on high vacuum side, 2.7 kPa (20 mmHg, 0.79 inHg) away from the specified value.

(2) Turn adjusting screw $1/4$ of a turn clockwise so that B.C.D.D. operating pressure drops by 2.7 kPa (20 mmHg, 0.79 inHg).

If B.C.D.D. operating pressure cannot be observed clearly even in step 10 (1), proceed as follows:

11.

(1) Turn adjusting screw counterclockwise so that B.C.D.D. operating pressure is on the high vacuum side 6.7 kPa (50 mmHg, 1.97 inHg) away from the specified value.

(2) Turn the adjusting screw $1/2$ of a turn clockwise.

The B.C.D.D. operating pressure should be correctly set within the specified range after the above adjustments, even if the engine speed cannot be decreased to idling.

7. Race the engine and check for adjustment.

CATALYTIC CONVERTER SYSTEM

DESCRIPTION

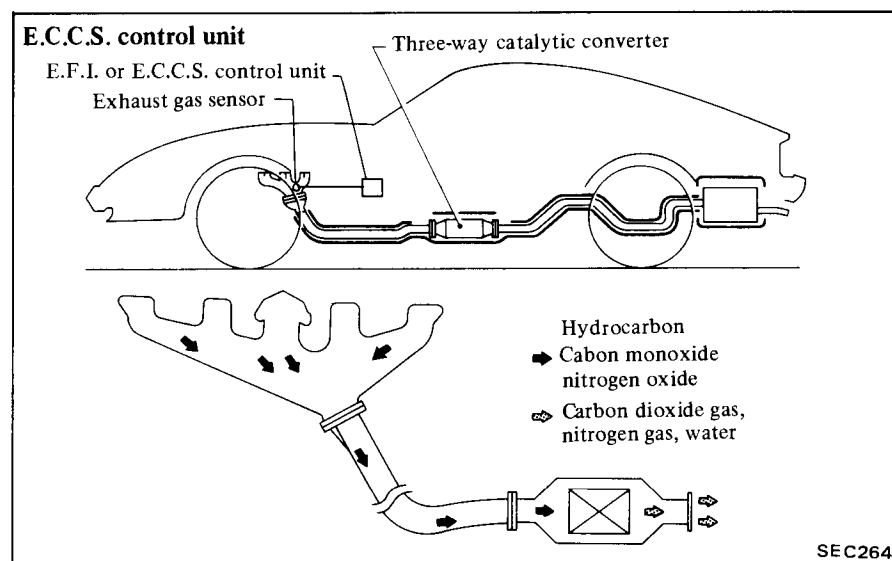
The three-way catalytic converter utilizes a catalyst to accelerate the re-combustion of HC and CO and reduce NOx in the exhaust gas, changing them into harmless CO₂, H₂O and N₂.

To accomplish the oxidization and reduction of such harmful contents, the exhaust gas sensor monitors O₂ level, feeds it back to the EFI control unit and maintains the mixture ratio to the stoichiometric point at all times.

OPERATION

The exhaust gas from the engine contains unburned, harmful components. The mixture ratio feedback system reduces such harmful components in the exhaust gas. In this system, an exhaust gas sensor monitors the contents of O₂ density to determine the combustion condition and maintains the mixture ratio to the stoichiometric point.

While the mixture ratio is so maintained, the three-way catalytic converter activates to change the harmful components (HC, CO, and NOx) into harmless CO₂, H₂O and N₂. In this way, the catalytic converter cleans the exhaust gas and discharges H₂O, CO₂ and N₂ into the atmosphere.



INSPECTION

Preliminary inspection

Visually check condition of all component parts including hoses, tubes, and wires, replace if necessary. Refer to Mixture Ratio Feedback System for inspection.

Catalytic converter

Check whether catalytic converter is normal or not by observing variation in CO percentage. The checking procedure is as follows:

Apply parking brake. Shift gears into "Neutral" (for manual transmission) and "N" or "P" (for automatic transmission) position.

E.F.I. models

1. Visually check catalytic converter for damage or cracks.
2. Adjust engine idle speed. Refer to Adjusting Idle RPM for adjustment.
3. Race engine (1,500 to 2,000 rpm) two or three times under no load.
4. If idle 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 idle 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 mixture ratio feedback system to see if it is functioning properly. 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.

E.C.C.S. models

Check whether catalytic converter is normal or not by observing variation in CO percentage. The checking procedure is as follows:

Apply parking brake. Shift gears into "N" or "P" position.

1. Visually check catalytic converter for damage or cracks.
2. Warm up engine for about four minutes at 2,000 rpm under no load.
3. Measure CO percentage at idle speed. After step 2 has been completed, wait for one minute before making CO percentage measurement.
4. If CO percentage measured in step 3 is less than 0.3%, the catalytic converter is normal.
5. If CO percentage measured in step 3 is over 0.3%, check mixture ratio feedback system to see if it is functioning properly. Then, perform inspection steps 2 and 3.
6. If CO percentage is still over 0.3% in step 5, catalytic converter is malfunctioning. Replace catalytic converter.

EVAPORATIVE EMISSION CONTROL SYSTEM

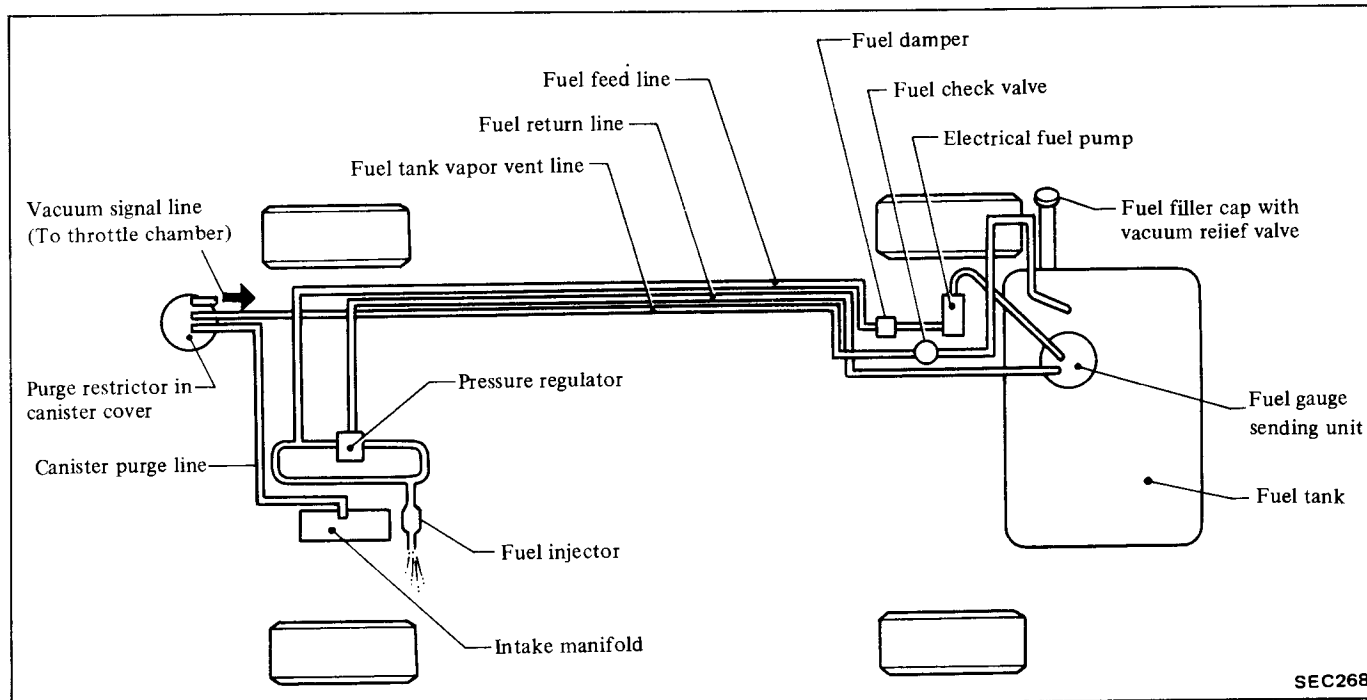
DESCRIPTION

The evaporative emission control system is used to reduce hydrocarbons

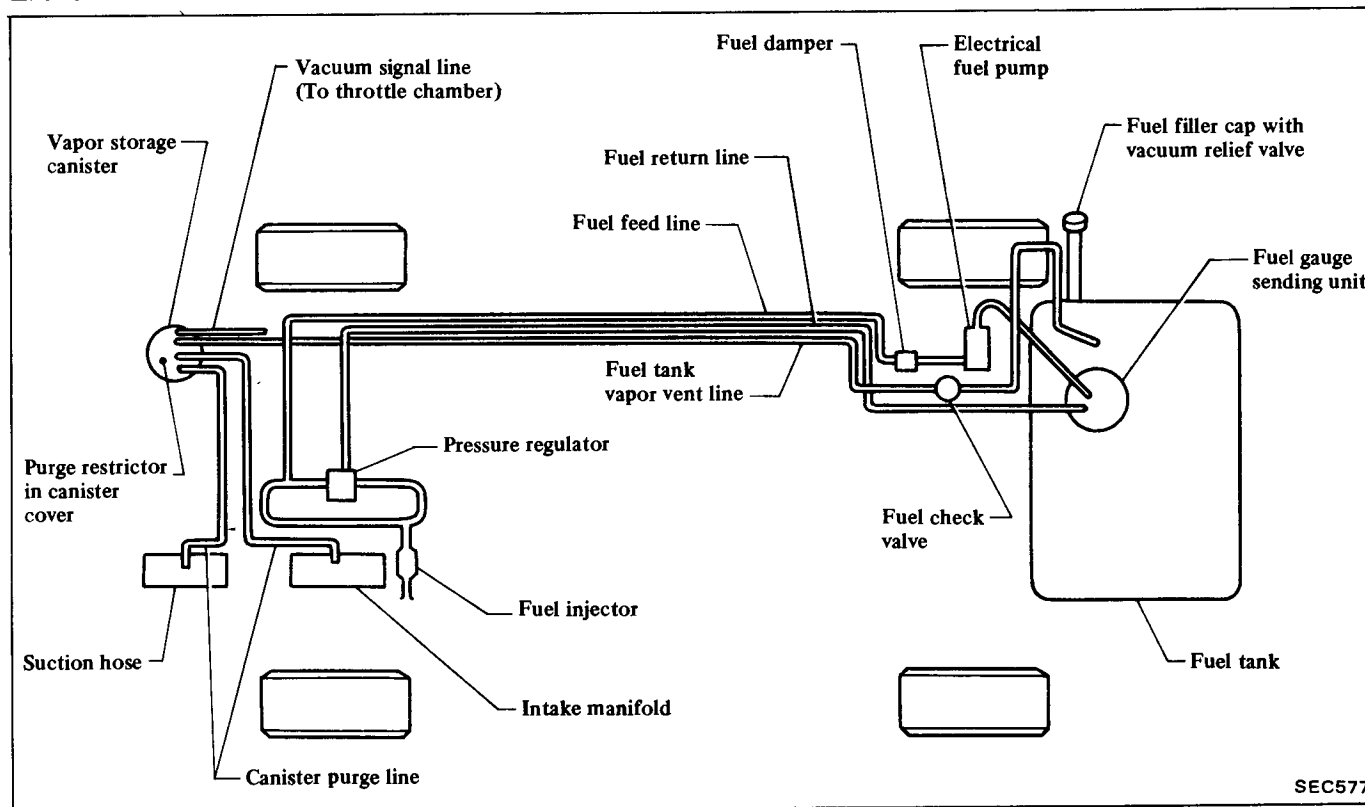
emitted to the atmosphere from the fuel system. This reduction of hydro-

carbons is accomplished by activated charcoals in the carbon canister.

E.F.I. MODELS



E.C.C.S. MODELS



OPERATION

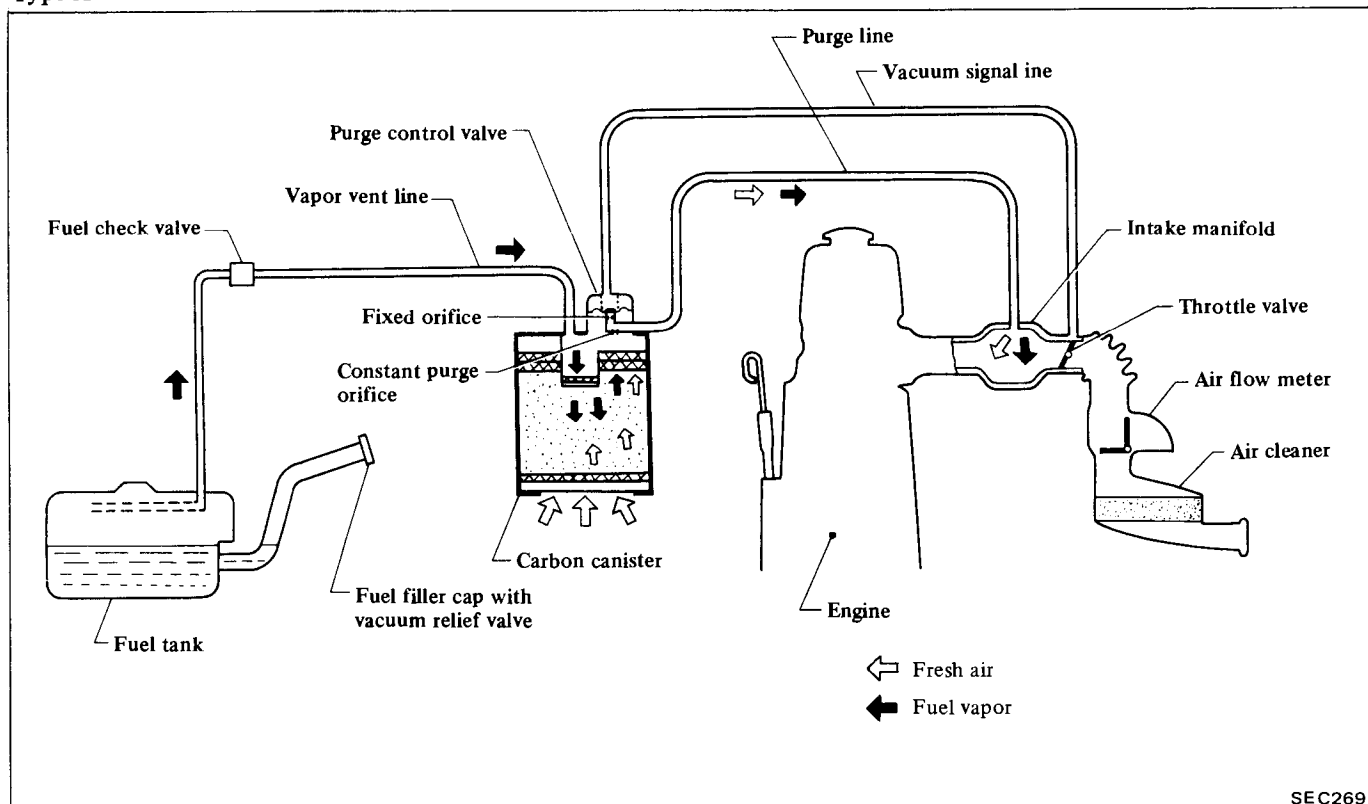
Fuel vapors from the sealed fuel

tank are led into the carbon canister, which is filled with activated char-

coals, and stored there when the engine is not running.

MODEL NOT EQUIPPED WITH TURBOCHARGER

Type-A

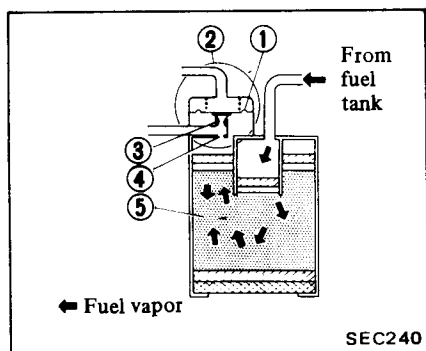


SEC269

The canister retains the vapor until the canister is purged by the air drawn through the purge line to the intake manifold when the engine is operated. When the engine runs at idle, the purge

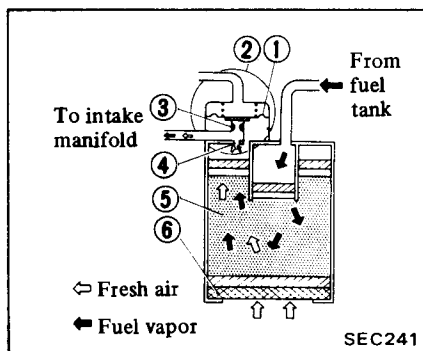
control valve is closed. Only a small amount of purge air flows into the intake manifold through the constant purge orifice. As the engine speed increases, and the ported vacuum rises

higher, the purge control valve opens and the vapor is sucked into the intake manifold through both the fixed orifice and the constant purge orifice.

(1) Engine does not operate

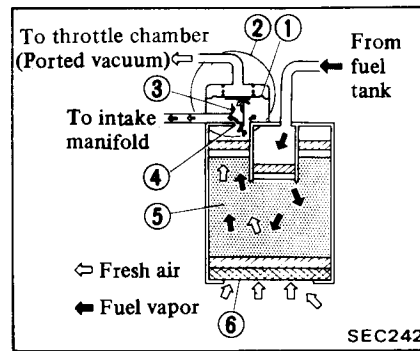
SEC240

- 1 Diaphragm
- 2 Purge control valve
- 3 Fixed orifice
- 4 Constant fixed orifice
- 5 Activated carbon

(2) Engine operates at idle

SEC241

- 1 Diaphragm
- 2 Purge control valve
- 3 Fixed orifice
- 4 Constant fixed orifice
- 5 Activated carbon
- 6 Filter

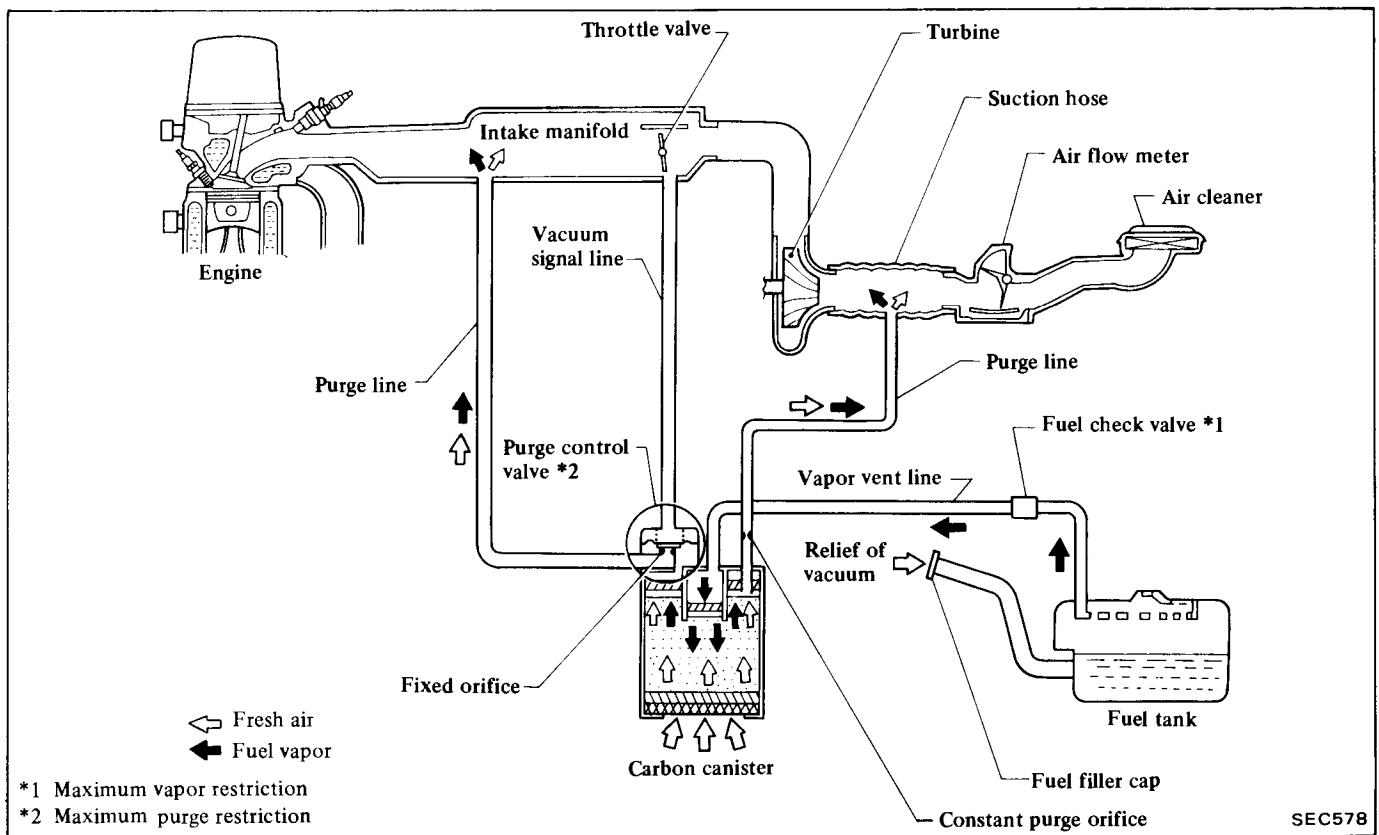
(3) Engine speed increases

SEC242

- 1 Diaphragm
- 2 Purge control valve
- 3 Fixed orifice
- 4 Constant fixed orifice
- 5 Activated carbon
- 6 Filter

MODEL EQUIPPED WITH TURBOCHARGER

Type-B

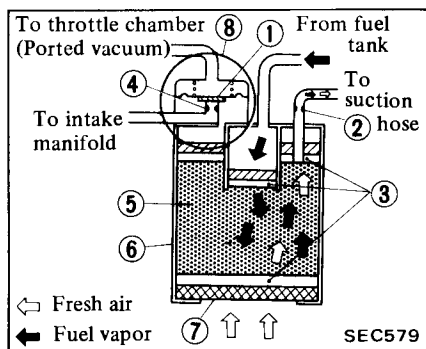


The canister retains the vapor until the canister is purged by the air drawn through the purge line to the intake manifold and the suction hose when the engine is operated. When the engine runs at idle, the purge control valve is closed. A small amount of

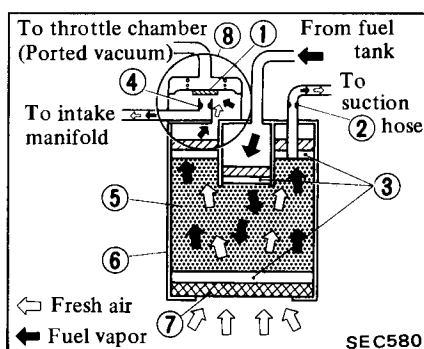
purge air flows into the suction hose through the constant purge orifice. As the engine speed increases, and the ported vacuum rises higher, the purge control valve opens and the vapor is sucked into the intake manifold and the suction hose through respectively

the fixed orifice and the constant purge orifice. When the engine stops and intake manifold pressure become atmospheric pressure, the purge control valve is closed, and the vapor is sucked only into the suction hose through the constant purge orifice.

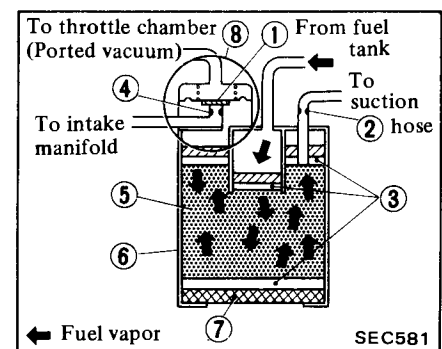
(1) Engine runs at idle



(2) Engine speed increases



(3) Engine stops



- | | |
|----------------------------------|-----------------------|
| 1 Diaphragm | 5 Activated carbon |
| 2 Fixed orifice (Constant purge) | 6 Case |
| 3 Filter | 7 Filter |
| 4 Fixed orifice | 8 Purge control valve |

- | | |
|----------------------------------|-----------------------|
| 1 Diaphragm | 5 Activated carbon |
| 2 Fixed orifice (Constant purge) | 6 Case |
| 3 Filter | 7 Filter |
| 4 Fixed orifice | 8 Purge control valve |

- | | |
|----------------------------------|-----------------------|
| 1 Diaphragm | 5 Activated carbon |
| 2 Fixed orifice (Constant purge) | 6 Case |
| 3 Filter | 7 Filter |
| 4 Fixed orifice | 8 Purge control valve |

INSPECTION

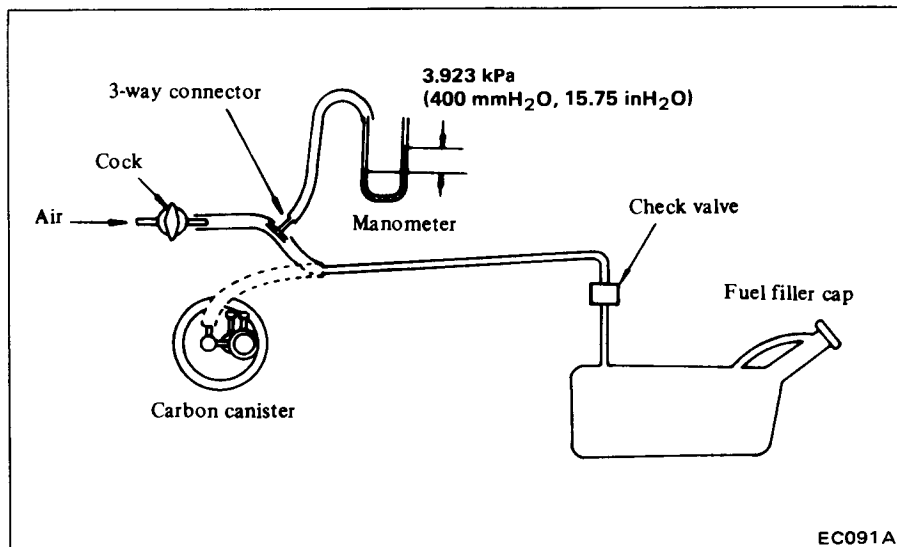
FUEL TANK AND VAPOR VENT LINE

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

3. Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way charge cock) to the end of the vent line.
4. Supply fresh air into the vapor vent line through the cock little by little until pressure becomes 3.923 kPa (400 mmH₂O, 15.75 inH₂O).

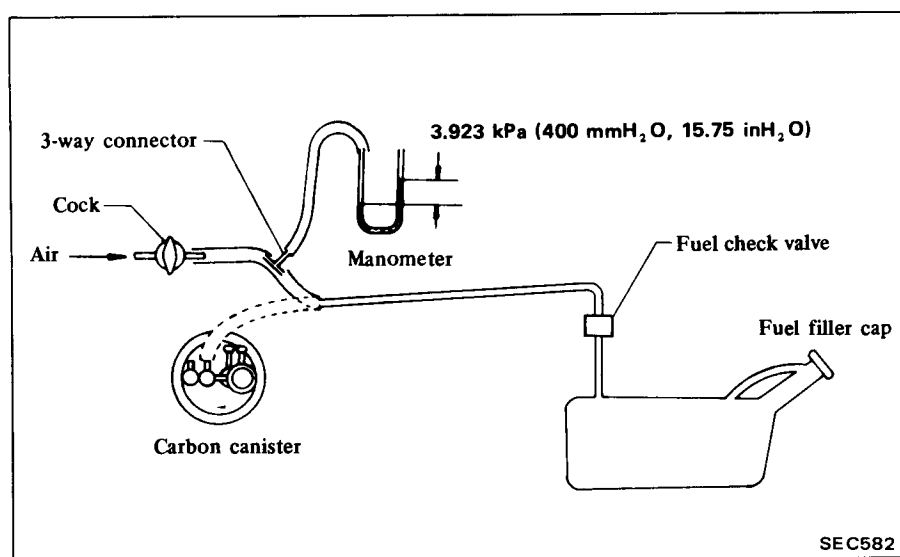
Model not equipped with turbocharger

Type-A



Model equipped with turbocharger

Type-B



5. Shut the cock completely and leave it unattended.
6. After 2.5 minutes, measure the height of the liquid in the manometer.
7. Variation in height should remain at 0.245 kPa (25 mmH₂O, 0.98 inH₂O).
8. When filler cap does not close completely, the height should drop to zero in a short time.
9. If the height does not drop to zero in a short time when filler cap is removed, the cause is a stuffy hose.

In case the vent line is stuffy the breathing in fuel tank is not thoroughly made thus causing insufficient deliver of fuel to engine or vapor lock. It must, therefore, be repaired or replaced.

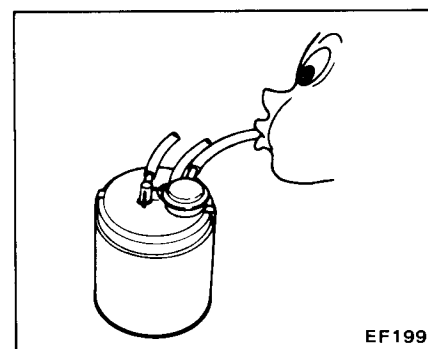
CARBON CANISTER PURGE CONTROL VALVE

Check for fuel vapor leakage, in the vacuum line, at diaphragm of carbon canister purge control valve.

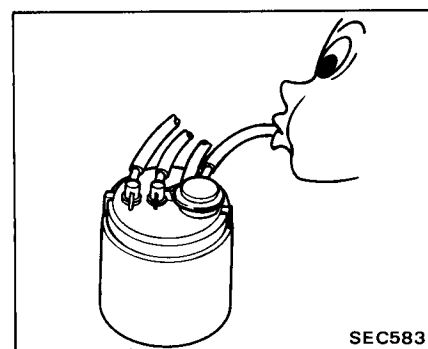
To check for leakage, proceed as follows:

1. Inhale air into the opening of rubber hose running to vacuum hole in carbon canister and ensure that there is no leak.

Type-A

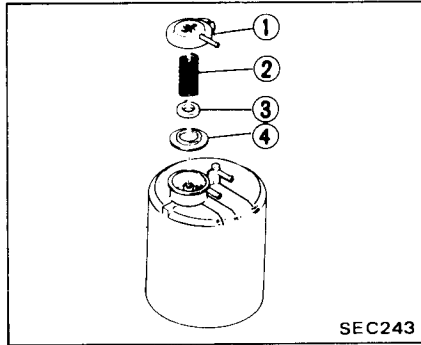


Type-B



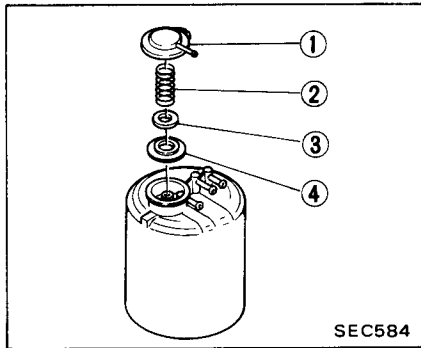
2. If there is a leak, remove top cover from purge control valve and check for dislocated or cracked diaphragm. If necessary, replace diaphragm kit (which is made up of a retainer, diaphragm and spring).

Type-A



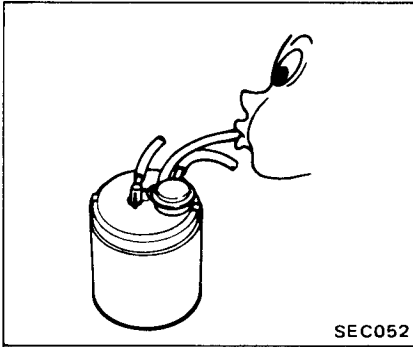
- 1 Cover
- 2 Diaphragm spring
- 3 Retainer
- 4 Diaphragm

Type-B

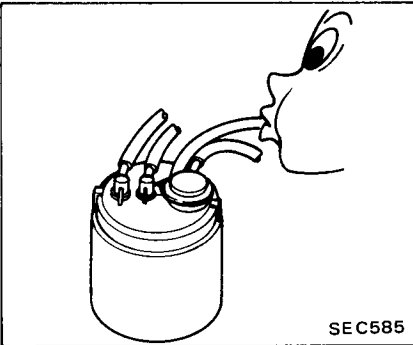


- 1 Cover
- 2 Diaphragm spring
- 3 Retainer
- 4 Diaphragm

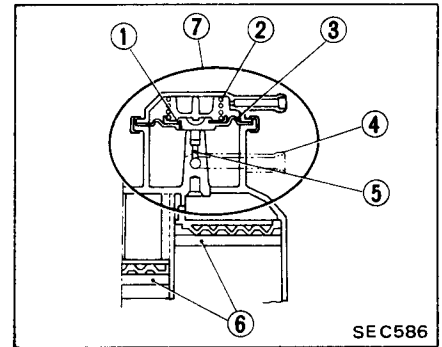
Type-A



Type-B



Type-B



- 1 Retainer
- 2 Spring
- 3 Diaphragm
- 4 Purge line
- 5 Fixed orifice
- 6 Filter
- 7 Purge control valve

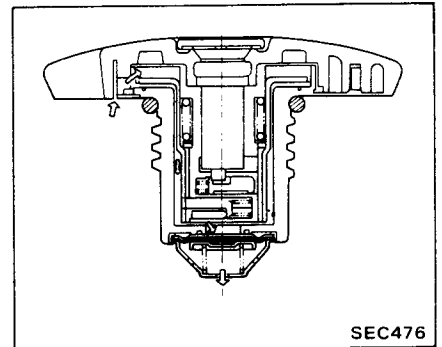
FUEL TANK VACUUM RELIEF VALVE

Remove fuel filler cap and see it functions properly.

1. Wipe clean valve housing and have it in your mouth.

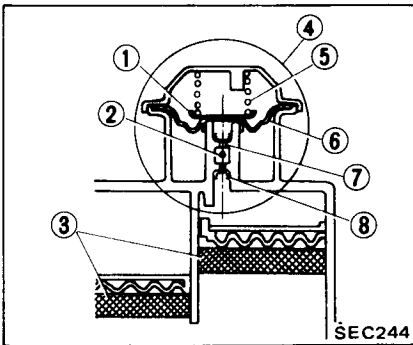
2. Inhale air. A slight resistance accompanied by valve indicates that valve is in good mechanical condition. Note also that, by further inhaling air, the resistance should be disappeared with valve clicks.

3. If valve is clogged, or if no resistance is felt, replace cap as an assembled unit.



2. If there is no leak, remove purge control valve and check constant purge orifice for leak. If necessary, blow constant purge orifice.

Type-A



- 1 Retainer
- 2 Purge line
- 3 Filter
- 4 Purge control valve
- 5 Spring
- 6 Diaphragm
- 7 Purge orifice
- 8 Constant purge orifice

CARBON CANISTER CONSTANT PURGE ORIFICE

Check for constant purge flow, in the intake manifold vacuum line, at constant purge orifice of carbon canister.

To check for purge flow, proceed as follows:

1. Inhale air into the opening of rubber hose running to carbon canister and ensure that there is a leak.

FUEL CHECK VALVE

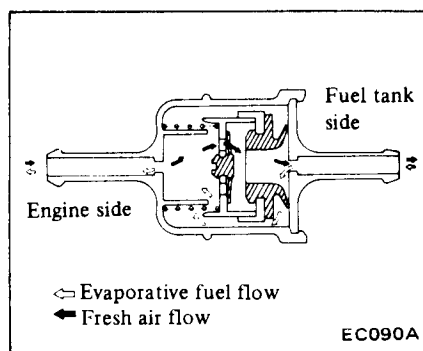
1. Blow air through connector on fuel tank side.

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.

**SERVICE DATA AND SPECIFICATIONS (S.D.S.)****GENERAL SPECIFICATIONS****FUEL PUMP**

Design voltage	V	12
Cut-off discharge pressure	kPa (kg/cm ² , psi)	294 - 441 (3.0 - 4.5, 43 - 64)
Design current	A	5.1

PRESSURE REGULATOR

Regulated pressure	kPa (kg/cm ² , psi)	250.1 (2.55, 36.3)
--------------------	--------------------------------	--------------------

COLD START VALVE

Injection quantity mL(US fl oz, Imp fl oz)	135 (4.6, 4.8)
Design voltage V	12

THERMOTIME SWITCH

Design voltage	V	12
Switch-over temperature	°C (°F)	19.5 (67)
Switch-over time [at -20°C (-4°F), 10V] sec.		9

AIR FLOW METER

Design voltage	V	12
----------------	---	----

AIR REGULATOR

Design voltage	V	12
Air flow quantity [at 20°C (68°F)]	m ³ (cu ft)/hr	27.5 (971)

CONTROL UNIT

Design voltage	V	12
----------------	---	----

INSPECTION AND ADJUSTMENT**FUEL PRESSURE**Unit: kPa (kg/cm², psi)

Measuring point: between fuel filter and fuel pipe	
At idling	Approximately 206 (2.1, 30)
The moment accelerator pedal is fully depressed	Approximately 255 (2.6, 37)

FUEL INJECTOR

Coil resistance	Ω	2.35
-----------------	---	------

THERMOTIME SWITCH

Cooling water temperature below 14°C (57°F)	ON
14 - 25°C (57 - 77°F)	ON or OFF
above 25°C (77°F)	OFF
Coil resistance	

AIR FLOW METER

E.F.I. models

Unit: Ω

Potentiometer resistance between terminals ③③ and ③④	100 - 400
between terminals ③④ and ③⑤	200 - 500
between terminals ③② and ③④	Except 0 and ∞

E.C.C.S. models

Unit: Ω

Potentiometer resistance between terminals ③③ and ②⑥	Approx. 280 - 400
between terminals ③③ and ③①	Except 0 and ∞

AIR TEMPERATURE SENSOR

Unit: $k\Omega$

Thermistor resistance at -10°C (14°F)	7.0 - 11.4
at 20°C (68°F)	2.1 - 2.9
at 50°C (122°F)	0.68 - 1.00

THROTTLE VALVE SWITCH

E.F.I. models

Engine speed when idle switch is changed from "ON" to "OFF"	rpm	Approximately 900
---	-----	-------------------

E.C.C.S. models

Engine speed when idle switch is changed from "ON" to "OFF"	rpm	Approximately 750
---	-----	-------------------

CYLINDER HEAD TEMPERATURE SENSOR

Unit: $k\Omega$

Thermistor resistance at -10°C (14°F)	7.0 - 11.4
at 20°C (68°F)	2.1 - 2.9
at 50°C (122°F)	0.68 - 1.0

WATER TEMPERATURE SENSOR

Unit: $k\Omega$

Thermistor resistance at -10°C (14°F)	7.0 - 11.4
at 20°C (68°F)	2.1 - 2.9
at 50°C (122°F)	0.68 - 1.0

V.C.M. SOLENOID VALVE

Coil resistance	Ω	40
-----------------	----------	----

WATER TEMPERATURE SENSING SWITCH (For auxiliary cooling fan)

Cooling water temperature		
E.F.I.	below about 102°C (216°F)	OFF
E.C.C.S.	below about 100°C (212°F)	
E.F.I.	above about 102°C (216°F)	ON
E.C.C.S.	above about 100°C (212°F)	

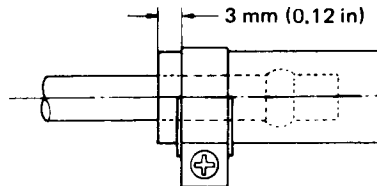
FAN MOTOR TIMER UNIT (For auxiliary cooling fan)

Operating period minutes	about 17
--------------------------	----------

TIGHTENING TORQUE

Unit	N·m	kg·m	ft·lb
Throttle chamber securing screw	15 - 20	1.5 - 2.0	11 - 14
Exhaust gas sensor	39 - 49	4.0 - 5.0	29 - 36
Fuel hose clamp	1.0 - 1.5	0.10 - 0.15	0.7 - 1.1

Fuel hose clamping position



EF336A

E.G.R. tube securing nut	34 - 44	3.5 - 4.5	25 - 33
Thermal vacuum valve	Less than 22	Less than 2.2	Less than 16
Catalytic converter bolt	31 - 42	3.2 - 4.3	23 - 31
Exhaust gas sensor	39 - 49	4.0 - 5.0	29 - 36

ENGINE REMOVAL & INSTALLATION

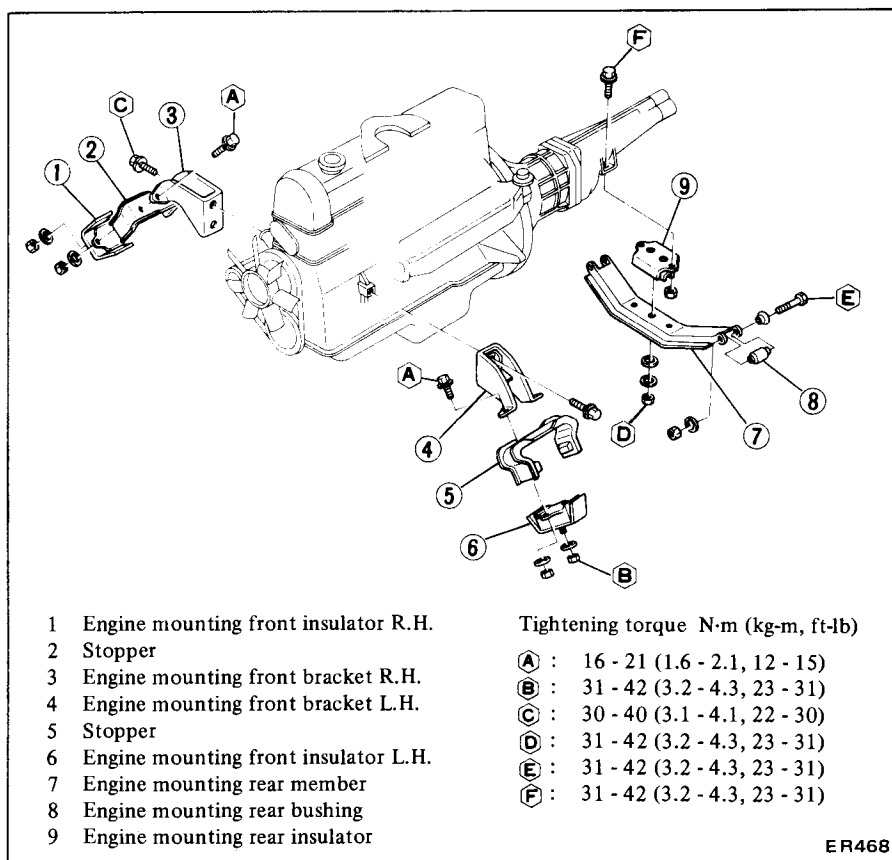
SECTION ER

CONTENTS

ENGINE REMOVAL AND INSTALLATION	ER-2	ENGINE MOUNTING INSULATOR	ER-5
REMOVAL	ER-2	SERVICE DATA AND SPECIFICATIONS (S.D.S.)	ER-6
INSTALLATION	ER-5	TIGHTENING TORQUE	ER-6



ENGINE REMOVAL AND INSTALLATION

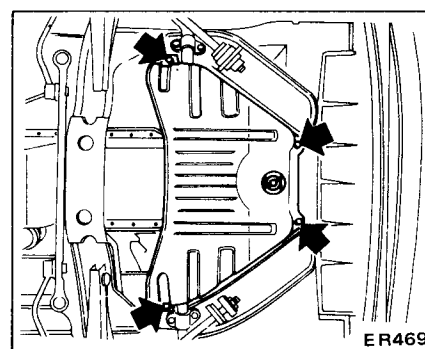


- (4) After engine stalls, crank engine twice or three times.
- (5) Turn ignition switch off.
- (6) Connect fuel pump harness connector.

If engine will not start, disconnect fuel pump harness connector and crank engine for about 5 seconds.

Then turn ignition switch off.

2. Remove battery.
3. Remove engine lower splash board.



REMOVAL

It is much easier to remove engine and transmission as a single unit than to remove only engine from engine compartment. After removal, engine can be separated from transmission assembly and torque converter.

WARNING:

- a. Place wheel chocks in front of front wheels and in rear of rear wheels.
- b. Be sure to hoist engine in a safe manner.
- c. You should not remove engine until exhaust system has completely cooled off. Otherwise, you may burn yourself and/or fire may break out in fuel line.

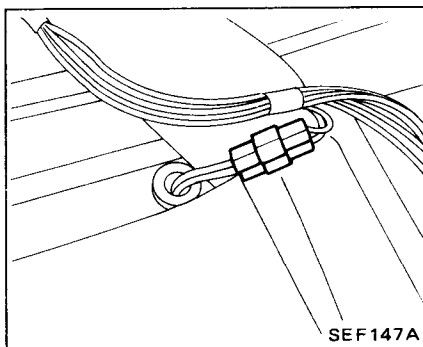
Fender covers should be used to protect car body.

1. Follow the procedure below to reduce fuel pressure to zero.

CAUTION:

Before disconnecting fuel hose, release fuel pressure from fuel line to eliminate danger.

- (1) Remove rear floor carpet and insulator.
- (2) Start engine.
- (3) Disconnect fuel pump harness connector with engine running.

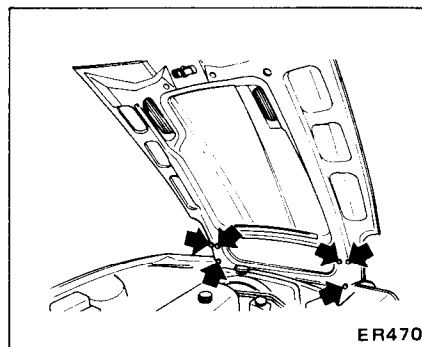


4. Drain engine coolant.
5. Remove hood as follows:

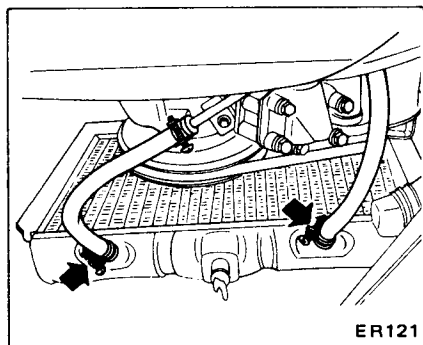
CAUTION:

Have an assistant help you so as to prevent damage to body.

- (1) Mark hood hinge locations on hood to facilitate proper reinstallation.
- (2) Support hood with hand and remove bolts securing it to hood hinges, taking care not to let hood slip when bolts are removed.



- (3) Remove hood assembly.
6. Disconnect radiator upper and lower hoses.
7. Remove radiator upper and lower shrouds.
8. Disconnect oil cooler hoses at oil cooler installed at the lower end of radiator and drain automatic transmission fluid (A/T models).



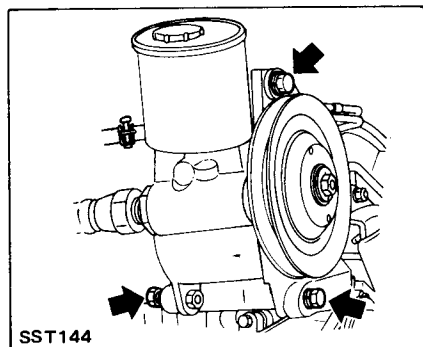
9. Remove reservoir tank hose from radiator and then remove radiator.
10. Remove power steering oil pump as follows:

Never drain power steering oil while service/repair work is being performed.

- (1) Remove oil pump drive belt. To remove, loosen idler pulley lock nut and adjusting bolt.

Refer to Power Steering Gear and Oil Pump (Section ST) for removal and installation.

- (2) Remove oil pump retaining bolts and fasten oil pump to hood ledge with suitable wire to facilitate removal of engine.



11. Remove air conditioner compressor as follows:

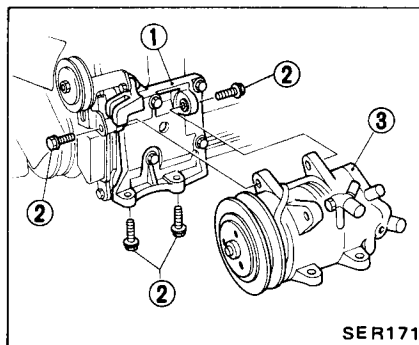
Never discharge gas from com-

pressor while service/repair work is being performed.

- (1) Remove compressor drive belt. To remove, loosen idler pulley lock nut and adjusting bolt.

Refer to Air Conditioning (Section HA) for removal.

- (2) Remove compressor retaining bolts and fasten compressor to hood ledge with suitable wire to facilitate removal of engine.

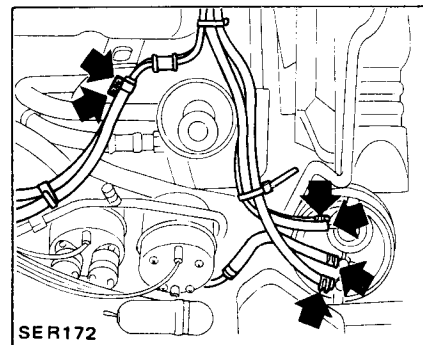


- 1 Compressor bracket
- 2 Compressor retaining bolt
- 3 Compressor

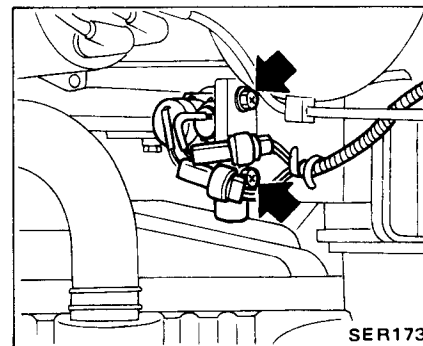
12. Disconnect following cables, wires, harness and hoses at the engine connection end.

- Wire to alternator.

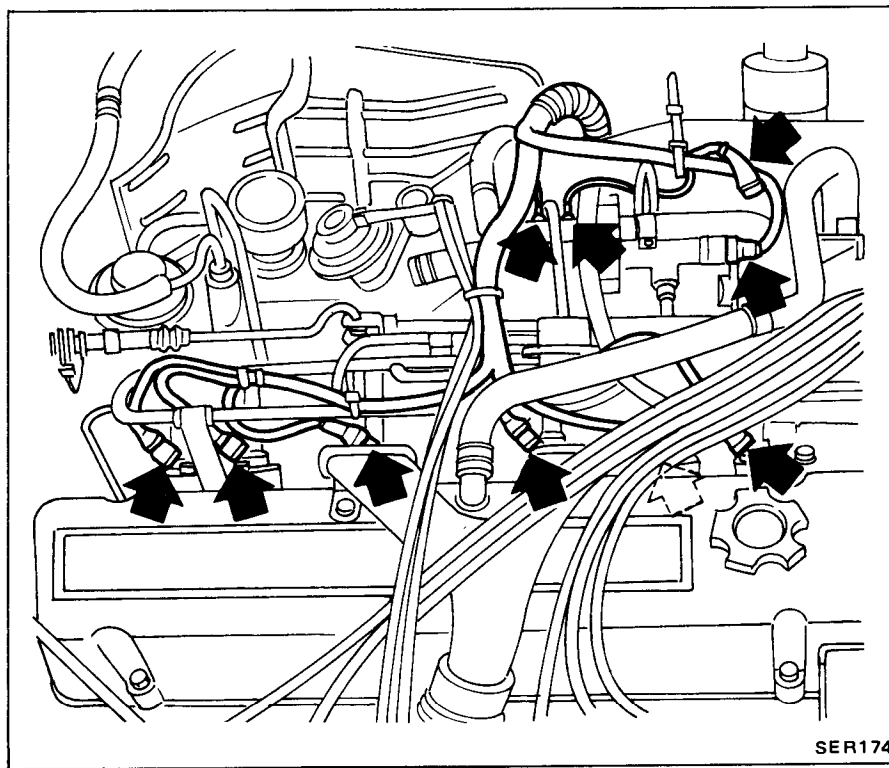
- Wire to oil pressure sending unit.
- Wire and cable to starter motor.
- Wire to auxiliary cooling fan.
- Heater inlet and outlet hoses.
- Fuel hoses and canister hoses.



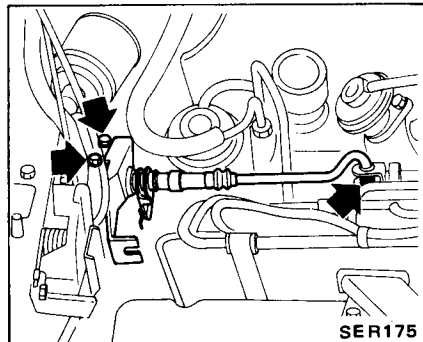
- V.C.M. from bracket (models equipped with turbocharger).



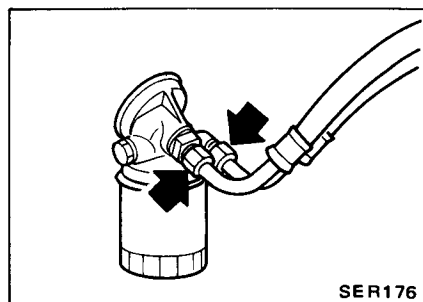
- E.F.I. harness and connector.



- High tension cable (Between ignition coil and distributor).
- Harness to distributor.
- Wires to thermal transmitter and cylinder head temperature sensor.
- F.I.C.D. vacuum hose.
- A.S.C.D. vacuum hose (If so equipped).
- Vacuum hose to intake manifold.
- Brake booster vacuum hose at intake manifold.
- Accelerator wire
- Accelerator torsion shaft.

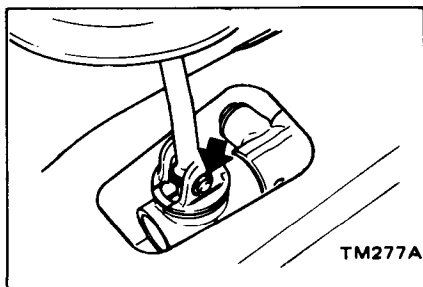


- Air flow meter duct, etc.
- Engine oil cooler hoses at oil filter bracket (models equipped with turbocharger).

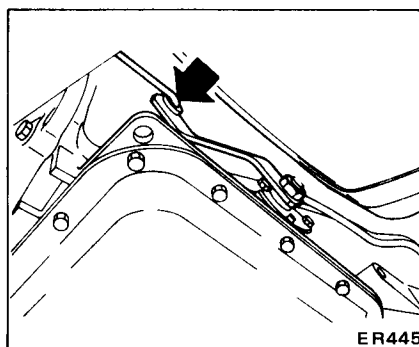


13. Disconnect speedometer cable from rear extension housing and wire for reverse lamp switch.
14. Disconnect wire at connections of inhibitor switch and downshift solenoid at wire connector (A/T models).
15. Remove transmission control linkage.

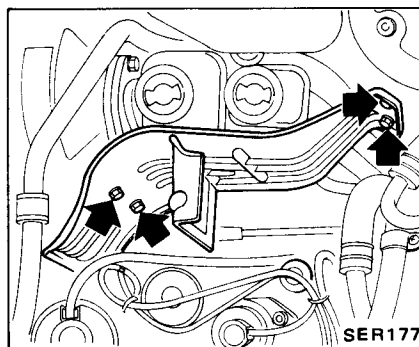
(1) Manual transmission



(2) Automatic transmission



16. Remove heat shield plate located beside brake master cylinder.



17. Remove exhaust front tube.

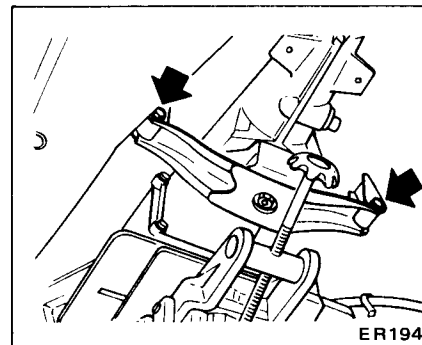
Refer to Exhaust Systems (Section FE) for removal.

18. Remove propeller shaft.

Refer to Propeller Shaft (Section PD) for removal.

19. Support transmission with jack.

20. Remove nuts securing rear engine mounting member to body.



CAUTION:

In this operation, care should always be taken to prevent the unit from hitting any adjacent parts.

21. Connect suitable wires of hoist to engine slingers.

For safety in subsequent steps, tension of wire or chain should be slackened against engine.

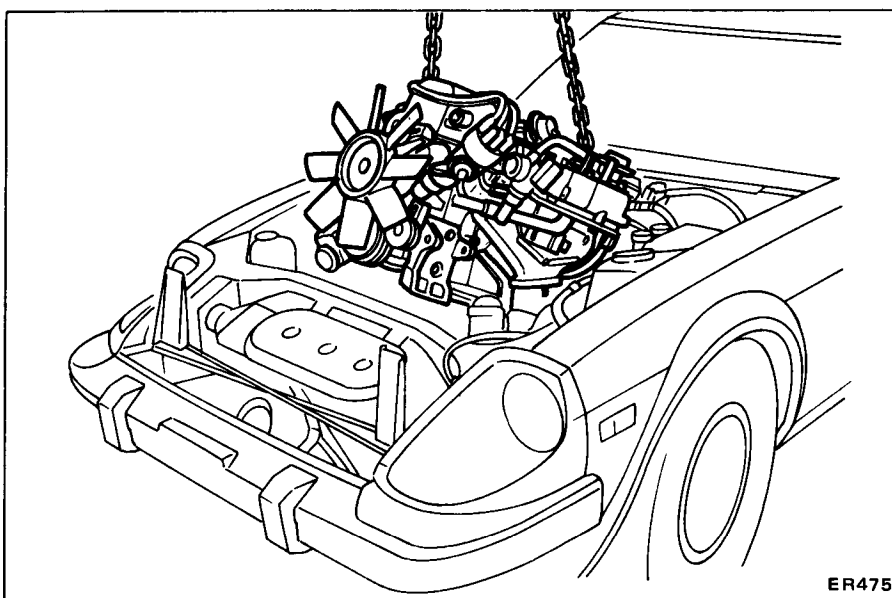
22. Remove nuts securing engine mounting front insulator to front suspension crossmember.

23. Raise engine with transmission, and remove it from car.

CAUTION:

- a. Before raising engine together with transmission, make sure that all hoses and wires connected thereto are disconnected or removed.

- b. When raising engine, be especially careful not to knock it against adjacent parts.



INSTALLATION

Install in the reverse order of removal, observing the following:

When installing, be sure to check that electrical harnesses are connected correctly.

1. When installing, first secure rear engine mounting member to body.
2. Refer to applicable section when installing and adjusting any parts.

- For installation of air conditioner compressor and belt adjustment.

Refer to Air Conditioning (Section HA) for adjustment.

- For installation of power steering oil pump and belt adjustment. Refer to Power Steering (Section ST) for adjustment.

3. When installing exhaust front tube on exhaust manifold, be sure to use new gasket.

4. When installing hood following engine installation, be sure that it is properly centered and that hood lock operates securely. Refer to Hood (Section BF) for adjustment.

5. Add enough engine coolant.

6. On automatic transmission models, add the same amount of automatic transmission fluid as was drained.

ENGINE MOUNTING INSULATOR

FRONT INSULATOR

Removal

1. Disconnect battery ground cable.
2. Loosen front engine mounting insulator lower and upper nuts and bolts (on both sides).
3. Make sure that wire or chain used to suspend engine is positioned properly so that no load is applied to insulators, and remove bolts completely.
4. Lift up engine, and separate insulators from engine mounting brackets.

Inspection

If there is damage, deterioration or

separation of bounded surface, replace.

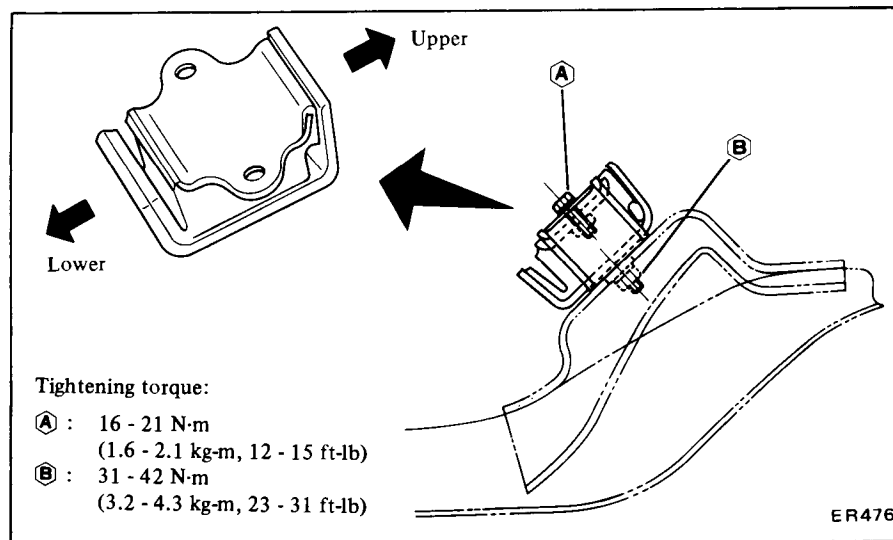
Installation

Install front insulators in reverse order of removal, noting the following:

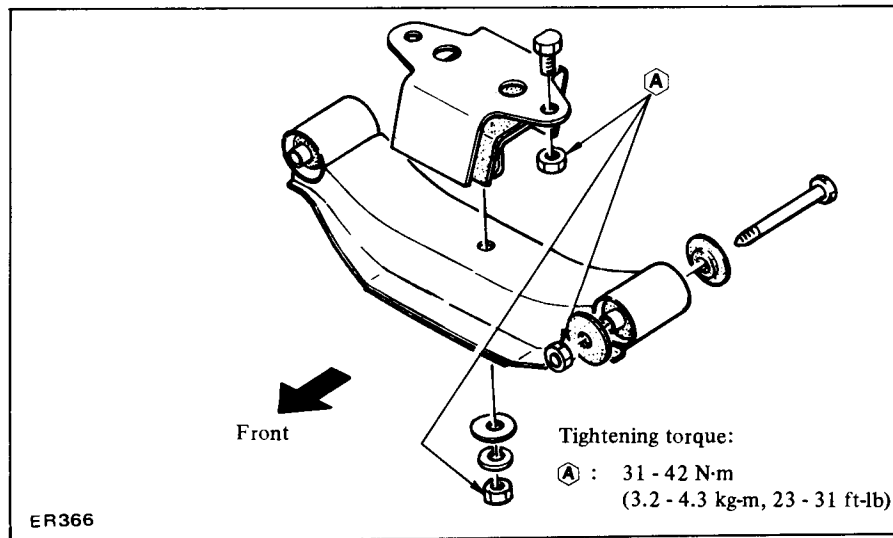
1. Both the left and right front

insulators are used commonly. However, when installing them, pay attention to their upper and lower directions.

2. The shape of the right side bracket differs from that of the left side bracket. Tighten the bolts and nuts correctly and securely.



REAR INSULATOR



Removal

1. Support transmission with jack.
2. Remove rear engine mounting member insulator bolts.
3. Remove bolts, and separate insulator from engine mounting member.

Inspection

If there is damage, deterioration or separation of bounded surface, replace.

Installation

Install rear engine mounting member and insulator in reverse sequence of removal, noting the following:

1. Tighten nuts and bolts correctly and securely.
2. Carefully arrange the front and rear directions of rear engine mounting member and insulator when installing.

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

TIGHTENING TORQUE

Unit	N-m	kg-m	ft-lb
Engine mounting rear member to body	31 - 42	3.2 - 4.3	23 - 31
Rear insulator to engine mounting rear member	31 - 42	3.2 - 4.3	23 - 31
Rear insulator to transmission	31 - 42	3.2 - 4.3	23 - 31
Engine mounting front bracket to engine	30 - 40	3.1 - 4.1	22 - 30
Front insulator to engine mounting bracket	16 - 21	1.6 - 2.1	12 - 15
Front insulator to suspension member	31 - 42	3.2 - 4.3	23 - 31

Unit	N-m	kg-m	ft-lb
Clutch operating cylinder to clutch housing	30 - 40	3.1 - 4.1	22 - 30
Front tube to exhaust manifold	45 - 60	4.6 - 6.1	33 - 44
Propeller shaft to companion flange L28E engine	34 - 44	3.5 - 4.5	25 - 33
L28ET engine	39 - 44	4.0 - 4.5	29 - 33
Air conditioner compressor retaining bolt	44 - 54	4.5 - 5.5	33 - 40
Power steering oil pump retaining bolt	19 - 25	1.9 - 2.6	14 - 19

ENGINE CONTROL, FUEL & EXHAUST SYSTEMS

SECTION FE

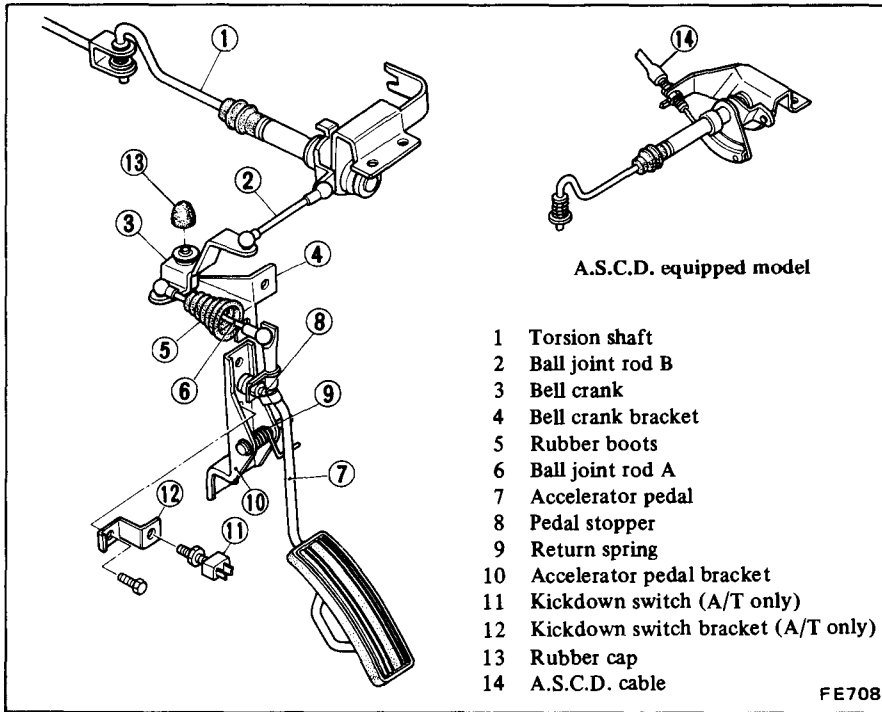
CONTENTS

ENGINE CONTROL SYSTEM	FE-2	INSTALLATION	FE-5
ACCELERATOR CONTROL SYSTEM	FE-2	EXHAUST SYSTEM	FE-6
FUEL SYSTEM	FE-3	REMOVAL	FE-8
REMOVAL	FE-4	INSPECTION	FE-8
INSPECTION	FE-5	INSTALLATION	FE-8

FE

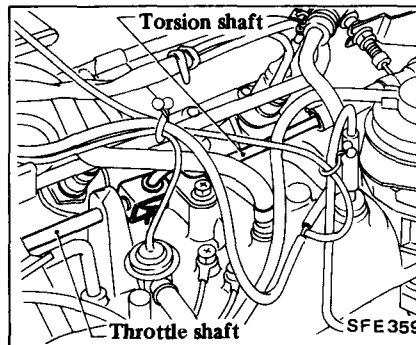
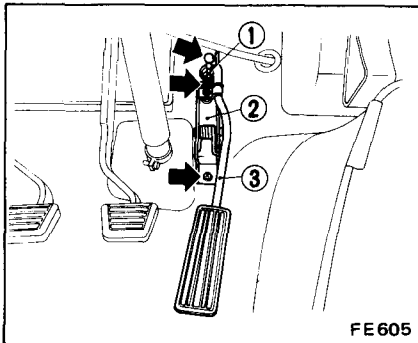
ENGINE CONTROL SYSTEM

ACCELERATOR CONTROL SYSTEM

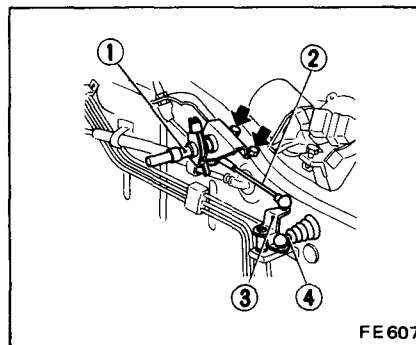


REMOVAL AND INSTALLATION

1. Separate ball joint rod A from pedal arm and remove pedal with bracket.



4. Remove ball joint rod B and torsion shaft.



2. Disconnect A.S.C.D. cable from torsion shaft (if so equipped).
3. Separate torsion shaft from throttle shaft.

5. Remove bell crank with bracket.
6. Installation is in the reverse order of removal.

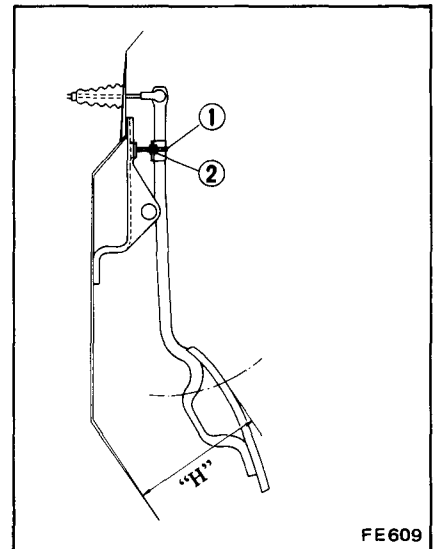
Apply a light coat of recommended multi-purpose grease to all sliding or friction surfaces. Do not apply grease to wire.

INSPECTION

1. Check accelerator pedal return spring for rust, fatigue or damage.
Replace if necessary.
2. Check accelerator linkage for rust, damage or looseness.
Repair or replace if necessary.

ADJUSTMENT

Accelerator pedal



Adjust accelerator pedal height "H" to the specified range with pedal stopper bolt ①. Then tighten lock nut ②.

Pedal height "H":

138 - 142 mm
(5.43 - 5.59 in)

Kickdown switch

Kickdown switch adjustment is correct if it is actuated by kickdown switch plunger when accelerator pedal is fully depressed.

Always tighten lock nut securely after proper adjustment is obtained.

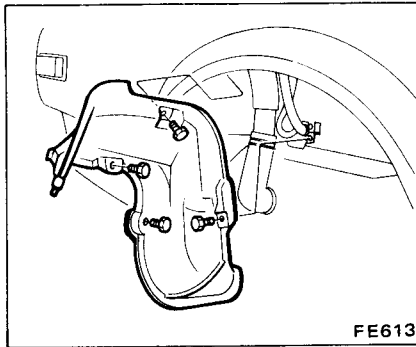
-
- This diagram illustrates the assembly of a rear window wiper motor. The main components are labeled as follows:
- 1**: Wiper motor housing.
 - 2**: Wiper motor shaft.
 - 3**: Wiper motor mounting bracket.
 - 4**: Wiper motor mounting nut.
 - 5**: Wiper motor mounting plate.
 - 6**: Wiper motor mounting bracket.
 - 7**: Wiper motor mounting bracket.
 - 8**: Wiper motor mounting bracket.
 - 9**: Wiper motor mounting bracket.
 - 10**: Wiper motor mounting bracket.
 - 11**: Wiper motor mounting bracket.
 - 12**: Wiper motor mounting bracket.
 - 13**: Wiper motor mounting bracket.
 - 14**: Wiper motor mounting bracket.
 - 15**: Wiper motor mounting bracket.
 - 16**: Wiper motor mounting bracket.
 - 17**: Wiper motor mounting bracket.
 - 18**: Wiper motor mounting bracket.

REMOVAL

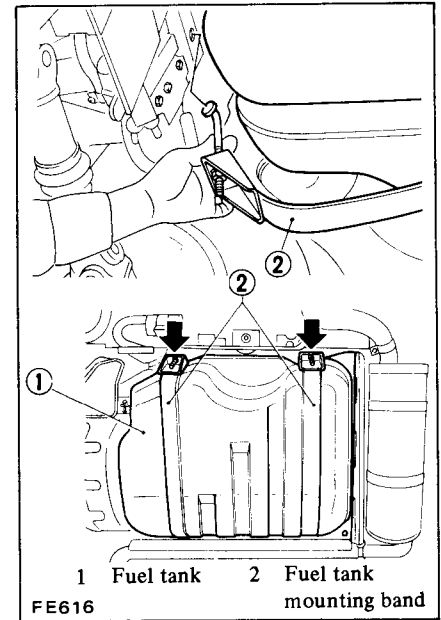
WARNING:

When replacing fuel line parts, be sure to observe the following:

- Put a "CAUTION: INFLAMMABLE" sign in workshop.
- Be sure to furnish workshop with an asphyxiator.
- Be sure to disconnect battery ground cable before conducting operations.
- Put drained fuel in an explosion-proof container and put on lid securely.



- Loosen nuts and take off fuel tank mounting bands. Then remove fuel tank.



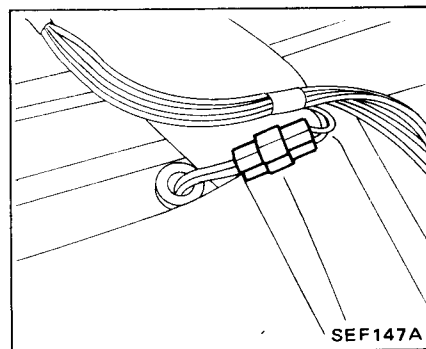
FUEL TANK

- Reduce fuel line pressure to zero, following the procedure below.

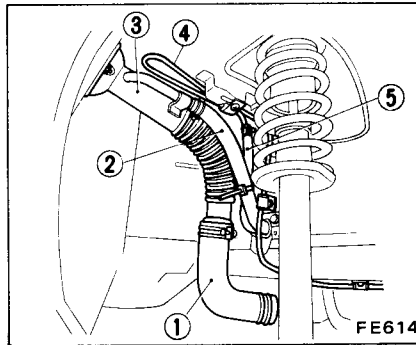
CAUTION:

Before disconnecting fuel hose, release fuel pressure from fuel line to eliminate danger.

- Turn up rear floor carpet.
- Start engine.
- Remove fuel pump connector with engine running.



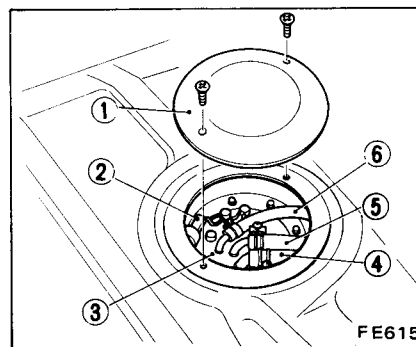
- After engine stall, crank engine twice or three times.
- Turn ignition switch off and connect fuel pump connector.
- Disconnect battery ground cable.
- Remove fuel filler cap and siphon, or pump fuel from fuel tank into a suitable container.
- Remove fuel filler hose protector located into R.H. wheel house and disconnect filler hose and evapo. hose.



- | | |
|--------------------|---------------|
| 1 Filler hose | 3 Filler tube |
| 2 Ventilation hose | 4 Evapo. tube |
| | 5 Evapo. hose |

Plug hose and pipe openings to prevent entry of dust or dirt during removal.

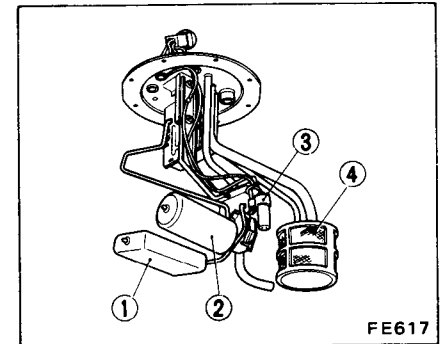
- Turn up rear floor carpet and remove rear floor padding and inspection hole cover.
- Disconnect harness connector of fuel tank gauge unit, ventilation hose, fuel feed hose and fuel return hose from fuel tank.



- | |
|--------------------------------|
| 1 Inspection hole cover |
| 2 Gauge unit harness connector |
| 3 Gauge unit |
| 4 Ventilation hose |
| 5 Fuel feed hose |
| 6 Fuel return hose |

Plug hose and pipe openings to prevent entry of dust or dirt during removal.

FUEL TANK GAUGE UNIT



- | |
|--------------------|
| 1 Sub gauge float |
| 2 Main gauge float |
| 3 Sending unit |
| 4 Filter |

- Disconnect battery ground cable.
- Turn up rear floor carpet and remove rear floor padding and inspection hole cover.
- Disconnect harness connector of fuel tank gauge unit, ventilation hose, fuel feed hose and fuel return hose.

Be careful not to spill fuel. Place a rag to absorb fuel.

- Remove fuel tank gauge unit.

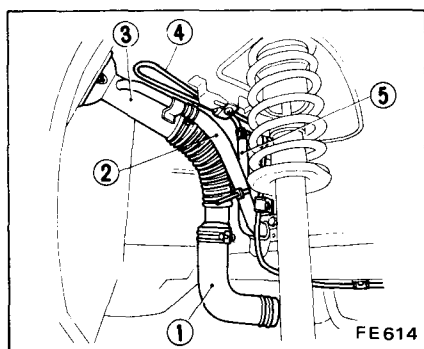
After removing gauge unit, plug the opening to prevent entry of dust or dirt.

FUEL TANK FILTER

1. Remove fuel tank gauge unit. Refer to Fuel Tank Gauge Unit for removal.
2. Remove fuel tank filter from fuel tank gauge unit.

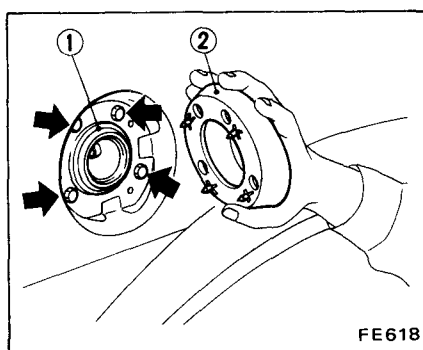
FUEL FILLER TUBE AND FILLER HOSE

1. Disconnect battery ground cable.
2. Drain fuel from fuel tank. Refer to items 1 through 3, under the heading Fuel Tank.
3. Remove fuel filler hose protector and fuel filler hose.



- | | |
|--------------------|---------------|
| 1 Filler hose | 3 Filler tube |
| 2 Ventilation hose | 4 Evapo. tube |
| | 5 Evapo. hose |

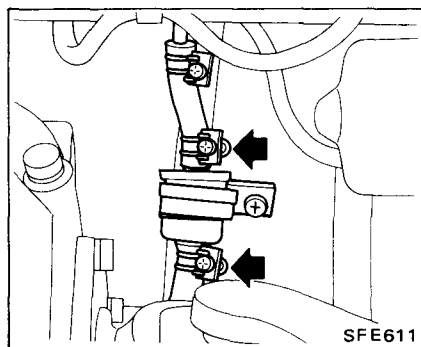
4. Remove filler cap, gas filler case cover and then remove screws attaching fuel filler tube to body.



- | |
|-------------------------|
| 1 Filler tube |
| 2 Gas filler case cover |

FUEL CHECK VALVE

Disconnect hoses connecting fuel check valve to evapo. tubes.

**FUEL PUMP, FUEL DAMPER AND FUEL FILTER**

Refer to Fuel Pump, Fuel Damper and Fuel Filter for component parts inspection (Section EF).

FUEL CHECK VALVE

Refer to Fuel Check Valve for inspection (Section EC).

FUEL TUBE

Fuel tubes are serviced as an assembly, so that replacement of fuel tube can be easily done. However, do not disconnect any fuel line unless absolutely necessary.

1. Disconnect battery ground cable.
2. Drain fuel from fuel tank. Refer to items 1 through 3, under the heading Fuel Tank.
3. Loosen fuel hose clamps and disconnect fuel tube at each end.

Plug hose and tube openings to prevent entry of dust or dirt while removing.

4. Unfasten clips that hold tube on underbody and remove tube from the car.

FUEL PUMP, FUEL DAMPER AND FUEL FILTER

Refer to Fuel Pump, Fuel Damper and Fuel Filter for removal and installation (Section EF).

INSPECTION**FUEL TANK**

Check fuel tank for cracks or deformation. If necessary, replace.

FUEL HOSE

Inspect all hoses for cracks, fatigue, sweating or deterioration.

Replace any hose that is damaged.

FUEL TUBE

Replace any fuel tube that is cracked, rusted, collapsed or deformed.

INSTALLATION

Install any parts of the fuel system in the reverse order of removal. Observe the following notes and refer to Fuel Filter, Fuel Pump, Fuel Damper and Fuel Hose for removal and installation (Section EF).

- Install hose clamps securely. Do not overtighten to avoid damaging hoses.
- Fasten clips holding fuel tube on underbody securely.
- Do not kink or twist hose and tube when they are routed.
- Run the engine and check for leaks at connections.
- Fuel tank

Do not twist or smash hoses when they are routed. Be sure to retain them with clips securely.

Ⓣ : Nut for fuel tank mounting band

Pinching nut

7 - 9 N·m

(0.7 - 0.9 kg-m,

5.1 - 6.5 ft-lb)

Lock nut

16 - 22 N·m

(1.6 - 2.2 kg-m,

12 - 16 ft-lb)

- Fuel tank gauge unit. Be sure to install gauge unit with O-ring in place.

Tighten bolts securing fuel tank gauge unit in a criss-cross fashion.

- Fuel check valve

Ⓣ : Hose clamp

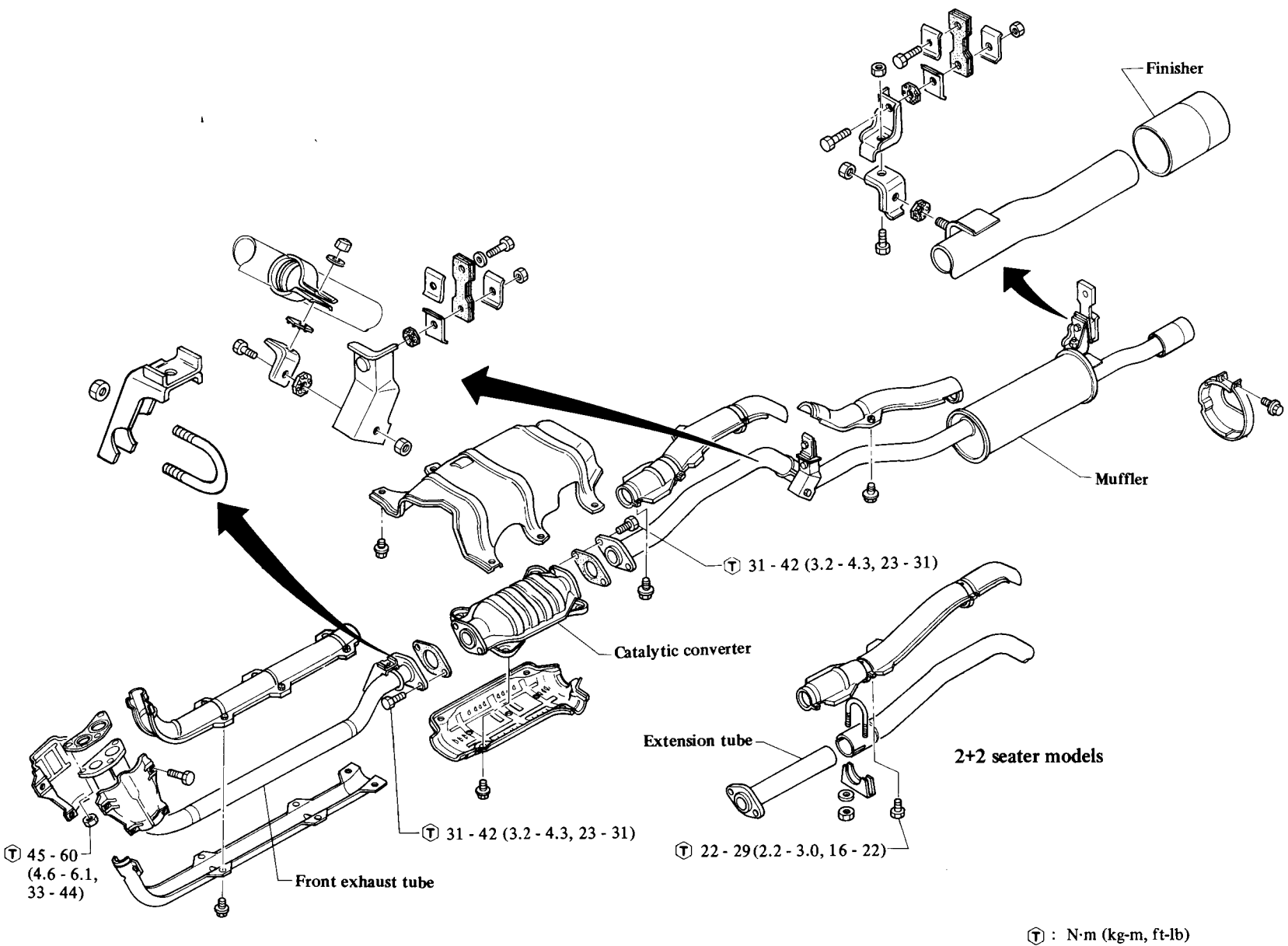
0.4 - 0.8 N·m

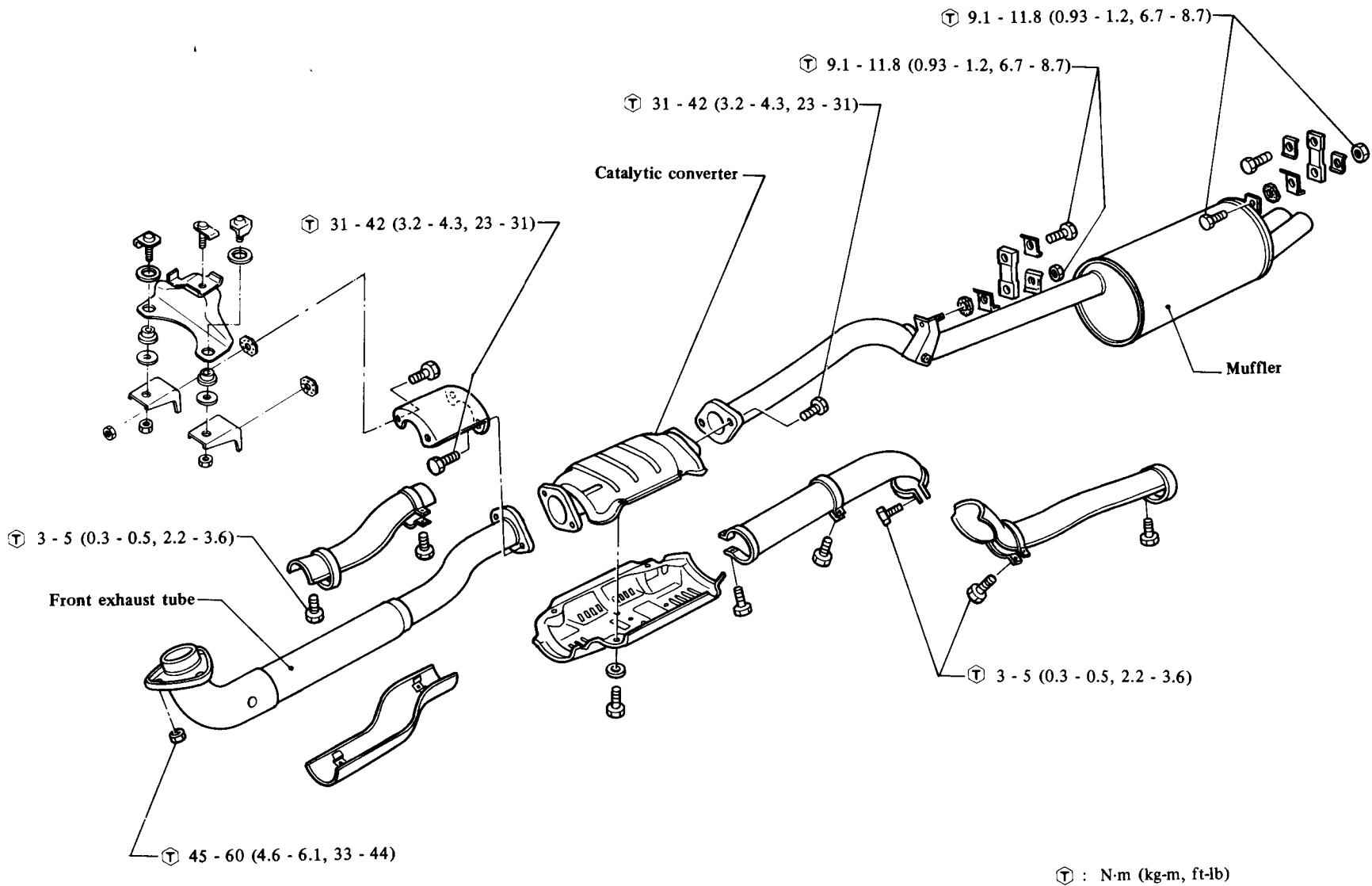
(4 - 8 kg-cm,

3.5 - 6.9 in-lb)

EXHAUST SYSTEM

L28E engine





REMOVAL

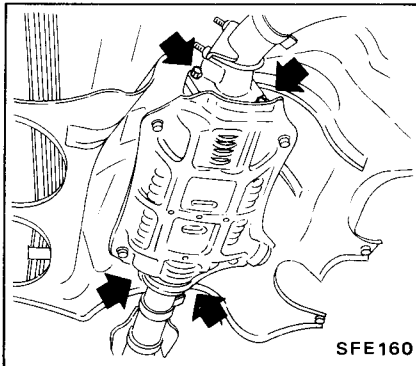
WARNING:

You should not remove the exhaust system until it has been cooled off. Otherwise, you may burn yourself.

FRONT EXHAUST TUBE

1. Remove catalytic converter lower shelter.
2. Remove bolts or nuts attaching front exhaust tube to exhaust manifold, transmission rear extension and catalytic converter. Front exhaust tube can then be taken out.

CATALYTIC CONVERTER



Remove catalytic converter lower shelter and remove catalytic converter.

CAUTION:

- a. Be careful not to damage catalytic converter when handling.
- b. Never wet catalytic converter with water, oil, etc.

EXTENSION TUBE (2+2 seater models)

1. Remove catalytic converter.
2. Remove center exhaust tube upper heat insulator.
3. Remove U-bolt and U-bolt clamp.
4. Break sealant off connection by lightly tapping around tube with a hammer and twisting extension tube. Extension tube can then be taken out.

MUFFLER

1. Remove following parts.
 - Tunnel second crossmember.
 - Catalytic converter.
 - Center exhaust tube upper heat insulator and extension tube. (2+2 seater models)
2. Remove nuts attaching exhaust tube to mounting brackets. Muffler can then be taken out.

INSPECTION

1. Check muffler and tubes for cracks, damage or corrosion. Replace if necessary.
2. Check catalytic converter, referring to Section EC. Replace if necessary.
3. Replace bracket and mounting rubber that are cracked, fatigued or sweated.

INSTALLATION

Install exhaust system which has been removed as an assembly in reverse order of removal.

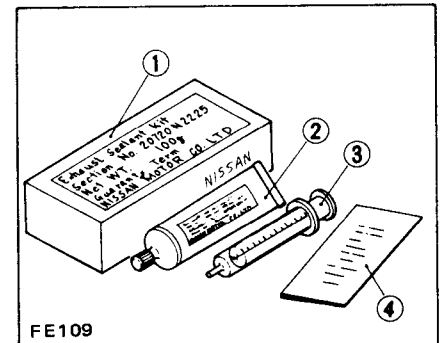
INSTALLATION PRECAUTIONS

1. When assembling, be careful not to let gas leak from around connections of exhaust system components. Evenly tighten nut securing exhaust manifold to front exhaust tube.
2. When installing exhaust tube and muffler, make sure that a proper clearance is maintained between these parts and parts on car body.
3. Be sure to install new gaskets after removing following parts.
 - Front tube
 - Catalytic converter

- a. After installation, check that mounting brackets and mounting insulator are free from undue stress. If any of above parts is not installed properly, excessive noises or vibrations may be transmitted to car body.
- b. Check all tube connections for exhaust gas leaks, and entire system for unusual noises, with engine running.

SEALING COMPOUND

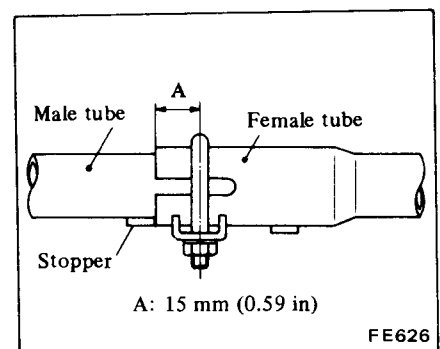
If exhaust tubes are separated at connection to renew muffler assembly, etc., use the Genuine Nissan Sealant "Exhaust Sealant Kit 20720-N2225" to eliminate gas leakage past the joint. Be sure to observe following procedures.



- 1 Case
- 2 Sealant tube (polyethylene)
- 3 Injector
- 4 Instruction sheet

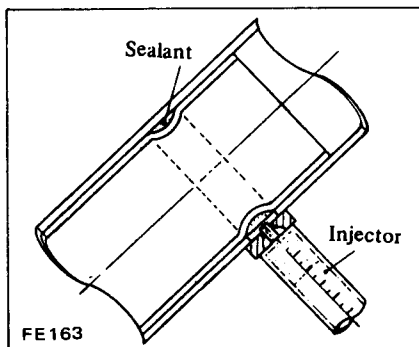
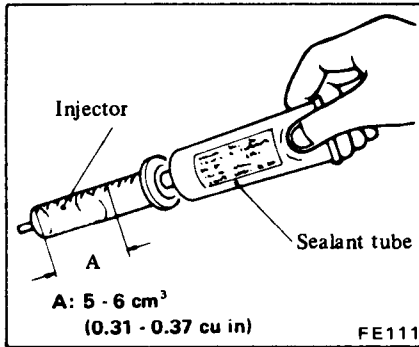
1. Wipe clean all the contact portions of tube joints; allow them to dry thoroughly.
2. Temporarily mount in place muffler assembly (and/or exhaust tube) as an assembled unit on the car.
3. Insert the male tube into the female tube fully until the front end of the female tube touches the stopper on the male tube.
4. Torque U-bolt securing nuts to specifications.

T : U-bolt securing nuts
 22 - 29 N·m
 (2.2 - 3.0 kg·m,
 16 - 22 ft·lb)



5. Squeeze 5 to 6 cm³ (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.



6. 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.

7. Start the engine and let it idle slowly for ten minutes (minimum) to harden sealant with the heat of exhaust gas.

8. Check the condition of sealant before driving the car. It is also essential that the car should not 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 sealant to the skin may cause a rash. Wash sealant off the skin with water.
- c. Do not keep the sealant tube in a place where the ambient tempera-

ture 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.

SECTION CL

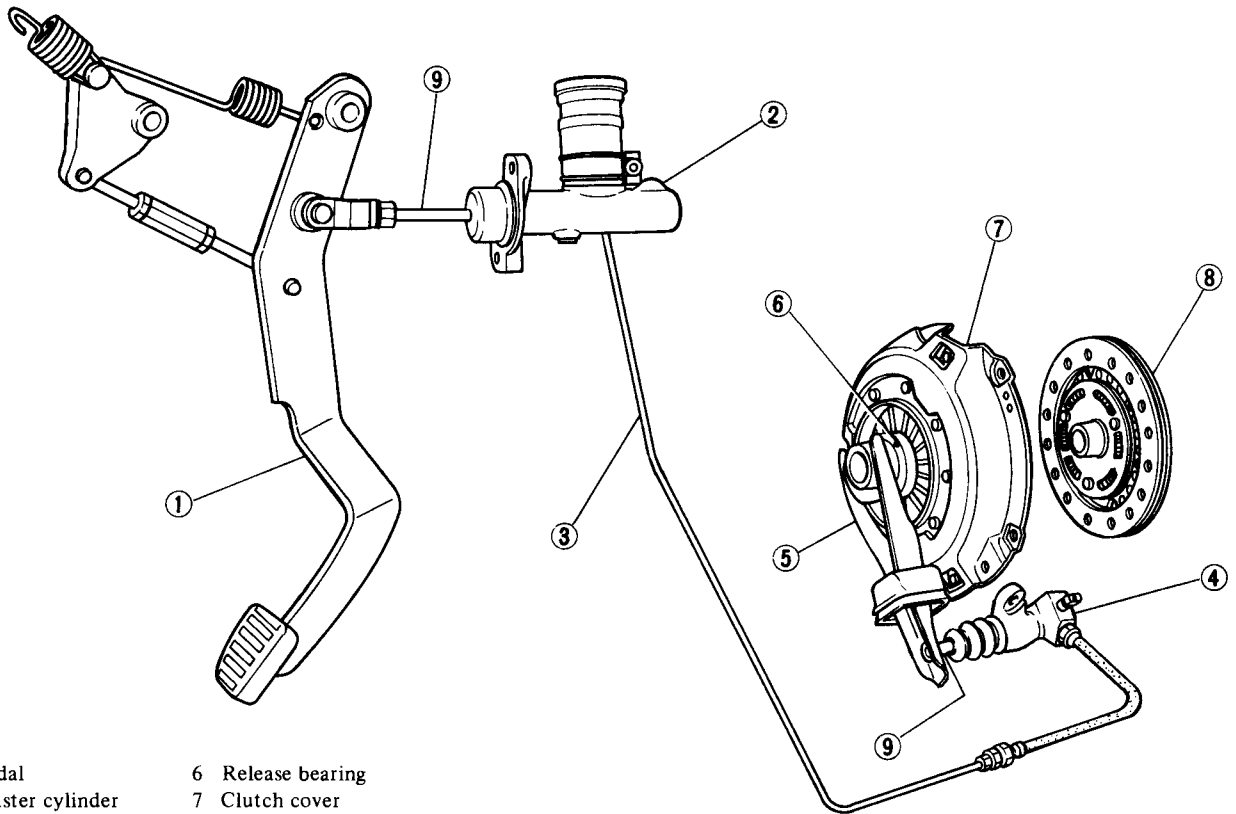
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Refer to Section MA (Clutch) for:

- CHECKING CLUTCH PEDAL HEIGHT AND FREE PLAY

HYDRAULIC CLUTCH CONTROL



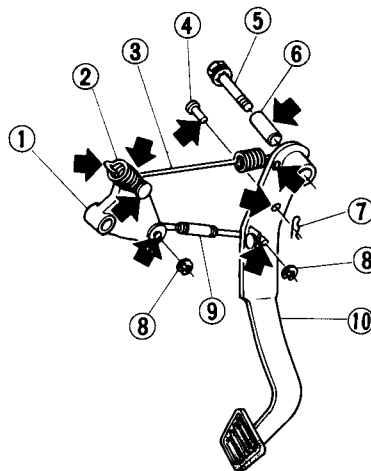
- | | |
|--------------------------|-------------------|
| 1 Clutch pedal | 6 Release bearing |
| 2 Clutch master cylinder | 7 Clutch cover |
| 3 Clutch piping | 8 Clutch disc |
| 4 Operating cylinder | 9 Push rod |
| 5 Withdrawal lever | |

CL367

CLUTCH PEDAL

REMOVAL

1. Remove instrument lower cover and floor assistant nozzle.
2. Remove snap pin (7) and clevis pin, disconnect push rod from pedal assembly.
3. Remove E-ring adjusting rod.
4. Remove fulcrum bolt.
5. Remove springs and assist spring clutch lever.



← : greasing point

- | | |
|------------------------|-----------------|
| 1 Assist spring | 6 Collar |
| 2 Return spring | 7 Snap pin |
| 3 Assist return spring | 8 E-ring |
| 4 Clevis pin | 9 Adjusting rod |
| 5 Fulcrum bolt | 10 Pedal |

SCL042

INSPECTION

Check clutch pedal parts for the following items, correcting as necessary.

1. Bent pedal.
2. Weakened return spring.
3. Worn or deformed clevis pin and pedal boss.
4. Cracks at welded part.

INSTALLATION

Install clutch pedal in the reverse procedures of removal. Observe the following:

1. Apply multi-purpose grease to the friction surface.
2. Adjust clutch pedal height. Refer to Section MA.

CLUTCH MASTER CYLINDER

REMOVAL

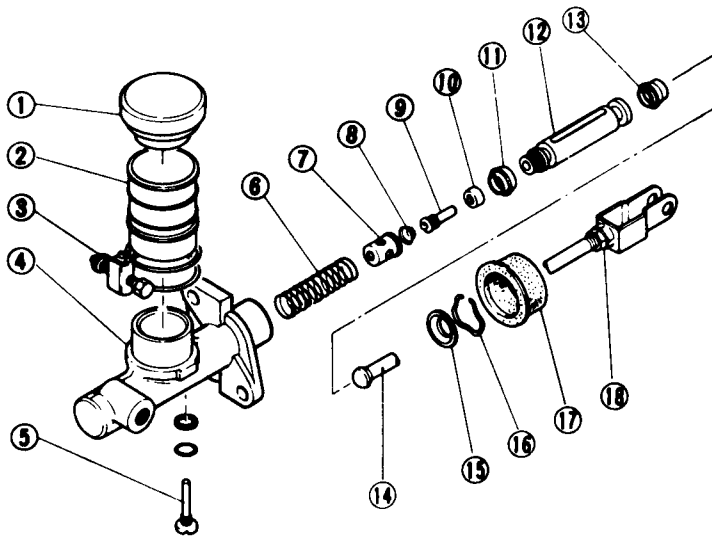
1. Remove snap pin from clevis pin.
2. Pull out clevis pin.
3. Disconnect clutch tube from master cylinder.
4. Remove windshield washer tank and dropping resistor for EFI from body and put them at a position where they won't interfere with master cylinder. Then remove master cylinder.

CAUTION:

When disconnecting clutch tube, use suitable flare nut wrench. Never use an open end wrench or adjustable wrench.

Note: When disconnecting clutch tube, be sure to receive draining clutch fluid into a container. Use of rags is also suggested to keep adjacent parts and area clean.

DISASSEMBLY



- | | | | |
|------------------------|------------------------|------------------|-----------------|
| 1 Reservoir cap | 6 Return spring | 11 Primary cup | 16 Stopper ring |
| 2 Reservoir | 7 Spring seat | 12 Piston | 17 Dust cover |
| 3 Reservoir band | 8 Valve spring | 13 Secondary cup | 18 Lock nut |
| 4 Cylinder body | 9 Supply valve stopper | 14 Push rod | |
| 5 Supply valve stopper | 10 Supply valve | 15 Stopper | |

CL345

1. Remove dust cover and take off stopper ring from body.
2. Then, the push rod and stopper can be taken out.
3. Loosen supply valve stopper and take it out.
4. The piston, spring seat, and return spring can be taken out.

Note: Do not reuse piston cup and dust cover after removal.

INSPECTION

CAUTION:

To clean or wash all parts of master cylinder, clean brake fluid must be used. Never use mineral oils such as gasoline and kerosene. It will ruin the rubber parts of the hydraulic system.

1. Check cylinder bore and piston for score or rust and if found, replace.
2. Check cylinder bore and piston for wear. If the clearance between cylinder bore and piston exceeds the

specified value, replace piston assembly or master cylinder assembly.

Clearance between cylinder bore and piston:

Less than 0.15 mm
(0.0059 in)

3. Check the condition of piston cup and dust cover. Always replace them after disassembly.
4. Check all recesses, openings and internal passages to ensure that they are clean and free from foreign matter.

ASSEMBLY

Assemble clutch master cylinder in the reverse order of disassembly. Observe the following:

1. Dip piston cup in brake fluid before installing. Make sure that it is correctly faced in position.
2. Apply a coating of brake fluid to cylinder and piston when assembling.

Ⓙ : Supply valve stopper

1.5 - 2.9 N·m
(0.15 - 0.3 kg·m,
1.1 - 2.2 ft·lb)

INSTALLATION

Install clutch master cylinder in the reverse order of removal. Observe the following:

1. Bleed air out of hydraulic system. Refer to Bleeding Clutch System for bleeding.
2. Adjust pedal height. Refer to Section MA.

Ⓙ : Master cylinder to dash panel securing nut

7.8 - 10.8 N·m
(0.8 - 1.1 kg·m,
5.8 - 8.0 ft·lb)

Clutch tube flare nut
15 - 18 N·m
(1.5 - 1.8 kg·m,
11 - 13 ft·lb)

CAUTION:

When connecting clutch tube, use Flare Nut Torque Wrench GG94310000.

Note: When tightening flare nut, hold pipe by hand to prevent it from twisting.

OPERATING CYLINDER

REMOVAL

1. Disconnect clutch tube from clutch hose at the bracket on side member.

CAUTION:

When disconnecting clutch tube, use suitable flare nut wrench. Never use an open end wrench or adjustable wrench.

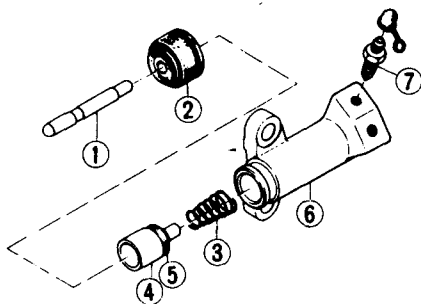
2. Remove lock spring, then disengage hose from bracket.
3. Remove clutch hose from operating cylinder.
4. Remove operating cylinder.

DISASSEMBLY

1. Remove push rod and dust cover.
2. Remove piston and piston cup as an assembly.

Note: Do not reuse piston cup and dust cover after removal.

3. Remove bleeder screw.



- | | |
|-----------------|----------------------|
| 1 Push rod | 5 Piston cup |
| 2 Dust cover | 6 Operating cylinder |
| 3 Piston spring | 7 Bleeder screw |
| 4 Piston | |

CL222

INSPECTION

Visually inspect all disassembled parts and replace parts which are worn or damaged too badly beyond specifications.

CAUTION:

To clean or wash all parts of operating cylinder, clean brake fluid must be used.

Never use mineral oils such as gasoline and kerosene. It will ruin the rubber parts of the hydraulic system.

1. Check cylinder bore and piston for score or rust and, if found, replace.
2. Check cylinder bore and piston for wear. If clearance between cylinder bore and piston is more than the specified value, replace piston or operating cylinder assembly.

Clearance between cylinder bore and piston:

Less than 0.15 mm (0.0059 in)

3. Check bleeder hole to be sure that it is clean.

ASSEMBLY

Assemble operating cylinder in the reverse order of disassembly. Observe the following:

1. Prior to assembly, dip a new piston cup in clean brake fluid. To install piston cup on piston, pay particular attention to its direction.

Note: Replace piston cup and dust cover with new ones.

2. Dip cylinder and piston in clean brake fluid before assembly.

INSTALLATION

Install operating cylinder in the reverse order of removal. Observe the following:

Bleed air thoroughly from clutch hydraulic system. Refer to Bleeding Clutch System for bleeding.

Note:

- a. Use new gasket.
- b. When operating cylinder is removed from, or installed on, clutch housing without disconnecting clutch hose from operating cylinder, loosen bleeder screw so that push rod moves lightly.
- c. Exercise care not to warp or twist clutch hose. Be sure to install clutch hose away from exhaust tube.
- d. When tightening flare nut, hold pipe by hand to prevent it from twisting.

CAUTION:

When connecting clutch tube, use Flare Nut Torque Wrench GG94310000.

Ⓙ : Bleeder screw

**6.9 - 8.8 N·m
(0.7 - 0.9 kg-m,
5.1 - 6.5 ft-lb)**

Operating cylinder to clutch housing securing bolts

**30 - 40 N·m
(3.1 - 4.1 kg-m,
22 - 30 ft-lb)**

Clutch hose to operating cylinder

**16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)**

Flare nut

**15 - 18 N·m
(1.5 - 1.8 kg-m,
11 - 13 ft-lb)**

CLUTCH LINE

INSPECTION

Check clutch lines (tube and hose) for evidence of cracks, deterioration or other damage. Replace if necessary.

If leakage occurs at or around joints, retighten and, if necessary, replace damaged parts.

REMOVAL

CAUTION:

When disconnecting clutch tube, use suitable flare nut wrench. Never use an open end wrench or adjustable wrench.

1. Disconnect clutch tube from clutch hose at bracket on side member.
2. Remove lock spring, then disengage hose from bracket.
3. Remove clutch hose from operating cylinder.
4. Disconnect clutch tube from master cylinder.
5. Remove clamp fixing clutch tube to dash panel.

INSTALLATION

Wipe the opening ends of hydraulic line to remove any foreign matter before making connections.

1.
 - (1) Connect clutch tube to master cylinder with flare nut.
 - (2) Fix clutch tube to dash panel with clamp.
 - (3) Then tighten flare nut.

Ⓙ : Flare nut

15 - 18 N·m
(1.5 - 1.8 kg·m,
11 - 13 ft·lb)

2. Install clutch hose on operating cylinder with a gasket in place.

Note: Use new gasket.

Ⓙ : 16 - 21 N·m

(1.6 - 2.1 kg·m,
12 - 15 ft·lb)

3. Engage opposite end of hose with bracket. Install lock spring fixing hose to bracket.

Note:

- a. When tightening flare nut, hold pipe by hand to prevent it from twisting.
- b. Exercise care not to warp or twist clutch hose.

4. Connect clutch tube to hose with flare nut and tighten it.
5. Check distance between clutch line and adjacent parts (especially between hose and exhaust tube).
6. Bleed air out of hydraulic system.
 Refer to Bleeding Clutch System for bleeding.

CAUTION:

When tightening flare nut, use Flare Nut Wrench GG94310000.

BLEEDING CLUTCH SYSTEM

The hydraulic clutch system must be bled whenever clutch line has been disconnected or air has entered it.

When pedal action has a "spongy" feeling, it is an indication that air has entered the system.

Bleeding clutch system is an essential part of regular clutch service.

1. Remove cap of reservoir and top up with recommended brake fluid.
2. Thoroughly clean mud and dust from bleeder screw of operating cylinder so that outlet hole is free from any foreign material. Install bleeder hose (vinyl hose) on bleeder screw.

Place the other end of it in a container filled with brake fluid.

3. Have a co-worker depress clutch pedal two or three times. With clutch pedal depressed fully, loosen bleeder screw to bleed air out of clutch system.

4. Close bleeder screw quickly as clutch pedal is on down stroke.
5. Allow clutch pedal to return slowly with bleeder screw closed.
6. Repeat steps 3 through 5 until no air bubble shows in the vinyl hose.

Ⓙ : Bleeder screw

6.9 - 8.8 N·m
(0.7 - 0.9 kg·m,
5.1 - 6.5 ft·lb)

7. Depress and release clutch pedal several times; then, check for external hydraulic leaks at connections.

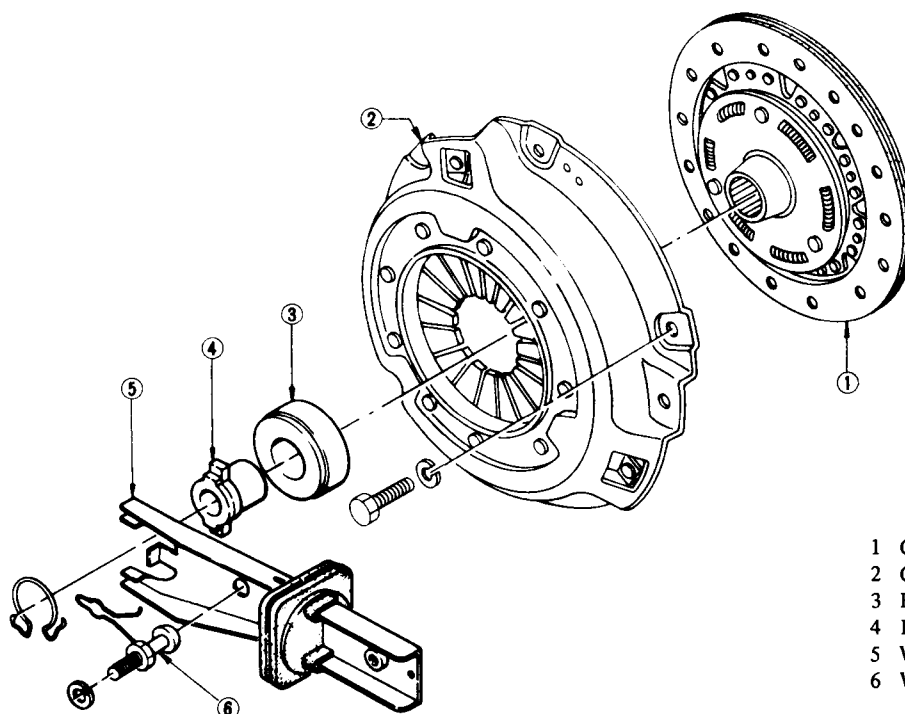
Note:

- a. Brake fluid containing air is white and has visible air bubbles.
- b. Brake fluid containing no air runs out of bleeder screw in a solid stream without air bubbles.
- c. Pay close attention to clutch fluid level in reservoir during bleeding operation.
- d. Pour brake fluid into reservoir up to the specified level.

CAUTION:

- a. Do not reuse brake fluid drained during bleeding operation.
- b. Exercise care not to splash brake fluid on exterior finish as it will damage the paint.
- c. When tightening flare nut, use Flare Nut Torque Wrench GG94310000.

CLUTCH UNIT



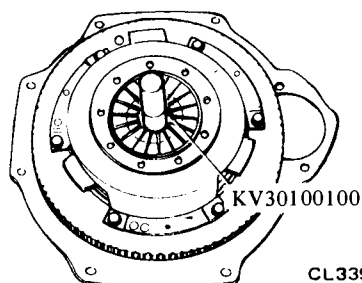
- 1 Clutch disc assembly
- 2 Clutch cover assembly
- 3 Release bearing
- 4 Release sleeve
- 5 Withdrawal lever
- 6 Withdrawal lever ball pin

CL319

CLUTCH DISC AND COVER

REMOVAL

1. Remove transmission from engine. Refer to Removal (Section MT).
2. Insert Clutch Aligning Bar KV30100100 into clutch disc hub until it will no longer go. It is important to support weight of clutch disc in the steps that follow.



CL339

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.

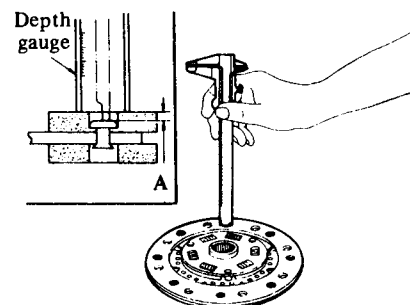
1. If facings are oily, disc should be replaced. In this case, inspect transmis-

sion front cover oil seal, pilot bushing, 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)



CL336

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.

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)
at "R"

L28E engine model

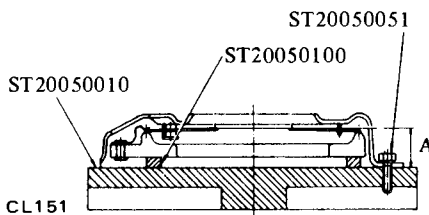
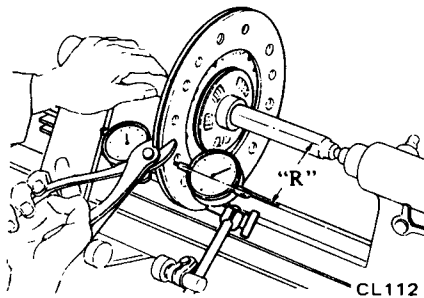
107.5 mm (4.23 in)

L28ET engine model

115 mm (4.53 in)

CAUTION:

When repairing disc plate, never hold it forcibly with pliers or bend it excessively; otherwise facing will be damaged.



(2) Measure height "A" at several points with a vernier caliper depth gauge. If height "A" of spring end is beyond the specified value, adjust spring height with Diaphragm Adjusting Wrench ST20050240.

Diaphragm spring height "A":

C225S model

33.0 - 35.0 mm

(1.299 - 1.378 in)

C240S model

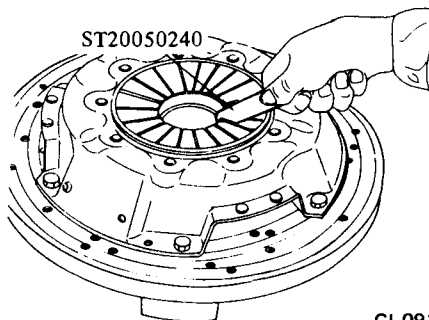
37.5 - 39.5 mm

(1.476 - 1.555 in)

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)



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

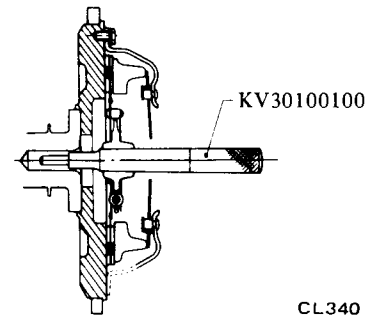
1. Apply a light coat of grease (including molybdenum disulphide) to transmission main drive gear splines.

Slide clutch disc on main drive gear several times. Remove clutch disc and wipe off excess lubricant pushed off by disc hub.

Note: 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 Clutch Aligning Bar KV30100100.

Note: Be sure to keep disc facings, flywheel and pressure plate clean and dry.



3. Install bolts to tighten clutch cover assembly to flywheel squarely. 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)

Note: Dowels are used to locate clutch cover on flywheel properly.

4. Remove clutch aligning bar.

5. Reinstall transmission. Refer to Installation (Section MT).

Clutch cover assembly

1. Check the 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:

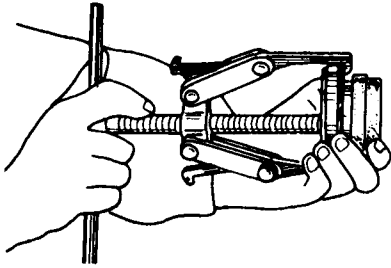
(1) Place Distance Piece ST20050100 on Base Plate ST20050010 and then tighten clutch cover assembly on base plate by using Set Bolts ST20050051.

RELEASE BEARING

REMOVAL

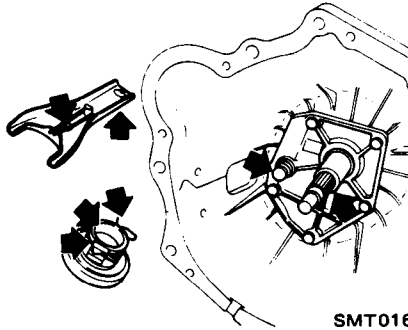
1. Remove transmission from engine. Refer to Removal (Section MT).
2. Disconnect retainer spring from bearing sleeve.
3. Remove release bearing and sleeve as an assembly from transmission case front cover.

4. Take clutch release bearing out from bearing sleeve, using a universal puller and a suitable adapter.



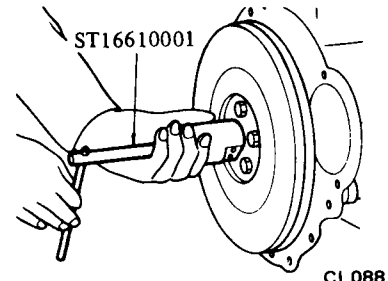
CL145

- (2) Contact surfaces of withdrawal lever, lever ball pin and bearing sleeve.
- (3) Bearing sleeve sliding surface of transmission case front cover.



SMT016

3. Remove pilot bushing in crankshaft by Pilot Bushing Puller ST16610001.



CL088

INSPECTION

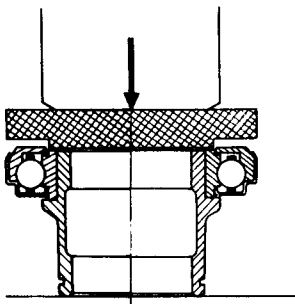
Check for abnormal wear on contact surface of withdrawal lever, ball pin and bearing sleeve.

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. Assemble release bearing on sleeve, using a press.

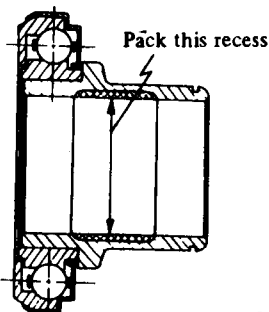
Note: Do not depress outer race.



CL117

2. Before or during assembly, lubricate the following points with a light coat of lithium-based grease including molybdenum disulphide.

- (1) Inner groove of release bearing sleeve.

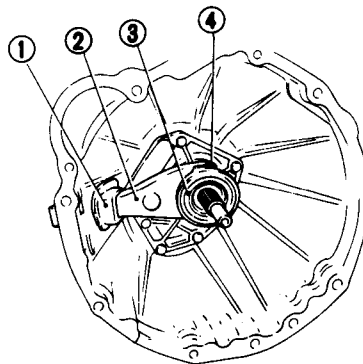


CL093

- (4) Transmission main drive gear splines.

Note: 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.

3. After lubricating, install withdrawal lever, release bearing and sleeve assembly in position. Connect them with retainer spring.



CL311

- | | |
|--------------------|-------------------|
| 1 Dust cover | 3 Release bearing |
| 2 Withdrawal lever | 4 Retainer spring |

4. Reinstall transmission. Refer to Installation (Section MT).

PILOT BUSHING

REMOVAL

1. Remove transmission from engine. Refer to Removal (Section MT).
2. Remove clutch disc and cover assembly. Refer to Clutch Disc and Cover for removal.

INSPECTION

Check pilot bushing for fit in bore of crankshaft.

Check inner surface of pilot bushing for wear, roughness or bell-mouthed condition. If pilot bushing is worn or damaged, replace. When bushing is damaged, be sure to check transmission main drive gear at the same time.

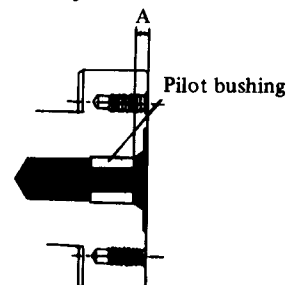
INSTALLATION

1. Before installing a new bushing, thoroughly clean bushing hole.
2. Insert pilot bushing until distance between flange end and pilot bushing is the specified distance A. Bushing need not be oiled.

Distance "A":

4.0 mm (0.157 in)

Note: When installing pilot bushing, be careful not to damage edge of pilot bushing and not to insert excessively.



EM719

3. Install clutch disc and clutch cover assembly. Refer to Clutch Disc and Cover for installation.
4. Install transmission. Refer to Installation (Section MT).

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

GENERAL SPECIFICATIONS

CLUTCH CONTROL SYSTEM

Type of clutch control	Hydraulic
------------------------	-----------

CLUTCH MASTER CYLINDER

Inner diameter	mm (in)	15.88 (5/8)
----------------	---------	-------------

CLUTCH COVER

L28E engine model

Item	Model	2 seater	2 + 2 seater
		C225S	C240S
Full load	N (kg, lb)	5,394 (550, 1,213)	4,904 (500, 1,103)

L28ET engine model

Type	C240S
Full load N (kg, lb)	5,884 (600, 1,323)

CLUTCH OPERATING CYLINDER

Unit: mm (in)

Type	Non-adjustable
Inner diameter	19.05 (3/4)

CLUTCH DISC

L28E engine model

Unit: mm (in)

Item	Model	2 seater	2 + 2 seater
		225CBL	240TBL
Facing size Outer dia. x Inner dia. x Thickness		225 x 150 x 3.5 (8.86 x 5.91 x 0.138)	240 x 150 x 3.5 (9.45 x 5.91 x 0.138)
Thickness of disc assembly Free		8.25 - 8.95 (0.3248 - 0.3524)	8.55 - 9.25 (0.3366 - 0.3642)
Installed		7.6 - 8.0 (0.299 - 0.315)	7.8 - 8.2 (0.307 - 0.323)
Number of torsion springs		6	6

L28ET engine model

Unit: mm (in)

Type	240TBL
Facing size Outer dia. x Inner dia. x Thickness	240 x 160 x 3.5 (9.45 x 6.30 x 0.138)
Thickness of disc assembly Free	8.55 - 9.25 (0.3366 - 0.3642)
Installed	7.8 - 8.2 (0.307 - 0.323)
Number of torsion springs	6

INSPECTION AND ADJUSTMENT

CLUTCH PEDAL

Unit: mm (in)

Pedal height "H"	203 (7.99)
Pedal free play "A"	1 - 5 (0.04 - 0.20)

CLUTCH MASTER CYLINDER

Clearance between cylinder bore and piston	mm (in)	Less than 0.15 (0.0059)
---	---------	-------------------------

CLUTCH OPERATING CYLINDER

Clearance between cylinder bore and piston	mm (in)	Less than 0.15 (0.0059)
---	---------	-------------------------

CLUTCH DISC

Unit: mm (in)

Item	Model	C225S	C240S
		0.3 (0.012)	
Wear limit of facing surface to rivet head			
Runout limit		0.5 (0.020)	0.5 (0.020)
Distance of runout checking point (from the hub center)		107.5 (4.23)	115 (4.53)
Maximum backlash of spline (at outer edge of disc)		0.4 (0.016)	

CLUTCH COVER

Unit: mm (in)

Item \ Model	C225S	C240S
Diaphragm spring height	33.0 - 35.0 (1.299 - 1.378)	37.5 - 39.5 (1.476 - 1.555)
Unevenness of diaphragm spring toe height	Less than 0.5 (0.020)	

PILOT BUSHING

Inserted distance of pilot bushing mm (in)	4.0 (0.157)
---	-------------

TIGHTENING TORQUE

Unit	N·m	kg·m	ft·lb
Pedal stopper (clutch switch) lock nut	9.1 - 11.8 (12 - 15)	0.93 - 1.2 (1.2 - 1.5)	6.7 - 8.7 (9 - 11)
Master cylinder push rod lock nut	7.8 - 11.8	0.8 - 1.2	5.8 - 8.7
Operating cylinder bleeder screw	6.9 - 8.8	0.7 - 0.9	5.1 - 6.5
Master cylinder to dash panel securing nut	7.8 - 10.8	0.8 - 1.1	5.8 - 8.0
Master cylinder reservoir band	2.5 - 3.9	0.25 - 0.4	1.8 - 2.9
Master cylinder supply valve stopper	1.5 - 2.9	0.15 - 0.3	1.1 - 2.2
Clutch tube flare nut	15 - 18	1.5 - 1.8	11 - 13
Operating cylinder to clutch housing securing bolt	30 - 40	3.1 - 4.1	22 - 30
Clutch hose to operating cylinder	16 - 21	1.6 - 2.1	12 - 15
Clutch cover bolt	16 - 21	1.6 - 2.1	12 - 15

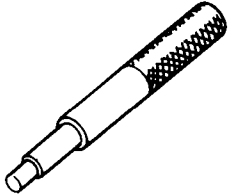

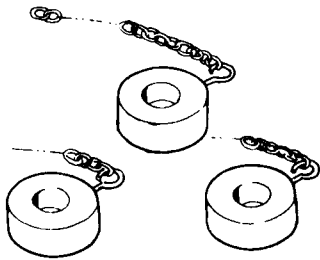
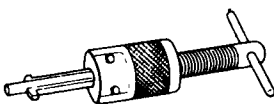
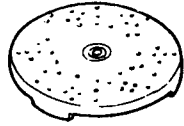
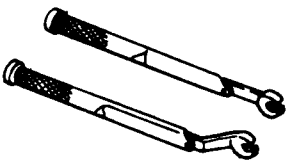

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause and testing	Corrective action
Clutch slips	<p>Slipping of clutch may be noticeable when any of the following symptoms is encountered during operation.</p> <p>(1) Car will not respond to engine speed during acceleration.</p> <p>(2) Insufficient car speed.</p> <p>(3) Lack of power during uphill driving.</p> <p>Some of the above conditions may also be attributable to engine problem. First determine whether engine or clutch is causing the problem.</p> <p>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.</p> <p>TO TEST FOR SLIPPING CLUTCH, proceed as follows:</p> <p>During upgrade travelling, run engine at about 40 to 50 km/h (25 to 31 MPH) with gear shift lever in 3rd-speed position, shift into highest gear and at the same time rev up engine. If clutch is slipping, car will not readily respond to depression of accelerator pedal.</p>	
	<ul style="list-style-type: none"> ● Clutch facing worn excessively. ● Oil or grease on clutch facing. ● Warped clutch cover or pressure plate. 	<p>Replace.</p> <p>Replace.</p> <p>Repair or replace.</p>
Clutch drags	<p>Dragging clutch is particularly noticeable when shifting gears, especially into low gear.</p> <p>TO TEST FOR DRAGGING CLUTCH, proceed as follows:</p> <p>(1) Start engine. Disengage clutch. Shift into reverse gear, and then into Neutral. Gradually increase engine speed, and again shift into reverse gear. If clutch is dragging, gear "grating" is heard when shifting gears from Neutral into Reverse.</p> <p>(2) Stop engine and shift gears. (Conduct this test at each gear position.)</p> <p>(3) In step (2), gears are shifted smoothly except 1st speed position at idling.</p> <p style="margin-left: 20px;">a. If dragging is encountered at the end of shifting, check condition of synchro-mechanism in transmission.</p> <p style="margin-left: 20px;">b. If dragging is encountered at the beginning of shifting, proceed to step (4) below.</p> <p>(4) Push change lever toward Reverse side, depress pedal to check for free travel of pedal.</p> <p style="margin-left: 20px;">a. If pedal can be depressed further, check clutch for condition.</p> <p style="margin-left: 20px;">b. If pedal cannot be depressed further, proceed to step (5) below.</p> <p>(5) Check clutch control. (Pedal height, pedal free play, etc.)</p> <p>If any abnormal condition does not exist and if pedal cannot be depressed further, check clutch for condition.</p>	
	<ul style="list-style-type: none"> ● Clutch disc runout or warped. ● Wear or rust on hub splines in clutch disc. ● Diaphragm spring toe height out of adjustment or toe tip worn. ● Worn or improperly installed parts. 	<p>Replace.</p> <p>Clean and lubricate with grease, or replace.</p> <p>Adjust or replace.</p> <p>Repair or replace.</p>

Clutch

Condition	Probable cause and testing	Corrective action
Clutch chatters	Clutch chattering is usually noticeable when car is just rolled off with clutch partially engaged.	
	<ul style="list-style-type: none"> Weak or broken clutch disc torsion spring. 	Replace.
	<ul style="list-style-type: none"> Oil or grease on clutch facing. 	Replace.
	<ul style="list-style-type: none"> Clutch facing out of proper contact or clutch disc runout. 	Replace.
	<ul style="list-style-type: none"> Loose rivets. 	Replace.
	<ul style="list-style-type: none"> Warped pressure plate or clutch cover surface. 	Repair or replace.
	<ul style="list-style-type: none"> Unevenness of diaphragm spring toe height. 	Adjust or replace.
Noisy clutch	<ul style="list-style-type: none"> Loose engine mounting or deteriorated rubber. 	Retighten or replace.
	A noise is heard after clutch is disengaged.	
	<ul style="list-style-type: none"> Damaged release bearing. 	Replace.
	A noise is heard when clutch is disengaged.	
	<ul style="list-style-type: none"> Insufficient grease on the sliding surface of bearing sleeve. 	Apply grease.
Clutch grabs	<ul style="list-style-type: none"> Clutch cover and bearing are not installed correctly. 	Adjust.
	A noise is heard when car is suddenly rolled off with clutch partially engaged.	
	<ul style="list-style-type: none"> Damaged pilot bushing. 	Replace.
Clutch grabs	When grabbing of clutch occurs, car will not roll off smoothly from a standing start or clutch will be engaged before clutch pedal is fully depressed.	
	<ul style="list-style-type: none"> Oil or grease on clutch facing. 	Replace.
	<ul style="list-style-type: none"> Clutch facing worn or loose rivets. 	Replace.
	<ul style="list-style-type: none"> Wear or rust on splines in drive shaft and clutch disc. 	Clean or replace.
	<ul style="list-style-type: none"> Warped flywheel or pressure plate. 	Repair or replace.
	<ul style="list-style-type: none"> Loose mountings for engine or power train units. 	Retighten.

SPECIAL SERVICE TOOLS

Tool number & tool name	Kent-Moore No.	Tool number & tool name	Kent-Moore No.
	Reference page		Reference page
KV30100100 Clutch aligning bar 	—	ST20050240 Diaphragm spring adjusting wrench 	—
	CL-6		CL-7
ST20050100 Distance piece 	—	ST16610001 Pilot bushing puller 	J23907
	CL-7		CL-8
ST20050010 Base plate 	—	GG94310000 Flare nut torque wrench 	—
	CL-7		CL-3 CL-4 CL-5
ST20050051 Set bolts 	—		
	CL-7		

MANUAL TRANSMISSION

SECTION MT

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REMOVAL	MT- 2
INSTALLATION	MT- 2
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(Model : FS5W71B)	MT- 3
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REPLACEMENT OF BEARINGS	MT-15
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REMOVAL AND INSTALLATION

REMOVAL

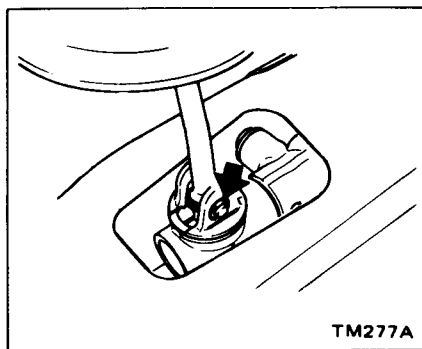
In dismantling transmission from the car, proceed as follows:

1. Disconnect battery ground cable from terminal.
2. Disconnect accelerator linkage.
3. Remove console.

Refer to Console (Section BF) for removal and installation.

4. Remove control lever boots.
5. Place transmission control lever in neutral position.

Remove E-ring and control lever pin from transmission striking rod guide, and remove control lever.



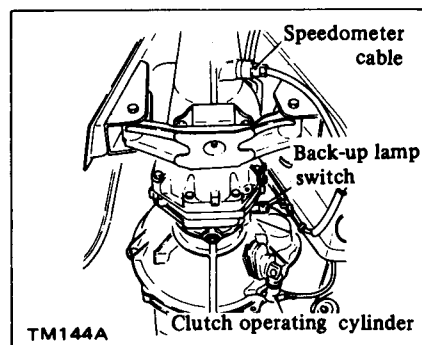
6. Jack up the car and support its weight on safety stands. Use a hydraulic hoist or open pit, if available.

Confirm that safety is insured.

7. Disconnect exhaust front tube from exhaust manifold.
8. Remove front tube bracket from rear extension housing. Refer to Section FE for removal.

Hold front tube end up with a thread or wire to prevent tube from falling.

9. Disconnect wires from back-up lamp switch.



10. Remove clutch operating cylinder from transmission case.

11. Disconnect speedometer cable from rear extension.

12. Remove heat shield plate. Refer to Section FE for removal.

13. Remove propeller shaft. Refer to Section PD.

CAUTION:

Remove propeller shaft carefully so as not to damage spline, sleeve yoke and rear oil seal.

Plug up the opening in the rear extension housing to prevent oil from flowing out.

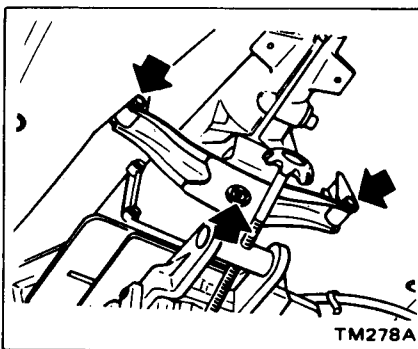
14. Support the engine by placing a jack under oil pan with a wooden block used between oil pan and jack.

CAUTION:

Do not place the jack under the oil pan drain plug.

15. Support transmission with a transmission jack.

16. Loosen rear engine mount securing nut temporarily and then remove rear engine mounting bracket from body.



17. Remove starting motor.

18. Remove bolts securing transmission to engine.

Then, support engine and transmission with jack, and slide transmission rearward away from engine and remove from car.

CAUTION:

Take care in dismantling the transmission not to strike any adjacent parts and main drive shaft.

INSTALLATION

Install transmission in the reverse order of removal, paying attention to the following points.

1. Before installing, clean mating surfaces of engine rear plate and transmission case.

2. Before installing, lightly apply grease to spline parts of clutch disc and main drive gear. And also apply grease to moving surfaces of control lever and striking rod.

3. Remove filler plug and fill transmission with recommended gear oil to the level of the plug hole.

Oil capacity:

2.0 liters

(4 1/4 US pt, 3 1/2 Imp pt)

Plug up opening in rear extension to prevent oil from flowing out.

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 transmission to engine to specifications.

Ⓘ : Ⓐ 43 - 58 N·m

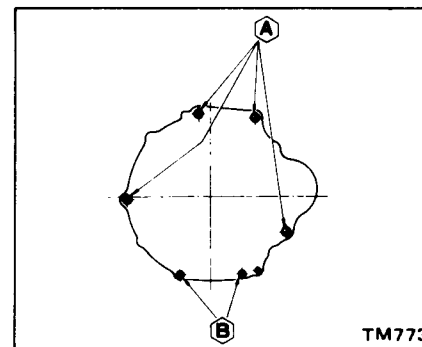
(4.4 - 5.9 kg-m,

32 - 43 ft-lb)

Ⓑ 9 - 12 N·m

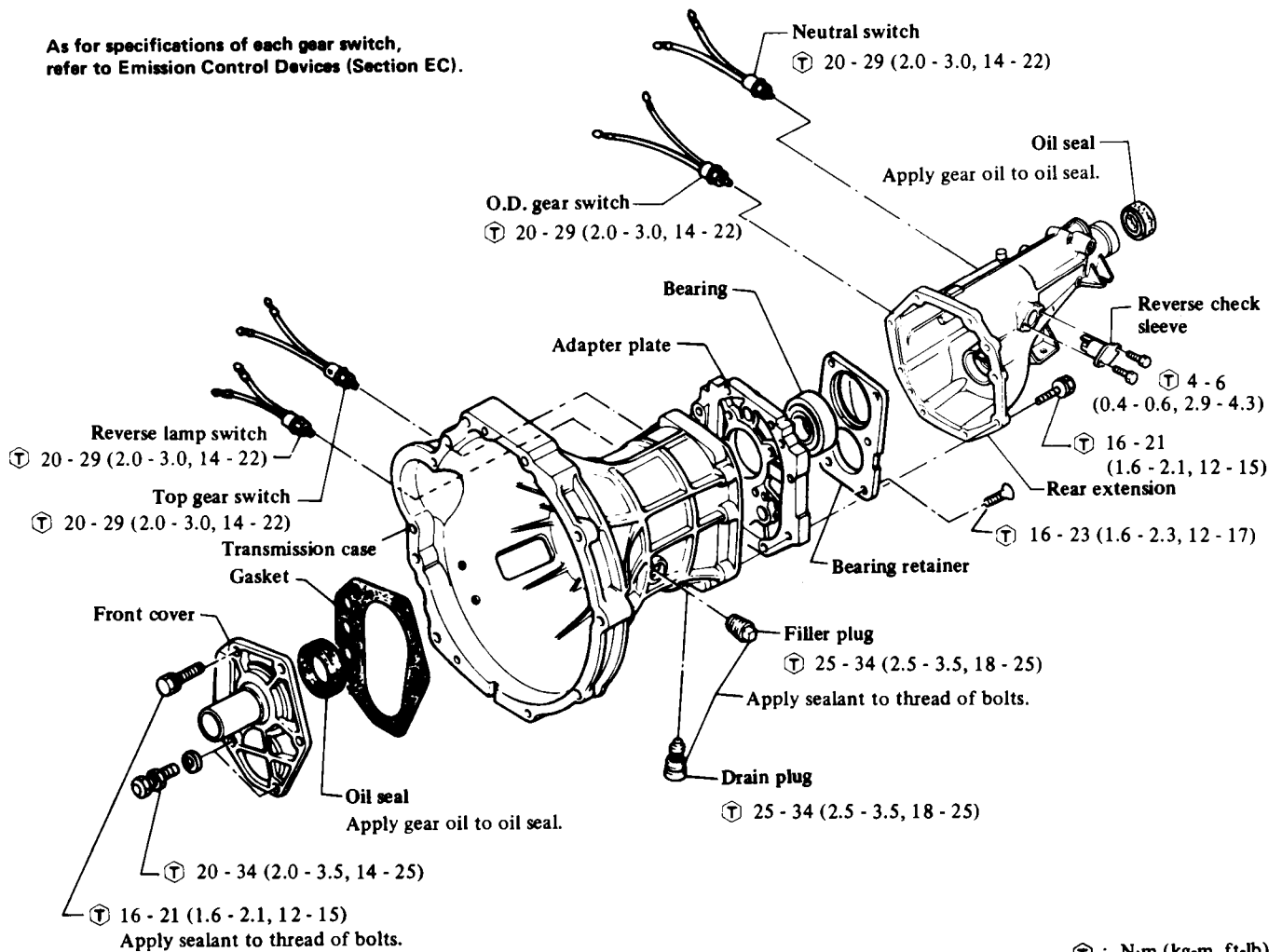
(0.9 - 1.2 kg-m,

6.5 - 8.7 ft-lb)



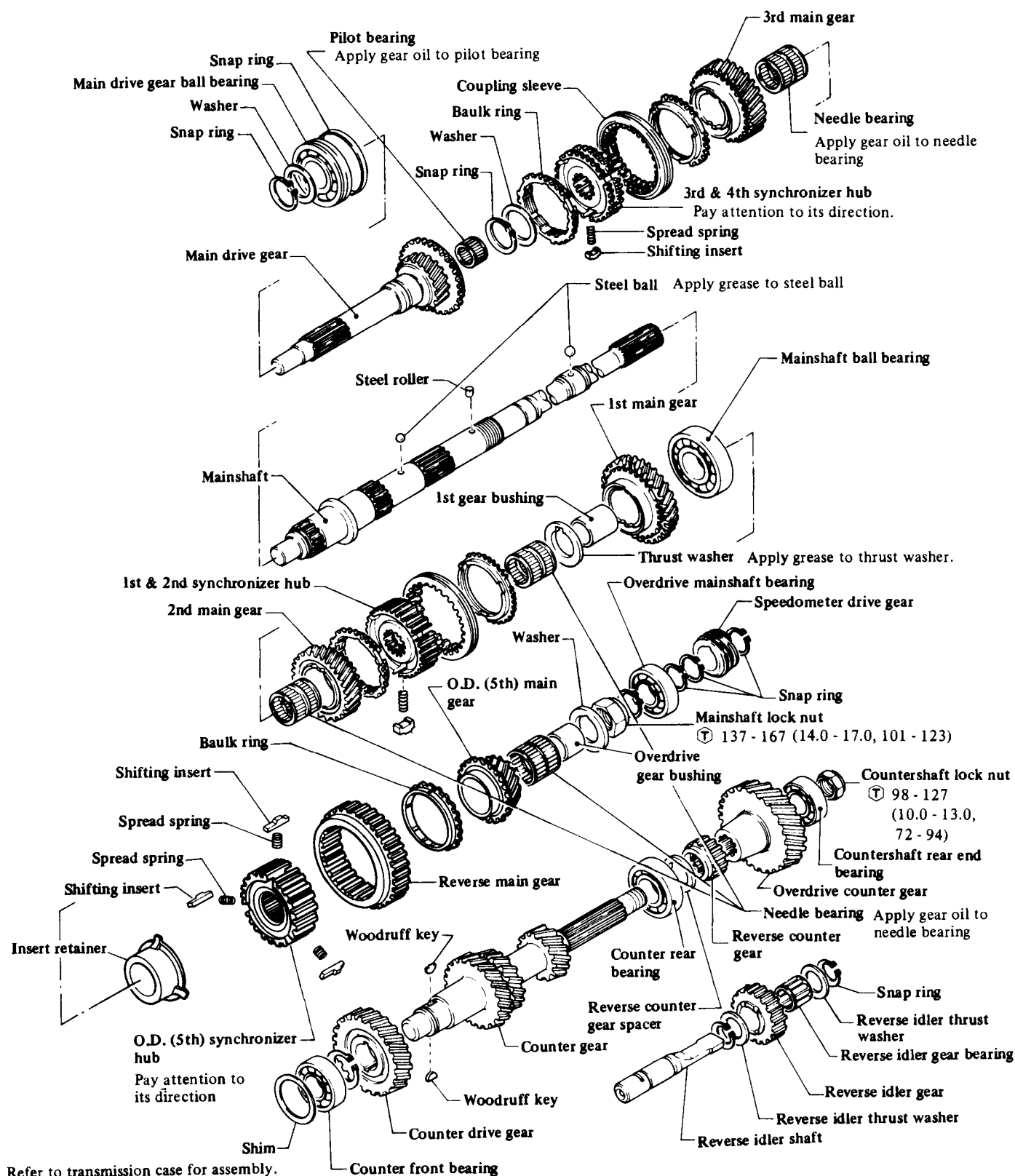
5-SPEED TRANSMISSION (Model : FS5W71B)

As for specifications of each gear switch,
refer to Emission Control Devices (Section EC).



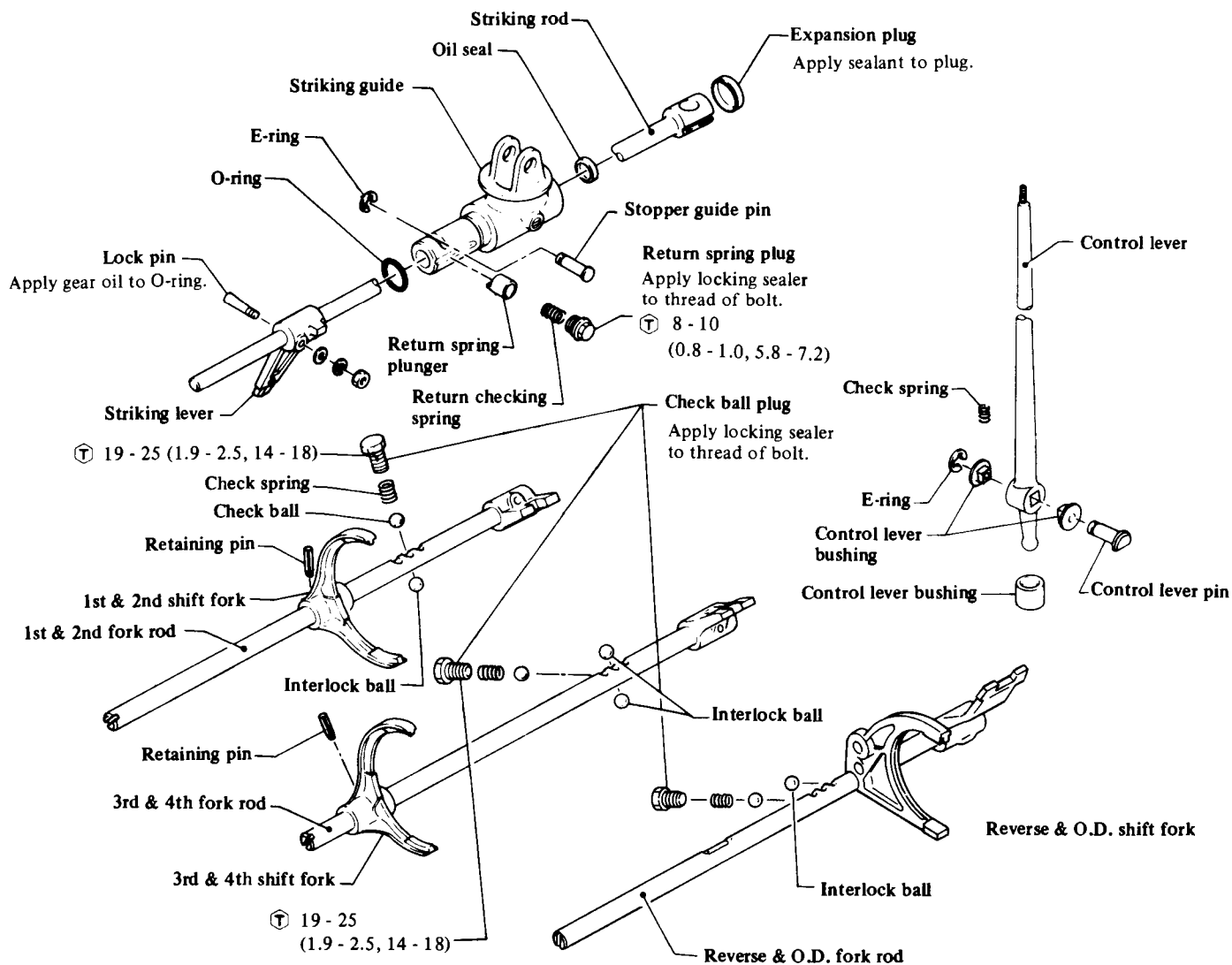
T : N·m (kg-m, ft-lb)

SMT358



Ⓣ : N·m (kg·m, ft·lb)

SMT738



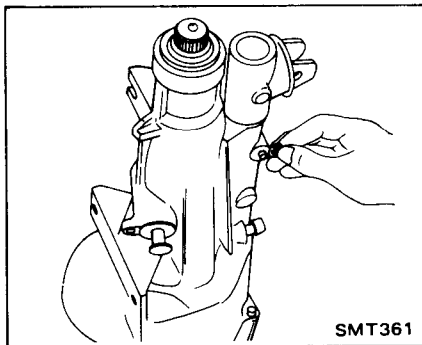
① : N·m (kg-m, ft-lb)

SMT360

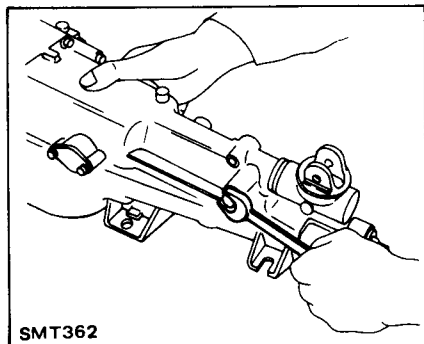
REAR EXTENSION

DISASSEMBLY

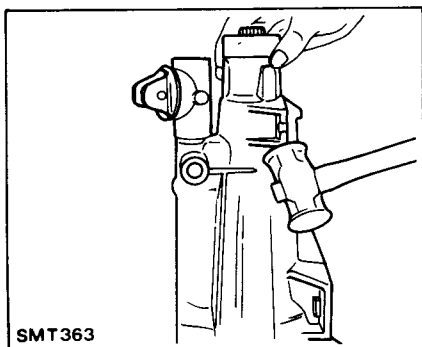
1. Wipe off dirt and grease.
2. Drain oil.
3. Remove E-ring and stopper guide pin.



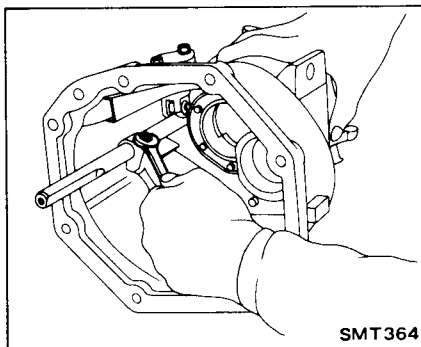
4. Remove return spring plug, return spring, and plunger from rear extension.



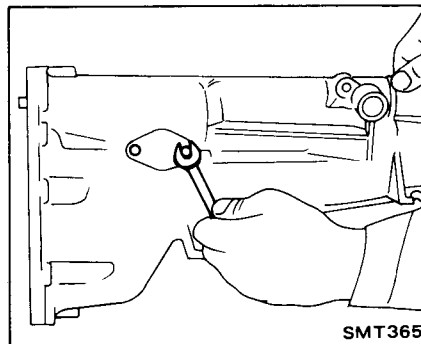
5. Remove rear extension by lightly tapping it.



6. Remove lock pin and then remove striking rod.



7. Remove Rev. check sleeve.



INSPECTION

1. Clean with solvent and check for cracks or cavities by means of dyeing test.
2. Check mating surface of rear extension for small nicks, projection or sealant.

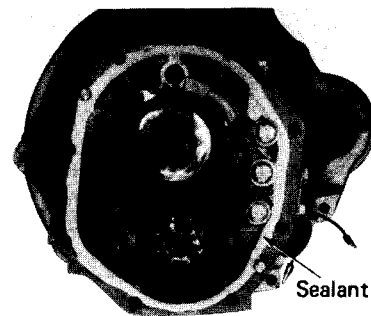
If rear extension bushing is worn or cracked, replace it as an assembly of bushing and rear extension housing.

ASSEMBLY

1. Assemble lock pin and striking rod.

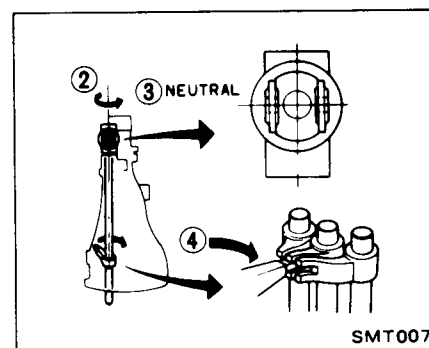
Ⓘ : 9 - 12 N·m
(0.9 - 1.2 kg-m,
6.5 - 8.7 ft-lb)

2. Stand transmission case assembly on wooden plates of more than 20 mm (0.79 in) thick.
3. Clean mating surfaces of adapter plate and rear extension.
4. Apply sealant to mating surface of adapter plate.

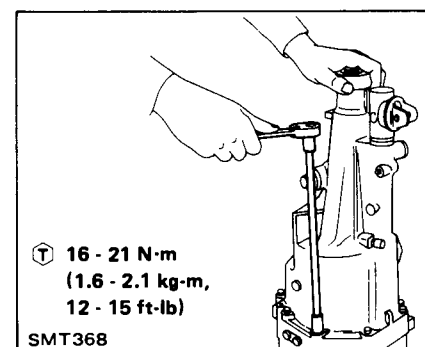


5. Install rear extension as follows:

- (1) Set gears at Neutral.
- (2) Turn striking guide counterclockwise.
- (3) Set striking guide at Neutral.
- (4) Align end of striking lever with cutout portion of fork rod.

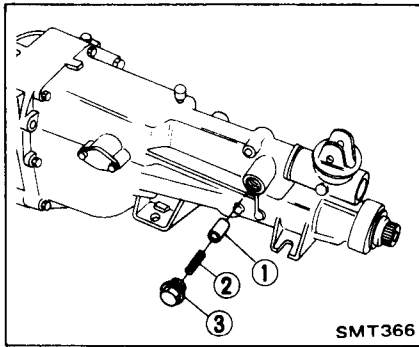


- (5) Apply sealant to threads of through-bolts and tighten them to transmission case.



Ⓘ 16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

6. Install plunger, return spring, and return spring plug.



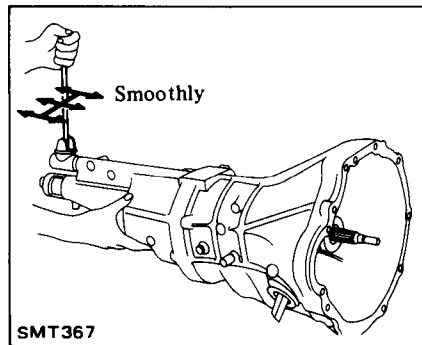
- 1 Plunger
- 2 Return spring
- 3 Return spring plug

7. Apply sealant to stopper guide pin, then install stopper guide pin and E-ring.

8. Install Rev. check sleeve.

Ⓙ : 4 - 6 N·m
(0.4 - 0.6 kg-m,
2.9 - 4.3 ft-lb)

9. Make sure that gears operate smoothly.



10. Install drain plug.

Ⓙ : 25 - 34 N·m
(2.5 - 3.5 kg-m,
18 - 25 ft-lb)

TRANSMISSION CASE

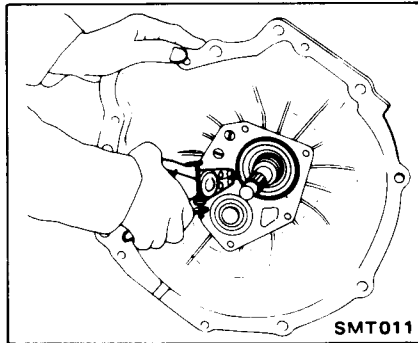
DISASSEMBLY

1. Remove rear extension. Refer to Rear Extension for disassembly.

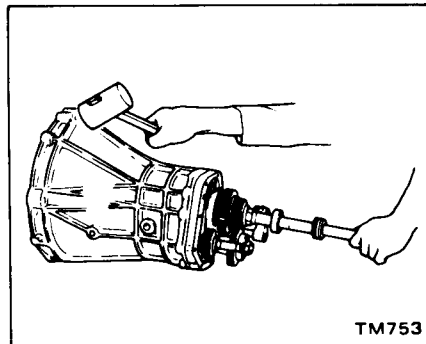
2. Remove dust cover, release bearing and withdrawal lever. Refer to Release Bearing (Section CL) for removal.

3. Remove front cover and gasket. Detach countershaft front bearing shim.

4. Remove main drive bearing snap ring.



5. Separate transmission case from adapter plate.

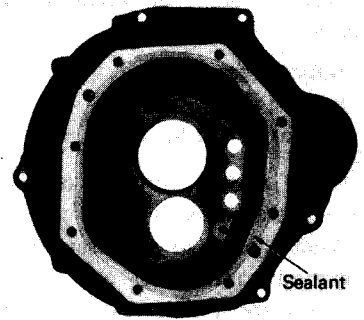


INSPECTION

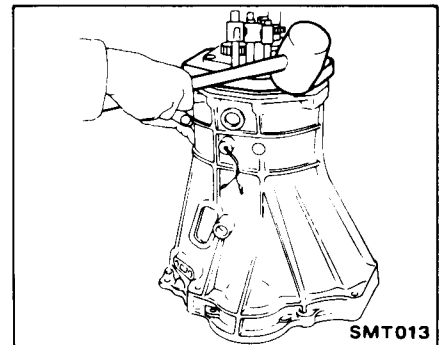
- Clean with solvent and check for cracks or pits by means of dyeing test.
- Check mating surface of transmission case for small nicks, projection or sealant.

ASSEMBLY

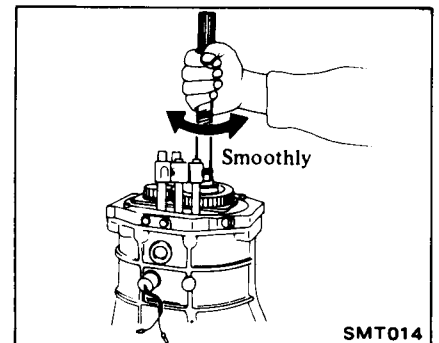
- Clean mating surfaces of adapter plate and transmission case.
- Stand transmission case on wooden plates of more than 20 mm (0.79 in) thick.
- Apply sealant to mating surface of transmission case.



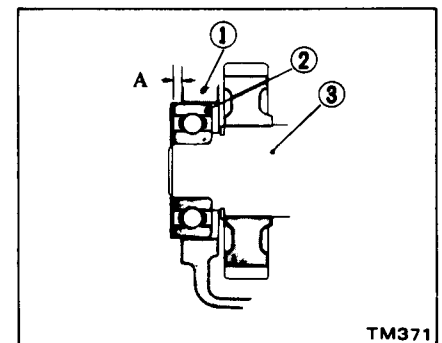
4. Slide gear assembly onto adapter plate by lightly tapping with a soft hammer.



5. Make certain that mainshaft rotates smoothly.



- Fit main drive bearing snap ring.
- Select countershaft front bearing shim as follows:
(1) Measure height "A".

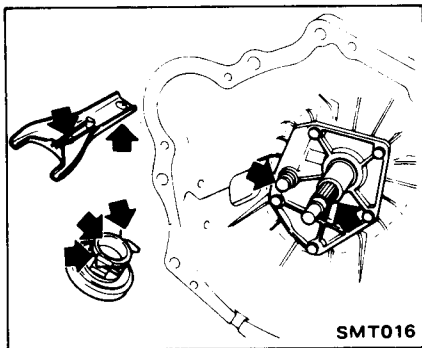


- 1 Transmission case
- 2 Counter gear front bearing
- 3 Counter gear

- (2) Select a shim of thickness "A" measured.

Counter gear front bearing shim:
Refer to S.D.S.

8. Clean mating surfaces of front cover and transmission case.
9. Apply grease to shim selected to retain it on front cover.
10. Lubricate seal lip and main drive shaft with gear oil, then install new gasket and front cover.
11. Install rear extension. Refer to Rear Extension for assembly.
12. Apply a light coat of lithium-based grease including molybdenum disulphide.

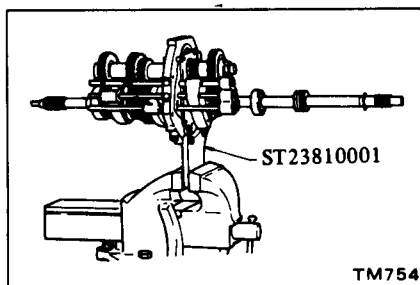


13. Install dust cover, release bearing and withdrawal lever.
14. Assemble Rear Extension. Refer to Rear Extension for assembly.

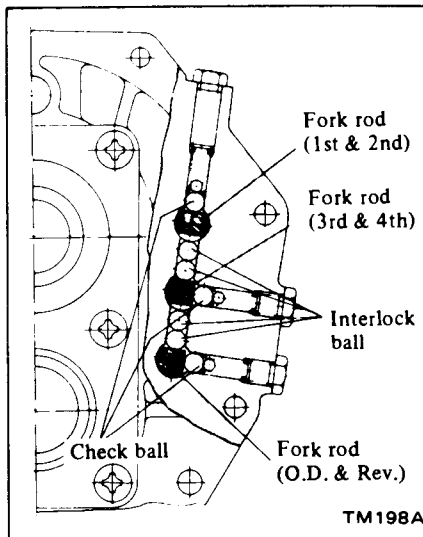
FORKS AND FORK RODS

DISASSEMBLY

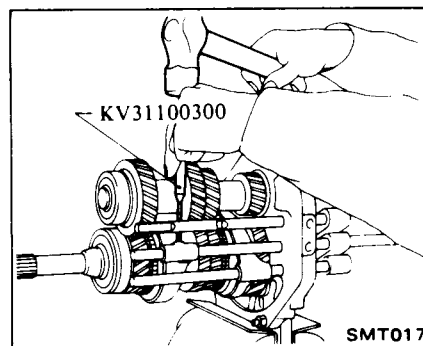
1. Remove rear extension. Refer to Rear Extension for disassembly.
2. Remove transmission case. Refer to Transmission Case for disassembly.
3. Set up Tool on adapter plate.
4. Place above assembly in a vise.



5. Remove check ball plugs and check springs.



6. Drive out retaining pins.

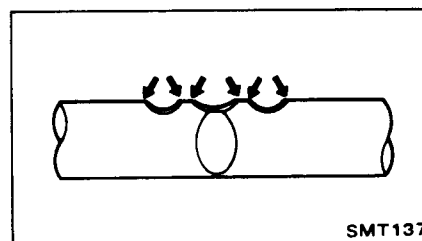


7. Drive out fork rods and remove interlock balls and check balls.

Be careful not to lose three check balls and four interlock balls.

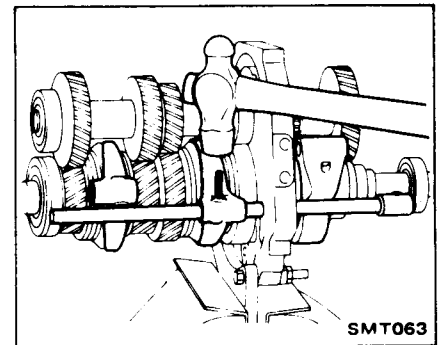
INSPECTION

Clean with solvent and check for wear, scratches, projection, damage or other faulty conditions. Replace any part which is worn or damaged.

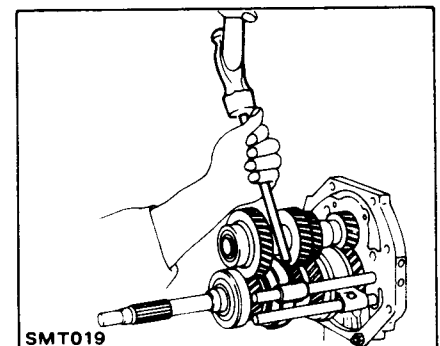


ASSEMBLY

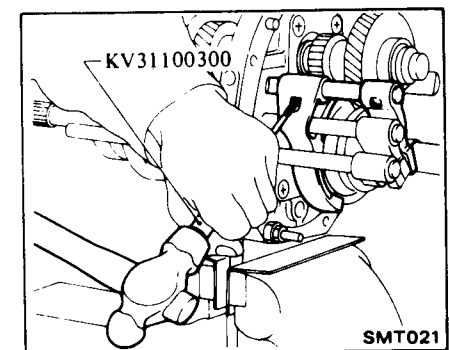
1. Install 1st & 2nd, 3rd & 4th and O.D. & Rev. shift forks and 1st & 2nd fork rod, then secure with retaining pin.



2. Install two (2) interlock balls.
3. Install 3rd & 4th fork rod, then secure with retaining pin.



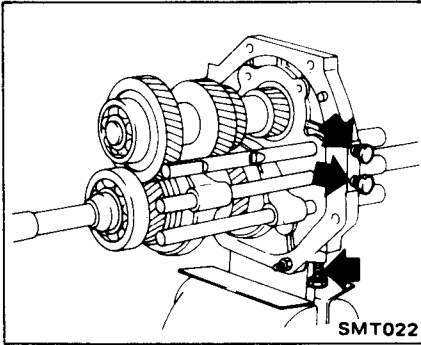
4. Install two (2) interlock balls.
5. Install O.D. & Rev. shift fork and fork rod, then secure with retaining pin.



6. Install check balls and check springs.

7. Apply locking sealer to check ball plugs and install them.

Ⓙ : 19 - 25 N·m
(1.9 - 2.5 kg-m,
14 - 18 ft-lb)



a. Check ball plug for 1st & 2nd fork rod is longer than that for Rev. shift fork rod and 3rd & 4th fork rod.

b. To insure that interlock plunger is installed properly, slide 3rd & 4th fork rod and operate the other fork rod. Make sure that the gear except 3rd or 4th gear does not mesh.

8. Apply gear oil to all sliding surfaces and check to see that shift rods operate correctly and gears are engaged smoothly.

9. Install transmission case. Refer to Transmission Case for assembly.

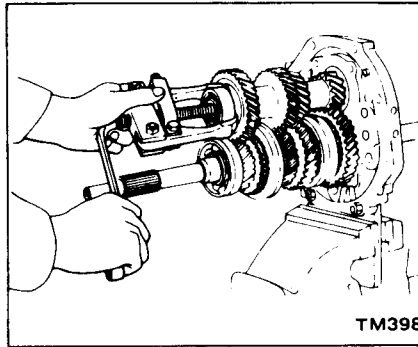
10. Install rear extension. Refer to Rear Extension for assembly.

GEARS AND SHAFTS

DISASSEMBLY

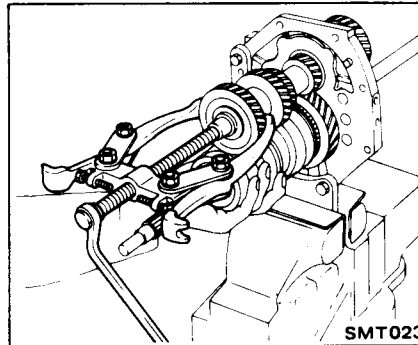
Main drive and counter drive gear

1. Remove rear extension. Refer to Rear Extension for disassembly.
2. Remove transmission case. Refer to Transmission Case for disassembly.
3. Remove forks and fork rods. Refer to Forks and Fork rods for disassembly.
4. **Measure gear end play.** Refer to Gears and Shafts for inspection.
5. Mesh 2nd and reverse gear, then draw out counter front bearing.



6. Remove counter drive gear snap ring.

7. Draw out counter drive gear with main drive gear.



When drawing out main drive gear assembly, be careful not to drop pilot needle bearing and baulk ring.

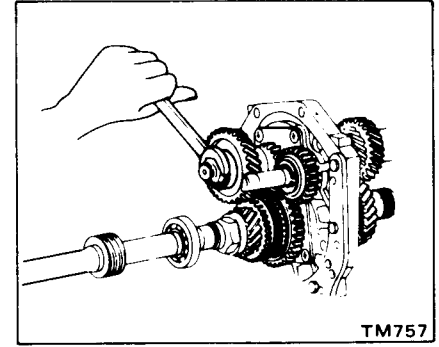
3rd main gear

1. Remove snap ring and thrust washer.
2. Draw out 3rd & 4th synchronizer and 3rd gear.

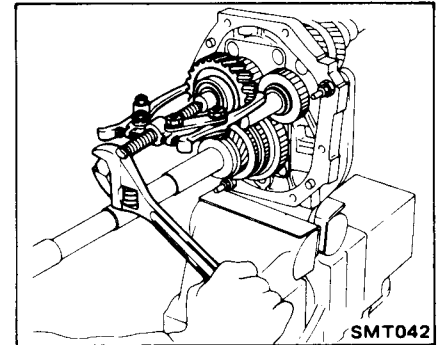
O.D. gear and reverse gear

1. Mesh 2nd and reverse gears. Release staking on counter gear nut and mainshaft nut and loosen these nuts. Remove counter gear nut.

Removed nuts should be discarded and should not be reused.



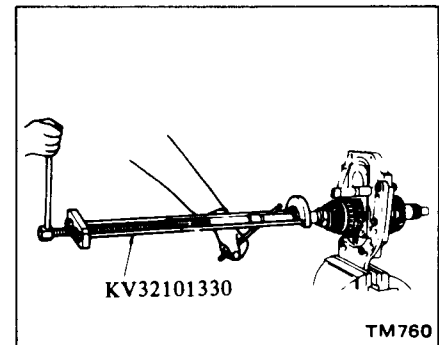
2. Drive out counter O.D. gear and bearing.



3. Remove reverse counter gear and spacer.

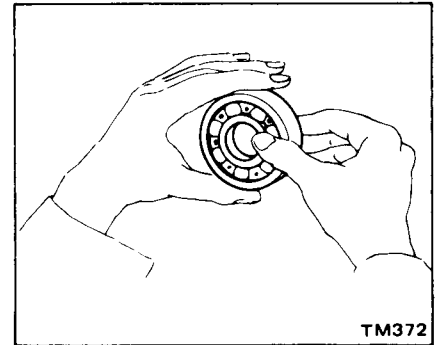
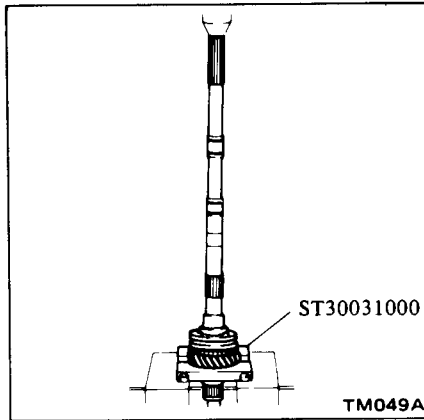
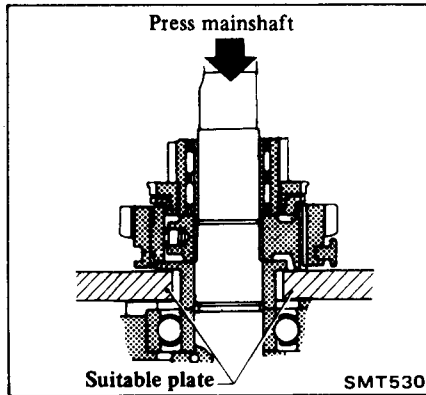
Remove snap ring from reverse idler shaft, and remove reverse idler gear.

4. Remove snap rings, steel ball, speedometer gear and bearing.



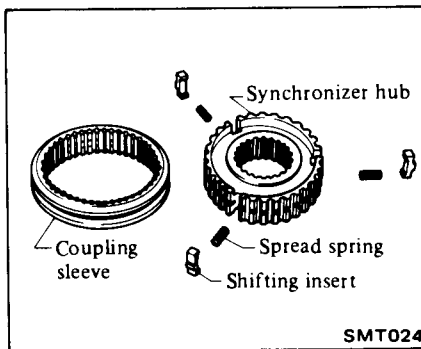
5. Remove mainshaft nut, thrust washer, speedometer drive gear, steel ball, steel roller, needle bearing, O.D. gear and baulk ring.

6. Remove O.D. gear bushing, insert retainer and O.D. synchronizer.



Synchronizer (1st & 2nd and 3rd & 4th)

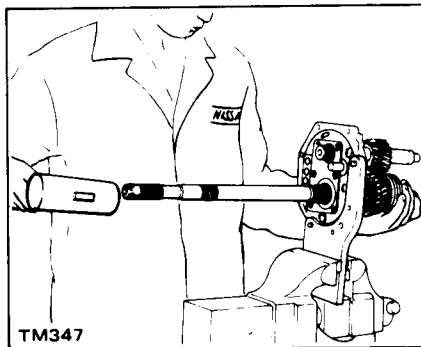
Disassemble synchronizer.



1st and 2nd main gear and counter gear

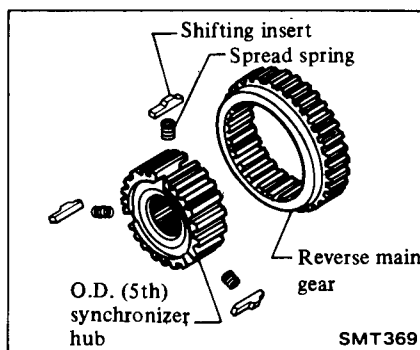
1. Draw out mainshaft assembly together with counter gear, by tapping rear end of mainshaft and counter gear.

Hold front of mainshaft assembly by hand, being careful not to drop counter gear.



Synchronizer (O.D.)

Disassemble synchronizer.



2. When race and ball surfaces are worn or rough, or when balls are out-of-round or rough, replace bearing with a new one.
3. 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, and worn spline; if necessary, replace.

3. Measure gear end play:

- It is necessary to measure end play before disassembling mainshaft and after reassembling mainshaft.
- Tighten mainshaft lock nut to specified limit and measure end play to insure that it is within specified limit.
- If end play is not within specified limit, disassemble and check parts for condition.
- Replace any part which is worn or damaged.

2. Remove thrust washer, steel ball, 1st gear and needle bearing.

Be careful not to lose steel ball retaining thrust washer.

3. Press out 1st gear mainshaft bushing together with 2nd gear and 1st & 2nd synchronizer.

When pressing out bushing, hold mainshaft by hand so as not to drop it.

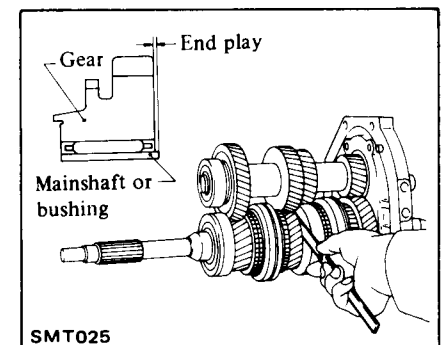
INSPECTION

Bearings

1. Thoroughly clean bearing and dry with compressed air.

CAUTION:

Do not allow the bearings to spin. Because it will damage the race and balls. Turn them slowly by hand.



Standard end play:

1st gear

0.27 - 0.34 mm
(0.0106 - 0.0134 in)

2nd gear

0.12 - 0.19 mm
(0.0047 - 0.0075 in)

3rd gear

0.13 - 0.37 mm
(0.0051 - 0.0146 in)

O.D. (5th) gear

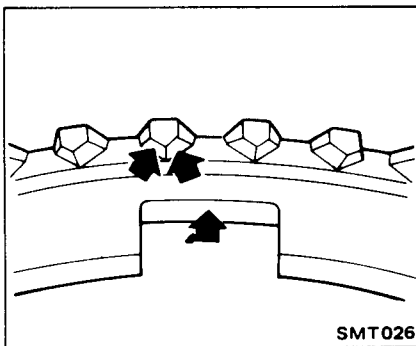
0.31 - 0.35 mm
(0.0122 - 0.0138 in)

Reverse idler gear

0.05 - 0.50 mm
(0.0020 - 0.0197 in)

Baulk ring

1. Replace baulk ring if found to be deformed, cracked or otherwise damaged excessively.



2. Place baulk ring in position on gear 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 wear limit, discard baulk ring.

Baulk ring to gear clearance:

Except O.D. (5th) gear

Standard

1.20 - 1.60 mm
(0.0472 - 0.0630 in)

Wear limit

Less than 0.8 mm
(0.031 in)

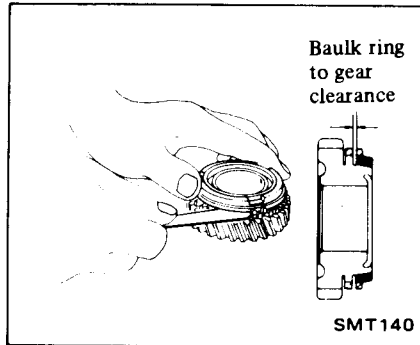
O.D. (5th) gear

Standard

1.00 - 1.40 mm
(0.0394 - 0.0551 in)

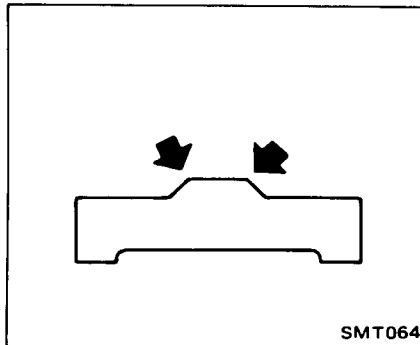
Wear limit

Less than 0.5 mm
(0.020 in)



Shifting Insert

Replace, if worn excessively, worn unevenly, deformed, or damaged.



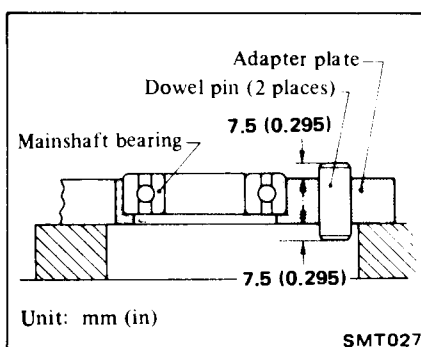
Oil seals

1. Replace oil seal if sealing lip is deformed or cracked. Also discard oil seal if spring is out of position. Refer to Replacement of Oil Seals.
2. Check the oil seal lip contacting with shaft; if necessary replace oil seal and shaft as a set.

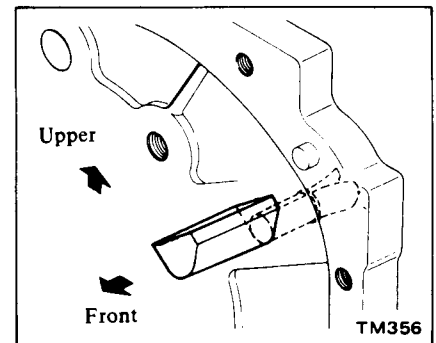
ASSEMBLY

Adapter plate

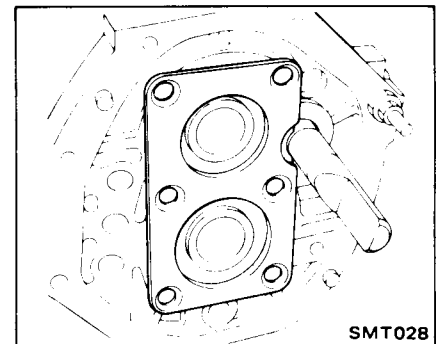
1. Place new dowel pin, mainshaft bearing on adapter plate and tap them.



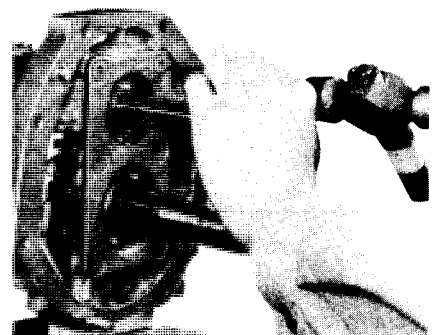
2. Install oil gutter on adapter plate and bend it on front side and expand on rear side.



3. Insert reverse idler shaft.
4. Install bearing retainer.



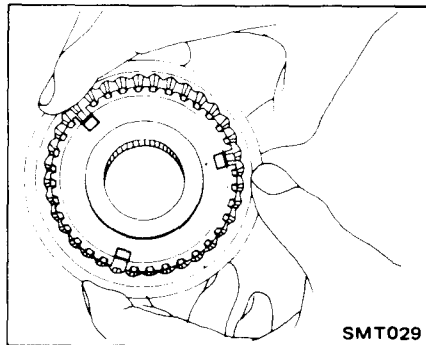
5. Tighten each screw, then stake it at two points.



6. Install counter rear bearing with a soft hammer.

Synchronizer

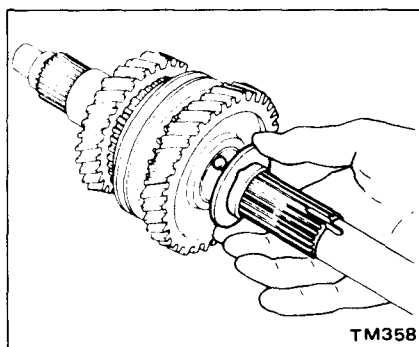
1. Assemble coupling sleeve, and hub.
2. Position spread springs and shifting inserts in three slots in synchronizer hub; put coupling sleeve (reverse main gear) on synchronizer hub.



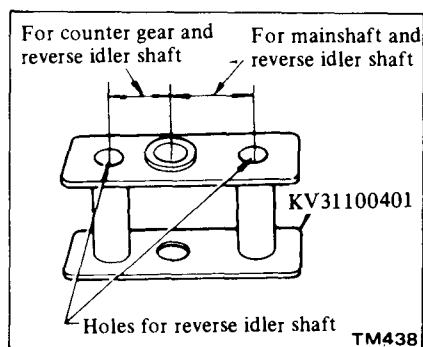
1st and 2nd main gear

1. Assemble 2nd gear needle bearing, 2nd gear, baulk ring, 1st & 2nd synchronizer assembly, 1st gear baulk ring, 1st gear bushing, needle bearing, 1st gear, steel ball, and thrust washer on mainshaft.

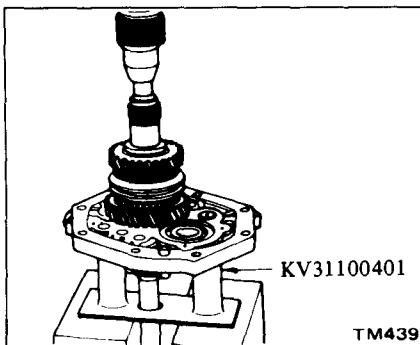
Before installing steel ball and thrust washer, apply grease to them.



2. Set Tool and place adapter plate assembly on it.

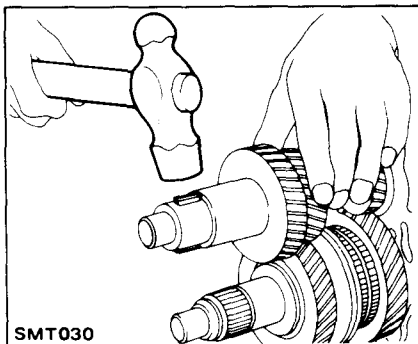


3. Press mainshaft assembly to adapter plate.

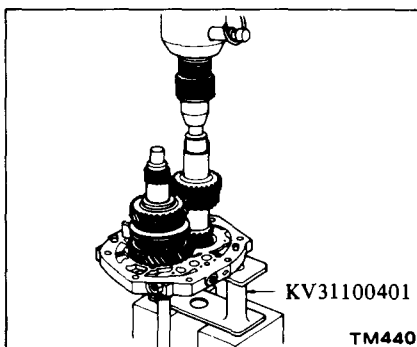


3rd main and counter gear

1. Tap new woodruff keys until they are seated securely.

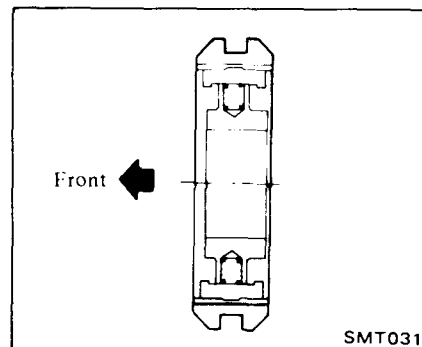


2. Press counter gear into adapter plate.



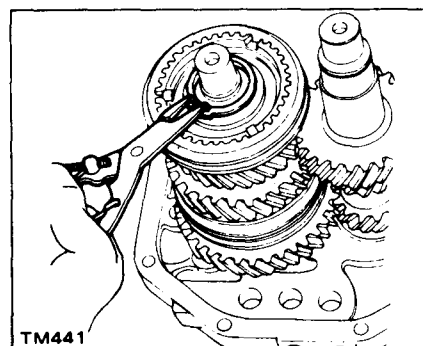
3. Position needle bearing, 3rd main gear, baulk ring and 3rd & 4th synchronizer assembly on the front of mainshaft.

Assemble 3rd & 4th synchronizer hub, paying attention to its direction.



4. Install thrust washer on mainshaft and secure it with snap ring of proper thickness that will minimize clearance of groove in mainshaft.

Mainshaft front snap ring:
Refer to S.D.S.

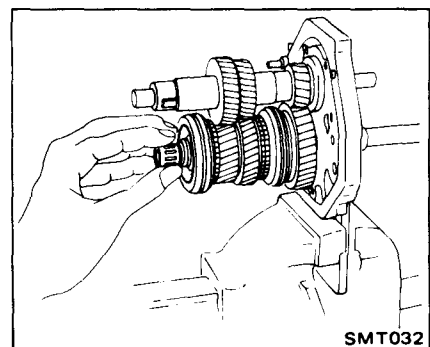


Main drive and counter drive gear

1. Install baulk ring on synchronizer.

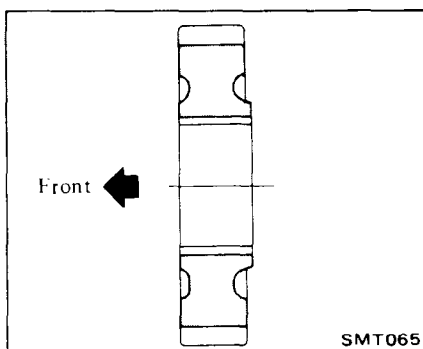
Be sure to align grooves of baulk ring with inserts.

2. Apply gear oil to mainshaft pilot bearing and install it on mainshaft.

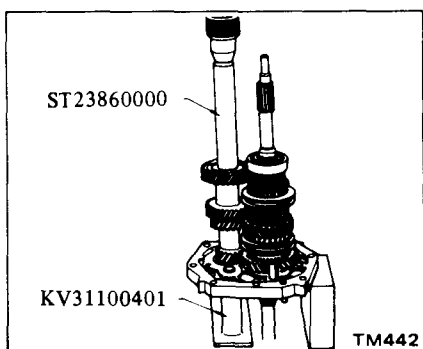


3. Install main drive gear with counter drive gear.

Assemble counter drive gear, paying attention to its direction.



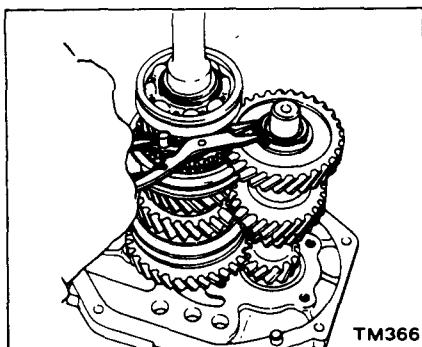
4. Press counter drive gear onto counter gear.



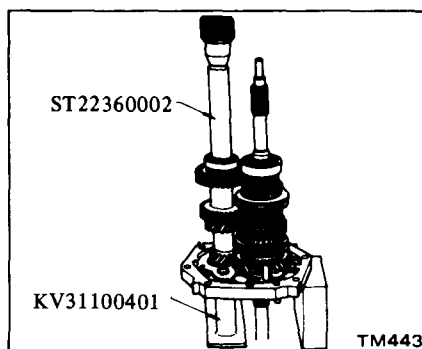
Main drive gear and counter drive gear should be handled as a matched set. When replacing main drive gear or counter drive gear, be sure to replace as a set of main drive gear and counter drive gear.

Counter drive gear snap ring:
Refer to S.D.S.

5. Secure counter drive gear with snap ring that will minimize clearance of groove in countershaft.



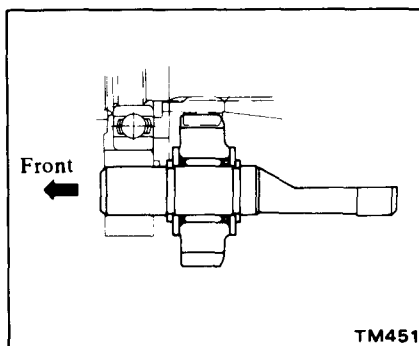
6. Press counter gear front bearing onto counter gear.



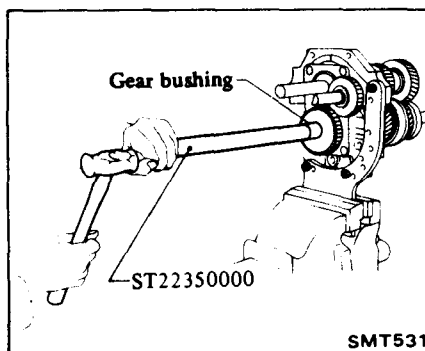
ASSEMBLY

O.D. gear and reverse gear

1. After front side is assembled, assemble reverse counter spacer, snap ring, spacer, needle bearing, reverse idler gear, spacer and snap ring.

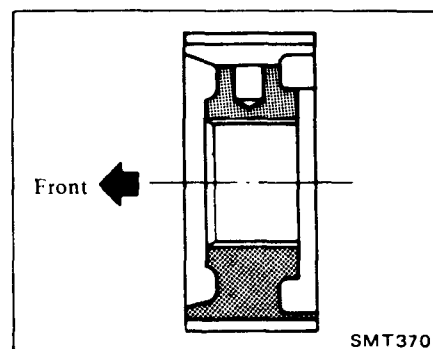


2. Assemble insert retainer and O.D. synchronizer.
3. Install O.D. gear bushing.



4. Apply gear oil to needle bearing, then install it in place.
5. Install O.D. gear assembly, steel roller and thrust washer. Before installing steel roller, apply grease to it.

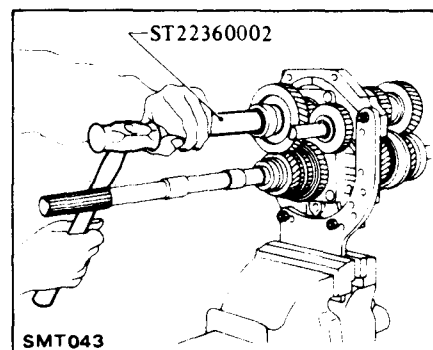
a. Assemble O.D.-reverse synchronizer hub, paying attention to its direction.



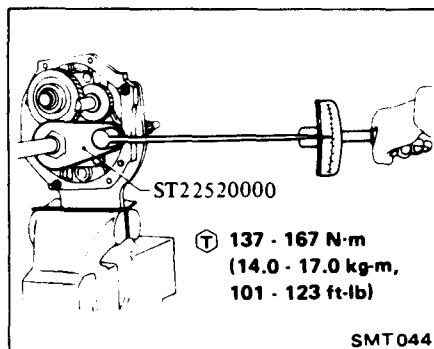
b. Main O.D. gear and counter O.D. gear should be handled as a matched set.

When replacing main O.D. gear and counter O.D. gear, be sure to replace as a set of main O.D. and counter O.D. gears.

6. Assemble reverse counter gear, overdrive counter gear.
7. Assemble speedometer drive gear, steel ball and new mainshaft nut, and tighten it temporarily.
8. Install bearing.



9. Mesh 2nd and reverse gears and tighten mainshaft lock nut and counter gear lock nut.

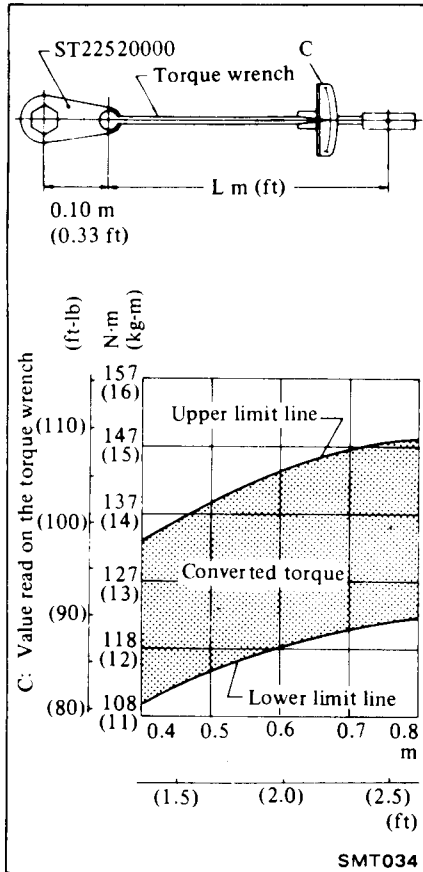


Ⓣ : Counter gear lock nut
98 - 127 N·m
(10.0 - 13.0 kg·m,
72 - 94 ft·lb)

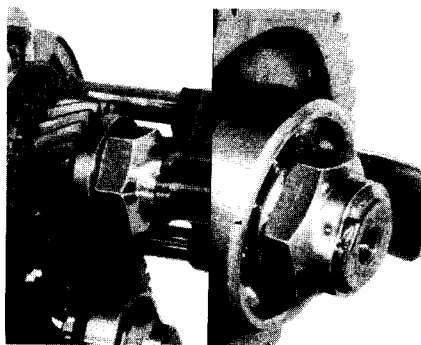
Conversion of torque

Mainshaft nut should be tightened to specified torque with Tool. When doing so, the amount of torque to be read on wrench needle should be modified according to the following chart.

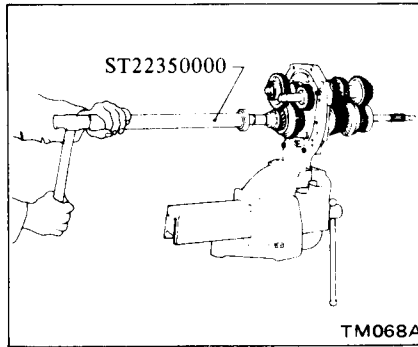
Ⓙ : 137 - 167 N·m
(14 - 17 kg-m, 101 - 123 ft-lb)



10. Stake mainshaft lock nut and counter gear lock nut with a punch.



11. Measure gear end play. Refer to Gears and Shafts for inspection.
12. Fit snap ring, then assemble mainshaft rear bearing.



13. Fit thick snap ring to mainshaft rear bearing to eliminate end play.

Mainshaft rear bearing snap ring:
Refer to S.D.S.

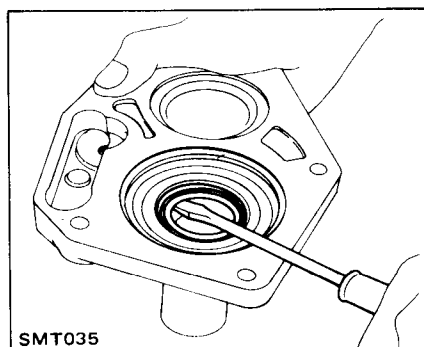
14. Assemble snap rings, steel ball and speedometer drive gear.
15. Install forks and fork rods. Refer to Forks and Fork Rods for assembly.
16. Install transmission case. Refer to Transmission Case for assembly.
17. Install rear extension. Refer to Rear Extension for assembly.

REPLACEMENT OF OIL SEALS

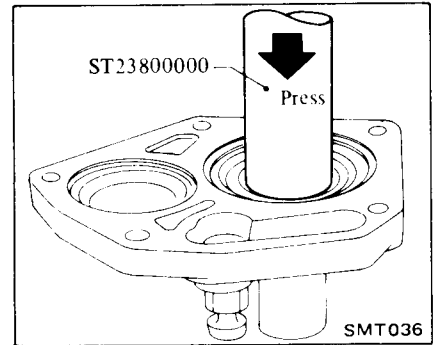
FRONT COVER OIL SEAL

It is necessary to remove transmission unit from car. Replace oil seal as follows:

1. Remove transmission. Refer to Removal.
2. Wipe off dirt and grease.
3. Drain oil.
4. Remove dust cover, release bearing and withdrawal lever. Refer to Release Bearing (Section CL) for removal.
5. Remove front cover.
6. Remove oil seal.



7. Apply coat of gear oil to oil seal surface, then drive new seal into place.

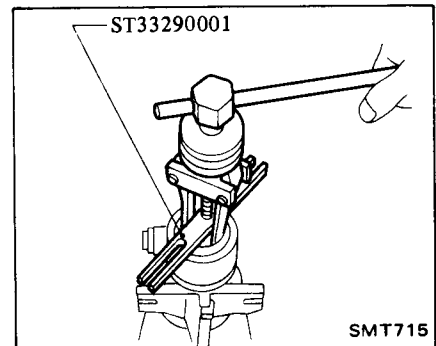


8. Lubricate seal lip and main drive shaft with gear oil.
9. Install front cover in reverse order of removal.

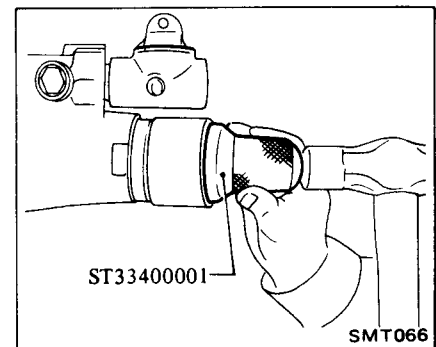
REAR EXTENSION OIL SEAL

Rear extension oil seal can be replaced without removing transmission. Replace oil seal as follows:

1. Remove propeller shaft. Refer to Propeller Shaft (Section PD) for removal.
2. Remove oil seal.



3. Apply coat of gear oil to oil seal surface, then drive new seal into place.

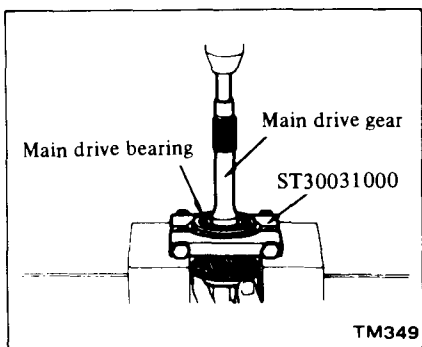


4. Install propeller shaft. Refer to Propeller Shaft (Section PD) for installation.

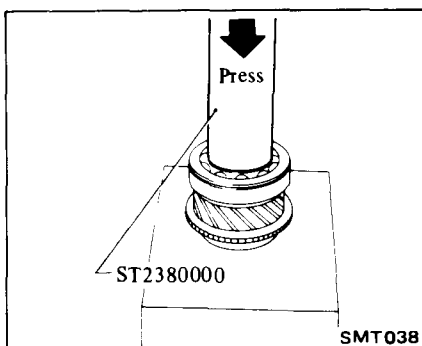
REPLACEMENT OF BEARINGS

MAIN DRIVE AND COUNTER FRONT

1. Remove main drive and counter drive gear. Refer to Gears and Shafts for disassembly.
2. Remove main drive gear snap ring and spacer.
3. Remove main drive bearing.



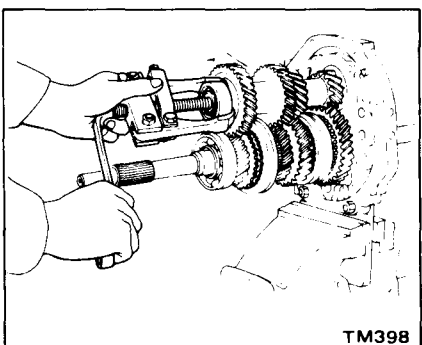
4. Press new main drive bearing.



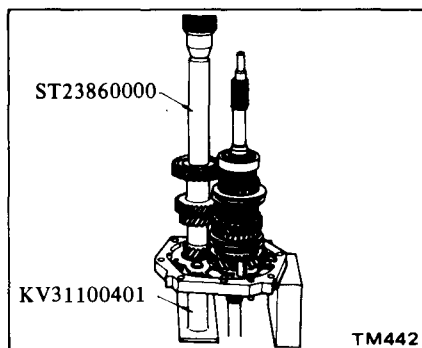
5. Place main drive bearing spacer on main drive bearing and secure main drive bearing with thicker snap ring that will eliminate end play.

Main drive gear snap ring:
Refer to S.D.S.

6. Mesh 2nd and reverse gear, then draw out counter front bearing.



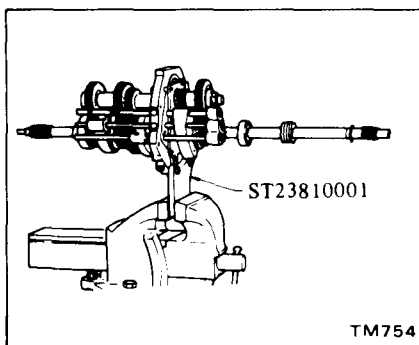
7. Press counter gear front bearing onto counter gear.



8. Install main drive and counter drive gear. Refer to Gears and Shafts for assembly.

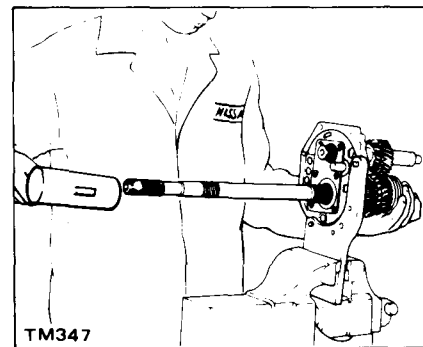
MAINSHAFT AND COUNTER GEAR

1. Remove rear extension. Refer to Rear Extension for disassembly.
2. Remove transmission case. Refer to Transmission Case for disassembly.
3. Set up Tool on adapter plate.
4. Place above assembly in a vise.

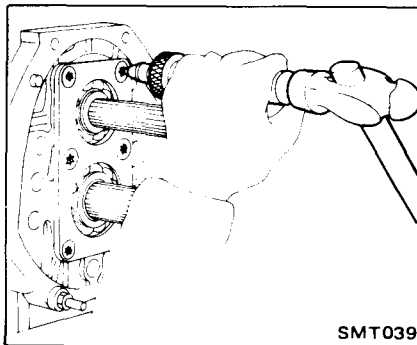


5. Remove main drive and counter drive gear. Refer to Gears and Shafts for disassembly.
6. Remove reverse main gear. Refer to Gears and Shafts for disassembly.
7. Draw out mainshaft assembly together with counter gear, by tapping rear end of mainshaft and counter gear.

Hold front of mainshaft assembly by hand, being careful not to drop counter gear.



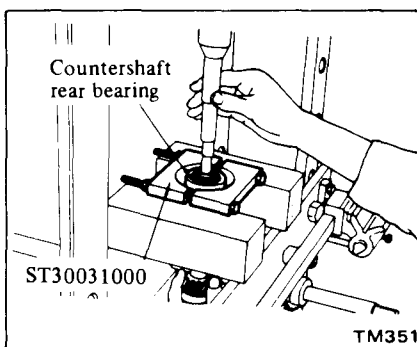
8. Remove bearing retainer.



9. Replace mainshaft bearing by new one.
10. Press out countershaft rear bearing.

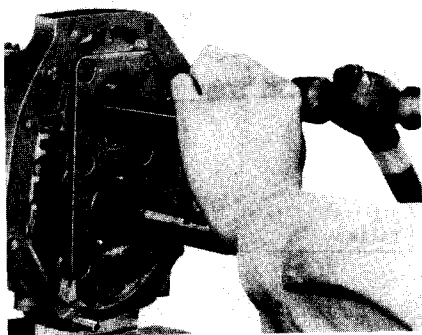
CAUTION:

When pressing out bearing gear, hold shaft by hand so as not to drop it.



11. Press counter rear bearing onto adapter plate.
12. Install mainshaft bearing onto adapter plate.
13. Install bearing retainer and align bearing retainer with reverse idler shaft at the cut-out portion of the shaft.

14. Tighten and stake each screw at two points.



15. Install main drive and counter drive gear. Refer to Gears and Shafts for assembly.

16. Install reverse main gear. Refer to Gears and Shafts for assembly.

17. Install transmission case. Refer to Transmission Case for assembly.

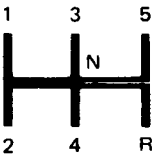
18. Install rear extension. Refer to Rear Extension for assembly.

MAINSHAFT REAR AND COUNTER REAR END

Refer to Gears and Shafts for disassembly and assembly.

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

GENERAL SPECIFICATIONS

Transmission model	FS5W71B
Shift pattern	
Synchromesh type	1st to 4th Warner, 5th Servo
Gear ratio	
1st	3.062
2nd	1.858
3rd	1.308
4th	1.000
5th	0.745
Reverse	3.026
Number of teeth	
Main drive gear	23
Main gear	
1st	34
2nd	28
3rd	28
5th	26
Reverse	36
Counter drive gear	29
Counter gear	
1st	14
2nd	19
3rd	27
5th	44
Reverse	15
Reverse idler gear	23
Oil capacity liter (US pt, Imp pt)	2.0 (4-1/4, 3-1/2)
Speedometer gear ratio	17/6, 19/6*
Final gear ratio	3.545, 3.900*
Tire size	195/70HR-14

*: 2 seater GL and 2+2 seater

INSPECTION AND ADJUSTMENT

Unit: mm (in)

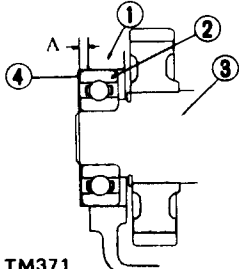
Transmission model	FS5W71B
Gear backlash	
Main drive gear	0.05 - 0.10 (0.0020 - 0.0039)
1st gear	0.05 - 0.20 (0.0020 - 0.0079)
2nd gear	0.05 - 0.20 (0.0020 - 0.0079)
3rd gear	0.05 - 0.20 (0.0020 - 0.0079)
5th gear	0.05 - 0.20 (0.0020 - 0.0079)
Reverse idler gear	0.05 - 0.20 (0.0020 - 0.0079)
Gear end play	
1st gear	0.27 - 0.34 (0.0106 - 0.0134)
2nd gear	0.12 - 0.19 (0.0047 - 0.0075)
3rd gear	0.13 - 0.37 (0.0051 - 0.0146)
5th gear	0.31 - 0.35 (0.0122 - 0.0138)
Reverse idler gear	0.05 - 0.50 (0.0020 - 0.0197)
Baulk ring to cone clearance	
Standard	1.20 - 1.60 (0.0472 - 0.0630)
Allowable limit	0.8 (0.031)
Main drive gear snap ring	1.73 (0.0681) 1.80 (0.0709) 1.87 (0.0736) 1.94 (0.0764) 2.01 (0.0791) 2.08 (0.0819)
Mainshaft front snap ring	1.4 (0.055) 1.5 (0.059) 1.6 (0.063)
Mainshaft rear bearing snap ring	1.1 (0.043) 1.2 (0.047) 1.3 (0.051) 1.4 (0.055)
Counter drive gear snap ring	1.4 (0.055) 1.5 (0.059) 1.6 (0.063)

Unit: mm (in)

TIGHTENING TORQUE

TRANSMISSION INSTALLATION

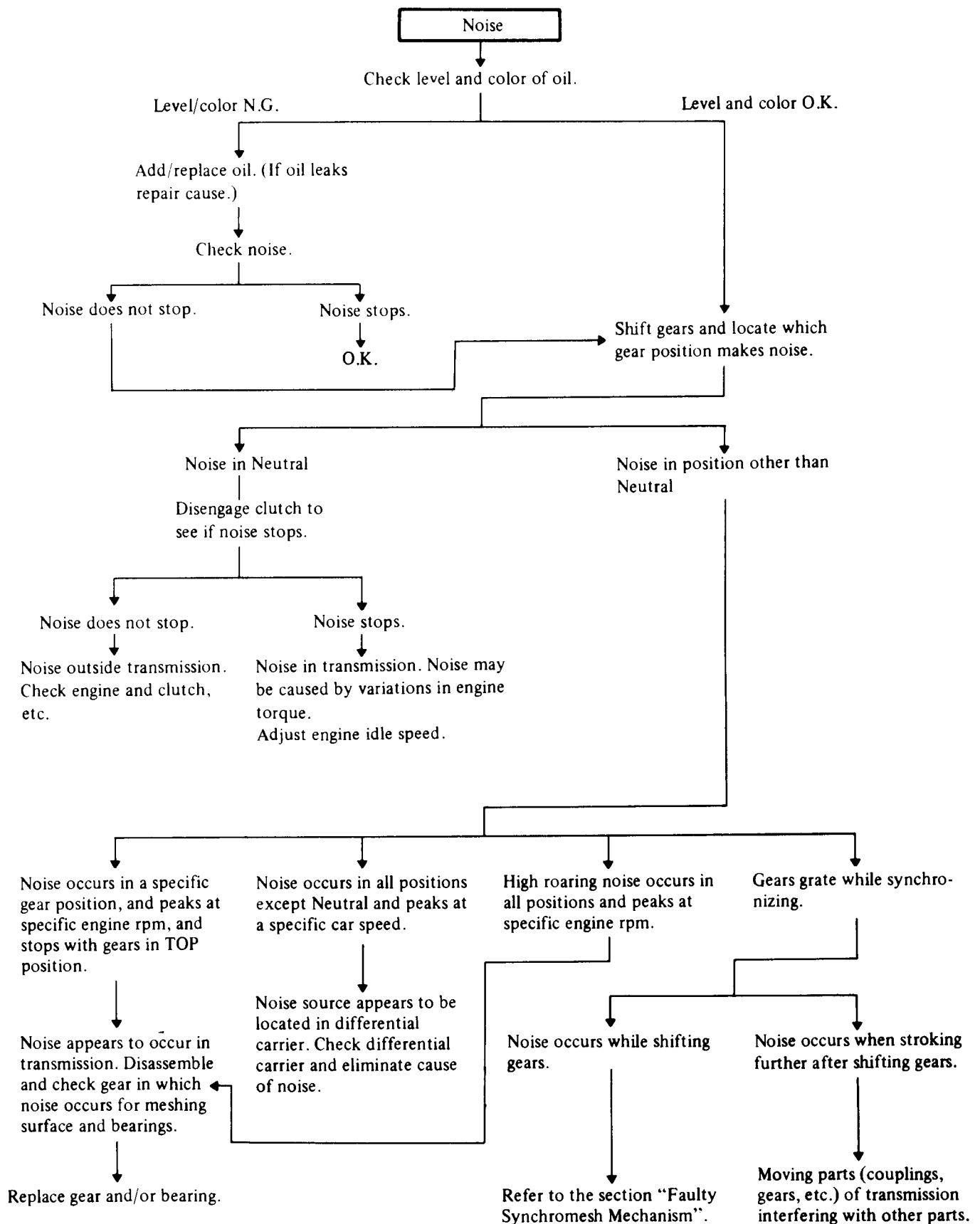
Unit	N·m	kg·m	ft·lb
Clutch operating cylinder	30 - 40	3.1 - 4.1	22 - 30
Transmission to engine	43 - 58	4.4 - 5.9	32 - 43
Engine rear plate to transmission	9 - 12	0.9 - 1.2	6.5 - 8.7
Crossmember to body	31 - 42	3.2 - 4.3	23 - 31
Rear mounting insulator to crossmember	31 - 42	3.2 - 4.3	23 - 31
Rear mounting insulator to rear extension	31 - 42	3.2 - 4.3	23 - 31
Transmission case to rear extension	16 - 21	1.6 - 2.1	12 - 15
Starter motor to transmission	29 - 39	3.0 - 4.0	22 - 29

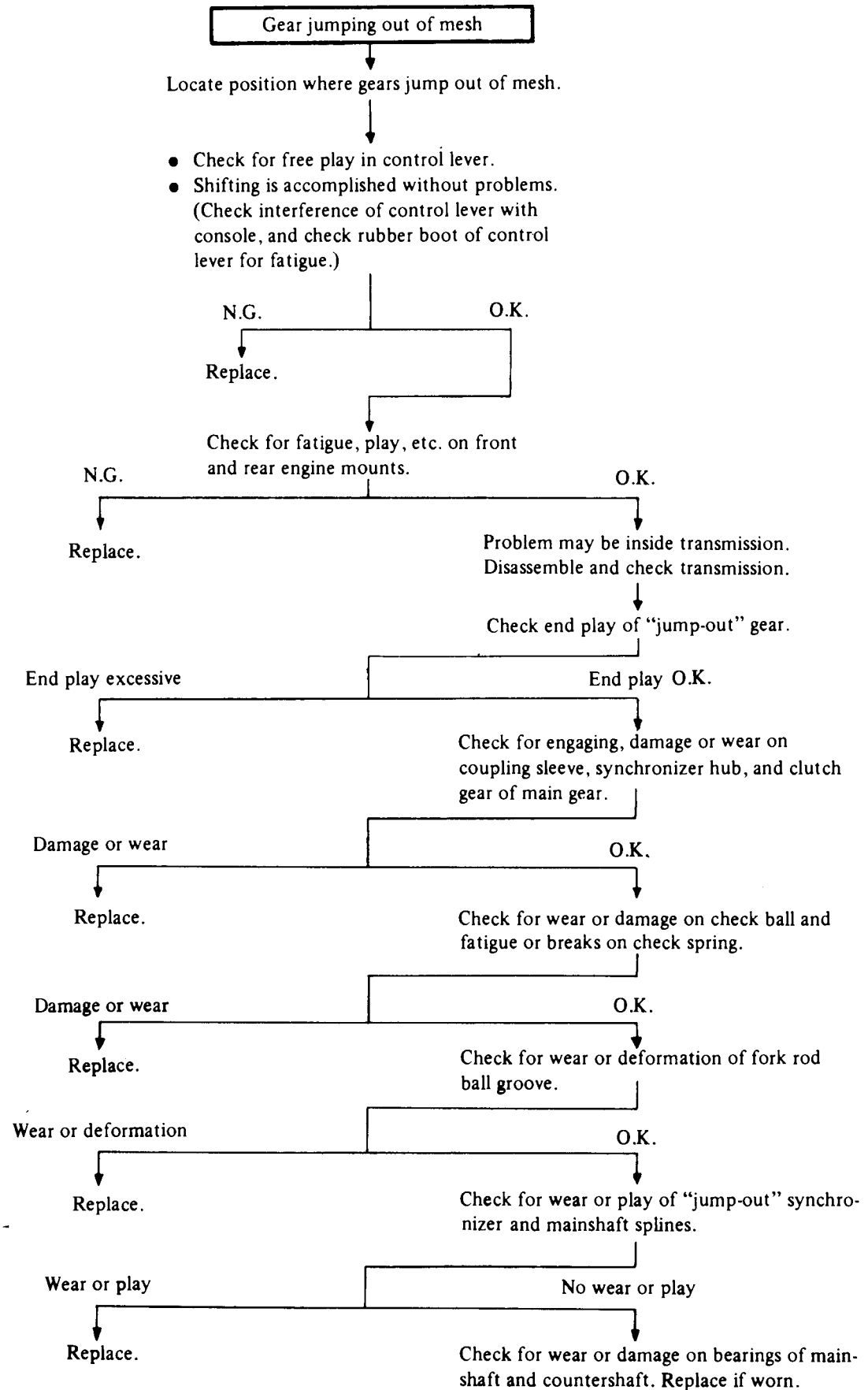
Transmission model	FS5W71B	
Counter gear front bearing shim	"A"	Counter gear front bearing shim
 <p>TM371</p> <p>1 Transmission case 2 Counter gear front bearing 3 Counter gear 4 Shim</p>	3.42 - 3.51 (0.1346 - 0.1382)	0.1 (0.004)
	3.32 - 3.41 (0.1307 - 0.1343)	0.2 (0.008)
	3.22 - 3.31 (0.1268 - 0.1303)	0.3 (0.012)
	3.12 - 3.21 (0.1228 - 0.1264)	0.4 (0.016)
	3.02 - 3.11 (0.1189 - 0.1224)	0.5 (0.020)
	2.92 - 3.01 (0.1150 - 0.1185)	0.6 (0.024)

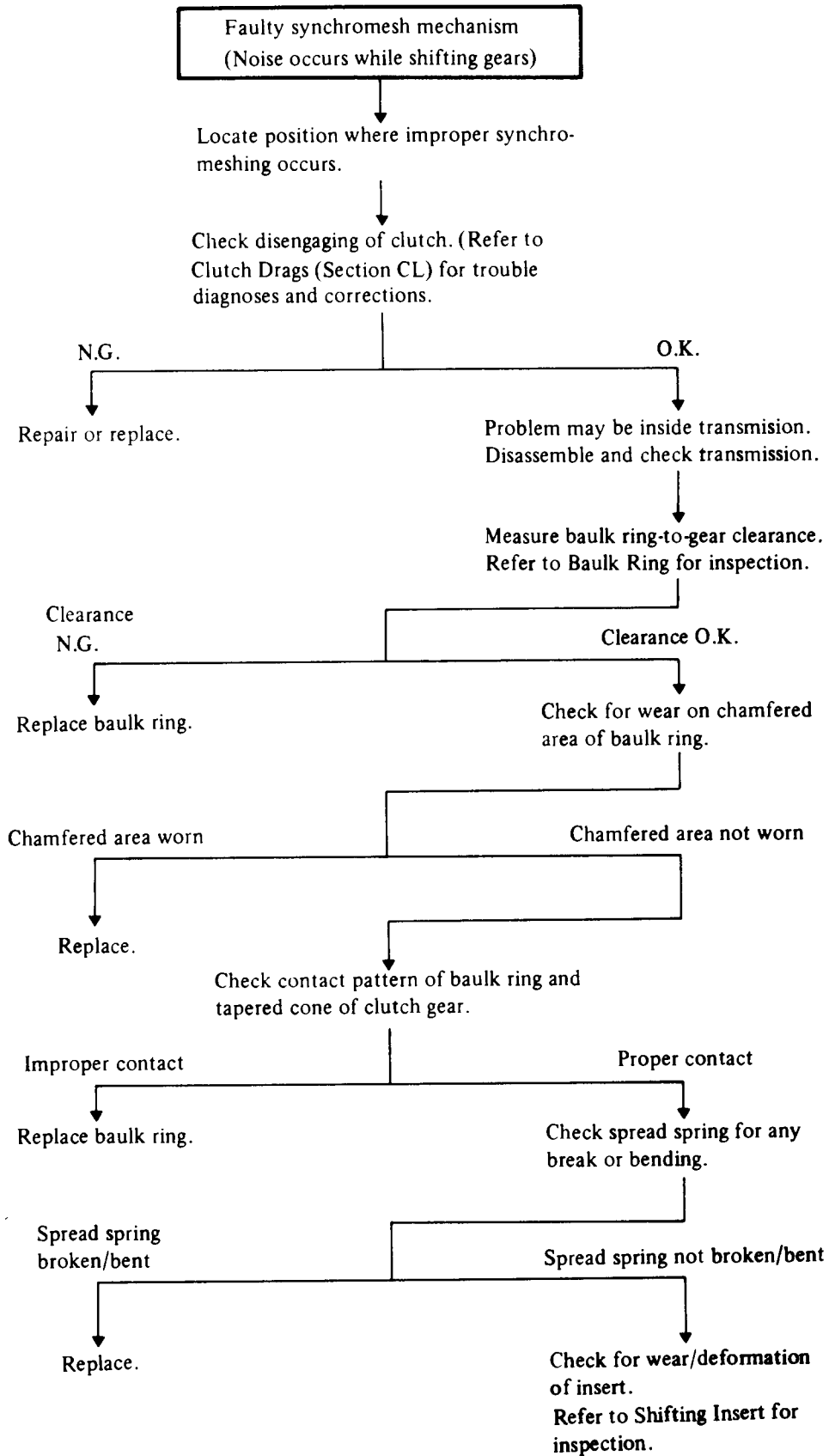
GEAR ASSEMBLY

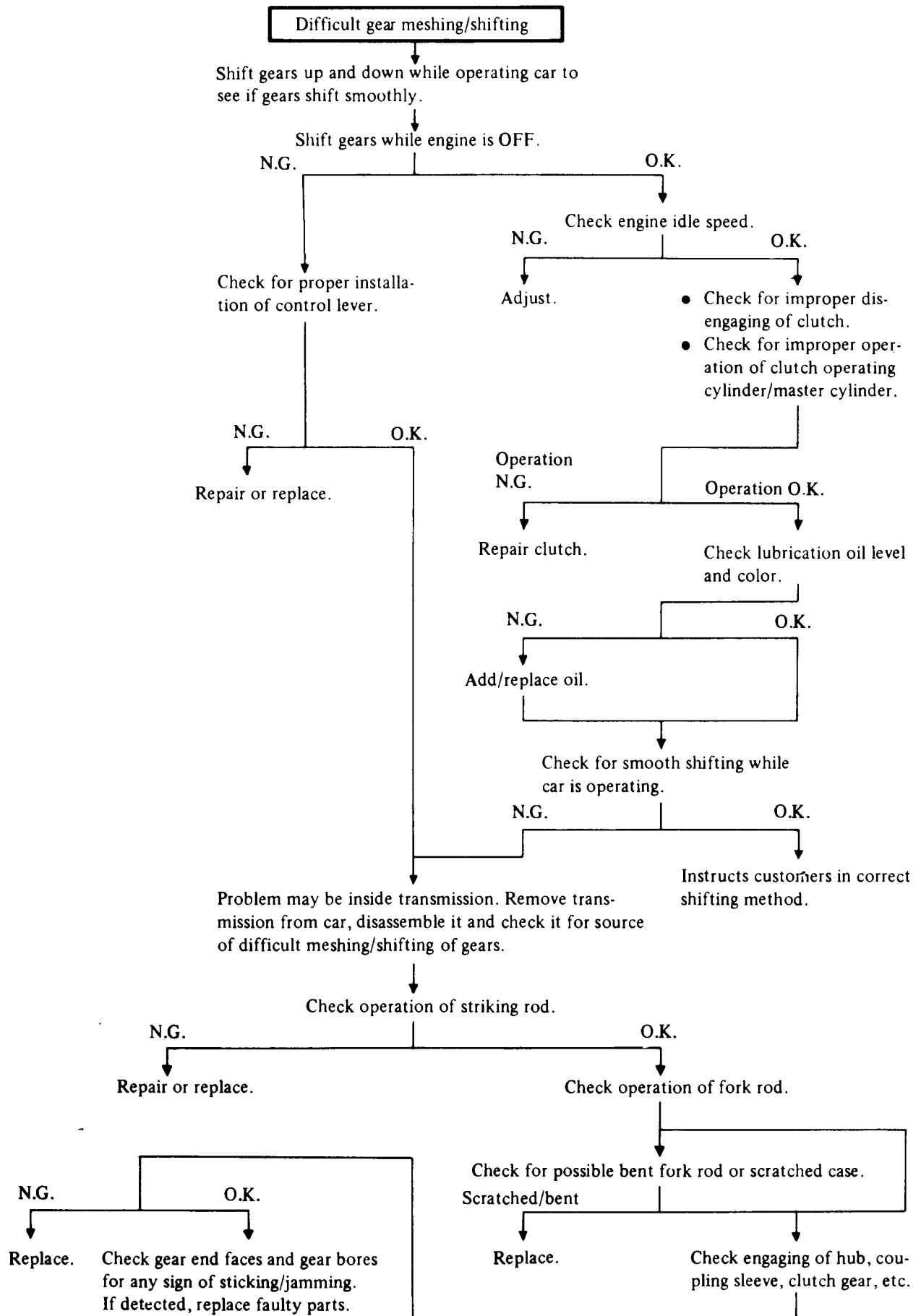
Unit	N·m	kg·m	ft·lb
Bearing retainer to adapter plate	16 - 23	1.6 - 2.3	12 - 17
Mainshaft lock nut	137 - 167	14.0 - 17.0	101 - 123
Counter gear lock nut	98 - 127	10.0 - 13.0	72 - 94
Rear extension to transmission case	16 - 21	1.6 - 2.1	12 - 15
Front cover to transmission case	16 - 21	1.6 - 2.1	12 - 15
Filler plug	25 - 34	2.5 - 3.5	18 - 25
Drain plug	25 - 34	2.5 - 3.5	18 - 25
Ball pin	20 - 34	2.0 - 3.5	14 - 25
Striking lever lock nut	9 - 12	0.9 - 1.2	6.5 - 8.7
Check ball plug	19 - 25	1.9 - 2.5	14 - 18
Speedometer sleeve installation	4 - 5	0.4 - 0.5	2.9 - 3.6
Back-up lamp switch	20 - 29	2.0 - 3.0	14 - 22
Return spring plug	8 - 10	0.8 - 1.0	5.8 - 7.2

TROUBLE DIAGNOSES AND CORRECTIONS

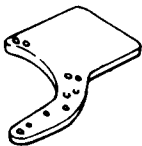

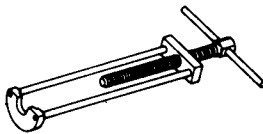
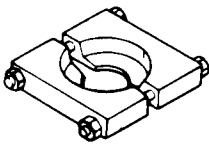
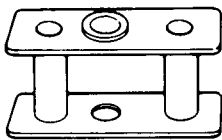
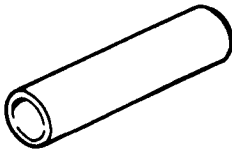
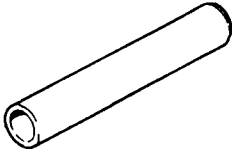
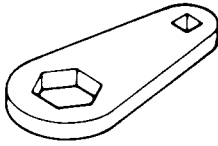
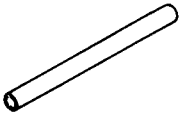



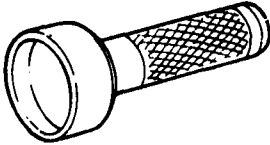







SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	
ST23810001 (J25693)	Adapter setting plate	
KV31100300 (J25689-A)	Fork rod pin punch	
KV32101330 (See J26349)	Bearing puller	
ST30031000 (J25733-1)	Bearing puller	
KV31100401 (-)	Transmission press stand	
ST23860000 (-)	Counter gear drift	
ST22360002 (J25679-91)	Bearing drift	
ST22520000 (J26348)	Wrench	
ST22350000 (J25678-01)	Mainshaft bearing drift	
ST23800000 (J25691-01)	Transmission adapter	

Tool number (Kent-Moore No.)	Tool name
ST33400001 (J26082)	Oil seal drift 
ST33290001 (J25810)	Bearing puller 

AUTOMATIC TRANSMISSION

SECTION AT

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DESCRIPTION

The 3N71B transmission is a fully automatic unit consisting primarily of a 3 element hydraulic torque converter and two planetary gear sets. 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 torque converter is attached to the crankshaft through a flexible drive plate. Heat generated in the torque converter is dissipated by circulating the transmission 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.

FLUID RECOMMENDATION

Use "DEXRON" type automatic transmission fluid only.

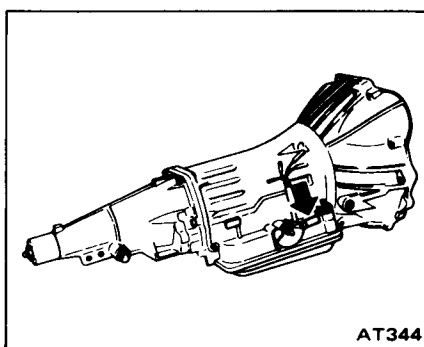
Identification of number arrangements :

JAPAN AUTOMATIC TRANSMISSION CO., LTD
MODEL X 0 1 2 3
NO. 7 6 0 1 2 3 4

IDENTIFICATION NUMBER

Stamped position :

The plate is attached to the right hand side of transmission case.

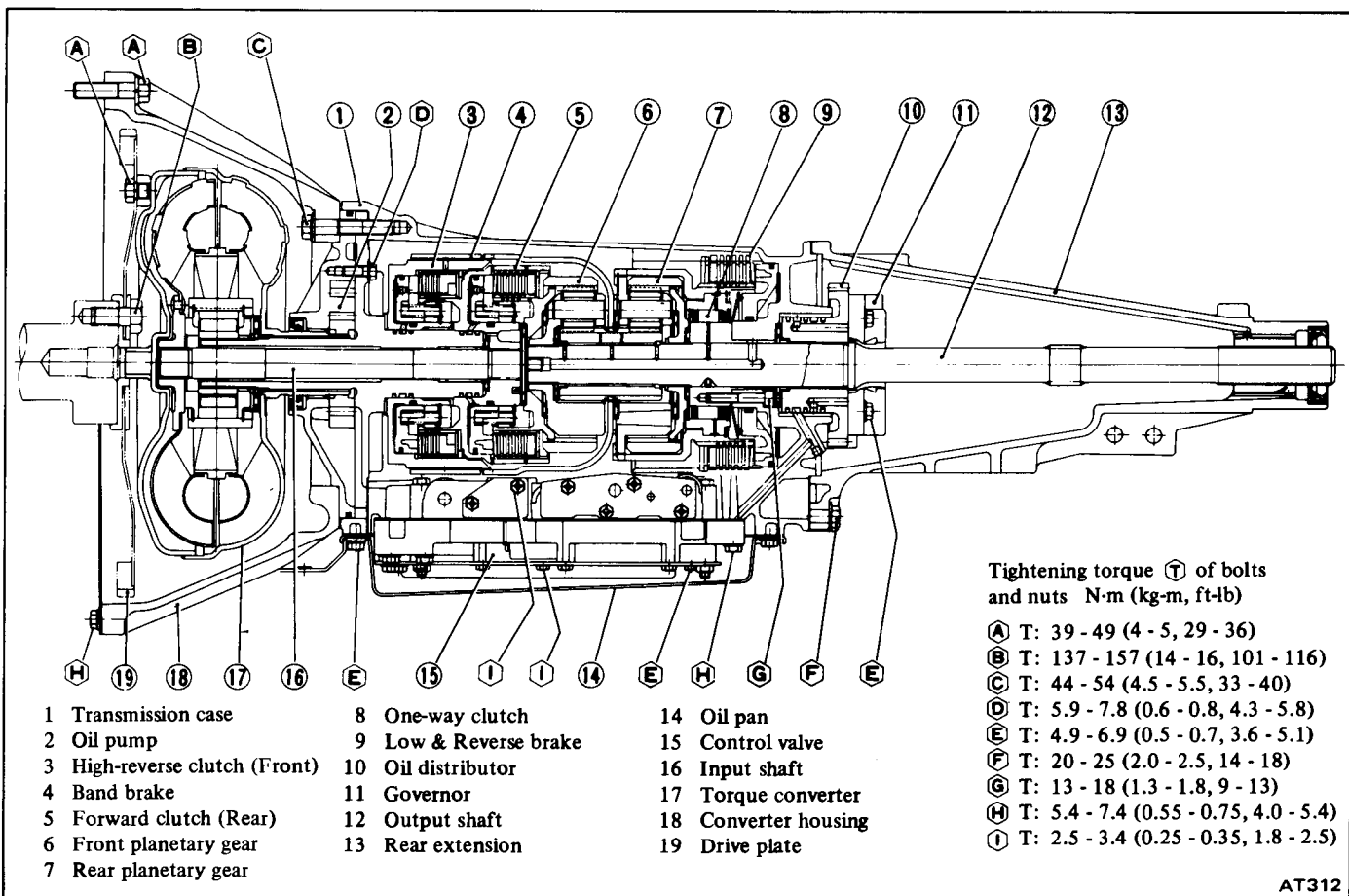


Number designation

7 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.]

Last figure denoting the year (A.D.)



Tightening torque T of bolts and nuts N·m (kg-m, ft-lb)

- (A) T: 39 - 49 (4 - 5, 29 - 36)
- (B) T: 137 - 157 (14 - 16, 101 - 116)
- (C) T: 44 - 54 (4.5 - 5.5, 33 - 40)
- (D) T: 5.9 - 7.8 (0.6 - 0.8, 4.3 - 5.8)
- (E) T: 4.9 - 6.9 (0.5 - 0.7, 3.6 - 5.1)
- (F) T: 20 - 25 (2.0 - 2.5, 14 - 18)
- (G) T: 13 - 18 (1.3 - 1.8, 9 - 13)
- (H) T: 5.4 - 7.4 (0.55 - 0.75, 4.0 - 5.4)
- (I) T: 2.5 - 3.4 (0.25 - 0.35, 1.8 - 2.5)

- | | | |
|-------------------------------|-----------------------|----------------------|
| 1 Transmission case | 8 One-way clutch | 14 Oil pan |
| 2 Oil pump | 9 Low & Reverse brake | 15 Control valve |
| 3 High-reverse clutch (Front) | 10 Oil distributor | 16 Input shaft |
| 4 Band brake | 11 Governor | 17 Torque converter |
| 5 Forward clutch (Rear) | 12 Output shaft | 18 Converter housing |
| 6 Front planetary gear | 13 Rear extension | 19 Drive plate |
| 7 Rear planetary gear | | |

AT312

HYDRAULIC CONTROL UNIT AND VALVES

The hydraulic, or automatic control system is comprised of four (4) basic groups: the pressure supply system, the pressure regulating system, the flow control valves, and the friction elements.

PRESSURE SUPPLY SYSTEM

The pressure supply system consists of a gear type oil pump driven by the engine through the torque converter. The pump provides pressure for all hydraulic and lubrication needs.

PRESSURE REGULATOR VALVES

The pressure regulating valves control the output pressure of the oil pump.

Pressure regulator valve

The pressure regulator valve controls mainline pressure, based on throttle opening, for the operation of the band, clutches and brake.

Governor valve

The governor valve transmits regulated pressure, based on car speed, to the shift valves to control upshifts and downshifts.

Vacuum throttle valve

The vacuum throttle valve transmits regulated pressure, based on engine load (vacuum). This pressure controls the pressure regulator valve. Also this pressure is applied to one end of the shift valves in opposition to governor pressure, which acts on the other end of the shift valves, controlling upshift and downshift speeds.

FLOW CONTROL VALVES

Manual valve

The manual valve is moved manually by the car operator to select the different drive ranges.

1-2 Shift valve

The 1-2 shift valve automatically shifts the transmission from first to second or from second to first depending upon governor and throttle pressure along with accelerator position (solenoid downshift valve). See Hydraulic Control Circuits, "Drive 2".

2-3 Shift valve

The 2-3 shift valve automatically shifts the transmission from second to top gear or from top to second depending upon governor and throttle pressure, or accelerator position (solenoid downshift valve). See Hydraulic Control Circuits "Drive 3" Range.

Solenoid downshift valve

The solenoid downshift valve is activated electrically when the accelerator is "floored", causing a forced downshift from top to second, top to first, or second to first gear depending upon car speed (governor pressure).

Pressure modified valve

The pressure modifier valve assists the mainline pressure regulator valve in lowering mainline pressure during high speed light load conditions, such as steady speed cruise. Governor pressure, working against a spring, opens the valve which allows modified throttle pressure to work against the pressure regulator valve spring, lowering mainline pressure. Lower operating pressure under light load reduces oil temperature, and increases transmission life.

Throttle back-up valve

The throttle back-up valve assists the vacuum throttle valve to increase line pressure when the manual valve is shifted either to "2" or "1" range.

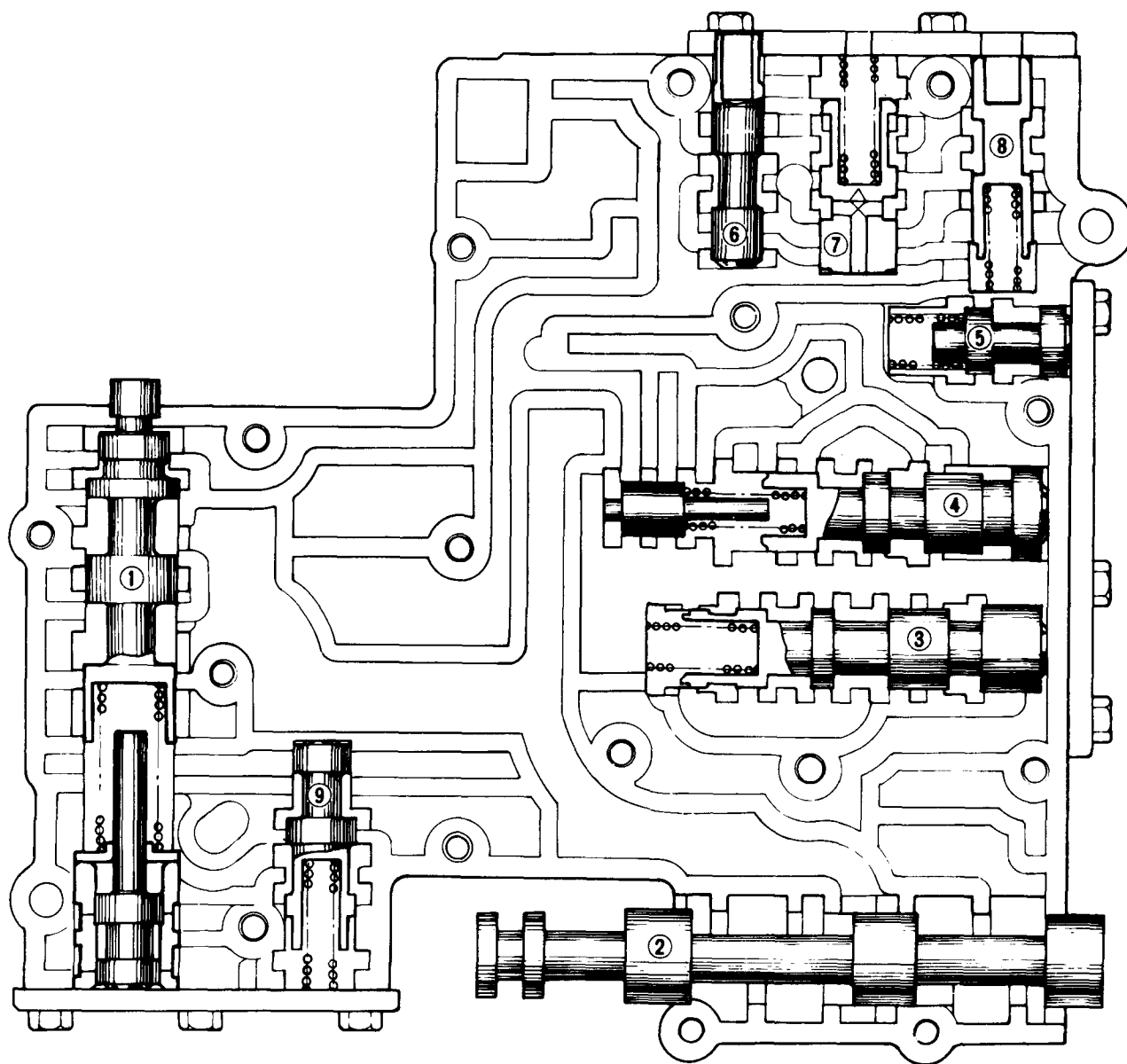
Second lock valve

The second lock valve is used to bypass the 1-2 shift valve to maintain the band apply pressure in "2" position. The valve is also used as an oil passage for the 1-2 shift valve band apply pressure in "D₂", "D₃" and "1₂" Range.

CLUTCHES AND BAND SERVOS

The servo pistons of the clutches, low reverse brake, and band are moved hydraulically to engage the clutches, brake, and apply the band. The clutch and brake pistons are released by spring tension, and band piston is released by spring tension and hydraulic pressure.

Control valve



- 1 Pressure regulating valve
- 2 Manual valve
- 3 1st-2nd shift valve
- 4 2nd-3rd shift valve
- 5 Pressure modifier valve
- 6 Vacuum throttle valve
- 7 Throttle back-up valve
- 8 Solenoid down shift valve
- 9 Second lock valve

OIL CHANNEL IDENTIFICATION

The circuit numbers shown in each Hydraulic Control Circuit are classified as follows according to the function.

Pressure source of the line: 7

Operating line pressure for friction elements:

1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12.

Auxiliary line pressure: 13

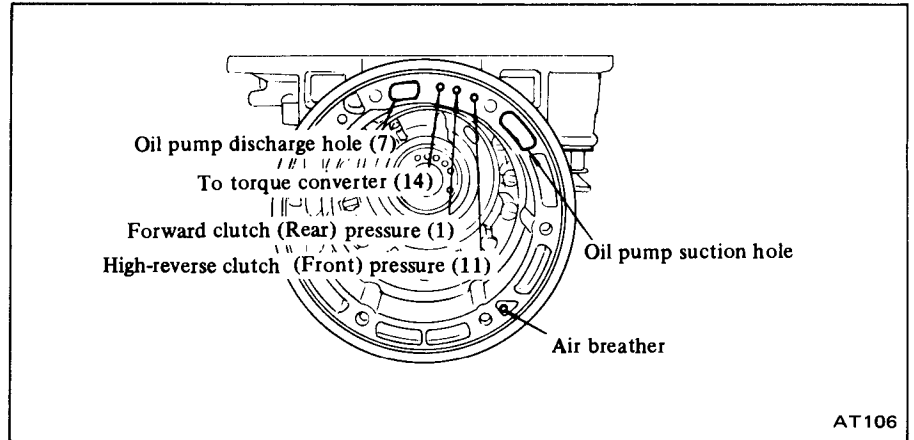
Torque converter pressure: 14

Governor pressure: 15

Throttle system pressure:

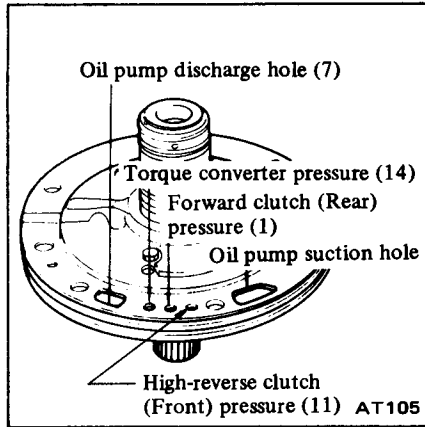
16, 17, 18, 19.

Oil Channels in Case Front Face



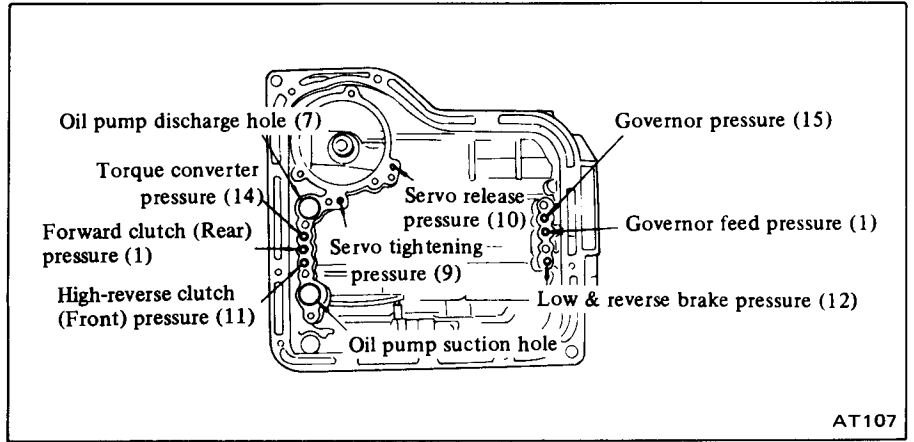
AT106

Oil Channels in Oil Pump



AT105

Oil Channels in Case Face



AT107

MECHANICAL OPERATION

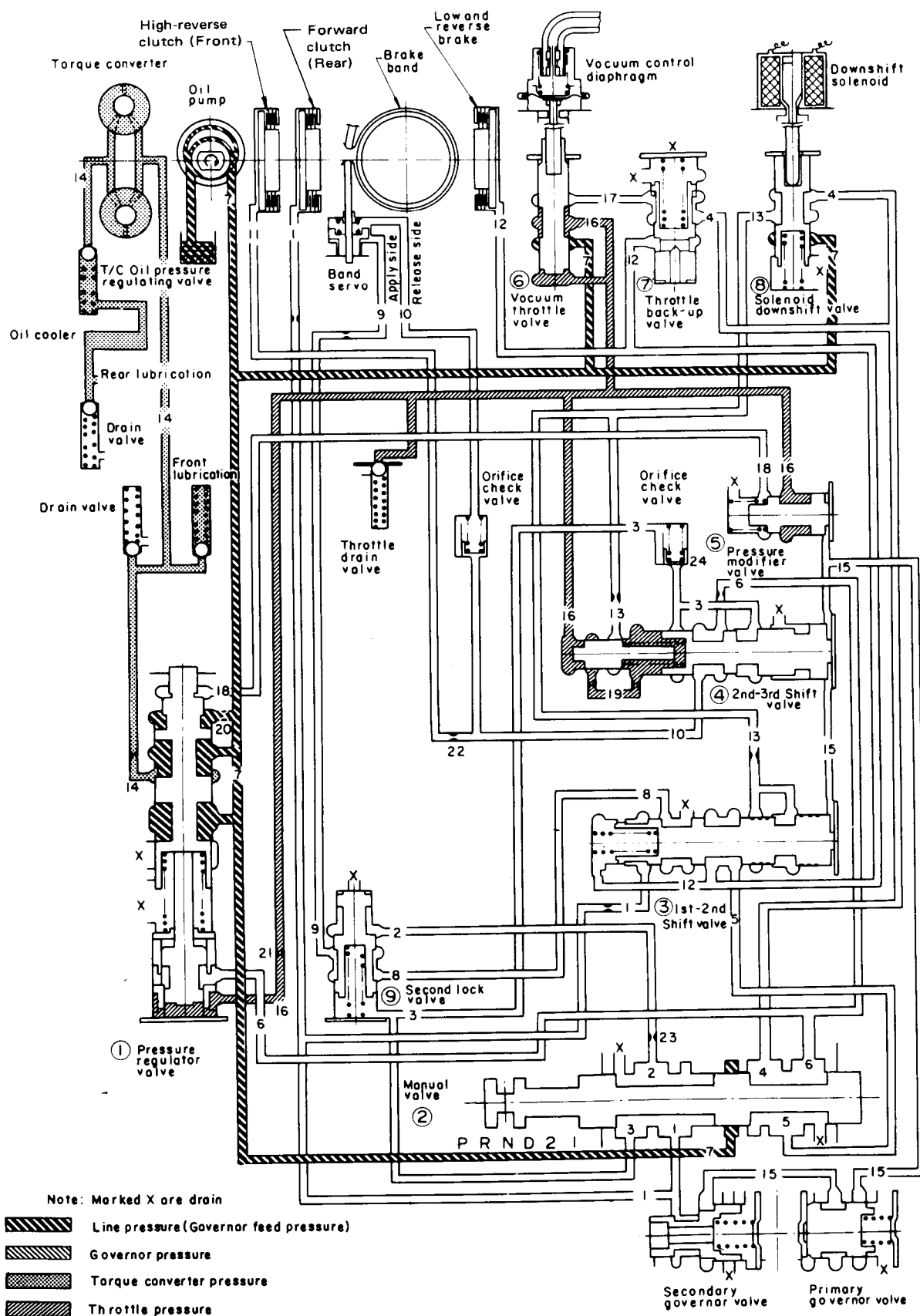
In the 3N71B automatic transmission, each part operates as shown in the following table at each gear select position.

Range		Gear ratio	Clutch		Low & reverse brake	Band servo		One way clutch	Parking pawl
			High-reverse (Front)	Forward (Rear)		Operation	Release		
Park					on				on
Reverse		2.182	on		on		on		
Neutral									
Drive	D1 Low	2.458		on				on	
	D2 Second	1.458		on		on			
	D3 Top	1.000	on	on		(on)	on		
2 Second		1.458		on		on			
1	1 ₂ Second	1.458		on		on			
	1 ₁ Low	2.458		on	on				

The low & reverse brake is applied in "1₁" range to prevent free wheeling when coasting and allows engine braking.

HYDRAULIC CONTROL CIRCUITS

Oil Pressure Circuit Diagram — “N” range (Neutral)

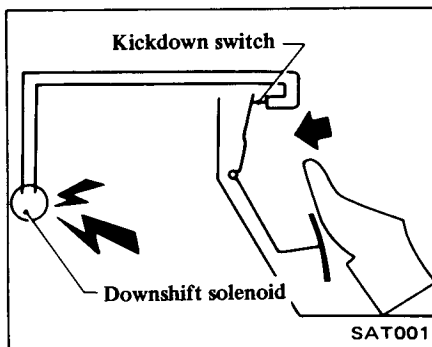


MINOR ADJUSTMENTS

KICKDOWN SWITCH ADJUSTMENT

The kickdown switch is located at the upper post of the accelerator pedal, inside the car.

When the pedal is fully depressed, a click can be heard just before the pedal bottoms out. If the click is not heard, loosen the locknut and extend the switch until the pedal lever makes contact with the switch and the switch clicks.



Do not allow the switch to make contact too soon. This would cause

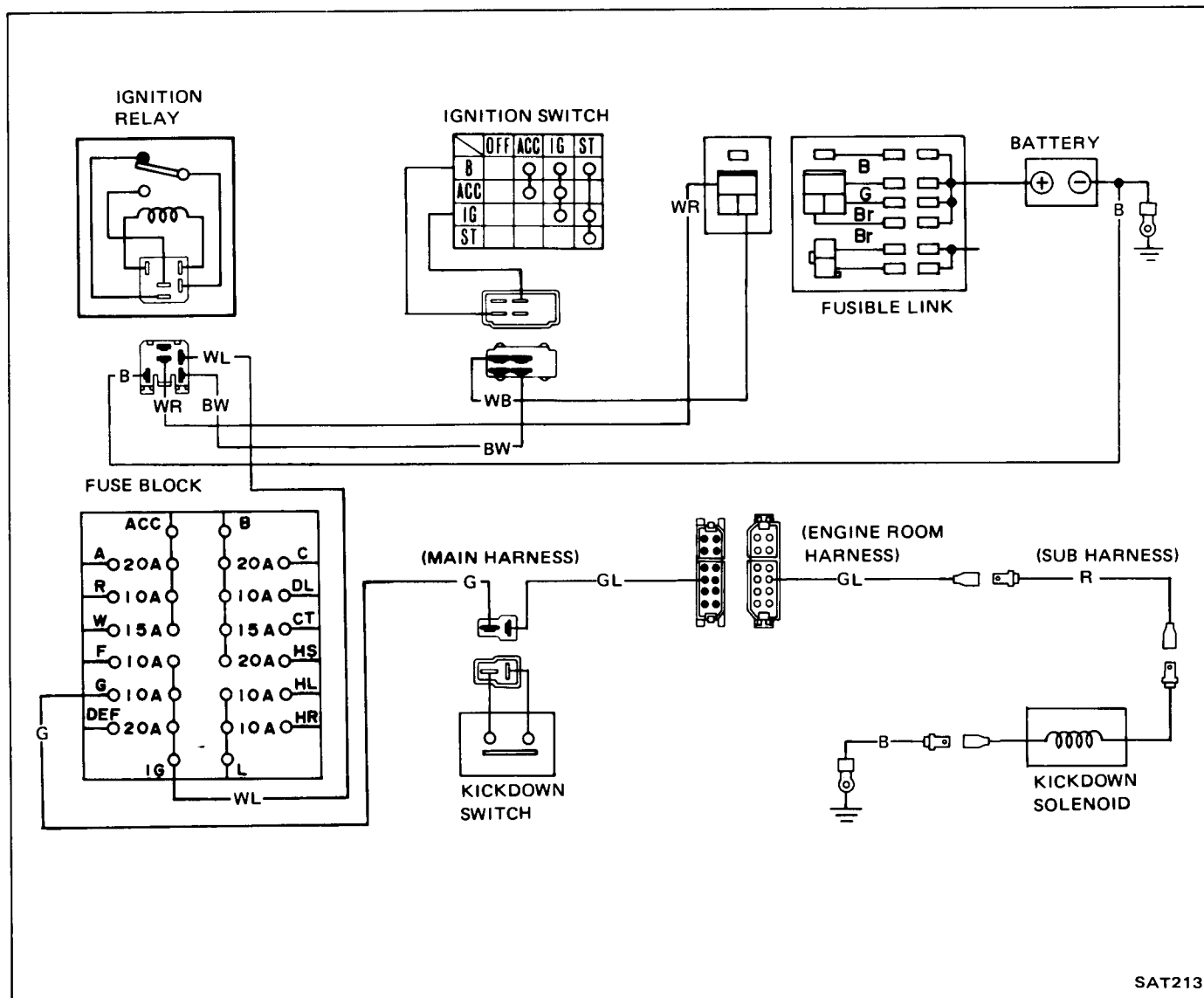
the transmission to downshift on part throttle.

DIAGNOSIS:

Switch can be heard clicking, and the transmission still does not kickdown: Check the continuity of the switch using a continuity tester. Also check for available current.

The car upshifts at approximately 65 and 110 km/h (40 and 70 MPH) only: The kickdown switch may be internally shorted. (When the switch is shorted, there is continuity through the switch in any position).

Wiring Diagram



SAT213

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.

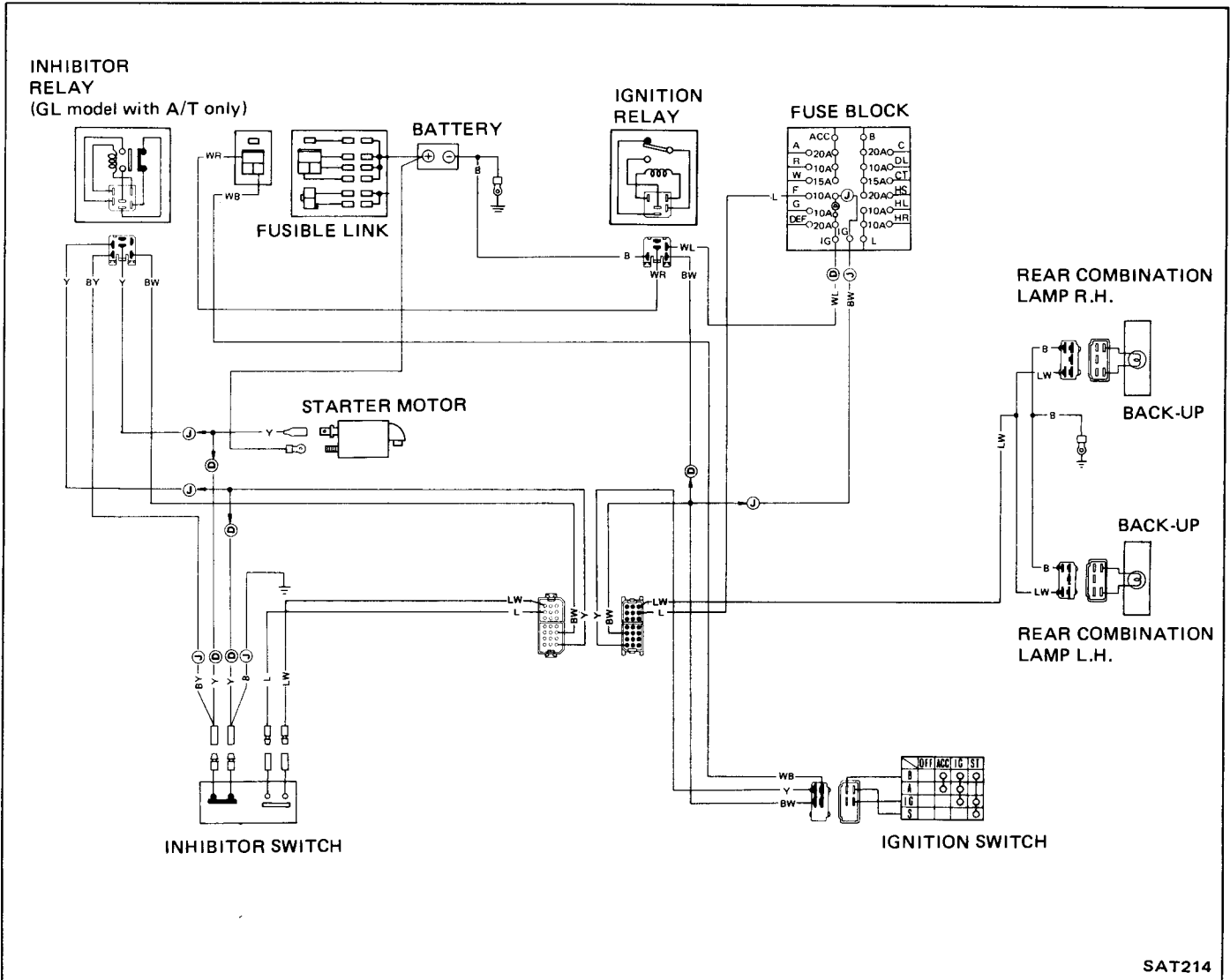
A continuity tester may be used to check the inhibitor switch for proper operation.

The two black and yellow (B-Y)

wires should have continuity when the lever is in the “P” and “N” positions.

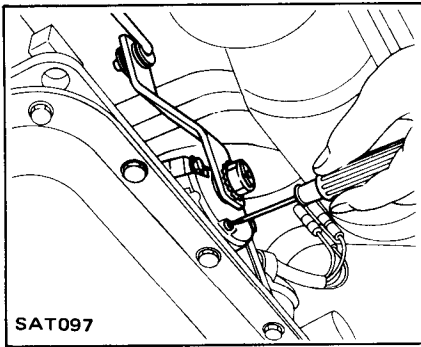
Red and black (R-B) wires should have continuity when the shift lever is moved to “R” range.

Wiring Diagram

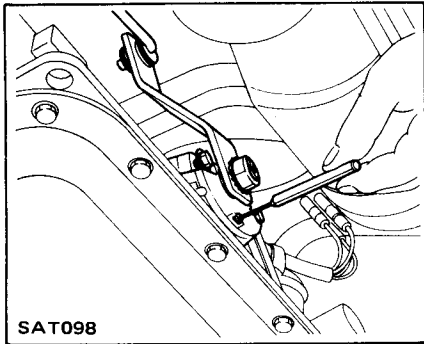


SAT214

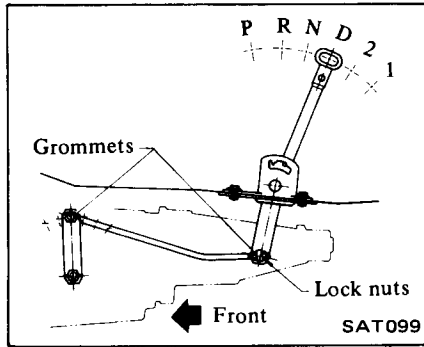
1. Place the manual valve in Neutral (vertical position).
2. Remove the screw as illustrated.



3. Loosen the attaching bolts.
4. Using an aligning pin, move the switch until the pin falls into the hole in the rotor.



5. Tighten the attaching bolts.
6. Recheck for continuity. If faulty, replace the switch.



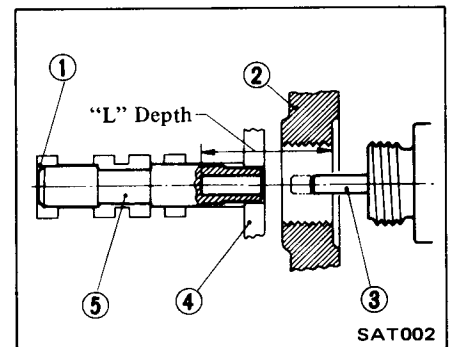
1. Place shift lever in "D" range.
2. Loosen locknuts and move shift lever until "D" is properly aligned and car is in "D" range.
3. Tighten locknut.

Recheck "P" and "Range 1" positions. As a safety measure, be sure you can feel full detent when shift lever is placed in "P". If you are unable to make an adjustment, grommets may be badly worn or damaged and should be replaced.

VACUUM DIAPHRAGM ROD ADJUSTMENT

The vacuum diaphragm and the length of its diaphragm rod help determine the shift patterns of the transmission. It is essential that the correct length rod be installed.

1. Disconnect vacuum hose at vacuum diaphragm and remove diaphragm from transmission case.
2. Using a depth gauge, measure depth "L". Be sure vacuum throttle valve is pushed into valve body as far as possible.
3. Check "L" depth with chart below and select proper length rod.



- 1 Note seated valve body
- 2 Transmission case wall
- 3 Diaphragm rod
- 4 Valve body side plate
- 5 Vacuum throttle valve

Vacuum diaphragm rod selection

Measured depth "L" mm (in)	Rod length mm (in)	Part number
Under 25.55 (1.0059)	29.0 (1.142)	31932 - X0103
25.65 - 26.05 (1.0098 - 1.0256)	29.5 (1.161)	31932 - X0104
26.15 - 26.55 (1.0295 - 1.0453)	30.0 (1.181)	31932 - X0100
26.65 - 27.05 (1.0492 - 1.0650)	30.5 (1.201)	31932 - X0102
Over 27.15 (1.0689)	31.0 (1.220)	31932 - X0101

MANUAL LINKAGE ADJUSTMENT

The adjustment of the manual linkage is an important adjustment of the automatic transmission. Move the shift lever from the "P" range to "Range 1". 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 linkage needs adjustment.

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 band servo piston stem to 12 to 15 N·m (1.2 to 1.5 kg·m, 9 to 11 ft·lb).

3. Back off band servo piston stem two complete turns.

CAUTION:

Do not back off EXCESSIVELY on adjusting stem as anchor block may fall out of place.

4. Tighten locknut to approximately 20 N·m (2 kg·m, 14 ft·lb) while holding band servo piston stem stationary.

REMOVAL AND INSTALLATION

TRANSMISSION ASSEMBLY

When dismantling the automatic transmission from a car, pay attention to the following points:

1. Before dismantling the transmission, rigidly inspect it by using the "Trouble-shooting Chart", and dismount it only when it is necessary.
2. Dismount the transmission with utmost care; and when mounting, observing the tightening torque indicated on another table, do not exert excessive force.

REMOVAL

In dismantling the automatic transmission from a car, proceed as follows:

1. Disconnect battery ground cable from terminal.
2. Disengage torsion shaft from accelerator linkage.
3. Jack up car and support it on safety stands. We recommend a hydraulic hoist or open pit be utilized, if available.

- Observe all safety regulations.
4. Remove propeller shaft.

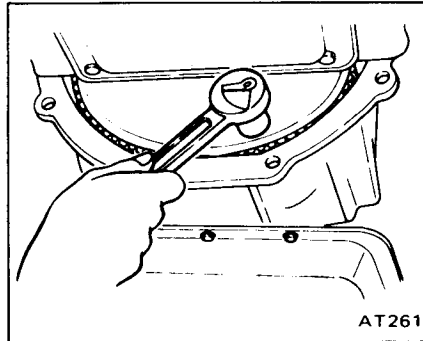
Plug up the opening in the rear extension to prevent oil from flowing out.

5. Disconnect front exhaust tube.
6. Disconnect selector range lever from manual shaft.
7. Disconnect wire connections at inhibitor switch.
8. Disconnect vacuum tube from vacuum diaphragm, and wire connections at downshift solenoid.
9. Disconnect speedometer cable from rear extension.
10. Disconnect oil charging pipe.
11. Disconnect oil cooler inlet and outlet tubes at transmission case.
12. Support engine by locating a jack under oil pan with a wooden block used between oil pan and jack. Support transmission by means of a transmission jack.

CAUTION:

Do not place the jack under the oil pan drain plug.

13. Detach converter housing dust cover. Remove bolts securing torque converter to drive plate.



Before removing torque converter, inscribe chalk marks on two parts so that they may be replaced in their original positions at assembly.

14. Remove rear engine mount securing bolts and crossmember mounting bolts.

15. Remove starter motor.

16. Remove bolts securing transmission to engine. After removing these bolts, support engine and transmission with jack, and lower the jack gradually until transmission can be removed and take out transmission under the car.

Plug up openings such as oil charging pipe, oil cooler tubes, etc.

CAUTION:

Take care when dismantling transmission not to strike any adjacent parts.

INSTALLATION

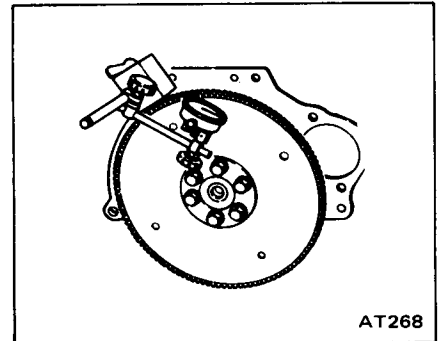
Installation of automatic transmission on car is in reverse order of removal. However, observe the following installation notes.

1. Drive plate runout

Turn crankshaft one full turn and measure drive plate runout with indi-

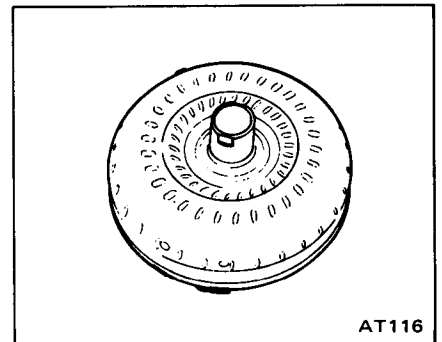
cating finger of a dial gauge rested against plate.

**Maximum allowable runout:
0.5 mm (0.020 in)**



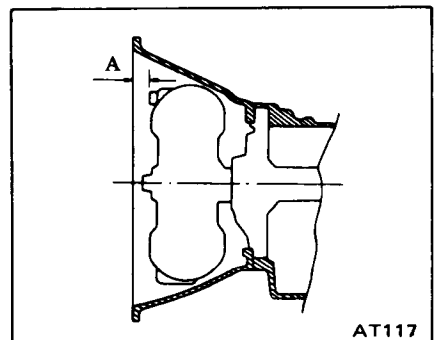
2. Installation of torque converter

Line up notch in torque converter with that in oil pump. Be extremely careful not to put undue stress on parts when installing torque converter.



3. When connecting torque converter to transmission, measure distance "A" to be certain that they are correctly assembled.

**Distance "A":
More than 21.5 mm (0.846 in)**



4. Bolt converter to drive plate.

Align chalk marks painted across both parts during disassembling processes.

5. After converter is installed, rotate crankshaft several turns and check to be sure that transmission rotates freely without binding.

6. Pour recommended automatic transmission fluid up to correct level through oil charge pipe.

7. Connect manual lever to shift rod. Operation should be carried out with manual and selector levers in "N".

8. Connect inhibitor switch wires.

a. Refer to pages AT-8 and 9 for Inhibitor Switch Adjustment.

b. Inspect and adjust switch as above whenever it has to be removed for service.

9. 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.

10. Check fluid level in transmission. For detailed procedure, see page AT-33.

11. Move selector lever through all positions to be sure that transmission 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 selector each

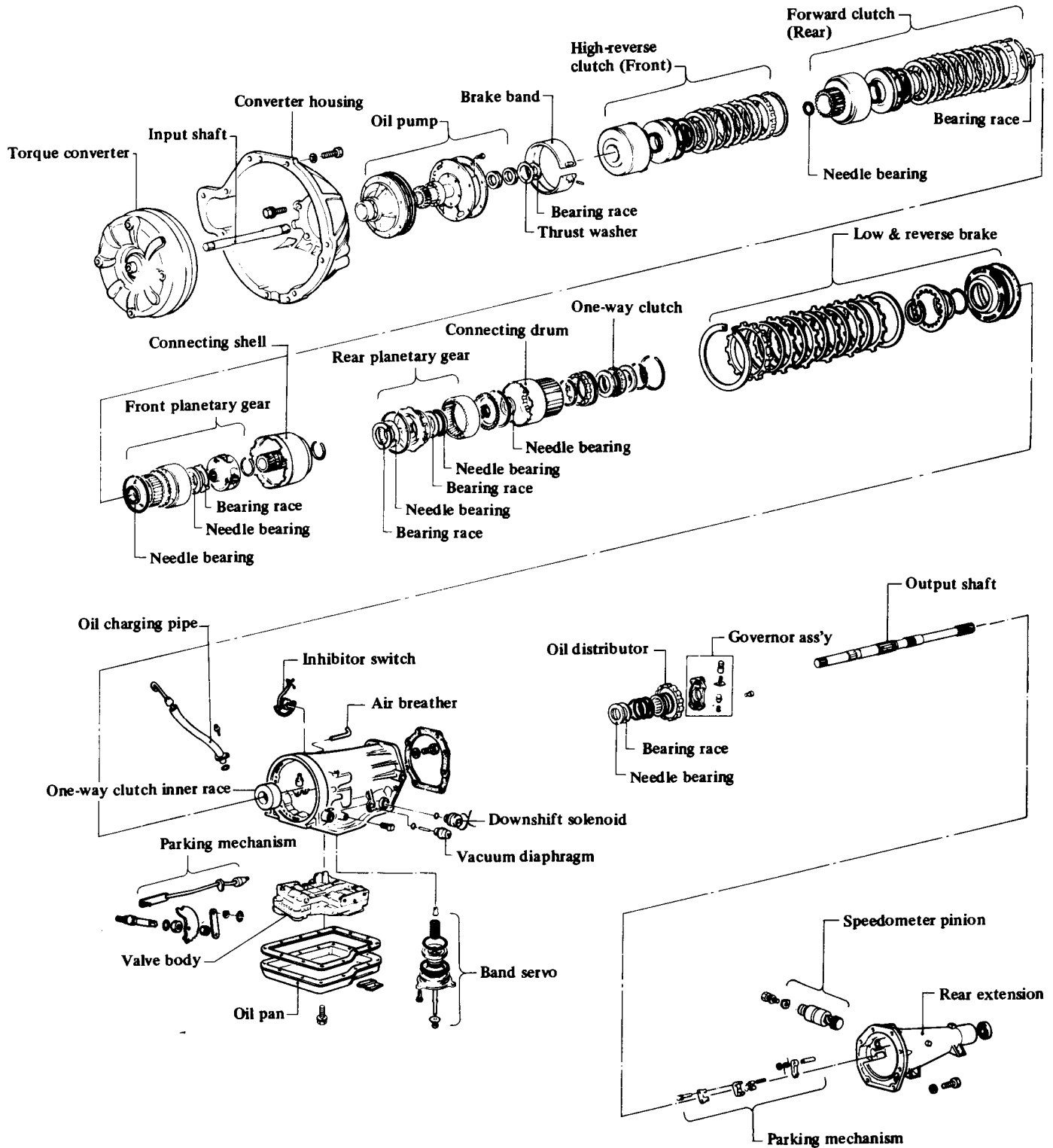
time transmission is shifted.

See page AT-34 for Checking Engine Idle.

12. Check to be sure that line pressure is correct. To do this, refer to page AT-37 for Line Pressure Test.

13. Perform stall test as described in page AT-39.

MAJOR OVERHAUL OPERATIONS



SERVICE NOTES FOR DISASSEMBLY

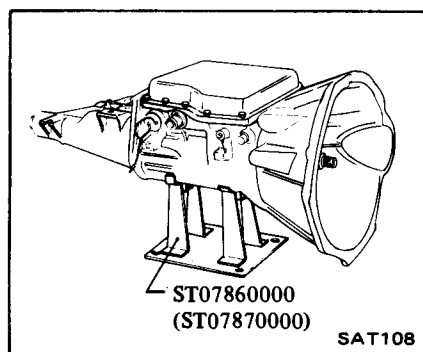
Before proceeding with disassembly, thoroughly clean the outside of the transmission. It is important to prevent the internal parts of the transmission from becoming contaminated by dirt or other foreign matter.

Disassembly should be done in a clean work area.

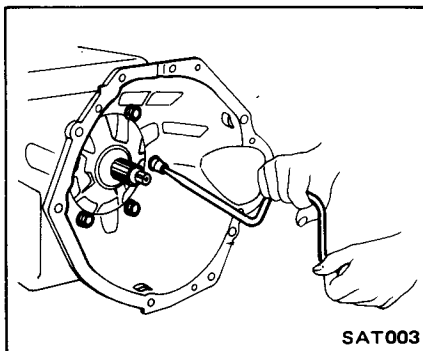
Use a nylon cloth or paper towel for wiping parts clean. Common shop rags can leave lint that might interfere with the transmission's operation.

DISASSEMBLY

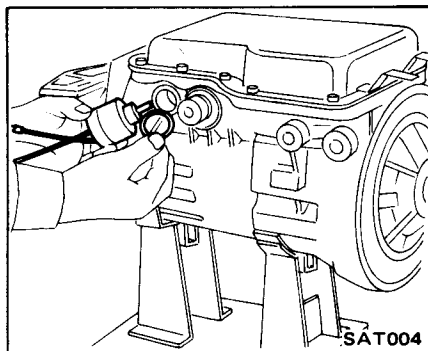
1. Remove torque converter, drain transmission fluid through end of rear extension, and place transmission on Tool.



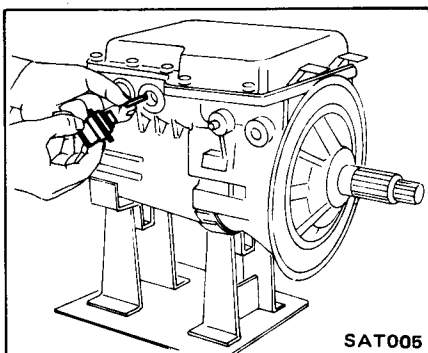
2. Remove converter housing.



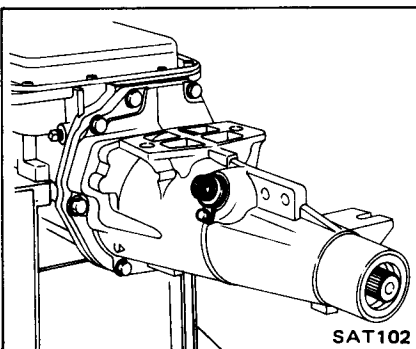
3. Unscrew and remove downshift solenoid and O-ring.



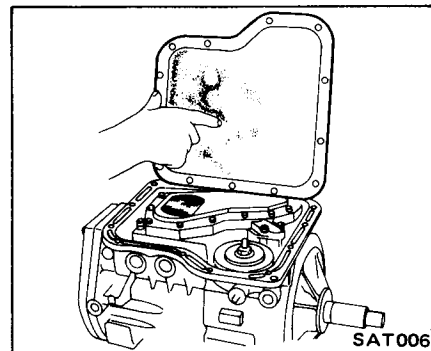
4. Unscrew and remove vacuum diaphragm, diaphragm rod and O-ring.



5. Remove speedometer lock plate retaining bolt. Remove speedometer pinion.



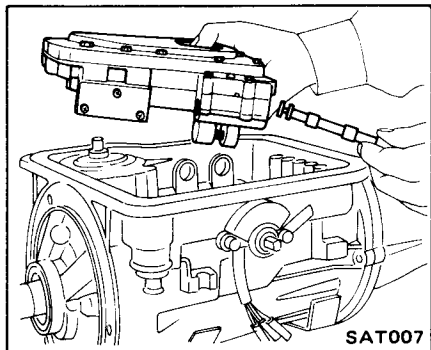
6. Remove oil pan and inspect its contents. An analysis of any foreign matter can indicate the types of problems to look for. If the fluid is very dark, smells burned, or contains foreign particles, the frictional material (clutches, band,) may need replacement. A tacky film that will not wipe clean indicates varnish build up which can cause valves, servo, and clutches to stick and may inhibit pump pressure.



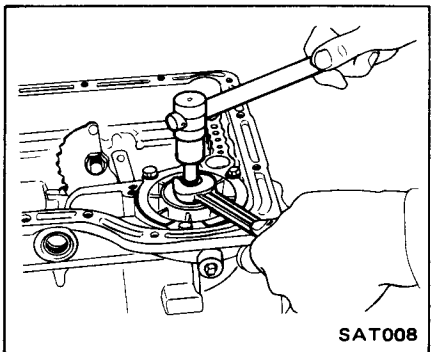
7. Remove control valve body.

Bolts of 3 different lengths are used. Care must be taken to identify individual bolt lengths and locations.

Remove manual valve from valve body as a precaution, to prevent valve from dropping out accidentally.



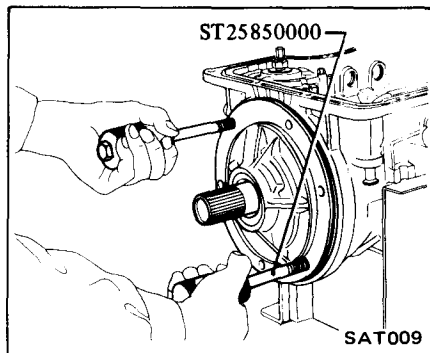
8. Loosen band servo piston stem locknut and tighten piston stem to prevent high-reverse clutch (Front) drum from dropping out when removing front pump.



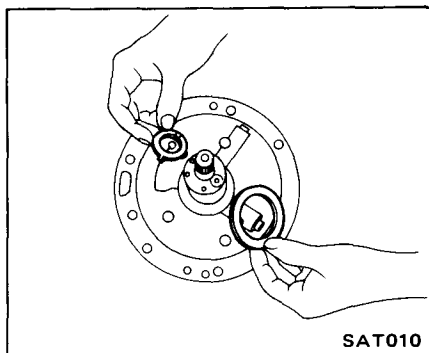
9. Remove input shaft from pump.
Attach Tool to pump and remove pump. Do not allow high-reverse

clutch (Front) to come out of position and drop onto floor.

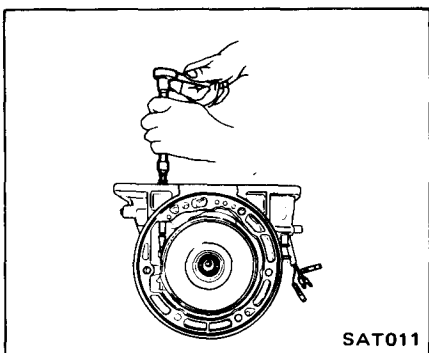
Take care that shaft is not inserted backwards during reassembly.



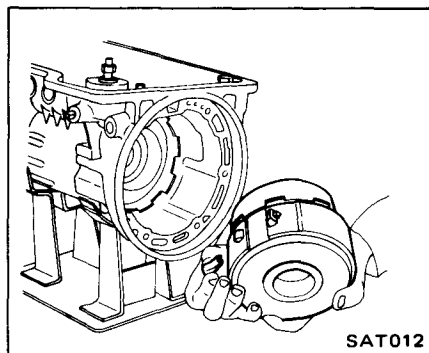
10. Remove high-reverse clutch (Front) thrust washer and bearing race.



11. Back off band servo piston stem to release band.

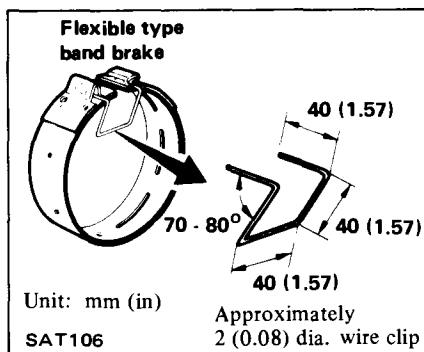


12. Remove brake band strut. Brake band, high-reverse clutch (Front) and forward clutch (Rear) assemblies may be removed together.

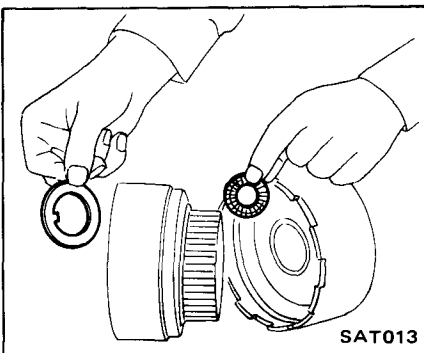


To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. Before removing the brake band, always secure it with a clip as shown in the figure below.

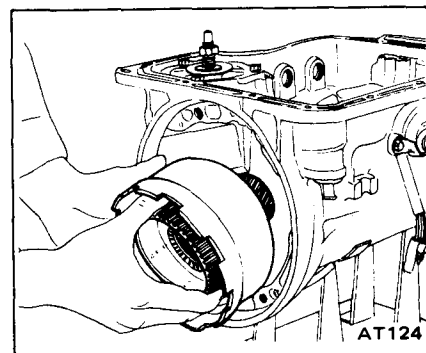
Leave the clip in position after removing the brake band.



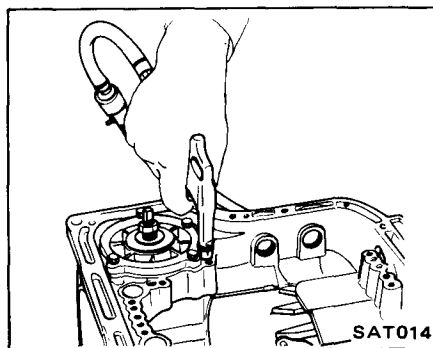
13. Remove pump thrust bearing and forward clutch (Rear) thrust washer.



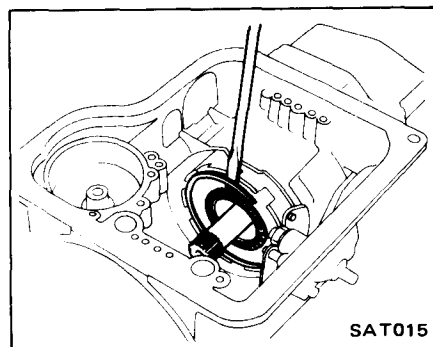
14. Remove forward clutch (Rear) hub, front planetary carrier and connecting shell, rear clutch thrust bearing, front planetary carrier thrust washer and thrust bearing.



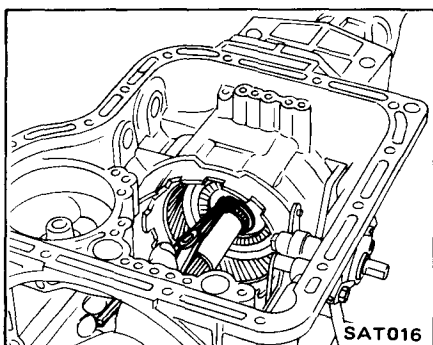
15. Back out, about half-way, band servo attaching bolts. Using an air gun, carefully apply pressure to loosen band servo. Remove band servo retaining bolts and pull band servo.



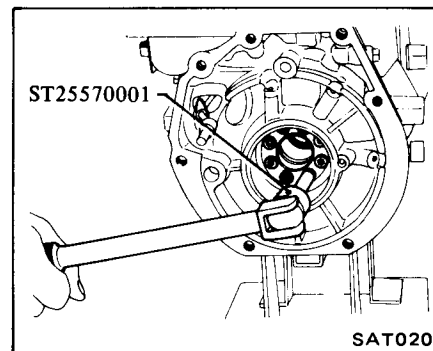
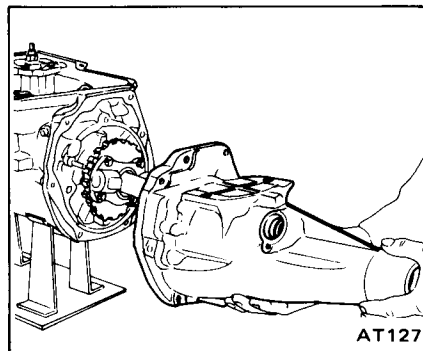
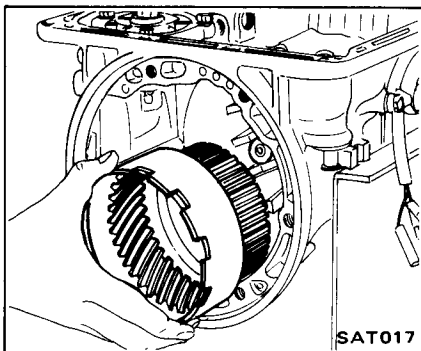
16. Remove rear planetary carrier snap ring and rear planetary carrier.



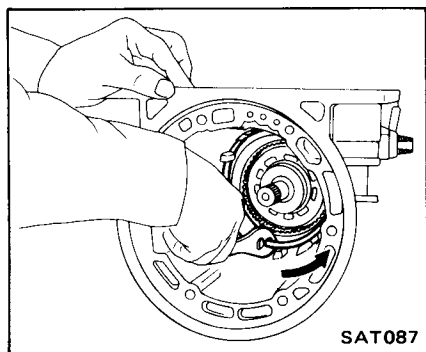
17. Remove output shaft snap ring.



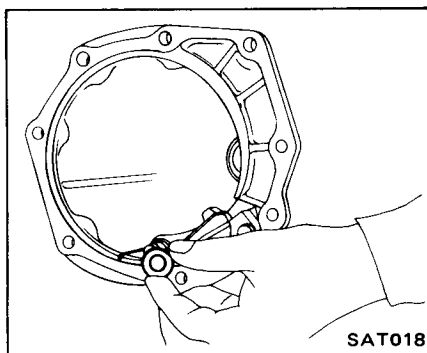
18. Remove rear connecting drum with internal (annulus) gear.



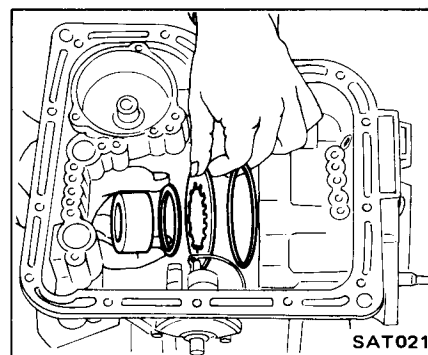
19. Pry off one end of snap ring with a screwdriver. Remove snap ring from low and reverse brake assembly while applying plier force in direction of arrow.



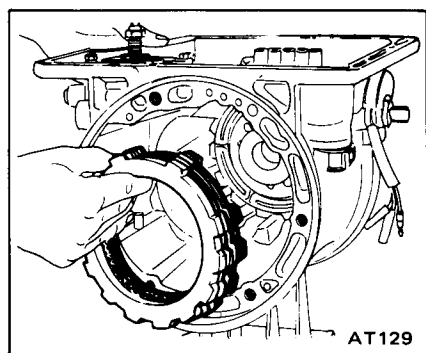
22. Be careful not to lose parking pawl, spring and retainer washer.



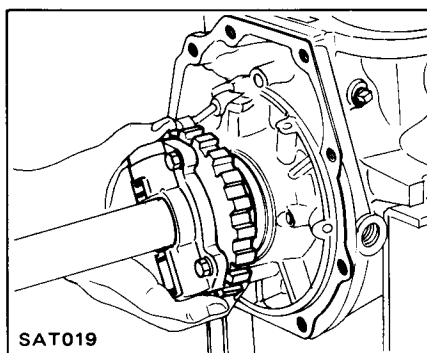
25. Remove one-way clutch inner race, return thrust washer, low and reverse return spring, and spring thrust ring.



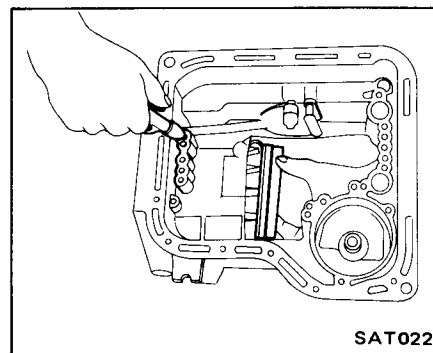
20. Tilt extension housing upward and remove low and reverse brake clutch assembly.



23. Remove output shaft with governor.



26. Using an air gun with a tapered rubber tip, carefully apply air pressure to remove low and reverse brake piston.

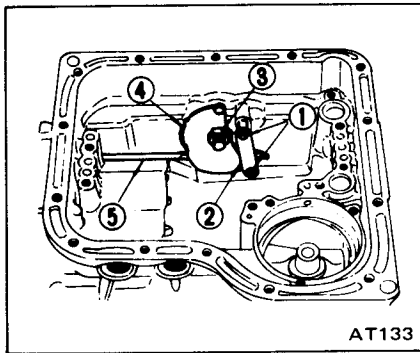


24. Remove governor thrust washer and needle bearing.

Remove one-way clutch inner race attaching hex-head slotted bolts using Tool.

27. Pry off snap rings ① from both ends of parking brake lever ② and remove the lever. Back off manual shaft lock nut ③ and remove manual plate ④ and parking rod ⑤.

21. Remove rear extension.



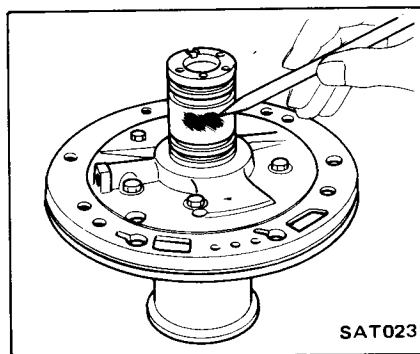
28. Remove inhibitor switch and manual shaft by loosening two securing bolts.

COMPONENT PARTS

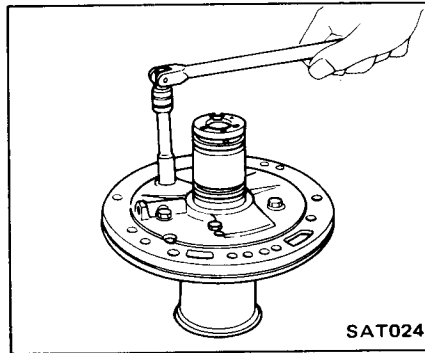
The transmission consists of many small parts that are quite alike in construction yet machined to very close tolerances. When disassembling parts, be sure to place them in order in part rack so they can be put back in the unit in their proper positions. All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection 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. Remove front pump gasket and O-ring. Inspect pump body, pump shaft and ring groove areas for wear.



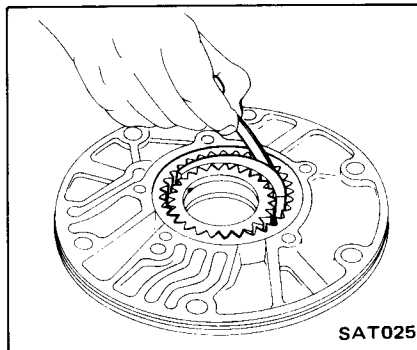
2. Remove pump cover from pump housing.



3. Inspect gears and all internal surfaces for faults and visible wear.
4. Measure clearance between outer gear and crescent.

Standard clearance:
0.14 - 0.21 mm
(0.0055 - 0.0083 in)

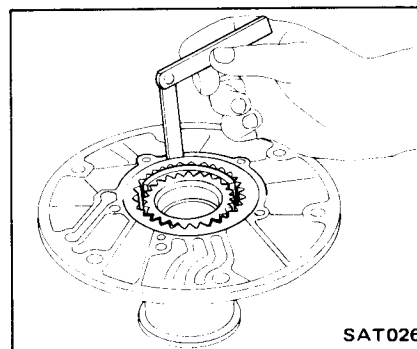
Replace if the clearance exceeds
0.25 mm (0.0098 in).



5. Measure clearance between outer gear and pump housing.

Standard clearance:
0.05 - 0.20 mm
(0.0020 - 0.0079 in)

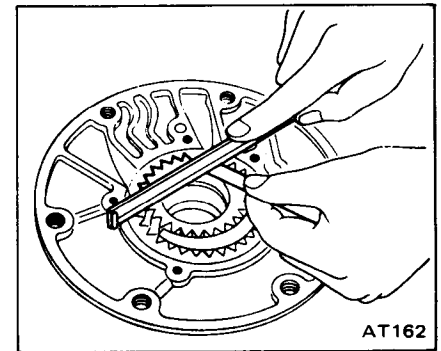
Replace if the clearance exceeds
0.25 mm (0.0098 in).



6. Using a feeler gauge and straight edge, measure clearance between gears and pump cover.

Standard clearance:
0.02 - 0.04 mm
(0.0008 - 0.0016 in)

Replace if the clearance exceeds
0.08 mm (0.0031 in).

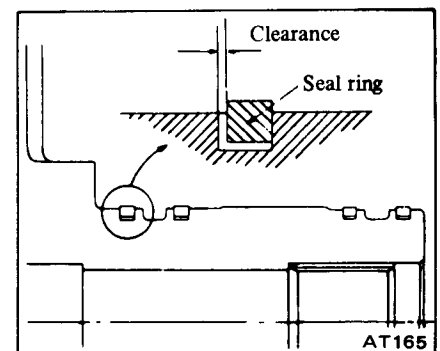


7. Measure clearance between seal ring and ring groove.

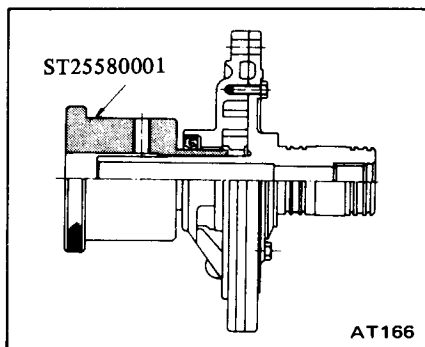
Standard clearance:
0.04 - 0.16 mm
(0.0016 - 0.0063 in)

Replace if the clearance exceeds
0.16 mm (0.0063 in).

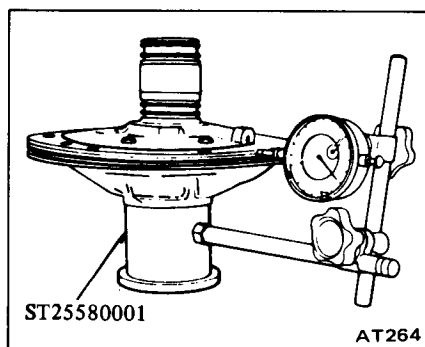
Of course, it is good practice to replace all seal rings during an overhaul.



8. Mount pump housing in Tool. Set up pump housing with inner and outer pump gears on it and install pump cover to pump housing. Temporarily assemble oil pump.



Total indicator reading:
Less than 0.07 mm
(0.0028 in)



9. Set run-out of the cover to within specified total indicator reading.

10. Tighten pump securing bolts to specified torque.

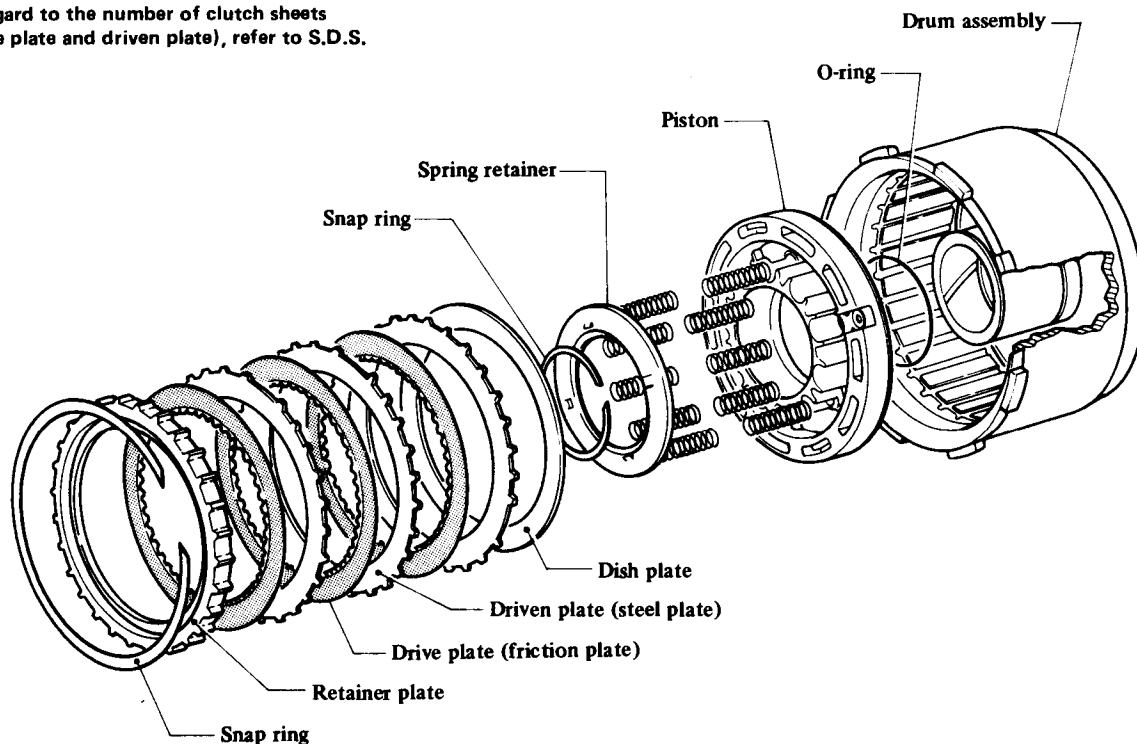
Ⓙ : Oil pump housing to oil pump cover

5.9 - 7.8 N·m
(0.6 - 0.8 kg-m,
4.3 - 5.8 ft-lb)

Recheck run-out. Replace O-ring and gasket.

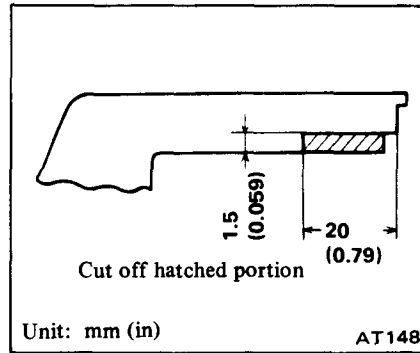
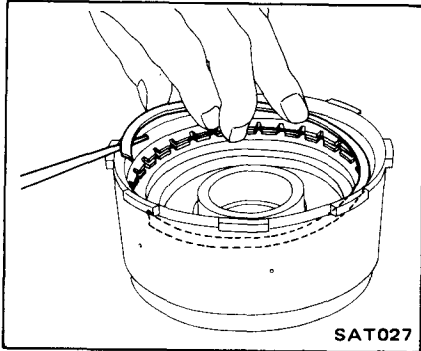
HIGH-REVERSE CLUTCH (FRONT)

In regard to the number of clutch sheets (drive plate and driven plate), refer to S.D.S.



SAT086

1. Using a screwdriver, remove large clutch retaining plate snap ring.



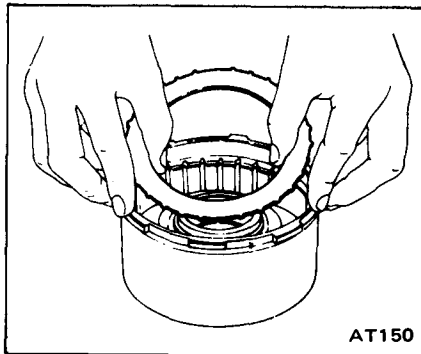
Standard drive plate thickness:
1.50 - 1.65 mm
(0.0591 - 0.0650 in)

7. Check for wear on snapping, weak or broken coil springs, and warped spring retainer.

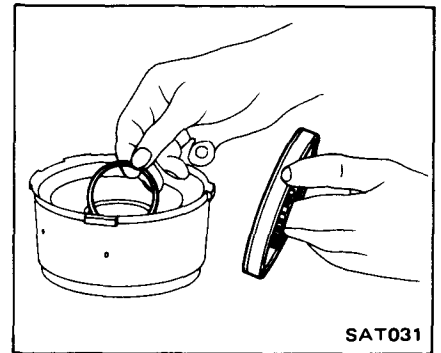
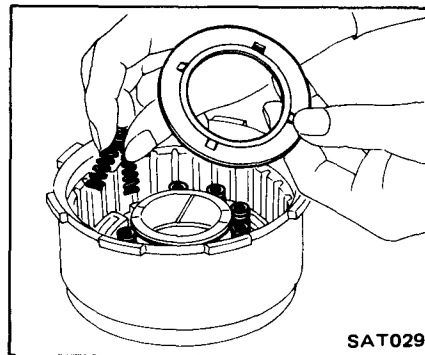
8. Lubricate clutch drum hub and seals, and install inner seal and piston seal as illustrated. *Be careful not to stretch seals during installation.*

Never assemble clutch dry; always lubricate its components thoroughly.

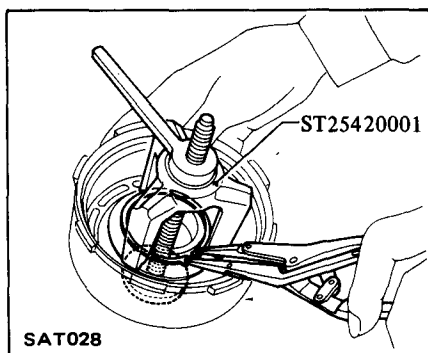
2. Remove clutch plate assembly.



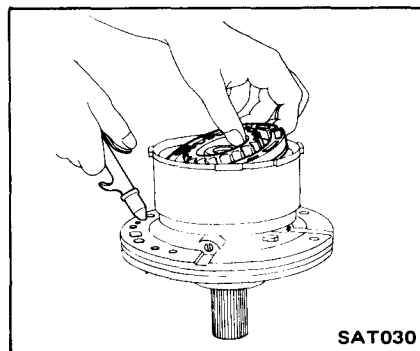
4. Remove spring retainer and springs.



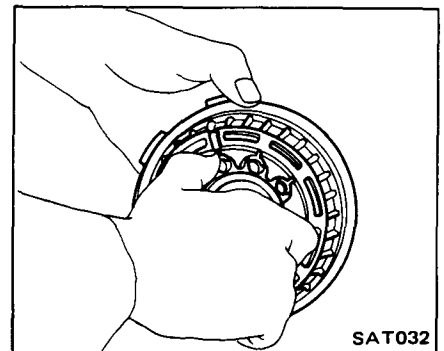
3. Compress clutch springs and remove snap ring from spring retainer.



5. For easy removal of piston from drum, mount clutch on pump. Use an air gun with a tapered rubber tip to carefully apply air pressure to loosen piston from drum.



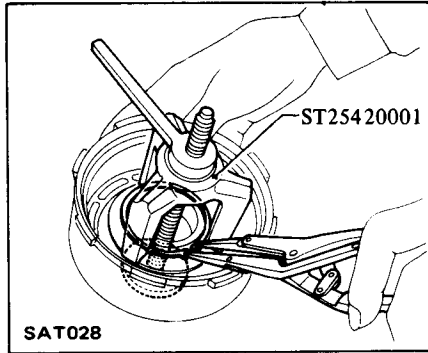
9. Assemble piston, being careful not to allow seal to kink or become damaged during installation. After installing, turn piston by hand to ensure that there is no binding.



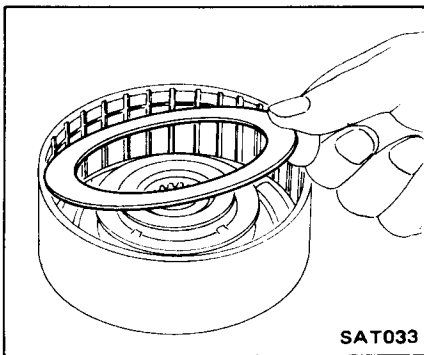
When Tool is to be used, cut toe-tips of three legs with a grinding wheel.

6. Check clutch drive plate facing for wear or damage. Drive plate thickness must not be less than 1.4 mm (0.055 in).

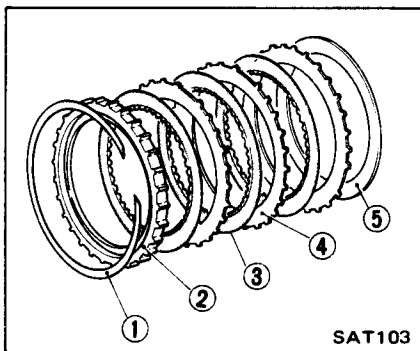
10. Reassemble spring and retainer. Reinstall snap ring. Be sure snap ring is properly seated.



11. Install dish plate with dish facing outward.



12. Now install driven plate (steel plate), then a drive plate (friction plate) and repeat in this order until correct number of plates has been installed (check Service Data and Specifications for proper quantity of plates). Now install retainer plate and snap ring.



- 1 Snap ring
- 2 Retainer plate
- 3 Drive plate (Friction plate)
- 4 Drive plate (Steel plate)
- 5 Dish plate

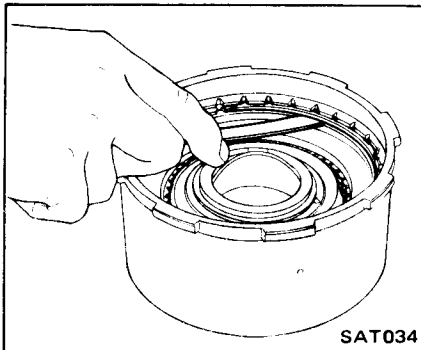
13. Measure clearance between re-
tainer plate and snap ring.

Specified clearance:
1.6 - 2.0 mm (0.063 - 0.079 in)

If necessary, try other retaining
plates having different thicknesses un-
til correct clearance is obtained.

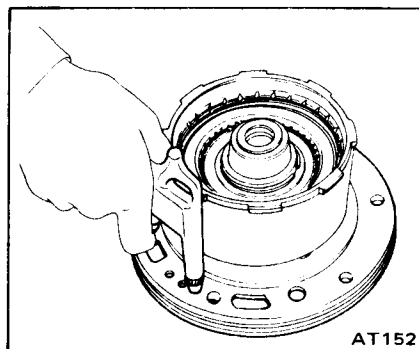
Available retaining plate

Thickness mm (in)	Part number
5.0 (0.197)	31567-X2900
5.2 (0.205)	31567-X2901
5.4 (0.213)	31567-X2902
5.6 (0.220)	31567-X2903
5.8 (0.228)	31567-X2904
6.0 (0.236)	31567-X2905
6.2 (0.244)	31567-X2906

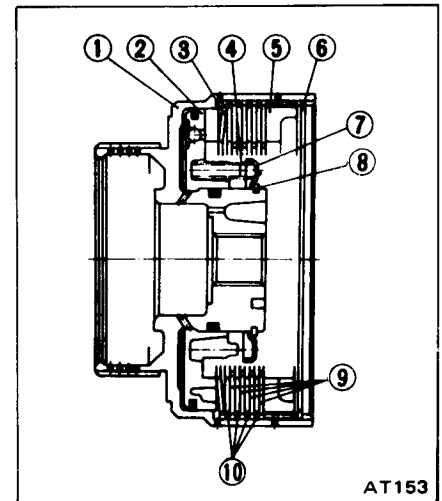


14. Testing high-reverse clutch
(Front)

With high-reverse clutch (Front)
assembled on oil pump cover, direct
a jet of air into hole in clutch drum
for definite clutch operation.



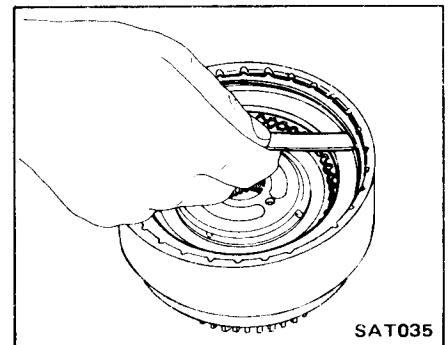
FORWARD CLUTCH (REAR)



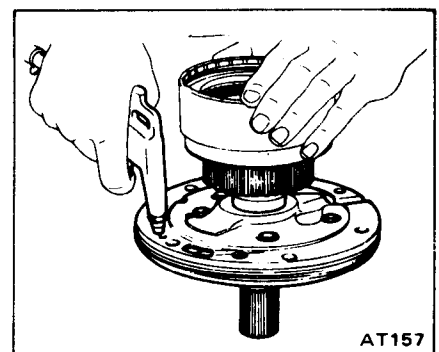
- | | |
|------------------------------|-------------------|
| 1 Forward clutch (Rear) drum | 6 Snap ring |
| 2 Piston | 7 Spring retainer |
| 3 Dished plate | 8 Snap ring |
| 4 Coil spring | 9 Drive plate |
| 5 Retaining plate | 10 Driven plate |

Service procedures for forward
clutch (Rear) are essentially the same
as those for high-reverse clutch
(Front), with the following excep-
tion:

**Specified clearance between
retainer plate and snap ring:**
0.8 - 1.6 mm
(0.031 - 0.063 in)

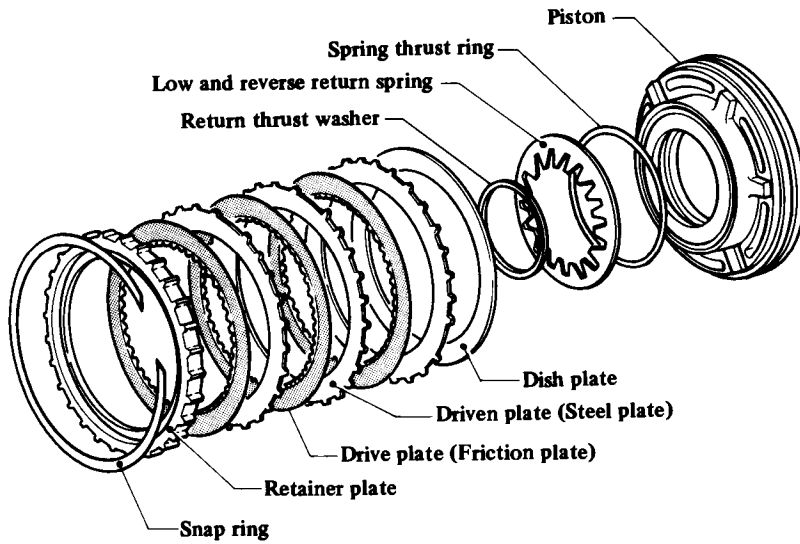


Test forward clutch (Rear)



LOW & REVERSE BRAKE

In regard to the number of clutch sheets (drive plate and driven plate), refer to S.D.S.



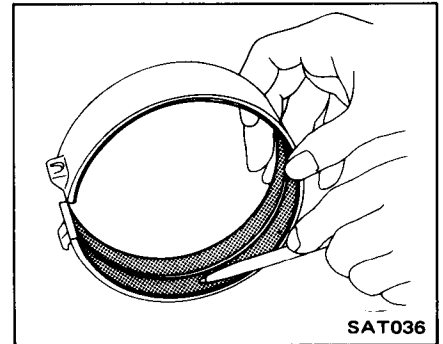
SAT094

- 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)

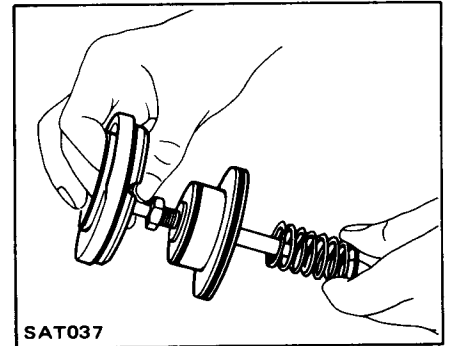
- Test piston return spring for weakness. Discard if it is too weak.

- Inspect band friction material for wear. If cracked, chipped or burnt spots are apparent, replace the band.



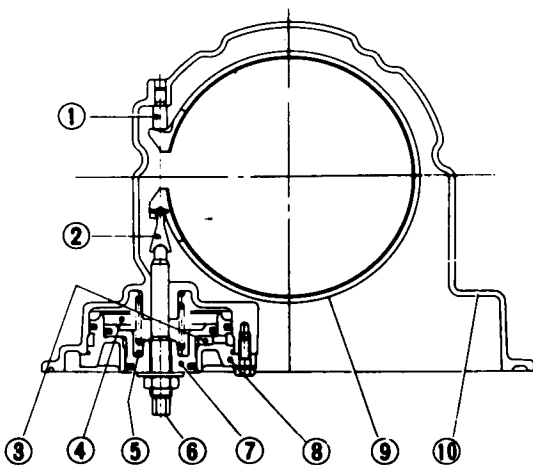
SAT036

- Check band servo components for wear and scoring. Replace piston O-rings and all other components as necessary.



SAT037

BRAKE BAND AND BAND SERVO

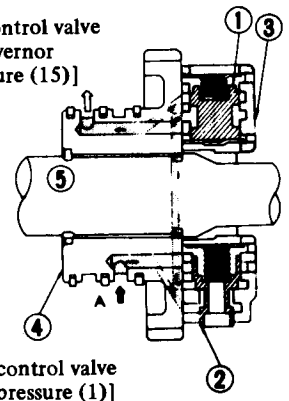


- 1 Anchor end pin
- 2 Band strut
- 3 Apply
- 4 Release
- 5 Return spring
- 6 Band servo piston stem
- 7 Band servo piston
- 8 Servo retainer
- 9 Brake band assembly
- 10 Transmission case

AT290

GOVERNOR

To control valve
 [Governor
 pressure (15)]



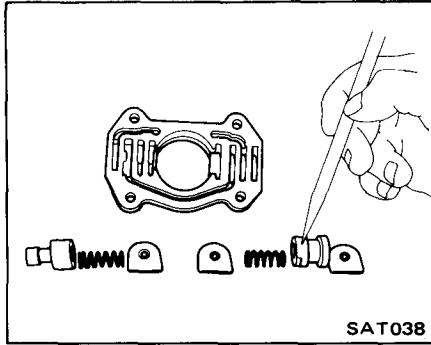
From control valve
 [Line pressure (1)]

AT090

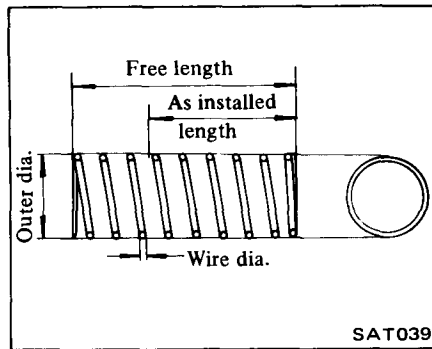
- 1 Primary governor
- 2 Secondary governor
- 3 Governor valve body
- 4 Oil distributor
- 5 Output shaft

- 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 oil distributor.
- Ⓙ : Governor valve body to oil distributor
5.4 - 7.4 N·m
(0.55 - 0.75 kg-m,
4.0 - 5.4 ft-lb)

Valve spring	Wire dia. mm (in)	Outer coil dia. mm (in)	No. of active coil	Free length mm (in)	Installed	
					Length mm (in)	Load N (kg, lb.)
Primary governor	0.45 (0.0177)	8.75 (0.3445)	5.0	21.8 (0.858)	7.5 (0.295)	2.109 (0.215, 0.474)
Secondary governor	0.70 (0.0276)	9.20 (0.3622)	5.5	25.1 (0.988)	10.5 (0.413)	10.788 (1.100, 2.426)

PLANETARY CARRIER

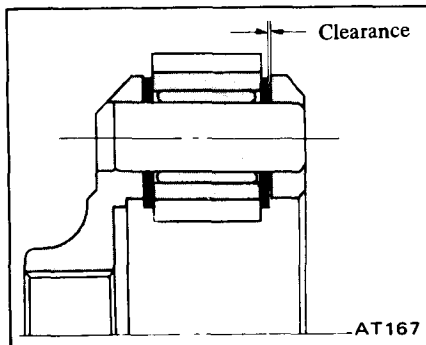
The planetary carrier cannot be divided into its individual components.

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.

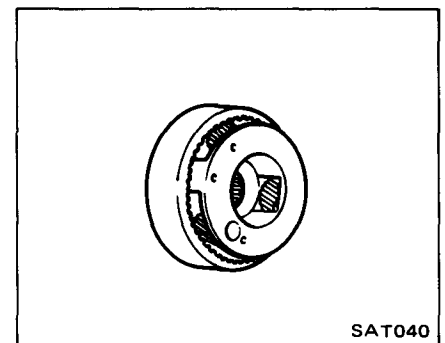
Standard clearance:
0.20 - 0.70 mm
(0.0079 - 0.0276 in)

Replace if the clearance exceeds
0.80 mm (0.0315 in).



- Check planetary gear sets for damaged or worn gears. Gear sets

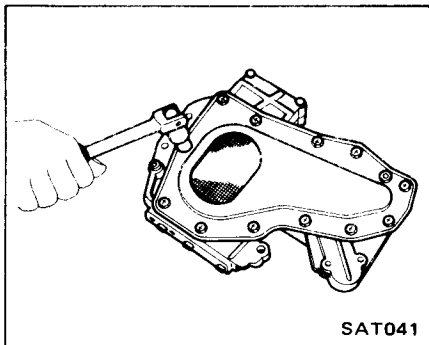
that have been damaged by overheating will have a blue discoloration.



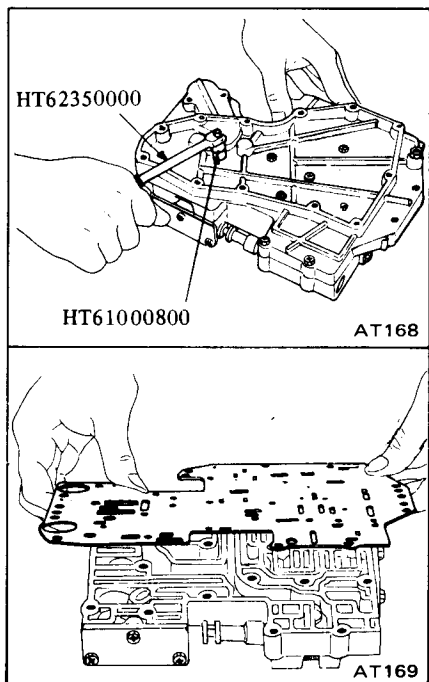
CONTROL VALVE BODY

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 its attaching screws, nuts and bolts.



2. Disassemble valve body and its remaining attaching bolts and nuts to carefully separate lower body, separator plate and upper body.

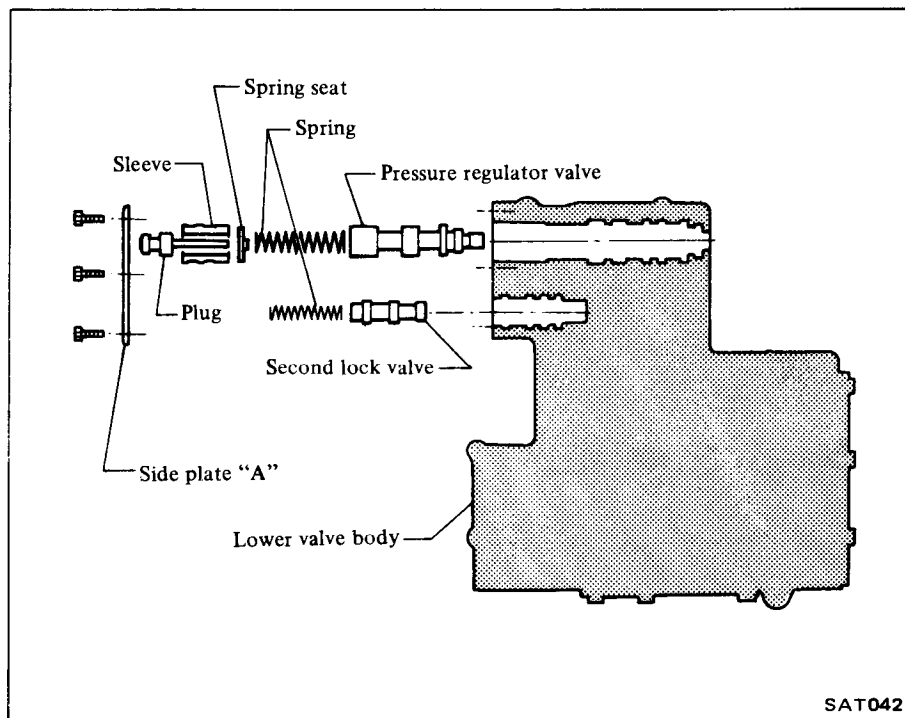


3. During valve body separation, do not scatter or lose orifice check valve, servo orifice check valve, and throttle

relief check valve (ball) and related springs.

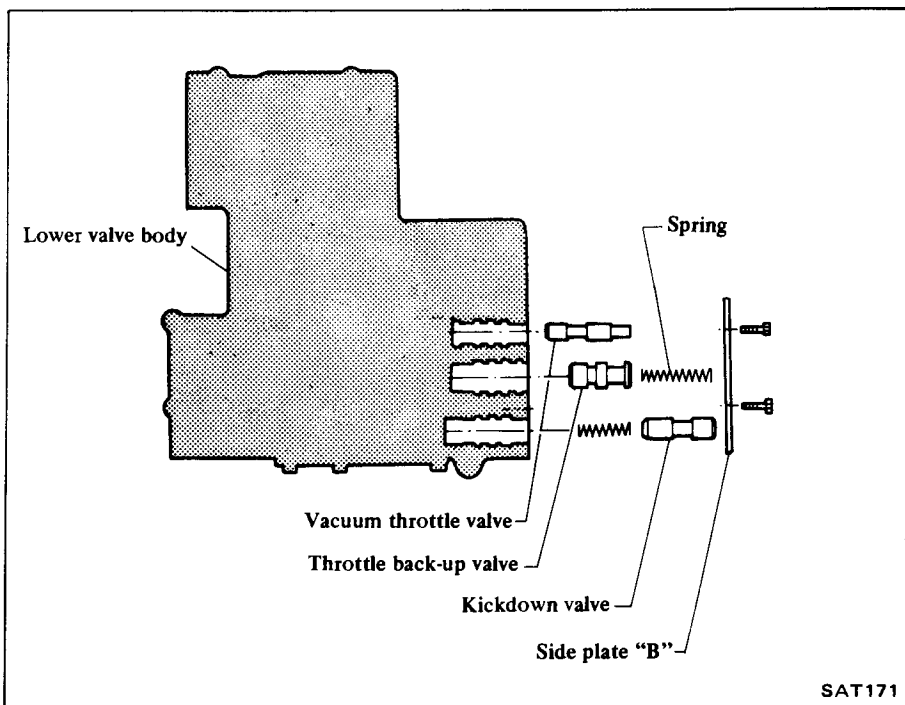
4. Remove side plate A, pressure regulator valve, spring, spring seat,

sleeve, and plug, and second lock valve and spring. Place each loose part on a rack to retain correct sequence of assembly.



5. Remove side plate B, 2nd-3rd timing valve and spring, vacuum throttle valve, throttle back-up valve and

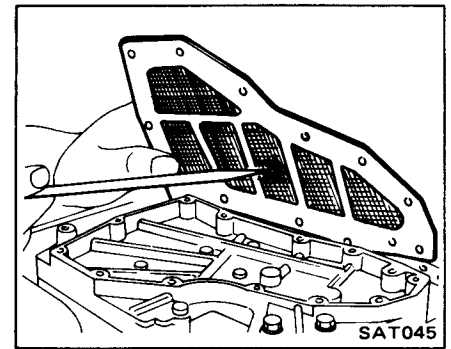
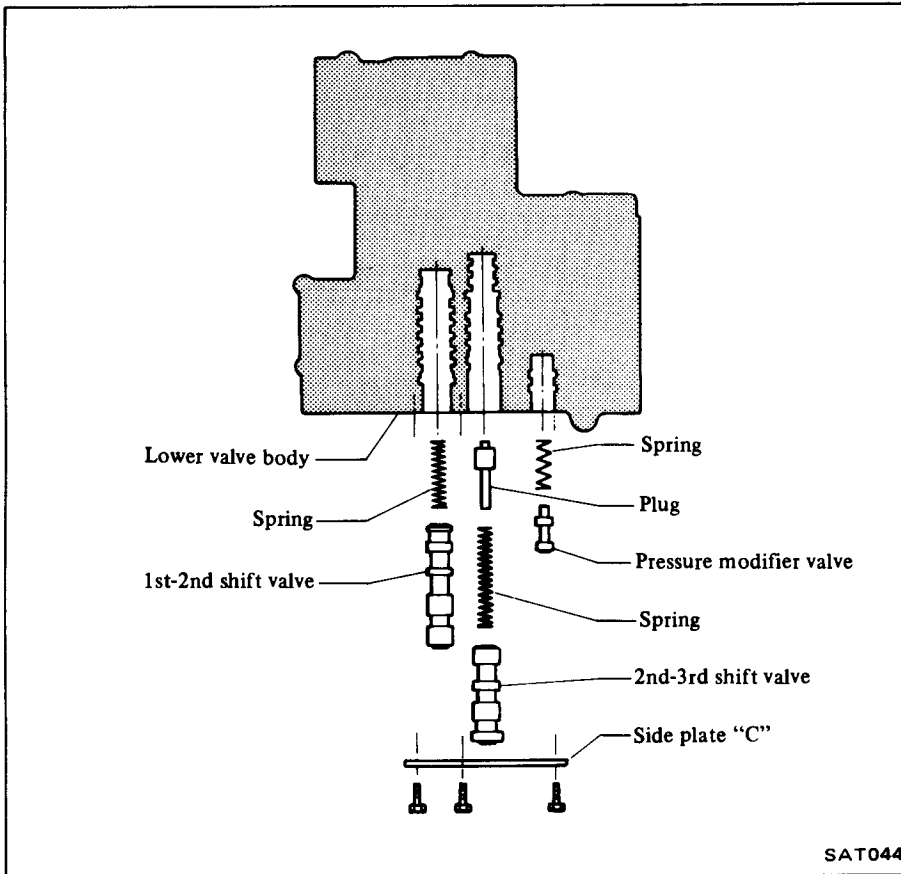
spring, and the kickdown valve and spring. Place each loose part on a rack to retain sequence of assembly.



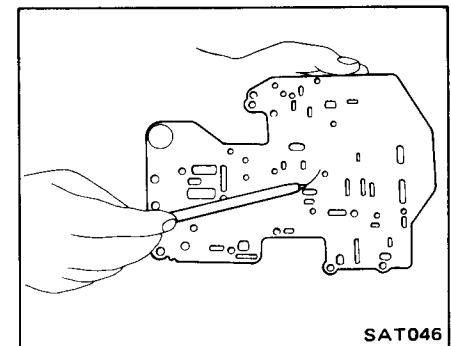
6. Remove side plate C, pressure modifier valve and spring, 2nd-3rd shift valve, spring and plug, and 1st-2nd shift valve and spring.

Place each loose part on a rack to retain sequence of assembly.

Manual valve was removed when valve body was removed from transmission. Include valve in subsequent inspection and service sequence.



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.

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, 0.03mm (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.

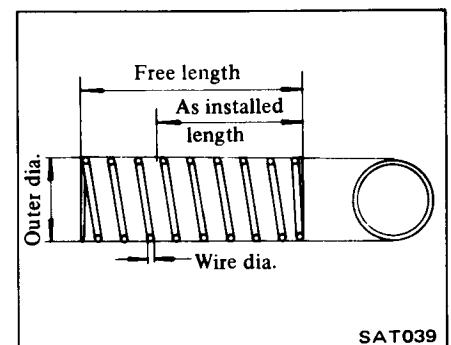
The valves may be cleaned using alcohol or lacquer thinner. The valve bodies can be dip cleaned with a good carburetor cleaner or lacquer thinner. **Do not leave valve bodies submerged in carburetor cleaner longer than five minutes. Rinse parts thoroughly and dry.**

Lubricate all parts in clean automatic transmission 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.

Valve body spring chart



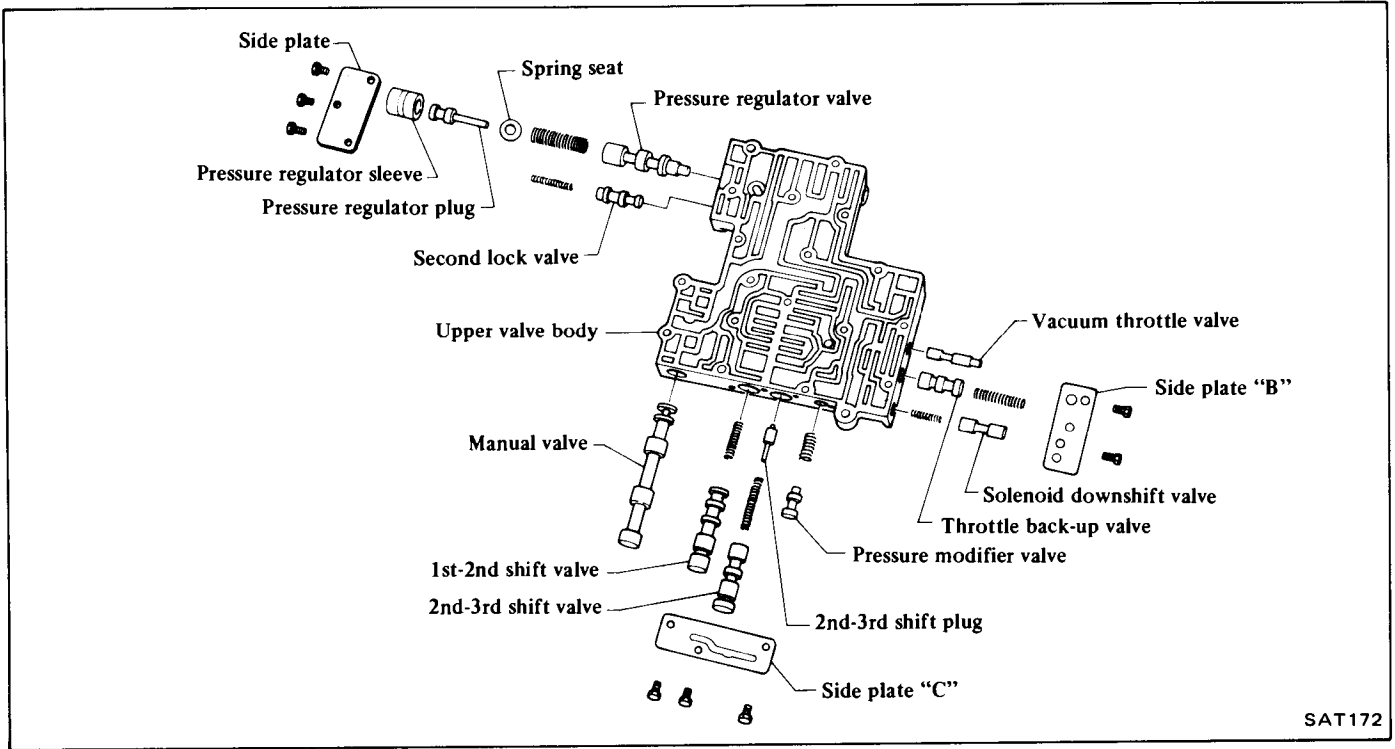
Valve spring	Wire dia. mm (in)	Outer coil dia. mm (in)	No. of active coil	Free length mm (in)	Installed	
					Length mm (in)	Load N (kg, lb)
Manual detent	1.3 (0.051)	7.3 (0.287)	15	32.4 (1.276)	26.5 (1.043)	53.9 (5.5, 12.1)
Pressure regulator valve	1.2 (0.047)	11.7 (0.461)	13	43.0 (1.693)	23.5 (0.925)	27.5 (2.8, 6.2)
Pressure modifier valve						
L28E engine	0.4 (0.016)	8.4 (0.331)	5	18.5 (0.728)	9.0 (0.354)	1.0 (0.1, 0.2)
L28ET engine	0.6 (0.024)	8.6 (0.339)	5.5	18.5 (0.728)	9.0 (0.354)	4.9 (0.5, 1.1)
1st - 2nd shift valve	0.6 (0.024)	6.6 (0.260)	16	32.0 (1.260)	16.0 (0.630)	6.129 (0.625, 1.378)
2nd - 3rd shift valve	0.7 (0.028)	6.9 (0.272)	18	41.0 (1.614)	17.0 (0.669)	13.73 (1.40, 3.09)
Throttle back-up valve	0.8 (0.031)	7.3 (0.287)	14	36.0 (1.417)	18.8 (0.740)	18.83 (1.92, 4.23)
Solenoid downshift valve	0.55 (0.0217)	5.55 (0.2185)	12	22.0 (0.866)	12.5 (0.492)	5.88 (0.60, 1.32)
Second lock valve	0.55 (0.0217)	5.55 (0.2185)	16	33.5 (1.319)	21.0 (0.827)	5.88 (0.60, 1.32)
Throttle relief check valve						
L28E engine	0.9 (0.035)	6.5 (0.256)	14	26.8 (1.055)	19.0 (0.748)	21.48 (2.19, 4.83)
L28ET engine	1.0 (0.039)	6.5 (0.256)	13	24.9 (0.980)	19.0 (0.748)	27.95 (2.85, 6.28)
Orifice check valve	0.23 (0.0091)	5.0 (0.197)	12	15.5 (0.610)	11.5 (0.453)	0.10 (0.01, 0.02)
Servo orifice check valve						

12. Assemble side plate A group of parts into lower valve body. Reinstall

side plate and finger tighten screws.

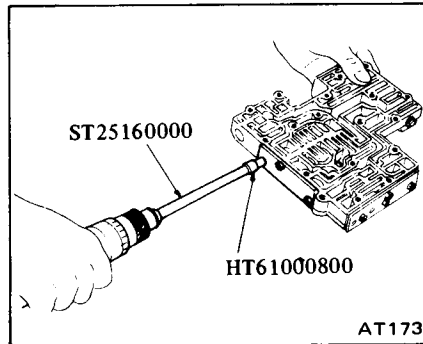
Assemble side plate B group and

side plate C group in same manner as A group.

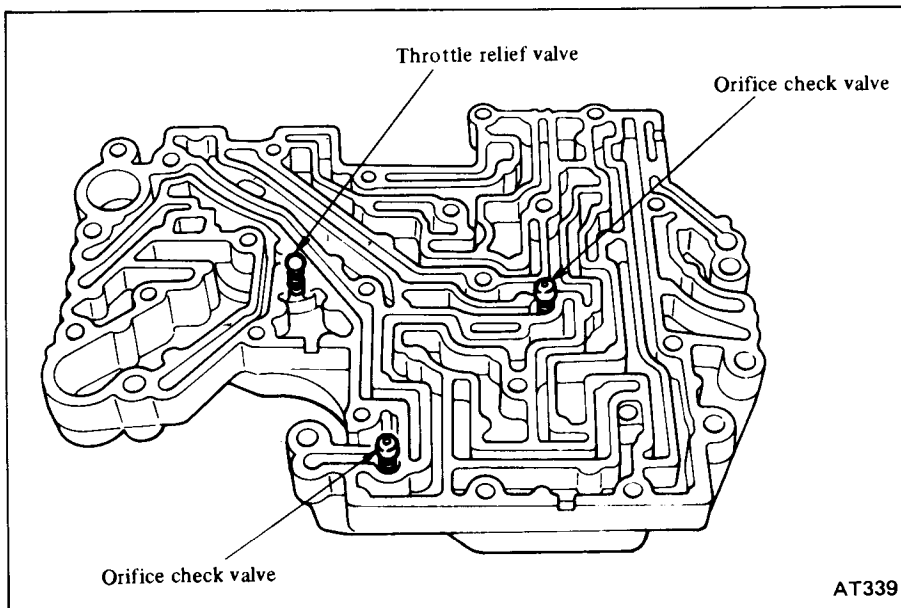


13. Tighten screws.

⊕ : Side plate to valve body
2.5 - 3.4 N·m
(0.25 - 0.35 kg-m,
1.8 - 2.5 ft-lb)

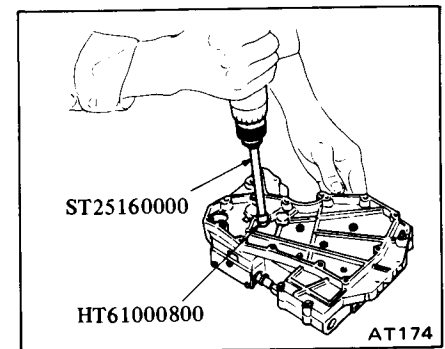


14. Install orifice check valve, valve spring, throttle relief valve spring and steel ball in valve body.



15. Install upper and lower valves.

⊕ : Upper and lower valves
2.5 - 3.4 N·m
(0.25 - 0.35 kg-m,
1.8 - 2.5 ft-lb)
Reamer bolt
4.9 - 6.9 N·m
(0.5 - 0.7 kg-m,
3.6 - 5.1 ft-lb)



16. Install oil strainer.

⊕ : Oil strainer to valve body
2.5 - 3.4 N·m
(0.25 - 0.35 kg-m,
1.8 - 2.5 ft-lb)

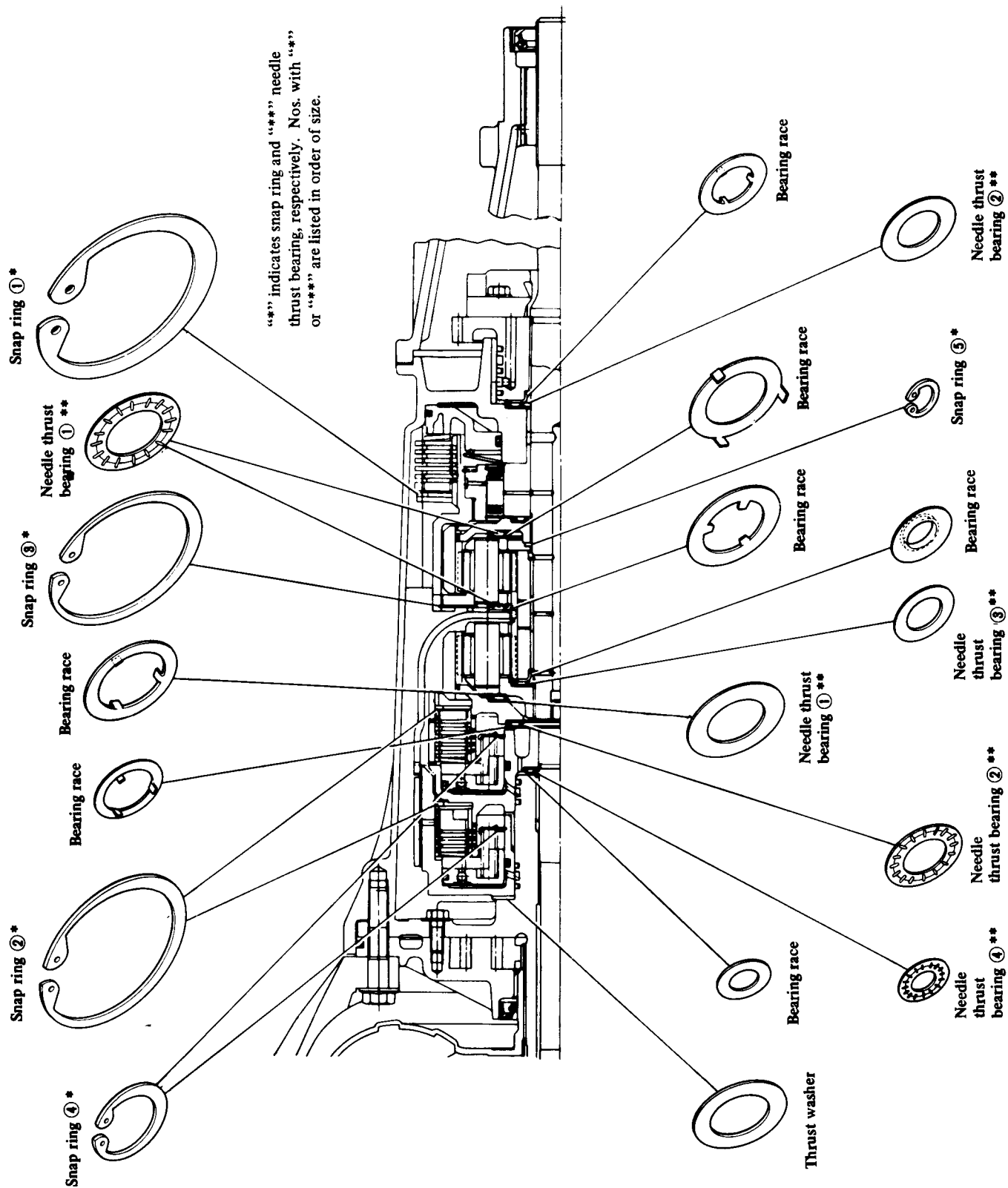
The manual valve is inserted into the valve body when the latter is installed in the transmission.

FINAL ASSEMBLY

When installing/assembling needle

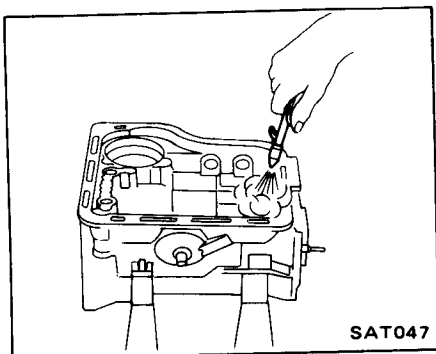
bearing, bearing race, snap ring and O-ring (seal ring), use the following

illustration as a guide to installation procedures and locations.

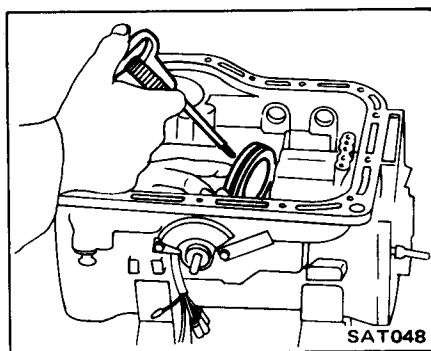


1. Before proceeding with the final assembly of all components, it is important to verify that the case, housing and parts are clean and free from dust, dirt and foreign matter (use air gun). Have a tray available with clean transmission fluid for lubricating parts.

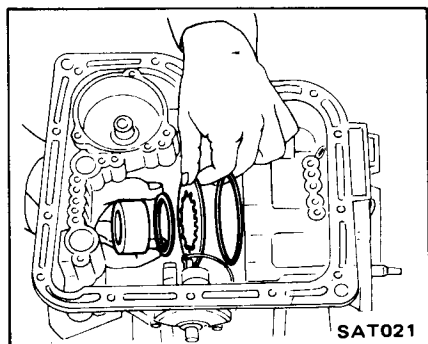
Petroleum jelly can be used to secure washers during installation. All new seals and rings should have been installed before beginning final assembly.



2. Lubricate and install low and reverse piston into the case.



3. Install thrust ring, piston return spring, thrust washer and one-way clutch inner race.



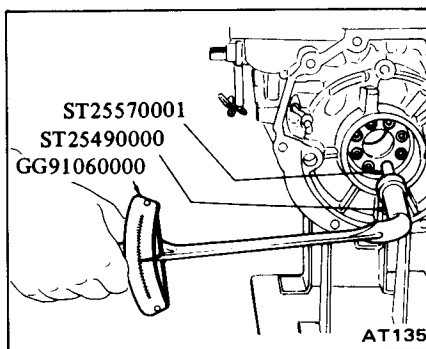
4. Align and start hex-head slotted bolts into inner race from rear of case.

WARNING:
Check that return spring is centered on race before tightening.

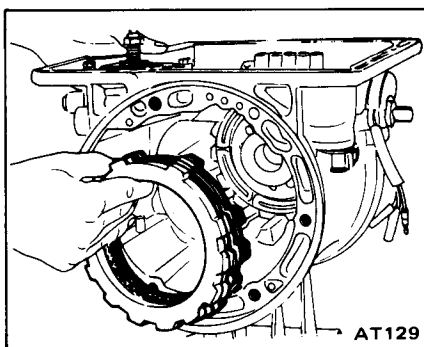
Tighten the bolts

Ⓣ : One-way clutch inner race to transmission case

13 - 18 N·m
(1.3 - 1.8 kg-m,
9 - 13 ft-lb)

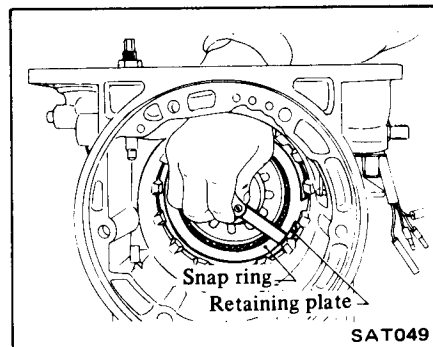


5. Install steel dished plate first, then steel and friction plates, and, finally, retaining plate and snap-ring.

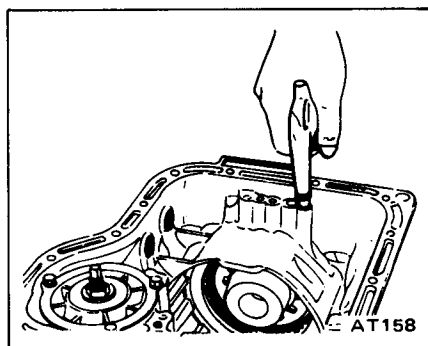


6. After low and reverse brake has been completely assembled, measure clearance between snapping and retainer plate. If measurement exceeds specifications it can be adjusted by replacing retainer plate with one of a different thickness.

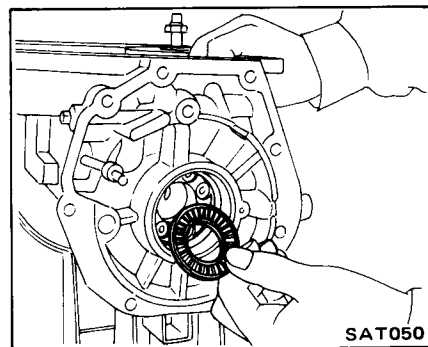
Low and reverse brake clearance:
0.80 - 1.25 mm
(0.0315 - 0.0492 in)



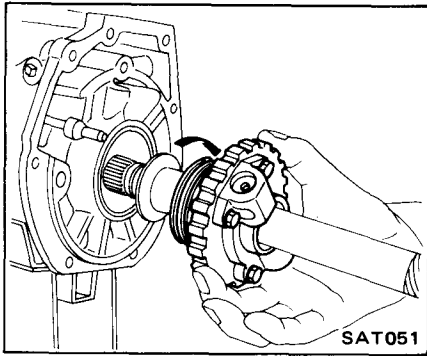
7. Using an air gun with a tapered rubber tip, check low and reverse brake operation.



8. Install governor thrust washer and needle bearing.

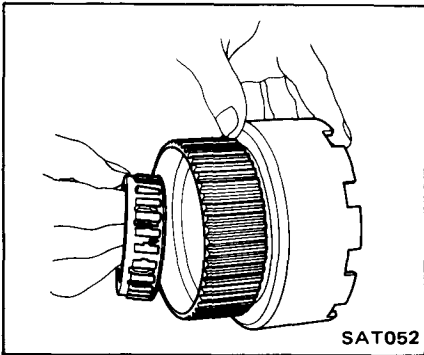


9. Slide governor distributor assembly on output shaft from front of shaft. Install shaft and governor distributor into case, using care not to damage distributor rings.

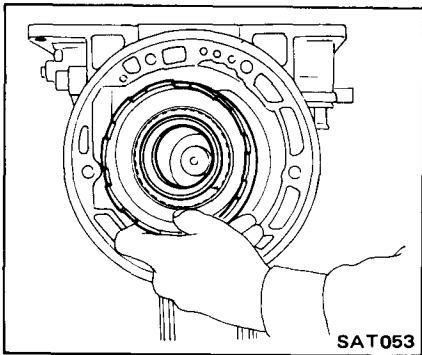


10. Install one-way sprag into one-way clutch outer race (attached to connecting drum).

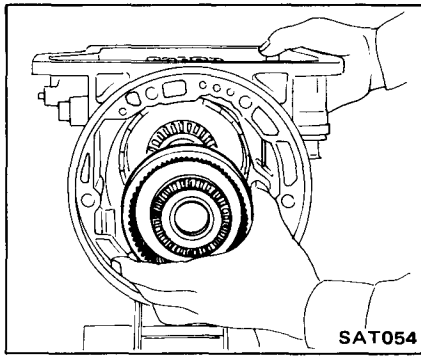
Arrow on sprag must face front of transmission.



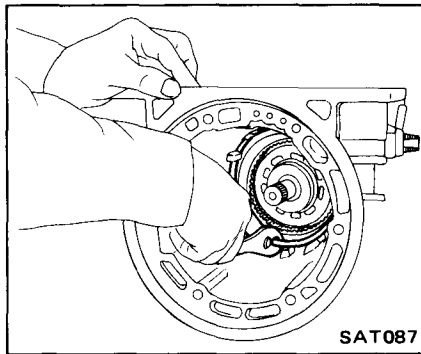
11. Install connecting drum with sprag by rotating drum clockwise using a slight pressure and wobbling to align plates with hub and sprag assembly. Connecting drum should now be free to rotate **clockwise only**. This check will verify that sprag is correctly installed and operative.



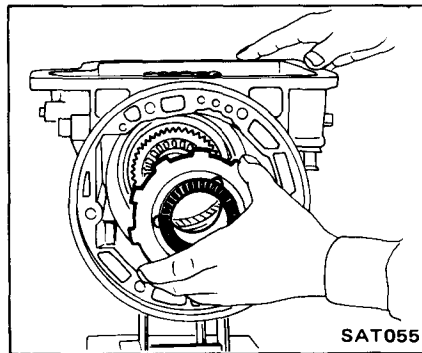
12. Install rear internal gear.



13. Install snap-ring on shaft.

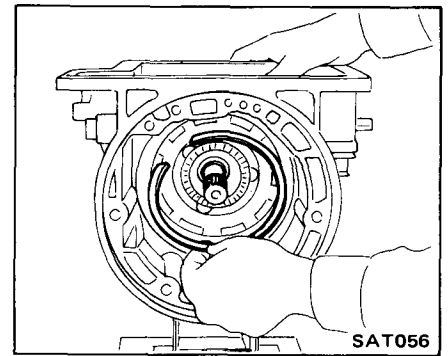


14. Secure thrust bearing and thrust washer with petroleum jelly and install rear planetary carrier.

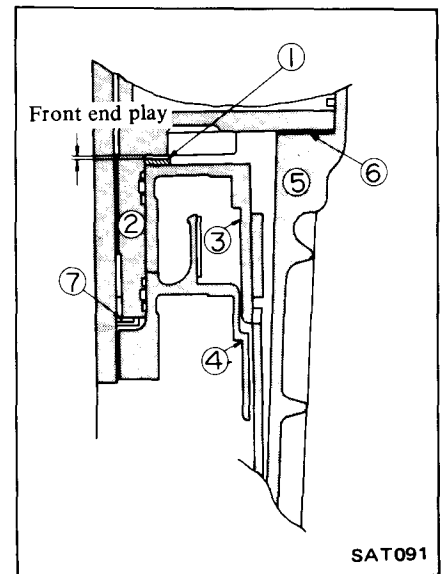


15. Install rear planetary carrier snap ring.

This snap ring is thinner than a clutch drum snap ring so be sure you are using correct size. If you have insufficient space to install snap ring into drum groove, pull connecting drum forward as far as possible. This will give you sufficient groove clearance to install drum snap ring.

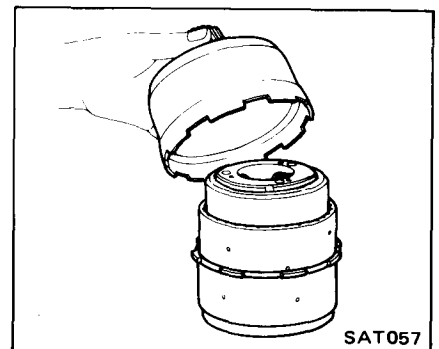


16. Adjust front end play as follows:

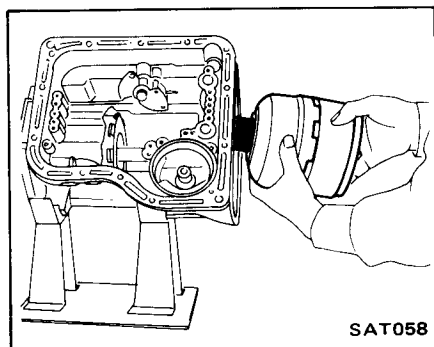


- | | |
|---|-------------------------------|
| 1 High-reverse clutch (Front) thrust washer | 4 Forward clutch (Rear) |
| 2 Oil pump cover | 5 Transmission case |
| 3 High-reverse clutch (Front) | 6 Oil pump gasket |
| | 7 Oil pump cover bearing race |

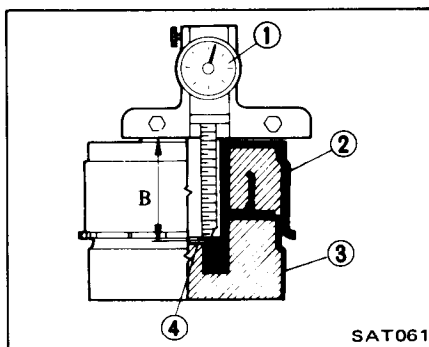
(1) Assemble high-reverse clutch (Front) and forward clutch (Rear), front internal gear, front planetary carrier and connecting shell. Secure thrust bearings with petroleum jelly.



(2) Install assembly into transmission case. Check that parts are properly seated before proceeding with measurements.

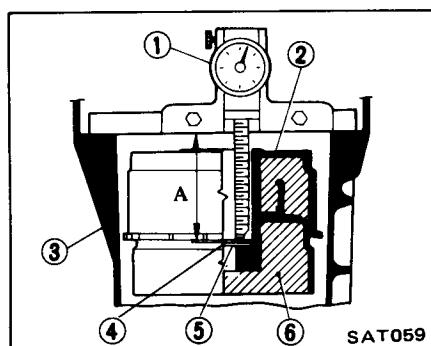


ure from face of clutch drum to top of thrust bearing race (dimension B).

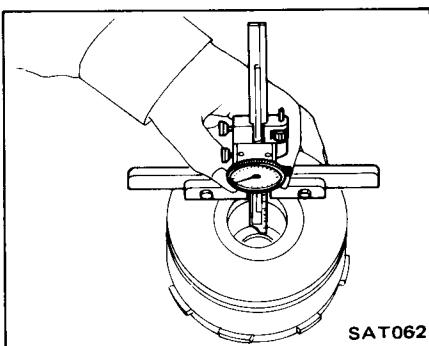


- 1 Depth gauge
- 2 High-reverse clutch (Front) drum
- 3 Forward clutch (Rear) drum
- 4 Thrust bearing

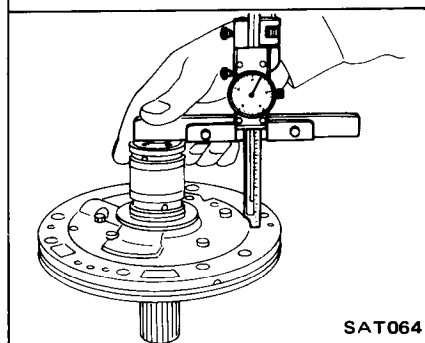
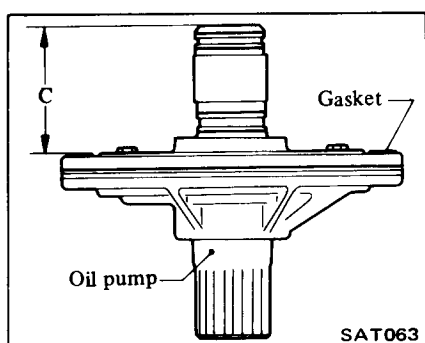
(3) Using a dial gauge or caliper with a seven inch base, measure from rear hub thrust bearing race to case (dimension A).



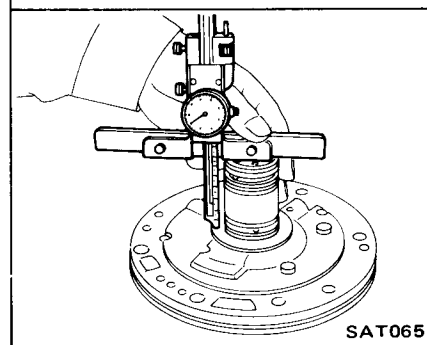
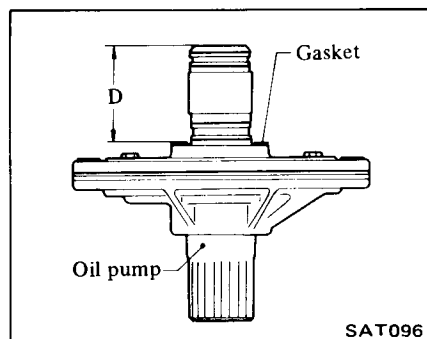
- 1 Dial gauge
- 2 High-reverse clutch (Front) drum
- 3 Transmission case
- 4 Bearing race
- 5 Thrust bearing
- 6 Forward clutch (Rear) drum



(5) Measure from top of oil pump shaft to gasket installed (dimension C).



(6) Install thrust washer. Measure from top of oil pump shaft to thrust washer (dimension D).



(7) Difference between dimension [A-0.1 mm (0.004 in)-B] and (C-D) is front end play and must be within specified value.

Specified front end play:
0.5 - 0.8 mm
(0.020 - 0.031 in)

Front end play can be adjusted with high-reverse clutch (Front) thrust washers of different thickness.

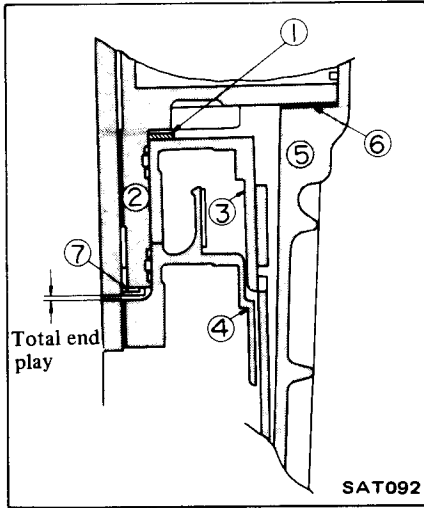
Available high-reverse clutch (Front) thrust washer

Thickness mm (in)	Part number
1.5 (0.059)	31528 X0106
1.7 (0.067)	31528 X0105
1.9 (0.075)	31528 X0100
2.1 (0.083)	31528 X0101
2.3 (0.091)	31528 X0102
2.5 (0.098)	31528 X0103
2.7 (0.106)	31528 X0104

(4) Assemble high-reverse clutch (Front) and forward clutch (Rear) drum assemblies together and lay them flat on bench. Be sure rear hub thrust bearing is properly seated. Meas-

17. Adjust total end play as follows:
 This adjustment is seldom required because this type of thrust bearing and

race will normally show very little wear. We also have a standard tolerance of 0.25 to 0.50 mm (0.0098 to 0.0197 in). However, we are presenting correct checking procedure.



- | | |
|---|-------------------------------|
| 1 High-reverse clutch (Front) thrust washer | 4 Forward clutch (Rear) |
| 2 Oil pump cover | 5 Transmission case |
| 3 High-reverse clutch (Front) | 6 Oil pump gasket |
| | 7 Oil pump cover bearing race |

(1) Measure dimension A using instructions in steps (1), (2) and (3) under No. 16 above.

(2) Measure dimension C using instructions in step (5) under No. 16 above.

(3) Difference between dimension [A-0.1 mm (0.004 in)] and C is total end play and it must be within specified value.

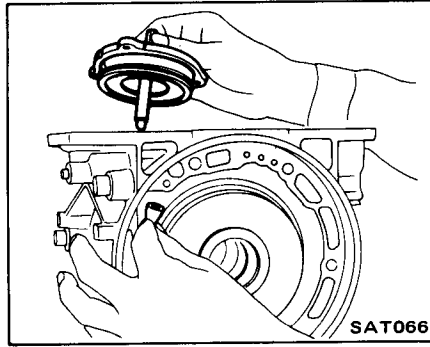
Specified total end play:
0.25 - 0.50 mm
(0.0098 - 0.0197 in)

If difference between [A-0.2 mm (0.008 in)] and C is not within tolerance, select proper size oil pump cover bearing race.

Available oil pump cover bearing race

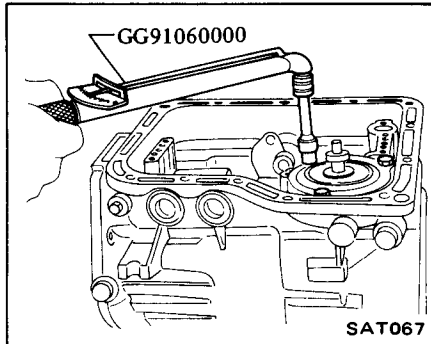
Thickness mm (in) -	Part number
1.2 (0.047)	31556 X0100
1.4 (0.055)	31556 X0101
1.6 (0.063)	31556 X0102
1.8 (0.071)	31556 X0103
2.0 (0.079)	31556 X0104
2.2 (0.087)	31556 X0105

18. Install brake band, band strut, and band servo. Lubricate servo O-rings before installing. **Care should be taken to avoid damaging O-rings when re-assembling.**

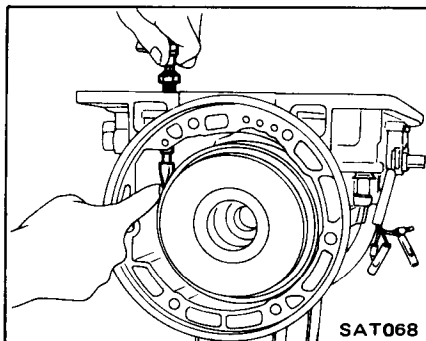


19. Install and torque the retainer bolts. Loosen piston stem.

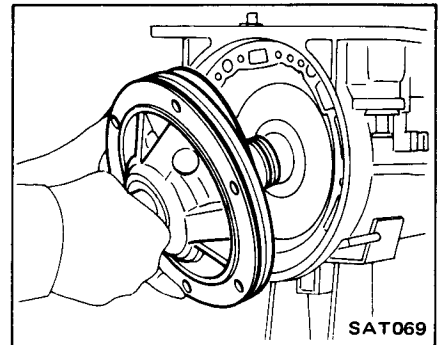
Ⓙ : Servo piston retainer bolt
4.9 - 6.9 N·m
(0.5 - 0.7 kg-m,
3.6 - 5.1 ft-lb)



20. Finger tighten brake band servo piston stem enough to prevent brake band and strut from falling out. **Do not adjust brake band at this time.**

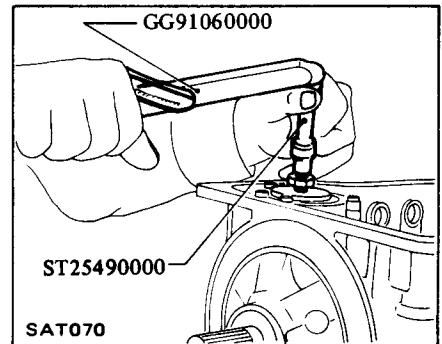


21. Mount oil pump gasket on oil pump with petroleum jelly. Align pump to transmission case and install.



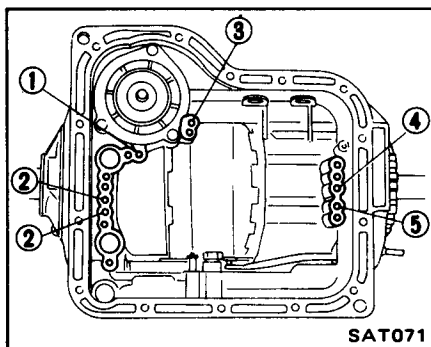
22. Adjust band. Make sure that brake band strut is correctly installed. Torque piston stem to specified value. Back off two full turns and secure with lock nut.

Ⓙ : Piston stem
12 - 15 N·m
(1.2 - 1.5 kg-m,
9 - 11 ft-lb)
Piston stem lock nut
15 - 39 N·m
(1.5 - 4.0 kg-m,
11 - 29 ft-lb)



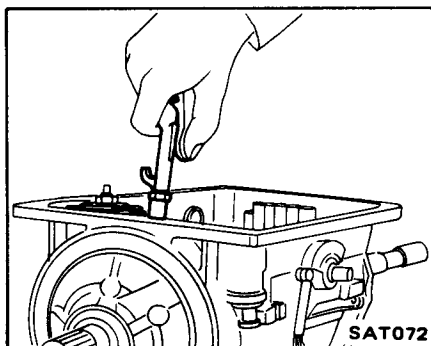
23. Before proceeding with installation of valve body assembly, perform a final air check of all assembled components. This will ensure that you have not overlooked tightening of any bolts or damaged any seals during assembly.

Air check point

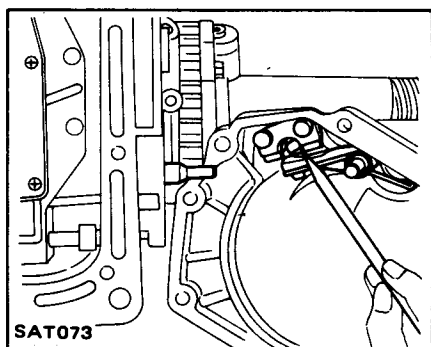


- 1 Band servo apply (9)
- 2 Forward clutch (Rear) (1)
- High-reverse clutch (Front) (11)
- 3 Band servo release (10)
- 4 Governor feed (1)
- 5 Low & reverse brake (12)

24. Using an air gun with a tapered rubber tip, perform air checks.



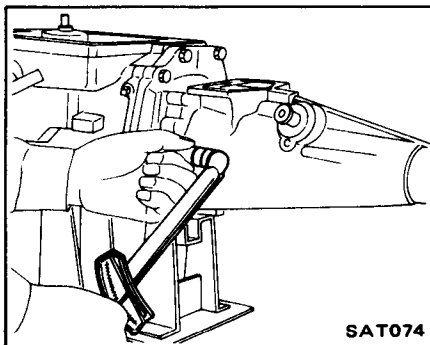
25. Check that parking pawl, pin, spring and washer are assembled correctly.



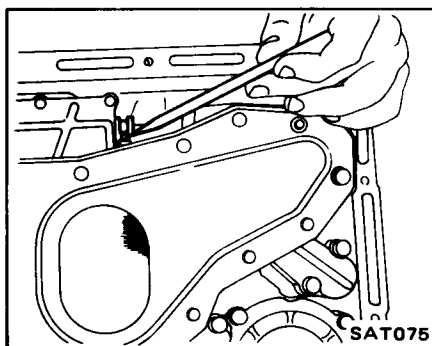
26. Install rear extension.

⊕ : Rear extension to transmission case

20 - 25 N·m
(2.0 - 2.5 kg-m,
14 - 18 ft-lb)



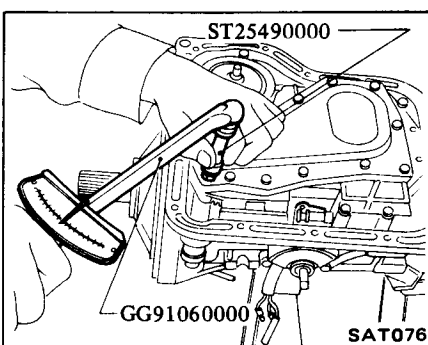
27. Install control valve body. Be sure manual valve is in alignment with selector pin.



28. Tighten control valve body attaching bolts.

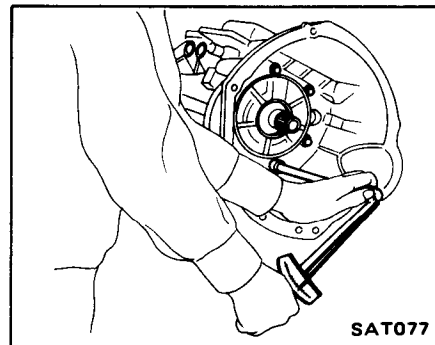
⊕ : 5.4 - 7.4 N·m
(0.55 - 0.75 kg-m,
4.0 - 5.4 ft-lb)

Control valve body attaching bolts vary in length. Care must be taken to ensure that each bolt is returned to correct hole.

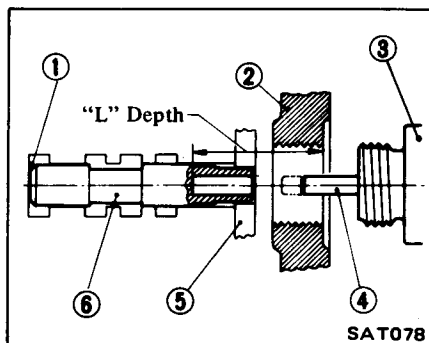


29. Check pump to transmission alignment and install converter housing.

⊕ : 44 - 54 N·m
(4.5 - 5.5 kg-m,
33 - 40 ft-lb)



30. Before installing vacuum diaphragm valve, measure depth of hole in which it is inserted. This measurement determines correct rod length to ensure proper performance.

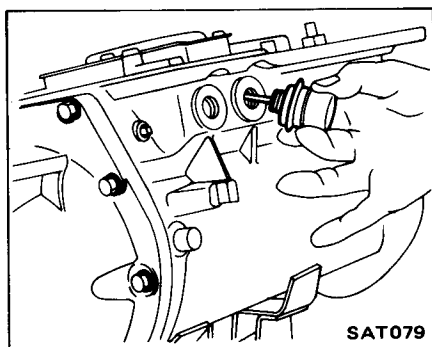


- 1 Note seated valve body
- 2 Transmission case wall
- 3 Vacuum diaphragm
- 4 Diaphragm rod
- 5 Valve body side plate
- 6 Vacuum throttle valve

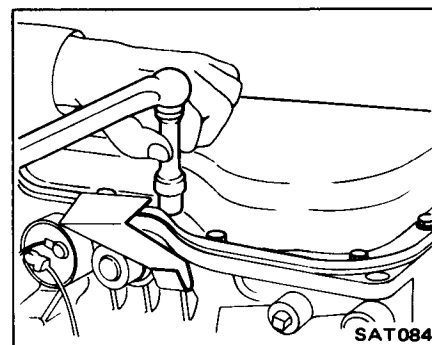
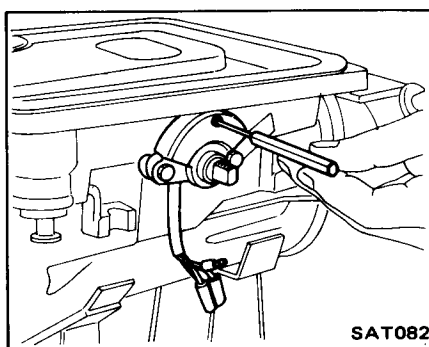
Vacuum diaphragm rod selection

Measured depth "L" mm (in)	Rod length mm (in)	Part number
Under 25.55 (1.0059)	29.0 (1.142)	31932 X0103
25.65 - 26.05 (1.0098 - 1.0256)	29.5 (1.161)	31932 X0104
26.15 - 26.55 (1.0295 - 1.0453)	30.0 (1.181)	31932 X0100
26.65 - 27.05 (1.0492 - 1.0650)	30.5 (1.201)	31932 X0102
Over 27.15 (1.0689)	31.0 (1.220)	31932 X0101

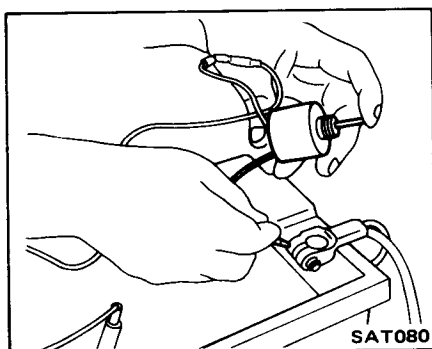
31. Install vacuum diaphragm.



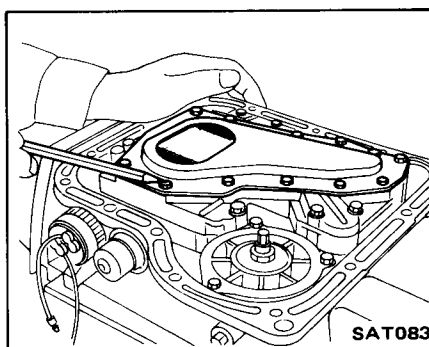
34. Install inhibitor switch. Check for proper operation in each range using a circuit tester. Refer to Minor Adjustment.



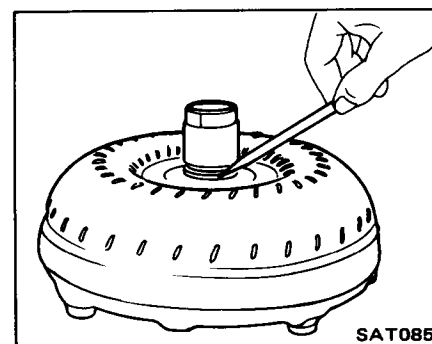
32. Before installing down shift solenoid, check to verify that it is operating properly. Use a hot lead and ground to check solenoid.



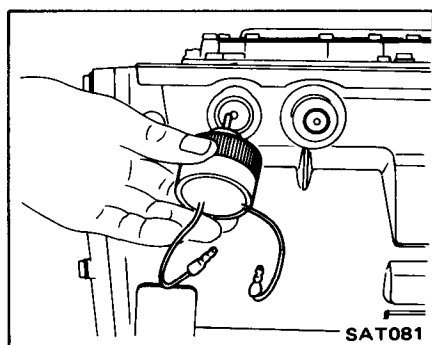
35. Before installing oil pan, check alignment and operation of control lever and parking pawl engagement. Blow mechanism with air to clean. Make final check to be sure all bolts are installed in valve body.



37. Carefully inspect torque converter for damage. Check converter hub for grooves caused by hardened seals. Also check bushing contact area.

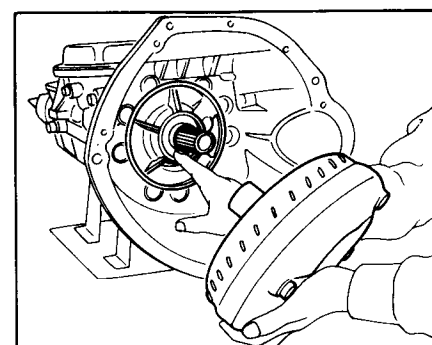


33. Install down shift solenoid.



38. Lubricate oil pump lip seal and converter neck before installing converter.

Install converter, being sure that converter is properly meshed with oil pump drive gear.



36. Install oil pan with new gasket.

Ⓙ : Oil pan to transmission case
 4.9 - 6.9 N·m
 (0.5 - 0.7 kg·m,
 3.6 - 5.1 ft·lb)

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

To properly check fluid level:

- 1) Place car on a level surface.
- 2) Put wheel chocks in place and apply parking brake securely.
- 3) Warm up engine on fast idle.
- 4) Return engine to curb idling speed.
- 5) Slowly move the gear selector through the entire shift pattern, and return it to park.
- 6) Remove the dipstick, clean it, and replace it fully in the filler tube.
- 7) Quickly remove it again and read the level.

The "L" mark on the dipstick indicates the transmission is approximately 0.4 liter (7/8 US pt, 3/4 Imp pt) low. Add only clean Dexron transmission fluid (or equivalent).

Fluid leakage

To detect a fluid leak:

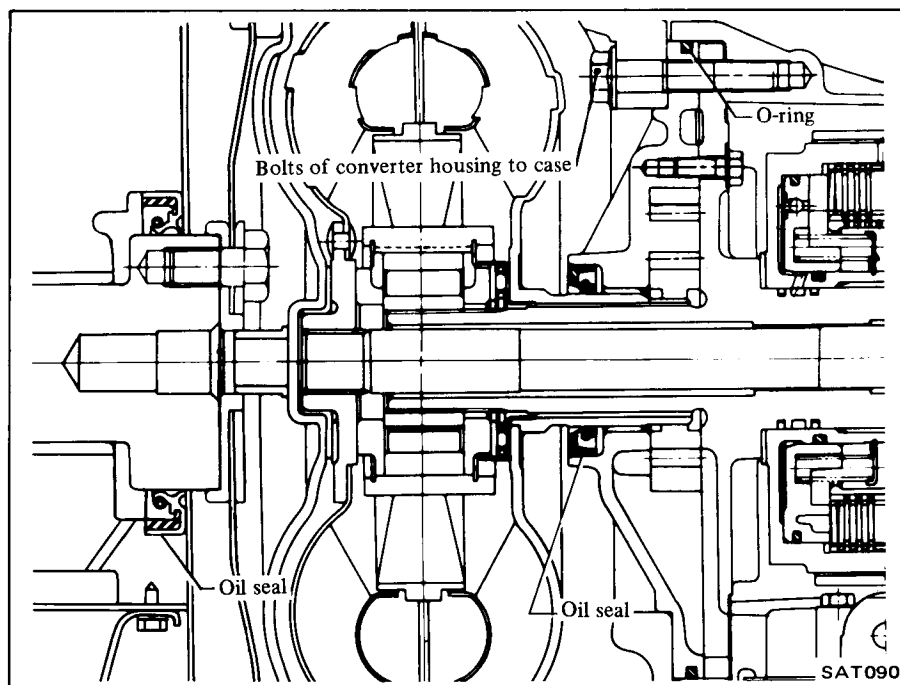
- 1) Raise car.
- 2) Clean area suspected of leaking.
- 3) Start engine, apply foot brake, place gear selector in drive, and wait a few minutes.
- 4) Stop engine.
- 5) Check for fresh leakage.

If the transmission breather is suspected:

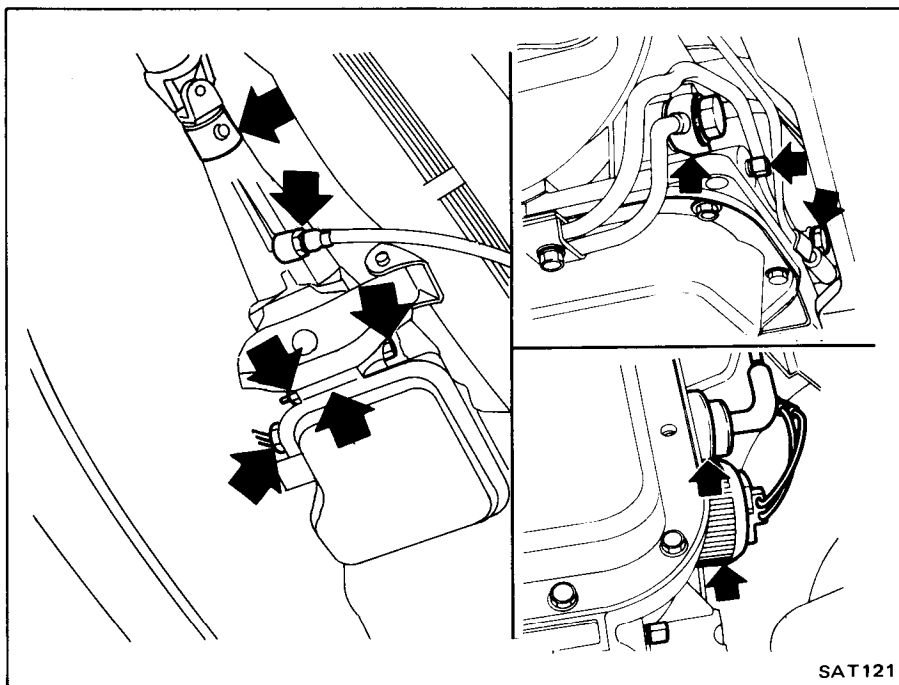
- 1) Raise car.
- 2) Clean the area around the breather.
- 3) Run the car at highway speeds.
- 4) Check the breather for fresh leakage.

To aid in locating leaks, use the following list of seals and gaskets.

- | | |
|--|---------------------------------------|
| 1) Converter housing | tion front seal). |
| • Rubber O-ring of oil pump housing. | • Crankshaft oil seal. |
| • Oil pump housing oil seal (transmis- | • Bolts of converter housing to case. |



- | | |
|--|--|
| 2) Transmission and rear extension. | • Vacuum diaphragm and downshift solenoid. |
| • Junction of transmission and rear extension. | • Speedometer pinion sleeve. |
| • Oil cooler tube connectors. | • Rear extension oil seal. |
| • Oil pressure inspection ports. | |



Fluid condition

Transmission fluid color and texture can aid greatly in transmission trouble-shooting. When checking fluid level, examine the transmission fluid and note its color, texture, and odor. Some common forms of contamination are listed below:

- 1) Dark or 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

L28E engine model

700±100 rpm at "D" range

L28ET engine model

650±50 rpm at "D" range

Engine oil and coolant levels

Prior to road testing, check engine oil and coolant levels, and fill as necessary.

Shift linkage

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 vacuum gauge and 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-43. It may be necessary to repeat sections of the test under different throttle conditions. (e.g. light, medium or full throttle.) After completing the road test, compare the test results to the Trouble-shooting Chart on page AT-40.

ROAD TESTING

1. Park Range

Place the gear selector 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. Mark all results on the Symptom Chart.

2. Reverse

Manually shift the gear selector 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 gear selector 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 gear selector 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 gear selector to range "2". Check for slippage, hesitation or abnormal condition. The transmission should remain in 2nd gear regardless of car speed or engine revolutions. Note results.

6. Range "1"

Manually shift the gear selector 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 transmission should not shift into 1st gear from "D" range if the car road speed is above approximately 70 km/h (45 MPH).

7. Record line pressure and governor pressure at each range and at each throttle vacuum in accordance with the pressure testing described below.

Car speed and line pressure when shifting gears (L28E engine model)

Intake manifold vacuum –kPa (–mmHg, –inHg)	Gearshift	Car speed * km/h (MPH)	Propeller shaft revolutions rpm	Line pressure kPa (kg/cm ² , psi)
0 (0, 0) (Kickdown)	D ₁ → D ₂	61 - 69 (38 - 43)	1,870 - 2,120	716 - 873 (7.3 - 8.9, 104 - 127)
	D ₂ → D ₃	104 - 112 (65 - 70)	3,210 - 3,460	
	D ₃ → D ₂	95 - 103, (59 - 64)	2,920 - 3,170	
	D ₂ → D ₁	46 - 54 (29 - 34)	1,420 - 1,670	
13.3 (100, 3.94)	D ₁ → D ₂	19 - 28 (12 - 17)	600 - 850	569 - 726 (5.8 - 7.4, 82 - 105)
	D ₂ → D ₃	59 - 67 (37 - 42)	1,830 - 2,080	
	D ₃ → D ₂	34 - 42 (21 - 26)	1,050 - 1,300	
	D ₂ → D ₁	11 - 19 (7 - 12)	350 - 600	
0 (0, 0) (Full throttle)	1 ₂ → 1 ₁	47 - 55 (29 - 34)	1,450 - 1,700	755 - 912 (7.7 - 9.3, 109 - 132)
40.0 (300, 11.81)	1 ₂ → 1 ₁	47 - 55 (29 - 34)	1,450 - 1,700	755 - 912 (7.7 - 9.3, 109 - 132)

***Car speed can be calculated by the following formula.**

$$V = 0.0324 \times N_p \left(= \frac{2 \times \pi \times r \times N_p \times 60}{R_F \times 1,000} \right)$$

where, **V** : Car speed (km/h)

N_p : Propeller shaft revolution (rpm)

R_F : Final gear ratio (3.545)

r : Tire effective radius (m), 195/70HR14 (0.305 m)

(**π** : The ratio of circumference of a circle
to its diameter : 3.14)

$$V = 0.0201 \times N_p \left(= \frac{2 \times \pi \times r \times N_p \times 60}{R_F \times 63,360} \right)$$

where, **V** : Car speed (MPH)

N_p : Propeller shaft revolution (rpm)

R_F : Final gear ratio (3.545)

r : Tire effective radius (in), 195/70HR14 (12.01 in)

(**π** : The ratio of circumference of a circle
to its diameter : 3.14)

Car speed and line pressure when shifting gears (L28ET engine model)

Intake manifold vacuum kPa (mmHg, inHg)	Gearshift	Car speed * km/h (MPH)	Propeller shaft revolutions rpm	Line pressure kPa (kg/cm ² , psi)
46.7 (350, 13.78) (Kickdown)	D ₁ → D ₂	62 - 70 (38 - 43)	1,900 - 2,150	569 - 686 (5.8 - 7.0, 82 - 100)
	D ₂ → D ₃	92 - 100 (57 - 62)	2,840 - 3,090	
	D ₃ → D ₂	92 - 84 (57 - 52)	2,820 - 2,570	
	D ₂ → D ₁	46 - 38 (29 - 24)	1,430 - 1,180	
0 (0, 0)	D ₁ → D ₂	25 - 33 (16 - 21)	780 - 1,030	559 - 657 (5.7 - 6.7, 81 - 95)
	D ₂ → D ₃	73 - 82 (46 - 51)	2,260 - 2,510	
	D ₃ → D ₂	50 - 42 (31 - 26)	1,550 - 1,300	
	D ₂ → D ₁	20 - 11 (12 - 7)	600 - 350	
-26.7 (-200, -7.87)	D ₁ → D ₂	13 - 21 (8 - 13)	400 - 650	382 - 481 (3.9 - 4.9, 55 - 70)
	D ₂ → D ₃	26 - 34 (16 - 21)	790 - 1,040	
	D ₃ → D ₂	20 - 11 (12 - 7)	600 - 350	
	or			
	D ₃ → D ₁		600 - 350	
D ₂ → D ₁	20 - 11 (12 - 7)	600 - 350		
46.7 (350, 13.78)	l ₂ → l ₁	38 - 46 (24 - 29)	1,180 - 1,430	569 - 696 (5.8 - 7.1, 82 - 101)
-60.0 (-450, -17.72)	l ₂ → l ₁	38 - 46 (24 - 29)	1,180 - 1,430	569 - 696 (5.8 - 7.1, 82 - 101)

 : means negative pressure.

*Car speed can be calculated by the following formula.

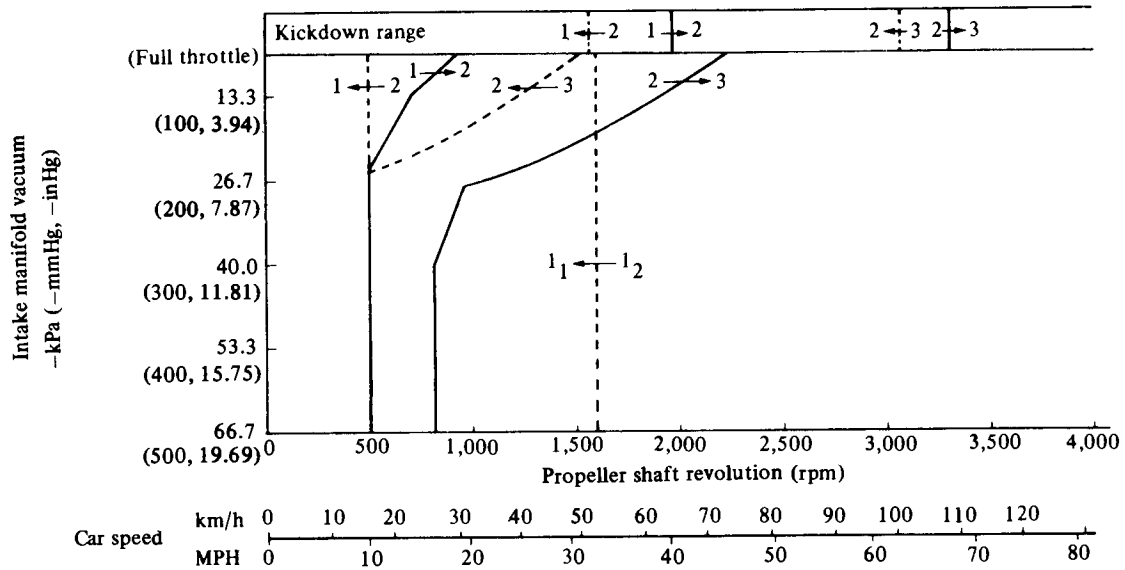
$$V = 0.0325 \times N_p \left(= \frac{2 \times \pi \times r \times N_p \times 60}{R_F \times 1,000} \right)$$

where, V : Car speed (km/h)
 N_p : Propeller shaft revolution (rpm)
 R_F : Final gear ratio (3.545)
 r : Tire effective radius (m), P205/60 R15 (0.306 m)
 (π : The ratio of circumference of a circle
 to its diameter : 3.14)

$$V = 0.0202 \times N_p \left(= \frac{2 \times \pi \times r \times N_p \times 60}{R_F \times 63,360} \right)$$

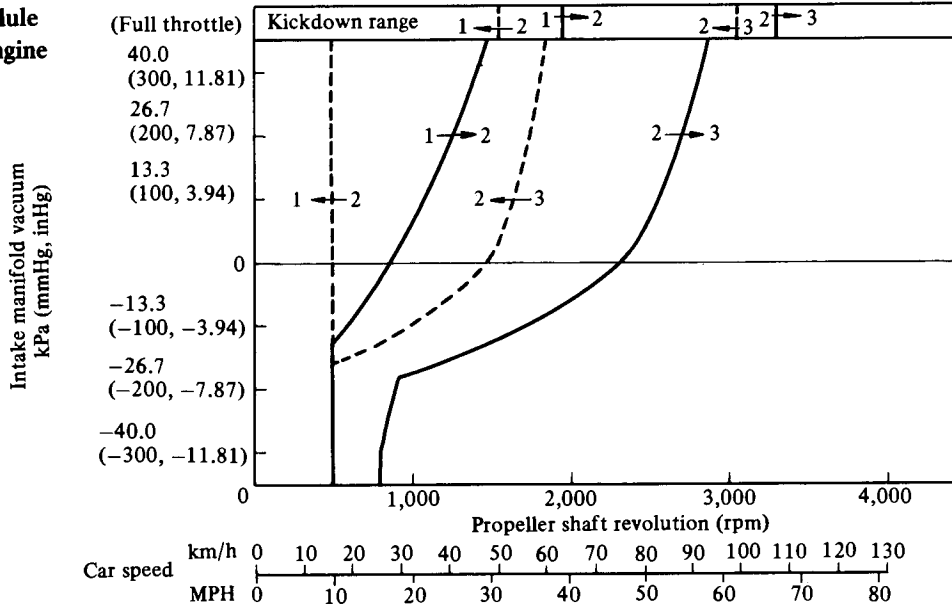
where, V : Car speed (MPH)
 N_p : Propeller shaft revolution (rpm)
 R_F : Final gear ratio (3.545)
 r : Tire effective radius (in), P205/60 R15 (12.05 in)
 (π : The ratio of circumference of a circle
 to its diameter : 3.14)

Shift schedule (L28E engine model)



AT433

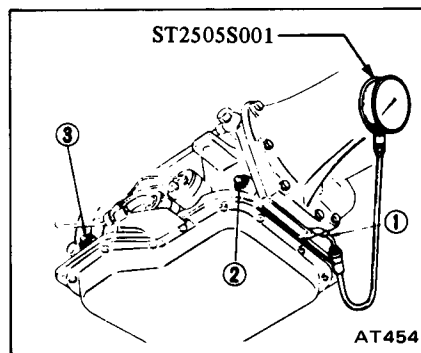
Shift schedule (L28ET engine model)



SAT222

PRESSURE TESTING

The 3N71B transmission is provided with three pressure test ports. Only two are useful for transmission trouble-shooting, Line Pressure and Governor Pressure.



- 1 Line pressure
- 2 Governor pressure
- 3 Servo release 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 ① and when in "R" range, install pressure gauge to port ③ 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 (L28E engine model)

Range	Line pressure kPa (kg/cm ² , psi)
R	510 - 696 (5.2 - 7.1, 74 - 101)
D	314 - 373 (3.2 - 3.8, 46 - 54)
2	775 - 1,353 (7.9 - 13.8, 112 - 196)
1	314 - 373 (3.2 - 3.8, 46 - 54)

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.

At idling (L28ET engine model)

Range	Line pressure kPa (kg/cm ² , psi)
R	392 - 490 (4.0 - 5.0, 57 - 71)
D	294 - 392 (3.0 - 4.0, 43 - 57)
2	588 - 1,177 (6.0 - 12.0, 85 - 171)
1	294 - 392 (3.0 - 4.0, 43 - 57)

At stall test (L28E engine model)

Range	Line pressure kPa (kg/cm ² , psi)
R	2,089 - 2,393 (21.3 - 24.4, 303 - 347)
D	1,128 - 1,275 (11.5 - 13, 164 - 185)
2	1,206 - 1,353 (12.3 - 13.8, 175 - 196)
1	1,128 - 1,275 (11.5 - 13, 164 - 185)

At stall test (L28ET engine model)

Range	Line pressure kPa (kg/cm ² , psi)
R	2,158 - 2,452 (22.0 - 25.0, 313 - 356)
D	1,785 - 1,942 (18.2 - 19.8, 259 - 282)
2	1,785 - 1,942 (18.2 - 19.8, 259 - 282)
1	1,785 - 1,942 (18.2 - 19.8, 259 - 282)

Cut-back point

The cut-back point indicates a point where line pressure changes from high to low value as output shaft

rotation is gradually increased from “stall” point. The car speed and output shaft rotation at that cut-back point are as indicated in chart below.

L28E engine model

Intake manifold vacuum –kPa (–mmHg, –inHg)	Car speed km/h (MPH)	Propeller shaft revolutions rpm
0 (0, 0)	34 - 42 (21 - 26)	1,040 - 1,290
13.3 (100, 3.94)	19 - 28 (12 - 17)	600 - 850

L28ET engine model

Intake manifold vacuum kPa (mmHg, inHg)	Car speed km/h (MPH)	Propeller shaft revolutions rpm
46.7 (350, 13.78)	43 - 53 (27 - 33)	1,320 - 1,620
–26.7 (–200, –7.87)	13 - 20 (8 - 12)	400 - 600

 : means negative pressure.

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.

CAUTION:

- a. Transmission 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 transmission.

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 transmission.

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:

L28E engine model

2,000 - 2,300 rpm

L28ET engine model

2,400 - 2,700 rpm

6. Place shift 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 transmission, and sprag clutch of torque converter, are functioning properly.
2. Stall revolution in “D” range, 1st gear, is above 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 sprag clutch is faulty (slipping), or engine is not performing properly.

If converter sprag clutch is frozen, car will have poor high speed performance. If converter sprag clutch is slipping, car 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 transmission must be removed from the car.

TROUBLE-SHOOTING CHART	ON CAR												OFF CAR										
	Oil level	Range select linkage	Inhibitor switch and wiring	Vacuum diaphragm and piping	Kickdown solenoid, switch and wiring	Engine idling rpm	Throttle pressure	Manual valve	Governor	Band servo	Transmission 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	Transmission one-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	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Transmission 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	. . .	. . .	. . .	. . .	. . .	. . .
	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 transmission must be removed from the car.

	ON CAR					OFF CAR		
	Oil level Range select linkage Vacuum diaphragm and piping	Kickdown solenoid, switch and wiring Throttle pressure Engine stall rpm	Manual valve Governor Band servo	Transmission 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	Transmission 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 over-runs 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 transmission must be removed from the car.

	ON CAR												OFF CAR									
	Oil level	Range select linkage	Vacuum diaphragm and piping	Engine idling rpm	Throttle pressure	Engine stall rpm	Rear lubrication	Manual valve	Governor	Band servo	Transmission 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	Transmission 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 "1st" or 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	.	.	.	.	.	.
Transmission 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									

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										
	Decel. 3-2										
	Kickdown 3-2										
	Decel. 2-1										
	Kickdown 2-1										
“2” RANGE	Man. shift D-2										
	2nd										
“1” RANGE	Man. shift 2-1										
	Man. shift D-1										
	Acceleration										
	“1” Engine Braking										

TROUBLE-SHOOTING GUIDE FOR 3N71B AUTOMATIC TRANSMISSION

Order	Test item	Procedure
Checking	<ol style="list-style-type: none"> 1. Oil level gauge 2. Downshift solenoid 3. Manual linkage 4. Inhibitor switch 5. Engine idling rpm. 6. Vacuum pressure of vacuum pipe. 7. Operation in each range. 8. Creep of car. 	<p>Check gauge for oil level and leakage before and after each test.</p> <p>Check for sound of operating solenoid when depressing accelerator pedal fully with ignition key "ON".</p> <p>Check by shifting into "P", "R", "N", "D", "2" and "1" ranges with selector lever.</p> <p>Check whether starter operates in "N" and "P" ranges only and whether reverse lamp operates in "R" range only.</p> <p>Check whether idling rpm meet standard.</p> <p>Check whether vacuum pressure is more than 60.0 kPa (450 mmHg, 17.72 inHg) in idling and whether it decreases with increasing rpm.</p> <p>Check whether transmission engages positively by shifting "N" → "D", "N" → "2", "N" → "1" and "N" → "R" range while idling with brake applied.</p> <p>Check whether there is any creep in "D", "2", "1" and "R" ranges.</p>
Stall test	<ol style="list-style-type: none"> 1. Oil pressure before testing. 2. Stall test. 3. Oil pressure after testing 	<p>Measure line pressures in "D", "2", "1" and "R" range while idling.</p> <p>Measure engine rpm and line pressure in "D", "2", "1" and "R" ranges during full throttle operation.</p> <p>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.</p> <hr/> <p>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.</p> <hr/> <p>Same as item 1.</p>
Road test	<ol style="list-style-type: none"> 1. Slow acceleration, 1st → 2nd 2nd → 3rd 2. Quick acceleration, 1st → 2nd 2nd → 3rd 3. Kick-down operation, 3rd → 2nd or 2nd → 1st 	<p>Check car speeds and engine rpm in shifting up 1st → 2nd range and 2nd → 3rd range while running with lever in "D" range and engine vacuum pressure of about 13.3 kPa (100 mmHg, 3.94 inHg).</p> <p>Same as item 1 above except with engine vacuum pressure of 0 kPa (0 mmHg, 0 inHg) (i.e., in position just before kickdown).</p> <p>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 "D₃" range.</p>

Order	Test item	Procedure
	<p>4. Shift down, D₃ → D₂ → D₁</p> <p>5. Shift down, D₃ → 1₂ → 1₁</p> <p>6. Shift down, D₃ → 2</p> <p>7. Shift up, 1₁ → 1₂</p> <p>8. Shift up or down when start- ing in “2” range.</p> <p>9. Parking.</p>	<p>Check car speeds and engine rpm in shifting down from 3rd → 2nd → 1st (sequentially) while coasting with accelerator pedal released in “D₃” range and engine vacuum pressure of about 60.0 kPa (450 mmHg, 17.72 inHg).</p> <p>Check for shifting down D₃ → 1₂ and engine braking, and further for shifting down 1₂ → 1₁ and engine braking after shifting the lever into “1” range with the accelerator pedal released and the engine vacuum pressure of 0 kPa (0 mmHg, 0 inHg) while driving at about 50 km/h (30 MPH) in “D₃” range.</p> <p>Check for quick shifting down D₃ → 2 and engine braking, after shifting the lever into “2” range while driving at about 50 km/h (30 MPH) in “D₃” range.</p> <p>Also, check for locking of the transmission in 2nd gear ratio regardless of car speed.</p> <p>Check for failure of the transmission to shift up during acceleration, when starting in “1” range.</p> <p>Check the transmission for not shifting up or down during acceleration or deceleration, when starting in “2” range.</p> <p>Confirm that car will not move on grade when shifting to “P” range.</p>
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

Automatic transmission model		3N71B
Stall torque ratio		2.0 : 1
Transmission gear ratio	1st	2.458
	2nd	1.458
	Top	1.000
	Reverse	2.182
Oil		Automatic transmission fluid "Dexron" type
Oil capacity		5.5 liters (5-7/8 US qt, 4-7/8 Imp qt)

Specifications and adjustment

Engine model		L28E	L28ET
Automatic transmission assembly Model code number		X2707	X2770
Torque converter assembly Stamped mark on the T/C		G	A
High-reverse clutch (Front)	Number of drive plates	3	4
	Number of driven plates	3	5
	Clearance mm (in)	1.6 - 2.0 (0.063 - 0.079)	
	Thickness of retaining plate	Thickness mm (in)	Part number
		5.0 (0.197) 5.2 (0.205) 5.4 (0.213) 5.6 (0.220) 5.8 (0.228) 6.0 (0.236) 6.2 (0.244)	31567-X2900 31567-X2901 31567-X2902 31567-X2903 31567-X2904 31567-X2905 31567-X2906

Engine model		L28E		L28ET	
For-ward clutch (Rear)	Number of drive plates	5		6	
	Number of driven plates	5		6	
	Clearance mm (in)	0.8 - 1.6 (0.031 - 0.063)			
	Thickness of retaining plate mm (in)	8.35 (0.3287)		4.8 (0.1890)	
Low & reverse brake	Number of drive plates	5		7	
	Number of driven plates	5		7	
	Clearance mm (in)	0.80 - 1.25 (0.0315 - 0.0492)			
	Thickness of retaining plate	Thickness mm (in)	Part number		
		7.8 (0.307)	31667-X0500		
		8.0 (0.315)	31667-X0501		
8.2 (0.323)		31667-X0502			
8.4 (0.331)		31667-X0503			
8.6 (0.339)	31667-X0504				
8.8 (0.346)	31667-X0505				
Brake band		64 (2.52)		72 (2.83)	
Piston size					
Big dia. mm (in)		40 (1.57)		44 (1.73)	
Small dia.					
Control valve assembly		MEK		TRBK	
Stamped mark on strainer					
Governor assembly		M33			
Stamped mark on governor body					

Stall revolution

Engine model		L28E	L28ET
Stall revolution rpm		2,000 - 2,300	2,400 - 2,700

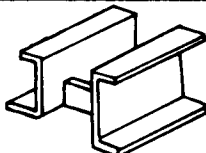
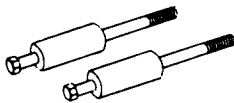
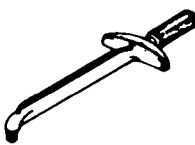
Tightening torque

Unit	N·m	kg·m	ft·lb
Drive plate to crankshaft	137 - 157	14.0 - 16.0	101 - 116
Drive plate to torque converter	39 - 49	4.0 - 5.0	29 - 36
Converter housing to engine	39 - 49	4.0 - 5.0	29 - 36
Transmission case to converter housing	44 - 54	4.5 - 5.5	33 - 40
Transmission case to rear extension	20 - 25	2.0 - 2.5	14 - 18
Oil pan to transmission case	4.9 - 6.9	0.5 - 0.7	3.6 - 5.1
Servo piston retainer to transmission case	4.9 - 6.9	0.5 - 0.7	3.6 - 5.1
Piston stem (when adjusting band brake)	*12 - 15	*1.2 - 1.5	*9 - 11
Piston stem lock nut	15 - 39	1.5 - 4.0	11 - 29
One-way clutch inner race to transmission case	13 - 18	1.3 - 1.8	9 - 13
Control valve body to transmission case	5.4 - 7.4	0.55 - 0.75	4.0 - 5.4
Lower valve body to upper valve body	2.5 - 3.4	0.25 - 0.35	1.8 - 2.5

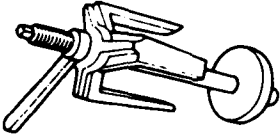
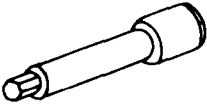
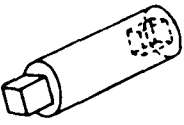
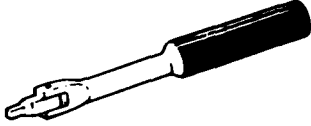

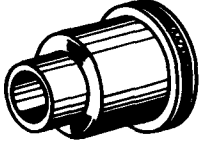
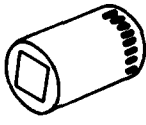

Unit	N·m	kg·m	ft·lb
Side plate to control valve body	2.5 - 3.4	0.25 - 0.35	1.8 - 2.5
Nut for control valve reamer bolt	4.9 - 6.9	0.5 - 0.7	3.6 - 5.1
Oil strainer to lower valve body	2.9 - 3.9	0.3 - 0.4	2.2 - 2.9
Governor valve body to oil distributor	4.9 - 6.9	0.5 - 0.7	3.6 - 5.1
Oil pump housing to oil pump cover	5.9 - 7.8	0.6 - 0.8	4.3 - 5.8
Inhibitor switch to transmission case	4.9 - 6.9	0.5 - 0.7	3.6 - 5.1
Manual shaft lock nut	29 - 39	3.0 - 4.0	22 - 29
Oil cooler pipe to transmission case	29 - 49	3.0 - 5.0	22 - 36
Test plug (oil pressure inspection hole)	14 - 21	1.4 - 2.1	10 - 15
Support actuator (parking rod inserting position) to rear extension	7.8 - 10.8	0.8 - 1.1	5.8 - 8.0

* Turn back two turns after tightening.

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
ST07870000 (-) (ST07860000) (J25605)	Transmission case stand 
ST25850000 (J25721)	Sliding hammer 
GG91060000 (-) (GG93010000) (J25703)	Torque wrench 

Special Service Tools – AUTOMATIC TRANSMISSION

Tool number (Kent-Moore No.)	Tool name
ST25420001 (J26063) (ST25420000) (J26063)	Clutch spring compressor 
ST25570001 (J23659) (ST25570000) (J23659)	Hex-head extension 
ST25490000 (-) (ST25512001) (J25713)	Socket extension 
HT62350000 (-)	Spinner handle 
ST25160000 (-)	Torque driver 
ST25580001 (J25719)	Oil pump assembling gauge 
HT61000800 (-)	Hexagon wrench 
ST2505S001 (J25695)	Oil pressure gauge set 

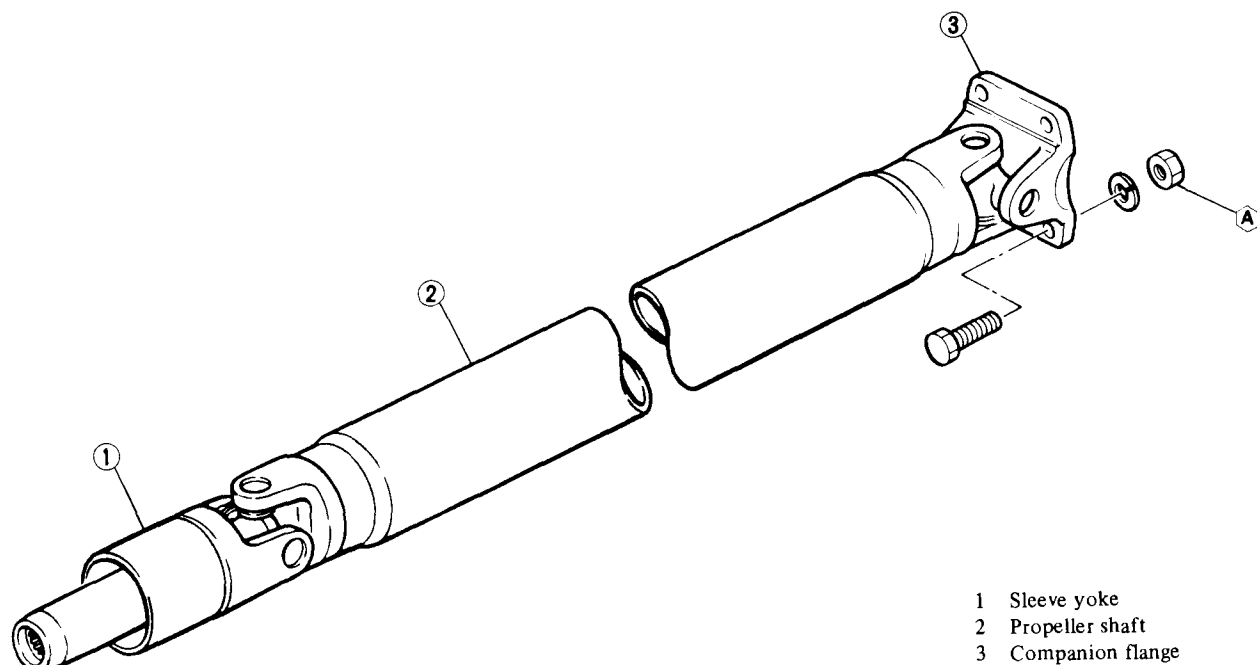
PROPELLER SHAFT & DIFFERENTIAL CARRIER

Service Data

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FRONT OIL SEAL	PD-10	TIGHTENING TORQUE	PD-23
SIDE OIL SEAL	PD-11	TROUBLE DIAGNOSES AND	
DIFFERENTIAL CARRIER		CORRECTIONS	PD-24
(Type R200)	PD-12	PROPELLER SHAFT	PD-24
REMOVAL	PD-12	DIFFERENTIAL CARRIER	PD-24
PRE-DISASSEMBLY INSPECTION	PD-13	SPECIAL SERVICE TOOLS	PD-26
DISASSEMBLY	PD-13		

PROPELLER SHAFT



- 1 Sleeve yoke
- 2 Propeller shaft
- 3 Companion flange

Tightening torque N-m (kg-m, ft-lb)

Ⓐ : 34 - 44 (3.5 - 4.5, 25 - 33)

PD427

Fig. PD-1 Propeller Shaft

INSPECTION

1. Check journal for axial play. If play exists, replace propeller shaft assembly.

Note: Journal cannot be disassembled.

2. Check the propeller shaft tube surface for dents or cracks. If necessary, replace propeller shaft assembly.

4. Draw out propeller shaft sleeve yoke from transmission by moving shaft rearward, passing it under rear axle.

Watch for oil leakage from transmission rear end. Take proper action if oil leak is discovered.

Note: Remove propeller shaft carefully so as not to damage the spline, sleeve yoke or rear oil seal.

Ⓐ : Propeller shaft to companion flange bolts

34 - 44 N-m
(3.5 - 4.5 kg-m,
25 - 33 ft-lb)

REMOVAL

1. Raise car on hoist.

Remove front exhaust tube and heat shield plate to free them from car body. (Only for California model)

2. Scribe match marks both on propeller shaft and companion flange so that shaft can be reinstalled in the original position.

3. Remove bolts securing shaft to companion flange.

INSTALLATION

To install, reverse the foregoing removal procedure.

CAUTION:

Align propeller shaft with companion flange using reference marks prescribed in "Removal" procedure and tighten them with bolts. Failure to do so could result in driving vibration.

CHECKING AND CORRECTING UNBALANCED PROPELLER SHAFT

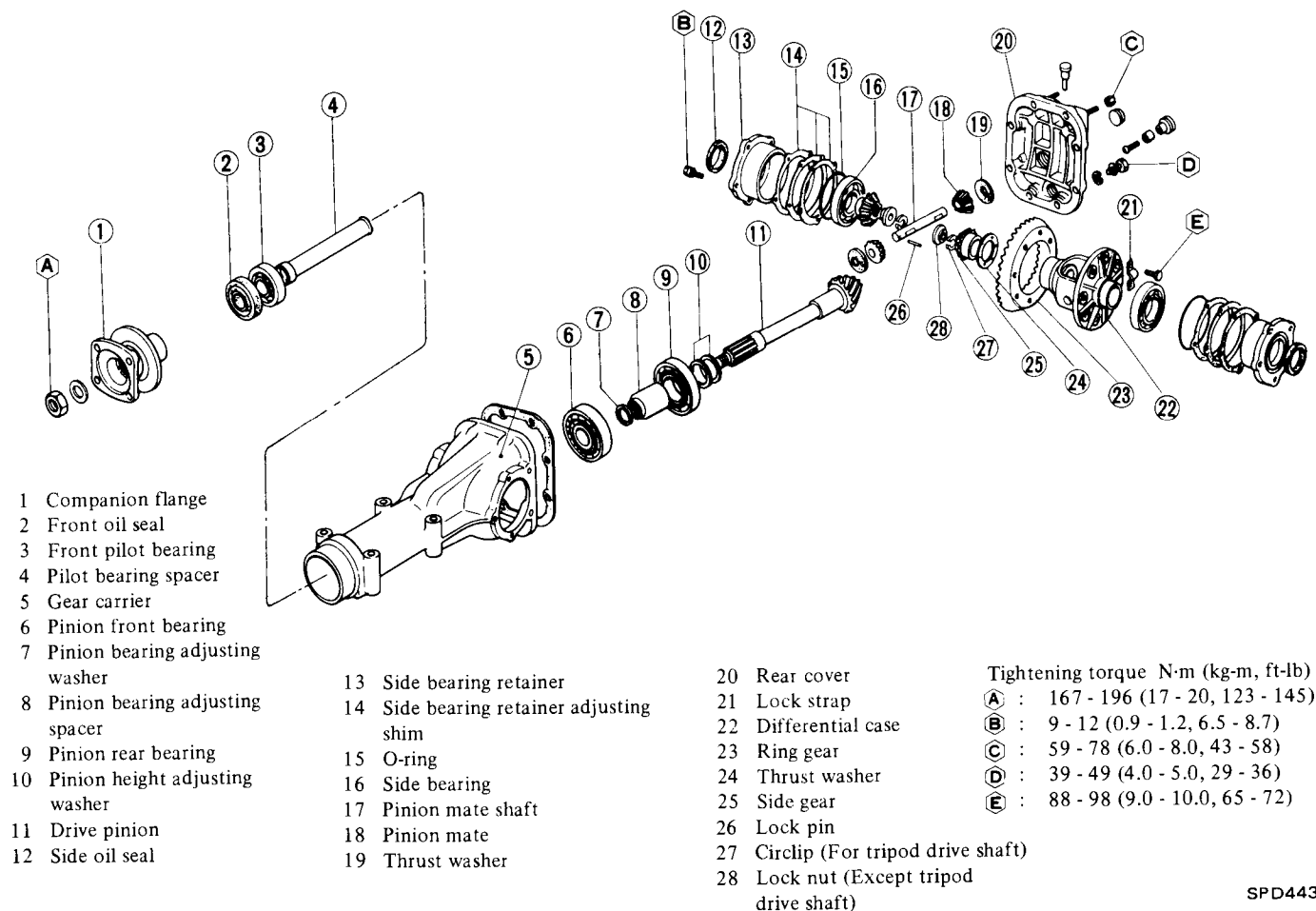
To check and correct an unbalanced propeller shaft, proceed as follows:

1. Remove undercoating and other foreign material which could upset shaft balance, and check shaft vibration by road test.

2. If shaft vibration is noted during road test, disconnect propeller shaft at differential carrier companion flange, rotate companion flange 180 degrees and reinstall propeller shaft.

3. Again check shaft vibration. If vibration still persists, replace propeller shaft assembly.

DIFFERENTIAL CARRIER (Type R180)



SPD443

Fig. PD-2 Differential Carrier (R180)

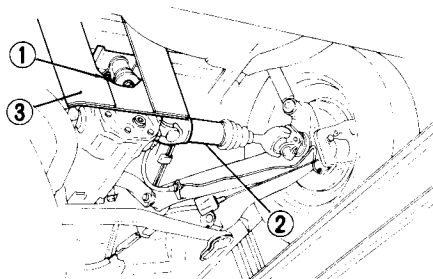
REMOVAL

1. Jack up rear of car and support on safety stands. Drain gear oil.
2. Disconnect propeller shaft at companion flange.
3. Disconnect drive shafts ② on the wheel side. See Fig. PD-3.
4. Remove side yoke fixing bolts, and extract side yokes together with drive shafts (except tripod type drive shaft).
5. Draw out drive shaft (tripod type drive shaft). Refer to section RA.

CAUTION:

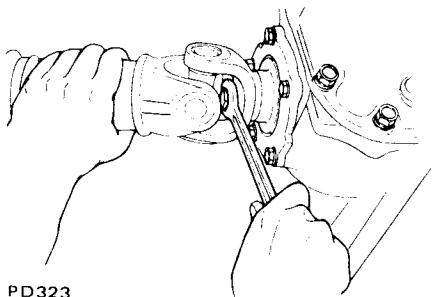
Be careful not to damage side yoke and oil seal when removing.

6. Remove plate ③. See Fig. PD-3.
7. With differential carrier jacked up, remove nuts ①.



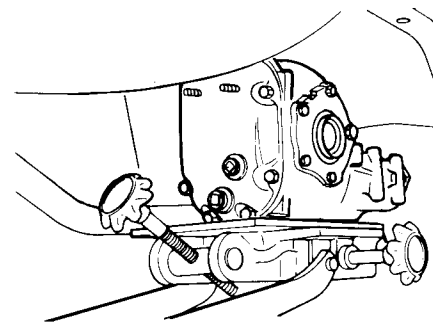
PD470

Fig. PD-3 Under View



PD323

Fig. PD-4 Removing Side Yoke Fixing Bolt



PD469

Fig. PD-5 Removing Differential Carrier

After differential carrier is removed, support suspension member on a stand to prevent its insulators being twisted or damaged.

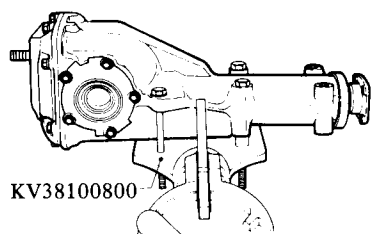
Note: Do not place the center of suspension member on the stand before removal operation. Otherwise, it will be difficult to extract the differential carrier.

PRE-DISASSEMBLY INSPECTION

Differential carrier should be inspected before any parts are removed from it.

These inspections are helpful in finding the cause of the malfunction and in determining the corrections needed.

1. Mount differential carrier on Diff. Attachment KV38100800. Remove differential mounting member and rear cover.



PD471

Fig. PD-6 Holding Differential Carrier

2. Visually inspect parts for wear or damage.
3. Rotate gears to see that there is any roughness which would indicate damaged bearings or chipped gears. Check gear teeth for scoring or signs of abnormal wear. Measure preload of drive pinion.
4. Set up a dial indicator and check backlash at several points around ring gear. Backlash should be specified value.

Ring gear-to-drive pinion backlash:
0.10 - 0.20 mm
(0.0039 - 0.0079 in)

5. Check the gear tooth contact with a mixture of recommended powder and oil applied sparingly to all ring gear teeth.

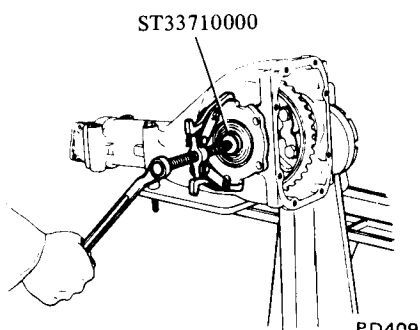
For the tooth contact pattern, see paragraph dealing with tooth contact pattern adjustment.

DISASSEMBLY

1. Remove side retainers, using Diff. Side Retainer Attachment ST33710000 and suitable puller.

Note:

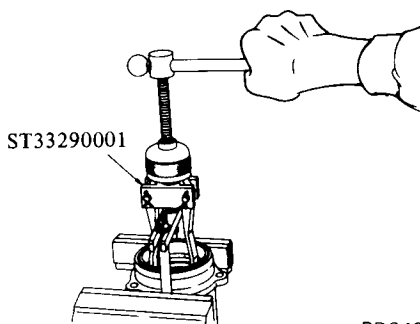
- a. Mark right and left side retainers before removal.
- b. Be careful not to confuse right and left hand side retainers and shims for proper reassembly.



PD409

Fig. PD-7 Removing Side Retainer

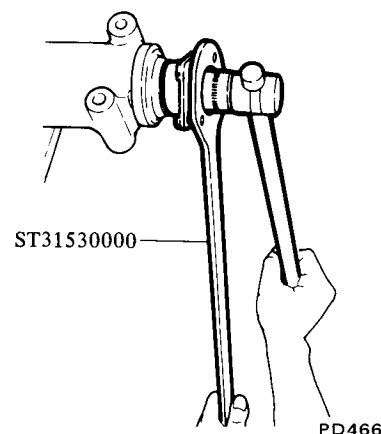
2. Extract differential case assembly from gear carrier.
3. When replacing side bearing, extract bearing outer race from side retainer using Side Bearing Outer Race Puller ST33290001.



PD243

Fig. PD-8 Removing Side Bearing Outer Race

4. Remove drive pinion nut, holding companion flange with Drive Pinion Flange Wrench ST31530000 and pull off companion flange using a suitable puller.



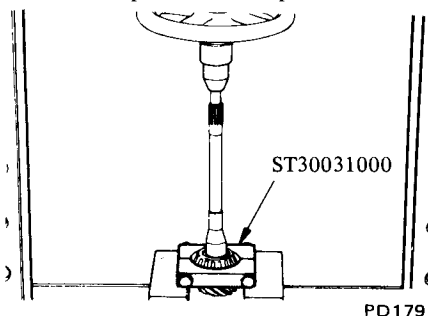
PD466

Fig. PD-9 Removing Drive Pinion Nut

5. Extract drive pinion from gear carrier using a press machine. Take out drive pinion together with rear bearing inner race, bearing spacer and adjusting washers.
6. Remove front oil seal from gear carrier.

Note: Oil seal must not be reused.

7. Remove pilot bearing together with pilot bearing spacer and front bearing cone using Pilot Bearing Drift ST30650001.
8. Hold rear bearing inner race with Drive Pinion Rear Bearing Inner Race Puller ST30031000 and extract from drive pinion with a press.



PD179

Fig. PD-10 Removing Pinion Rear Bearing Inner Race

9. To remove front and rear bearing outer races, put a drift to race surface, and withdraw them by tapping top of drift with a hammer.

DIFFERENTIAL CASE

1. Extract bearing inner race from differential case assembly using Differential Side Bearing Puller Set ST3306S001.

Body: ST33051001
Adapter: ST33061000

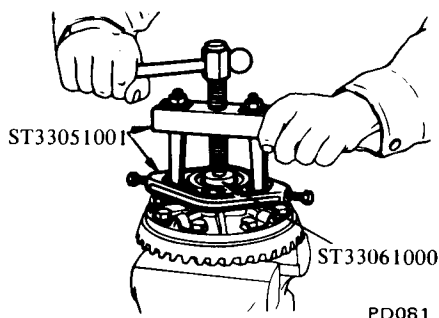


Fig. PD-11 Removing Side Bearing

Note:

- The puller should be handled with care in catching the edge of bearing inner race.
- Be careful not to confuse the right and left hand parts.

- Remove ring gear by spreading out lock strap and loosening ring gear bolts diagonally.
- Punch off pinion mate shaft lock pin from ring gear side using Solid Punch KV31100300.

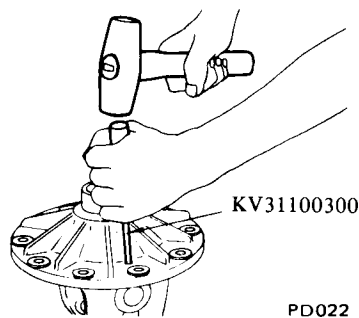


Fig. PD-12 Removing Lock Pin

- Draw out pinion mate shaft and remove pinion mate gears, side gears and thrust washers.

Note: Put marks on gear and thrust washer so that they can be reinstalled in their original positions from which they were removed.

INSPECTION

Thoroughly clean all disassembled parts, and examine them to see that they are worn, damaged or otherwise faulty, and how they are affected. Repair or replace all faulty parts, whichever is necessary.

- Check gear teeth for scoring, cracking or chipping, and make sure that tooth contact pattern indicates correct meshing depth. If any fault is evident, replace parts as required.

Note: Drive pinion and ring gear are supplied for replacement as a set, therefore, should either part be damaged, replace as a set.

- Check pinion gear shaft, and pinion gear for scores and signs of wear, and replace as required.

Follow the same procedure for side gear and their seats on differential case.

- Inspect all bearing races and rollers for scoring, chipping or evidence of excessive wear. They should be in tiptop condition such as not worn and with mirror-like surfaces. Replace if there is a shadow of doubt on their efficiency, as incorrect bearing operation may result in noises and gear seizure.

- Inspect thrust washer faces. Small damage can be corrected with sand paper. If pinion mate to side gear backlash (or the clearance between side gear and thrust washer) exceeds the specified value, replace thrust washers.

Pinion mate-to-side gear backlash:

For tripod drive shaft

Less than 0.15 mm
(0.0059 in)

Except tripod drive shaft

0.10 - 0.20 mm
(0.0039 - 0.0079 in)

- Inspect gear carrier and differential case for cracks or distortion. If either condition is evident, replace faulty parts.

- As a general rule, oil seal should be replaced at each disassembly.

ASSEMBLY AND ADJUSTMENT

Assembly can be done in the reverse order of disassembly. The following directions for adjustment and usage of special tools enable to obtain a perfect differential operation.

PRECAUTIONS IN REASSEMBLY

- Arrange shims, washers and the like to install them correctly.
- Thoroughly clean the surfaces on which shims, washers, bearings and bearing retainers are installed.
- Apply gear oil when installing bearings.
- Pack recommended multi-purpose grease into cavity between lips when fitting oil seal.

ASSEMBLY OF DIFFERENTIAL GEAR CASE

- Assemble pinion mates, side gears and thrust washers in differential case.
- Fit pinion shaft to differential case so that it meets lock pin holes.
- Adjust pinion mate-to-side gear backlash (or the clearance between the rear face of side gear and thrust washer) to the specified value by selecting side gear thrust washer.

Pinion mate-to-side gear backlash:

For tripod drive shaft

Less than 0.15 mm
(0.0059 in)

Except tripod drive shaft

0.10 - 0.20 mm
(0.0039 - 0.0079 in)

Side gear thrust washer

Thickness mm (in)
0.75 - 0.80 (0.0295 - 0.0315)
0.80 - 0.85 (0.0315 - 0.0335)
0.85 - 0.90 (0.0335 - 0.0354)

- Lock pinion shaft lock pin using a punch after it is secured into place.
- Apply oil to gear tooth surfaces and thrust surfaces and check if they turn properly.

- Place ring gear on differential case and install bolts and lock straps.

Torque bolts to specifications, and bend up lock straps.

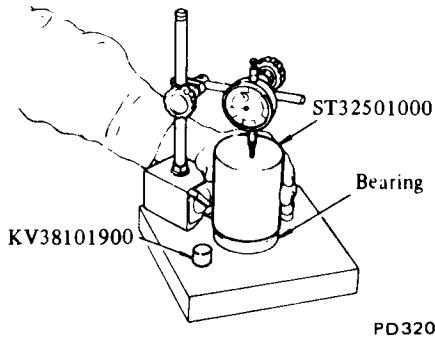
CAUTION:

- Use only genuine ring gear bolts and new lock straps.
- Tighten bolts in criss-cross fashion lightly tapping around bolt head with a hammer.

Ⓙ : Ring gear bolts
88 - 98 N·m
(9.0 - 10.0 kg·m,
65 - 72 ft·lb)

7. When replacing side bearing, measure bearing width using Master Gauge KV38101900 and Weight Block ST32501000 prior to installation.

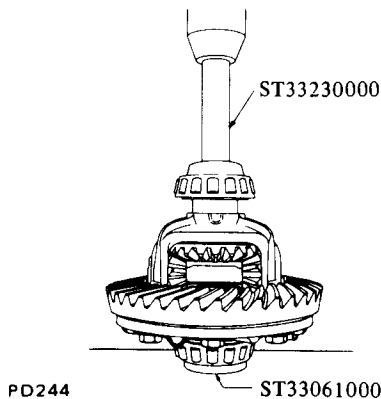
Standard bearing width:
20.0 mm (0.787 in)



PD320

Fig. PD-13 Measuring Bearing Width

8. Press fit side bearing inner race on differential case using Diff. Side Bearing Drift ST33230000 and Adapter ST33061000.



PD244

Fig. PD-14 Installing Side Bearing Inner Race

ADJUSTMENT OF DRIVE PINION PRELOAD

Adjust preload of drive pinion with spacer and washer between front and rear bearing inner races, regardless of thickness of pinion height adjusting washer.

This adjustment must be carried out without oil seal inserted.

1. Press fit front and rear bearing outer races into gear carrier using

Drive Pinion Outer Race Drift Set ST30611000, ST30701000 and ST30621000.

Front: ST30611000 and ST30701000

Rear: ST30611000 and ST30621000

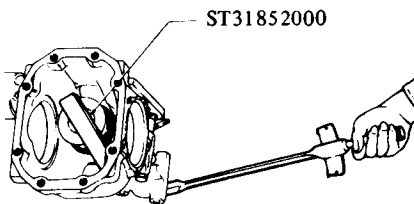
2. Insert Dummy Shaft Spacer ST31851000, pinion height adjusting washer and rear bearing inner race into Dummy Shaft ST31212000. See Fig. PD-17.

Note: Pinion height adjusting washer is inserted to facilitate adjustment of drive pinion height described below. Reuse removed washer if normal contact pattern is obtained with it.

Standard pinion height adjusting washer thickness:
3.09 - 3.66 mm
(0.1217 - 0.1441 in)

3. Fit drive pinion bearing spacer, washer, front bearing cone, Drive Pinion Dummy Collar ST31214000 and companion flange in this order on dummy shaft and tighten drive pinion nut to the specified torque using Stopper ST31852000.

Ⓙ : Drive pinion nut
167 - 196 N·m
(17 - 20 kg·m,
123 - 145 ft·lb)

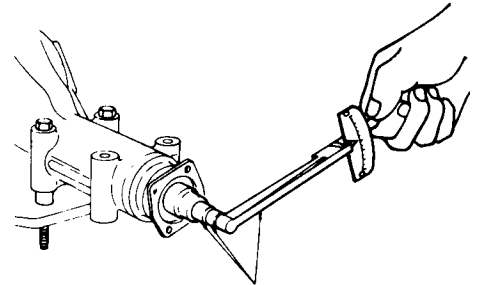


PD184

Fig. PD-15 Tightening Drive Pinion Nut

4. Measure pinion bearing preload using Preload Gauge ST3127S000, and select washer and spacer that will provide required preload.

Note: Replace bearing washer and spacer with thicker ones if pinion cannot be turned by hand while it is being tightened.



ST3127S000

PD245

Fig. PD-16 Measuring Pinion Preload

Pinion bearing preload (without oil seal):
1.0 - 1.3 (10 - 13 kg·cm,
8.7 - 11.3 in·lb)

Pinion bearing adjusting spacer

Length mm (in)
52.20 (2.0551)
52.40 (2.0630)
52.60 (2.0709)
52.80 (2.0787)
53.00 (2.0866)
53.20 (2.0945)

Pinion bearing adjusting washer

Thickness mm (in)
2.30 - 2.32 (0.0906 - 0.0913)
2.32 - 2.34 (0.0913 - 0.0921)
2.34 - 2.36 (0.0921 - 0.0929)
2.36 - 2.38 (0.0929 - 0.0937)
2.38 - 2.40 (0.0937 - 0.0945)
2.40 - 2.42 (0.0945 - 0.0953)
2.42 - 2.44 (0.0953 - 0.0961)
2.44 - 2.46 (0.0961 - 0.0969)
2.46 - 2.48 (0.0969 - 0.0976)
2.48 - 2.50 (0.0976 - 0.0984)
2.50 - 2.52 (0.0984 - 0.0992)
2.52 - 2.54 (0.0992 - 0.1000)
2.54 - 2.56 (0.1000 - 0.1008)
2.56 - 2.58 (0.1008 - 0.1016)
2.58 - 2.60 (0.1016 - 0.1024)

ADJUSTMENT OF DRIVE PINION HEIGHT

Adjust pinion height with washer

provided between rear bearing inner race and back of pinion gear.

1. Install Height Gauge ST31211000 on carrier with dummy shaft mounted.

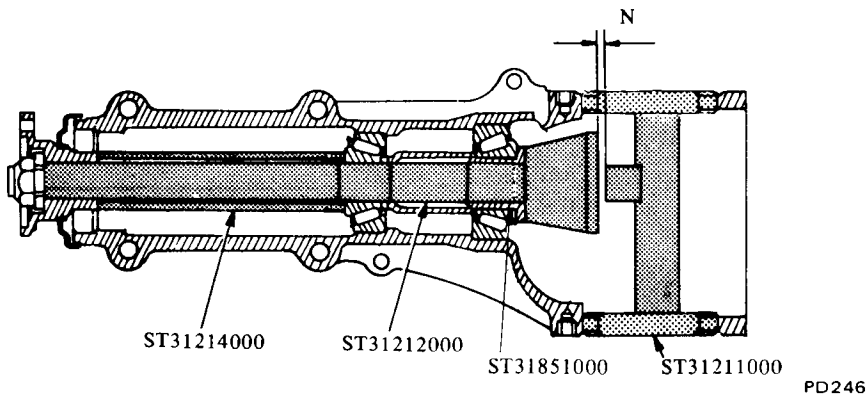


Fig. PD-17 Measuring Clearance

2. Measure the clearance (N) between the tip end of height gauge and the end surface of dummy shaft, using a thickness gauge.

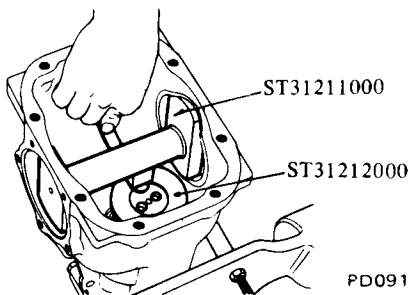


Fig. PD-18 Adjusting Pinion Height

3. The thickness of drive pinion height adjusting washer can be obtained from the following formula:

$$T = W + N - [(H - D' - S) \times 0.01] - 0.20$$

Where,

- T : Required thickness of rear bearing adjusting washers (mm).
- W : Thickness of washers temporarily inserted (mm).
- N : Measured value with thickness gauge (mm).
- H : Figure marked on the drive pinion head. See Fig. PD-19.
- D' : Figure marked on the dummy shaft.
- S : Figure marked on the height gauge.

Figures for H, D' and S are dimensional variations in a unit of 1/100 mm against each standard measurement.

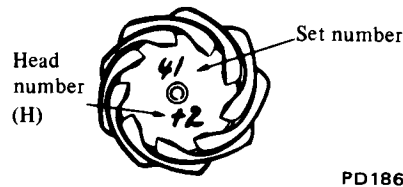


Fig. PD-19 Variation Number on Drive pinion

Examples of calculation

Ex. 1 ---

$$\begin{aligned} W &= 3.09 \text{ mm} \\ N &= 0.33 \text{ mm} \\ H &= +2, D' = -1, S = 0 \end{aligned}$$

$$\begin{aligned} T &= W + N - [(H - D' - S) \times 0.01] - 0.20 \\ &= 3.09 + 0.33 - [(+2) - (-1) - (0)] \times 0.01 - 0.20 \\ &= 3.09 + 0.33 - [2 + 1 - 0] \times 0.01 - 0.20 \\ &= 3.09 + 0.33 - [3 \times 0.01] - 0.20 \\ &= 3.09 + 0.33 - 0.03 - 0.20 \\ &= 3.19 \text{ mm} \end{aligned}$$

The correct washer is 3.18 mm thick.

Ex. 2 ---

$$\begin{aligned} W &= 3.09 \text{ mm} \\ N &= 0.28 \text{ mm} \\ H &= -2, D' = +1, S = -1 \end{aligned}$$

$$\begin{aligned} T &= W + N - [(H - D' - S) \times 0.01] - 0.20 \\ &= 3.09 + 0.28 - [((-2) - (+1) - (-1)) \times 0.01] - 0.20 \\ &= 3.09 + 0.28 - [(-2 - 1 + 1) \times 0.01] - 0.20 \\ &= 3.09 + 0.28 - [-2 \times 0.01] - 0.20 \\ &= 3.09 + 0.28 + 0.02 - 0.20 \\ &= 3.19 \text{ mm} \end{aligned}$$

The correct washer is 3.18 mm thick.

Ex. 3 ---

$$\begin{aligned} W &= 3.09 \text{ mm} \\ N &= 0.45 \text{ mm} \\ H &= 0, D' = 0, S = 0 \end{aligned}$$

$$\begin{aligned} T &= W + N - [(H - D' - S) \times 0.01] - 0.20 \\ &= 3.09 + 0.45 - [(0 - 0 - 0) \times 0.01] - 0.20 \\ &= 3.09 + 0.45 - [0 \times 0.01] - 0.20 \\ &= 3.09 + 0.45 - 0 - 0.20 \\ &= 3.34 \text{ mm} \end{aligned}$$

The correct washer is 3.33 mm thick.

Pinion height adjusting washer

Thickness mm (in)
3.09 (0.1217)
3.12 (0.1228)
3.15 (0.1240)
3.18 (0.1252)
3.21 (0.1264)
3.24 (0.1276)
3.27 (0.1287)
3.30 (0.1299)
3.33 (0.1311)
3.36 (0.1323)
3.39 (0.1335)
3.42 (0.1346)
3.45 (0.1358)
3.48 (0.1370)
3.51 (0.1382)
3.54 (0.1394)
3.57 (0.1406)
3.60 (0.1417)
3.63 (0.1429)
3.66 (0.1441)

Note: If values signifying H, D' and S are not given, regard them as zero and compute. After assembly, check to see that tooth contact is correct. If not, readjust.

4. Fit determined pinion height adjusting washer in drive pinion, and press fit rear bearing inner race in it using Base ST30901000.

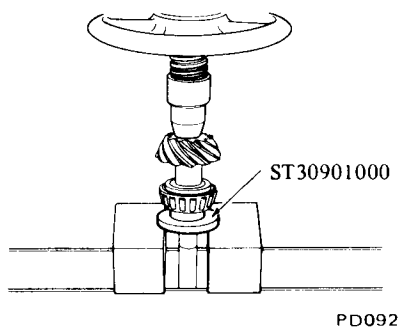


Fig. PD-20 Pressing Rear Bearing Inner Race

5. Lubricate pinion front and rear bearings. Install drive pinion in gear carrier into which drive pinion bearing spacer and washer, front bearing inner race and front bearing pilot spacer, moreover, pilot bearing and oil seal are fitted. Fit oil seal using Oil Seal Drift ST30720000.

6. Fit companion flange on drive pinion, and secure it in position by tightening nut to specified torque confirming preload.

Note: If drive pinion lock nut is worn, replace it.

Ⓣ : Drive pinion nut
167 - 196 N·m
(17 - 20 kg·m,
123 - 145 ft·lb)

Drive pinion preload
(with oil seal):
0.9 - 1.7 N·m
(9 - 17 kg·cm,
7.8 - 14.8 in·lb)

ADJUSTMENT OF SIDE RETAINER SHIMS

1. If the hypoid gear set, gear carrier, differential case, side bearing or side bearing retainer has been replaced with new part, adjust the side bearing

preload with adjusting shim. The required thickness of the right and left retainer shims can be obtained from the following formulas:

$$T_1 = (A + C + G_1 - D) \times 0.01 + 0.76 - E$$

$$T_2 = (B + D + G_2) \times 0.01 + 0.76 - F$$

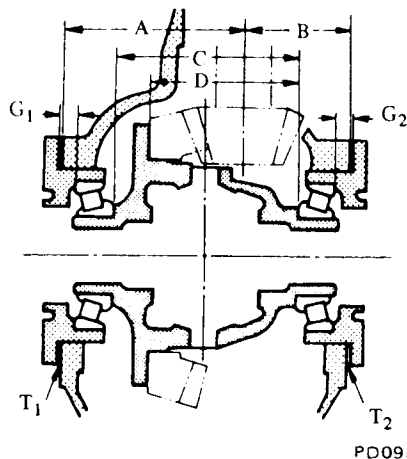


Fig. PD-21 Thickness of Right and Left Shims

Where,

T₁ : Required thickness of left side retainer shim (mm).

T₂ : Required thickness of right side retainer shim (mm).

A & B : Figures marked on the gear carrier.

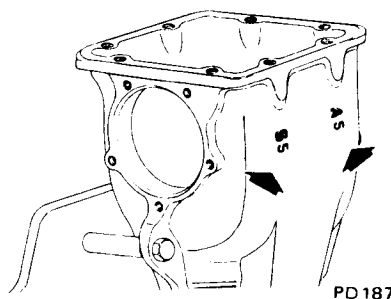


Fig. PD-22 A & B Figures

C & D : Figures marked on the differential case.

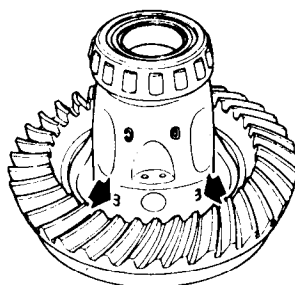


Fig. PD-23 C & D Figures

E & F : These are differences in width of left or right side bearing against the standard width 20.00 mm (0.7874 in).

If bearing width is 19.90, the difference will be as follows:

$$20.00 - 19.90 = 0.10$$

G₁ & G₂ : Figures marked on the left or right side retainer.

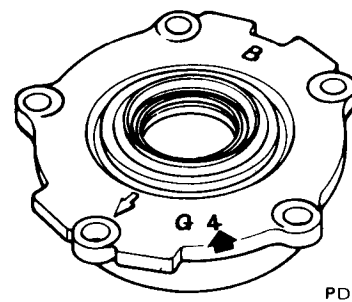


Fig. PD-24 G1 & G2 Figure

Figures for A, B, C, D, G₁ and G₂ are dimensional variations in a unit of 1/100 mm against each standard measurement.

Examples of calculation

Ex. 1 ---

A = 5, B = 5, C = 3, D = 3,
G₁ = 4, G₂ = 1, E = 0.10 mm,
F = 0.15 mm

Left side:

$$\begin{aligned} T_1 &= (A + C + G_1 - D) \times 0.01 + 0.76 - E \\ &= (5 + 3 + 4 - 3) \times 0.01 + 0.76 - 0.10 \\ &= 9 \times 0.01 + 0.76 - 0.10 \\ &= 0.09 + 0.76 - 0.10 \\ &= 0.75 \text{ mm} \end{aligned}$$

The correct shims are as follows:

Thickness	Quantity	
0.25	x 1	= 0.25
0.50	x 1	= 0.50
Total thickness		= 0.75 mm

Right side:

$$\begin{aligned}
 T_2 &= (B + D + G_2) \times 0.01 + 0.76 \\
 &\quad - F \\
 &= (5 + 3 + 1) \times 0.01 + 0.76 \\
 &\quad - 0.15 \\
 &= 9 \times 0.01 + 0.76 - 0.15 \\
 &= 0.09 + 0.76 - 0.15 \\
 &= 0.70 \text{ mm}
 \end{aligned}$$

The correct shims are 0.20 plus 0.50 mm thick.

Ex. 2 ---

$$\begin{aligned}
 A &= 2, \quad B = 3, \quad C = 0, \quad D = 3 \\
 G_1 &= 2, \quad G_2 = 3, \quad E = 0.20 \text{ mm}, \\
 F &= 0.20 \text{ mm}
 \end{aligned}$$

Left side:

$$\begin{aligned}
 T_1 &= (A + C + G_1 - D) \times 0.01 \\
 &\quad + 0.76 - E \\
 &= (2 + 0 + 2 - 3) \times 0.01 \\
 &\quad + 0.76 - 0.20 \\
 &= 1 \times 0.01 + 0.76 - 0.20 \\
 &= 0.01 + 0.76 - 0.20 \\
 &= 0.57 \text{ mm}
 \end{aligned}$$

The correct shims are 0.25 plus 0.30 mm thick.

Right side:

$$\begin{aligned}
 T_2 &= (B + D + G_2) \times 0.01 \\
 &\quad + 0.76 - F \\
 &= (3 + 3 + 3) \times 0.01 + 0.76 \\
 &\quad - 0.20 \\
 &= 9 \times 0.01 + 0.76 - 0.20 \\
 &= 0.09 + 0.76 - 0.20 \\
 &= 0.65 \text{ mm}
 \end{aligned}$$

The correct shims are as follows:

Thickness	Quantity	
0.25	x 1	= 0.25
0.40	x 1	= 0.40
Total thickness		= 0.65 mm

Note: If values signifying A, B, C, D, G₁ and G₂ are not given, regard them as zero and compute.

After assembly, check to see that preload and backlash are correct. If not, readjust.

Side retainer adjusting shim

Thickness mm (in)
0.20 (0.0079)
0.25 (0.0098)
0.30 (0.0118)
0.40 (0.0157)
0.50 (0.0197)

2. Press fit side bearing outer race into side retainer using a set of Drive Pinion Bearing Outer Race Drift Bar ST30611000 and Drift ST30621000.

3. Fit given shims and O-ring in both side retainers, and install retainers in gear carrier using Diff. Side Retainer Guide ST33720000, and the arrow mark on retainer positioned as shown in Fig. PD-26.

Note: When installing retainers, take care that side bearing outer races are not damaged by roller.

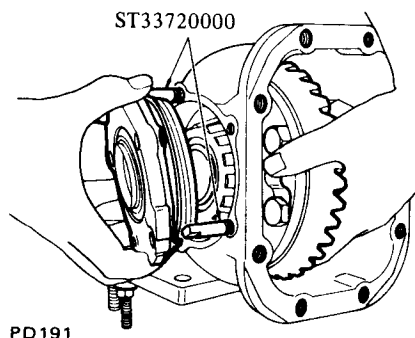


Fig. PD-25 Installing Side Retainer

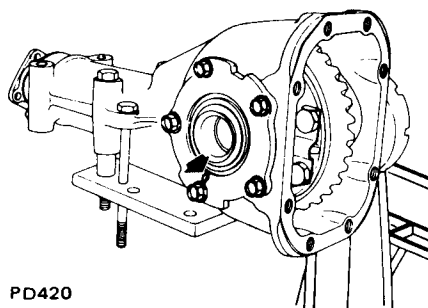


Fig. PD-26 Arrow Mark on Retainer

4. Measure ring gear-to-drive pinion backlash. If backlash is too small, decrease thickness of left shim and

increase thickness of right shim by the same amount. If backlash is too great, reverse the above procedure.

Ring gear-to-drive pinion backlash

**0.10 - 0.20 mm
(0.0039 - 0.0079 in)**

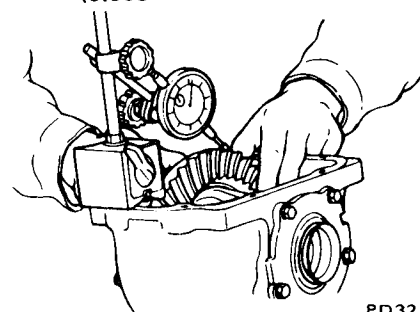


Fig. PD-27 Measuring Backlash of Ring Gear and Pinion

5. At the same time, check side bearing preload. Bearing preload should be the specified torque.

If preload is not according to this specification, adjust it with side retainer shims.

Side bearing preload:

**1.2 - 2.0 N·m
(12 - 20 kg·cm,
10.4 - 17.4 in-lb)**

At ring gear bolt:

**17.7 - 29.4 N
(1.8 - 3.0 kg,
4.0 - 6.6 lb)**

6. Check and adjust the tooth contact pattern of ring gear and drive pinion.

(1) Thoroughly clean ring and drive pinion gear teeth.

(2) Paint ring gear teeth lightly and evenly with a mixture of powdered ferric oxide and oil of a suitable consistency to produce a contact pattern.

(3) Rotate pinion through several revolutions in the forward and reverse direction until a definite contact pattern is developed on ring gear.

(4) When contact pattern is incorrect, readjust thickness of adjusting shim. Be sure to wipe off ferric oxide completely upon completion of adjustment.

(5) Incorrect contact pattern of teeth can be adjusted in the following manner.

Contact pattern

a. Heel contact

To correct, increase thickness of pinion height adjusting washer in order to bring drive pinion close to ring gear.

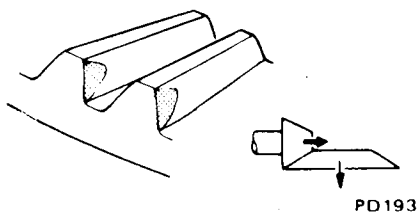


Fig. PD-28 Heel Contact

b. Toe contact

To correct, reduce thickness of pinion height adjusting washer in order to make drive pinion go away from ring gear.

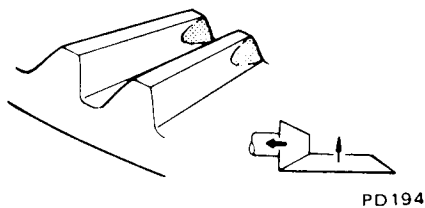


Fig. PD-29 Toe-Contact

c. Flank contact

Adjust in the same manner as in b.

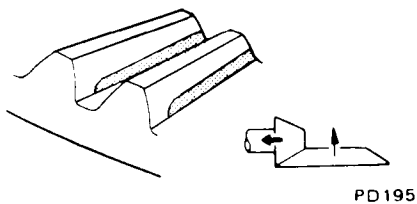


Fig. PD-30 Flank Contact

d. Face contact

Adjust in the same manner as in a.

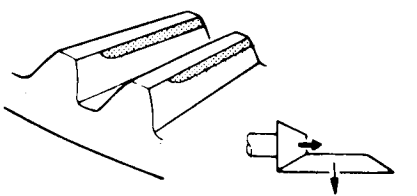


Fig. PD-31 Face Contact

e. Correct tooth contact

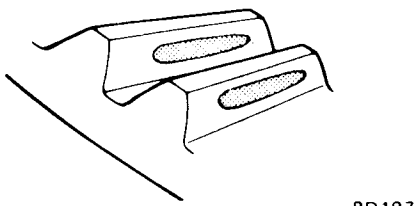


Fig. PD-32 Correct Contact

Note: Change in thickness of adjusting washer is accompanied by change in backlash. Check it when installing gear.

7. Install rear cover.

- Ⓣ : **Rear cover attaching bolts**
39 - 49 N·m
(4.0 - 5.0 kg-m,
29 - 36 ft-lb)

INSTALLATION

Install in the reverse order of removal.

1. Position differential carrier onto suspension member, and temporarily tighten it with four bolts.
2. Fit rear cover to mounting insulator nuts ① in Fig. PD-3 and tighten nuts to specified torque.

- Ⓣ : **Rear cover to mounting insulator nuts**
59 - 78 N·m
(6.0 - 8.0 kg-m,
43 - 58 ft-lb)

3. Secure differential carrier onto rear suspension member with bolts.

- Ⓣ : **Differential carrier to suspension member bolts**
59 - 78 N·m
(6.0 - 8.0 kg-m,
43 - 58 ft-lb)

4. Install side yokes together with drive shafts to differential carrier, and tighten side yoke fixing bolts to specified torque (except tripod drive shaft).

Note: Be careful not to damage side yoke and oil seal when installing.

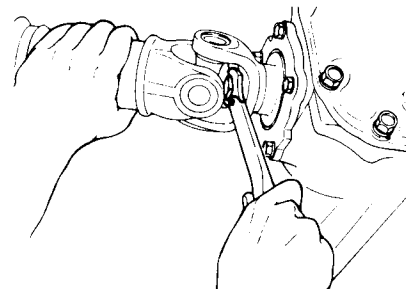


Fig. PD-33 Tightening Side Yoke Fixing Bolt

- Ⓣ : **Side yoke fixing bolts**
31 - 42 N·m
(3.2 - 4.3 kg-m,
23 - 31 ft-lb)

5. Install drive shaft (tripod drive shaft).

6. Join drive shafts with companion flanges of rear axle shafts and tighten connecting bolts to specified torque.

- Ⓣ : **Drive shaft to axle shaft bolts**
Except tripod drive shaft
49 - 59 N·m
(5.0 - 6.0 kg-m,
36 - 43 ft-lb)

- Tripod drive shaft**
27 - 37 N·m
(2.8 - 3.8 kg-m,
20 - 27 ft-lb)

7. Install other parts in the reverse manner of removal.

- Ⓣ : **Drain and filler plugs**
41 - 68 N·m
(4.2 - 6.9 kg-m,
30 - 50 ft-lb)

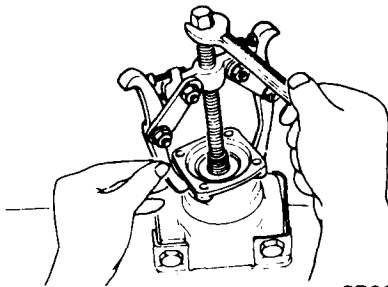
- Gear oil capacity:**
1.0 liter (2-1/8 US pt,
1-3/4 Imp pt)

REPLACEMENT OF OIL SEAL

FRONT OIL SEAL

To replace front oil seal with differential carrier installed on the car, proceed as follows:

1. Drain gear oil.
2. Raise car on hoist.
3. Detach propeller shaft.
4. Remove drive pinion nut.
5. Extract companion flange using a standard puller.



PD264

Fig. PD-34 Removing Companion Flange

6. Remove oil seal.
7. Set new oil seal in position using Oil Seal Drift ST30720000. Apply grease cavity between seal lips.
8. Fit companion flange on drive pinion, and secure them in position by tightening nut to specified torque confirming the following preload, using Drive Pinion Flange Wrench ST31530000.

- Ⓙ : Drive pinion nut
 167 - 196 N·m
 (17 - 20 kg-m,
 123 - 145 ft-lb)
 Pinion bearing preload
 (with oil seal):
 0.9 - 1.7 N·m
 (9 - 17 kg-cm,
 7.8 - 14.8 in-lb)

Note: The preload of old bearing is the same value as that of a new bearing.

9. Reinstall propeller shaft by reversing the foregoing removal procedure. And fill up gear oil.

SIDE OIL SEAL

Side oil seal is replaced by using the

following procedures.

- (1) Detach drive shaft from differential carrier.
- (2) Remove oil seal.
- (3) Set in new oil seal with Side Oil Seal Drift ST33270000.

Note: Apply grease cavity between oil seal lips.

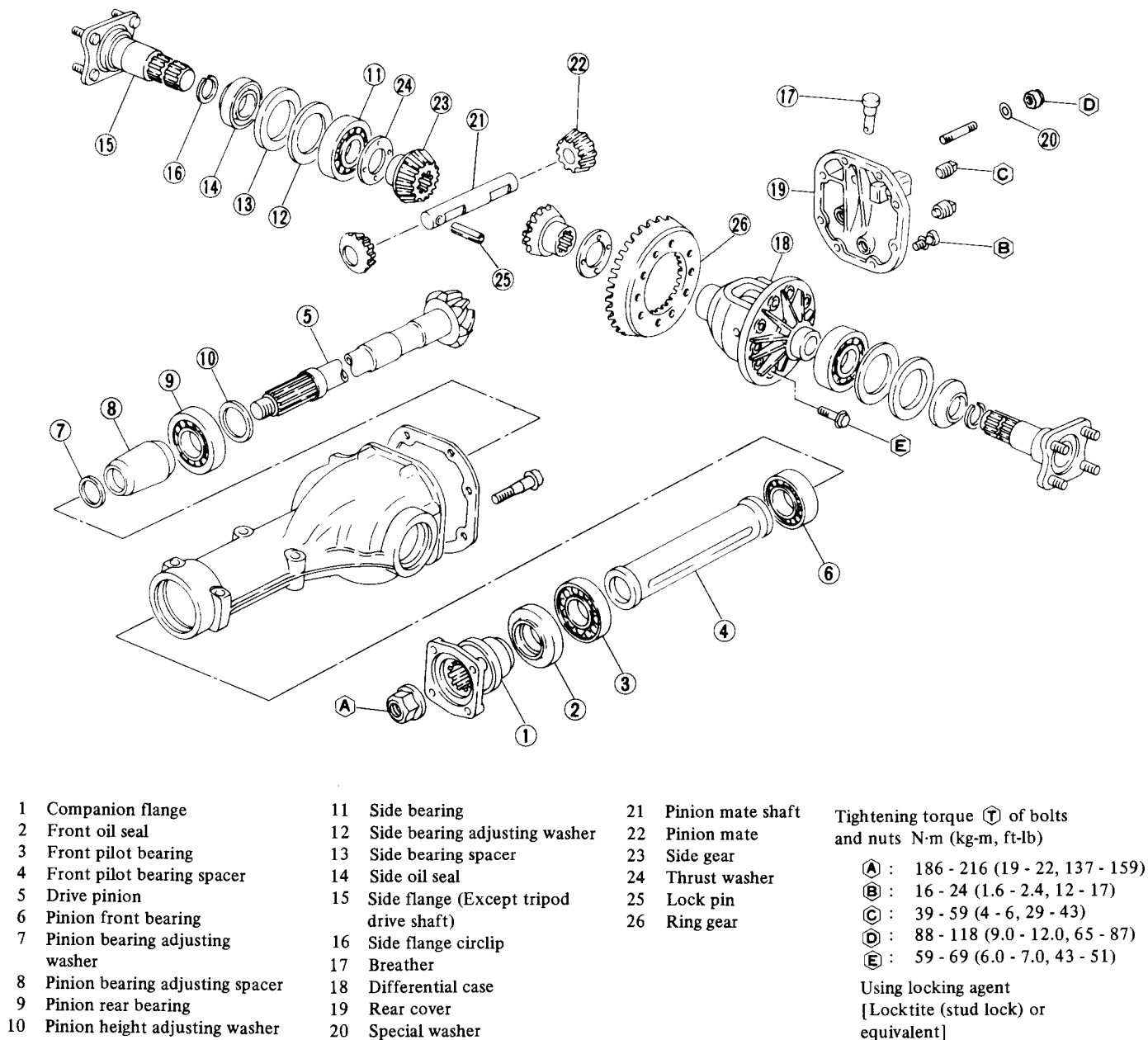
- (4) Reinstall drive shaft.

Note: Check O-ring of side flange fixing bolt, and replace if necessary.

- Ⓙ : Side yoke fixing bolt
 31 - 42 N·m
 (3.2 - 4.3 kg-m,
 23 - 31 ft-lb)

Drive shaft to axle shaft bolts
 49 - 59 N·m
 (5.0 - 6.0 kg-m,
 36 - 43 ft-lb)

DIFFERENTIAL CARRIER (Type R200)



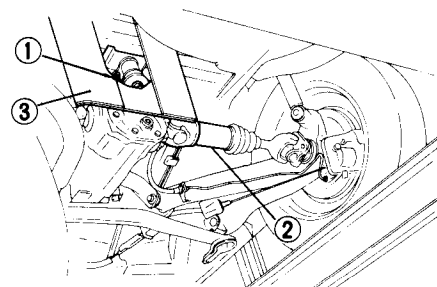
PD467

Fig. PD-35 Differential Carrier (R200)

REMOVAL

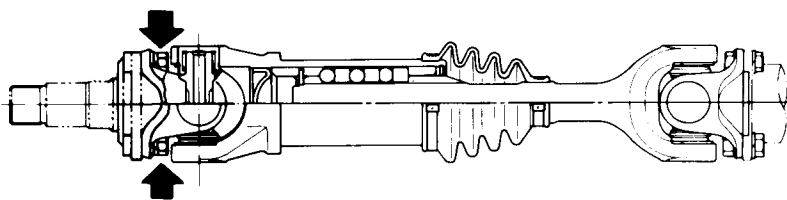
1. Jack up rear of car and support on safety stands. Drain gear oil.
2. Disconnect propeller shaft at companion flange.
3. Disconnect drive shafts ② on the wheel side. See Fig. PD-36.
4. Remove side flange fixing bolts, and disconnect flange yokes together with drive shafts from differential carrier (except tripod type drive shaft).

5. Draw out drive shaft (tripod type drive shaft). Refer to section RA.
6. Remove plate ③ . See Fig. PD-36.
7. With differential carrier jacked up, remove nuts ① .



PD470

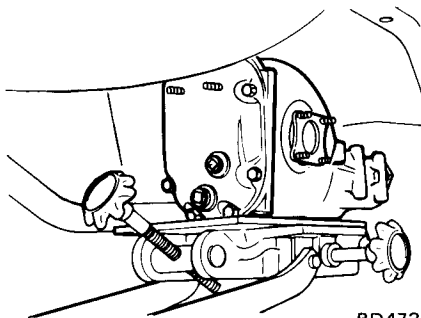
Fig. PD-36 Under View



PD468

Fig. PD-37 Removing Side Flange Fixing Bolt

8. Loosen off four fitting bolts that hold differential carrier onto suspension member.
9. Pull off differential carrier backward together with jack.



PD472

Fig. PD-38 Removing Differential Carrier

After carrier assembly is removed, support suspension member on a stand to prevent its insulators being twisted or damaged.

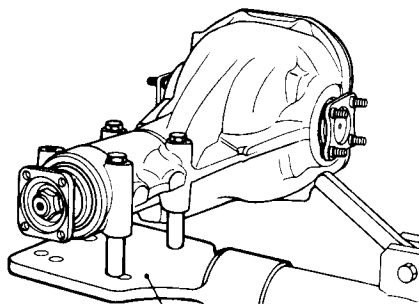
Note: Do not place the center of suspension member on the stand before removal operation. Otherwise, it will be difficult to extract the gear carrier assembly.

PRE-DISASSEMBLY INSPECTION

Differential carrier should be inspected before parts except rear cover are removed from it.

These inspections are helpful in finding the cause of the problem and in determining necessary corrections.

1. Using three 45 mm (1.77 in) spacers, mount carrier on Diff. Attachment KV38100800.

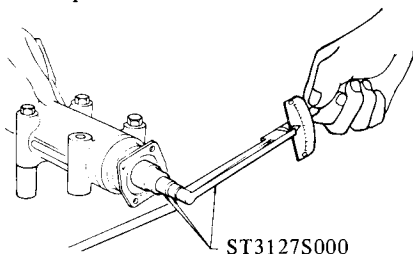


KV38100800

PD418

Fig. PD-39 Mounting Differential Carrier

2. Remove rear cover.
3. Visually inspect parts for wear or damage.
4. Rotate gears checking for any roughness which would indicate damaged bearings or chipped gears. Check gear teeth for scoring or signs of abnormal wear. Measure preload of drive pinion.



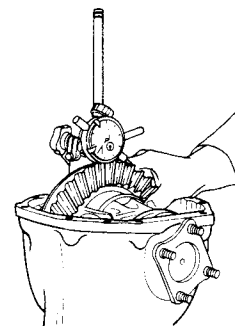
ST3127S000

PD340

Fig. PD-40 Measuring Pinion Preload

5. Set up a dial indicator and check the backlash at several points around ring gear.

Ring gear-to-drive pinion backlash:
0.13 - 0.18 mm
(0.0051 - 0.0071 in)



PD341

Fig. PD-41 Measuring Backlash of Ring Gear and Pinion

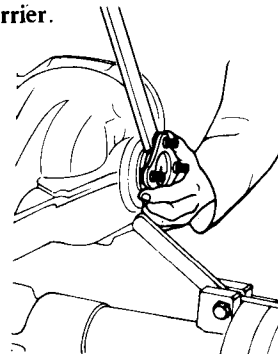
6. Check gear tooth contact with a mixture of recommended powder and oil.

For the tooth contact pattern, see Figs. PD-28 through PD-32. — Contact Pattern.

DISASSEMBLY

1. Drive side flange out with pry bar.

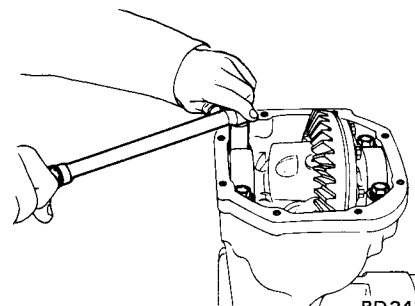
Note: Hold side flange with hand to prevent it from jumping out of carrier.



PD342

Fig. PD-42 Removing Side Flange

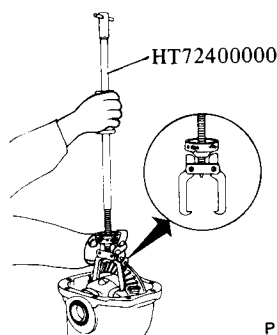
2. Put match marks on side bearing caps and carrier.
3. Loosen side bearing cap bolts and remove bearing caps.



PD343

Fig. PD-43 Removing Side Bearing Cap

4. Using Slide Hammer HT72400000 lift differential case assembly out.

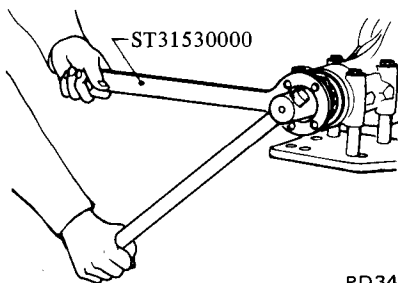


PD344

Fig. PD-44 Removing Differential Assembly Case

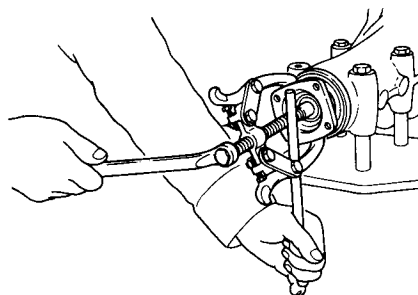
Note: Care should be taken not to confuse the left and right hand bearing caps and bearing outer races so that parts may be installed to the original position.

5. Loosen drive pinion nut, holding companion flange with Drive Pinion Flange Wrench ST31530000 and pull off companion flange using a suitable puller.



PD345

Fig. PD-45 Removing Drive Pinion Nut



PD346

Fig. PD-46 Removing Companion Flange

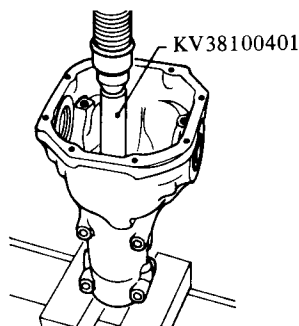
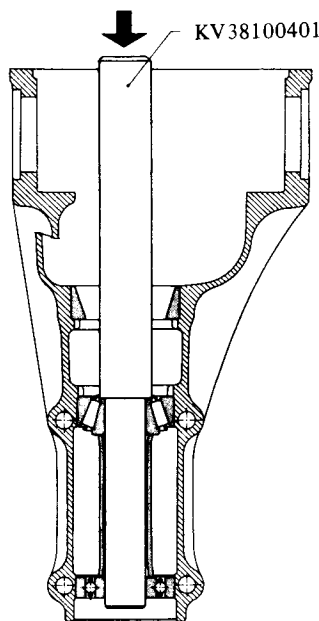
6. Extract drive pinion from carrier using a press. Take out drive pinion together with rear bearing inner race, bearing spacer and adjusting washer.
7. Remove oil seal.

Note: Oil seal must not be reused.

8. Remove pilot bearing together with pilot bearing spacer and front bearing inner race using Pilot Bearing Drift KV38100401. See Fig. PD-47.
9. Remove side oil seal.

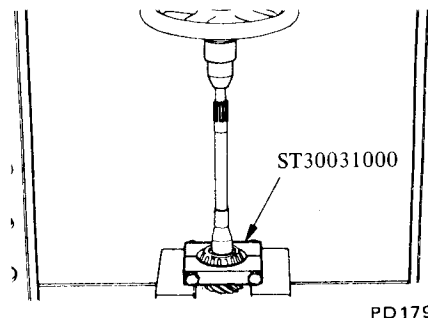
Note: Oil seal must not be reused.

10. Hold rear bearing inner race with Puller ST30031000 and extract from drive pinion with a press. See Fig. PD-48.



PD348

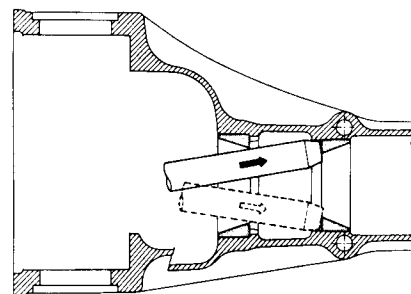
Fig. PD-47 Removing Pilot Bearing



PD179

Fig. PD-48 Removing Pinion Rear Bearing Inner Race

11. To remove front and rear bearing outer races, put a drift to race surface, and withdraw them by tapping the top of drift with a hammer.

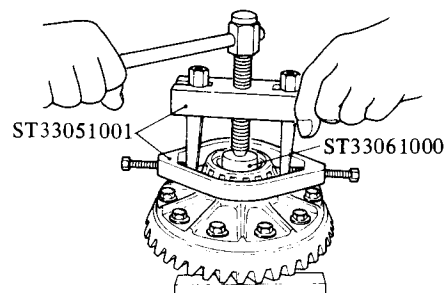


PD349

Fig. PD-49 Removing Pinion Bearing Outer Races

DIFFERENTIAL CASE

1. Extract bearing using Differential Side Bearing Puller ST3306S001 (set of ST33051001 and ST33061000).



PD350

Fig. PD-50 Removing Side Bearing

Note:

- Securely attach puller to bearing inner race, utilizing two grooves in differential case.
- Be careful not to confuse the left and right hand parts.

2. Remove ring gear by loosening ring gear bolts.

Note: Loosen bolts diagonally.

3. Punch off pinion mate shaft lock pin from ring gear side using Sold Punch KV31100300.

Note: Lock pin is caulked at pin hole mouth on differential case. Do not punch it off forcibly without checking how it is caulked.

4. Draw out pinion mate shaft and remove pinion mate gears, side gears and thrust washers.

Note: Put marks on gear and thrust washer so that they can be re-installed in their original positions from which they were removed.

4. Inspect thrust washer faces. Small faults can be corrected with sand-paper. If pinion mate to side gear backlash (or the clearance between side gear and thrust washer) exceeds the specified value, replace thrust washers.

Pinion mate-to-side gear backlash:

For tripod drive shaft

**Less than 0.15 mm
(0.0059 in)**

Except tripod drive shaft

**0.10 - 0.20 mm
(0.0039 - 0.0079 in)**

5. Inspect carrier and differential case for cracks or distortion. If either condition is evident, replace faulty parts.

6. As a general rule, oil seal should be replaced at each disassembly.

If above procedure is not effective with existing washer, try with other washers.

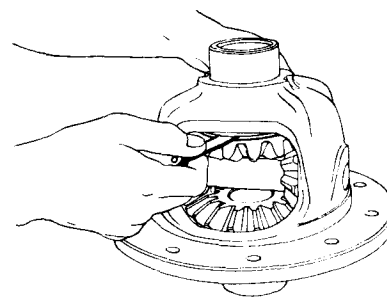
Pinion mate-to-side gear backlash:

For tripod drive shaft

**Less than 0.15 mm
(0.0059 in)**

Except tripod drive shaft

**0.10 - 0.20 mm
(0.0039 - 0.0079 in)**



PD023

Fig. PD-51 Measuring Clearance

INSPECTION

Thoroughly clean all disassembled parts, and examine them to see that they are worn, damaged or otherwise faulty, and how they are affected. Repair or replace all faulty parts, whichever is necessary.

1. Check gear teeth for scoring, cracking or chipping, and make sure that tooth contact pattern indicates correct meshing depth. If any fault is evident, replace parts as required.

Note: Drive pinion and drive gear are supplied for replacement as a set, therefore, should either part be damaged, replace as a set.

2. Check pinion gear shaft, and pinion gear for scores and signs of wear, and replace as required.

Follow the same procedure for side gears and their seats on differential case.

3. Inspect all bearing races and rollers for scoring, chipping or evidence of excessive wear. They should be in tiptop condition such as not worn and with mirror-like surfaces. Replace if there is a shadow of doubt on their efficiency, as an incorrect bearing operation may result in noise and gear seizure.

ASSEMBLY AND ADJUSTMENT

Assembly can be done in the reverse order of disassembly. Adherence to the following directions for adjustment and usage of special tools enable to obtain a perfect differential operation.

PRECAUTIONS IN REASSEMBLY

1. Arrange shims, washers and the like to install them correctly.
2. Thoroughly clean the surfaces on which shims, washers, bearings and bearing retainers are installed.
3. Thoroughly clean oil from ring gear bolt and its hole with "Locktite Lacquic Primer" or equivalent.
4. Apply gear oil when installing bearings.
5. Pack recommended multi-purpose grease into cavity between lips when fitting oil seal.

ASSEMBLY OF DIFFERENTIAL GEAR CASE

1. Assemble pinion mates, side gears and thrust washers in differential case.
2. Fit pinion shaft to differential case so that it meets lock pin holes.
3. Adjust side gear-to-pinion mate backlash or adjust the clearance between the rear face of side gear and thrust washer.

4. Lock pinion shaft lock pin using a punch after it is secured in place.

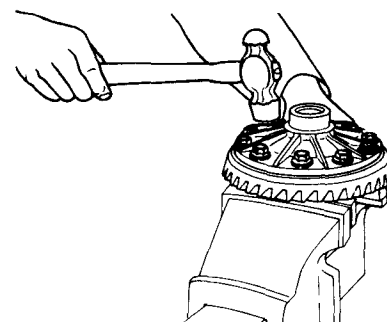
5. Apply oil to gear tooth surfaces and thrust surfaces and check that they turn properly.

6. Place ring gear on differential case and apply a small amount of locking agent [Locktite (stud lock) or equivalent] to the bolts; then install bolts.

CAUTION:

- a. Use only genuine drive gear bolts and new lock straps.
- b. Tighten bolts in criss-cross fashion lightly tapping around bolt heads with a hammer.

Ⓙ : Ring gear bolts
59 - 69 N·m
(6.0 - 7.0 kg·m,
43 - 51 ft·lb)

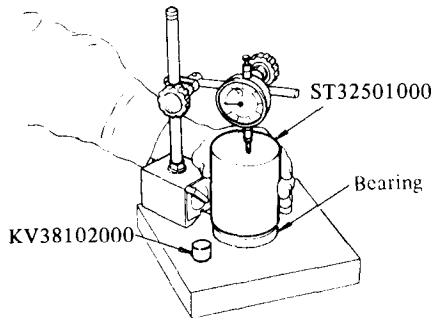


PD351

Fig. PD-52 Tapping Bolt Heads

7. When replacing side bearing, measure bearing width using Master Gauge KV38102000 and Weight Block ST32501000 prior to installation.

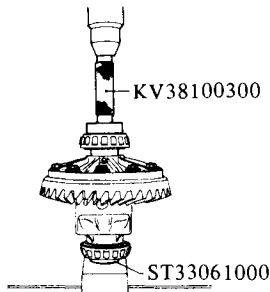
Standard bearing width:
21.0 mm (0.827 in)



PD425

Fig. PD-53 Measuring Bearing Width

8. Press fit side bearing inner race on differential case with Diff. Side Bearing Drift KV38100300 and Adapter ST33061000.



PD353

Fig. PD-54 Installing Side Bearing Inner Race

ADJUSTMENT OF DRIVE PINION PRELOAD

Adjust drive pinion preload with spacer and washer between front and rear bearing inner races, regardless of thickness of pinion height adjusting washer.

This adjustment must be carried out without oil seal inserted.

1. Press fit front and rear bearing outer races into gear carrier using Drive Pinion Outer Race Drift Set ST30611000, ST30613000 and ST30621000.

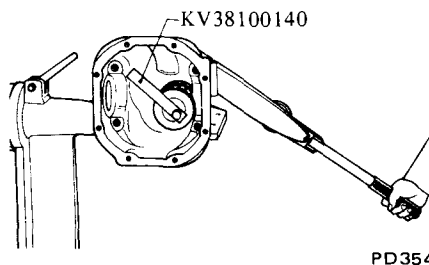
Front: ST30611000 and ST30613000

Rear: ST30611000 and ST30621000

2. Insert rear bearing inner race into Dummy Shaft KV38100110.

3. Fit drive pinion bearing spacer, washer, front bearing inner race, Dummy Shaft Collar KV38100130 and companion flange in that order on dummy shaft and tighten drive pinion nut with Stopper KV38100140.

Ⓙ : Drive pinion nut
186 - 216 N·m
(19 - 22 kg·m,
137 - 159 ft·lb)



PD354

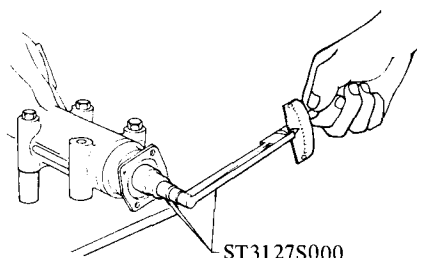
Fig. PD-55 Tightening Drive Pinion Nut

4. Measure pinion bearing preload using Preload Gauge ST3127S000, and select washer and spacer that will provide required preload.

Pinion bearing preload
(without oil seal):
1.0 - 1.3 N·m
(10 - 13 kg·cm,
8.7 - 11.3 in·lb)

Note:

- Replace bearing washer and spacer with thicker ones if pinion cannot be turned by hand while it is being tightened.
- Preload of old bearing is the same value as that of a new bearing.



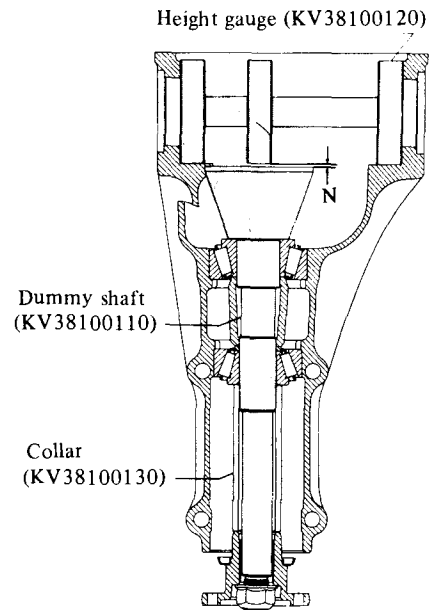
PD340

Fig. PD-56 Measuring Pinion Preload

ADJUSTMENT OF DRIVE PINION HEIGHT

Adjust pinion height with washer located between rear bearing inner race and back of pinion gear.

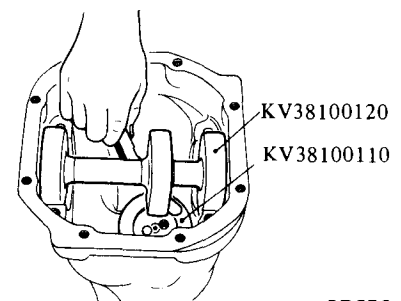
1. Install Height Gauge KV38100120 on carrier with dummy shaft mounted.



PD355

Fig. PD-57 Measuring Clearance (N)

2. Measure the clearance (N) between the tip end of height gauge and the end surface of dummy shaft, using a thickness gauge.



PD356

Fig. PD-58 Adjusting Pinion Height

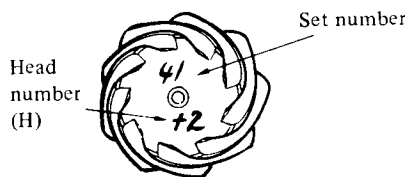
3. The thickness of drive pinion height adjusting washer can be obtained from the following formula:

$$T = N - [(H - D') \times 0.01] + 3.00$$

Where,

- T** : Required thickness of rear bearing adjusting washers (mm).
N : Measured value with thickness gauge (mm).
H : Figure marked on the drive pinion head. See Fig. PD-59.
D' : Figure marked on the dummy shaft.

Note: Figures for **H** and **D'** are dimensional variations in a unit of 1/100 mm (4/10,000 in) against each standard measurement.



PD186

Fig. PD-59 Variation Number on Drive Pinion

Examples of calculation

Ex. 1 ---

$$N = 0.23 \text{ mm}$$

$$H = +2, D' = 1$$

$$T = N - [(H - D') \times 0.01] + 3.00$$

$$= 0.23 - [((+2) - 1) \times 0.01] + 3.00$$

$$= 0.23 - [(2 - 1) \times 0.01] + 3.00$$

$$= 0.23 - [1 \times 0.01] + 3.00$$

$$= 0.23 - 0.01 + 3.00$$

$$= 3.22 \text{ mm}$$

The correct washer is 3.21 mm thick.

Ex. 2 ---

$$N = 0.35 \text{ mm}$$

$$H = -1, D' = 2$$

$$T = N - [(H - D') \times 0.01] + 3.00$$

$$= 0.35 - [((-1) - 2) \times 0.01] + 3.00$$

$$= 0.35 - [(-1 - 2) \times 0.01] + 3.00$$

$$= 0.35 - [(-3) \times 0.01] + 3.00$$

$$= 0.35 - [-0.03] + 3.00$$

$$= 0.35 + 0.03 + 3.00$$

$$= 3.38$$

The correct washer is 3.39 mm thick.

Ex. 3 ---

$$N = 0.27 \text{ mm}$$

$$H = 0, D' = 0$$

$$T = N - [(H - D') \times 0.01] + 3.00$$

$$= 0.27 - [(0 - 0) \times 0.01] + 3.00$$

$$= 0.27 - [0 \times 0.01] + 3.00$$

$$= 0.27 - 0 + 3.00$$

$$= 3.27$$

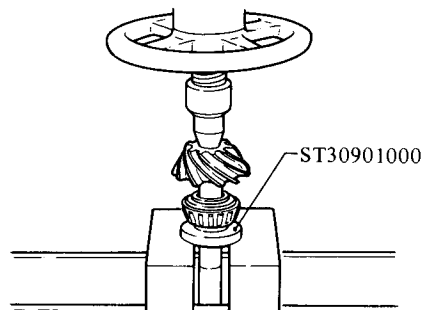
The correct washer is 3.27 mm thick.

Note: If values signifying **H** and **D'** are not given, regard them as zero and compute. After assembly, check to see that tooth contact is correct. If not, readjust.

For the tooth contact pattern, see Figs. PD-28 through PD-32 for Contact Pattern.

Note: Pinion height adjustment can be made in a unit of 1/100 mm (4/10,000 in) by selecting either 0.05 mm (0.0020 in) or 0.07 mm (0.0028 in) shim in above chart.

4. Fit determined pinion height adjusting washer in drive pinion, and press fit rear bearing inner race in it using Base ST30901000.



PD092

Fig. PD-60 Pressing Rear Bearing Inner Race

Note: Insert washer into pinion with the chamfered side towards gear.

5. Lubricate pinion front and rear bearings. Install drive pinion in gear carrier into which drive pinion bearing spacer and washer, front bearing inner race and front pilot bearing spacer, moreover, pilot bearing and front oil seal are fitted. Fit front oil seal using Gear Carrier Front Oil Seal Drift KV38100500.

6. Fit companion flange on drive pinion, and secure it in position by tightening nut to specified torque confirming preload.

Note: If drive pinion lock nut is worn, replace it.

Ⓘ : **Drive pinion nut**
186 - 216 N·m
(19 - 22 kg·m,
137 - 159 ft·lb)
Drive pinion preload
(with oil seal)
1.13 - 1.72 N·m
(11.5 - 17.5 kg·cm,
10.0 - 15.2 in·lb)

ADJUSTMENT OF SIDE BEARING WASHERS

1. If the hypoid gear set, carrier, differential case or side bearing has been replaced with new part, adjust the side bearing preload with adjusting washer. The required thicknesses of the left and right washers can be obtained from the following formulas:

$$T_1 = (A - C + D - H') \times 0.01 + E + 2.05$$

$$T_2 = (B - D + H') \times 0.01 + F + G + 1.95$$

Where,

- T₁** : Required thickness of left side washer (mm).
T₂ : Required thickness of right side washer (mm).
A & B : Figure marked on the gear carrier. See Fig. PD-62.
C & D : Figure marked on the differential case. See Fig. PD-63.
E & F : These are differences in width of left or right side bearing against the standard width (21.00 mm).

If bearing width is 20.82 mm, this figure will be as follows:

$$21.00 - 20.82 = 0.18 \text{ (mm)}$$

- G** : This is the difference in thickness of side spacer against the standard width (8.10 mm). If spacer width is 8.02 mm, this figure will be as follows.

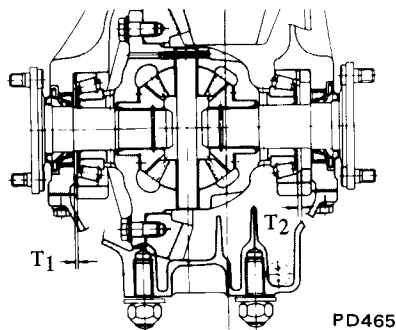
H' : Figure marked on ring gear. See Fig. PD-64.

$$8.10 - 8.02 = 0.08 \text{ (mm)}$$

Figures for A, B, C and D are dimensional variations in a unit of 1/100 mm against each standard measurement.

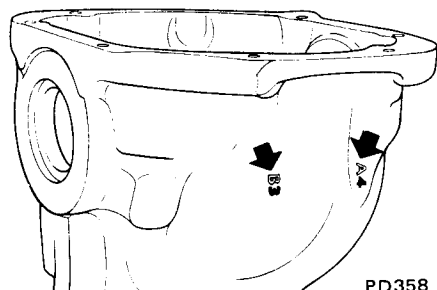
To measure width of side bearing, see differential case assembly procedure.

Before calculation, determine "G" value by measuring spacer thickness. If spacer is deformed or scratched, replace.



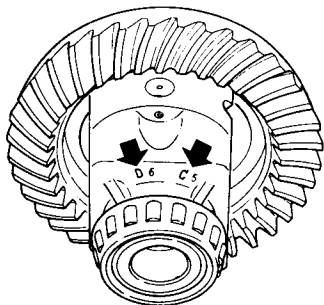
PD465

Fig. PD-61 Thickness of Left and Right Washers



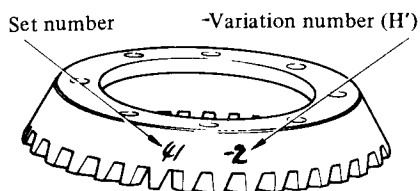
PD358

Fig. PD-62 A & B Figures



PD359

Fig. PD-63 C & D Figures



PD190

Fig. PD-64 Variation Number on Ring Gear

Example of calculation

Ex. 1 ---

A = 4, B = 3, C = 5, D = 6

E = 0.18 mm, F = 0.15 mm

G = 0.08 mm, H' = -2

Left side:

$$\begin{aligned} T_1 &= (A - C + D - H') \times 0.01 + E \\ &\quad + 2.05 \\ &= [4 - 5 + 6 - (-2)] \times 0.01 \\ &\quad + 0.18 + 2.05 \\ &= 7 \times 0.01 + 0.18 + 2.05 \\ &= 0.07 + 0.18 + 2.05 \\ &= 2.30 \end{aligned}$$

The correct washer is 2.30 mm thick.

Right side:

$$\begin{aligned} T_2 &= (B - D + H') \times 0.01 + F + G \\ &\quad + 1.95 \\ &= [3 - 6 + (-2)] \times 0.01 + 0.15 \\ &\quad + 0.08 + 1.95 \\ &= (-5) \times 0.01 + 0.15 + 0.08 \\ &\quad + 1.95 \\ &= -0.05 + 0.15 + 0.08 + 1.95 \\ &= 2.13 \end{aligned}$$

The correct washer is 2.15 mm thick.

Ex. 2 ---

A = 6, B = 6, C = 5, D = 3

E = 0.17 mm, F = 0.22 mm

G = 0.10 mm, H' = 2

Left side:

$$\begin{aligned} T_1 &= (A - C + D - H') \times 0.01 + E \\ &\quad + 2.05 \\ &= (6 - 5 + 3 - 2) \times 0.01 + 0.17 \\ &\quad + 2.05 \\ &= 2 \times 0.01 + 0.17 + 2.05 \\ &= 0.02 + 0.17 + 2.05 \\ &= 2.24 \end{aligned}$$

The correct washer is 2.25 mm thick.

Right side:

$$\begin{aligned} T_2 &= (B - D + H') \times 0.01 + F + G \\ &\quad + 1.95 \\ &= (6 - 3 + 2) \times 0.01 + 0.22 \\ &\quad + 0.10 + 1.95 \\ &= 5 \times 0.01 + 0.22 + 0.10 \\ &\quad + 1.95 \\ &= 0.05 + 0.22 + 0.10 + 1.95 \\ &= 2.32 \end{aligned}$$

The correct washer is 2.30 mm thick.

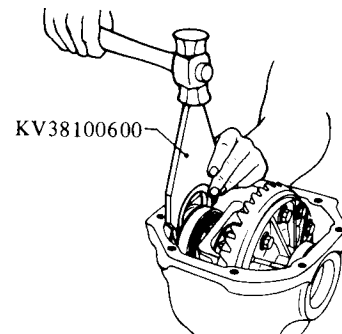
Note: If values signifying A, B, C and D are not given, regard them as zero and compute.

After assembly, check to see that preload and backlash are correct. If not, readjust.

2. Install differential case assembly with side bearing outer races into carrier.

3. Insert left and right side bearing preload adjusting washers in place between side bearings and housing.

4. Drive in side bearing spacer between R.H. washer and housing with Side Bearing Spacer Drift KV38100600. If too great or too small a driving force is required, check to be sure that calculation and side bearing width are correct.



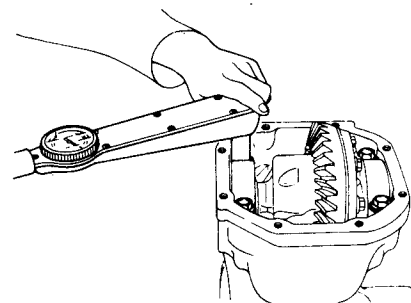
PD361

Fig. PD-65 Driving Spacer Into Place

Note: When driving spacer into place, be careful not to tilt side bearing outer race to either side.

5. Align mark on bearing cap with that on carrier and install bearing cap on carrier. And tighten bolts to specified torque.

Ⓣ : Side bearing cap bolts
88 - 98 N·m
(9.0 - 10.0 kg·m,
65 - 72 ft·lb)



PD362

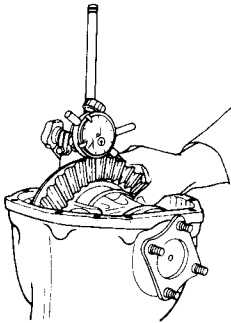
Fig. PD-66 Tightening Side Bearing Cap

6. Measure ring gear-to-drive pinion backlash with a dial indicator.

If it is below the specified value, replace left washer with a thinner one and right washer with a thicker one. If it is over it, replace left washer with a thicker one and right washer with a thinner one.

Note: To maintain correct preload at all times, do not change total thickness of washers.

Ring gear-to-drive pinion backlash:
0.13 - 0.18 mm
(0.0051 - 0.0071 in)



PD341

Fig. PD-67 Measuring Backlash of Ring Gear and Pinion

Incidentally a decrease or increase in thickness of washers causes change in ring gear-to-pinion backlash.

Thus, check for proper backlash.

7. Check and adjust the tooth contact pattern of ring gear and drive pinion.

- (1) Thoroughly clean ring and drive pinion gear teeth.
- (2) Paint ring gear teeth lightly and evenly with a mixture of powdered ferric oxide and oil of a suitable consistency to produce a contact pattern.
- (3) Rotate pinion through several revolutions in the forward and reverse direction until a definite contact pattern is developed on ring gear.

(4) If contact pattern is incorrect, readjust thickness of adjusting washer.

Be sure to completely wipe off red lead upon completion of adjustment.

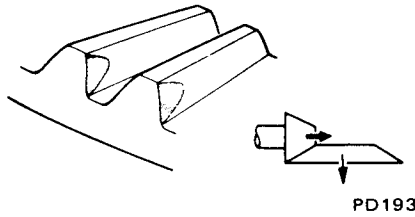
(5) Incorrect teeth contact pattern can be adjusted in the following manner.

Contact pattern

a. Heel contact

To correct, increase thickness of pinion height adjusting washer in order

to bring drive pinion close to ring gear.

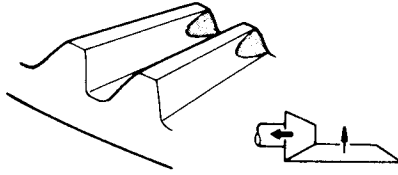


PD193

Fig. PD-68 Heel Contact

b. Toe contact

To correct, reduce thickness of pinion height adjusting washer in order to make drive pinion move away from ring gear.

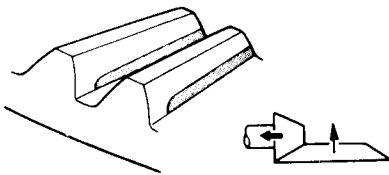


PD194

Fig. PD-69 Toe Contact

c. Flank contact

Adjust in the same manner as in b.

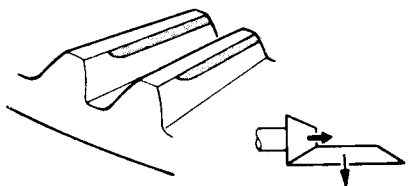


PD195

Fig. PD-70 Flank Contact

d. Face contact

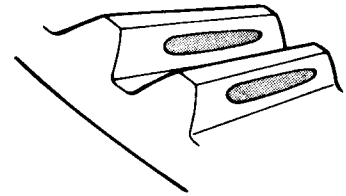
Adjust in the same manner as in a.



PD196

Fig. PD-71 Face Contact

e. Correct tooth contact



PD197

Fig. PD-72 Correct Contact

Note: Change in thickness of adjusting washer is accompanied by change in backlash. Check it when installing gear.

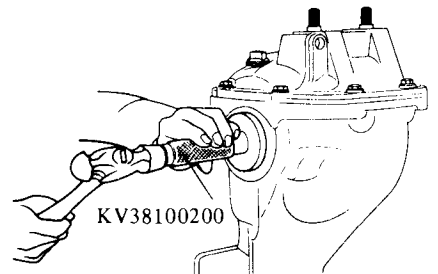
8. Install rear cover.

Ⓣ : Rear cover attaching bolts

16 - 24 N·m
(1.6 - 2.4 kg·m,
12 - 17 ft·lb)

9. Apply grease to cavity at sealing lips of oil seal.

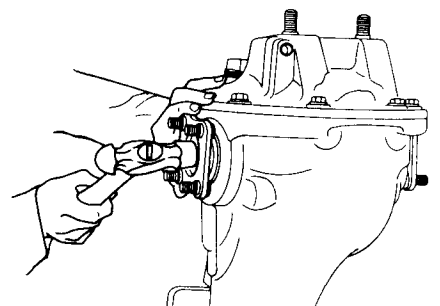
Press side oil seal into carrier with Gear Carrier Side Oil Seal Drift KV38100200.



PD363

Fig. PD-73 Installing Side Oil Seal

10. Install side flange on carrier. Engage spline in side flange with that in side gear and apply light hammer blows until side flange circlip is fitted into groove in side flange.



PD364

Fig. PD-74 Installing Side Flange

Note:

- The length of side flanges differs for their locations. Install the shorter flange on the left side (ring gear) and the longer one on the right side.
- Be careful not to scratch oil seal lips with side flange.

INSTALLATION

Install in the reverse order of removal.

- Position differential carrier onto suspension member, and temporarily tighten it with four bolts.
- Fit rear cover to mounting insulator nuts ①. See Fig. PD-36.

① : Rear cover to mounting insulator nuts
88 - 118 N·m
(9.0 - 12.0 kg·m,
65 - 87 ft·lb)

- Secure differential carrier onto rear suspension member with four bolts.

① : Differential carrier to suspension member bolts
59 - 78 N·m
(6.0 - 8.0 kg·m,
43 - 58 ft·lb)

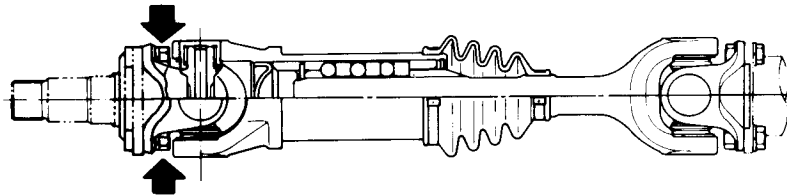
- Install flange yokes together with drive shafts to differential carrier, and tighten side flange fixing bolts to specified torque (except tripod drive shaft).

- Fit companion flange on drive pinion, and secure it in position by tightening nut to specified torque confirming the following preload, with Drive Pinion Flange Wrench ST31530000.

① : Drive pinion nut
186 - 216 N·m
(19 - 22 kg·m,
137 - 159 ft·lb)
Pinion bearing preload
(with oil seal):
1.13 - 1.72 N·m
(11.5 - 17.5 kg·cm,
10.0 - 15.2 in·lb)

At companion flange bolt hole
30.4 - 48.1 N
(3.1 - 4.9 kg,
6.8 - 10.8 lb)

- Reinstall propeller shaft in reverse order of removal, and fill up with gear oil.



PD468

Fig. PD-75 Tightening Side Flange Fixing Bolt

① : Side flange fixing bolts
49 - 59 N·m
(5.0 - 6.0 kg·m,
36 - 43 ft·lb)

- Install drive shaft (tripod drive shaft).
- Join drive shafts with companion flanges of rear axle shafts and tighten connecting bolts.

T : Drive shaft to axle shaft bolts
Except tripod drive shaft
49 - 59 N·m
(5.0 - 6.0 kg·m,
36 - 43 ft·lb)
Tripod drive shaft
27 - 37 N·m
(2.8 - 3.8 kg·m,
20 - 27 ft·lb)

- Install other parts in the reverse manner of removal.
- Fill with correct gear oil.

Note: Gear oil capacity:
1.3 liter (2-3/4 US pt, 2-1/4 Imp pt)

REPLACEMENT OF OIL SEALS

Replacement of oil seals with differential gear carrier assembly installed on the car.

FRONT OIL SEAL

Procedures are as follows:

- Drain gear oil.
- Raise car on hoist.
- Remove insulator, exhaust tube and main muffler mounting bolt to free them from car body.
- Detach propeller shaft.
- Remove drive pinion nut.
- Extract companion flange with a suitable puller.
- Remove oil seal.
- Set new oil seal in position with Gear Carrier Front Oil Seal Drift KV38100500. Apply grease to cavity between seal lips.

SIDE OIL SEAL

Side oil seal is replaced as follows:

- Disconnect drive shaft on the gear carrier side.
- Drive side flange out with pry bar.

Note: Hold side bearing flange with hand to prevent it from jumping out of carrier.

- Remove oil seal.
- Set in new oil seal with Gear Carrier Side Oil Seal Drift KV38100200.

Note: Apply grease to cavity between oil seal lips.

- Install side flange on carrier. Engage spline in side flange with that in side gear and apply light hammer blows until side flange circlip is fitted into groove in side flange.
- Join drive shaft with side flange and tighten nuts.

① : Drive shaft to axle shaft bolts
49 - 59 N·m
(5.0 - 6.0 kg·m,
36 - 43 ft·lb)

Note: Be careful not to scratch oil seal lips with side flange.

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

PROPELLER SHAFT

GENERAL SPECIFICATIONS

Unit: mm (in)

Applied model	S130 (2 seater)		GS130 (2+2 seater)	
	L28E engine	L28ET engine	L28E engine	L28ET engine
Type	2S63A	2S71A	2S63A	2S71A
Length	580 (22.83)	575 (22.64)	780 (30.71)	775 (30.51)
Outer diameter	63.5 (2.500)	75 (2.95)	63.5 (2.500)	75 (2.95)

SERVICE DATA

Permissible dynamic unbalance	gr-cm (oz-in)	35 (0.49)/5,800 rpm
Axial play of spider journal	mm (in)	0 (0)
Journal swinging torque	N·m (kg-cm, in-lb)	0.3 - 1.5 (3 - 15, 2.6 - 13.0)

TIGHTENING TORQUE

Unit		N·m	kg-m	ft-lb
Shaft to companion flange bolts	2S63A	34 - 44	3.5 - 4.5	25 - 33
	2S71A	39 - 44	4.0 - 4.5	29 - 33

DIFFERENTIAL CARRIER

GENERAL SPECIFICATIONS

Applied model	S130 (2 seater)				GS130 (2+2 seater)		
	L28E engine		L28ET engine		L28E engine		L28ET engine
	Deluxe	GL		GL	M/T	A/T	M/T A/T
	M/T A/T	M/T	A/T	M/T A/T			
Type	R180	R200	R180	R200	R200	R180	R200
Gear ratio (number of teeth)	3.545 (39/11)	3.900 (39/10)	3.545 (39/11)	3.545 (39/11)	3.900 (39/10)	3.545 (39/11)	3.545 (39/11)
Drive pinion preload adjusted by	Washer						
Oil capacity (about) liter (US pt, Imp pt)	1.0 (2-1/8, 1-3/4)	1.3 (2-3/4, 2-1/4)	1.0 (2-1/8, 1-3/4)	1.3 (2-3/4, 2-1/4)		1.0 (2-1/8, 1-3/4)	1.3 (2-3/4, 2-1/4)

Propeller Shaft & Differential Carrier

SERVICE DATA

Type	R180	R200
Drive pinion		
Preload (without oil seal) (with oil seal) N·m (kg-cm, in-lb)	1.0 - 1.3 (10 - 13, 8.7 - 11.3) 0.9 - 1.7 (9 - 17, 7.8 - 14.8)	1.0 - 1.3 (10 - 13, 8.7 - 11.3) 1.13 - 1.72 (11.5 - 17.5, 10.0 - 15.2)
Thickness of pinion height adjusting washer mm (in)	3.09 (0.1217) 3.39 (0.1335) 3.12 (0.1228) 3.42 (0.1346) 3.15 (0.1240) 3.45 (0.1358) 3.18 (0.1252) 3.48 (0.1370) 3.21 (0.1264) 3.51 (0.1382) 3.24 (0.1276) 3.54 (0.1394) 3.27 (0.1287) 3.57 (0.1406) 3.30 (0.1299) 3.60 (0.1417) 3.33 (0.1311) 3.63 (0.1429) 3.36 (0.1323) 3.66 (0.1441)	3.09 (0.1217) 3.39 (0.1335) 3.12 (0.1228) 3.42 (0.1346) 3.15 (0.1240) 3.45 (0.1358) 3.18 (0.1252) 3.48 (0.1370) 3.21 (0.1264) 3.51 (0.1382) 3.24 (0.1276) 3.54 (0.1394) 3.27 (0.1287) 3.57 (0.1406) 3.30 (0.1299) 3.60 (0.1417) 3.33 (0.1311) 3.63 (0.1429) 3.36 (0.1323) 3.66 (0.1441) 0.05 (0.0020) 0.07 (0.0028)
Length of pinion bearing adjusting spacer mm (in)	52.20 (2.0551) 52.40 (2.0630) 52.60 (2.0709) 52.80 (2.0787) 53.00 (2.0866) 53.20 (2.0945)	55.10 (2.1693) 55.40 (2.1811) 55.70 (2.1929) 56.00 (2.2047) 56.25 (2.2146)
Thickness of pinion bearing adjusting washer mm (in)	2.30 - 2.32 (0.0906 - 0.0913) 2.32 - 2.34 (0.0913 - 0.0921) 2.34 - 2.36 (0.0921 - 0.0929) 2.36 - 2.38 (0.0929 - 0.0937) 2.38 - 2.40 (0.0937 - 0.0945) 2.40 - 2.42 (0.0945 - 0.0953) 2.42 - 2.44 (0.0953 - 0.0961) 2.44 - 2.46 (0.0961 - 0.0969) 2.46 - 2.48 (0.0969 - 0.0976) 2.48 - 2.50 (0.0976 - 0.0984) 2.50 - 2.52 (0.0984 - 0.0992) 2.52 - 2.54 (0.0992 - 0.1000) 2.54 - 2.56 (0.1000 - 0.1008) 2.56 - 2.58 (0.1008 - 0.1016) 2.58 - 2.60 (0.1016 - 0.1024)	3.80 - 3.82 (0.1496 - 0.1504) 3.82 - 3.84 (0.1504 - 0.1512) 3.84 - 3.86 (0.1512 - 0.1520) 3.86 - 3.88 (0.1520 - 0.1528) 3.88 - 3.90 (0.1528 - 0.1535) 3.90 - 3.92 (0.1535 - 0.1543) 3.92 - 3.94 (0.1543 - 0.1551) 3.94 - 3.96 (0.1551 - 0.1559) 3.96 - 3.98 (0.1559 - 0.1567) 3.98 - 4.00 (0.1567 - 0.1575) 4.00 - 4.02 (0.1575 - 0.1583) 4.02 - 4.04 (0.1583 - 0.1591) 4.04 - 4.06 (0.1591 - 0.1598) 4.06 - 4.08 (0.1598 - 0.1606) 4.08 - 4.10 (0.1606 - 0.1614)
Side gear and pinion mate		
Thickness of side gear thrust washer mm (in)	0.75 - 0.80 (0.0295 - 0.0315) 0.80 - 0.85 (0.0315 - 0.0335) 0.85 - 0.90 (0.0335 - 0.0354)	0.75 - 0.80 (0.0295 - 0.0315) 0.80 - 0.85 (0.0315 - 0.0335) 0.85 - 0.90 (0.0335 - 0.0354)
Pinion mate-to-side gear backlash (or clearance between side gear and thrust washer) mm (in)	For tripod drive shaft Less than 0.15 (0.0059) Except tripod drive shaft 0.10 - 0.20 (0.0039 - 0.0079)	For tripod drive shaft Less than 0.15 (0.0059) Except tripod drive shaft 0.10 - 0.20 (0.0039 - 0.0079)

Propeller Shaft & Differential Carrier

Type		R180	R200
Ring gear			
Ring gear-to-drive pinion backlash	mm (in)	0.10 - 0.20 (0.0039 - 0.0079)	0.13 - 0.18 (0.0051 - 0.0071)
Thickness of side retainer shim (R180) or side bearing adjusting washer (R200)	mm (in)	0.20 (0.0079) 0.25 (0.0098) 0.30 (0.0118) 0.40 (0.0157) 0.50 (0.0197)	2.00 (0.0787) 2.35 (0.0925) 2.05 (0.0807) 2.40 (0.0945) 2.10 (0.0827) 2.45 (0.0965) 2.15 (0.0846) 2.50 (0.0984) 2.20 (0.0866) 2.55 (0.1004) 2.25 (0.0886) 2.60 (0.1024) 2.30 (0.0906)
Side bearing standard width	mm (in)	20.0 (0.787)	21.0 (0.827)

TIGHTENING TORQUE

Type	R180			R200		
Unit	N·m	kg·m	ft·lb	N·m	kg·m	ft·lb
Drive pinion nut	167 - 196	17 - 20	123 - 145	186 - 216	19 - 22	137 - 159
Ring gear bolt [using Locktite (stud lock) or equivalent]	88 - 98	9.0 - 10.0	65 - 72	59 - 69	6.0 - 7.0	43 - 51
Side bearing cap bolt	—	—	—	88 - 98	9.0 - 10.0	65 - 72
Side retainer bolt	8.8 - 11.8	0.9 - 1.2	6.5 - 8.7	—	—	—
Rear cover fixing bolt	39 - 49	4.0 - 5.0	29 - 36	16 - 24	1.6 - 2.4	12 - 17
Rear cover to mounting insulator nut	59 - 78	6.0 - 8.0	43 - 58	88 - 118	9.0 - 12.0	65 - 87
Differential carrier to suspension member bolt	59 - 78	6.0 - 8.0	43 - 58	59 - 78	6.0 - 8.0	43 - 58
Companion flange to propeller shaft fixing bolt	34 - 44	3.5 - 4.5	25 - 33	34 - 44	3.5 - 4.5	25 - 33
Side flange to drive shaft fixing nut	—	—	—	49 - 59	5.0 - 6.0	36 - 43
Side yoke fitting bolt	31 - 42	3.2 - 4.3	23 - 31	—	—	—
Filler and drain plug	39 - 59	4 - 6	29 - 43	39 - 59	4 - 6	29 - 43

TROUBLE DIAGNOSES AND CORRECTIONS

PROPELLER SHAFT

Condition	Probable cause	Corrective action
Vibration at medium or high speed	Worn or damaged universal joint needle bearing. Unbalance due to bent or dented propeller shaft. Loose propeller shaft installation. Worn transmission rear extension bushing. Undercoating or mud on the shaft causing unbalance. Tire unbalance. Balance weights missing.	Replace propeller shaft assembly. Replace propeller shaft assembly. Retighten. Replace. Clean shaft. Balance wheel and tire assembly. Replace.
Knocking sound on propeller shaft while starting or noise while coasting.	Worn or damaged universal joint. Worn sleeve yoke and main shaft spline. Loose propeller shaft installation.	Replace propeller shaft assembly. Replace propeller shaft assembly. Retighten.
Scraping noise	Dust cover on sleeve yoke rubbing on transmission rear extension. Dust cover on companion flange rubbing on differential carrier.	Straighten dust cover to remove interference.

DIFFERENTIAL CARRIER

When gear carrier is suspected causing noise, it is advisable to make a thorough test to determine whether the noise originates in the tires, road

surface, exhaust, universal joint, propeller shaft, wheel bearings, engine, transmission, or gear carrier. Noise which originates in other places cannot

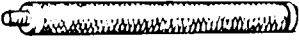
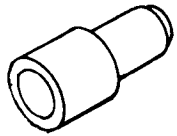

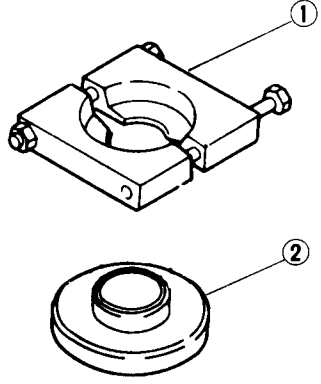

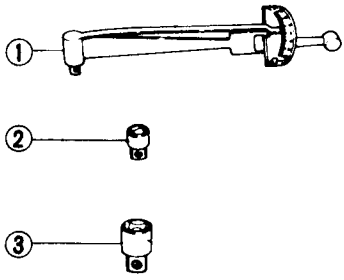
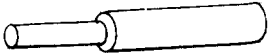



be corrected by adjustment or replacement of parts in the rear axle assembly.

Condition	Probable cause	Corrective action
Noise during driving and/or coasting	Shortage of oil. Incorrect tooth contact between ring gear and drive pinion. Incorrect backlash between ring gear and drive pinion. Seized or damaged ring gear and drive pinion. Seized, damaged or broken drive pinion bearing. Seized, damaged or broken side bearing. Loose bolts or nuts fixing ring gear, side bearing caps, etc.	Supply gear oil. Rebuild gear carrier if necessary. Adjust tooth contact or replace the hypoid gear set. Adjust backlash or replace the hypoid gear set if necessary. Replace the hypoid gear set. Replace the pinion bearing and faulty parts. Replace the side bearing and faulty parts. Tighten to specified torque, and replace faulty parts.

Propeller Shaft & Differential Carrier

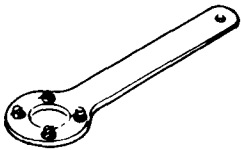
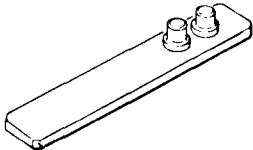
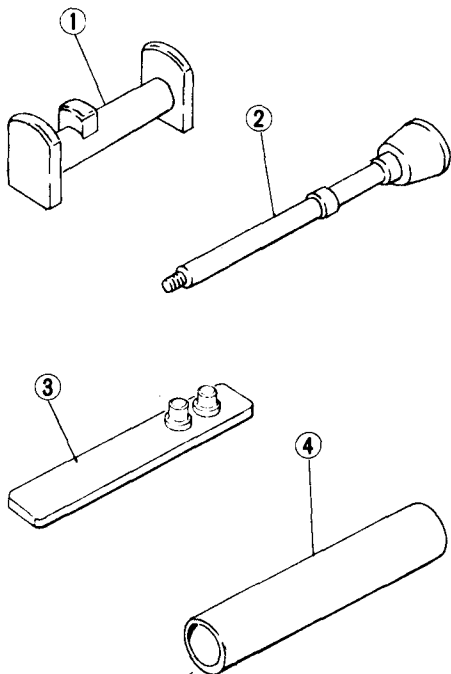
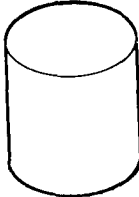
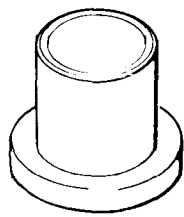
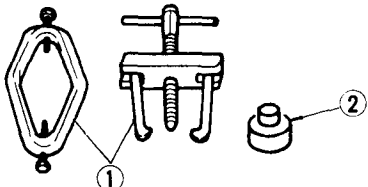
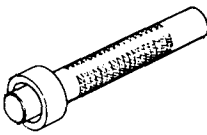
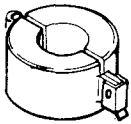
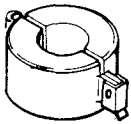
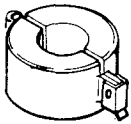
Condition	Probable cause	Corrective action
Noise on turns.	<p>Seized, damaged or broken side and pinion gears.</p> <p>Seized, damaged or broken side gear and pinion thrust washer.</p> <p>Pinion gears too tight on their shaft.</p> <p>Interference between side flange and differential case.</p>	<p>Replace faulty parts.</p> <p>Replace faulty parts.</p> <p>Replace faulty parts.</p> <p>Repair the part responsible for interference, or replace the side flange and differential case.</p>
Knocking sound during starting or gear shifting	<p>Excessive backlash.</p> <p>Incorrect backlash of ring gear-to-drive pinion or side gear-to-pinion gear.</p> <p>Worn gears or case.</p> <p>Worn side flange and side gear spline.</p> <p>Pinion bearing under preload.</p> <p>Loose drive pinion nut.</p> <p>Loose bolts or nuts fixing ring gear, side bearing caps, etc.</p>	<p>Adjust backlash.</p> <p>Replace worn parts.</p> <p>Replace worn parts.</p> <p>Adjust preload.</p> <p>Repair or replace.</p> <p>Tighten or replace if necessary.</p>
Seizure or breakage.	<p>Shortage of oil or use of unsuitable oil.</p> <p>Excessively small backlash.</p> <p>Incorrect adjustment of bearings or gears.</p> <p>Severe service due to excessive loading, improper use of clutch.</p> <p>Loose bolts and nuts, such as ring gear bolts.</p>	<p>Replace faulty parts.</p> <p>Adjust backlash and replace as required.</p> <p>Replace faulty parts.</p> <p>Replace faulty parts.</p> <p>Replace faulty parts.</p>
Oil leakage.	<p>Worn-out, damaged or improperly driven front oil seal, or bruised, dented or abnormally worn slide face of companion flange.</p> <p>Worn, damaged or improperly driven side oil seal, or bruised, dented or abnormally worn slide flange.</p> <p>Loose rear cover bolts.</p> <p>Worn rear cover gasket.</p> <p>Loose filler or drain plug.</p> <p>Clogged or damaged breather.</p>	<p>Replace the faulty oil seal. Ammend the affected flange with sandpaper or replace if necessary.</p> <p>Treat as above.</p> <p>Tighten the bolts to specified torque.</p> <p>Replace the faulty gasket with new one.</p> <p>Tighten the plug.</p> <p>Repair or replace.</p>

SPECIAL SERVICE TOOLS

Tool number & tool name	Kent-Moore No.	Tool number & tool name	Kent-Moore No.
	Reference page or Fig. No.		Reference page or Fig. No.
	Unit application		Unit application
ST30611000 Drift 	J 25742-1	ST30720000 Gear carrier front oil seal drift 	J 25751
	Page PD-6 Page PD-9 Page PD-16		Page PD-8 Page PD-11
	*		R180
ST30613000 Drift 	J 25742-3	ST3090S000 Drive pinion rear bearing inner race puller set ① ST30031000 Puller ② ST30901000 Base 	① J25733-1 ② —
	Page PD-16		Fig. PD-10 Fig. PD-20 Fig. PD-48 Fig. PD-60
	R200 (Front)		*
ST30621000 Drift 	—	ST3127S000 Preload gauge ① GG91030000 Torque wrench ② HT62940000 Socket adapter ③ HT62900000 Socket adapter 	See J 25765 ① J25765 ② — ③ —
	Page PD-9 Page PD-16		Fig. PD-16 Fig. PD-40 Fig. PD-56
	*		*
ST30650001 Pilot bearing drift 	J 25749	ST30701000 Drive pinion outer race drift 	R180 (Front)
	Page PD-4		
	R180		
ST30701000 Drive pinion outer race drift 	J 25742-2	ST30701000 Drive pinion outer race drift 	R180 (Front)
	Page PD-6		
	R180 (Front)		

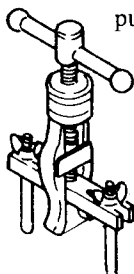
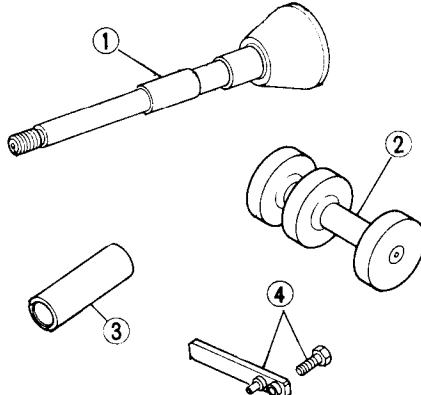
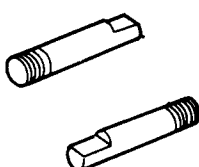
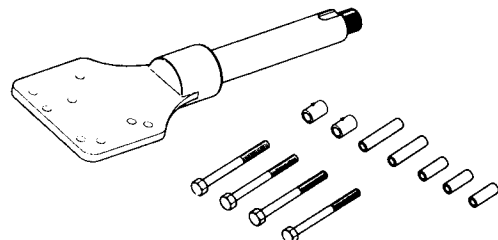
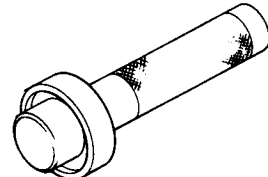
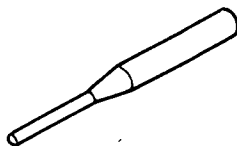
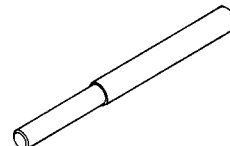
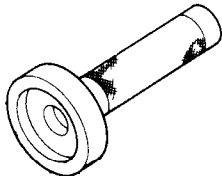
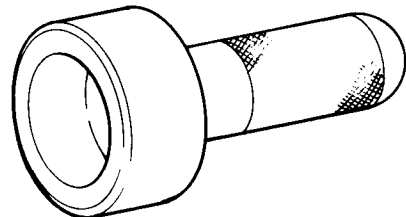
*: Applicable to all S130 series models

Propeller Shaft & Differential Carrier

Tool number & tool name	Kent-Moore No.	Tool number & tool name	Kent-Moore No.
	Reference page or Fig. No.		Reference page or Fig. No.
	Unit application		Unit application
ST31530000 Drive pinion flange wrench 	J25774-A	ST31852000 Stopper (R180) 	—
	Page PD-11 Page PD-20 Fig. PD-9 Fig. PD-45		Fig. PD-15
	*		R180
ST3121S000 Height gauge assembly ① ST31211000 Height gauge ② ST31212000 Dummy shaft ③ ST31213000 Stopper (R160 only) ④ ST31214000 Collar 	See J 25269-01 ① See J25269-B ② See J25269-B ③ See J25269-B ④ See J25269-B	ST32501000 Weight block 	J 25407-3
	Fig. PD-17 Fig. PD-18		Fig. PD-13 Fig. PD-53
	R180		*
ST31851000 Spacer (R180) 	See J25269-B Fig. PD-17	ST3306S001 Diff. side bearing puller set ① ST33051001 Body ② ST33061000 Adapter 	① — ② J25797-2
			Fig. PD-11 Fig. PD-14 Fig. PD-50 Fig. PD-54
			*
ST33230000 Diff. side bearing drift 		ST33270000 Gear carrier side oil seal drift 	J 25805-01
			Fig. PD-14
			R180
ST33270000 Gear carrier side oil seal drift 		ST33270000 Gear carrier side oil seal drift 	J 25809
			Page PD-11
			R180

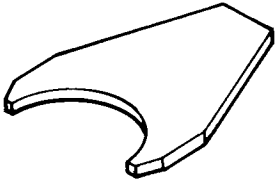


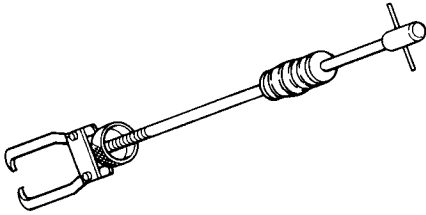
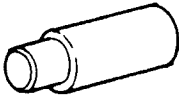
*: Applicable to all S130 series models

Propeller Shaft & Differential Carrier

Tool number & tool name	Kent-Moore No.	Tool number & tool name	Kent-Moore No.
	Reference page or Fig. No.		Reference page or Fig. No.
	Unit application		Unit application
ST33290001 Side bearing outer race puller 	J 25810	KV381001S0 Drive pinion setting gauge set (R200) ① KV38100110 Dummy shaft ② KV38100120 Height gauge ③ KV38100130 Collar ④ KV38100140 Stopper 	—
	Fig. PD-8		Page PD-16 Fig. PD-55 Fig. PD-57 Fig. PD-58
	R180		
ST33720000 Gear carrier side retainer guide (R160, R180) 	J 25817		
	Fig. PD-25		
	R180		R200
KV38100800 Diff. attachment 	—	KV38100300 Diff. side bearing drift 	—
	Fig. PD-6 Fig. PD-39		Fig. PD-54
	*		R200
KV31100300 Solid punch 	J25689-A	KV38100401 Pilot bearing drift 	—
	Page PD-15 Fig. PD-12		Fig. PD-47
	*		R200
KV38100200 Gear carrier side oil seal drift 	—	KV38100500 Gear carrier front oil seal drift 	—
	Page PD-20 Fig. PD-73		Page PD-17 Page PD-20
	R200		R200

*: Applicable to all S130 series models

Propeller Shaft & Differential Carrier

Tool number & tool name	Kent-Moore No.	Tool number & tool name	Kent-Moore No.
	Reference page or Fig. No.		Reference page or Fig. No.
	Unit application		Unit application
KV38100600 Side bearing spacer drift 	—	KV38102000 Master gauge [21.0 mm (0.827 in)] 	—
	Fig. PD-65		Fig. PD-53
	R200		R200
KV38101900 Master gauge [20.0 mm (0.787 in)] 	—	HT72400000 Slide hammer 	—
	Fig. PD-13		Fig. PD-44
	R180		R200
ST33710000 Diff. side retainer attachment 	—		
	Fig. PD-7		
	R180		

*: Applicable to all S130 series models

FRONT AXLE & FRONT SUSPENSION

SECTION FA

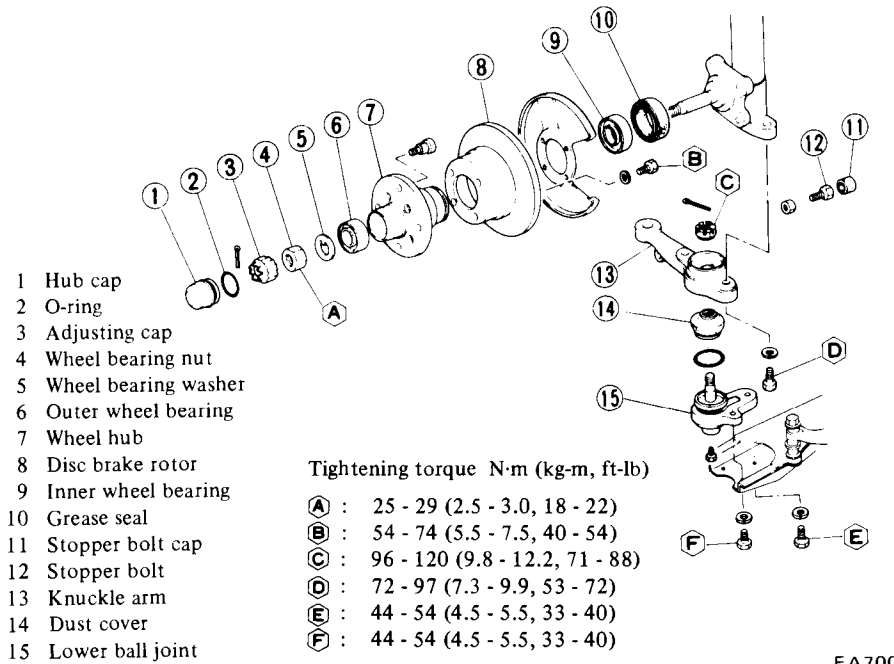
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BALL JOINT	FA- 9		

Refer to Section MA (Front Axle and Front Suspension)
for:

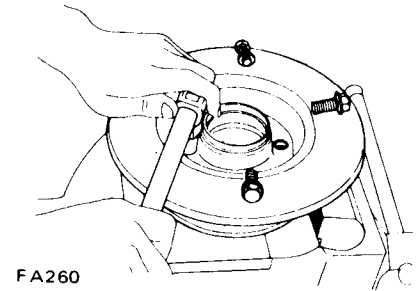
- ADJUSTING WHEEL BEARING PRELOAD
- CHECKING WHEEL ALIGNMENT

FRONT AXLE



Note: Be careful not to drop outer bearing cone out of hub when removing hub from knuckle spindle.

8. Remove outer bearing cone.
9. Loosen four bolts securing brake disc; remove disc brake rotor from wheel hub assembly.



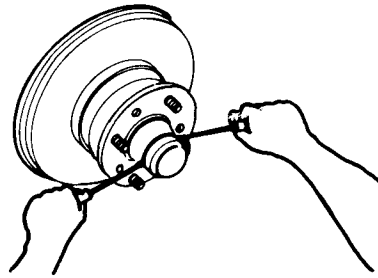
FA260

Loosen screws securing baffle plate; take out baffle plate.

REMOVAL

1. Block rear wheels with chocks.
2. Jack up front of car and support it with safety stands.
3. Remove wheel and tire assembly.
4. Remove brake caliper assembly.

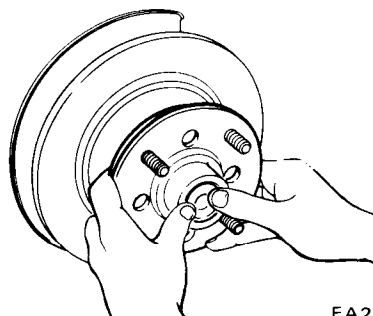
Note: Brake tube must not be disconnected from brake carrier assembly.



FA702

Note: During operation, be careful to avoid damaging O-ring.

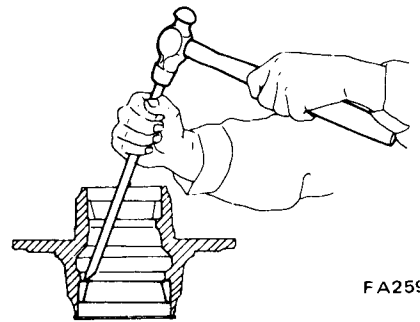
6. Pry off cotter pin; take out adjusting cap and wheel bearing lock nut.
7. Remove wheel hub with disc brake rotor from spindle with bearing installed.



FA258

10. Remove inner bearing cone after prying out grease seal. Discard grease seal.

11. If it is necessary to replace bearing outer race, drive it out from hub with a brass drift and mallet. Evenly tap bearing outer race through two grooves inside hub.



FA259

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.

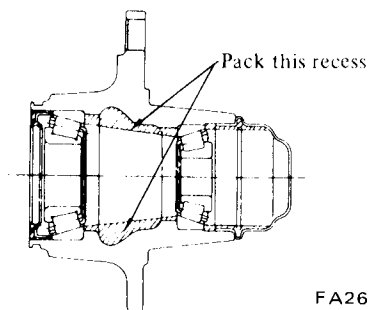
WHEEL HUB

Check wheel hub for crack by means of a magnetic exploration or dyeing test, and replace if cracked.

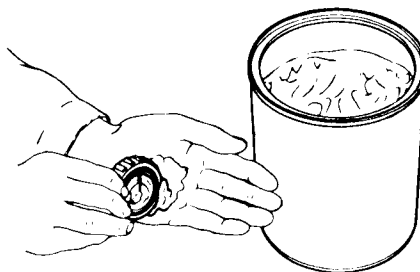
INSTALLATION

Install front axle in the reverse order of removal, noting the following:

1. Install bearing outer race with Front Wheel Bearing Drift ST35300000 until they seat in hub.
2. Pack hub and hub cap with recommended multi-purpose grease up to shaded portions.



3. Coat each bearing cone with recommended multi-purpose grease.



4. Place inner bearing cone in hub and install a new grease seal, coating sealing lips with recommended multi-purpose grease.

5. Concerning installation of brake parts, refer to Section BR.

T : Rotor to hub
54 - 74 N·m
(5.5 - 7.5 kg-m,
40 - 54 ft-lb)

6. Install hub with rotor and outer bearing cone.

7. Sparingly apply recommended multi-purpose grease to threaded portion of spindle and bearing washer to bearing contacting face. Then install washer and wheel bearing nut.

8. Adjust wheel bearing preload. Refer to Section MA for adjustment.

- a. In order to assure correct bearing starting torque and to extend service life of wheel bearings, be sure to avoid dirt and foreign particles getting in bearings, grease seal, washer, bearing nut, etc.

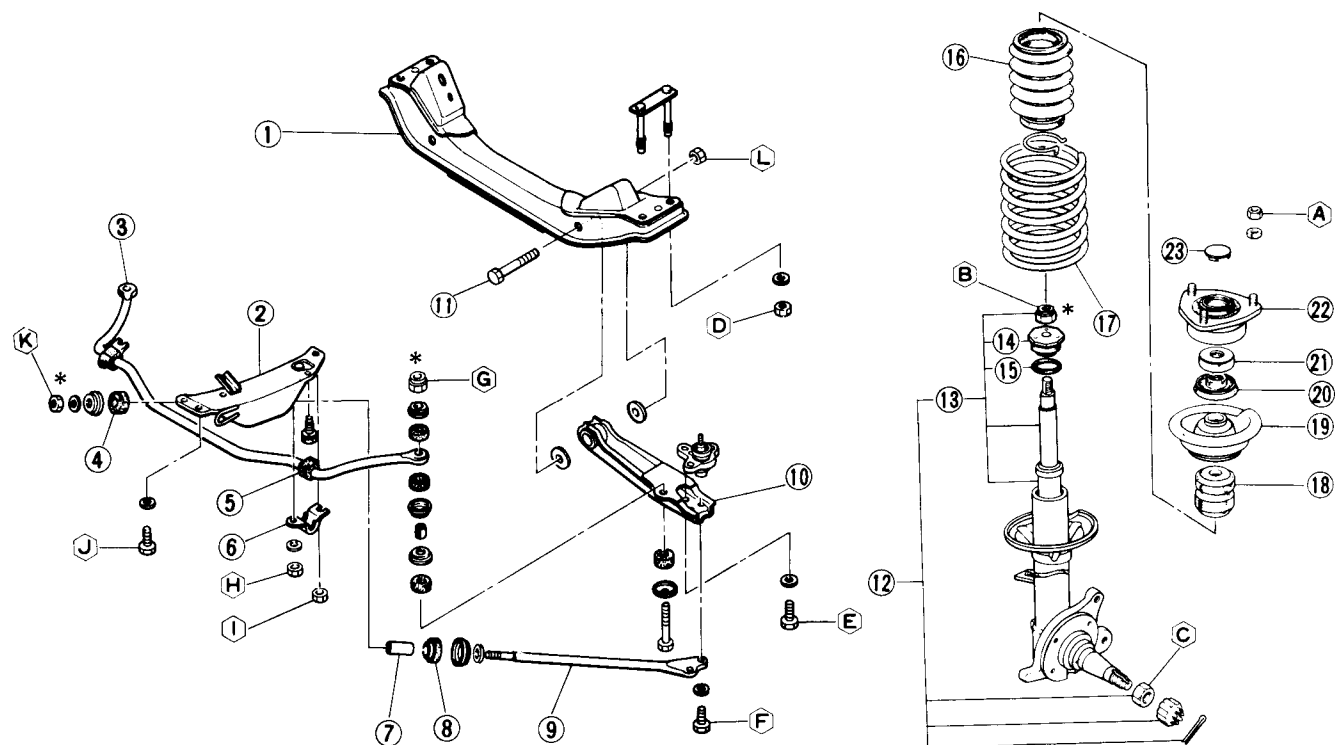
- b. Grease should be changed at each disassembly and in accordance with Periodic Maintenance Schedule.

8. Install O-ring on hub cap and install hub cap on hub.

9. Install brake caliper assembly, referring to Section BR.

10. Install wheel and tire.

FRONT SUSPENSION



- 1 Suspension crossmember
- 2 Tension rod bracket
- 3 Stabilizer bar
- 4 Tension rod mounting bushing
- 5 Stabilizer bushing
- 6 Stabilizer bracket
- 7 Tension rod collar
- 8 Tension rod mounting bushing
- 9 Tension rod
- 10 Transverse link

- 11 Transverse link mounting bolt
- 12 Strut assembly
- 13 Shock absorber
- 14 Gland packing
- 15 O-ring
- 16 Dust cover
- 17 Front spring
- 18 Bound bumper
- 19 Front spring upper seat
- 20 Dust seal
- 21 Strut mounting bearing
- 22 Strut mounting insulator
- 23 Cap

Tightening torque N·m (kg-m, ft-lb)

- A : 29 - 39 (3.0 - 4.0, 22 - 29)
 B : 59 - 74 (6.0 - 7.5, 43 - 54)
 C : 25 - 29 (2.5 - 3.0, 18 - 22)
 D : 69 - 88 (7.0 - 9.0, 51 - 65)
 E : 44 - 54 (4.5 - 5.5, 33 - 40)
 F : 44 - 54 (4.5 - 5.5, 33 - 40)
 G : 16 - 22 (1.6 - 2.2, 12 - 16)
 H : 26 - 36 (2.7 - 3.7, 20 - 27)
 I : 26 - 36 (2.7 - 3.7, 20 - 27)
 J : 31 - 42 (3.2 - 4.3, 23 - 31)
 K : 44 - 54 (4.5 - 5.5, 33 - 40)
 L : 78 - 98 (8.0 - 10.0, 58 - 72)

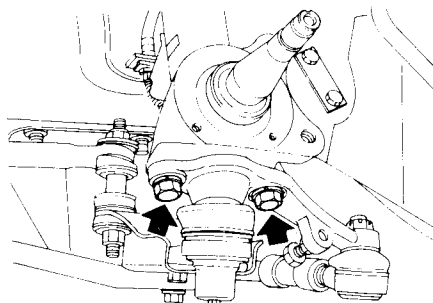
*: Replace self-locking nut whenever strut is disassembled.

FA790

SPRING AND STRUT ASSEMBLY

REMOVAL

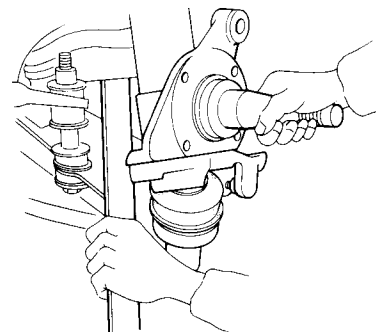
1. Disconnect brake tube from brake assembly.
2. Remove brake caliper assembly.
3. Remove wheel hub and wheel bearing, if necessary.
4. Remove bolt connecting strut to knuckle arm.



FA704

5. Detach knuckle arm from bottom of strut. This can be done by forcing

lower arm down with a suitable bar.



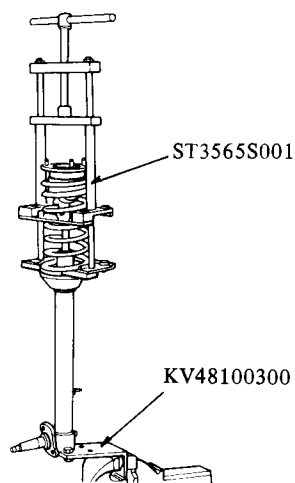
FA791

6. Support strut assembly with a jack or suitable stand and remove three nuts securing strut to hoodledge. Strut assembly and spring can then be removed as a unit.

DISASSEMBLY

When disassembling a strut, extra caution should be exercised to avoid dirt and dust getting inside strut. This dirt and dust is loaded with abrasive which, if enters strut, causes internal leak and premature wear of moving parts.

1. Secure Strut & Steering Gear Housing Attachment KV48100300 in a vise and install strut on attachment.
2. Set up Spring Compressor ST3565S001 on spring. Compress spring just far enough to permit turning of strut mounting insulator by hand.

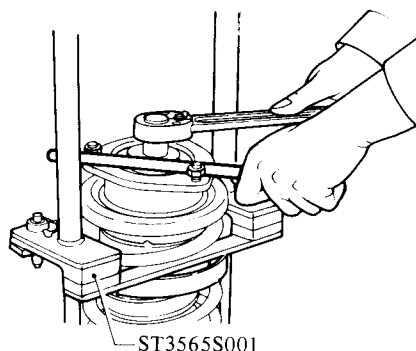


FA658

3. Remove lock nut on top of piston rod; remove mounting insulator, strut mounting bearing, dust seal, spring seat, spring and bumper rubber.

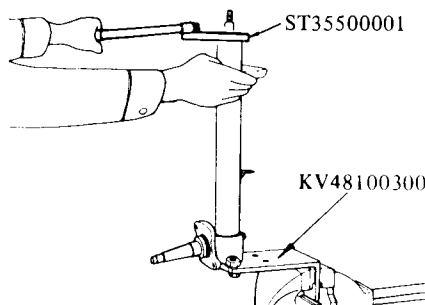
CAUTION:

Be sure to hook special tool (ST35651001) evenly on a minimum of three coils, paying attention not to damage piston rod.



FA706

4. Retract piston rod by pushing it down until it bottoms. Remove gland packing with Gland Packing Wrench ST35500001.

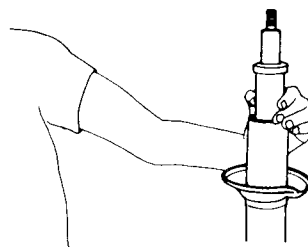


FA209

Note: Clean gland packing of mud and other foreign particles accumulated.

5. Remove O-ring from top of piston rod guide bushing.
6. Lift out piston rod together with cylinder.

Note: Do not remove piston rod quickly as this will cause oil to spurt out.



FA275

Note: Piston rod, piston rod guide and cylinder are adjusted to provide precision mating surfaces and should be handled as a matched set.

7. Drain fluid thoroughly from inner cylinder and discard.
8. Wash all parts in suitable solvent.
9. Drain fluid thoroughly from outer casing.

Note: This operation is very important since performance of strut varies with amount of fluid filled within strut.

INSPECTION

1. Replace gland packing, O-ring and fluid whenever strut is disassembled.
2. Wash all parts, except for non-metallic parts, with suitable solvent and dry with compressed air.
3. Blow dirt and dust off of non-metallic parts using compressed air.

Note:

- a. Oil oozing out at and around gland packing does not call for strut maintenance. If oil leaks past spring seat, check piston rod and gland packing to correct the cause of problem. If oil leakage occurs on welded portion of outer strut casing, replace strut outer casing assembly.
- b. If shock absorber itself is malfunctioning, replace as an assembly (including piston rod, cylinder, bottom valve and guide bushing).

Outer casing

Check outer casing for evidences of deformation, cracking or other damage. If necessary, discard.

Strut mounting insulator

Replace if cemented rubber-to-metal joints are melted or cracked. Rubber parts should also be replaced, if deteriorated.

Strut mounting bearing

Replace if inspection reveals abnormal noise or excessive rattle in axial direction.

Note: Check dust seal for scratches or cracks on lips and replace if necessary.

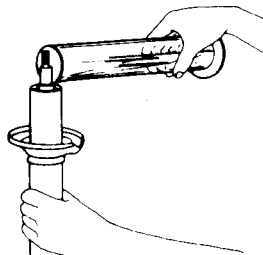
ASSEMBLY

When assembling strut, be careful not to drop or scratch parts since they are precisely machined to very close tolerances. Before assembly, clean away all dirt to prevent any possible entry of dirt into strut.

Note: If replacement of any strut component parts is found to be necessary, make sure that parts are the same brand as those used in the strut assembly.

1. Install strut outer casing on Strut & Steering Gear Housing Attachment KV48100300.
2. Install cylinder and piston rod assembly (shock absorber kit) in outer casing.
3. Remove piston rod guide from cylinder and pour correct amount of new fluid into cylinder and strut outer casing.

Amount of oil:
275 ml (9.3 US fl oz,
9.7 Imp fl oz)



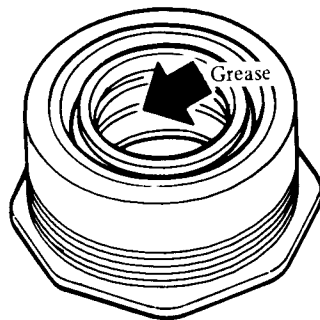
FA065

Note:

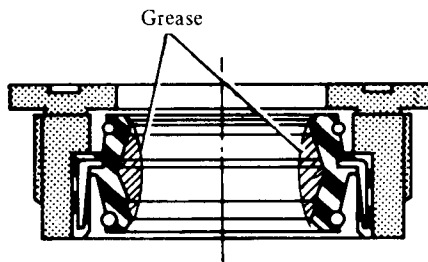
- a. It is important that correct amount of fluid be poured into strut to assure correct damping force of shock absorber.
 - b. Use GENUINE NISSAN STRUT OIL or equivalent every after overhaul.
4. Securely install piston rod guide in cylinder.

Note: Be careful not to damage guide with thread portion of piston rod.

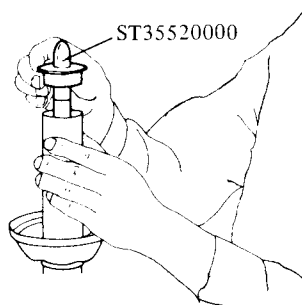
5. Install new O-ring over rod guide.
6. Lubricate sealing lips of gland packing with lithium base grease (containing molybdenum disulphide) and install gland packing with Gland Packing Guide ST35520000.



FA659



FA464



FA276

7. Tighten gland packing.

T : Gland packing
98 - 127 N·m
(10.0 - 13.0 kg·m,
72 - 94 ft·lb)

Note:

- a. When tightening gland packing, it is important that piston rod be extended approximately 120 mm (4.72 in) from upper surface of gland packing to facilitate spring installation.
- b. Gland packing should be tightened to specified torque with the aid of Gland Packing Wrench ST35500001. When doing so, the amount of torque to be read beneath wrench needle should be modified according to the following formula:

$$C \text{ N·m} = 98 \times \left(\frac{L}{L + 0.10} \right) \text{ or}$$

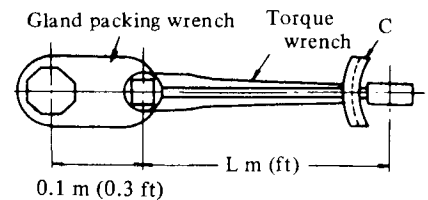
$$C \text{ kg·m} = 10 \times \left(\frac{L}{L + 0.10} \right) \text{ or}$$

$$C \text{ ft·lb} = 72 \times \left(\frac{L}{L + 0.33} \right)$$

where,

C Value to be read on the torque wrench [N·m (kg·m, ft·lb)]

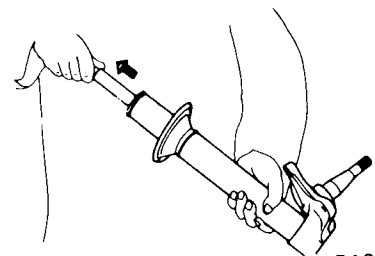
L Effective length of torque wrench [m (ft)]



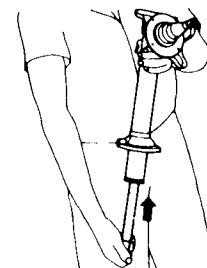
FA278

8. Bleed air out of shock absorber as follows:

- (1) Holding strut by hand with its spindle side facing down, pull out piston rod completely. Then, turn strut upside down so that spindle side is now facing up. Under this condition, retract piston rod all the way in.
- (2) Repeat the above procedure several times so that air will be bled out from strut thoroughly.
- (3) If, during the above step, an equal pressure is felt through the hand gripping piston rod on both strokes, it is an indication that air is expelled from strut thoroughly.



FA070

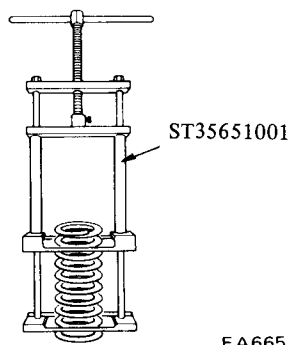


FA071

9. Place Strut & Steering Gear Housing Attachment KV48100300 in jaws of a vise.

10. Before proceeding with further steps, pull piston rod all the way out to the limit of its stroke; install bound bumper rubber in place to prevent piston rod from falling by its own weight.

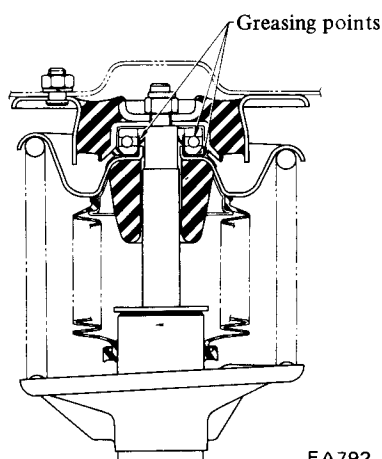
11. Compress spring with Spring Compressor ST35651001.



FA665

Note: To prevent interference between upper spring seat and special tool, leave upper 2.5 to 3 turns of spring coils free, compress spring and assemble to strut.

12. Lubricate dust seal indicated by arrow in following figure with recommended multi-purpose grease.



FA792

13. Install dust cover, upper spring seat, dust seal, mounting bearing and insulator in this written order.

Note:

- Do not allow piston rod to go too far into strut. If it does, screw Piston Rod Puller ST35600000 into rod end and pull out.
- Be careful to avoid damaging piston rod during disassembly and assembly. Do not use pliers or the like in an effort to extract piston rod.
- Install thrust bearing so that it points in correct direction.

14. Tighten new piston rod self-locking nut.

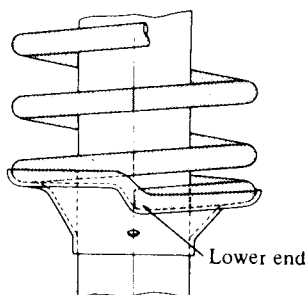
T : Piston rod self-locking nut
59 - 74 N·m
(6.0 - 7.5 kg-m,
43 - 54 ft-lb)

Note:

- Temporarily tighten self-locking nut on tip of piston rod. After installing piston rod on car, tighten self-locking nut to specification.
- Replace self-locking nut whenever strut is disassembled.

15. To prevent entry of water and dust, apply a thick coat of recommended multi-purpose grease

16. After placing spring in position between upper and lower spring seats, release compressor gradually.



FA074

17. Raise bound bumper rubber to upper spring seat.

INSTALLATION

Install strut and spring assembly in reverse order of removal.

T : Strut to hoodledge

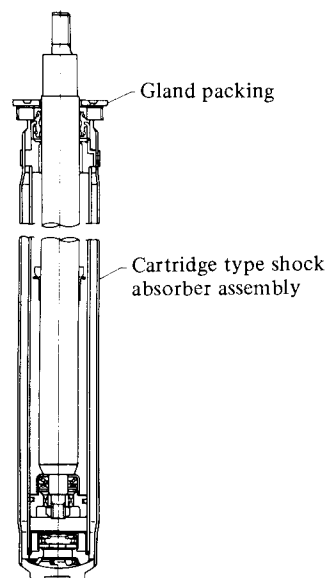
29 - 39 N·m
(3.0 - 4.0 kg-m,
22 - 29 ft-lb)

Steering knuckle arm to strut

72 - 97 N·m
(7.3 - 9.9 kg-m,
53 - 72 ft-lb)

Note: Make sure brake hose is secure and not twisted.

CARTRIDGE TYPE SHOCK ABSORBER



SFA174

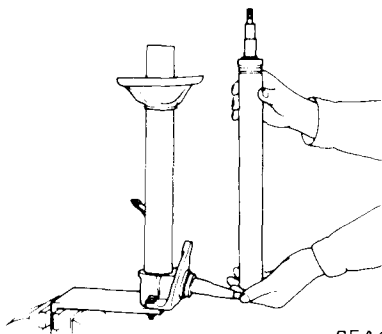
REMOVAL, INSTALLATION AND DISASSEMBLY

Refer to Spring and Strut Assembly for removal, disassembly and installation.

ASSEMBLY

1. Visually check the exterior of the shock absorber for any abnormality.

Note: Also check the part number of the shock absorber to see that the shock absorber is the correct type specified for the car.

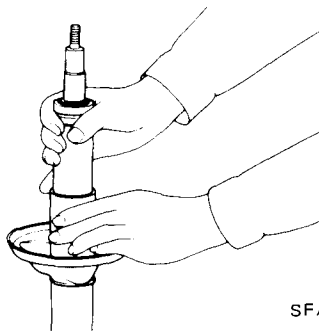


SFA164

2. Carefully insert the shock absorber into the outer strut tube.

CAUTION:

Do not drop the shock absorber or otherwise mishandle it.



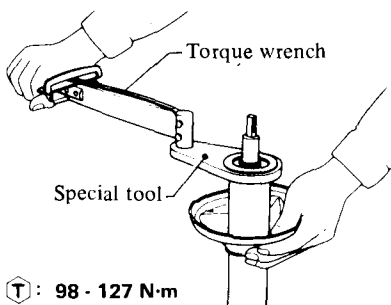
SFA165

3. After the shock absorber has been inserted into the outer tube, gently shake the strut assembly right and left so that the shock absorber is centered.

4. Install gland packing and tighten the gland packing with the Gland Packing Wrench and a torque wrench.

Refer to items 6 and 7 of Spring and Strut Assembly for assembly.

Note: Be careful not to damage the piston rod during tightening.



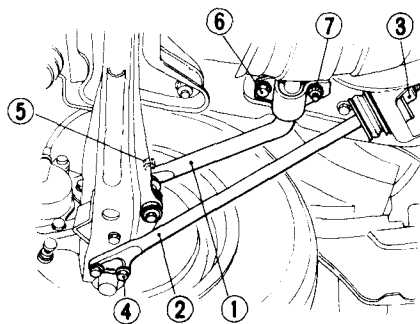
SFA167

5. Further steps are the same procedure as the standard type spring and strut assembly. Refer to item 8 through 17 of Spring and Strut Assembly for assembly.

TENSION ROD AND STABILIZER BAR

REMOVAL

1. Jack up the front of car and support it with safety stands; remove wheels.
2. Remove splashboard.
3. Back off nut ③ securing tension rod to bracket and remove bolts ④ which secure tension rod to lower arm. Tension rod can then be taken out.



FA835

- 1 Stabilizer bar
- 2 Tension rod

4. Remove nuts ⑤ securing stabilizer bar to connecting rod.

Note: Two wrenches are necessary in this operation.

5. Remove bolts ⑥ and nuts ⑦ securing stabilizer bar bracket in position. Stabilizer bar can then be taken out.

INSPECTION

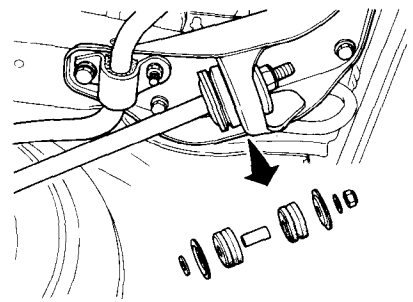
1. Check tension rod and stabilizer bar for evidence of deformation or cracks; if necessary, replace.
2. Check rubber parts (such as tension rod and stabilizer bar bushings) to be sure they are not deteriorated or cracked; if necessary, replace.

INSTALLATION

Install tension rod and stabilizer bar in the reverse order of removal.

Note:

- a. To install stabilizer bar, first temporarily tighten stabilizer bar bracket securing nuts and bolts. Final tightening should be carried out at curb weight with tires on ground.
- b. Noting direction of tension rod bushing, properly center bushing in tension rod bushing washer.



FA793

- c. After installation, make sure minimum clearances between tension rods and stabilizer bar are equal on both sides.
- d. Closely observe torque specification when tightening tension rod bracket retaining bolts.
- e. First tighten tension rod on bracket side to specified torque setting; then tighten the other end on lower arm.

Ⓘ : Tension rod bushing installation nut

44 - 54 N·m
(4.5 - 5.5 kg-m,
33 - 40 ft-lb)

Tension rod to transverse link
44 - 54 N·m
(4.5 - 5.5 kg-m,
33 - 40 ft-lb)

Tension rod bracket to body
31 - 42 N·m
(3.2 - 4.3 kg-m,
23 - 31 ft-lb)

Stabilizer bar bracket
26 - 36 N·m
(2.7 - 3.7 kg-m,
20 - 27 ft-lb)

Stabilizer bar connecting rod
16 - 22 N·m
(1.6 - 2.2 kg-m,
12 - 16 ft-lb)

TRANSVERSE LINK AND LOWER BALL JOINT

The transverse link is connected to the suspension member through a rubber bushing and to the strut through a ball joint.

The lower ball joint is assembled at factory and cannot be disassembled.

REMOVAL

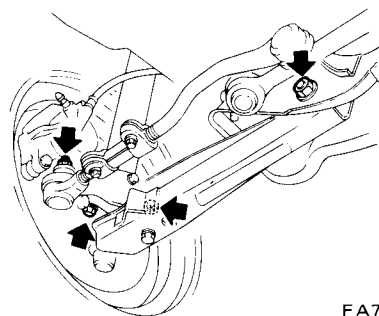
1. Block rear wheels with chocks.
2. Jack up the front of car and support it with safety stands; remove wheel.
3. Remove splashboard.
4. Pry cotter pin off side rod socket ball joint.

Remove castle nut and separate side rod from knuckle arm with Ball Joint Remover HT72520000. For details, refer to Steering Linkage (Section ST) for removal.

5. Loosen bolts securing knuckle arm to lower end of strut, and separate knuckle arm from strut. For details, refer to Spring and Strut Assembly for removal.

6. Remove tension rod and stabilizer bar. For details, refer to Tension Rod and Stabilizer Bar for removal.

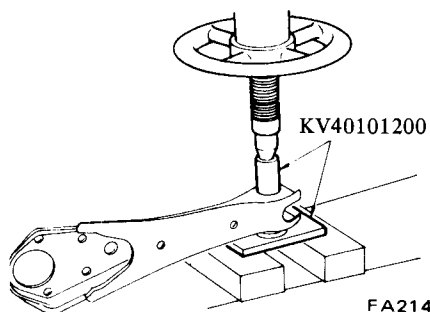
7. Loosen transverse link mounting bolt and separate transverse link from suspension member. Remove transverse link with lower ball joint and knuckle arm.



FA794

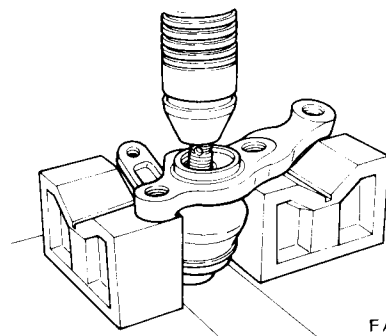
8. Place transverse link in a vise, loosen bolt securing ball joint to transverse link and remove ball joint from transverse link.

9. Withdraw transverse link bushing from transverse link using Front Transverse Link Bushing Replacer Set KV40101200.



FA214

10. Remove suspension ball joint from knuckle arm using a press.



FA712

INSPECTION

Transverse link

1. Repair or replace transverse link if deformed, cracked or damaged.
2. If rubber bushing shows evidence of cracking, replace with a new one.
3. Make sure mating surface of bushing is clean and free from oil or grease.

Lower ball joint

1. Ball joint is assembled at factory and cannot be disassembled. Check ball stud turning torque with nut in place on ball stud.

If it is far from specifications, replace.

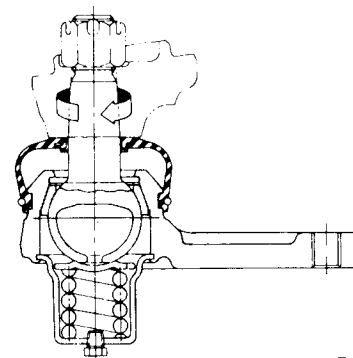
Turning torque:

New parts

2.5 - 7.8 N·m
(25 - 80 kg·cm,
22 - 69 in·lb)

Used parts

More than 1.5 N·m
(15 kg·cm, 13 in·lb)



FA333

2. Check condition of dust cover. If it is cracked excessively, replace ball joint.

3. Lubricate ball joint with recommended multi-purpose grease.

To lubricate, remove plug and install grease nipple.

Pump grease slowly until old grease is completely forced out. After greasing, reinstall plug.

Note: When a high-pressure grease gun is used, operate it carefully so that grease is injected slowly and new grease does not come out from clamp portion.

INSTALLATION

Install transverse link and suspension ball joint in reverse order of removal.

Note:

- a. When installing transverse link spindle, install it together with rear side lower arm bushing.
- b. To install transverse link, first temporarily tighten nuts securing transverse link spindle which connects transverse link to suspension crossmember. Final tightening should be carried out at curb weight with tires on ground. And also, at this time, front side nut should be tightened before rear side nuts.
- c. Make sure mating surface of bushing is clean and free from oil and grease.

Ⓙ : Ball joint socket to transverse link

44 - 54 N·m
(4.5 - 5.5 kg·m,
33 - 40 ft·lb)

Ball joint to knuckle arm

96 - 120 N·m
(9.8 - 12.2 kg·m,
71 - 88 ft·lb)

Transverse link to suspension crossmember

78 - 108 N·m
(8.0 - 11.0 kg·m,
58 - 80 ft·lb)

Side rod ball joint to knuckle arm

54 - 98 N·m
(5.5 - 10.0 kg·m,
40 - 72 ft·lb)

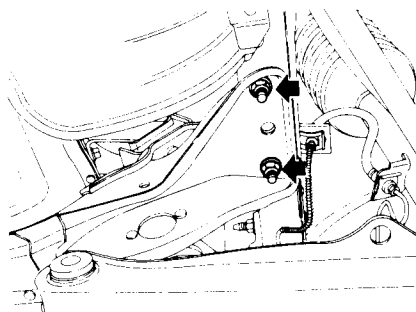
Knuckle arm to strut

72 - 97 N·m
(7.3 - 9.9 kg·m,
53 - 72 ft·lb)

SUSPENSION CROSSMEMBER

REMOVAL

1. Remove transverse link, referring to previous part of this section.
2. With an overhead hoist and lifting cable, support weight of engine to remove loads from mountings.
3. Remove engine mounting nuts. Separate suspension crossmember from engine.
4. Separate steering gear from suspension crossmember. Refer to section ST.
5. Remove bolt, indicated by arrow, and separate suspension crossmember from car body.



FA713

INSPECTION

Check suspension crossmember for evidence of deformation or cracking; if necessary, replace.

INSTALLATION

Install suspension crossmember in reverse order of removal.

Ⓙ : Suspension member to body frame

69 - 88 N·m
(7.0 - 9.0 kg·m,
51 - 65 ft·lb)

Engine mounting insulator to suspension member

31 - 42 N·m
(3.2 - 4.3 kg·m,
23 - 31 ft·lb)

SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

COIL SPRING

Item Model	Side	Dimension A x C x L*1	Color identi- fication	Spring constant N/mm (kg/mm, lb/in)
2 seater (Except GL)	R.H.	13.0 x 150 x 306.5 (0.512 x 5.91 x 12.07)	White & Yellow	2.22 (2.26, 126.6)
	L.H.			
2 seater GL 2 + 2 seater (Except GL)	R.H.	13.0 x 150 x 315.5 (0.512 x 5.91 x 12.42)	White & White	2.22 (2.26, 126.6)
	L.H.			
2 + 2 seater GL	R.H.	13.0 x 150 x 324.5 (0.512 x 5.91 x 12.78)	Red & Blue	2.22 (2.26, 126.6)
	L.H.			

*1: A x C x L

Wire diameter [mm (in)] x Coil diameter [mm (in)]
x Free length [mm (in)]

STRUT ASSEMBLY

Shock absorber type	Double acting hydraulic	
Shock absorber fluid mL (US fl oz, Imp fl oz)	275 (9.3, 9.7)	
Piston rod diameter	mm (in)	22 (0.87)
Piston diameter	mm (in)	32 (1.26)
Stroke	mm (in)	More than 165 (6.50)
Damping force [at 0.3 m (1.0 ft)/sec.]		
Expansion	N (kg, lb)	1,373 (140, 309)
Compression	N (kg, lb)	392 (40, 88)

STABILIZER BAR

Bar diameter	mm (in)	23 (0.91)
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INSPECTION AND ADJUSTMENT

WHEEL ALIGNMENT (Unladen * 1)

		Power steering models	Manual steering models
Camber	degree	-35' - 55'	
Caster	degree	4° 10' - 5° 40'	
Toe-in	mm (in)	1 - 3 (0.04 - 0.12)	
	degree *2	6' - 16'	
Kingpin inclination	degree	8° 35' - 10° 5'	
Front wheel Turning angle	Toe-cut-turns (Inside/Outside)	degree	20°/18.1°
	Inside	degree	32° - 36°
	Outside	degree	24-1/2° - 28-1/2°

- *1: Tankful of fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools, mats in designed position.
*2: On both sides

WHEEL BEARING

Wheel bearing axial play	mm (in)	0 (0)	
Wheel bearing nut tightening torque	N·m (kg·m, ft·lb)	25 - 29 (2.5 - 3.0, 18 - 22)	
Return angle	degree	60°	
Wheel bearing starting torque at wheel bearing nut	With new grease seal	N·m (kg·cm, in·lb)	0.39 - 0.83 (4.0 - 8.5, 3.5 - 7.4)
	With used grease seal	N·m (kg·cm, in·lb)	0.10 - 0.44 (1.0 - 4.5, 0.9 - 3.9)
At wheel hub bolt	With new grease seal	N (kg, lb)	Less than 17.7 (1.8, 4.0)
	With used grease seal	N (kg, lb)	Less than 6.9 (0.7, 1.5)

TIGHTENING TORQUE

Unit	N·m	kg·m	ft·lb
BALL JOINT			
Socket to transverse link	44 - 54	4.5 - 5.5	33 - 40
Ball joint to knuckle arm (stud nut)	96 - 120	9.8 - 12.2	71 - 88
STRUT			
Knuckle arm to strut	72 - 97	7.3 - 9.9	53 - 72
Strut to hoodledge	29 - 39	3.0 - 4.0	22 - 29
Piston rod self-locking nut	59 - 74	6.0 - 7.5	43 - 54
Gland packing	98 - 127	10.0 - 13.0	72 - 94
DISC BRAKE			
Rotor to hub	54 - 74	5.5 - 7.5	40 - 54
SIDE ROD			
Ball joint nut	54 - 98	5.5 - 10.0	40 - 72
Side rod lock nut Power steering models	14 - 17	1.4 - 1.7	10 - 12
Manual steering models	78 - 98	8.0 - 10.0	58 - 72
TRANSVERSE LINK			
Transverse link to suspension cross-member	78 - 108	8.0 - 11.0	58 - 80
TENSION ROD			
Bushing nut	44 - 54	4.5 - 5.5	33 - 40
Tension rod to transverse link	44 - 54	4.5 - 5.5	33 - 40
Tension rod bracket	31 - 42	3.2 - 4.3	23 - 31
STABILIZER BAR			
Stabilizer bar bracket	26 - 36	2.7 - 3.7	20 - 27
Stabilizer mounting nut	16 - 22	1.6 - 2.2	12 - 16
SUSPENSION CROSSMEMBER			
Suspension member to body frame	69 - 88	7.0 - 9.0	51 - 65
Engine mounting insulator to suspension member	31 - 42	3.2 - 4.3	23 - 31

LOWER BALL JOINT

Turning torque	New parts	N·m (kg·cm, in·lb)	2.5 - 7.8 (25 - 80, 22 - 69)
	Used parts	N·m (kg·cm, in·lb)	More than 1.5 (15, 13)

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
<p>Vibration, shock and shimmy of steering wheel.</p> <p>Vibration: Loose connection of the serration parts and wear of each part of linkage cause vibration of front wheels and, steering wheel vibration. This is very noticeable when travelling on rough road.</p> <p>Shock: When the front wheels are travelling on bumpy roads, the play of the steering linkage is transmitted to the steering wheel. This is especially noticeable when travelling on rough road.</p> <p>Shimmy: Abnormal vibration of the front suspension system and the whole steering linkage, which occurs at specific speeds.</p>	<p>Improper tire pressure.</p> <p>Imbalance and deformation of road wheel.</p> <p>Unevenly worn tire or insufficient tightening of wheel nuts.</p> <p>Improperly adjusted or worn front wheel bearing.</p> <p>Faulty wheel alignment.</p> <p>Worn lower arm bushings.</p> <p>Insufficiently tightened steering gear housing.</p> <p>Wear of steering linkage.</p> <p>Worn suspension ball joint.</p> <p>Excessive backlash due to improper adjustment of the steering gear box.</p> <p>Damaged idler arm.</p> <p>Worn column bearing, weakened column bearing spring, or loose clamp.</p> <p>Malfunction of shock absorber (inside the strut) or loose installation bolts.</p> <p>Imbalance of car level.</p>	<p>Adjust.</p> <p>Correct the imbalance or replace.</p> <p>Replace or tighten.</p> <p>Adjust or tighten.</p> <p>Adjust.</p> <p>Replace.</p> <p>Retighten.</p> <p>Replace faulty parts.</p> <p>Replace.</p> <p>Adjust correctly.</p> <p>Replace.</p> <p>Replace or retighten.</p> <p>Replace or retighten.</p> <p>Correct the imbalance.</p>
<p>Car pulls to right or left.</p> <p>When driving with hands off the steering wheel on a flat road, the car gently swerves to right or left.</p> <p>Note: A faulty rear suspension may also be the cause of this problem and, therefore, see also Section RA.</p>	<p>Improper tire pressure or insufficient tightening of wheel nuts.</p> <p>Difference in wear and tear of right and left tire treads.</p> <p>Incorrect adjustment or abrasion of front wheel bearing.</p> <p>Collapsed or twisted front spring.</p> <p>Incorrect wheel alignment.</p> <p>Incorrect brake adjustment (binding).</p> <p>Worn rubber bushings for lower arm and tension rod.</p> <p>Deformed steering linkage and lower arm and tension rod.</p> <p>Imbalance of car level.</p>	<p>Adjust or tighten.</p> <p>Replace tires.</p> <p>Adjust or replace.</p> <p>Replace.</p> <p>Adjust.</p> <p>Adjust.</p> <p>Replace.</p> <p>Replace.</p> <p>Correct the imbalance.</p>

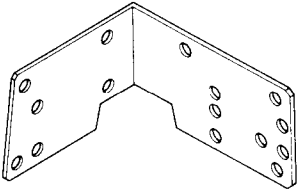

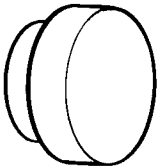
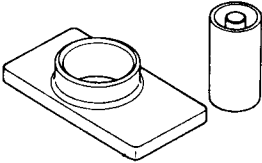
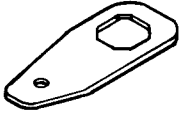
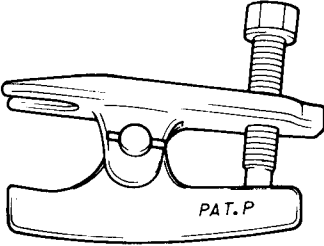
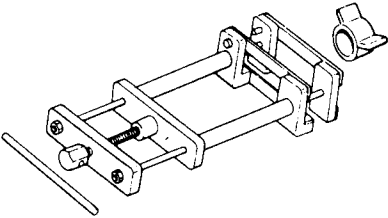
Front Axle & Front Suspension

Condition	Probable cause	Corrective action
Instability of car.	Improper tire pressure. Worn rubber bushings for lower arm and tension rod. Incorrect wheel alignment. Worn or deformed steering linkage and suspension link. Incorrect adjustment of steering gear. Deformed or unbalanced wheel.	Adjust. Replace. Adjust. Replace. Adjust. Correct or replace.
Stiff steering wheel. (Checking up procedure) Jack up front wheels, detach the steering gear arm and operate the steering wheel, and; If it is light, check steering linkage, and suspension parts. If it is heavy, check steering gear and steering column parts.	Improper tire pressure. Insufficient lubricants or mixing impurities in steering gear box or excessively worn steering linkage. Stiff or damaged suspension ball joint, or lack of grease. Worn or incorrectly adjusted wheel bearing. Worn or damaged steering gear and bearing. Incorrectly adjusted steering gear. Deformed steering linkage. Incorrect wheel alignment. Damaged strut mounting bearing. Damaged or stiff piston or shock absorber piston rod (in the strut). Interference of steering column with turn signal switch.	Adjust. Replenish grease or replace the part. Replace. Replace or adjust. Replace. Adjust. Replace. Adjust. Replace. Replace. Replace.
Excessive steering wheel play.	Incorrectly adjusted steering gear housing. Worn steering linkage. Improperly fitted gear housing. Incorrectly adjusted wheel bearing. Worn lower arm and tension rod bushings.	Adjust. Replace. Retighten. Adjust. Replace.
Noises.	Improper tire pressure. Insufficient lubricating oil and grease for suspension ball joint and steering linkage, or their breakage. Loose steering gear bolts, linkage and suspension parts. Faulty shock absorber (inside the strut). Faulty wheel bearing. Worn steering linkage and steering gear. Worn lower arm and tension rod bushings. Broken or collapsed coil spring.	Adjust. Replenish lubricating oil and grease, or replace. Retighten. Replace. Replace. Replace. Replace. Replace.

Front Axle & Front Suspension

Condition	Probable cause	Corrective action
	Loose stabilizer bar installation bolts and nuts.	Retighten.
	Loose strut to hoodledge installation nuts.	Retighten.
Grating tire noise.	Improper tire pressure.	Adjust.
	Incorrect wheel alignment.	Adjust.
	Deformed knuckle spindle and suspension linkage.	Replace.
Jumping of disc wheel.	Improper tire pressure.	Adjust.
	Imbalanced wheels.	Adjust.
	Faulty shock absorber.	Replace.
	Faulty tire.	Replace.
	Deformed wheel rim.	Replace.
Excessively or partially worn tire.	Improper tire pressure.	Adjust.
	Incorrect wheel alignment.	Adjust.
	Faulty wheel bearing.	Replace.
	Incorrect brake adjustment.	Adjust.
	Tires not rotated.	Rotate tires at recommended intervals.
	Rough and improper driving manner.	Drive more gently.

SPECIAL SERVICE TOOLS

Tool number & tool name	Kent-Moore No.	Tool number & tool name	Kent-Moore No.
	Reference page		Reference page
KV48100300 Strut and steering gear housing attachment 	J 25729	ST35520000 Gland packing guide 	J25826
	Page FA-5		Page FA-6
ST35300000 Front wheel bearing drift 	—	KV40101200 Transverse link bushing replacer 	See J26363-A
	Page FA-3		Page FA-9
ST35500001 Gland packing wrench 	J 25825	HT72520000 Ball joint remover 	J25730-A
	Page FA-5		Page FA-9
ST3565S001 Coil spring compressor set 	J 25833		
	Page FA-5		

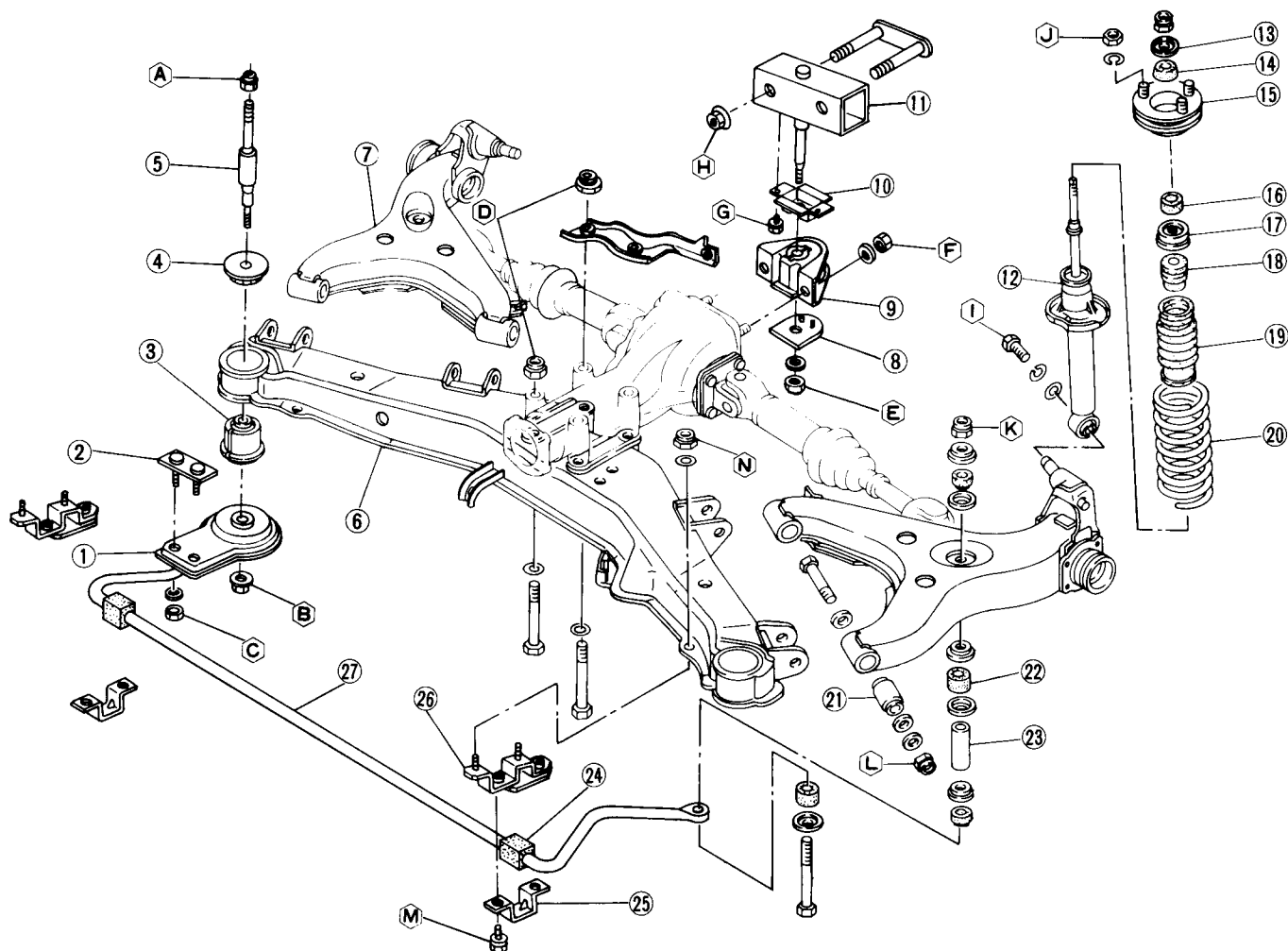
REAR AXLE & REAR SUSPENSION

SECTION RA

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REAR SUSPENSION



- 1 Suspension member mounting stay
- 2 Suspension member mounting bolt
- 3 Member mounting insulator
- 4 Member mounting upper stopper
- 5 Suspension mounting bolt
- 6 Suspension member assembly
- 7 Suspension arm assembly
- 8 Differential mounting plate
- 9 Differential mounting insulator
- 10 Differential mounting adapter plate
- 11 Differential mounting bracket
- 12 Shock absorber assembly
- 13 Special washer
- 14 Shock absorber mounting bushing A

- 15 Shock absorber mounting insulator
- 16 Shock absorber mounting bushing B
- 17 Bound bumper cover
- 18 Bound bumper
- 19 Dust cover
- 20 Coil spring
- 21 Suspension arm bushing
- 22 Stabilizer bushing
- 23 Stabilizer collar
- 24 Stabilizer mounting bushing
- 25 Stabilizer mounting clip
- 26 Stabilizer mounting bracket
- 27 Rear stabilizer

Tightening torque N-m (kg-m, ft-lb)

- A** : 118 - 157 (12 - 16, 87 - 116)
B : 78 - 98 (8 - 10, 58 - 72)
C : 20 - 25 (2.0 - 2.6, 14 - 19)
D : 59 - 78 (6 - 8, 43 - 58)
E : 118 - 147 (12 - 15, 87 - 108)
F : R200 Diff.:
88 - 118 (9 - 12, 65 - 87)
R180 Diff.:
59 - 78 (6 - 8, 43 - 58)
G : 31 - 42 (3.2 - 4.3, 23 - 31)
H : 59 - 78 (6 - 8, 43 - 58)
I : 59 - 78 (6 - 8, 43 - 58)
J : 29 - 39 (3 - 4, 22 - 29)
K : 16 - 21 (1.6 - 2.1, 12 - 15)
L : 78 - 98 (8 - 10, 58 - 72)
M : 16 - 21 (1.6 - 2.1, 12 - 15)
N : 16 - 21 (1.6 - 2.1, 12 - 15)

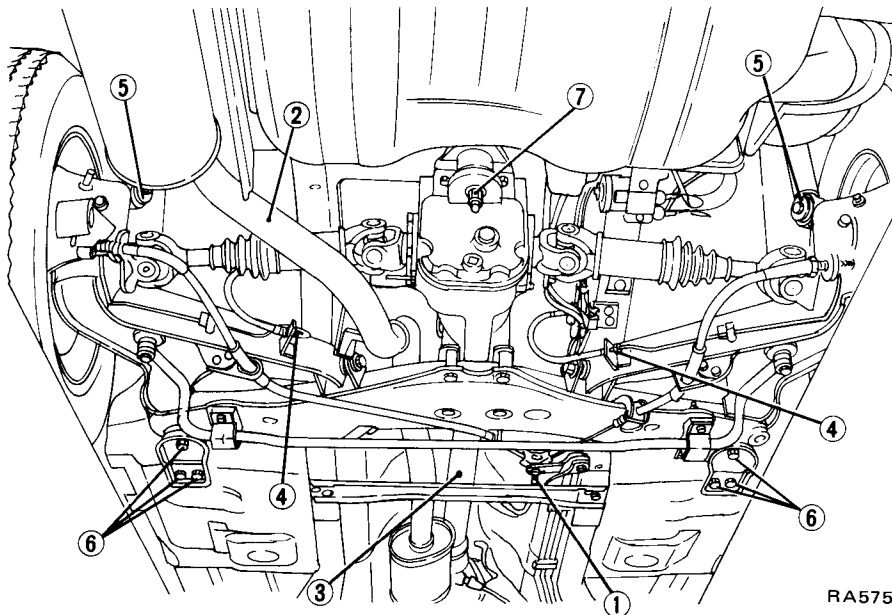
SRA237

REAR AXLE AND SUSPENSION ASSEMBLY

REMOVAL

It is not necessary to remove rear axle and suspension assembly for any normal repairs. However, if the rear suspension member is damaged, the rear axle and the suspension member assembly may be removed and installed using the following procedure.

1. Block front wheels with chocks.
2. Raise the rear of car high enough to permit working underneath, and support it on safety stands. Place stands solidly under body member on both sides.
3. Remove rear wheels.
4. Remove heat shield plate located in front of fuel tank.
5. Disconnect hand brake cable by removing lock nut at adjuster and clevis pin ①.



GI414

6. Remove rear exhaust tube and muffler ②. Refer to Exhaust System (Section FE).
7. Mark flange yoke of propeller shaft and companion flange of differential gear carrier for proper reassembly, then remove propeller shaft ③.
8. Disconnect rear brake hoses ④.

CAUTION:

- a. When disconnecting brake tube, use suitable tube wrench. Never use open-end or adjustable wrench.
- b. Cover brake hose and tube openings to prevent entrance of dirt.

9. Support under center of suspension member and differential carrier with a transmission jack.
10. Disconnect shock absorbers at lower end ⑤.
11. Disconnect suspension member from body by removing nuts ⑥ at both ends of member.
12. Disconnect differential carrier mounting lock nut ⑦.
13. Carefully lower jack with suspension assembly, and take it out from under car. Support suspension assembly so that it does not tilt and fall off jack.

INSPECTION AND REPAIR

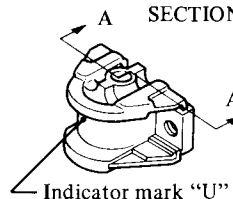
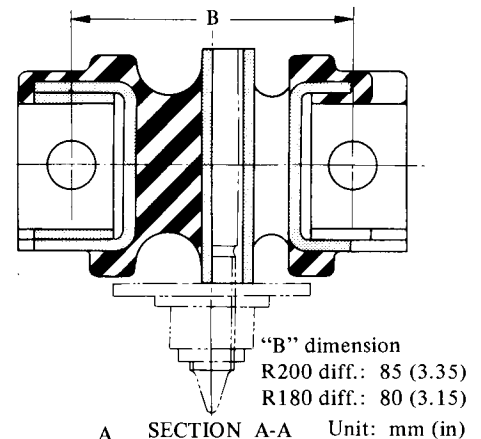
When the rear suspension has been removed, examine all parts for wear or damage. Particular attention should be given to bushing in suspension arms and bound bumper rubbers. Also check the condition of rubber insulators in the suspension member and the differential mounting.

Any of these components, if worn, can result in noise and vibration to the interior of car.

If necessary, replace differential mounting insulator.

Note:

- a. Mounting insulator of R200 differential carrier differs in dimension "B" from that of R180 differential carrier.
- b. When replacing, be sure to install differential mounting insulator with "U" mark facing upward.



RA576

INSTALLATION

Install rear axle and suspension assembly in the reverse order of removal, noting the following points.

CAUTION:

When installing brake tubes, use Flare Nut Torque Wrench GG94310000.

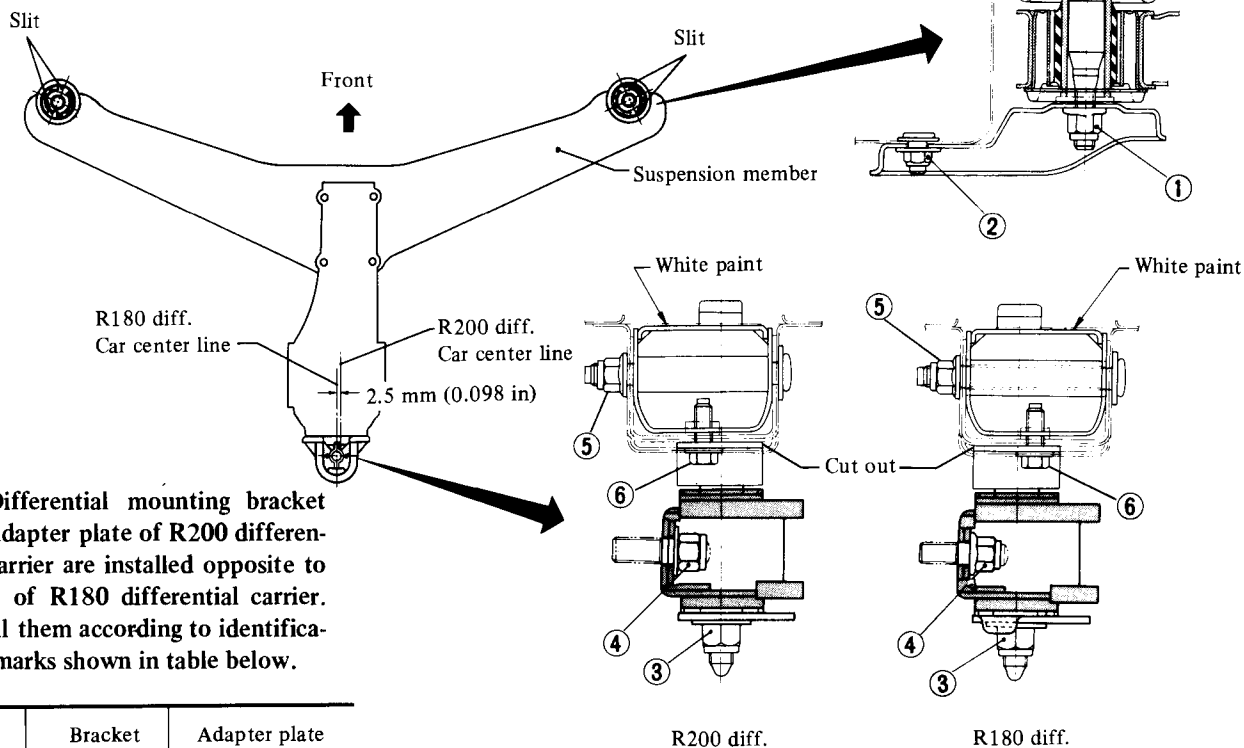
1. Ensure suspension member and differential mounting insulator are correctly lined up.
2. When installing suspension member insulator, two slits in rubber insulators should be positioned in fore-and-after direction as shown below. Rubber insulators should be inserted from the underside of member.
3. Do not use lesser quality or substitute design parts.
4. Replace self-locking nuts at each removal.
5. Tightening torque values must be used as specified during reassembly to assure proper retention of parts.

CAUTION:

When reinstalling suspension member mounting bolt, make sure that bolt and tapered surface of collar are free from foreign material. Be sure to tighten lock nut **A** on body side to specification before tightening suspension member mounting lock nut **1**.

- T** : Propeller shaft to companion flange connecting nut
34 - 44 N·m
(3.5 - 4.5 kg-m,
25 - 33 ft-lb)
- Brake tube connector flare nut
15 - 18 N·m
(1.5 - 1.8 kg-m,
11 - 13 ft-lb)
- Shock absorber lower end fixing bolt
59 - 78 N·m
(6 - 8 kg-m,
43 - 58 ft-lb)
- Suspension member mounting lock nut **1**
78 - 98 N·m
(8 - 10 kg-m,
58 - 72 ft-lb)
- Suspension member mounting stay nut **2**
20 - 26 N·m
(2.0 - 2.6 kg-m,
14 - 19 ft-lb)
- Differential carrier mounting lock nut **3**

- 118 - 147 N·m
(12 - 15 kg-m,
87 - 108 ft-lb)
- Differential carrier to mounting insulator **4**
(R200 diff.)
88 - 118 N·m
(9 - 12 kg-m,
65 - 87 ft-lb)
(R180 diff.)
59 - 78 N·m
(6 - 8 kg-m,
43 - 58 ft-lb)
- Differential mounting bracket fixing nut **5**
59 - 78 N·m
(6 - 8 kg-m,
43 - 58 ft-lb)
- Differential mounting adapter plate bolt **6**
31 - 42 N·m
(3.2 - 4.3 kg-m,
23 - 31 ft-lb)



Note: Differential mounting bracket and adapter plate of R200 differential carrier are installed opposite to those of R180 differential carrier. Install them according to identification marks shown in table below.

	Bracket	Adapter plate
	White paint	Cutout
R200 diff.	Front	Rear
R180 diff.	Rear	Front

R200 diff.

R180 diff.

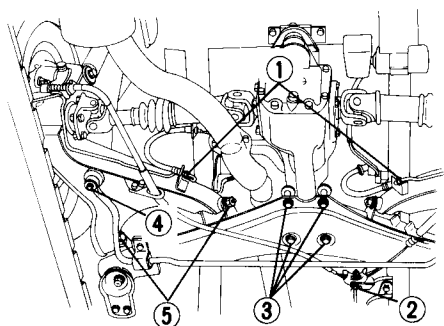
Tightening torque N·m (kg-m, ft-lb)

A : 118 - 157 (12 - 16, 87 - 116)

SUSPENSION MEMBER AND STABILIZER

REMOVAL

1. Block front wheels with chocks.
2. Raise the rear of car high enough to permit working underneath, and support it on safety stands. Place stands solidly under body member on both sides.
3. Support under center of differential carrier with a garage jack.
4. Disconnect brake tube ① and hand brake cable ② from suspension arm and member.



RA578

CAUTION:

- a. When disconnecting brake tube, use suitable tube wrench. Never use open-end or adjustable wrench.
- b. Cover brake hose and tube openings to prevent entrance of dirt.
- c. When disconnecting brake hose, be careful not to twist it while holding one side of it.

5. Disconnect differential gear carrier by removing bolts ③ at center of suspension member.
6. Remove stabilizer bar fixing bolt from suspension arm ④.
7. Disconnect suspension arms by removing suspension arm pins ⑤.
8. Disconnect suspension member from body by removing nuts at both ends of member.

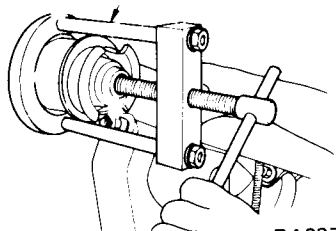
9. Carefully lower jack with suspension member together with stabilizer, and take it out from under car. Support suspension assembly so that it does not tilt and fall off jack.
10. Remove stabilizer bar from suspension member by removing mounting clip bolts.

INSPECTION AND REPAIR

1. Check for evidence of deformation or cracks; if necessary, replace.
2. Check the rubber insulators of suspension member and mounting bushing of stabilizer for deterioration or cracks; if necessary, replace.

Replace rubber insulators of the suspension member using Rear Suspension Member Insulator Replacer KV40101300.

KV40101300



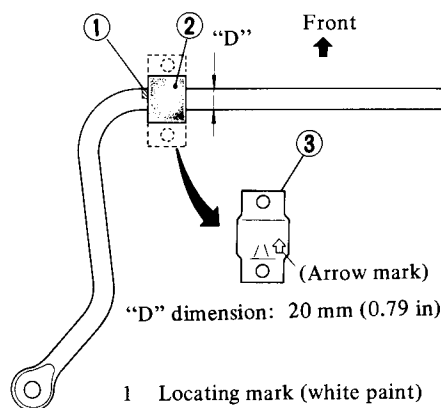
RA027

INSTALLATION

Install the rear suspension member and stabilizer in the reverse order of removal.

When installing, observe the following points:

1. Be sure to install stabilizer bushing with locating mark at outer side.
2. Install stabilizer mounting clip with arrow mark pointing to front.



- 1 Locating mark (white paint)
- 2 Stabilizer bushing
- 3 Stabilizer mounting clip

RA579

3. Securely tighten stabilizer fixing bolt self-locking nut until it will no longer go.
4. Replace self-locking nuts at each removal.

CAUTION:

When installing brake tubes, use Flare Nut Torque Wrench GG94310000.

Note: Car weight must be on rear wheels when tightening suspension arm pins in order to clamp rubber bushings in a neutral or unloaded position.

Ⓙ : Brake tube connector flare nut

15 - 18 N·m

(1.5 - 1.8 kg-m,

11 - 13 ft-lb)

Differential gear carrier fitting nut

59 - 78 N·m

(6 - 8 kg-m,

43 - 58 ft-lb)

Suspension arm pin nut

78 - 98 N·m

(8 - 10 kg-m,

58 - 72 ft-lb)

Suspension member mounting lock nut

78 - 98 N·m

(8 - 10 kg-m,

58 - 72 ft-lb)

Suspension member mounting stay nut

20 - 25 N·m

(2 - 2.6 kg-m,

14 - 19 ft-lb)

Stabilizer bar fixing bolt

16 - 21 N·m

(1.6 - 2.1 kg-m,

12 - 15 ft-lb)

Stabilizer mounting clip bolt

16 - 21 N·m

(1.6 - 2.1 kg-m,

12 - 15 ft-lb)

Stabilizer mounting bracket nut

16 - 21 N·m

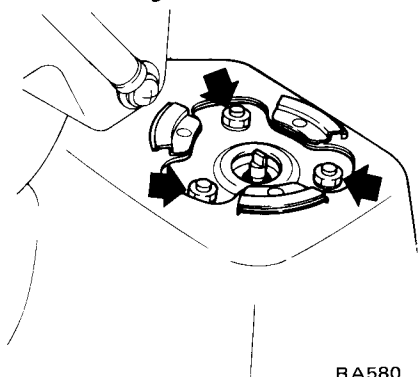
(1.6 - 2.1 kg-m,

12 - 15 ft-lb)

COIL SPRING AND SHOCK ABSORBER ASSEMBLY

REMOVAL

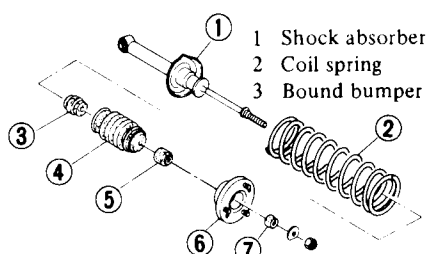
1. Block front wheels with chocks.
2. Raise the rear of car high enough to permit working underneath and until rear spring does not support car weight, and support it on safety stands. Place stands solidly under body member on both sides.
3. Open tail gate and turn cap at upper end of wheel house counter-clockwise.
4. Remove nuts securing shock absorber mounting insulator to body.



RA580

CAUTION:
Set Spring Compressor only on spring.
Be careful so as not to damage shock absorber housing and piston rod.

3. Remove piston rod self-locking nut and washer. Release Spring Compressor ST35651001 and remove it from spring.
4. Take out bushing A, shock absorber mounting insulator, bushing B, bound bumper cover (dust cover) and bound bumper in that order.



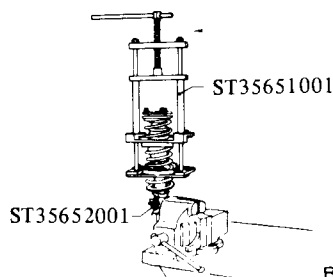
- 4 Bound bumper cover and dust cover assembly
- 5 Bushing B
- 6 Shock absorber mounting insulator
- 7 Bushing A

SRA238

5. Disconnect shock absorber by removing bolt at suspension arm.

DISASSEMBLY

1. Mark position of shock absorber mounting insulator and shock absorber lower end pin for proper reassembly.
2. Set up Spring Compressor ST35651001 on spring. Compress spring just far enough to permit turning of mounting insulator by hand.



RA395

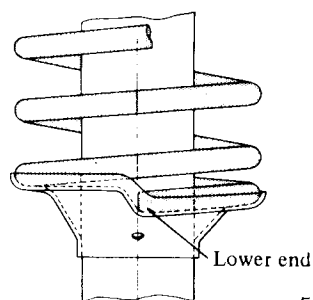
Rubber parts

Check all rubber parts for wear, cracks, damage or deformation. Replace if necessary.

ASSEMBLY

Assemble spring and shock absorber assembly in the reverse order of disassembly, noting the following:

1. Correctly place coil spring in the lower spring seat. (Flat face of spring is top.)



FA074

2. Make sure position of shock absorber mounting insulator and shock absorber lower end pin is correct.
3. Replace self-locking nut whenever it is removed.
4. Securely tighten piston rod self-locking nut until it will no longer go.

INSPECTION

Coil spring

1. Check coil spring for yield, deformation or cracks.
2. Test spring and compare with the specifications given in Service Data and Specifications.

Shock absorber

1. Test shock absorber and compare with the specification given in Service Data and Specifications. Replace if necessary.
2. Check for oil leakage and cracks. Also check piston rod for straightness.

Shock absorber mounting insulator

Replace if rubber and metal joints are melted or cracked.

INSTALLATION

Install spring and shock absorber assembly in the reverse order of removal, noting the following:

Install top end of spring and shock absorber assembly first.

ⓘ : Shock absorber mounting insulator to body nut

29 - 39 N·m
(3 - 4 kg-m,
22 - 29 ft-lb)

Shock absorber lower end fixing bolt

59 - 78 N·m
(6 - 8 kg-m,
43 - 58 ft-lb)

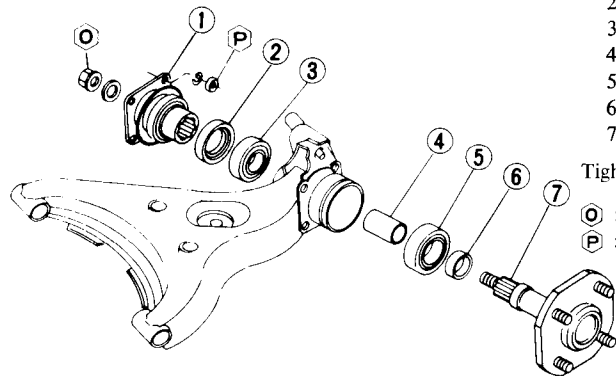
Piston rod nut

19 - 25 N·m
(1.9 - 2.6 kg-m,
14 - 19 ft-lb)

REAR AXLE

REAR AXLE SHAFT, WHEEL BEARINGS AND SEALS

REMOVAL AND DISASSEMBLY



- 1 Companion flange
 - 2 Grease seal
 - 3 Inner wheel bearing
 - 4 Distance piece
 - 5 Outer wheel bearing
 - 6 Bearing spacer
 - 7 Rear axle shaft assembly
- Tightening torque N·m (kg-m, ft-lb)
- O : 245 - 324 (25 - 33, 181 - 239)
- P : 49 - 59 (5 - 6, 36 - 43)

RA531

INSPECTION

Inspect the following parts. Replace or repair if necessary.

1. Check wheel bearing for end play and rolling surface for flaking, wear or seizure.
2. Check axle shaft for straightness, cracks, wear or distortion.
3. Check grease seal for cracks or deformation and seal lip for damage or wear.

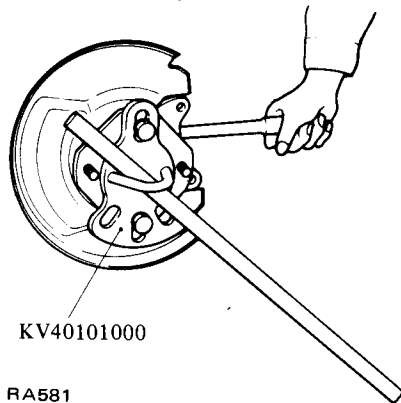
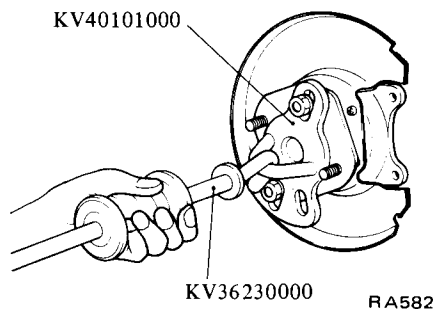
ASSEMBLY AND INSTALLATION

Install in the reverse order of removal, noting the following points.

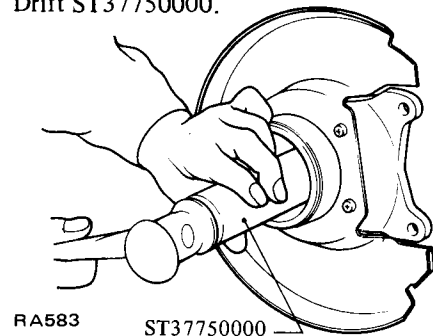
1. Clean wheel bearings, grease seal and the inside of axle shaft housing.
2. Wheel bearings are sealed type. When installing ensure that the sealed side of outer bearing faces the wheel and that the sealed side of inner bearing faces the differential.
3. When installing outer bearing to rear axle shaft, use Rear Axle Shaft Bearing Drift ST37750000.
4. A mark "N", "M", or "P" is stamped on bearing housing. Select a distance piece having a mark corresponding to the mark on bearing housing.

When a distance piece is reused, make sure that both ends are not collapsed or deformed.

1. Chock front wheels.
2. Loosen rear wheel nuts, jack up the rear of car and support it with safety stands.
3. Remove brake rotor and caliper assembly, referring to Section BR.
4. Disconnect drive shaft from axle shaft.
5. Remove wheel bearing lock nut using Rear Axle Stand KV40101000 and suitable bar.



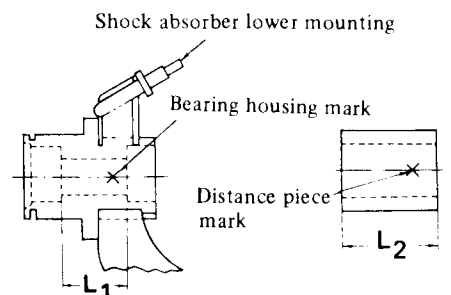
7. Remove companion flange.
8. Remove grease seal and inner bearing using Rear Axle Shaft Bearing Drift ST37750000.



6. Draw out axle shaft using Rear Axle Stand KV40101000 and Sliding Hammer ST36230000. Remove rear axle shaft.

9. Withdraw outer bearing from rear axle shaft using a suitable bearing puller.

Note: Do not reuse bearings and grease seal after removal.

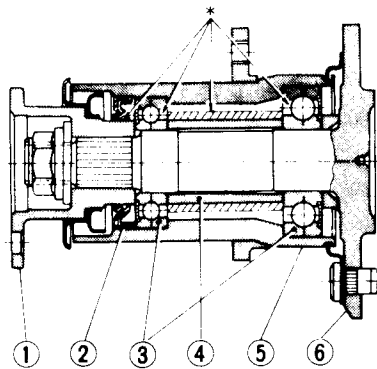


BEARING HOUSING DISTANCE PIECE

RA268

Rear bearing housing		Distance piece	
Mark	Size (L ₁ length) mm (in)	Mark	Size (L ₂ length) mm (in)
N	55.85 - 55.95 (2.1988 - 2.2028)	N	55.82 - 55.88 (2.1976 - 2.2000)
M	55.95 - 56.05 (2.2028 - 2.2067)	M	55.92 - 55.98 (2.2016 - 2.2039)
P	56.05 - 56.15 (2.2067 - 2.2106)	P	56.02 - 56.08 (2.2055 - 2.2079)

5. Fill recommended multi-purpose grease to the portions indicated by asterisk (*) as shown below.



- 1 Companion flange
- 2 Grease seal
- 3 Wheel bearing
- 4 Distance piece
- 5 Bearing housing
- 6 Rear axle shaft

RA399

6. Install grease seal by Rear Axle Grease Seal Drift ST37710000.

7. Tighten new wheel bearing lock nut and measure the preload and rear axle shaft end play. If the correct preload or end play cannot be obtained, disassemble again and replace distance piece.

ⓘ : Wheel bearing lock nut

245 - 324 N·m

(25 - 33 kg·m,

181 - 239 ft·lb)

Wheel bearing preload

0.69 N·m (7.0 kg·cm,

6.1 in·lb) or less

At the hub bolt

11.8 N (1.2 kg,

2.6 lb) or less

Rear axle shaft end play

Less than 0.3 mm (0.012 in)

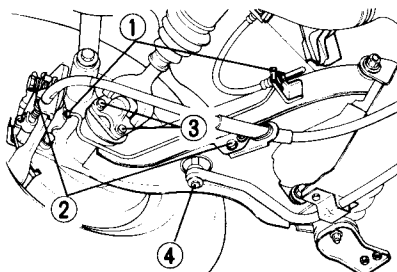
8. Caulk wheel bearing lock nut securely after checking preload and end play.

SUSPENSION ARM REMOVAL

1. Chock front wheels.
2. Loosen wheel nuts, jack up the rear of car and support it with safety stands.
3. Disconnect brake tube ① from brake hose and wheel cylinder, remove brake tube from suspension arm.
4. Disconnect hand brake cable ② from caliper assembly and remove hand brake cable from suspension arm.
5. Disconnect drive shaft ③ from axle shaft.
6. Remove stabilizer bar bolt ④.

CAUTION:

- a. When disconnecting brake tube, use suitable tube wrench. Never use open-end or adjustable wrench.
- b. Cover brake hose and tube openings to prevent entrance of dirt.



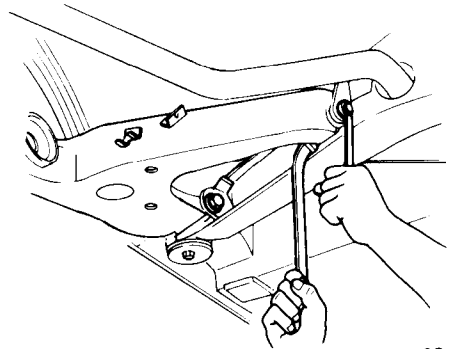
RA584

7. Remove brake rotor and caliper assembly, referring to Section BR.

8. Remove rear axle shaft, wheel bearings and grease seal. Refer to Rear Axle for removal and disassembly.

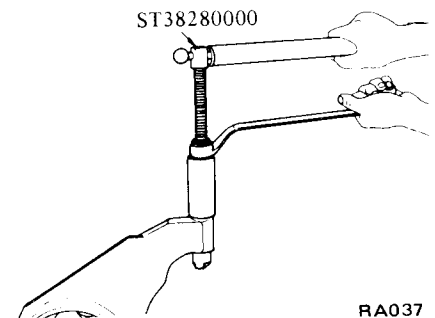
9. Disconnect shock absorber at lower end.

10. Disconnect suspension arm by removing suspension arm pins securing suspension arm to suspension member.



RA402

11. Draw out rubber bushings from suspension arm using Rear Suspension Arm Bushing Remover ST38280000.



RA037

INSPECTION

1. Examine suspension arms to ensure they are not deformed or cracked.
2. Check rubber bushings for wear, damage or separation. Replace if necessary.

INSTALLATION

Install in the reverse order of removal, noting the following points:

1. Replace self-locking nuts at each removal.
2. Finally tighten suspension arm pin nut to specifications after install-

ing wheels and placing car on ground under the curb weight in order to clamp rubber bushings in a neutral position.

3. Adjust parking brake cable. Refer to Hand Brake (Section MA) for adjustment.

4. Bleed air from brake system. Refer to Bleeding Hydraulic System (Section BR).

T : Brake tube connector flare nut

15 - 18 N·m
(1.5 - 1.8 kg-m,
11 - 13 ft-lb)

Brake baffle plate
3.1 - 4.3 N·m
(0.32 - 0.44 kg-m,
2.3 - 3.2 ft-lb)

Brake caliper
38 - 52 N·m
(3.9 - 5.3 kg-m,
28 - 38 ft-lb)

Wheel bearing lock nut
245 - 324 N·m
(25 - 33 kg-m,
181 - 239 ft-lb)

Drive shaft flange yoke nut
49 - 59 N·m
(5 - 6 kg-m,
36 - 43 ft-lb)

Suspension arm pin nut
78 - 98 N·m
(8 - 10 kg-m,
58 - 72 ft-lb)

Stabilizer bar fixing or mounting bolts
16 - 21 N·m
(1.6 - 2.1 kg-m,
12 - 15 ft-lb)

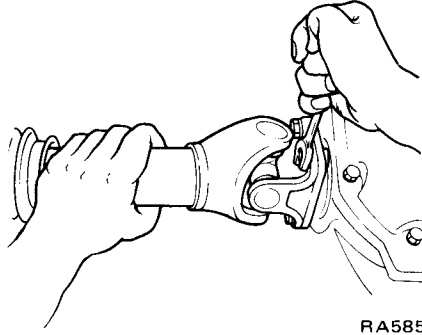
DRIVE SHAFT (Cardan universal joint type)

REMOVAL

1. Chock front wheels.
2. Jack up rear of car and support on safety stands.

3. Side Flange type (R200 diff.);

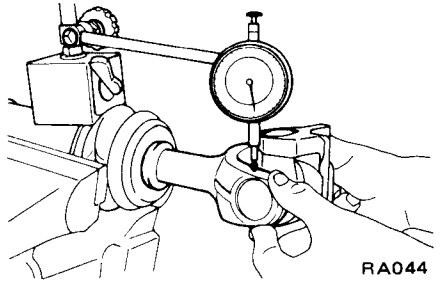
Remove drive shaft universal joint yoke flange bolts and nuts from both sides.



Pre-disassembly inspection

1. Visually inspect parts for wear, deformation or damage.
2. Stroke drive shaft to see if it moves smoothly.
3. Check play in drive shaft. If the play exceeds 0.2 mm (0.008 in), replace drive shaft assembly.

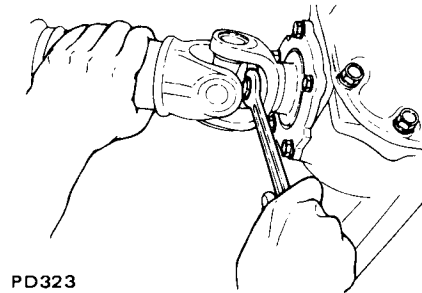
Note: Measurement should be taken with drive shaft fully compressed.



4. Side Yoke type (R180 diff.);

Disconnect drive shaft on the wheel side.

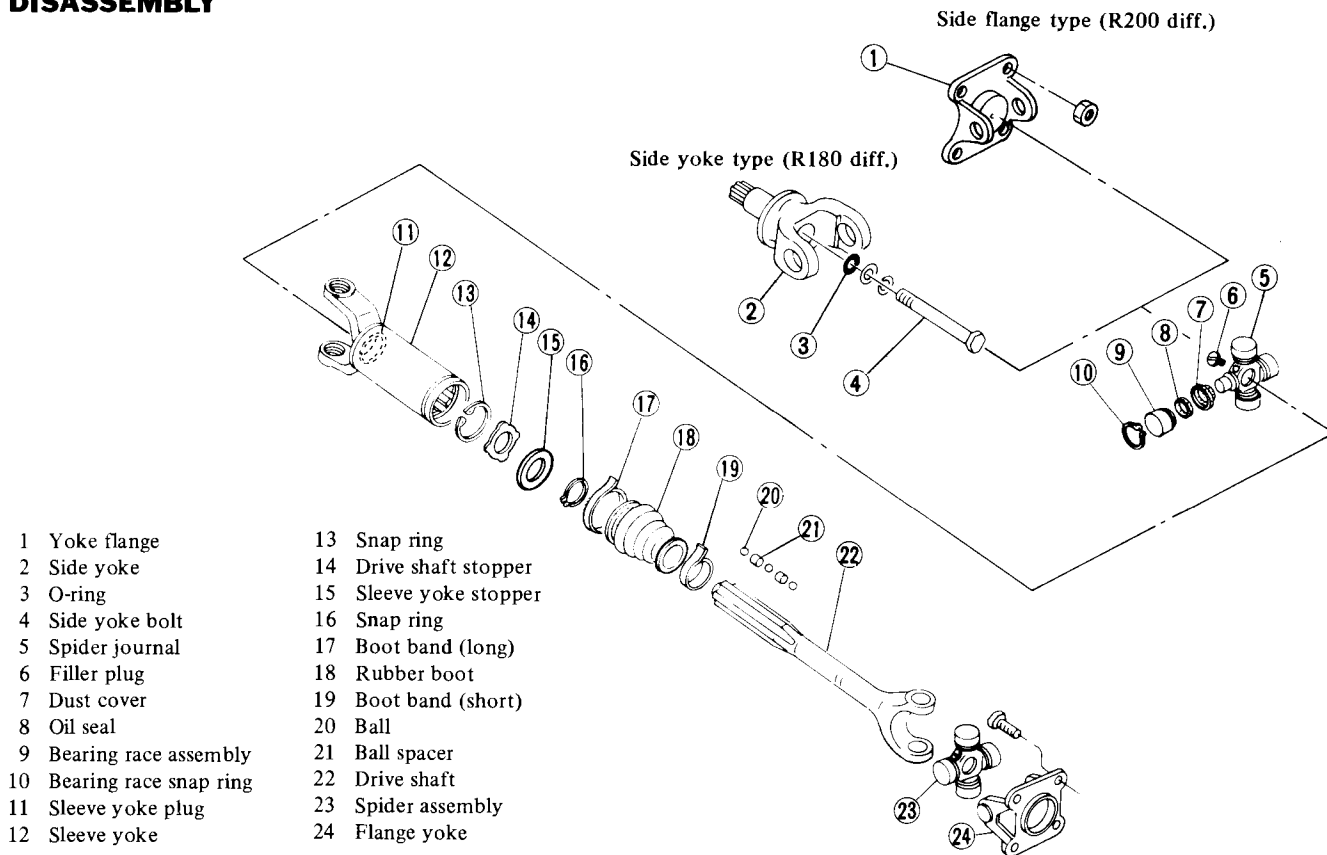
Remove side yoke fitting bolts, and extract side yokes together with drive shafts.



4. Check movement of spider journal. If journal does not move smoothly, disassemble and replace journal.

5. Check journal axial play. If the play exceeds 0.02 mm (0.0008 in), adjust or replace as required.

DISASSEMBLY



RA586

1. Mark relationship across propeller shaft and journal so that the original combination is restored at assembly.
2. Remove snap ring with a standard screwdriver.
3. Lightly tap base of yoke with a hammer, and withdraw bearing race.
4. Cut boot band and remove boot from sleeve yoke.
5. Remove snap ring from sleeve yoke using suitable snap ring plier.
6. Withdraw drive shaft carefully from sleeve yoke so as not to lose balls and spacers.

4. Check journal pin for dent or brinell marks, and yoke hole for sign of wear or damage.

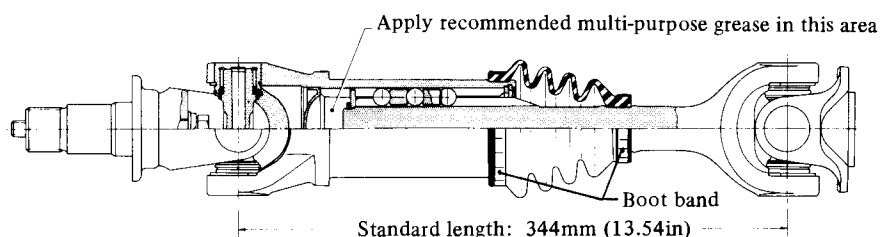
Snap ring, bearing, grease seal and dust seal should also be inspected to see if they are damaged, worn or deformed. Replace as required.

Note: Sleeve yoke, balls, spacers and drive shaft are not available as service parts. Therefore, if any wear or damage exists in above parts, drive shaft must be replaced as an assembly.

ASSEMBLY

Assemble drive shaft in the reverse order of disassembly, noting the following:

1. Thoroughly remove used grease from sleeve yoke, drive shaft ball rolling grooves and grease grooves, and clean them.
2. Align the yokes and ensure that steel balls and spacers are fitted in the correct sequence.
3. Apply an adequate quantity of multi-purpose grease to the ball rolling groove and grease groove, approximately 10 g (0.35 oz). In addition, apply 35 g (1.23 oz) of grease to the area shown below.



RA404

INSPECTION

1. Replace boot and O-ring of side yoke, if damaged.
2. Check drive shaft for straightness, cracks, damage, wear or distortion. Replace drive shaft assembly as required.
3. Check steel balls and sleeve yoke for damage, wear or distortion. Replace drive shaft assembly as required.

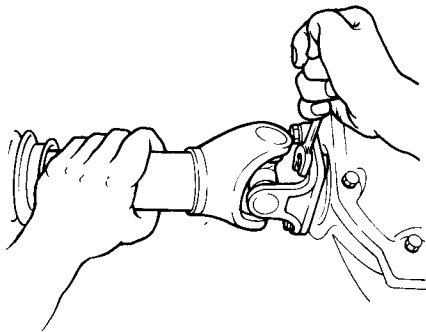
4. Check the drive shaft play. Refer to Drive Shaft for pre-disassembly inspection.
5. Adjust distance between spider journals to standard length of 344 mm (13.54 in). Cover sleeve yoke with boot and secure with boot band.
6. Selecting a suitable snap ring, adjust the axial play of universal joint to within 0.02 mm (0.0008 in). Snap rings of seven different thicknesses are available. Refer to Service Data and Specifications.

Note: Two opposite snap rings should be equal in thickness.

INSTALLATION

1. Side Flange type (R200 diff.);
Install drive shaft universal joint yoke flange bolts and nuts on both sides, and tighten yoke flange bolts and nuts to specified torque using torque wrench.

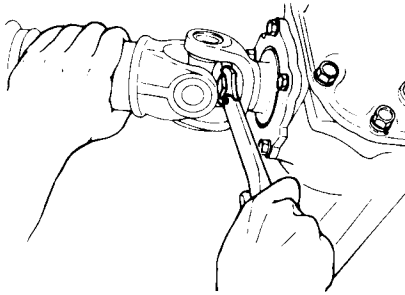
Ⓙ : 49 - 59 N·m
(5 - 6 kg-m,
36 - 43 ft-lb)



RA585

2. Side Yoke type (R180 diff.);
Install side yoke together with drive shafts to differential gear carrier assembly, and tighten side yoke fitting bolts to specified torque using torque wrench.

Ⓙ : 31 - 42 N·m
(3.2 - 4.3 kg-m,
23 - 31 ft-lb)



PD324

CAUTION:

Be careful not to damage side yoke and oil seal when installing.

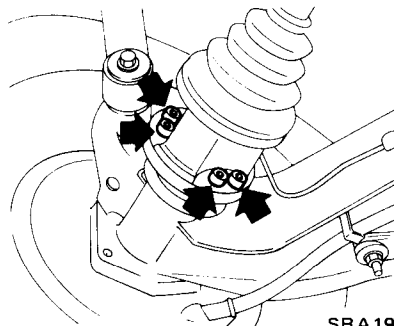
3. Join drive shafts with rear axle flanges and tighten connecting bolts to specified torque.

Ⓙ : 49 - 59 N·m
(5 - 6 kg-m,
36 - 43 ft-lb)

DRIVE SHAFT (Tripod universal joint type)

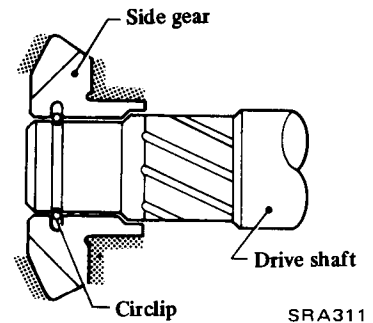
REMOVAL AND INSTALLATION

1. Block front wheels.
2. Disconnect drive shaft on the wheel side.

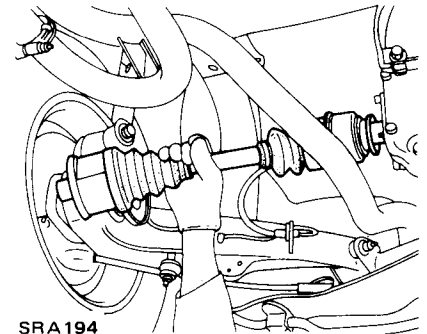


SRA193

3. Extract drive shaft from differential carrier by prying it with a suitable steel bar.



SRA311



SRA194

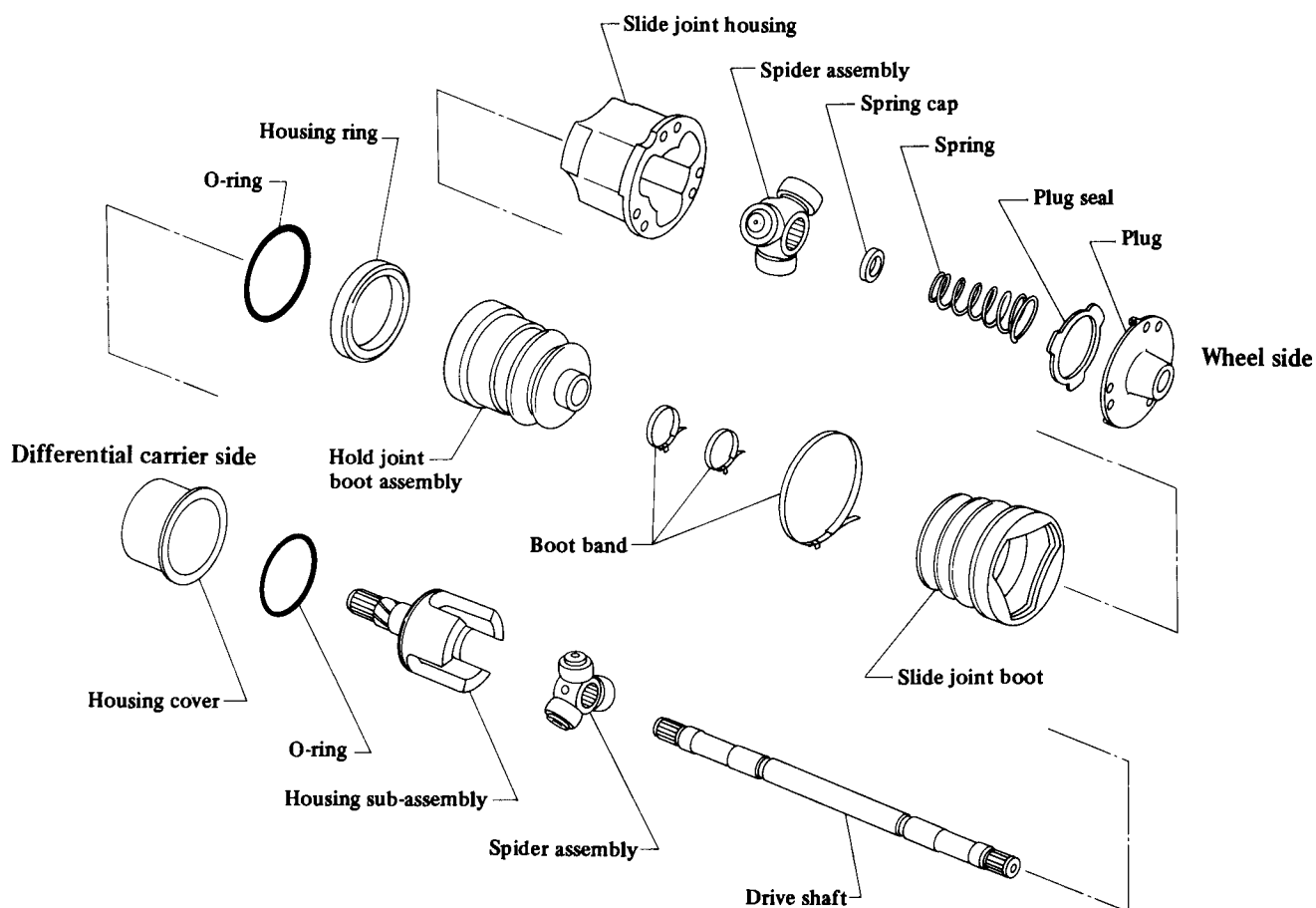
4. Install in reverse order of removal, noting the following points.

CAUTION:

Be careful not to damage oil seal and either end of drive shaft when installing.

Ⓙ : Drive shaft to companion flange fixing bolt
27 - 37 N·m
(2.8 - 3.8 kg-m,
20 - 27 ft-lb)

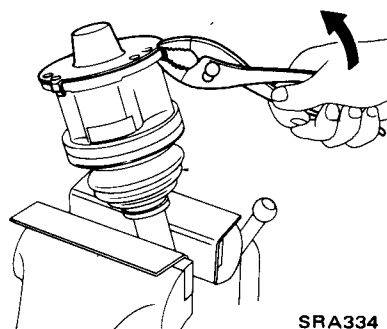
DISASSEMBLY



SRA333

Wheel side

1. Place "soft" jaws over steel jaws of bench vise, and place drive shaft securely in vise.
2. Remove plug.

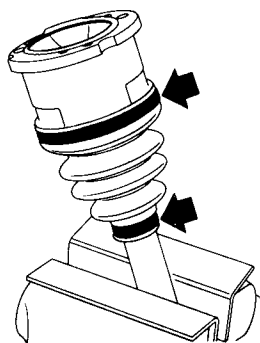


SRA334

3. Remove plug seal, spring and spring cap.

4. Remove boot bands.

Do not reuse boot bands once they have been removed.



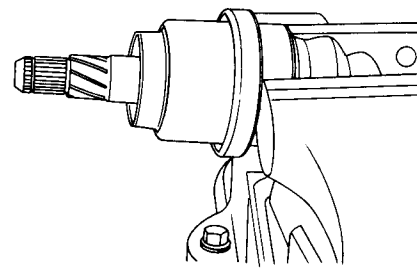
SRA335

5. Remove spider assembly.
Refer to Spider Assembly for disassembly.
6. Draw out slide joint boot.

Differential carrier side

1. Snugly place drive shaft assembly in a vise.

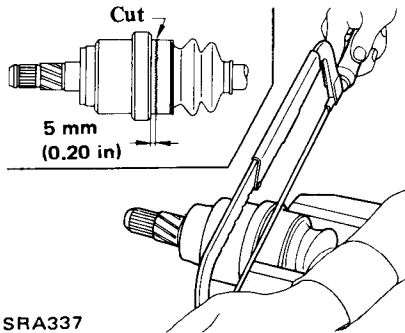
Be careful not to damage drive shaft assembly by forcing it into place.



SRA336

2. Cut off hold joint boot assembly with a metal saw blade and remove housing sub-assembly.

- When cutting off hold joint boot assembly, ensure that drive shaft is pushed into housing sub-assembly to prevent spider assembly from being scratched.
- Do not reuse hold joint boot assembly once it has been removed.



SRA337

3. Remove boot band.

Do not reuse boot band once it has been removed.

4. Remove spider assembly.

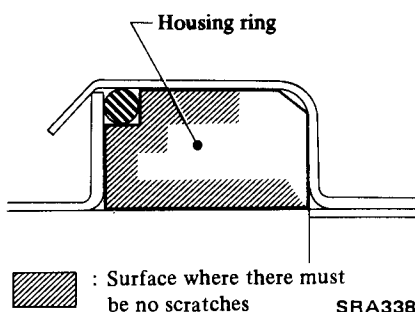
Refer to Spider Assembly for disassembly.

5. Cut off remaining part of hold joint boot assembly with a metal saw blade and remove it from housing sub-assembly.

- Be careful not to scratch housing sub-assembly.
- Be careful not to scratch housing ring excessively.

CAUTION:

Housing ring is selected to suit outside diameter of housing sub-assembly. Do not attempt to change original combination when replacing parts.



SRA338

6. Remove housing cover.

Do not reuse housing cover once it has been removed.

7. Remove O-ring.

Do not reuse O-ring once it has been removed.

8. Remove housing ring.

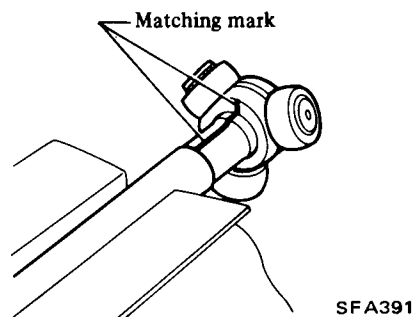
9. Draw out hold joint boot.

Spider assembly

CAUTION:

The spider assembly is a non-disassembling type, consisting of a tripod, rollers, needle bearing and washer.

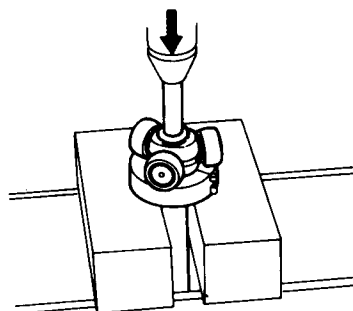
1. Make matching mark.



SFA391

2. Detach spider assembly using a press.

- Do not attempt to directly touch contact surface of drive shaft end at spring cap or housing sub-assembly. Use a suitable tool.
- To prevent drive shaft from dropping, always support drive shaft by hand when removing spider assembly.



SFA392

INSPECTION

Thoroughly clean all parts in cleaning solvent, and dry with compressed air. Check parts for evidence of deformation or other damage.

Drive shaft

1. Replace drive shaft assembly if drive shaft is twisted or cracked.
2. Replace drive shaft if it is deformed or damaged.

Spider assembly

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 housing sub-assembly for abnormalities. If necessary, replace.

Boot, boot band and O-ring

1. Replace boot if it is cracked or torn.
2. Do not reuse boot bands and O-rings after they have been removed.

Other component parts

Replace other parts if deformed or damaged.

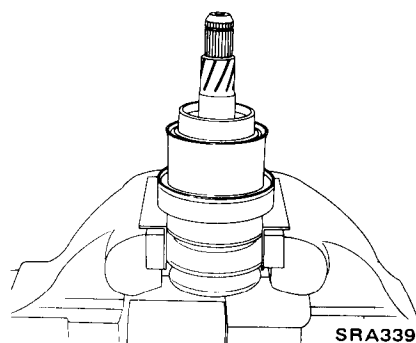
ASSEMBLY

- 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.

Differential carrier side

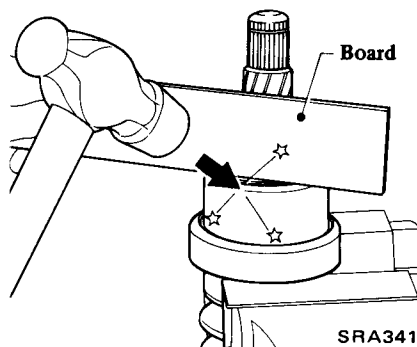
1. Attach housing ring, O-ring, housing sub-assembly and housing cover to a new hold joint boot assembly and place assembled unit flange on a vise.

- Do not place any other part of assembled unit on a vise.
- Apply a coat of grease to O-ring.

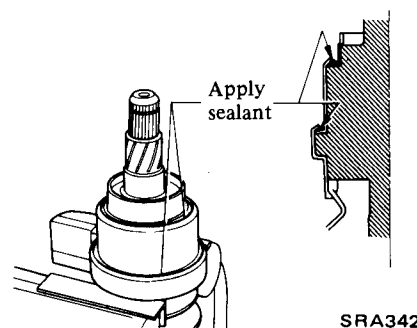


- Place hold joint boot assembly so that its flange in vise.
- Do not place any other part of hold joint boot assembly on a vise.
- Insert housing sub-assembly into place.
- Bend the edge over along the entire circumference.

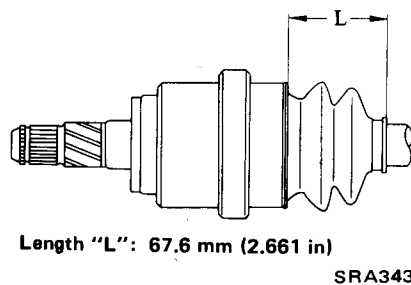
- Bend the edge at two positions (180° apart) and ensure that housing sub-assembly does not rattle.
- Place a board on housing sub-assembly to prevent it from being scratched.



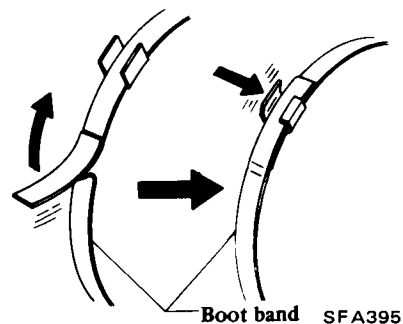
- Apply sealant.



- Set boot so that it does not swell or deform when its length is "L".



- Install boot band.

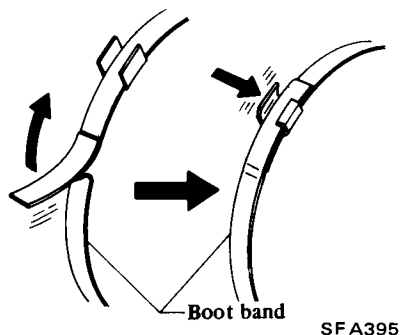


Wheel side

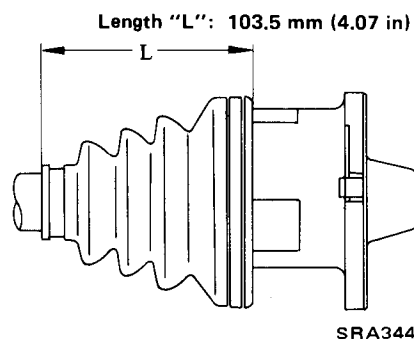
- Insert new boot bands, slide joint boot and slide joint housing to drive shaft.

Be careful not to scratch boot with drive shaft end.

- Install spider assembly. Refer to Spider Assembly for assembly.
- Install large diameter boot band.



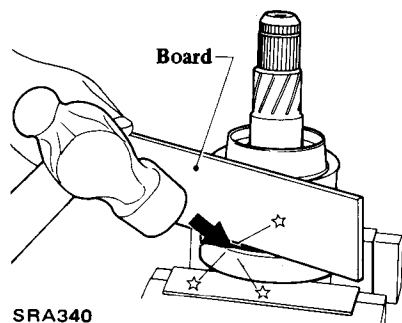
- Pack with grease. Specified amount of grease: Approx. 175 g (6.17 oz)
- Install spring cap, spring and plug seal.
- Secure plugs using dummy bolts and lock plug by bending plug.
- Set boot so that it does not swell or deform when its length is "L".



- Install smaller diameter boot band.

- Bend the edge over along the entire circumference.

- Bend the edge at two positions (180° apart) and ensure that housing cover does not rattle.
- Place a board on housing cover to prevent it from being scratched.



- Withdraw housing sub-assembly.
- Install new boot band and hold joint boot assembly onto drive shaft.

- Be careful not to scratch boot with end of drive shaft.

- Install spider assembly. Refer to Spider Assembly for assembly.
- Pack with grease.

Specified amount of grease:
Approx. 190 g (6.70 oz)

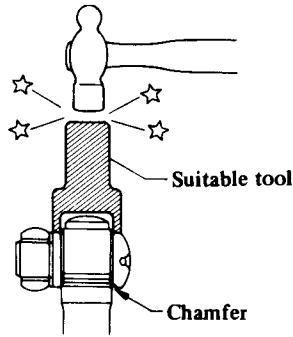
- Install O-ring to housing sub-assembly.

Apply a coat of grease to O-ring.

Spider assembly

1. Place drive shaft in a vise, using soft cushioning pads.
2. Install spider assembly securely, ensuring marks are properly aligned.

- If there is no mark, position both spider assemblies (one on the wheel side and the other on the differential carrier side) so that their phases are nearly 180°.
- Press-fit with spider assembly serration chamfer facing shaft.

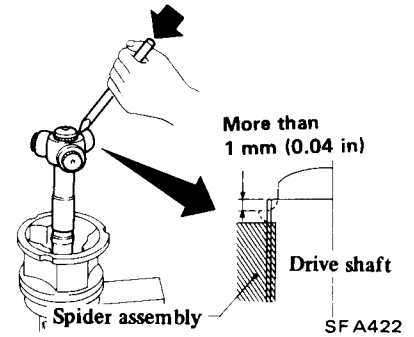


SFA397

3. Stake serration portion evenly at three places.

- Avoid areas which have been previously staked.

- Always stake two or three teeth at a place where staked gap is more than 1 mm (0.04 in).



SFA422

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

GENERAL SPECIFICATIONS

Items \ Models		S130	S130J GS130(J)
Suspension type		Independent rear suspension	
Coil spring	Wire diameter mm (in)	11.8 (0.465)	
	Coil diameter mm (in)	100 (3.94)	
	Free length mm (in)	358.3 (14.11)	367.2 (14.46)
	Spring constant N/mm (kg/mm, lb/in)	22.07 (2.25, 126.0)	
	Identification color	Orange 1 & Orange 2	Pink 1 & Orange 2

Shock absorber	Maximum length "L"	mm (in)	537.3 (21.15)
	Stroke	mm (in)	175 (6.89)
Stabilizer bar	Bar diameter	mm (in)	20 (0.79)

Shock absorber maximum length "L"

INSPECTION AND ADJUSTMENT**WHEEL ALIGNMENT (Unladen)**

Camber	degree	-5' - 1°25'
Toe-in	mm (in)	0 - 2 (0 - 0.08)

SHOCK ABSORBER

Damping force at 0.3 m (1.0 ft)/s		
Expansion	N (kg, lb)	1,373 (140, 309)
Compression	N (kg, lb)	441 (45,99)

REAR AXLE

Turning torque	N-m (kg-cm, in-lb)	Less than 0.69 (7.0, 6.1) [11.8 N (1.2 kg, 2.6 lb) at hub bolt]
End play	mm (in)	Less than 0.3 (0.012)

DRIVE SHAFT (Cardan universal joint type)

Radial play of ball spline	mm (in)	Less than 0.2 (0.008)
Axial play of spider journal	mm (in)	Less than 0.02 (0.0008)
Journal swinging torque	N-m (kg-cm, in-lb)	Less than 1.0 (10, 8.7)

Thickness of spider journal adjusting snap ring.

Thickness mm (in)	Identification color
1.49 (0.0587)	White
1.52 (0.0598)	Yellow
1.55 (0.0610)	Red
1.58 (0.0622)	Green
1.61 (0.0634)	Blue
1.64 (0.0646)	Light brown
1.67 (0.0657)	Black

TIGHTENING TORQUE

Unit	N-m	kg-m	ft-lb
Brake tube connector flare nut	15 - 18	1.5 - 1.8	11 - 13
Brake caliper	38 - 52	3.9 - 5.3	28 - 38
Brake baffle plate	3.1 - 4.3	0.32 - 0.44	2.3 - 3.2
Propeller shaft to companion flange connecting nut	34 - 44	3.5 - 4.5	25 - 33
Wheel bearing lock nut	245 - 324	25 - 33	181 - 239
Drive shaft installation bolts			
Gear carrier side (R200 diff.)	49 - 59	5 - 6	36 - 43
Gear carrier side (R180 diff.)	31 - 42	3.2 - 4.3	23 - 31
Wheel side	49 - 59	5 - 6	36 - 43
Shock absorber mounting insulator to body nut	29 - 39	3 - 4	22 - 29
Shock absorber lower end fixing bolt	59 - 78	6 - 8	43 - 58
Shock absorber piston rod nut	19 - 25	1.9 - 2.6	14 - 19
Suspension member mounting lock nut	78 - 98	8 - 10	58 - 72
Suspension member mounting stay nut	20 - 25	2.0 - 2.6	14 - 19
Differential gear carrier fitting nut	59 - 78	6 - 8	43 - 58
Differential carrier mounting lock nut	118 - 147	12 - 15	87 - 108
Differential carrier to mounting insulator (R200 diff.)	88 - 118	9 - 12	65 - 87
(R180 diff.)	59 - 78	6 - 8	43 - 58
Differential mounting bracket fixing nut	59 - 78	6 - 8	43 - 58
Differential mounting adapter plate bolt	31 - 42	3.2 - 4.3	23 - 31
Suspension arm pin nut	78 - 98	8 - 10	58 - 72
Stabilizer bar fixing bolt	16 - 21	1.6 - 2.1	12 - 15
Stabilizer mounting clip bolt	16 - 21	1.6 - 2.1	12 - 15
Stabilizer mounting bracket nut	16 - 21	1.6 - 2.1	12 - 15
Wheel nut	78 - 98	8 - 10	58 - 72

TROUBLE DIAGNOSES AND CORRECTIONS

When rear axle and suspension is suspected of being noisy it is advisable to make thorough test to determine whether the noise originates in the tires, road surface,

exhaust, propeller shaft, engine, transmission, universal joint, wheel bearings or suspension.

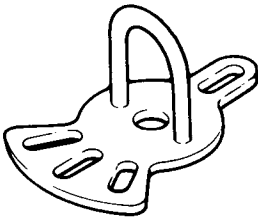
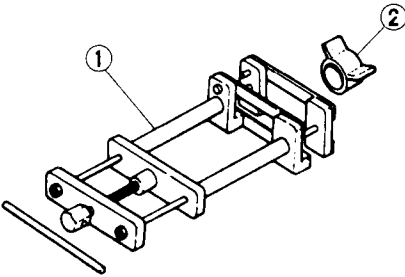
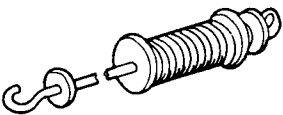
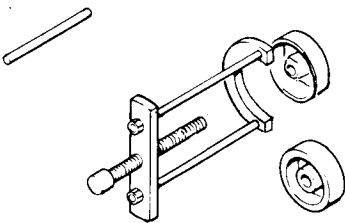
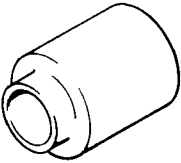
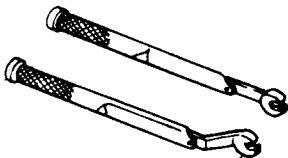
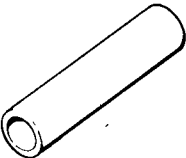
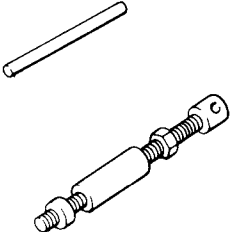
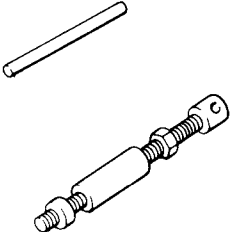
Noise which originates in other places cannot be corrected by adjust-

ment or replacement of parts in the rear axle and rear suspension.

In case of oil leak, first check if there is any damage or restriction in breather.

Condition	Probable cause	Corrective action
Noise (unusual sound)	<p>Loose wheel nuts.</p> <p>One or more securing bolts loose.</p> <p>Lack of lubricating oil or grease.</p> <p>Faulty shock absorber.</p> <p>Incorrect adjustment of rear axle shaft end play.</p> <p>Damaged or worn wheel bearing.</p> <p>Worn spline portion of rear axle shaft.</p> <p>Loose journal, connections, etc.</p> <p>Unbalance of wheel and tire.</p> <p>Damage of the rubber parts such as suspension arm bush, shock absorber mounting bush, differential mounting plate rubber.</p> <p>Deformed differential mounting insulator.</p> <p>Faulty universal joints.</p> <p>Worn or damaged rear suspension member mounting insulator.</p> <p>Worn or seized sliding portion of drive shaft ball spline.</p> <p>Breakage of coil spring.</p>	<p>Tighten.</p> <p>Tighten to specified torque.</p> <p>Lubricate as required.</p> <p>Replace.</p> <p>Adjust.</p> <p>Replace.</p> <p>Replace if necessary.</p> <p>Tighten to torque.</p> <p>Balance.</p> <p>Replace damaged parts.</p> <p>Replace.</p> <p>Adjust or replace.</p> <p>Replace.</p> <p>Replace drive shaft assembly.</p> <p>Replace.</p>
<p>Instability in driving</p> <p>This problem is also related to the front suspension. For trouble diagnosis, also refer to the FA section.</p>	<p>Loose wheel nuts.</p> <p>Worn shock absorber.</p> <p>Incorrect wheel alignment.</p> <p>1) Coil spring wear.</p> <p>2) Worn-out drive shaft ball spline.</p> <p>Damaged rear suspension arm rubber bushing, suspension member insulator, differential mounting insulator.</p>	<p>Tighten to specified torque.</p> <p>Replace.</p> <p>Replace.</p> <p>Replace.</p> <p>Replace drive shaft assembly.</p>
Oil leakage	<p>Damaged oil seal on rear axle shaft.</p> <p>Oil leakage from the differential carrier.</p> <p>Damaged dust cover of drive shaft.</p> <p>Damaged grease seal of rear axle shaft.</p>	<p>Replace.</p> <p>Replace parts as required.</p> <p>Replace.</p> <p>Replace.</p>

SPECIAL SERVICE TOOLS

Tool number & tool name	Kent-Moore No.	Tool number & tool name	Kent-Moore No.
	Reference page		Reference page
KV40101000 Rear axle stand 	J 25604-01	ST3565S001 Coil spring compressor set ① ST35651001 Spring compressor ② ST35652001 Clamp 	J 25833
	Page RA-7		Page RA-6
ST36230000 Sliding hammer 	J 25840	KV40101300 Rear suspension member insulator replacer 	— Page RA-5
	Page RA-7		
ST37710000 Rear axle grease seal drift 	J 25861	GG94310000 Flare nut torque wrench 	— Page RA-3 Page RA-5
	Page RA-8		
ST37750000 Rear axle shaft bearing drift 	J 25862	ST38280000 Rear suspension arm bushing remover 	
	Page RA-7		
ST38280000 Rear suspension arm bushing remover 	J 25871		
	Page RA-8		

BRAKE SYSTEM

SECTION BR

CONTENTS

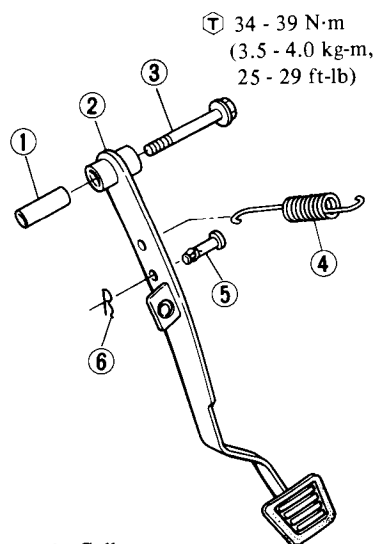
SERVICE BRAKE	BR- 2	BLEEDING HYDRAULIC SYSTEM	BR-14
BRAKE PEDAL	BR- 2	PARKING BRAKE	BR-15
MASTER CYLINDER	BR- 2	PARKING BRAKE	BR-15
BRAKE FLUID LEVEL GAUGE	BR- 4	SERVICE DATA AND	
BRAKE LINE	BR- 4	SPECIFICATIONS (S.D.S.)	BR-16
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FRONT DISC BRAKE.....	BR- 5	INSPECTION AND ADJUSTMENT	BR-16
FRONT DISC ROTOR	BR- 7	TIGHTENING TORQUE	BR-17
REAR DISC BRAKE —CL14H—	BR- 9	TROUBLE DIAGNOSES AND	
REAR DISC ROTOR	BR-12	CORRECTIONS	BR-18
BRAKE BOOSTER	BR-13	SPECIAL SERVICE TOOL	BR-20

Refer to Section MA (Brake System) for:

- CHECKING FOOT BRAKE
- CHECKING PARKING BRAKE

SERVICE BRAKE

BRAKE PEDAL



- 1 Collar
- 2 Brake pedal
- 3 Fulcrum bolt
- 4 Return spring
- 5 Clevis pin
- 6 Snap pin

SBR242

REMOVAL

1. Remove instrument lower cover and floor assist nozzle.
2. Remove snap pin and clevis pin and then separate Brake Booster operating rod from pedal.
3. Remove fulcrum bolt.

INSPECTION

Check brake pedal for the following items, servicing as necessary.

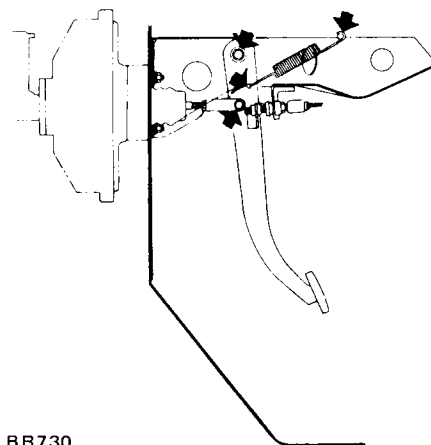
1. Check pedal bushing for wear, deformation or damage.
2. Check for bent brake pedal.
3. Check for fatigued return spring.

INSTALLATION

Install brake pedal in reverse order of removal, paying attention to the following:

- Ⓣ : Fulcrum bolt
34 - 39 N·m
(3.5 - 4.0 kg-m,
25 - 29 ft-lb)

1. Apply sufficient amount of recommended multi-purpose grease to sliding contact surface and hook of return spring.

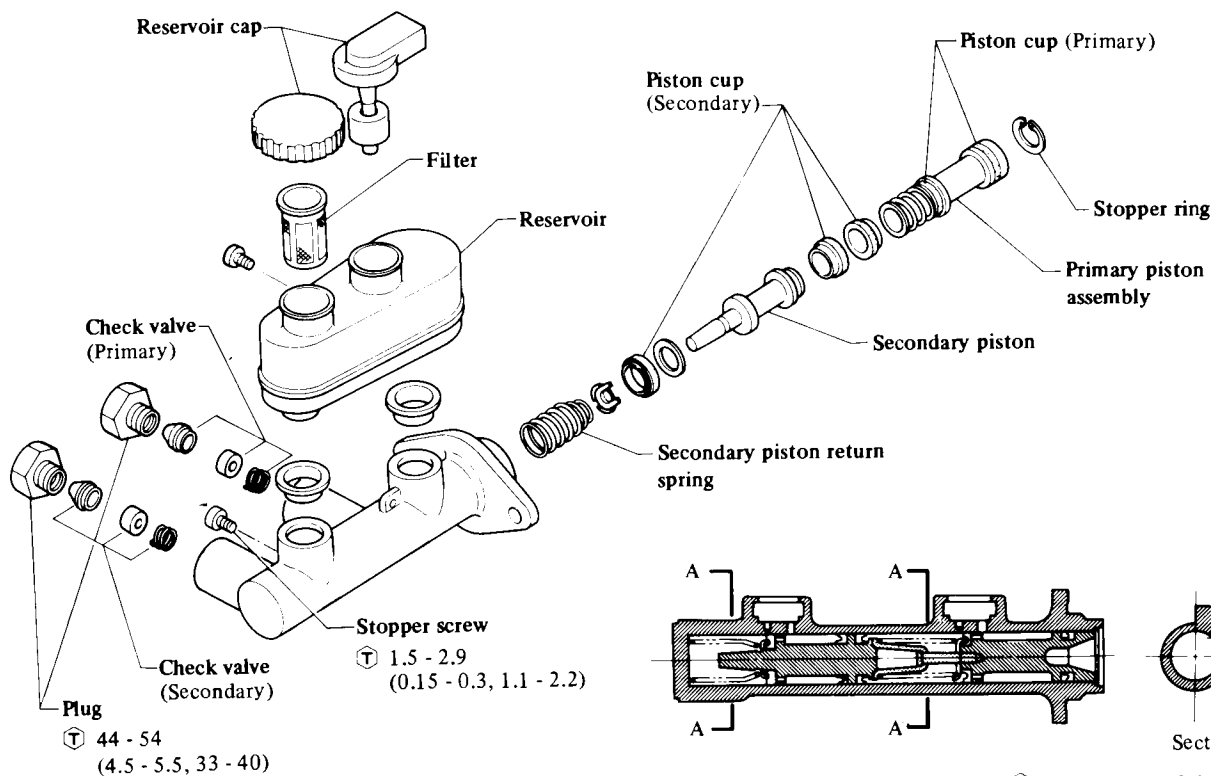


BR730

2. Adjust brake pedal, referring to Section MA.

MASTER CYLINDER

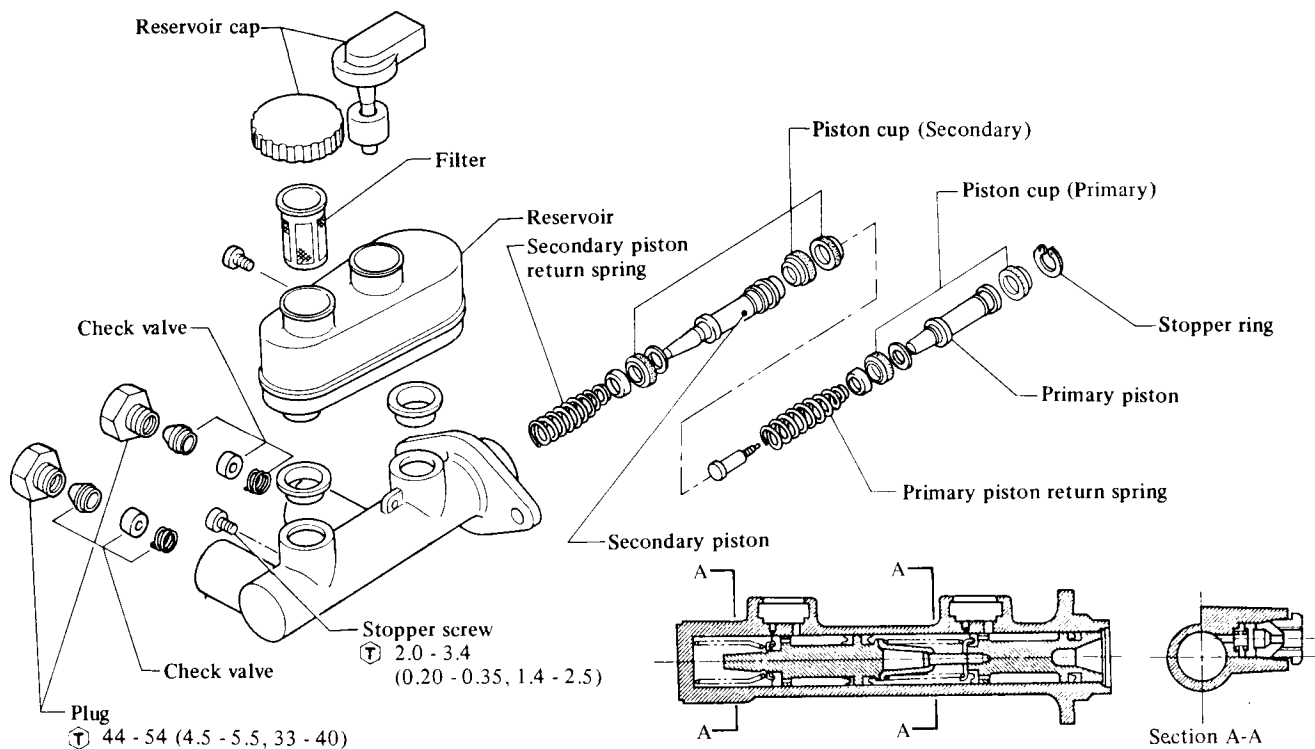
NABCO make



Ⓣ : N·m (kg-m, ft-lb)

SBR390

TOKICO make



⌚ : N·m (kg-m, ft-lb)

SBR590

DISASSEMBLY

There is no interchangeability of repair kits or component parts between NABCO and TOKICO makes.

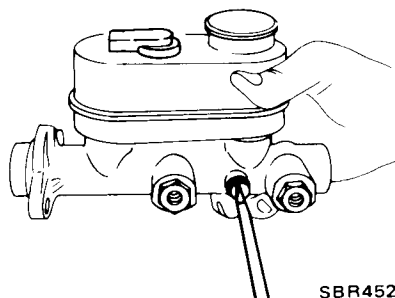
When replacing the repair kit or component parts, ascertain the brand of the brake master cylinder body. Be sure to use parts of the same make as the former ones.

1. Pry off stopper ring.

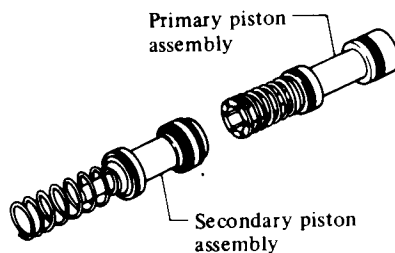
Primary piston assembly can then be taken out.

2. Remove stopper screw.

Secondary piston assembly can then be taken out.

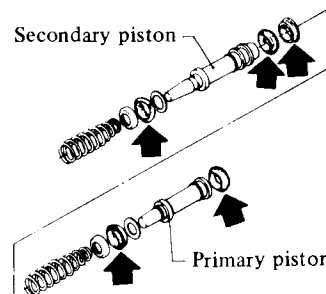


3. Disassemble piston assembly. Do not disassemble primary piston assembly of NABCO make.

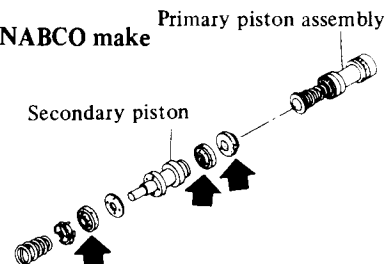


4. Remove piston cups and discard them.

TOKICO make



NABCO make



SBR260

5. Unscrew plugs for disassembling check valve.

INSPECTION

1. Clean all parts in a brake fluid.
2. Check the parts for evidence of abnormal wear or damage.
3. Check piston-to-cylinder clearance.

Piston-to-cylinder clearance:
Less than 0.15 mm (0.0059 in)

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.
- c. Use care to install the proper check valves on primary side and secondary side.

Ⓣ : Check valve plug
44 - 54 N·m
(4.5 - 5.5 kg-m,
33 - 40 ft-lb)

BRAKE FLUID LEVEL GAUGE

INSPECTION

1. Disengage hand brake control lever.
2. Raise cap and make sure that brake warning lamp goes on when float comes into contact with stopper.

BRAKE LINE

REMOVAL

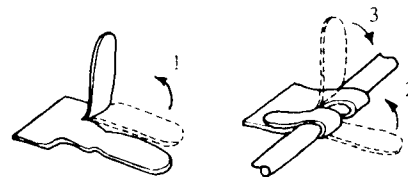
1. Remove flare nuts on both ends, and remove retainers and clips.

CAUTION:

When removing brake tubes and hoses, use suitable tube wrench. Never use open end or adjustable wrench.

2. To remove brake hose, first remove flare nut securing brake tube to brake hose and withdraw lock spring. End of hose can then be removed from bracket. Next remove brake hose. Do not twist brake hose.

Bend short clip straight up. With brake tube on long clip, bend clip up and around tube. Finally, wrap short clip around tube to secure the installation.



BR141

5. Do not tighten brake line mounting flare nut excessively.

CAUTION:

When installing brake tubes, use Flare Nut Torque Wrench GG94310000.

Ⓣ : 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)

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.

INSTALLATION

Pay particular attention to following instructions when installing brake lines.

1. Leave a sufficient space between brake lines and adjacent parts so that brake lines are completely free from vibration during driving.
2. Be careful not to warp or twist.
3. When installing brake tube, keep a certain distance between tube and adjacent parts as follows:

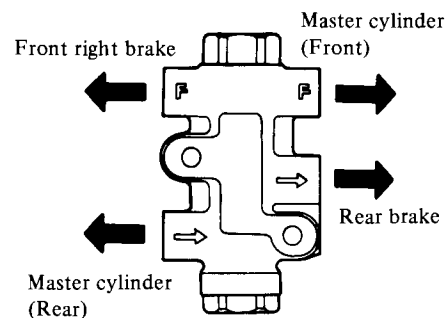
- Tube to rotating parts
More than 10 mm (0.39 in)
- Tube to other parts
More than 5 mm (0.20 in)

4. Always fasten brake tubes with mounting clips where necessary.

On rear suspension arm, there are two double clips which should be used to secure brake tubes in manner described below.

6. Upon completion of installation of brake lines, bleed air out of brake lines.

NP-VALVE



BR163A

REMOVAL AND INSTALLATION

1. Remove flare nuts.

CAUTION:

When removing brake tube, use suitable tube wrench. Never use open end or adjustable wrench.

2. Remove NP-valve retaining bolts, and remove NP-valve.

Note: Do not disassemble NP-valve.

3. Installation is in the reverse order of removal.

CAUTION:

When installing brake tube, use Flare Nut Torque Wrench GG94310000.

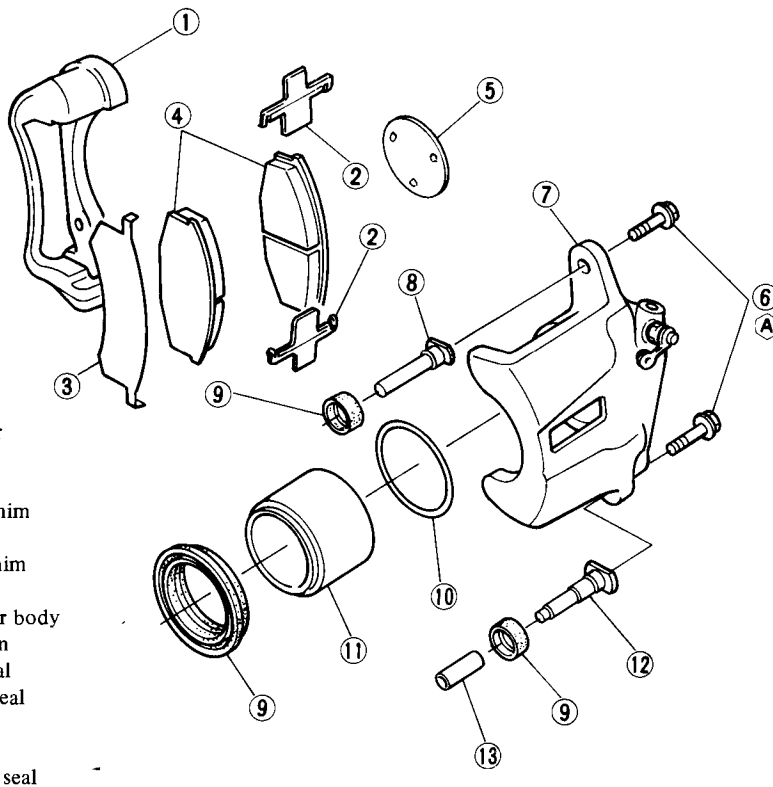
Ⓙ : Flared nut

15 - 18 N·m
(1.5 - 1.8 kg-m,
11 - 13 ft-lb)

NP-valve attaching bolt

6 - 7 N·m
(0.6 - 0.7 kg-m,
4.3 - 5.1 ft-lb)

FRONT DISC BRAKE



- 1 Torque member
- 2 Pad retainer
- 3 Outer shim
- 4 Pad
- 5 Inner shim
- 6 Pin bolt
- 7 Cylinder body
- 8 Main pin
- 9 Dust seal
- 10 Piston seal
- 11 Piston
- 12 Sub pin
- 13 Rubber seal

Tightening torque N·m (kg-m, ft-lb)

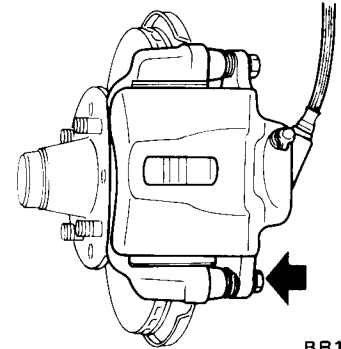
Ⓐ : 22 - 31 (2.2 - 3.2, 16 - 23)

BR164A

PAD REPLACEMENT

Removal

1. Jack up front of car, and support it on safety stands. Remove wheel.
2. Remove lower pin bolt.

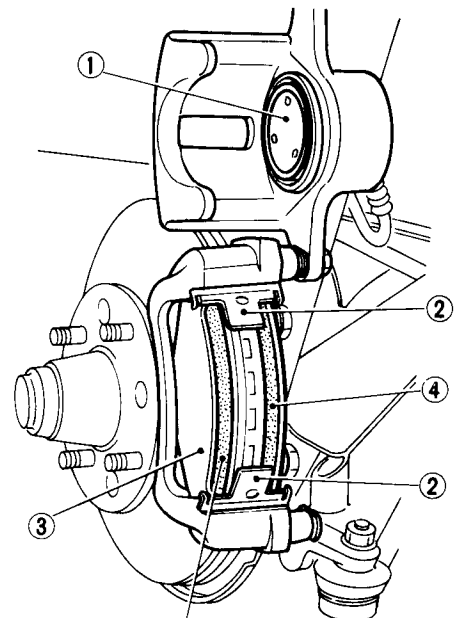


BR165A

3. Open cylinder body upward and remove pad retainer (2), and inner and outer shims (1 & 3).

Note: Do not pull out cylinder body in axial direction (direction of pin guide).

4. Detach pads.



- 1 Inner shim
- 2 Pad retainer
- 3 Outer shim
- 4 Pads

BR166A

CAUTION:

After removing pads, do not depress brake pedal, or pistons will jump out.

Inspection

1. When pads are heavily fouled with oil or grease or when pad is deteriorated or deformed, replace it.
2. If pad is worn to less than the specified value, replace.

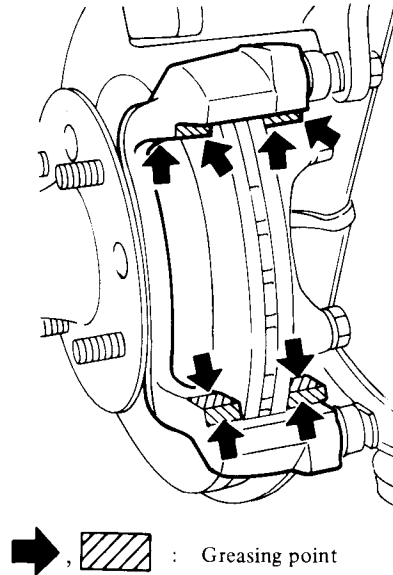
Pad wear limit

(Minimum thickness):

2 mm (0.08 in)

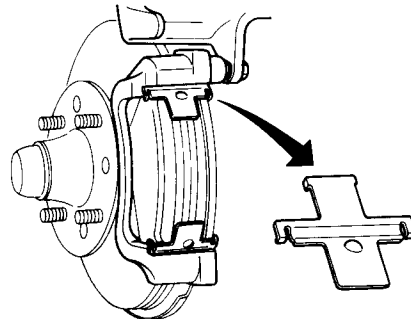
Note: Always replace pads in pad kit (four pads).

3. Check rotor, referring to Rotor for inspection.



BR167A

4. Install new pad (outer side), and inner and outer shims.
5. After installing pads, install pad retainer, being careful not to fit it upside down.



BR168A

Installation

1. Clean piston end and surroundings of pin bolts.

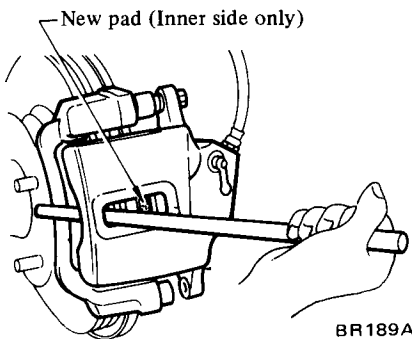
CAUTION:

Use brake fluid to clean. Never use mineral oil.

Note: Be careful not to get oil on rotor.

2. Install new pad (inner side).

Insert lever into opening in cylinder body as shown below and push piston by catching torque member.



BR189A

3. Coat the following point with PBC grease or silicone-based grease.

- Torque member-to-pad clearance

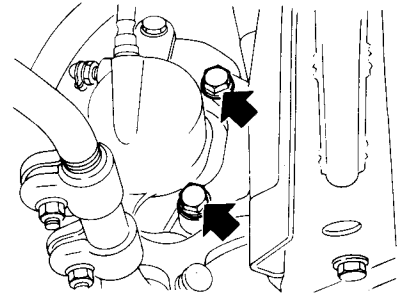
Note: Do not grease friction face of pad.

CAUTION:

When removing brake tube, use suitable tube wrench. Never use open-end or adjustable wrench.

Note: Plug up hole in caliper and brake tube so that brake fluid does not flow out.

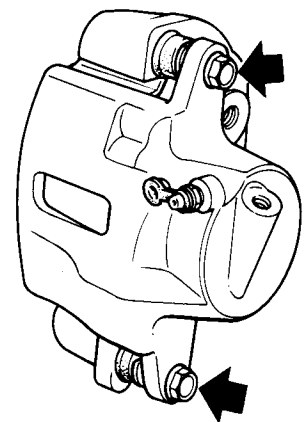
3. Remove caliper assembly from knuckle spindle.



BR169A

DISASSEMBLY

1. Drain brake fluid from cylinder body.
2. Wipe off dust and mud from caliper assembly.
3. Remove pin bolts.



BR170A

6. Install cylinder body and then tighten lower pin bolt.

Ⓣ : Pin bolt

22 - 31 N·m
(2.2 - 3.2 kg·m,
16 - 23 ft·lb)

7. Depress brake pedal several times, and pads will settle into proper position.
8. Install wheels and lower car to ground.

REMOVAL

1. Jack up front of car, and support it on safety stands. Remove wheel.
2. Remove front brake hose.

4. Separate cylinder body and torque member.

5. Remove pad retainers and pads.

6. Force out pistons with dust seal from cylinder by feeding compressed air gradually.

WARNING:

Gradually increase air pressure so that piston does not pop out.

- Remove piston seals.

CAUTION:

Be careful not to damage seals and cylinder body.

- If necessary, remove sub pin, main pin and dust seals.

INSPECTION

Clean all parts and check as follows:

CAUTION:

Use brake fluid to clean. Never use mineral oil.

Cylinder body

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign substances. If any surface fault is detected, replace cylinder body.
- 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 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 on sliding surface.

Piston seal and dust seal

Replace piston seal and dust seal at each disassembly.

Main pin, sub pin and rubber bushing

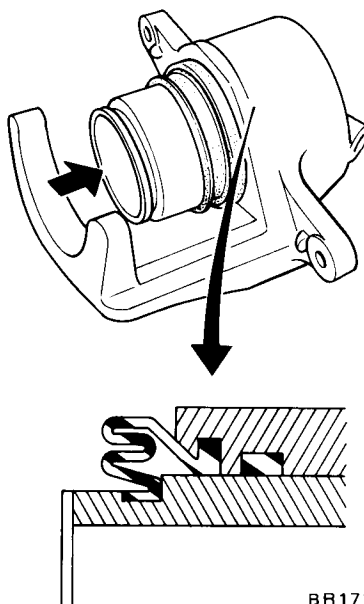
Check for wear, cracks or other damage. Replace if any fault is detected.

ASSEMBLY

Assemble front brake in reverse order of disassembly, closely observing the following:

- Install piston seals, taking care not to damage them.
- Apply brake fluid to sliding portions of piston, inside of cylinder body.
- With dust seal fitted to piston, insert dust seal into groove in cylinder body and install piston. Then securely fit dust seal.

Note: Apply rubber grease to inside of dust seal.



- Coat the following part with recommended brake grease.

- Torque member-to-pad clearance.
- Apply a coat of recommended multi-purpose grease to main pin rubber bushing and to sub pin.

- Tighten pin bolts.

ⓧ : Pin bolts

22 - 31 N·m
(2.2 - 3.2 kg-m,
16 - 23 ft-lb)

INSTALLATION

- Install caliper assembly without pads and pad retainer to knuckle spindle.

ⓧ : Caliper mounting bolt

72 - 97 N·m
(7.3 - 9.9 kg-m,
53 - 72 ft-lb)

- Install pads and pad retainer. Refer to Pad Replacement.
- Install front brake hose and bleed brake system.

CAUTION:

When installing brake tubes, use Flare Nut Torque Wrench GG94310000.

ⓧ : Brake tube flare nut

15 - 18 N·m
(1.5 - 1.8 kg-m,
11 - 13 ft-lb)

Air bleeder

7 - 9 N·m
(0.7 - 0.9 kg-m,
5.1 - 6.5 ft-lb)

- After installing, see if there is no leak by depressing brake pedal several times.

Note: Turn rotor to make sure it does not drag excessively.

FRONT DISC ROTOR

REMOVAL

Refer to Removal (Section FA).

INSPECTION

Check the following items and, if necessary, replace. Checks can be made by removing only wheel.

Brake System

1. Sliding surface

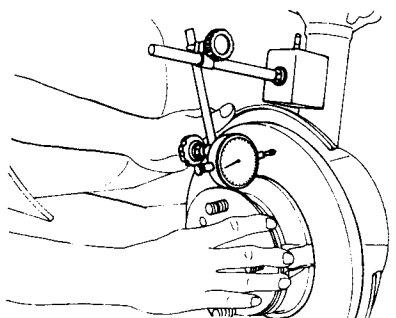
If there are cracks or considerable chips, replace.

2. Runout

Adjust wheel bearing correctly. Using a dial gauge, measure runout.

Runout limit:

**Total indicator reading
Less than 0.10 mm (0.0039 in)
at center of rotor pad
contact surface**



BR025A

3. Parallelism

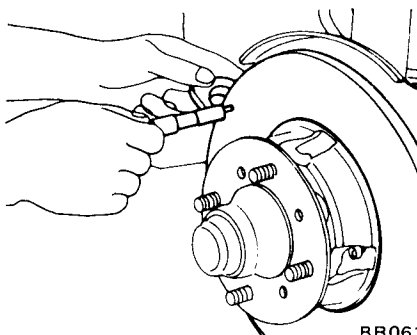
Measure thickness of rotor in circumferential direction, using a micrometer.

Parallelism:

Circumferential direction

**Less than
0.03 mm (0.0012 in)**

Note: As this value increases (wear occurs progressively), vibration corresponding to revolution of tire may often be transmitted to interior of car.



BR061

4. Thickness

If rotor thickness is beyond wear limit, replace rotor. When correcting thickness, be sure that the thickness after correction does not exceed the limit.

Standard thickness:

20.0 mm (0.787 in)

Wear limit (Minimum thickness):

18.0 mm (0.709 in)

INSTALLATION

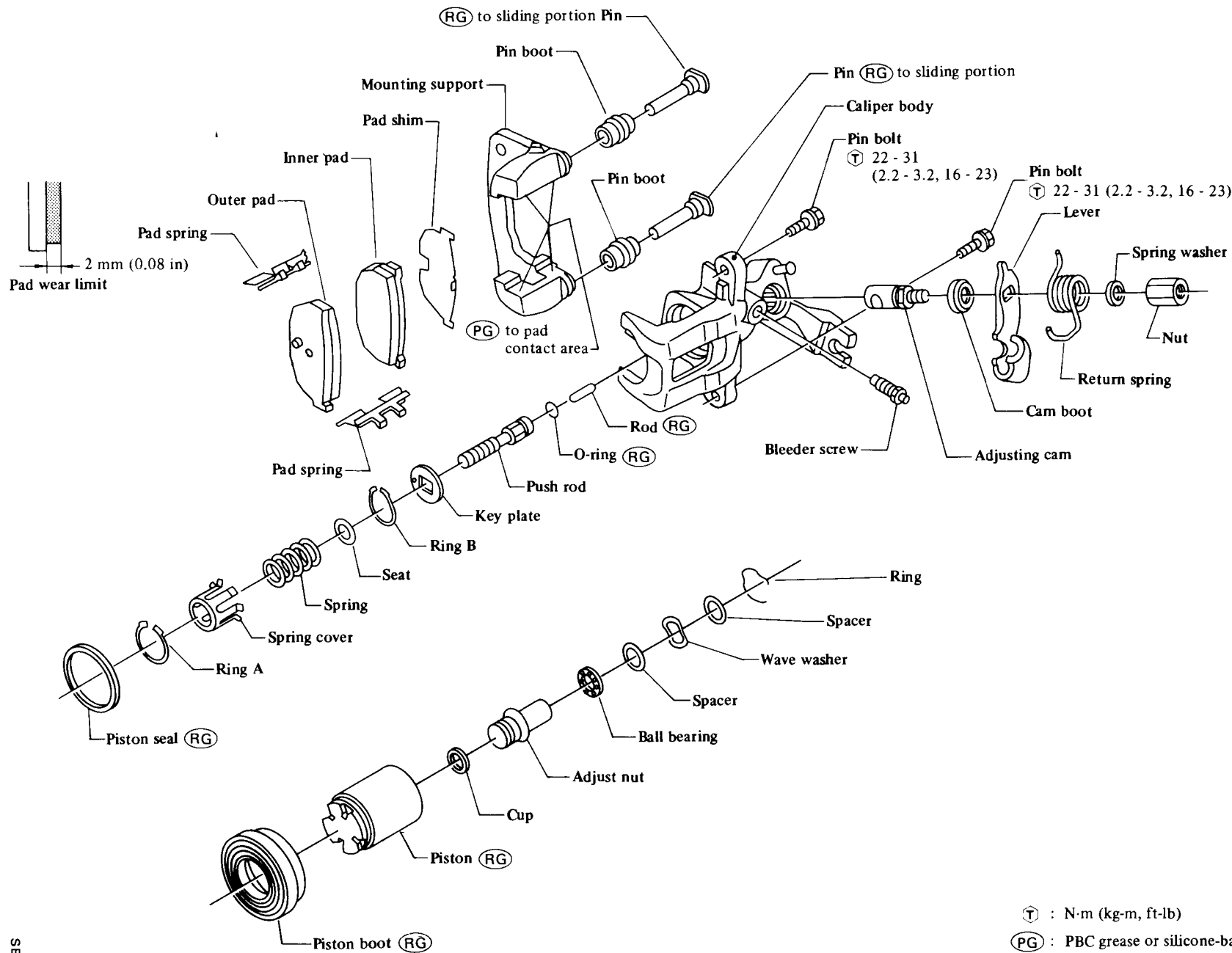
Install rotor in reverse order of removal. Adjust wheel bearing preload correctly. Refer to Adjustment (Section MA).

: Rotor to wheel hub

54 - 74 N·m

(5.5 - 7.5 kg-m,

40 - 54 ft-lb)

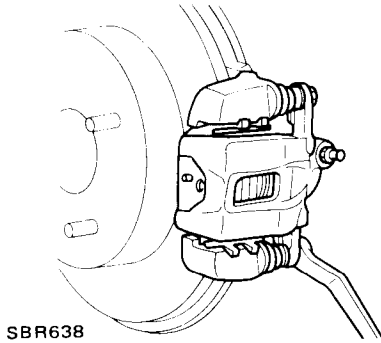


Ⓣ : N·m (kg-m, ft-lb)
 Ⓟ : PBC grease or silicone-based grease point
 Ⓡ : Rubber grease point

PAD REPLACEMENT

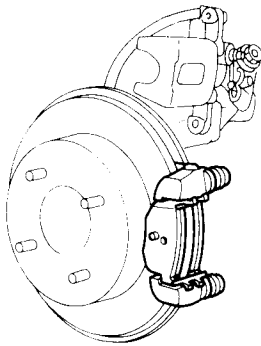
Removal

1. Remove pin bolts.



SBR638

2. Remove pad springs, pads and pad shim.



SBR640

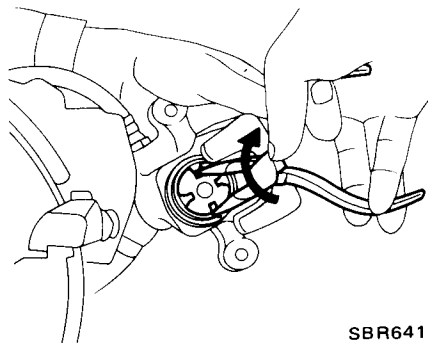
Installation

1. Clean piston end and area around pin bolts.

Be careful not to get oil on rotor.

2. Retract piston into cylinder body by turning it clockwise.

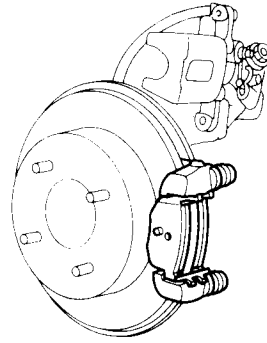
Be careful not to damage piston boot.



SBR641

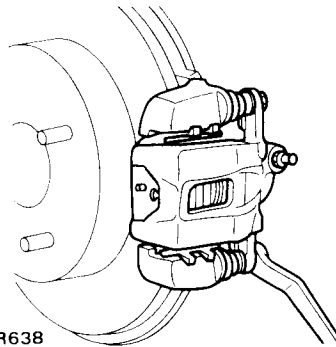
3. Coat the pad contact area on mounting support with PBC grease or silicone-based grease.

4. Install pads, shim and pad springs.



SBR640

5. Fix cylinder body.



SBR638

Ⓙ : 22 - 31 N·m
(2.2 - 3.2 kg-m, 16 - 23 ft-lb)

Ⓙ : Caliper fixing bolts

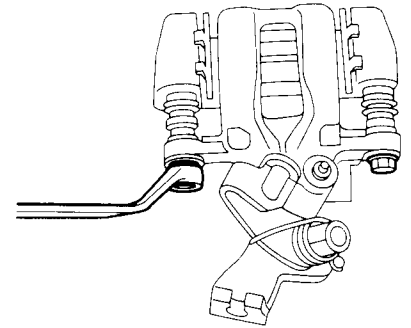
38 - 52 N·m
(3.9 - 5.3 kg-m,
28 - 38 ft-lb)

Brake hose connector

17 - 20 N·m
(1.7 - 2.0 kg-m,
12 - 14 ft-lb)

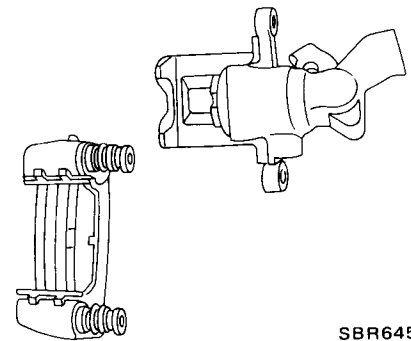
DISASSEMBLY

1. Remove outer spring retainer and pin bolt.



SBR644

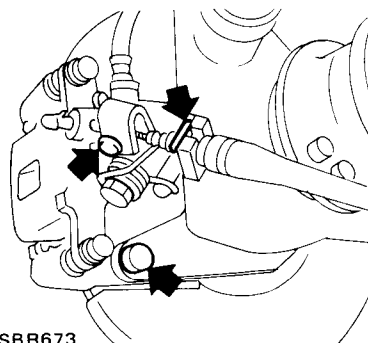
2. Separate cylinder body from torque member.



SBR645

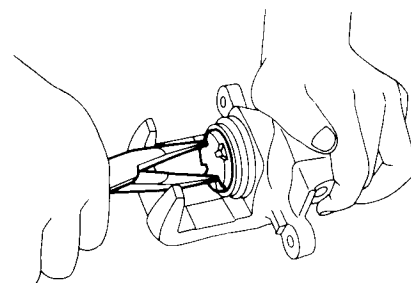
REMOVAL AND INSTALLATION

Disconnect parking brake cable and brake hose, then remove caliper assembly.

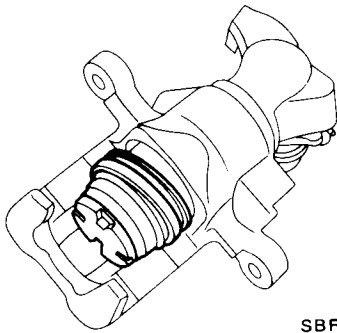


SBR673

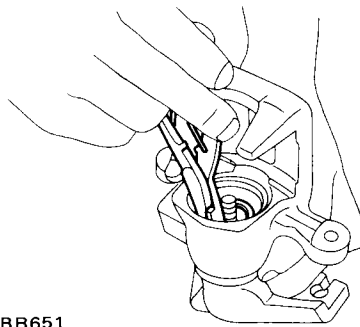
3. Remove piston by turning it counterclockwise with suitable long nose pliers.



SBR646

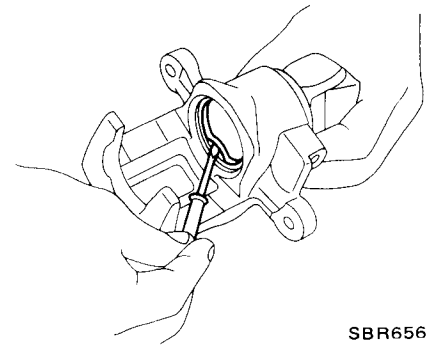


SBR647



SBR651

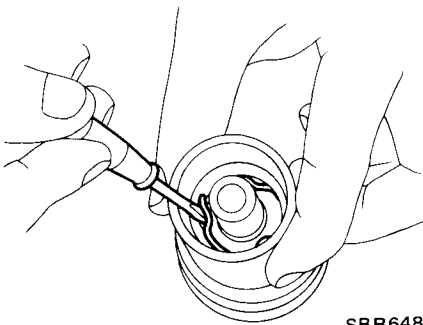
6. Remove piston seal.



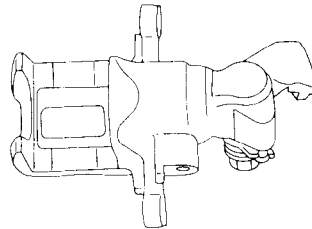
SBR656

4. Disassemble piston as follows.

(1) Pry off ring.

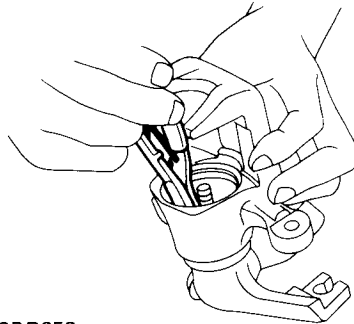


SBR648



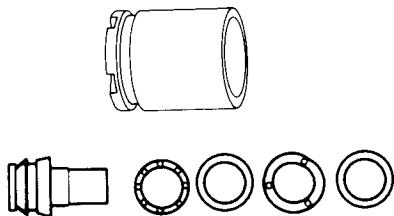
SBR652

(2) Pry off ring B, then remove key plate, push rod and rod.



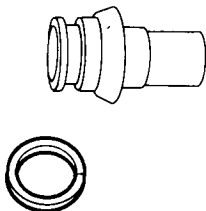
SBR653

(2) Adjust nut, ball bearing, wave washer and spacers can then be removed.

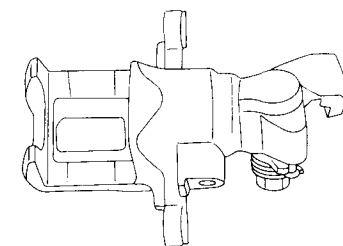


SBR649

(3) Remove cup.

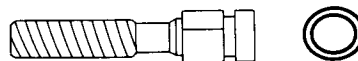


SBR650



SBR654

(3) Remove O-ring.



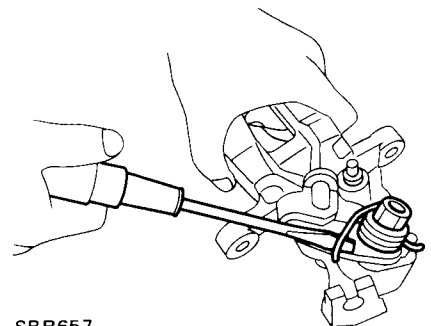
SBR655

5. Disassemble cylinder body.

(1) Pry off ring A with suitable pliers, then remove spring cover, spring and seat.

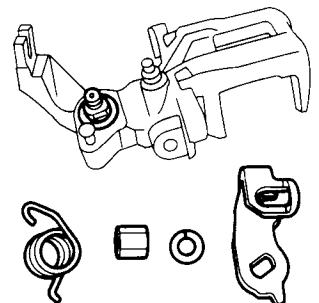
7. Disassemble lever.

(1) Remove return spring.



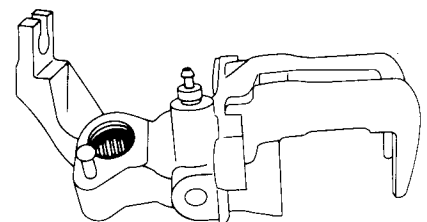
SBR657

(2) Remove nut, spring washer and lever.



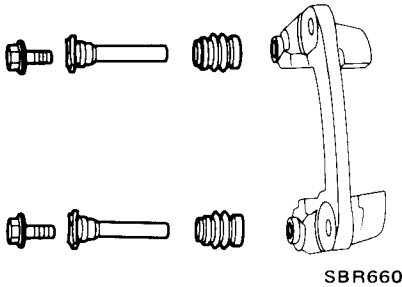
SBR658

(3) Remove adjusting cam and cam boot.



SBR659

8. Remove pin and pin boot as necessary.



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 replaced.

Mounting support

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 piston boot

Replace piston seal and piston boot at each disassembly.

Pin and pin boot

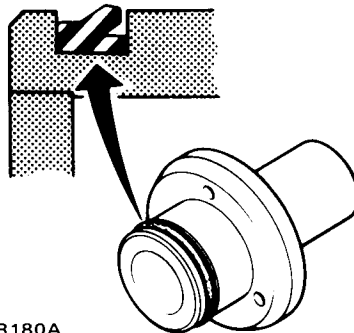
Check for wear, cracks or other damage. Replace if any fault is detected.

Adjust nut cup and push rod O-ring

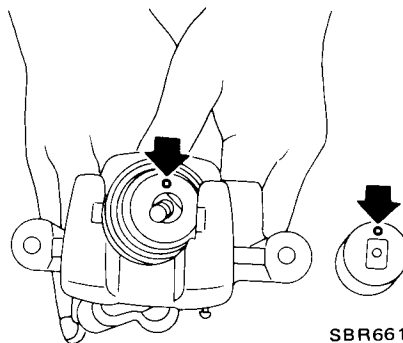
Replace once they have been disassembled.

ASSEMBLY

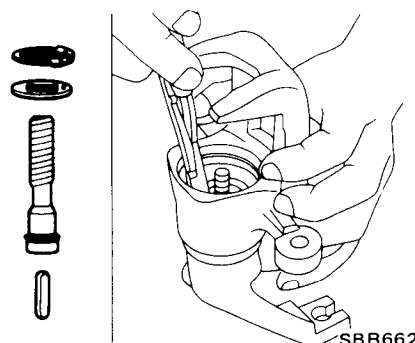
- Before assembling, apply thin coat of rubber grease to the following:
Groove in **push rod** and new **O-ring**
Strut ends
Groove in **adjust nut** and **cup**
Piston seal
Inside of boot
Sliding portions of **piston** and **pins**
- Install cup securely in the specified direction.



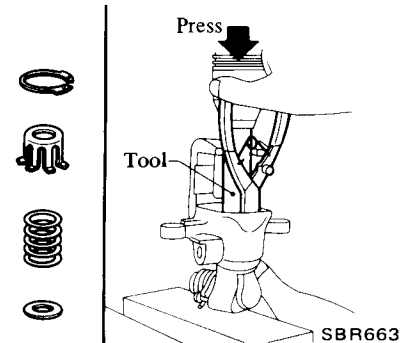
- Fit push rod into square hole in key plate. Also fit convex portion of key plate with concave portion of cylinder.



- Install ring B with suitable tool.



- Install seat, spring, spring cover and ring A with suitable press and drift.



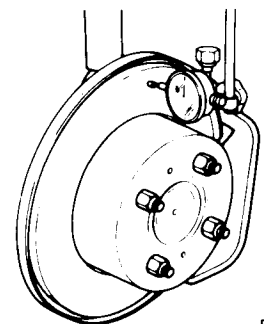
REAR DISC ROTOR

REMOVAL AND INSTALLATION

Remove caliper. Rotor can then be taken out.

INSPECTION

1. Sliding surface
If there are cracks or a considerable number of chips, repair or replace.
2. Runout
Adjust wheel bearing correctly.
Measure runout at the center of rotor pad contact surface.



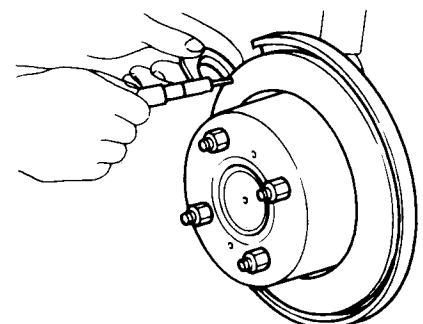
Rotor repair limit:

Maximum runout

(Total indicator reading at center of rotor pad contact surface):

0.15 mm (0.0059 in)

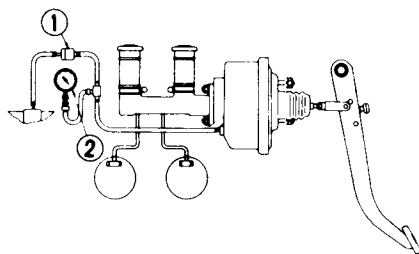
3. Thickness



Standard thickness:
9.6 mm (0.378 in)
Rotor repair limit:
Minimum thickness
8.6 mm (0.339 in)

4. Parallelism

Rotor repair limit:
Maximum parallelism
(Circumferential direction):
0.03 mm (0.0012 in)



- 1 Check valve
- 2 Vacuum gauge

BR942

2. Start engine and increase engine speed. Stop engine when vacuum gauge indicates 66.7 kPa (500 mmHg, 19.69 inHg).

Air tight test (No load)

Fifteen seconds after engine is stopped, observe the rate of drop in air pressure registered by vacuum gauge. If vacuum pressure drops more than the specified value, refer to the following chart to determine the cause of failure.

Maximum vacuum leakage:
3.3 kPa
(25 mmHg, 0.98 inHg)

BRAKE BOOSTER

INSPECTION OF OPERATION

Checking vacuum pressure

1. Connect a vacuum gauge, in the line, between check valve and Brake Booster.

Probable cause	Corrective action
1. Air leakage at check valve.	Replace check valve.
2. Air leakage at push rod seal.	Replace Brake Booster as an assembly.
3. Air leakage between valve body and seal.	
4. Air leakage at valve plunger seat.	
5. Damaged piping or joints.	Repair or replace.

Air tight test (Under load)

Fifteen seconds after engine is stopped and brake fully applied, observe the rate of drop in air pressure registered by vacuum gauge. If vacuum

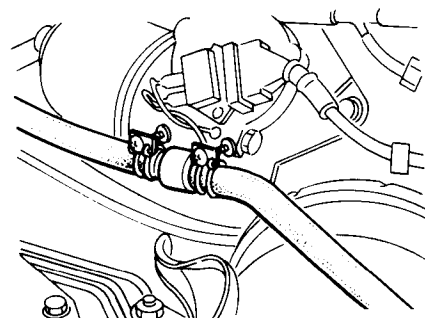
pressure drops more than the specified value, refer to the following chart to determine the cause of failure.

Maximum vacuum leakage:
3.3 kPa
(25 mmHg, 0.98 inHg)

Probable cause	Corrective action
1. Air leakage at check valve.	Replace check valve.
2. Damaged diaphragm.	Replace Brake Booster as an assembly.
3. Reaction disc dropped off. (Brake Booster)	
4. Air leakage at poppet assembly seat and valve body.	

Inspecting check valve

1. Remove clip and disconnect hoses at connections. The check valve can now be removed.

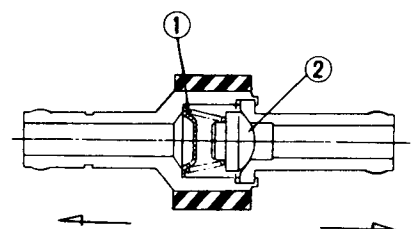


BR183A

2. Using a Brake Booster tester, apply a vacuum pressure of 26.7 kPa (200 mmHg, 7.87 inHg) to the port of check valve on the Brake Booster side. 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)

3. When vacuum pressure is applied to the Brake Booster side of check valve and valve does not open, replace check valve with a new one.



Manifold side Brake Booster side

- 1 Spring
- 2 Valve

BR953

4. When installing check valve, be careful to avoid incorrect connections.

Operating test

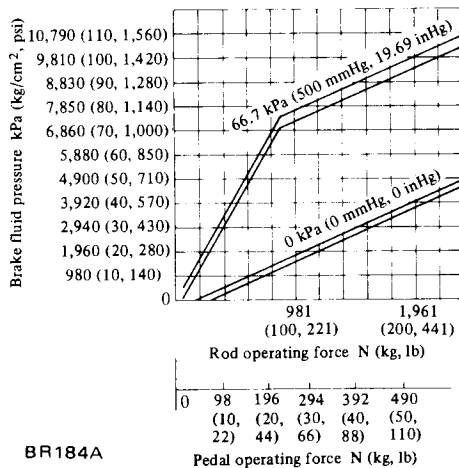
1. Connect an oil pressure gauge to brake line, at connection on master cylinder.
2. Install a pedal force gauge on brake pedal.

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 following chart. If test results are not as specified in following chart, check Brake Booster for condition in manner described under "Inspection" before removal of this unit.

Also check brake line for evidence of fluid leakage.

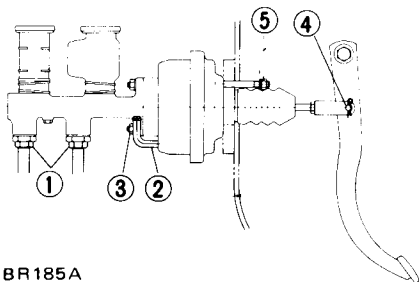
Note: Determine whether source of problem is in Brake Booster or check valve. Before you reach a final conclusion, always inspect check valve first.



BR184A

REMOVAL

Remove parts in numerical order enumerated.



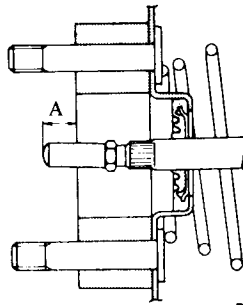
BR185A

ADJUSTMENT

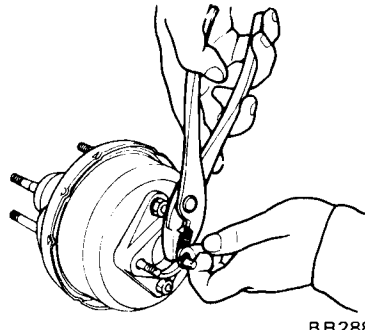
1. Adjust the length of push rod to the value indicated below. Length adjustment of push rod is made at the tip of push rod.

Length "A":

9.75 - 10.0 mm
(0.3839 - 0.3937 in)



BR109A

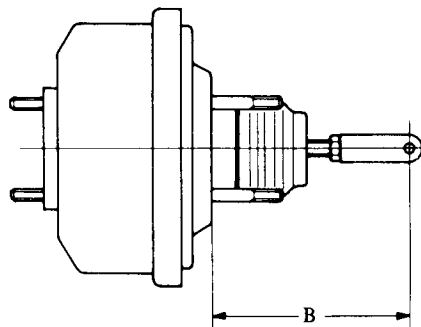


BR288

2. Install clevis. Adjust length of operating rod to specified value.

Length "B":

143 mm (5.63 in)



BR110A

INSTALLATION

Install in the reverse sequence of removal.

ⓧ : Master cylinder to Brake Booster

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

Brake Booster to body

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

Note: After Brake Booster is properly installed in car, conduct an air-tight and operational tests as previously described.

BLEEDING HYDRAULIC SYSTEM

Hydraulic brake system must be bled whenever any line has been disconnected or air has in some way entered system.

"Spongy" pedal action is an indication that air has entered brake system.

Bleeding hydraulic system deserves much attention as it is an essential element in regular brake servicing.

1. Clean all dirt around master cylinder reservoir, remove cylinder cover and top up reservoir with recommended brake fluid.

Note: Do not mix two different brand oils.

2. Thoroughly clean mud or dust from bleeder valve so that outlet hole is free from foreign material. Install a bleeder hose on bleeder valve.

Dip other end of hose into brake fluid bled in a container.

3. Depress brake pedal two or three times and then keep pedal fully depressed.

4. With brake pedal fully depressed, open bleeder valve to exhaust air.

Note:

a. Carefully monitor brake fluid level at master cylinder during bleeding operation.

b. Do not re-use brake fluid drained during bleeding operation.

c. Bleed air in the following sequence.

Master cylinder →

Rear wheel → Front wheel

d. Be careful not to splash brake fluid on painted areas.

5. Close bleeder valve quickly as brake pedal is on down stroke.

6. Allow brake pedal to return slowly with bleeder screw closed.

7. Repeat bleeding operations until no air bubbles show in hose.

Note:

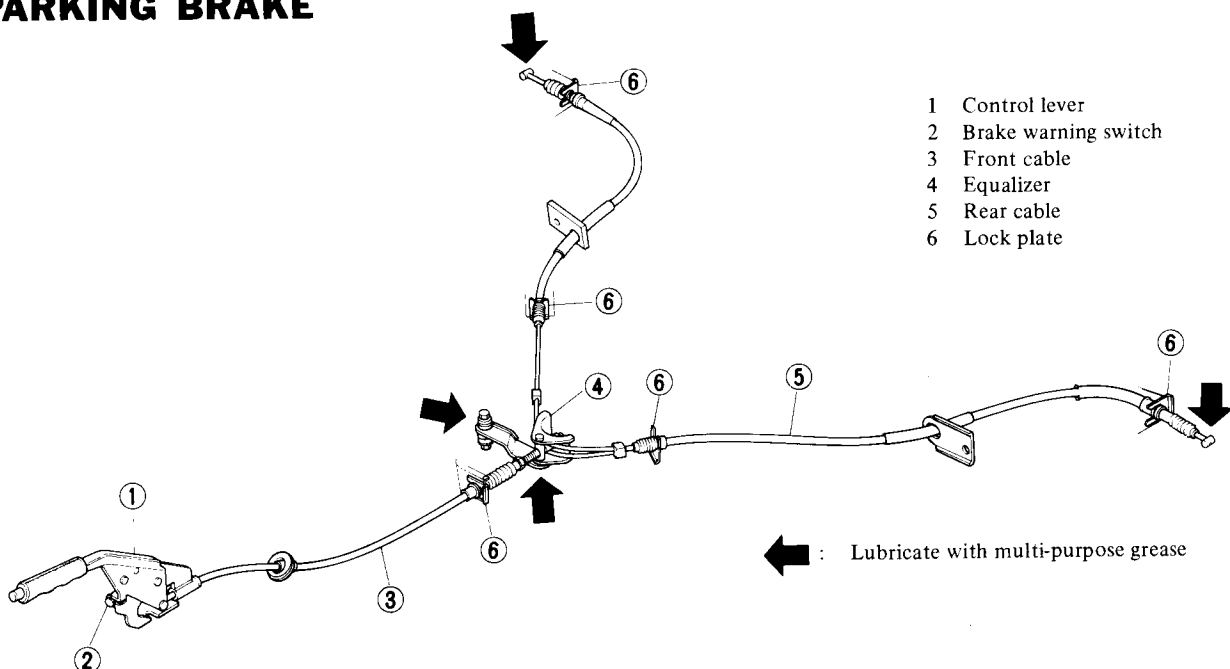
a. Brake fluid containing air is white and contains air bubbles.

b. Brake fluid containing no air runs out of bleeder valve in a solid stream free of air bubbles.

8. Repeat steps above on remaining brake line to expel air.

PARKING BRAKE

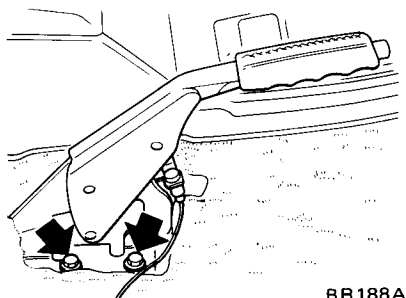
PARKING BRAKE



REMOVAL

Control lever and front cable

1. Remove front assistant's seat.
2. Disconnect terminal from parking brake warning switch.
3. Remove bolts securing parking brake control lever to floor.



4. Remove lock plate, adjusting nut and lock nut.
5. Pull front cable out into driver's compartment and remove it together with control assembly.

CAUTION:

Be careful not to deform or damage control lever.

Note: Front cable, clevis pin and cotter pin are available as service parts.

Rear cable

1. Disconnect rear cable at equalizer.
2. Remove cable lock plate from rear suspension and rear disc brake.
3. Remove clevis pin and clevis from rear disc brake.
4. Disconnect rear cable from suspension arm and then remove rear cable.

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 light or switch.
4. Check parts at each connection and, if found deformed or damaged, replace.

INSTALLATION

Install parking brake assembly following the reverse procedure of removal. Closely observing the following items:

1. When installing, apply a coating of grease to sliding contact surfaces.
2. Upon completion of installation of parking brake assembly, adjust the entire system as described in Section MA.
3. Make sure that adjacent parts do not interfere with cable.

Do not apply an undue stress to cable.

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

GENERAL SPECIFICATIONS

SERVICE BRAKE

Unit: mm (in)

	Front	Rear
Type	Disc-CL28V	Disc-CL14H
Pad dimension Width x thickness x length	49 x 11 x 118 (1.93 x 0.43 x 4.65)	40 x 8 x 75 (1.57 x 0.31 x 2.95)
Rotor outer diameter	252 (9.92)	258 (10.16)
Caliper inner diameter	60.6 (2.386)	42.8 (1.685)

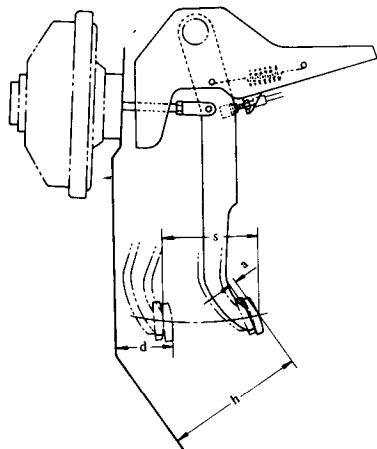
Master cylinder inner diameter mm (in)	23.81 (15/16)
Brake Booster Type	M90
Diaphragm diameter mm (in)	228.6 (9)
NP-valve Split point kPa (kg/cm ² , psi)	3,923 (40, 569)
Reducing ratio	0.4

INSPECTION AND ADJUSTMENT

BRAKE PEDAL

Unit: mm (in)

	M/T	A/T
Pedal play "a"	1 - 5 (0.04 - 0.20)	
Depressed height "d"	More than 80 (3.15)	More than 90 (3.54)
Pedal height "h"	181 - 187 (7.13 - 7.36)	190 - 196 (7.48 - 7.72)
Full stroke "s"	125 (4.92)	134 (5.28)



PARKING BRAKE

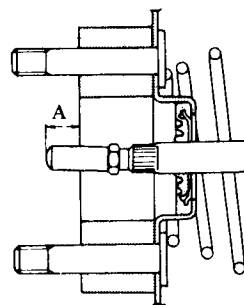
Pulling force	N (kg, lb)	265 (27, 60)
Stroke	mm (in)	86 - 109 (3.39 - 4.29)
Number of notches		4 - 6

MASTER CYLINDER

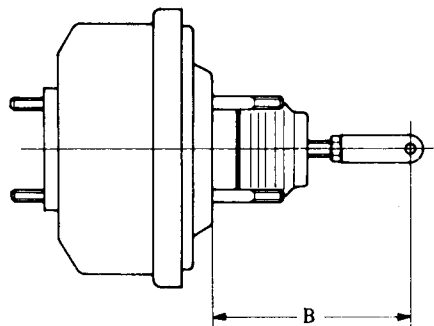
Allowable clearance between cylinder and piston mm (in)	Less than 0.15 (0.0059)
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BRAKE BOOSTER

Maximum vacuum leakage (15 seconds after engine is stopped) kPa (mmHg, inHg)	3.3 (25, 0.98)
Push rod length "A" mm (in)	9.75 - 10.0 (0.3839 - 0.3937)
Operating rod length "B" mm (in)	143 (5.63)



BR109A



BR947

CHECK VALVE

Maximum vacuum leakage [15 seconds after 26.7 kPa (200 mmHg, 7.87 inHg) pressure is applied] kPa (mmHg, inHg)	1.3 (10, 0.39)
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DISC BRAKE

Unit: mm (in)

Item	Front	Rear
	CL28V	CL14H
Pad wear limit (Minimum thickness)	2 (0.08)	
Rotor repair limit Maximum runout	0.10 (0.0039)	0.15 (0.0059)
Maximum parallelism circumferential direction	0.03 (0.0012)	
Minimum thickness	18.0 (0.709)	8.6 (0.339)

TIGHTENING TORQUE

Unit		N·m	kg-m	ft-lb
Master cylinder to Brake Booster		8 - 11	0.8 - 1.1	5.8 - 8.0
Brake tube flare nut		15 - 18	1.5 - 1.8	11 - 13
Brake hose connector		17 - 20	1.7 - 2.0	12 - 14
Air bleeder valve		7 - 9	0.7 - 0.9	5.1 - 6.5
Connector mounting bolt	6 mm dia. bolt	5 - 7	0.5 - 0.7	3.6 - 5.1
	8 mm dia. bolt	8 - 11	0.8 - 1.1	5.8 - 8.0
NP-valve		6 - 7	0.6 - 0.7	4.3 - 5.1
Fulcrum bolt of brake pedal		34 - 39	3.5 - 4.0	25 - 29
Brake warning lamp switch lock nut		12 - 15	1.2 - 1.5	9 - 11
Caliper fixing bolt	Front	72 - 97	7.3 - 9.9	53 - 72
	Rear	38 - 52	3.9 - 5.3	28 - 38
Front disc rotor fixing bolt		54 - 74	5.5 - 7.5	40 - 54
Front brake baffle plate fixing bolts		3.1 - 4.3	0.32 - 0.44	2.3 - 3.2
Rear disc caliper pin bolt		22 - 31	2.2 - 3.2	16 - 23
Rear brake baffle plate fixing bolts		3.1 - 4.3	0.32 - 0.44	2.3 - 3.2
Brake booster				
Brake booster to body		8 - 11	0.8 - 1.1	5.8 - 8.0
Operating rod lock nut		16 - 22	1.6 - 2.2	12 - 16
Flange to shell cover		8 - 11	0.8 - 1.1	5.8 - 8.0
Push rod adjusting nut		16 - 22	1.6 - 2.2	12 - 16

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Excessive pedal travel	<p>Low brake fluid level or empty master cylinder reservoir.</p> <p>Leakage in master cylinder.</p> <p>Deteriorated check valve.</p> <p>Air in system.</p> <p>Faulty brake adjustment.</p> <p>Excessive lateral play on disc caused by loose or worn wheel bearings or steering parts.</p>	<p>Fill and bleed as necessary. Test for source of leakage by examining all lines, connections and wheel cylinder.</p> <p>Overhaul master cylinder.</p> <p>Replace check valve and bleed system.</p> <p>Bleed system.</p> <p>Adjust pad-to-rotor clearance. Inspect auto-adjuster operation.</p> <p>Replace or adjust faulty parts.</p>
Spongy pedal	<p>Low fluid level in master cylinder.</p> <p>Air in system.</p> <p>Faulty brake adjustment.</p> <p>Reservoir filler cap vent hole clogged.</p> <p>Swollen hose due to deterioration or use of poor quality hose.</p> <p>Distorted brake shoes, or excessively worn or cracked brake drum.</p> <p>Soft or swollen caliper seals.</p> <p>Use of a brake fluid with too low boiling point.</p>	<p>Top with fluid and inspect for leakage.</p> <p>Correct as necessary.</p> <p>Adjust pad-to-rotor clearance. Inspect auto-adjuster operation.</p> <p>Clean and bleed system.</p> <p>Replace hose and bleed system.</p> <p>Replace faulty parts.</p> <p>Drain hydraulic system, flush with alcohol and replace all seals.</p> <p>Replace with specified brake fluid and bleed system.</p>
Poor braking effect	<p>Fluid leakage in brake lines.</p> <p>Low brake fluid level or empty master cylinder reservoir.</p> <p>Air in brake lines.</p> <p>Grease, oil, mud or water on pads.</p> <p>Deterioration of pads.</p> <p>Local fit of pads.</p> <p>Pads excessively worn.</p> <p>Master cylinder or caliper assembly in poor condition.</p> <p>Frozen or seized caliper pistons on disc brakes.</p> <p>Binding mechanical linkage at brake pedal.</p>	<p>Check master cylinder, piping and caliper for leaks, and repair.</p> <p>Fill and bleed as necessary.</p> <p>Bleed system.</p> <p>Clean brake mechanism and check for cause of problem. Replace pads.</p> <p>Replace.</p> <p>Shave or replace.</p> <p>Replace.</p> <p>Repair or replace.</p> <p>Disassemble caliper and free up as required.</p> <p>Free up as required.</p>

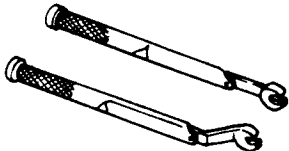
Brake System

Condition	Probable cause	Corrective action
Unbalanced brakes	<p>Improper tire inflation.</p> <p>Improper auto adjustment of pad-to-rotor clearance.</p> <p>Grease, oil, mud or water on pads.</p> <p>Mud in rotor.</p> <p>Deterioration of pads.</p> <p>Excessive wear of pads.</p> <p>Caliper cylinder in poor condition.</p> <p>Looseness of caliper assembly securing bolts.</p> <p>Scored or out-of-round rotor.</p> <p>Incorrect adjustment of wheel bearings.</p> <p>Incorrect adjustment of wheel alignment.</p>	<p>Inflate to correct pressure.</p> <p>Readjust.</p> <p>Clean brake mechanism and check for cause of problem. Replace pads.</p> <p>Clean.</p> <p>Replace.</p> <p>Replace.</p> <p>Repair or replace.</p> <p>Fasten or replace.</p> <p>Recondition or replace rotor as required. Check for improper pad contact with rotor and grind pad if necessary.</p> <p>Adjust or replace.</p> <p>Adjust.</p>
Brakes fade	<p>Brake fluid has too low boiling point.</p> <p>Use of improper pads.</p> <p>Brake rotor is out-of-round.</p> <p>Hydraulic connections, master cylinder and caliper cylinders are corroded or damaged.</p> <p>Bleed screw is open.</p>	<p>Drain and fill system with approved fluid.</p> <p>Replace.</p> <p>Repair or replace as necessary.</p> <p>Repair as necessary.</p> <p>Close screw and bleed system.</p>
Brakes drag	<p>Pedal linkage is binding or push rod adjustment is too long.</p> <p>Master cylinder compensator port is obstructed.</p> <p>Seized master cylinder piston.</p> <p>Poor pad condition.</p> <p>Poor caliper cylinder condition.</p> <p>Deformation of piston cups.</p> <p>Poor condition of caliper because of faulty piston seals.</p> <p>Excessive runout of rotor.</p> <p>Hand brake will not return.</p> <p>Clogged master cylinder return port.</p> <p>Clogged brake lines.</p> <p>Incorrect adjustment of wheel bearings.</p> <p>Improper pad-to-rotor clearance.</p> <p>No free travel in brake pedal return.</p>	<p>Lubricate linkage, check pedal return spring for condition and adjust push rod as necessary.</p> <p>Blow out foreign matter with compressed air.</p> <p>Disassemble master cylinder and replace piston. Bleed system.</p> <p>Clean and repair.</p> <p>Repair or replace.</p> <p>Replace.</p> <p>Replace piston seals.</p> <p>Turn rotor on lathe or replace.</p> <p>Check and repair.</p> <p>Clean.</p> <p>Check and clean.</p> <p>Adjust or repair.</p> <p>Adjust.</p> <p>Adjust pedal height.</p>

Brake System

Condition	Probable cause	Corrective action
Brake chatters	Groove or out-of round rotor. Loose or bent support plate. Distorted pads. Grease or brake fluid on pads.	Grind or replace as required. Tighten support plate bolts to specified torque, or replace plate. Replace as necessary. Replace pads.
Brake squeals	Dirty or scored rotor. Bent support plate. Glazed or contaminated pads.	Blow out assembly with compressed air or refinish rotor. Replace faulty unit. Grind pad to eliminate glaze. If it doesn't, replace pad.
Pedal pulsates	Lateral runout of brake rotor is excessive. Excessive variation in thickness of brake rotor surfaces.	Check with dial indicator, turning disc by hand. If runout exceeds specifications, replace disc. Measure around disc face with micrometer. Replace disc as required.
Rear lock (under light brake pedal force)	Improper tire pressures. Excessive wear of tires. Faulty NP-valve.	Check and adjust. Check and replace. Replace.
Rear lock (under heavy brake pedal force)	Improper tire pressures. Excessive wear of tires. Poor front braking effect. <ul style="list-style-type: none"> Grease oil, mud or water on pads. Excessive wear pads. Local fit pads. Master cylinder or caliper cylinder in poor condition. 	Check and adjust. Check and replace. Clean or replace. Replace. Shave or replace. Repair or replace.

SPECIAL SERVICE TOOL

Tool number & tool name	Kent-Moore No.	Tool number & tool name	Kent-Moore No.
	Reference page		Reference page
GG94310000 Flare nut torque wrench 	—		
	Page BR-4 Page BR-5 Page BR-7 Page BR-12		

STEERING SYSTEM

SECTION ST

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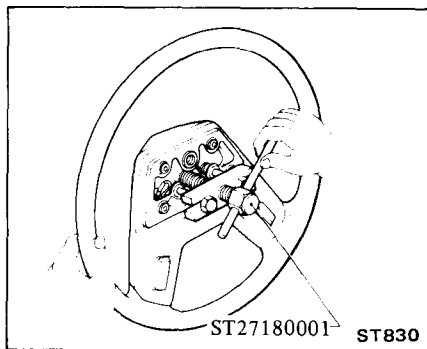
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STEERING WHEEL	ST-2	POWER STEERING OIL PUMP	ST-24
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STEERING COLUMN

STEERING WHEEL

REMOVAL

1. Disconnect battery ground cable.
2. Remove horn pad.
3. Remove steering wheel nut.
4. Remove steering wheel using Steering Wheel Puller ST27180001.



CAUTION:

Do not strike end of steering column shaft with a hammer. Striking shaft will damage bearing or column shaft.

Ⓙ : Steering wheel nut
39 - 49 N·m
(4.0 - 5.0 kg·m,
29 - 36 ft·lb)

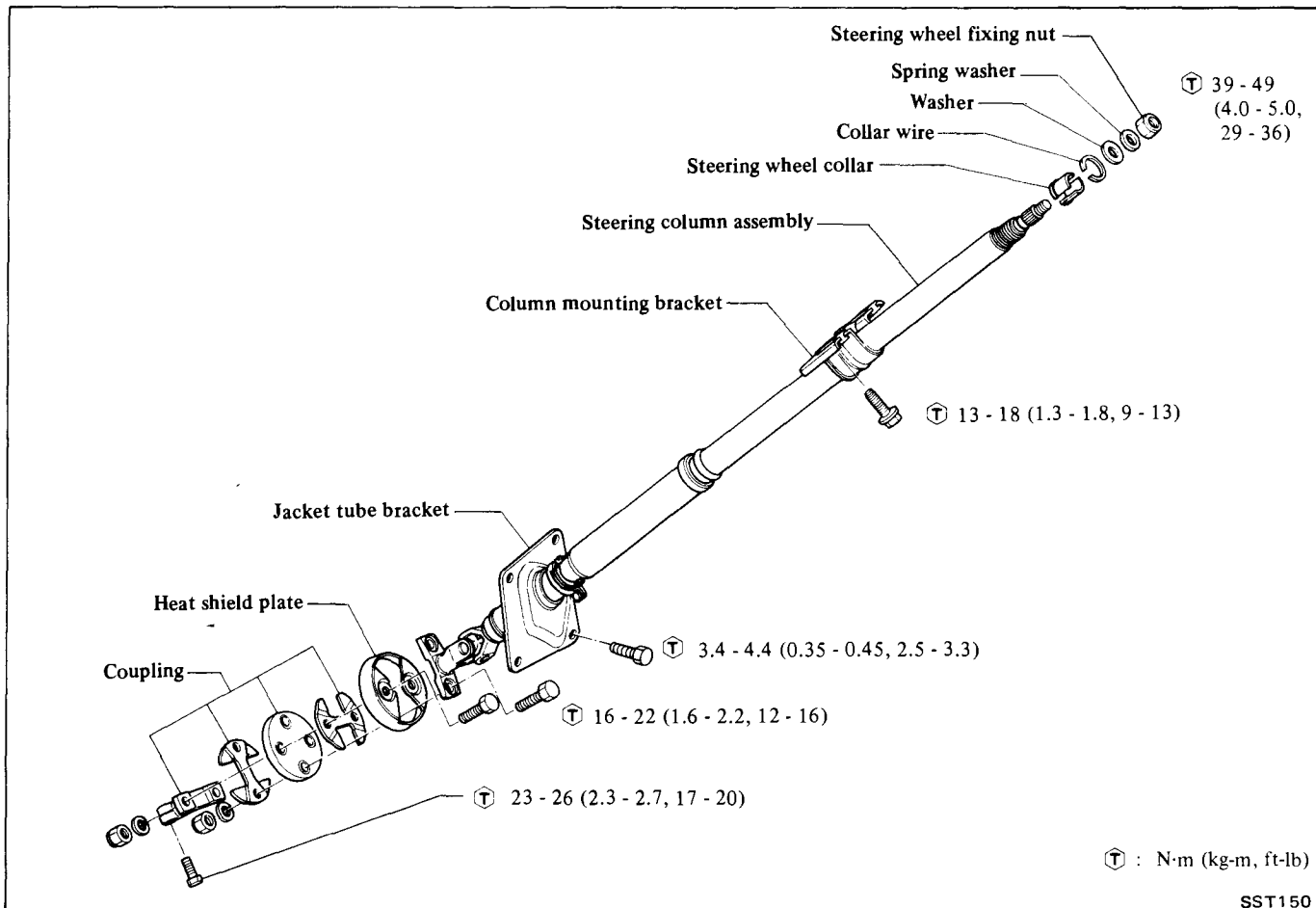
After installing steering wheel, turn it clockwise and counterclockwise, checking for catch or drag. Also check horn for operation.

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 after facing punch mark on the top of upper column shaft in that direction.

STEERING COLUMN



SST150

CAUTION:

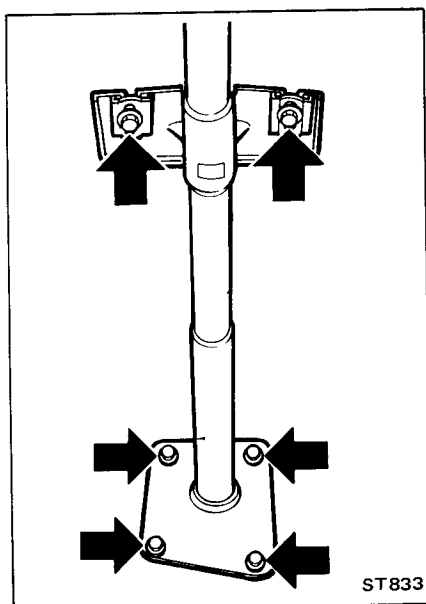
- a. Never in any case should undue stress be applied to steering column in axial direction.
- b. When installing, do not apply bending force to steering column.

When a head-on collision is encountered, inspect steering system as follows:

The steering system is very important unit for driving. The collapsible type steering column should not be disassembled, and if necessary, replace it as an assembly.

REMOVAL

1. Remove bolt securing lower joint and rubber coupling.
2. Remove steering wheel. Refer to Steering Wheel.
3. Remove steering column shell covers.
4. Remove combination switch assembly.
5. Remove jacket tube bracket and jacket tube bracket cover from dash panel.
6. Remove column mounting bracket.



7. Draw out steering column assembly from the room side.

INSTALLATION

Install steering column in reverse order of removal.

1. Set wheels in a straight ahead position.
2. Fit steering column assembly into lower joint serration through dash panel.

Carefully install so that punch mark at top end of column shaft faces upward.

3. Tighten column mounting bracket temporarily.
4. Tighten lower joint securing bolts temporarily to support upper side of steering column assembly.
5. After sliding jacket tube bracket to dash panel, tighten bolts to retain it.

CAUTION:

- a. Make sure that undue stress is not applied to rubber coupling.
- b. To avoid damaging bolt or serrations, align groove in lower joint shaft with bolt hole in rubber coupling.

Ⓣ : Jacket tube bracket and cover to dash panel
3.4 - 4.4 N·m
(0.35 - 0.45 kg-m,
2.5 - 3.3 ft-lb)

6. Tighten lower joint securing bolts and then tighten column mounting bracket securing bolts.

Ⓣ : Column mounting bracket
13 - 18 N·m
(1.3 - 1.8 kg-m,
9 - 13 ft-lb)
Lower joint to coupling
23 - 26 N·m
(2.3 - 2.7 kg-m,
17 - 20 ft-lb)

7. Install steering wheel. Refer to Steering Wheel.
8. After installation, make sure that steering wheel turns smoothly.

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.
- (3) Check column spring, and replace if damaged or weakened.

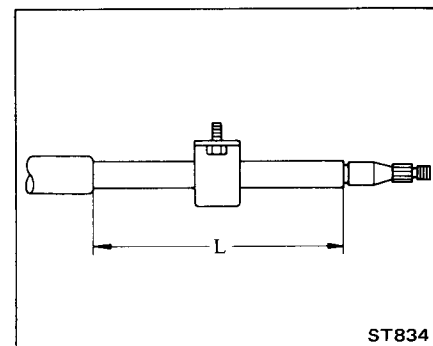
2. When the car comes into light collision, check the following parts and replace if necessary.

- (1) Jacket tube

Measure dimension "L".

When jacket tube is crushed, dimension "L" is reduced.

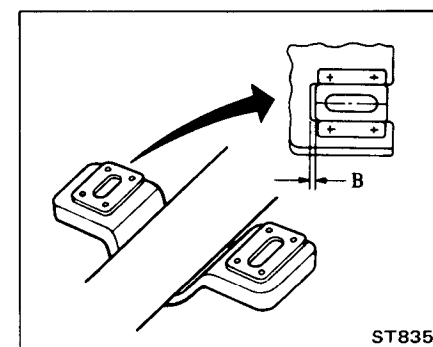
Column length "L":
399.5 - 400.5 mm
(15.73 - 15.77 in)



- (2) Column mounting bracket

Make sure column mounting bracket touches block.

Measure distance "B". Standard distance "B" is 0 mm (0 in). When jacket tube is crushed, distance "B" becomes larger.



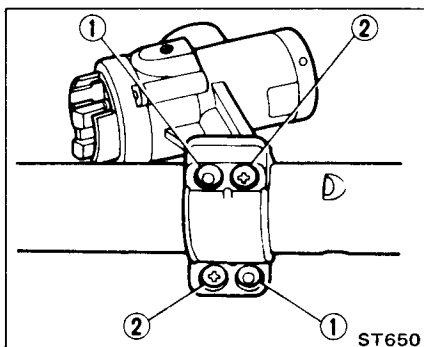
ST835

STEERING LOCK

To make steering lock system tamper-proof, self-shear type screws are used; their heads are sheared off upon installation so that steering lock system cannot be easily removed.

REMOVAL

1. Break self-shear type screws with a drill or other appropriate tool.
2. Remove screws and dismount steering lock.

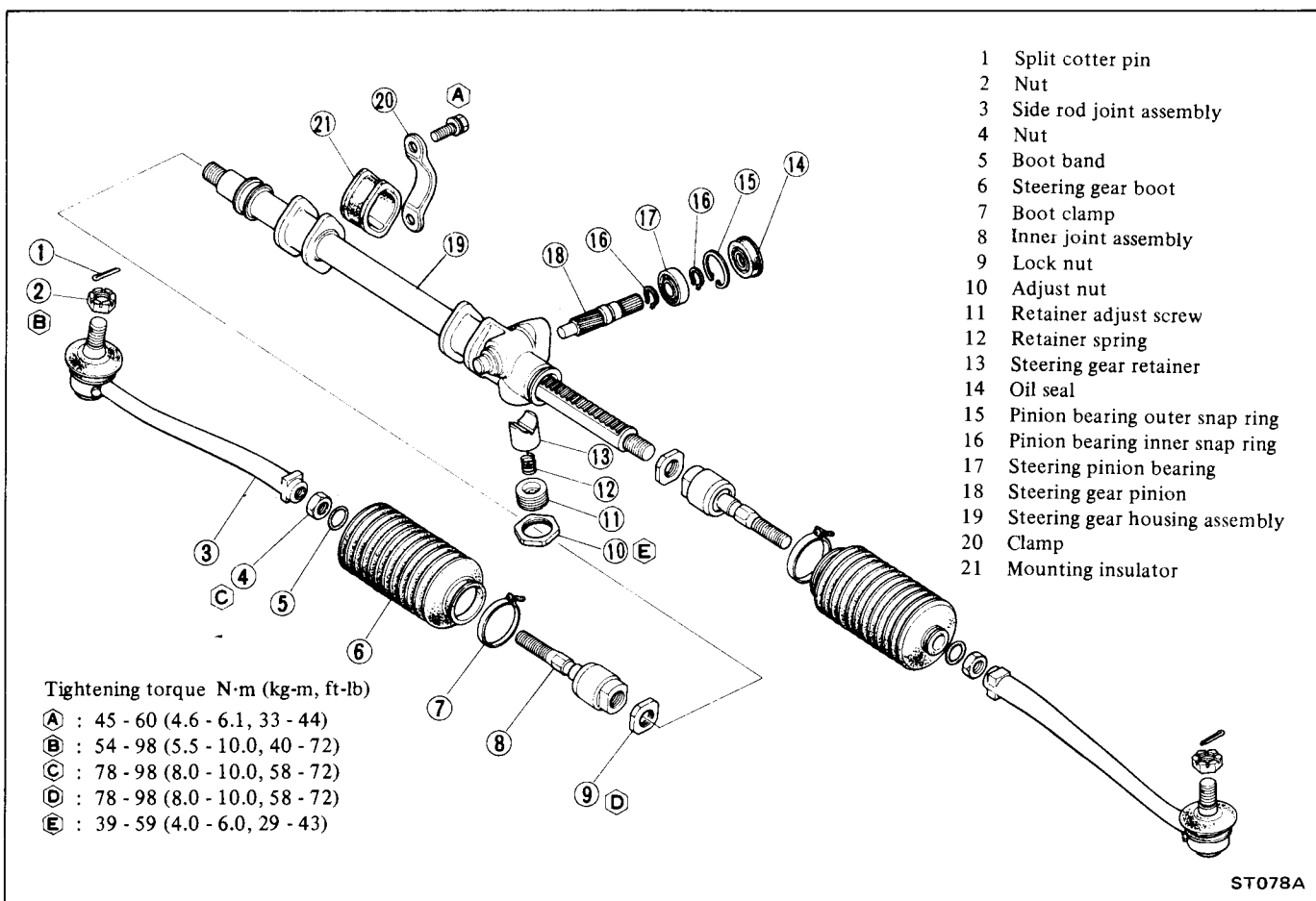


- 1 Self-shear type screw
- 2 Screw

INSTALLATION

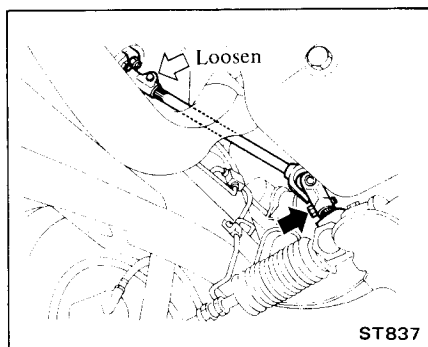
1. Align steering lock hole in jacket tube with mating portion of steering lock.
2. Install self-shear type screws and cut off their heads.

MANUAL STEERING GEAR (Model : RP15L) AND LINKAGE

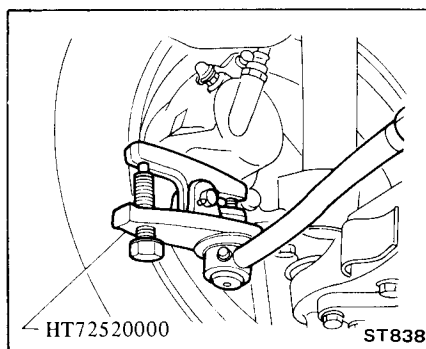


REMOVAL

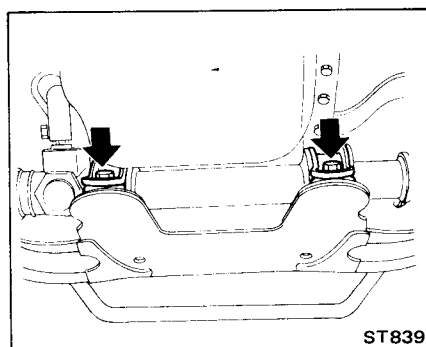
1. Jack up front of car and support it with safety stand.
2. Loosen bolt securing lower joint shaft to rubber coupling.



3. Disconnect bolt securing lower joint to steering pinion gear and then draw out lower joint from steering pinion gear.
4. Remove cotter pins and nuts fastening side rod ball studs.
5. To detach side rod ball studs from knuckle arms, insert Steering Ball Joint Remover HT72520000 between them and separate them.



6. Remove bolts securing steering gear housing to suspension cross-member.



Before removal, loosen nuts mounting front engine mount, place a wooden block under oil pan and jack up so that front engine mount is raised by 10 to 15 mm (0.39 to 0.59 in).

7. Remove steering gear and linkage assembly from car.

INSTALLATION

Install steering gear and linkage in reverse order of removal.

Observe the following instructions:

Ⓓ : Side rod to knuckle arm

54 - 98 N-m
(5.5 - 10 kg-m,
40 - 72 ft-lb)

Gear housing clamp bolt

45 - 60 N-m
(4.6 - 6.1 kg-m,
33 - 44 ft-lb)

Lower joint to pinion gear

39 - 49 N-m
(4.0 - 5.0 kg-m,
29 - 36 ft-lb)

Lower joint to coupling

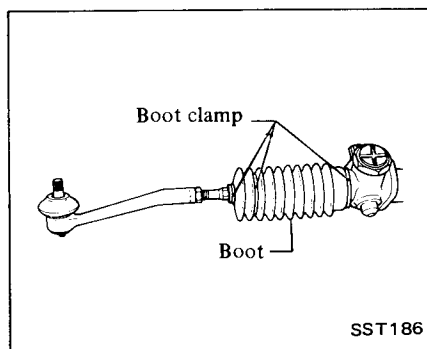
23 - 26 N-m
(2.3 - 2.7 kg-m,
17 - 20 ft-lb)

Check wheel alignment, and if necessary adjust.

Refer to Section MA.

DISASSEMBLY

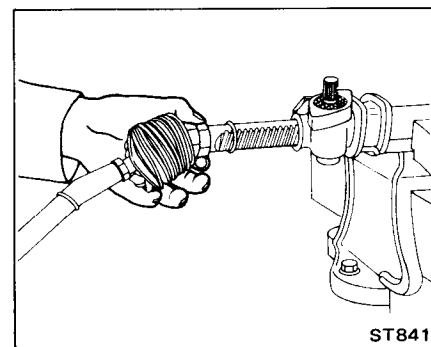
1. Clamp steering gear and linkage assembly in a vise using patches on steering gear housing to prevent scarring.
2. Remove boot clamps from steering gear boots. (Both left and right)



3. Loosen inner joint lock nut.
4. Remove side rod assembly from rack.

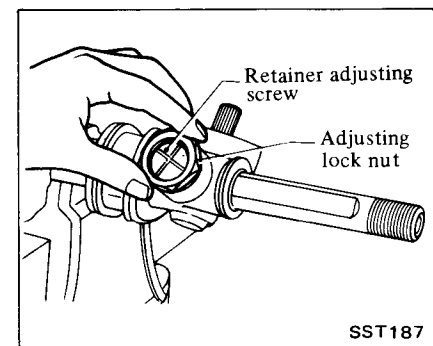
CAUTION:

Do not disassemble inner joint assembly and side rod socket assembly.



5. Loosen adjust lock nut and remove retainer adjust screw.

Then take retainer spring and steering gear retainer out.



6. Remove oil seal from gear housing.

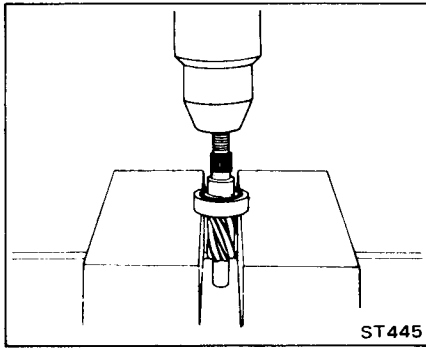
Oil seal must not be reused.

7. Pry off snap ring from gear housing.
8. Draw steering pinion assembly out.
9. Draw rack out from gear housing.

Pinion gear

1. Pry off snap ring securing pinion bearing from the side of bearing.

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 worn, replace.

Fractures, hollows, or roughness in surfaces of rack indicate unserviceability.

Pinion

Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace.

Side 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.

Side rod outer ball joint:

Swinging torque:

0.3 - 4.9 N·m
(3 - 50 kg-cm,
2.6 - 43.4 in-lb)

2. Check condition of dust cover. If it is cracked excessively, replace ball joint.

Side rod inner ball joint

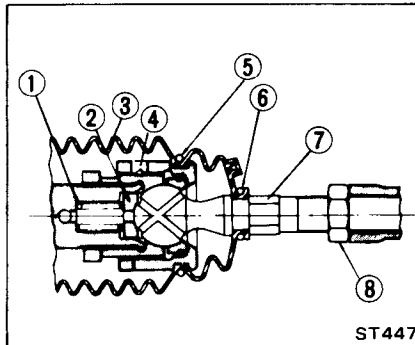
Ball joint is assembled at factory and cannot be disassembled.

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.

Side rod inner ball joint:

Swinging torque:

0 - 4.9 N·m
(0 - 50 kg-cm,
0 - 43 in-lb)



- | | |
|-------------------|--------------------|
| 1 Side rod spring | 5 Dust cover clamp |
| 2 Spring seat | 6 Boot clamp |
| 3 Boot | 7 Side rod ball |
| 4 Welded | 8 Stopper nut |

2. Check condition of boot. If it is cracked excessively, replace it.

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

Replace oil seal every disassembly even if it appears serviceable.

ASSEMBLY AND ADJUSTMENT

Assemble steering gear in reverse order of disassembly. Observe following instructions.

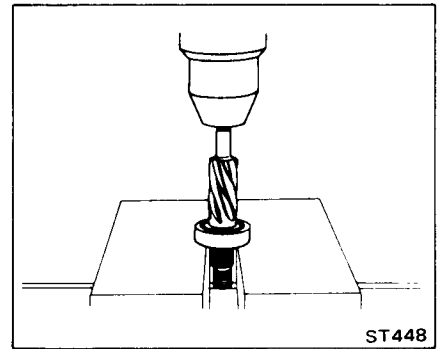
Rack and pinion

1. Install inner snap ring ② onto pinion gear.

Inner snap ring thickness:

1.19 - 1.24 mm
(0.0469 - 0.0488 in)

2. Press bearing onto pinion gear.



3. Install outer snap ring ①.

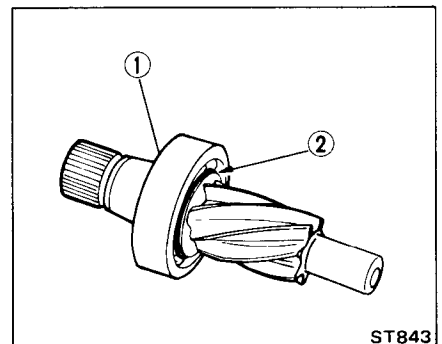
Snap ring ① should be of such thickness that axial play is less than 0.1 mm (0.004 in).

To ensure proper axial play, select snap ring of proper thickness.

Pinion bearing inner snap ring:

Refer to Service Data and Specifications.

Snap rings should be fitted to grooves correctly.

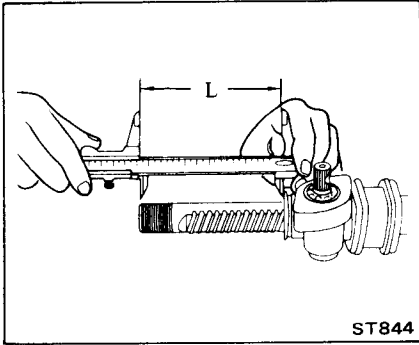


4. Clamp steering gear housing in a vise.
5. Sparingly apply recommended multi-purpose grease to toothed faces and friction surfaces of rack.
6. Insert rack gear from gear housing side.

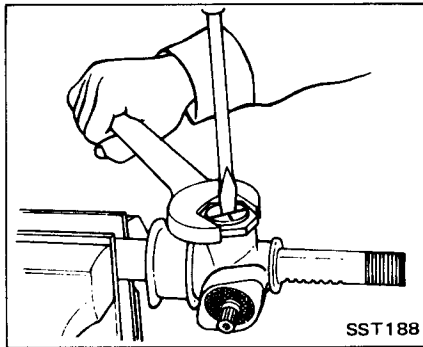
Pay attention to direction of rack teeth.

7. Properly mesh pinion with rack, and insert pinion assembly into groove in pinion serration part facing upward.
8. Make sure that rack protrudes by the same amount from both ends of housing.

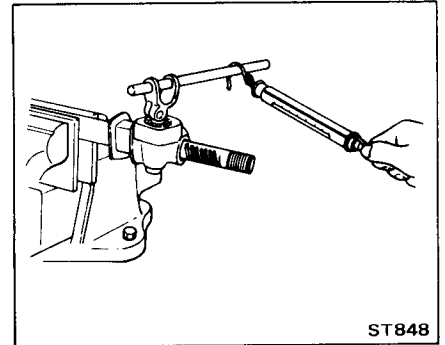
Standard length "L" (both sides)
L : 89.4 mm (3.520 in)



Ⓘ : 39 - 59 N·m
(4 - 6 kg-m,
29 - 43 ft-lb)



Both parts should move smoothly
over their entire travel.

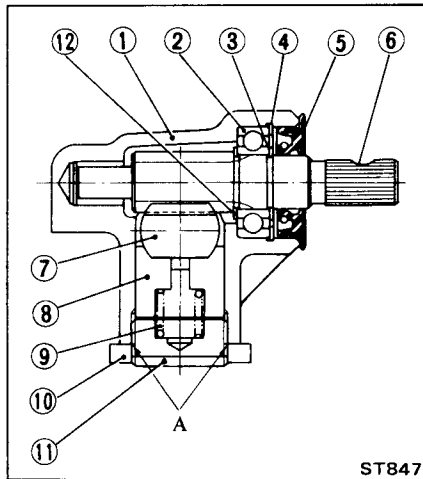
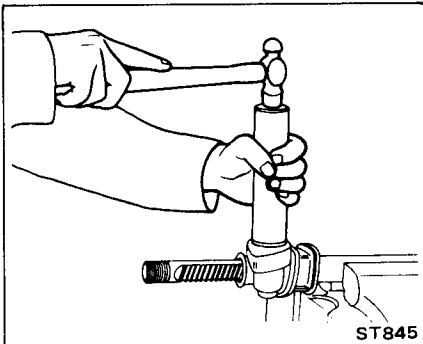


9. Secure pinion bearing to gear housing with snap ring.

Snap ring should be of such thickness that axial play is less than 0.1 mm (0.004 in).

Pinion bearing outer snap ring:
Refer to Service Data and Specifications.

10. Fit grease seal.



- 1 Steering gear housing
- 2 Steering pinion bearing
- 3 Snap ring
- 4 Pinion bearing outer snap ring
- 5 Oil seal
- 6 Steering gear pinion
- 7 Steering rack gear
- 8 Steering gear retainer
- 9 Retainer spring
- 10 Lock nut
- 11 Retainer adjust screw
- 12 Snapping

Side rod and gear boot

1. Fit boot and small clamp on side rod assembly.
2. Thread lock nut and lock nut over the threaded portion of rack.
3. Apply an adequate amount of recommended multi-purpose grease to the sliding surfaces of side rod inner joint and spring seat.
4. Fit side rod assembly to rack end together with inner spring and spring seat.

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 gear retainer and retainer spring into housing. Turn retainer adjusting screw in, and install adjusting lock nut.

14. Fully tighten adjusting screw and then back it off 20 to 25 degrees.

15. Apply suitable liquid sealant around lock nut at "A" and tighten lock nut.

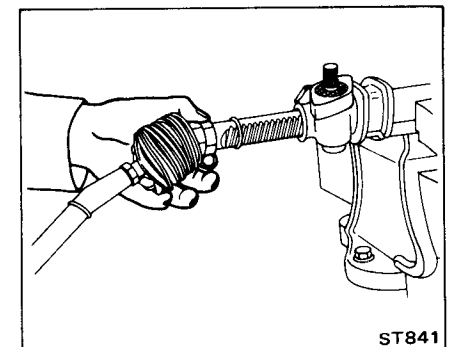
16. Upon completion of gear assembly measure the torque required to keep pinion and rack in motion. Re-adjust retainer adjusting screw as necessary to obtain proper torque.

Pinion (turning torque):

Less than 2.0 N·m
(20 kg-cm, 17 in-lb)

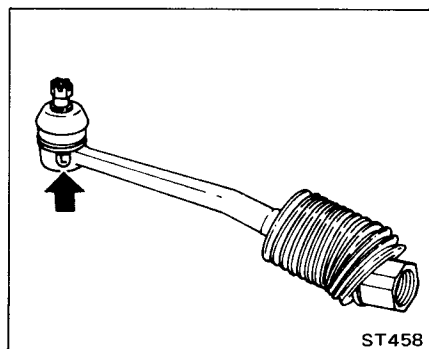
Rack (force to pull at neutral position):

Less than 98 N
(10 kg, 22 lb)

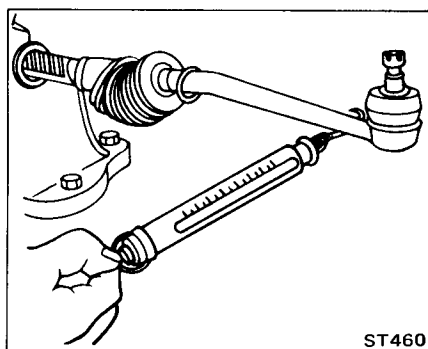


a. Make sure that boot is carefully positioned toward the ball stud end.

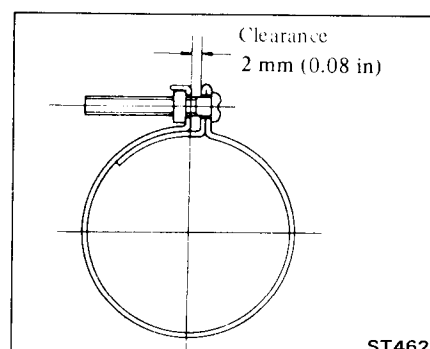
- b. Side rod assembly for the left side has an L-mark. (No mark is used for the right side.)



Axial play:
0 - 0.05 mm
(0 - 0.0020 in)

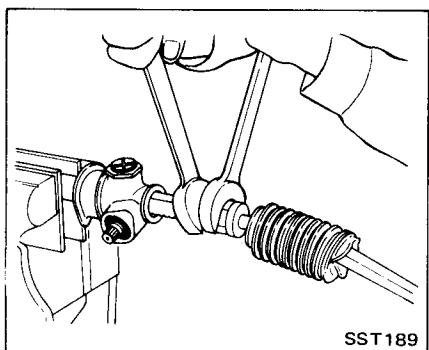


9. Install boot to gear housing, then tighten inside boot clamp securely.



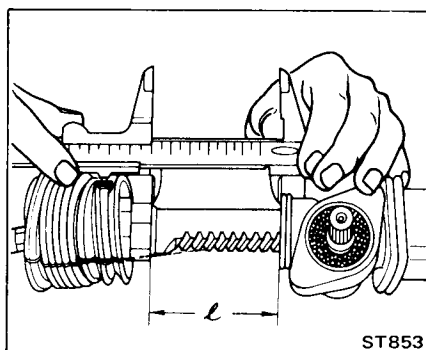
5. Screw inner socket portion until ball seat reaches the rack end, and then tighten lock nut securely.

Ⓙ : 78 - 98 N·m
(8 - 10 kg-m,
58 - 72 ft-lb)



7. Measure rack stroke.

Rack stroke "L" (both sides):
66.4 mm (2.614 in)



Boot should be neither too inflated nor too elongated.

10. Adjust the side rod length both left and right, and tighten steering stopper nuts.

Ⓙ : 78 - 98 N·m
(8 - 10 kg-m,
58 - 72 ft-lb)
Side rod length "L"
29.5 mm (1.161 in)

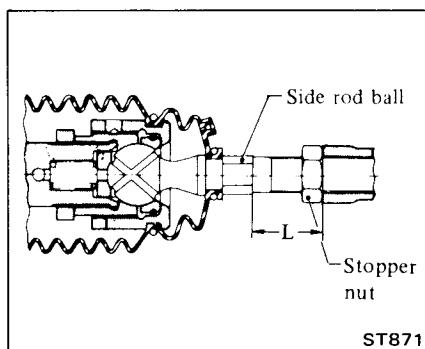
6. Upon completion of side rod assembly, measure swinging torque and axial play of inner ball joint.

Swinging torque:
0 - 4.9 N·m
(0 - 50 kg-cm,
0 - 43 in-lb)

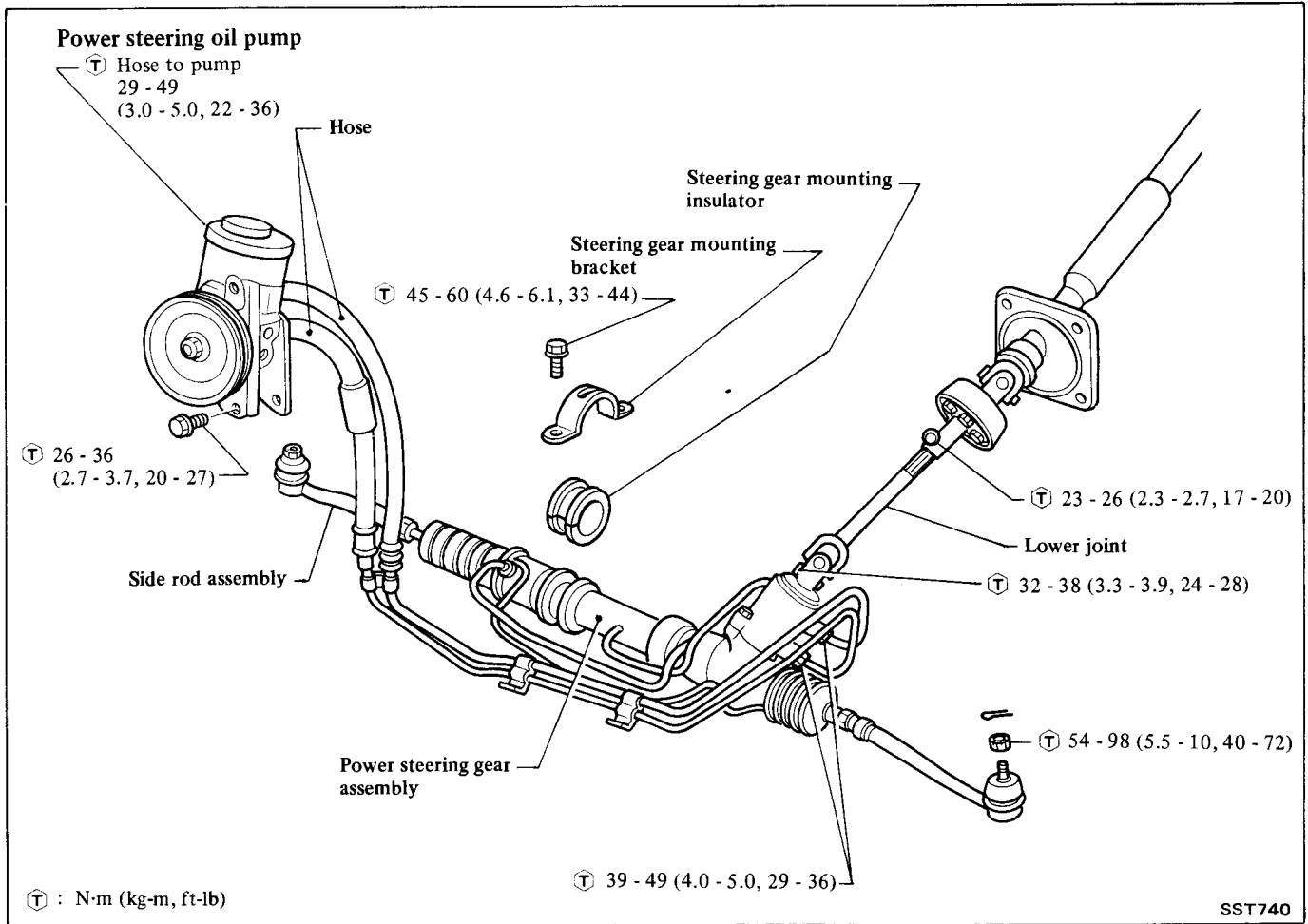
8. Fit large boot clamp at inner socket, install a grease nipple at both ends of rack, and apply recommended multi-purpose grease to each joint.

Lubrication of the rack ends is made so that a small quantity of new grease appears at the boot grease outlet hole.

Do not apply an excessive amount of grease.



POWER STEERING SYSTEM (Model : IPRP15L)



DESCRIPTION

POWER STEERING SYSTEM

The power steering gear is licensed by ZF company in West Germany.

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:

- The parts which can be disassembled are strictly limited, and never disassemble other parts than the specified ones.
- Disassembly of integral power steering gear should be performed in a place as clean as possible.
- Hands should be cleaned before disassembly.
- Do not use a rag. Be sure to use nylon or paper cloth.
- Be sure to follow procedures and cautions indicated in the Service Manual.

POWER STEERING SYSTEM

INSPECTION

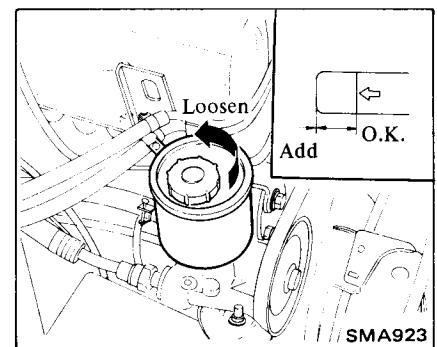
Fluid level

- 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.



- Check fluid level and leakage.

Recommended fluid is Automatic Transmission Fluid "Dexron Type".

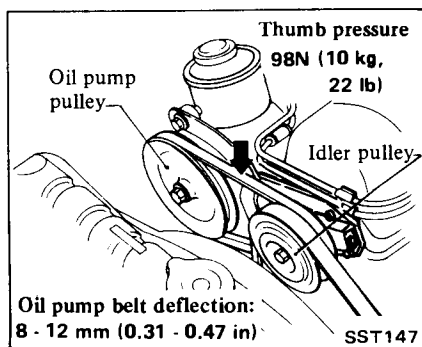
Refer to Section MA for "Recommended Lubricant".

Fluid capacity (With pump, each hose and steering gear assembly):

Approximately: 1.1 ℓ
(1 - 1/8 US qt, 1 Imp qt)

Pump belt adjustment

Adjust power steering oil pump 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
- 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.

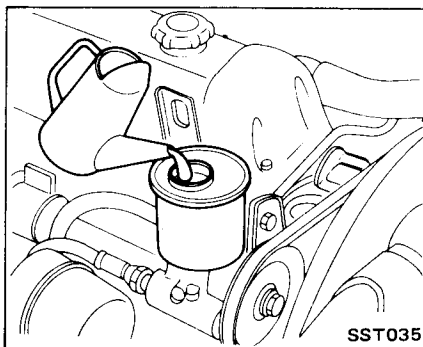
Hydraulic system check

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.



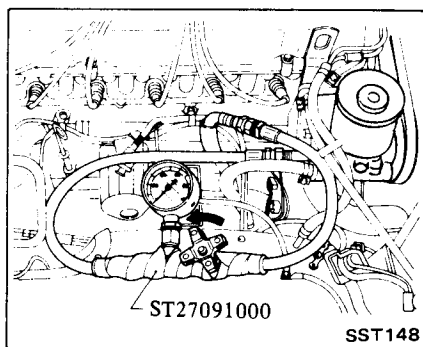
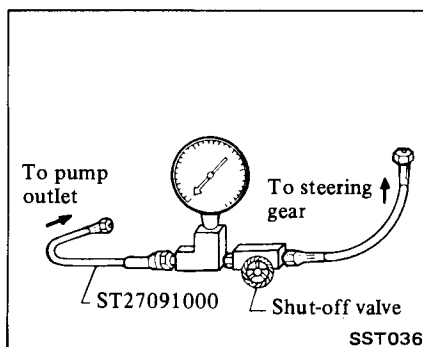
2. Run engine.

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.



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:

6,571 - 7,748 kPa

(67 - 79 kg/cm², 953 - 1,123 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:

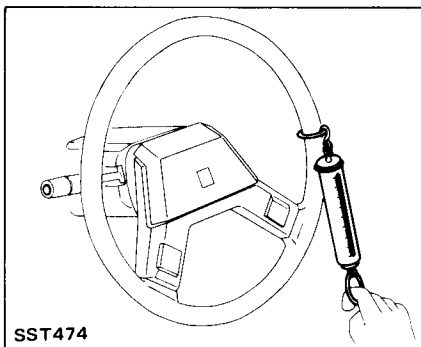
The power steering system consists primarily of an accurate hydraulic pressure unit.

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.

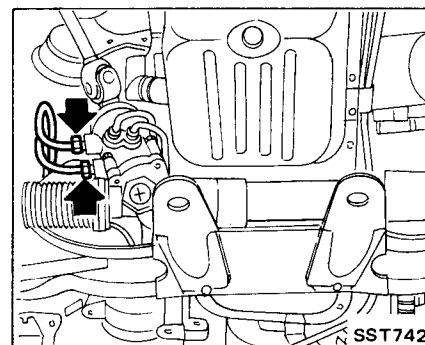
15. Repeat steps 10 through 14 above until oil pressure is normal.

After checking hydraulic system, remove Tool and add fluid as necessary, then completely bleed air out of system.

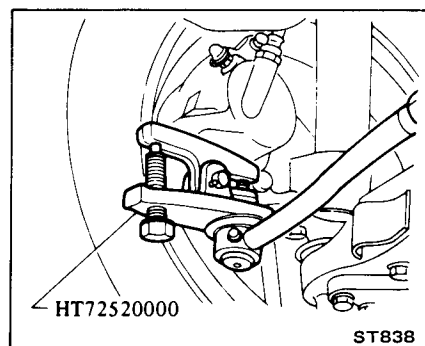


3. Disconnect flare nut at steering gear and drain fluid.

Be careful not to damage flare nut.



4. Remove cotter pins and nuts fastening side rod ball studs, and detach side rod ball studs from knuckle arms with Tool.



Steering wheel turning force check

1. Park car 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 car 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:
Less than 24.5 - 29.4 N (2.5 - 3.0 kg, 5.5 - 6.6 lb)

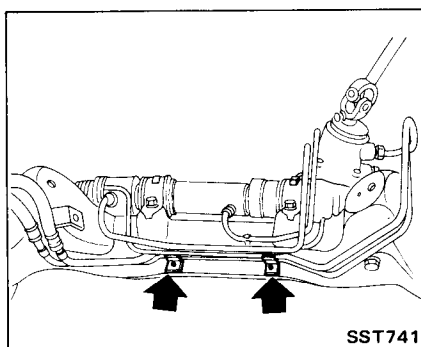
REMOVAL

Power steering gear and linkage

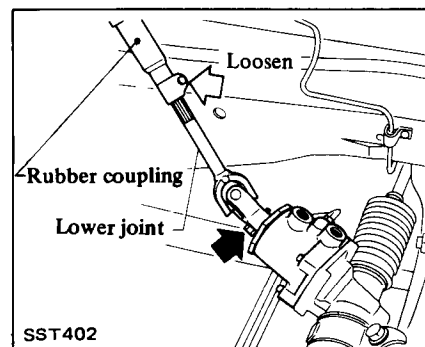
CAUTION

- 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.

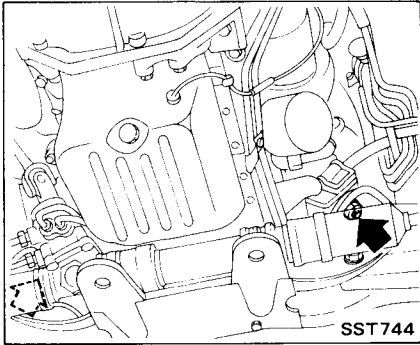
1. Jack up front of car and support it with safety stand.
2. Disconnect hose clamp fixing bolt.



5. Loosen bolt securing lower joint to rubber coupling. Disconnect bolt securing lower joint to pinion gear. And then draw out lower joint from pinion gear.

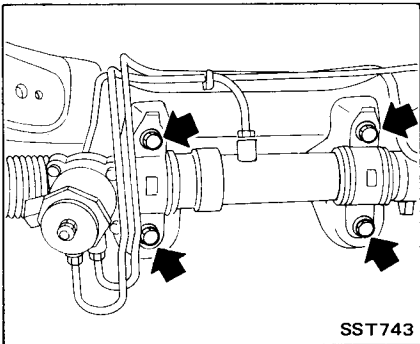


6. Remove nuts that secure front engine mounting insulator to front suspension crossmember.

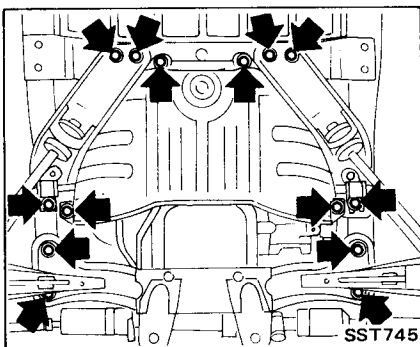


7. Refer to the ER section and remove engine hood. Lift engine until front engine mounting insulator is slightly away from front suspension crossmember.

8. Loosen (not remove) steering gear mounting bolts.



9. Lightly support front suspension crossmember with a garage jack, remove bolts and then lower jack.



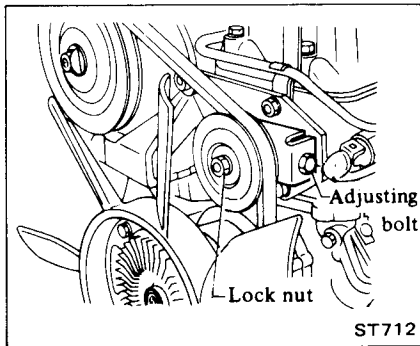
10. Remove bolt securing steering gear housing to suspension crossmember. And then remove steering gear and linkage assembly from car.

Oil pump

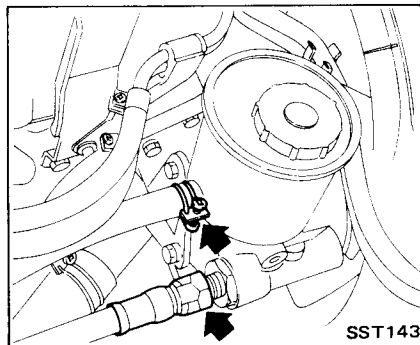
CAUTION:

Whenever disconnecting hydraulic lines, cover openings to prevent foreign matter from entering.

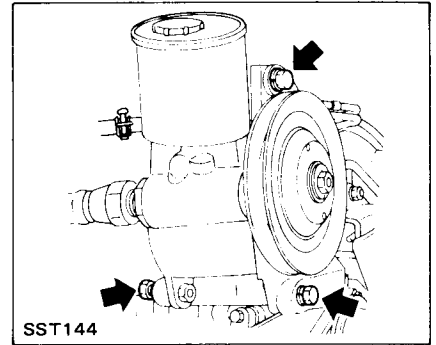
1. Loosen power steering pump pulley lock nut.
2. Turn adjusting bolt counterclockwise to loosen pump belt.



3. Remove power steering pump belt.
4. Disconnect pressure hose flare nut at power steering pump, and drain fluid. Then remove return hose clamp.

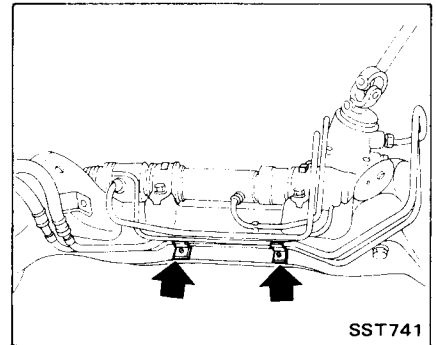


5. Remove power steering pump assembly.

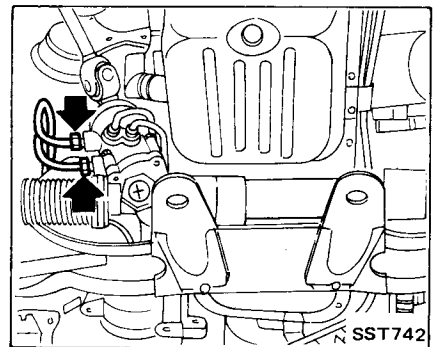


Hose

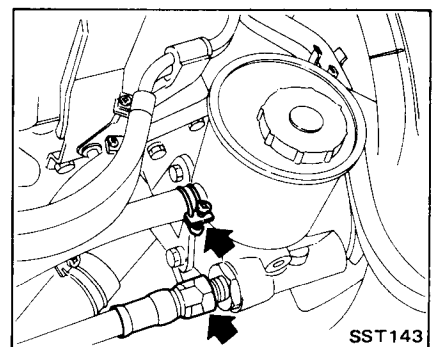
1. Remove bolts.



2. Disconnect flare nut at steering gear and drain fluid.



3. Disconnect hose from oil pump and remove it from car.

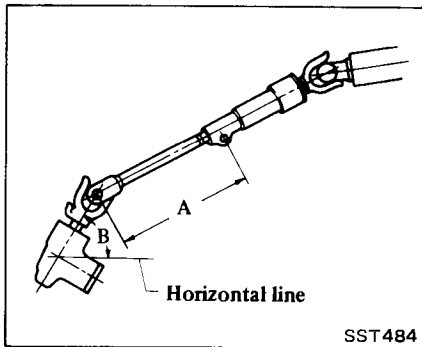


INSTALLATION AND ADJUSTMENT

Power steering gear and linkage

Install steering gear and linkage in the reverse order of removal.

Install lower joint on steering gear as shown, and then tighten steering gear mounting bolts.



"A" dimension:
197.3 mm (7.77 in)
"B" angle: 57.07°

Ⓣ : Side rod to knuckle arm
54 - 98 N·m
(5.5 - 10 kg·m,
40 - 72 ft·lb)

Gear housing clamp bolt
45 - 60 N·m
(4.6 - 6.1 kg·m,
33 - 44 ft·lb)

Lower joint to pinion gear
32 - 38 N·m
(3.3 - 3.9 kg·m,
24 - 28 ft·lb)

Lower joint to rubber coupling
23 - 26 N·m
(2.3 - 2.7 kg·m,
17 - 20 ft·lb)

Front suspension crossmember to body
69 - 88 N·m
(7.0 - 9.0 kg·m,
51 - 65 ft·lb)

Tension rod bracket to body
31 - 42 N·m
(3.2 - 4.3 kg·m,
23 - 31 ft·lb)

Front suspension crossmember to front engine mounting insulator
31 - 42 N·m
(3.2 - 4.3 kg·m,
23 - 31 ft·lb)

Hose to power steering gear
39 - 49 N·m
(4.0 - 5.0 kg·m,
29 - 36 ft·lb)

Check wheel alignment, and if necessary adjust.

Refer to Section MA.

After installation is completed, fill fluid and bleed system.

Oil pump

Install power steering pump and hoses in the reverse order of removal.

Ⓣ : Pressure hose to pump
29 - 49 N·m
(3.0 - 5.0 kg·m,
22 - 36 ft·lb)

Pump mounting bolt
26 - 36 N·m
(2.7 - 3.7 kg·m,
20 - 27 ft·lb)

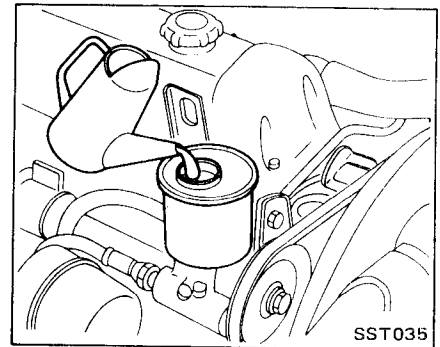
After installation is completed, fill fluid and bleed system.

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.



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:

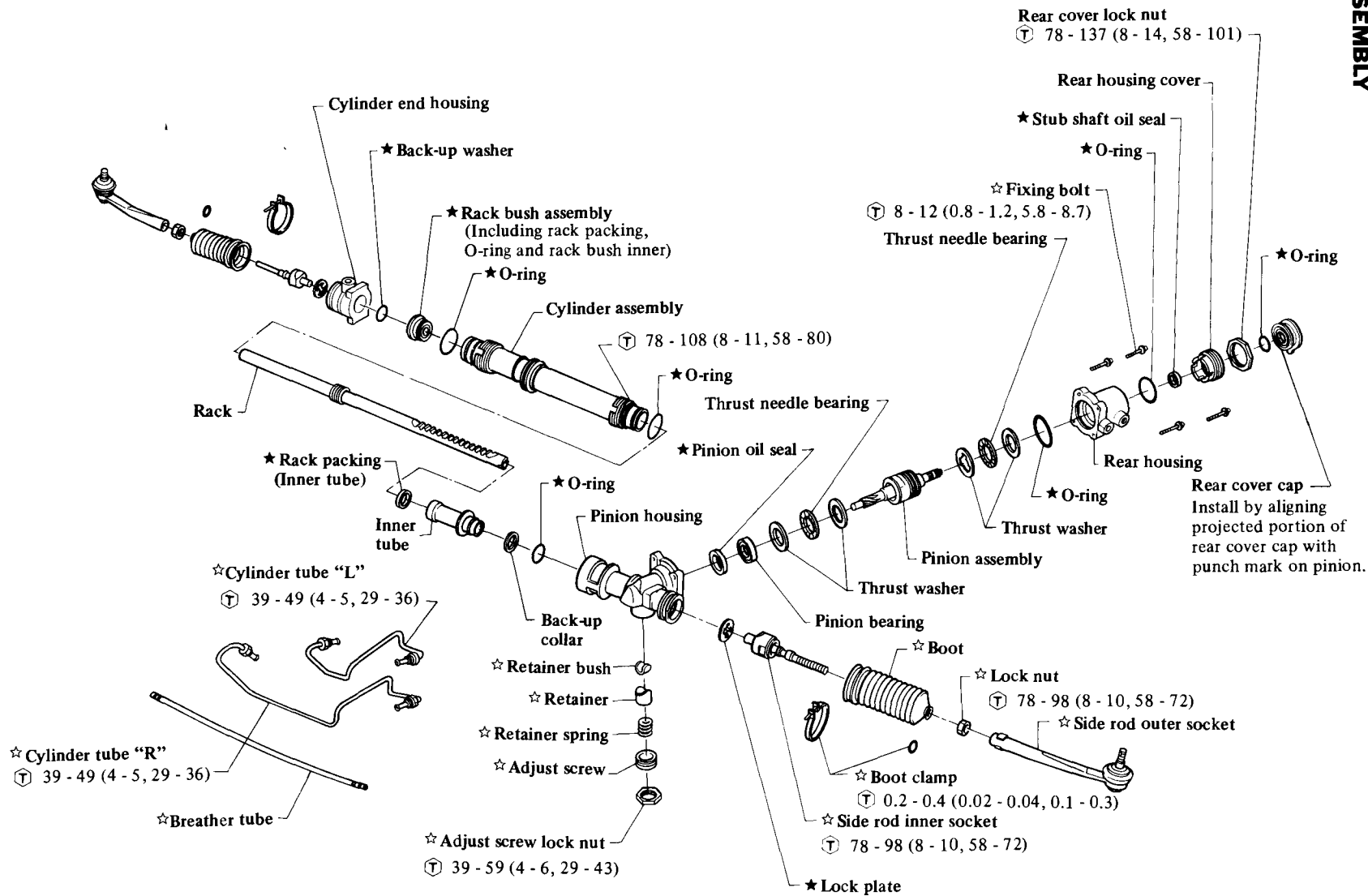
Turn steering wheel to right and left from lock to lock five to ten times. Carefully check fluid leakage with steering wheel held at each lock position for five seconds.

CAUTION:

Do not hold steering wheel at lock position for more than fifteen seconds at a time.

POWER STEERING GEAR AND LINKAGE

DISASSEMBLY



(T) : N·m (kg-m, ft-lb)

★ or ☆ : are available for service replacement.

★ : always replace when disassembled.

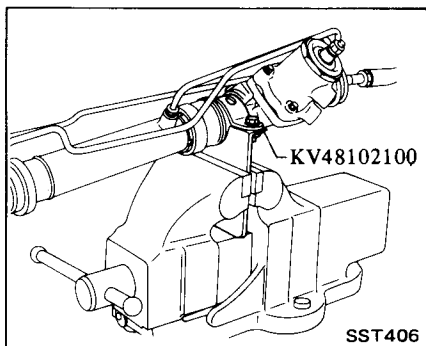
CAUTION:

When disassembling and reassembling, do not allow any foreign matter to enter or contact parts.

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.

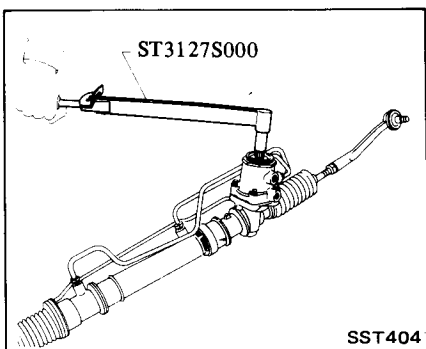
Install steering gear on Tool KV48102100 in a vice.



Before measuring, be sure to disconnect cylinder tube and drain fluid.

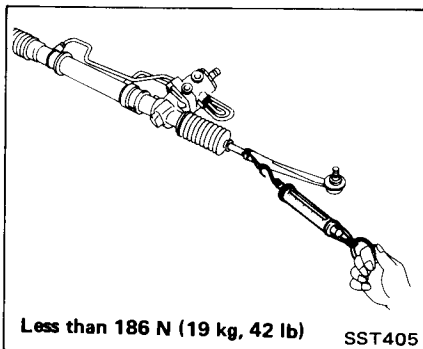
a. Pinion rotating torque

Less than 0.9 N·m
(9 kg-cm, 7.8 in-lb) on average and
less than 1.5 N·m (15 kg-cm,
13 in-lb) at maximum.



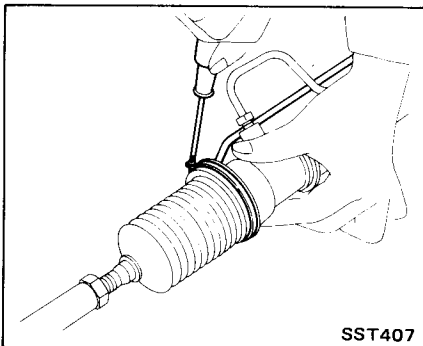
- Stub shaft can be turned by wrapping vinyl tape around serration area of stub shaft and fitting socket wrench.

b. Rack starting force



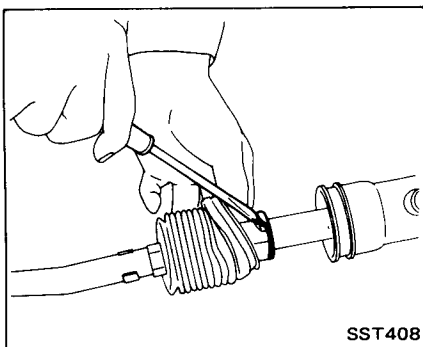
Side rod and breather tube

1. Install steering gear on Tool KV48102100 in a vice.
2. Remove boot clamp and then remove breather tube. (Both left and right)



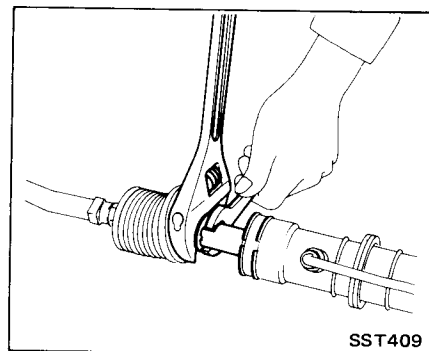
3. Flatten lock plate.

Always replace lock plate when disassembled.

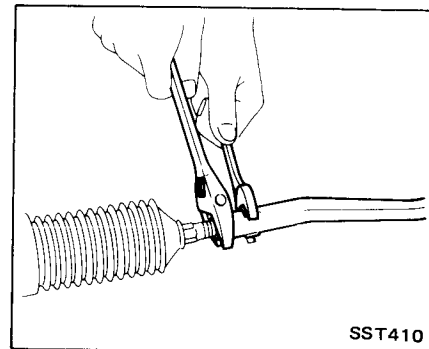


4. Disconnect side rod inner socket and remove side rod assembly from steering gear assembly.

Use a wrench of approximately 6 mm (0.24 in) in thickness which can be placed in the thickness across the flats of the rack.



5. Remove side rod inner socket from side rod outer socket.

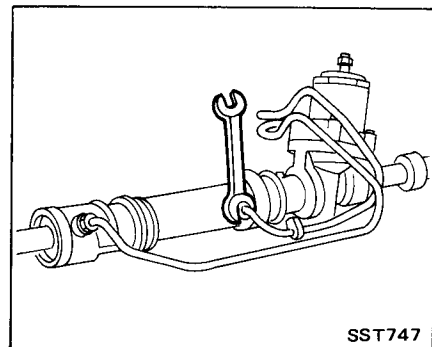


CAUTION:

Do not disassemble inner socket assembly and outer socket assembly.

Cylinder tubes

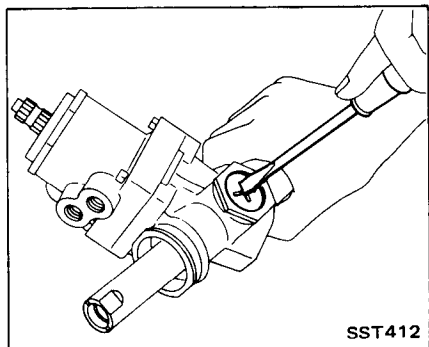
1. Install steering gear on Tool KV48102100 in a vice.
2. On cylinder tube "L", first disconnect flare nut at cylinder side and then the other one at pinion housing side.



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.

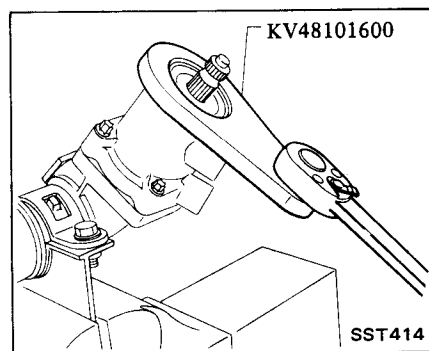


Stub shaft oil seal

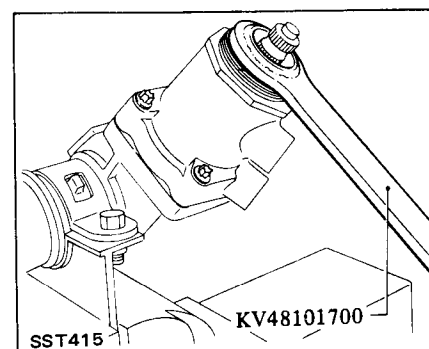
1. Install steering gear on Tool KV48102100 in a vice.
2. Remove retainer.

Refer to Retainer for disassembly.

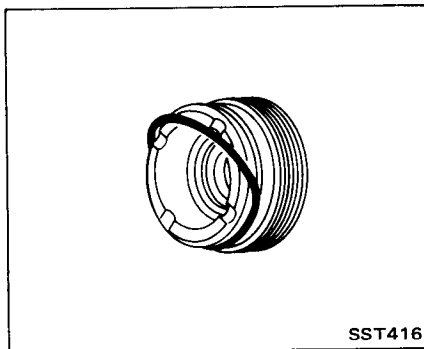
3. Remove rear cover cap and loosen rear cover lock nut two or three pitches using Tool.



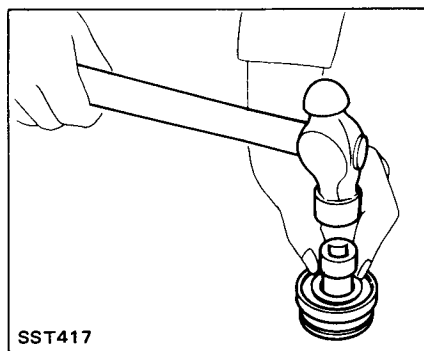
4. Remove rear housing cover using Tool.



5. Remove rear cover O-ring and discard.

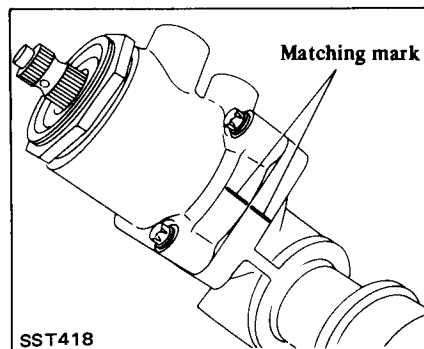


6. Remove stub shaft oil seal using suitable tool and discard.



Pinion oil seal

1. Install steering gear on Tool KV48102100 in a vice.
2. Before disassembling, put matching marks on rear housing and pinion housing.



3. Remove cylinder tubes.

Refer to Cylinder Tubes for disassembly.

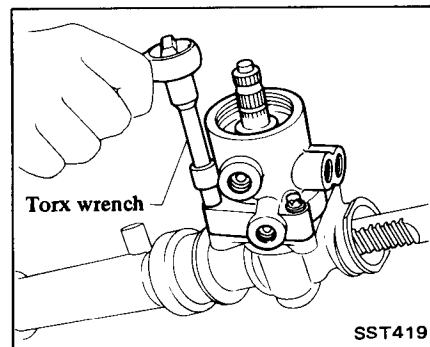
4. Remove retainer.

Refer to Retainer for disassembly.

5. Remove rear cover.

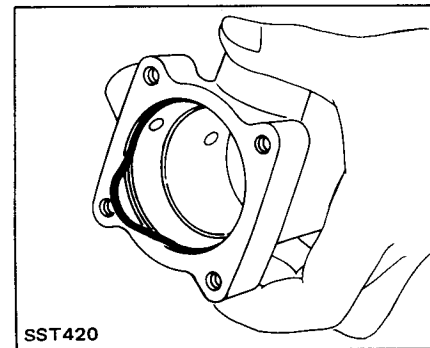
Refer to Stub Shaft Oil Seal for disassembly.

6. Disconnect rear housing fixing bolts using torx wrench.

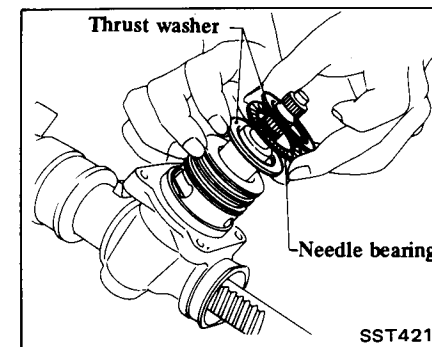


7. Remove rear housing and then remove O-ring.

Always replace O-ring when disassembled.

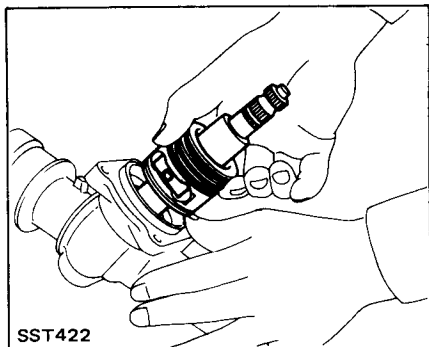


8. Remove two thrust washers and needle bearing from upper surface of pinion.



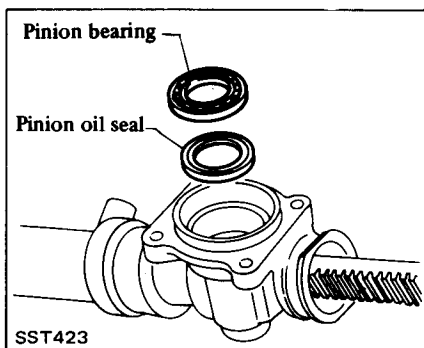
9. Remove pinion assembly and then remove thrust washers and needle bearing.

- a. Do not hammer pinion assembly nor damage its teflon seal.
- b. Do not attempt to disassemble pinion assembly.



10. Remove pinion bearing and pinion oil seal using suitable tool.

Always replace oil seal when disassembled.



Rack bush assembly (Cylinder end housing)

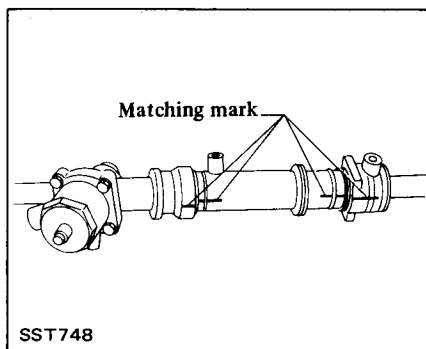
1. Install steering gear on Tool KV48102100 in a vice.
2. Remove side rod and breather tube.

Refer to Side Rod and Breather Tube for disassembly.

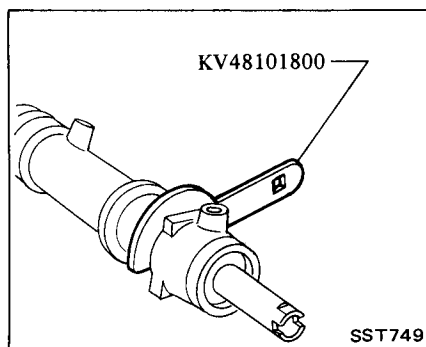
3. Remove cylinder tubes.

Refer to Cylinder Tubes for disassembly.

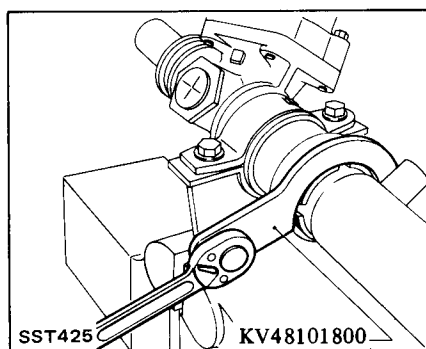
4. Put matching mark.



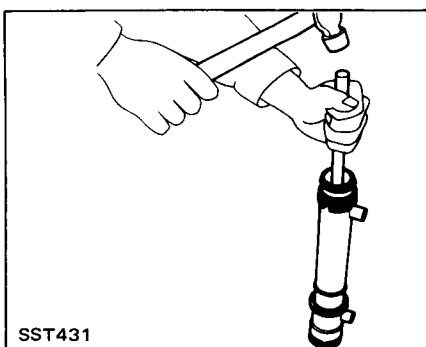
5. Remove cylinder end housing using Tool.



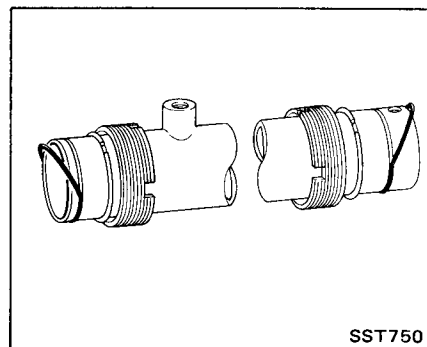
6. Disconnect cylinder lock nut using Tool and separate cylinder from pinion housing.



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 side rod and breather tube.

Refer to Side Rod and Breather Tube for disassembly.

3. Remove cylinder tubes.

Refer to Cylinder Tubes for disassembly.

4. Remove retainer.

Refer to Retainer for disassembly.

5. Remove cylinder end cover and cylinder assembly.

Refer to Rack Bush Assembly (Cylinder End Housing) for disassembly.

6. Remove pinion assembly.

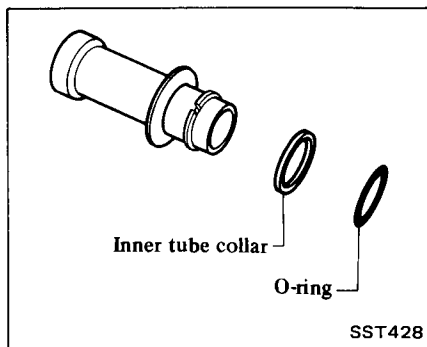
Refer to Stub Shaft Oil Seal for disassembly.

7. Draw out rack from pinion housing.

8. Remove inner tube assembly from pinion housing.

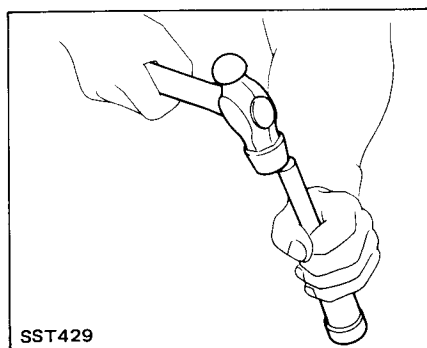
9. Remove O-ring and inner tube collar from inner tube.

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.

Side 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.

Side 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.

Side 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.

Side rod inner ball joint:

Swinging torque

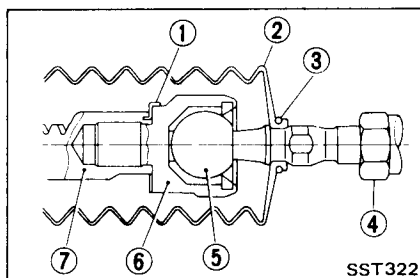
0.1 - 7.8 N·m

(1 - 80 kg-cm,

0.9 - 69.4 in-lb)

Axial play

0 mm (0 in)



1 Lock plate

2 Boot

3 Boot clamp

4 Lock nut

5 Inner ball joint

6 Inner socket

7 Rack

2. Check condition of boot. If it is cracked excessively, replace it.

Cylinder tubes and breather tube

Check cylinder tubes and breather tube 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:

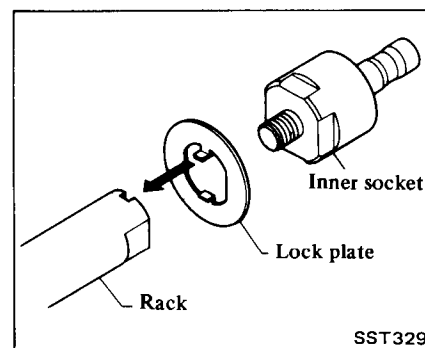
- When assembling power steering gear, apply a coat of automatic transmission fluid "Dexron Type" as necessary.
- Be careful not to damage or deform O-rings and oil seals when installing them.

Assemble power steering gear and linkage in reverse order of disassembly. Observe the following instructions.

Side rod and breather tube

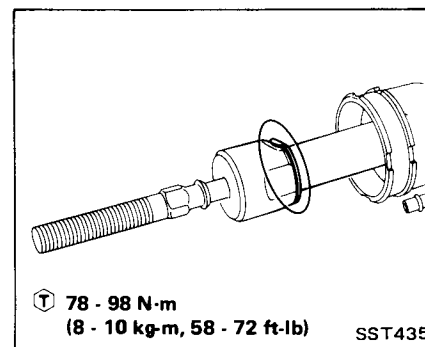
1. Apply locking agent to threaded portion of inner socket and fit inner socket to rack end together with new lock plate.

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.

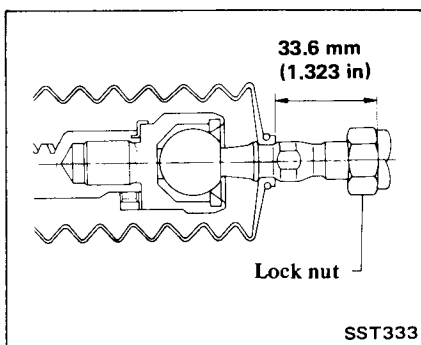
To prevent damage to boot, remove burrs after bending lock plate.



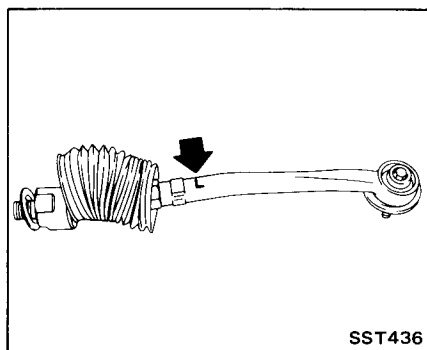
78 - 98 N·m
(8 - 10 kg-m, 58 - 72 ft-lb)

3. Screw in side rod outer socket until the distance shown in the figure below is reached. Then tighten lock nut.

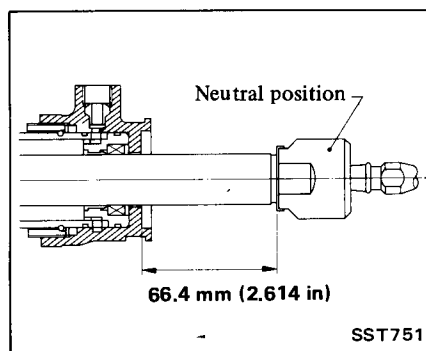
Ⓙ : 78 - 98 N·m
(8 - 10 kg-m, 58 - 72 ft-lb)



Side rod outer socket for the left side has an L-mark. (R-mark is used for the right side.)

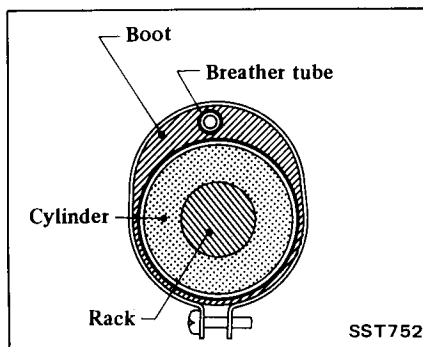


4. Measure rack stroke (both sides).



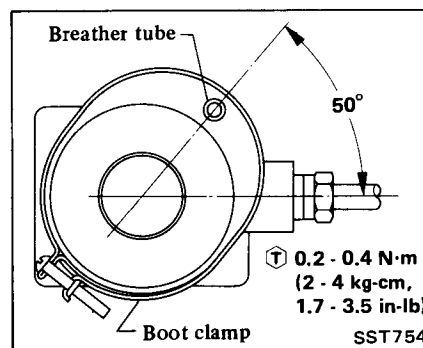
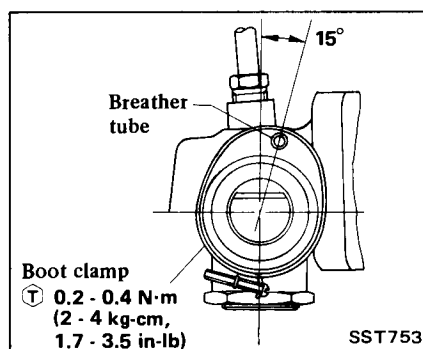
5. Apply a coat of sealant to contact surfaces between boot and cylinder and breather tube before installing boot.

Do not block through hole in breather tube with sealant.



6. Set breather tube as shown below, and tighten boot clamp.

Locate clamp bolt in its place opposite to breather tube.

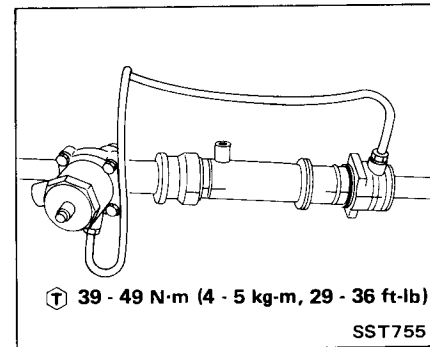


7. Upon completion of assembly, make sure that rack operates smoothly, that boot is not deformed, and that clamp is tightly in place.

Cylinder tubes

1. On cylinder tube "R", temporarily tighten flare nut at rear housing side and then the other one at cylinder side. Finally tighten these nuts to specified torque.

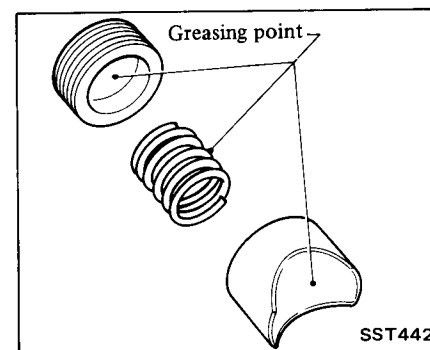
Be careful not to damage flare nut.



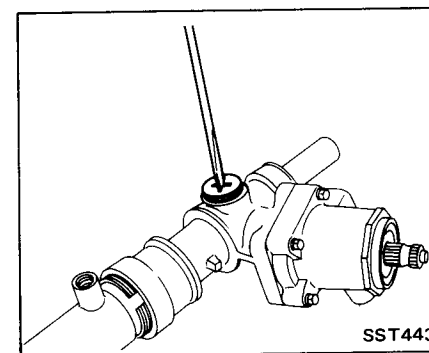
2. Install and tighten flare nuts for cylinder tube "L" in the same way.

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.



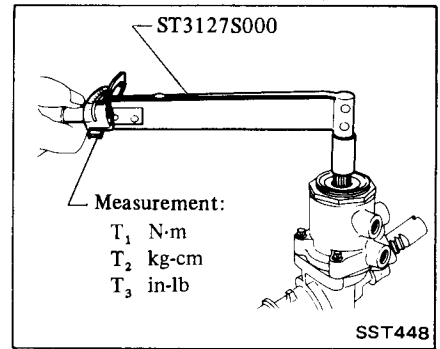
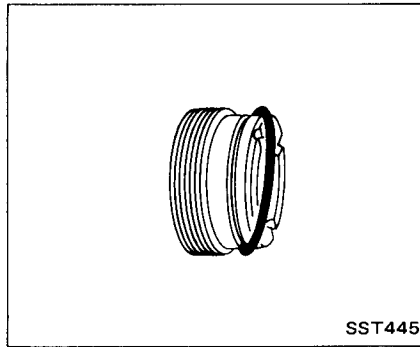
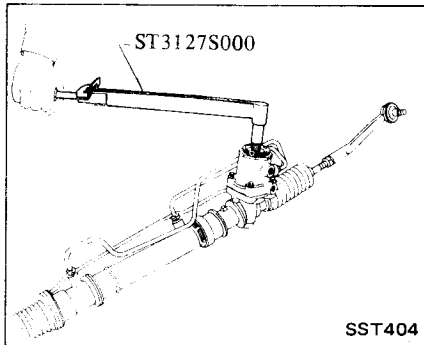
3. Turn back adjust screw 20 to 25° and tighten lock nut.

Ⓙ : 39 - 59 N·m
(4 - 6 kg-m,
29 - 43 ft-lb)

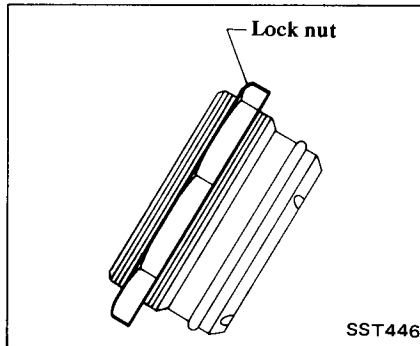
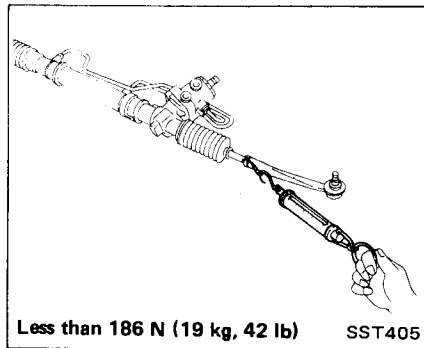
4. Measure pinion rotating torque and rack starting force. If they are not within specifications, readjust.

a. Pinion rotating torque

Less than 0.9 N·m (9 kg-cm,
7.8 in-lb) on average and
less than 1.5 N·m (15 kg-cm,
13 in-lb) at maximum



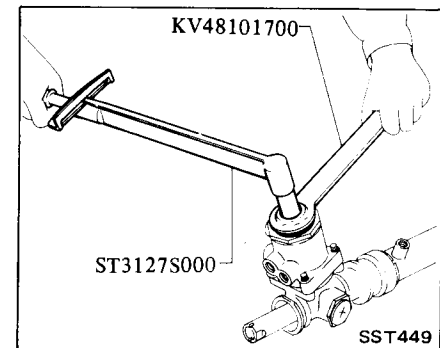
b. Rack starting force



6. Tighten rear housing cover until pinion rotating torque is within specified range, using Tool.

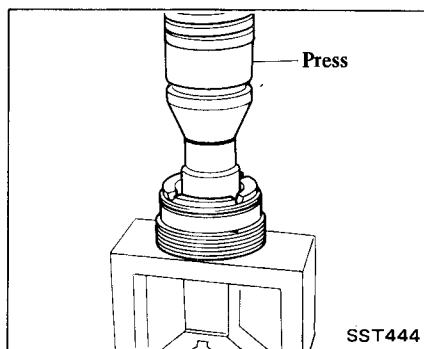
Ⓙ : Stub shaft preload

$T_1 + 0.15$ to 0.25 N·m
($T_2 + 1.5$ to 2.5 kg-cm,
 $T_3 + 1.3$ to 2.2 in-lb)

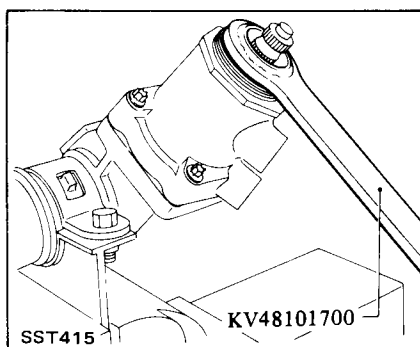


Stub shaft oil seal

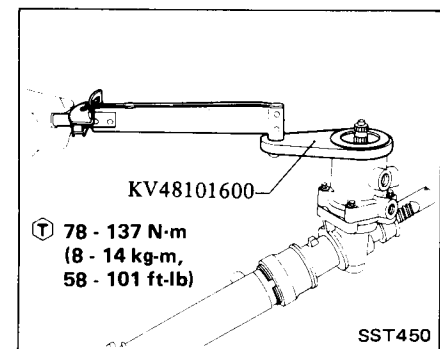
1. Apply a coat of automatic transmission fluid to new stub shaft oil seal and press it into rear housing cover using a suitable tool.



4. Completely tighten rear housing cover assembly to pinion housing and then turn back one pitch from that position.



7. Tighten rear cover lock nut using Tool.



2. Apply a coat of automatic transmission fluid to new O-ring before installing it.

5. Turn stub shaft all the way to right and left several times. Measure pinion rotating torque (pinion bearing friction).

8. Remeasure pinion rotating torque. If it is not within specifications, re-adjust.

Ⓙ : Less than 0.9 N·m
(9 kg-cm, 7.8 in-lb)

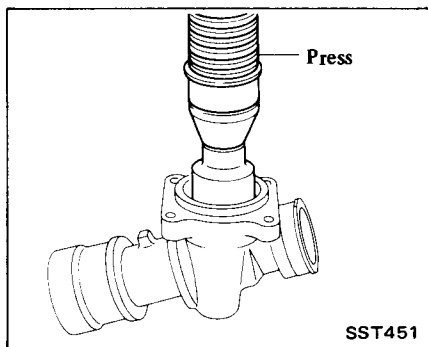
9. Install retainer and adjust pinion rotating torque.

Refer to Retainer for assembly.

Pinion oil seal

1. Press new pinion oil seal into pinion housing, using a suitable tool.

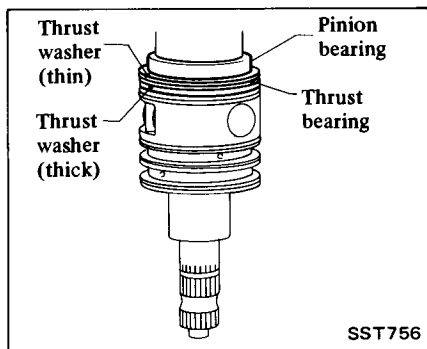
Be sure to apply a coat of automatic transmission fluid to oil seal before installing it.



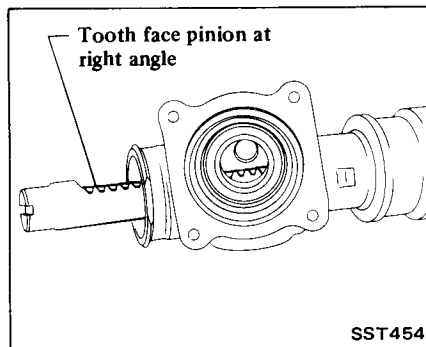
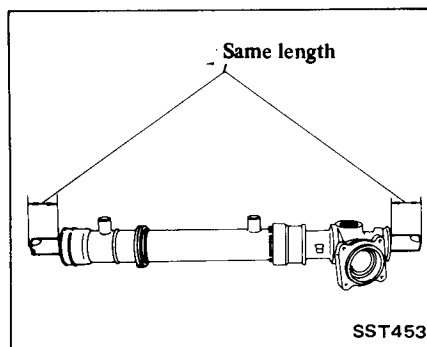
Apply a coat of bearing grease to oil seal lip.

2. Attach two thrust washers and thrust bearing and install pinion bearing.

Apply grease to bearing.

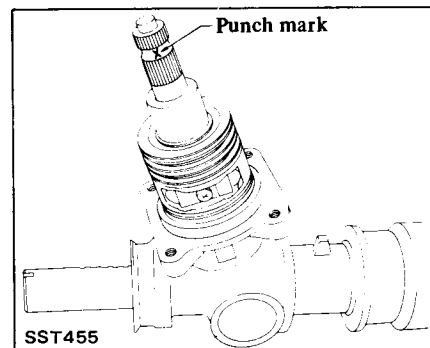


3. Situate rack as shown in figure below.

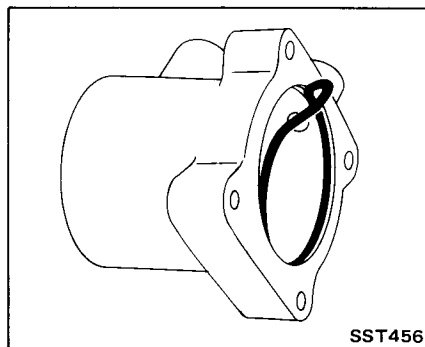


4. Install pinion assembly so that punch mark on pinion stub shaft is located exactly on rear side as it is mounted in car.

- a. Be careful not to damage pinion oil seal.
- b. Do not apply any undue pressure to pinion stub shaft.
- c. Apply a coat of grease to rack and pinion gear.

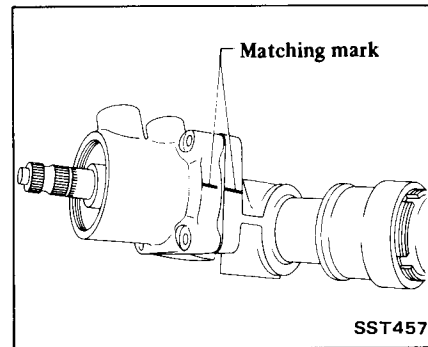


5. Apply a coat of automatic transmission fluid to new O-ring before installing it.

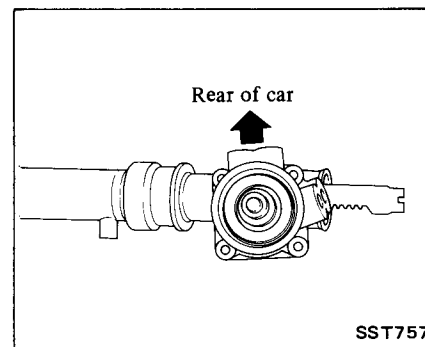


6. Install rear housing by aligning matching marks.

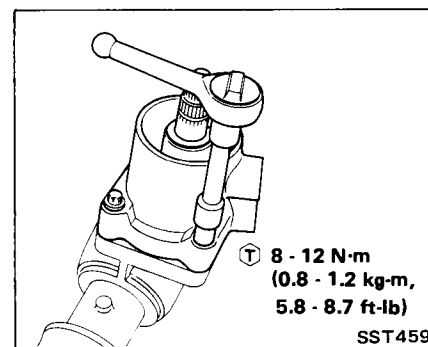
Be careful not to damage pinion teflon ring.



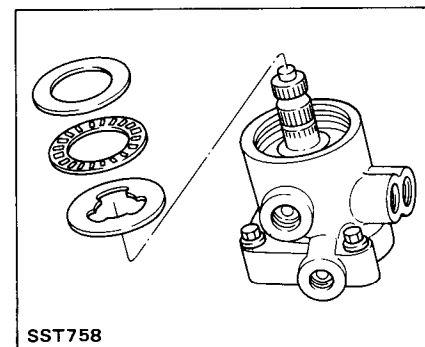
If a matching mark is not present, position cylinder as follows:



7. Tighten rear housing fixing bolts using torx wrench.



8. Properly position thrust washer and needle bearing on pinion's upper surface.



9. Install rear cover.

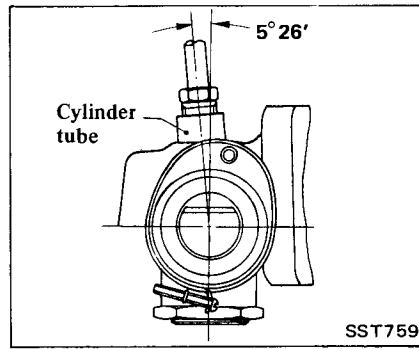
Refer to **Stub Shaft Oil Seal for assembly.**

10. Install retainer and adjust pinion rotating torque.

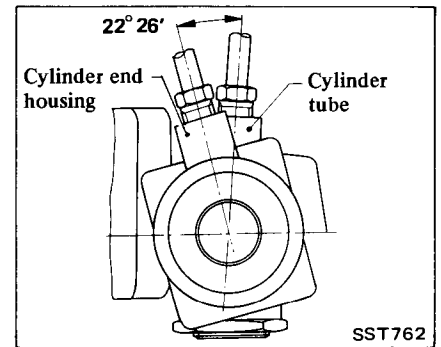
Refer to **Retainer for assembly.**

11. Install cylinder tubes.

Refer to **Cylinder Tubes for assembly.**

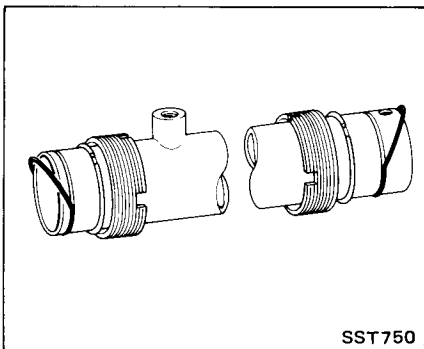


If a matching mark is not present, position cylinder end housing as follows:

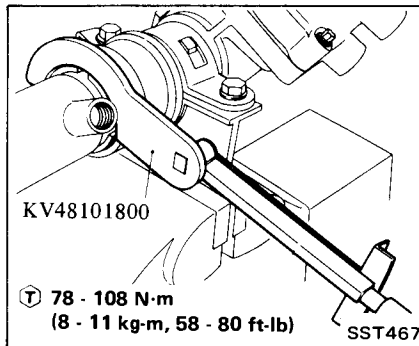


Rack bush assembly (Cylinder and housing)

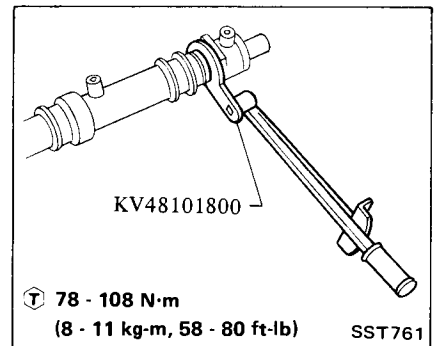
1. Apply a coat of automatic transmission fluid to new O-ring before installing it on cylinder.



3. Tighten cylinder lock nut using Tool.

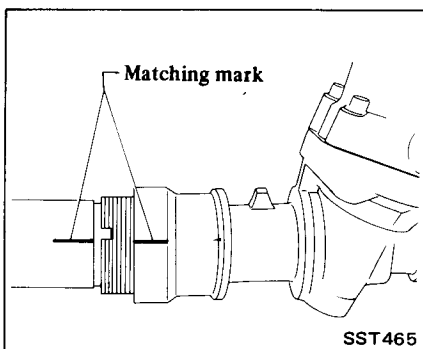


5. Tighten cylinder end housing using Tool.

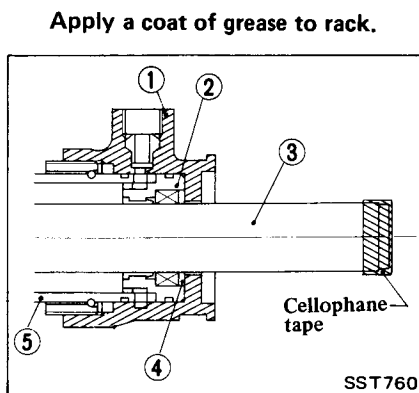


2. Position cylinder on pinion housing by aligning matching marks.

Be careful not to damage piston teflon ring.



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.



- | | |
|------------------------|---------------------|
| 1 Cylinder end housing | 3 Rack |
| 2 Rack bush assembly | 4 Back-up washer |
| | 5 Cylinder assembly |

6. Install cylinder tubes.

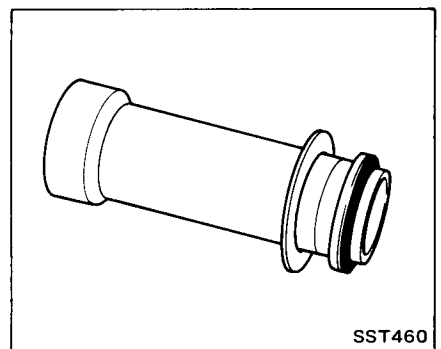
Refer to **Cylinder Tubes for assembly.**

7. Install side rod and breather tube.

Refer to **Side Rod and Breather Tube for assembly.**

Rack packing (Inner tube)

1. Apply a coat of automatic transmission fluid to new O-ring when installing it to inner tube.

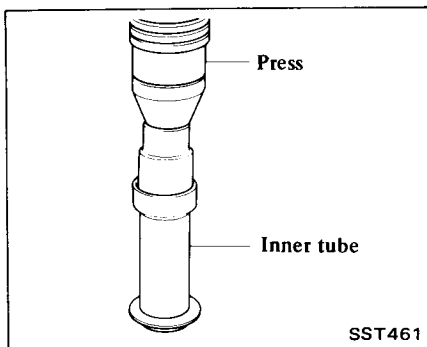


If a matching mark is not present, position cylinder as follows:

2. Attach back-up collar to inner tube and press new rack packing into place, using a suitable tool.

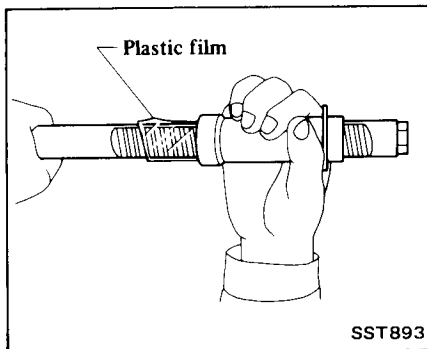
Pressing force:

**Less than 5,884 N
(600 kg, 1,323 lb)**

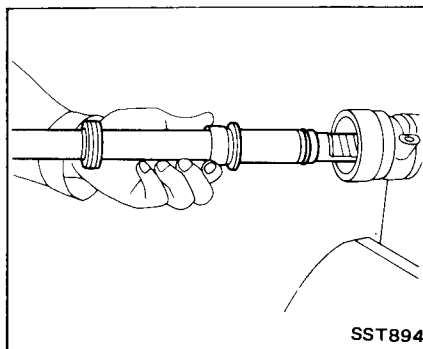


3. Insert inner tube assembly.

- 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 cylinder and rack bush assembly.

Refer to Rack Bush Assembly (Cylinder end housing) for assembly.

6. Install pinion assembly.

Refer to Stub Shaft Oil Seal for assembly.

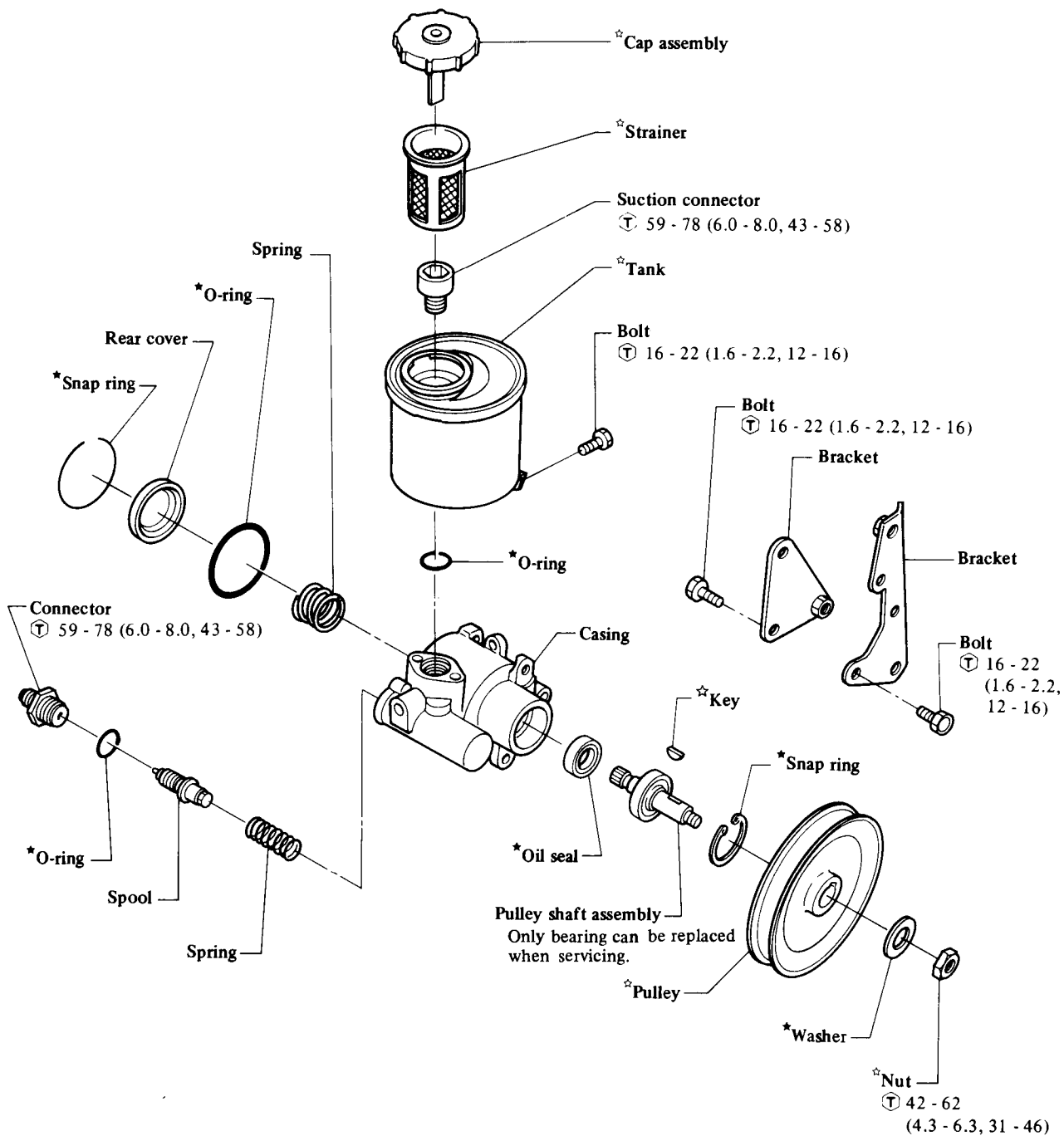
7. Install cylinder tubes.

Refer to cylinder Tubes for assembly.

8. Install side rod and breather tube.

Refer to Side Rod and Breather Tube for assembly.

POWER STEERING OIL PUMP



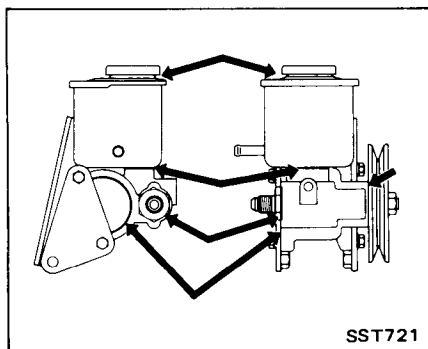
Ⓣ : N·m (kg·m, ft·lb)

☆ or ☆: are available for service replacement.
 ☆: always replace when disassembled.

SST720

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

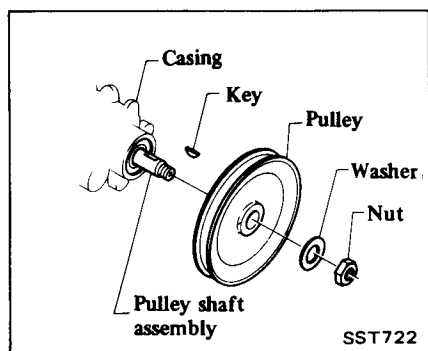
CAUTION:

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

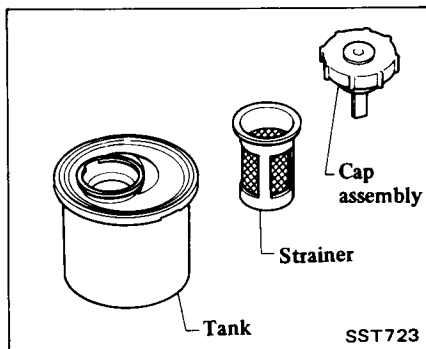
Remove pulley.



Do not reuse washer once it has been removed.

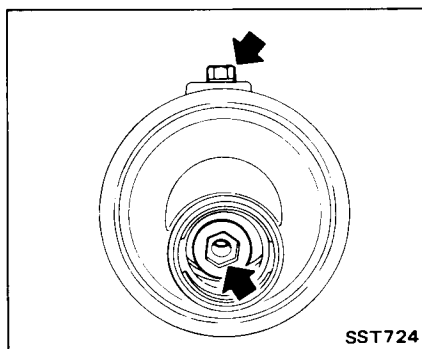
Cap assembly and strainer

Remove cap assembly.

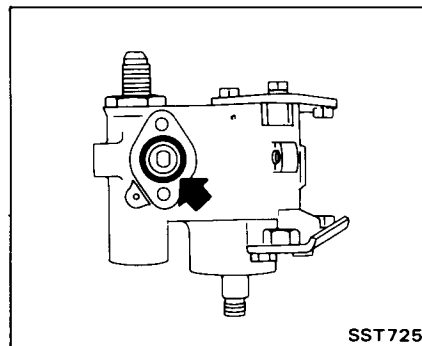


Tank O-ring

1. Remove tank.



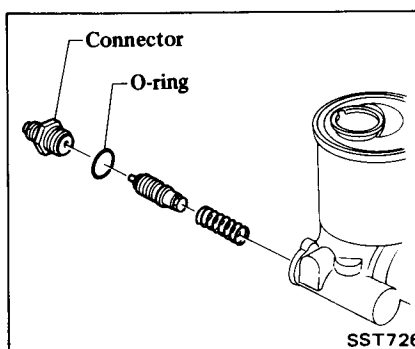
2. Remove O-ring.



Do not reuse O-ring once it has been removed.

Connector

Remove connector, then remove O-ring.



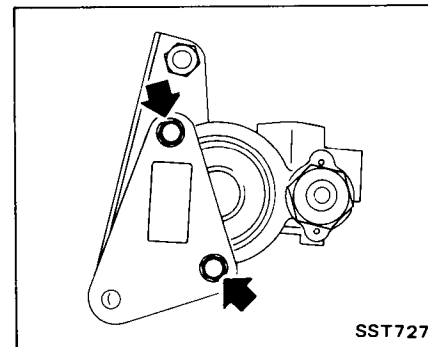
Do not reuse O-ring once it has been removed.

Rear cover O-ring

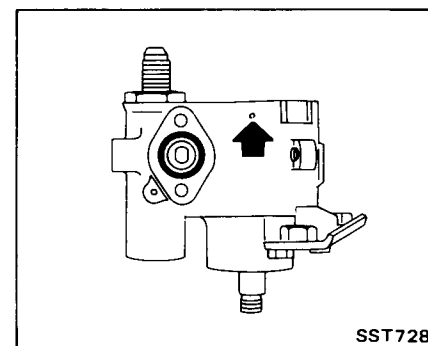
1. Remove tank.

Refer to "Tank O-ring" for disassembly.

2. Remove bracket.

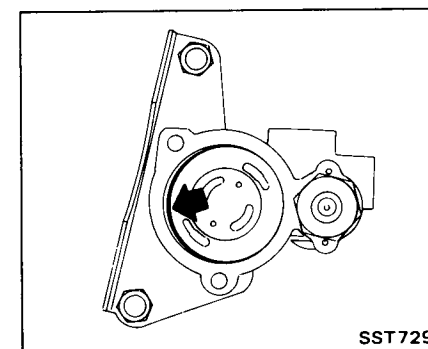


3. Remove snap ring.



Do not reuse snap ring once it has been removed.

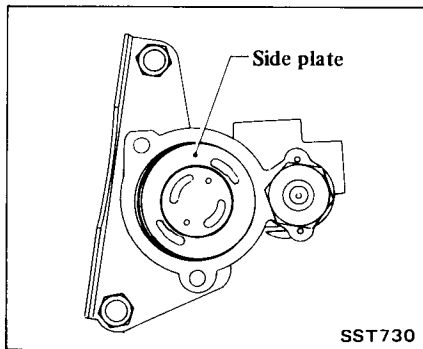
4. Remove rear cover and spring.
5. Remove O-ring.



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.

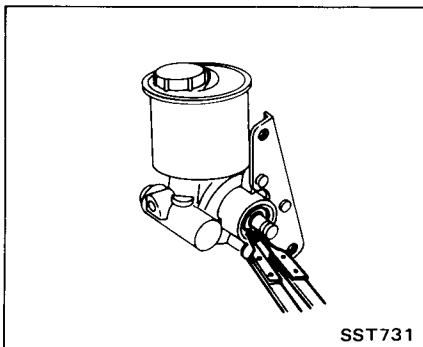


Pulley shaft oil seal

1. Remove pulley.

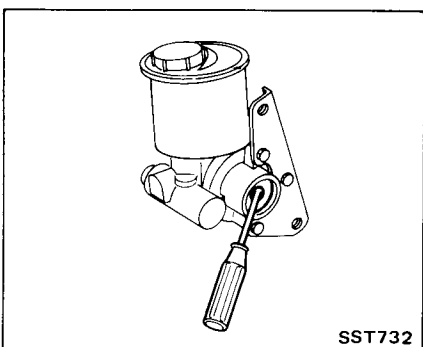
Refer to "Pulley" for disassembly.

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

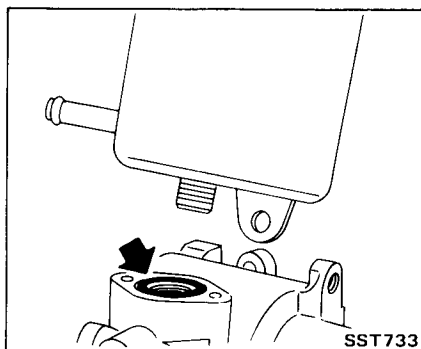
- a. If pulley is cracked or deformed, replace it.
- b. If an oil leak is noticed around pulley shaft oil seal, replace it.
- c. If key or pulley's key groove is deformed or worn, replace oil pump assembly.

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

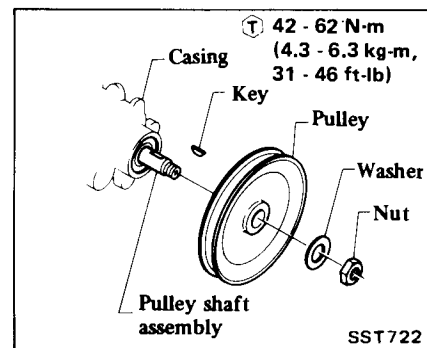
If an oil leak is noticed, replace O-ring.

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.

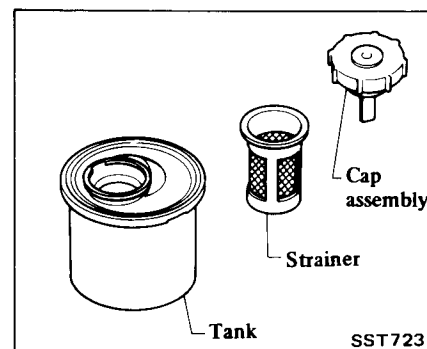
ASSEMBLY

Pulley



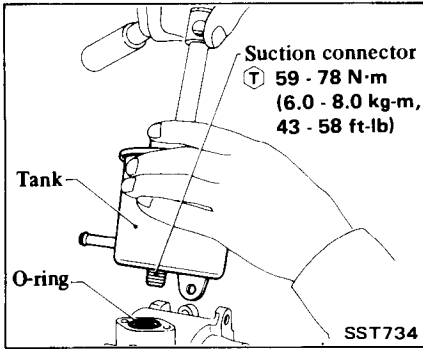
- a. Always use new washer.
- b. After tightening nuts securely, be sure to bend washer.

Cap assembly and strainer



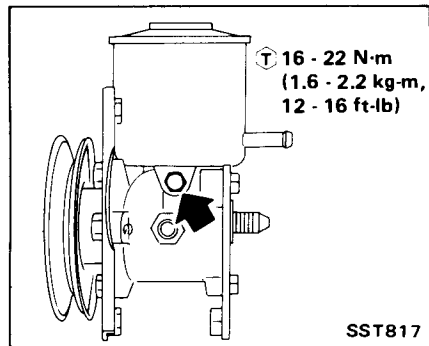
Tank O-ring

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.

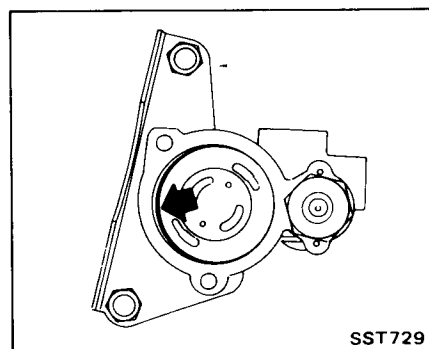


4. Install cap assembly.

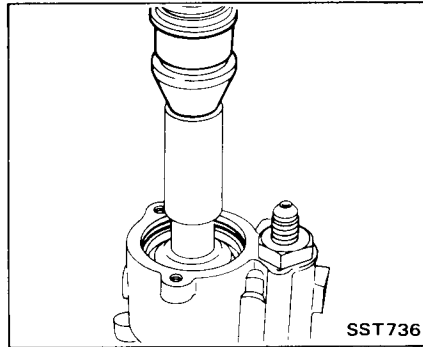
Refer to "Cap assembly and strainer" for assembly.

Rear cover O-ring

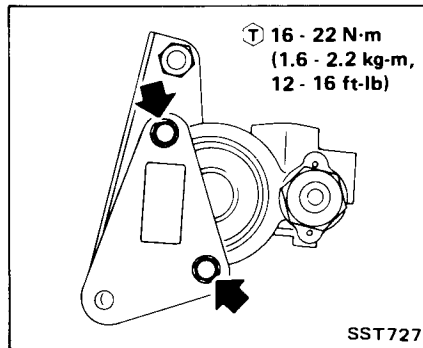
1. Install new O-ring.



- 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.



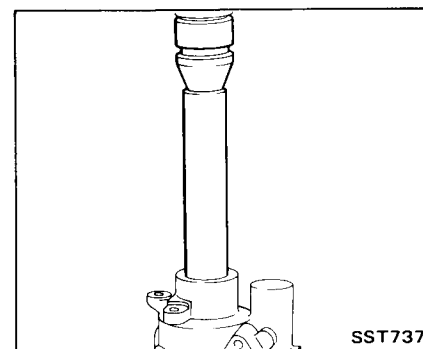
3. Install new snap ring.
4. Install bracket.



5. Assemble by referring to "Assembly of Tank O-ring".

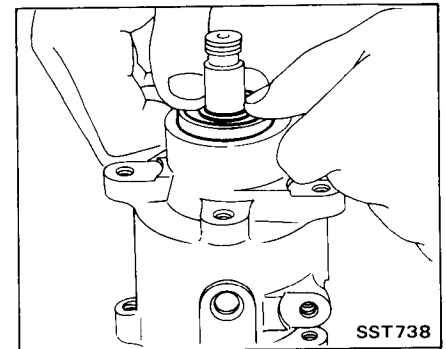
Pulley shaft oil seal

1. Using a suitable tool, install new oil seal.

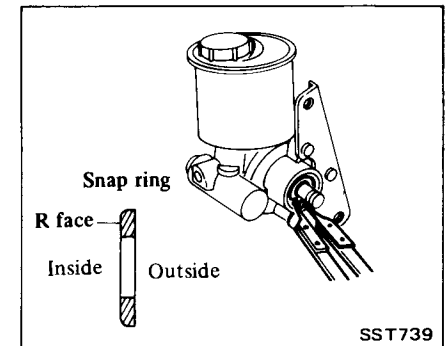


Before installing, apply a thin coat of vaseline to oil seal.

2. Securely install pulley shaft assembly by adjusting with screwdriver until rotor comes to the center position.



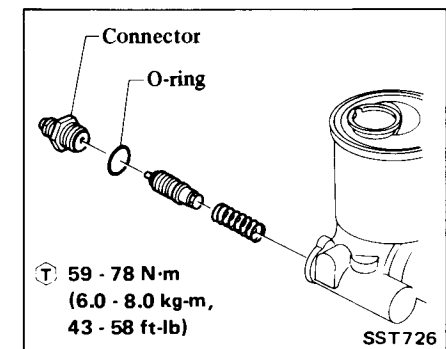
3. Install new snap ring.



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 column	Collapsible column
Steering gear type	
Manual steering gear	RP15L (Rack-and-pinion)
Power steering gear	IPRP15L
Turns of steering wheel (Lock to Lock)	
RP15L	3.5
IPRP15L	3.2
Steering gear ratio (Overall ratio)	
RP15L	19.6 : 1
IPRP15L	17.8 : 1
Standard clearance between upper jacket head and lower jacket mm (in)	399.5 - 400.5 (15.73 - 15.77)

INSPECTION AND ADJUSTMENT

	RP15L, IPRP15L
Front wheel turning angle degree	
Inside	33-1/2° - 37-1/2°
Outside	29° - 33°
Steering wheel axial play mm (in)	
Equipped with RP15L	0 (0)
Equipped with IPRP15L	0 (0)
Steering wheel play mm (in)	
Equipped with RP15L	20 - 30 (0.79 - 1.18)
Equipped with IPRP15L	Less than 35 (1.38)

MODEL : RP15L

Side rod outer ball joint Swinging torque N·m (kg-cm, in-lb)	0.3 - 4.9 (3 - 50, 2.6 - 43.4)
Side rod inner ball joint Swinging torque N·m (kg-cm, in-lb)	0 - 4.9 (0 - 50, 0 - 43)
Pinion gear turning torque (Pinion gear and rack gear assembly) N·m (kg-cm, in-lb)	Less than 2.0 (20, 17)
Rack force to pull N (kg, lb)	Less than 98 (10, 22)
Side rod length mm (in)	29.5 (1.161)
Pinion bearing inner snap ring thickness mm (in)	1.04 - 1.09 (0.0409 - 0.0429) 1.09 - 1.14 (0.0429 - 0.0449) 1.14 - 1.19 (0.0449 - 0.0469) 1.19 - 1.24 (0.0469 - 0.0488) 1.24 - 1.29 (0.0488 - 0.0508)
Pinion bearing outer snap ring thickness mm (in)	1.55 - 1.60 (0.0610 - 0.0630) 1.60 - 1.65 (0.0630 - 0.0650) 1.65 - 1.70 (0.0650 - 0.0669) 1.70 - 1.75 (0.0669 - 0.0689)

MODEL: IPRP15L

Side rod outer ball joint Axial play mm (in)	0.1 - 0.8 (0.004 - 0.031)
Swinging torque N·m (kg-cm, in-lb)	0.3 - 2.9 (3 - 30, 2.6 - 26.0)
Side rod inner ball joint Axial play mm (in)	0 (0)
Swinging torque N·m (kg-cm, in-lb)	0.1 - 7.8 (1 - 80, 0.9 - 69.4)
Pinion rotating torque (Gear assembly) N·m (kg-cm, in-lb)	Less than 1.5 (15, 13)
Rack starting force (Gear assembly) N (kg, lb)	Less than 186 (19, 42)
Side rod length mm (in)	33.6 (1.323)
Oil pump belt deflection mm (in)	8 - 12 (0.31 - 0.47) at 98 N (10 kg, 22 lb)
Steering wheel turning force N (kg, lb)	24.5 - 29.4 (2.5 - 3.0, 5.5 - 6.6)
Normal operating temperature at fluid °C (°F)	60 - 80 (140 - 176)
Oil pump maximum pressure kPa (kg/cm ² , psi)	6,571 - 7,748 (67 - 79, 953 - 1,123)
Fluid capacity ℓ (US qt, Imp qt)	1.1 (1-1/8, 1)

TIGHTENING TORQUE**STEERING COLUMN**

Unit	N·m	kg·m	ft-lb
Steering wheel nut	39 - 49	4.0 - 5.0	29 - 36
Jacket tube bracket and cover to dash panel	3.4 - 4.4	0.35 - 0.45	2.5 - 3.3
Steering column mounting bracket	13 - 18	1.3 - 1.8	9 - 13
Coupling to column shaft	16 - 22	1.6 - 2.2	12 - 16
Lower joint to rubber coupling	23 - 26	2.3 - 2.7	17 - 20
Lower joint to pinion gear (RP15L)	39 - 49	4.0 - 5.0	29 - 36
Lower joint to pinion gear (IPRP15L)	32 - 38	3.3 - 3.9	24 - 28

STEERING GEAR AND LINKAGE**Model : RP15L**

Unit	N·m	kg·m	ft-lb
Side rod to knuckle arm	54 - 98	5.5 - 10.0	40 - 72
Side rod lock nut	78 - 98	8.0 - 10.0	58 - 72
Gear housing clamp	45 - 60	4.6 - 6.1	33 - 44
Retainer lock nut	39 - 59	4.0 - 6.0	29 - 43
Side rod inner socket lock nut	78 - 98	8.0 - 10.0	58 - 72

Model: IPRP15L

Unit	N·m	kg·m	ft-lb
Side rod to knuckle arm	54 - 98	5.5 - 10.0	40 - 72
Side rod lock nut	78 - 98	8.0 - 10.0	58 - 72
Gear housing clamp	45 - 60	4.6 - 6.1	33 - 44
Oil pump to bracket	26 - 36	2.7 - 3.7	20 - 27
Hose to oil pump	29 - 49	3.0 - 5.0	22 - 36
Hose to gear housing	39 - 49	4.0 - 5.0	29 - 36
Side rod inner socket lock nut	78 - 98	8.0 - 10.0	58 - 72
Boots clamp securing bolt	0.2 - 0.4	0.02 - 0.04	0.1 - 0.3
Retainer lock nut	39 - 59	4.0 - 6.0	29 - 43
Rear cover lock nut	78 - 137	8.0 - 14.0	58 - 101
Cylinder lock nut	78 - 108	8.0 - 11.0	58 - 80
Rear housing fixing bolt	8 - 12	0.8 - 1.2	5.8 - 8.7
Cylinder tube flare nut	39 - 49	4.0 - 5.0	29 - 36
Pulley nut	42 - 62	4.3 - 6.3	31 - 46
Oil pump bracket	16 - 22	1.6 - 2.2	12 - 16
Oil pump to tank	16 - 22	1.6 - 2.2	12 - 16
Connector	59 - 78	6.0 - 8.0	43 - 58
Suction connector	59 - 78	6.0 - 8.0	43 - 58

TROUBLE DIAGNOSES AND CORRECTIONS

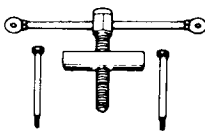
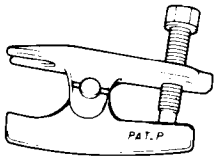
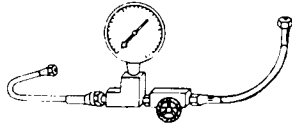
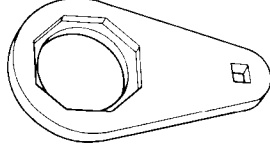
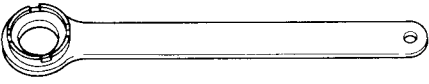

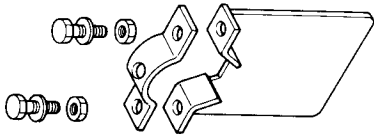
MANUAL STEERING

Refer to TROUBLE DIAGNOSES AND CORRECTIONS in “Front Axle & Front Suspension” Section.

POWER STEERING

Condition	Probable cause	Corrective action
Oil pressure does not build up.	Pump drive belt slipping on pulley. Pump malfunctioning. Oil leaking through hose joints. Oil leaking through power steering.	Readjust belt tension. Replace. Replace or retighten copper washer. Replace sealing parts at steering system.
Steering wheel moves heavily.	Lack of oil in oil pump.* Air present in oil. Oil pressure too low. Wheel alignment out of specifications or air pressure in tires too low.* Steering gears improperly engaged.* Steering column out of alignment.* Worn or damaged ball joint at suspension and steering linkage.*	Refill. Bleed air. See “Hydraulic system check”. Re-align or inflate tires to correct pressure. Replace gear assembly. Repair or replace. Replace.
Steering wheel fails to return.	Refer to items marked “*” above. Front wheel caster improperly adjusted. Internal gears dragged or gouged.	Readjust. Replace gear assembly.
Steering effort is not the same in both directions.	Oil leakage in steering gear. Stuffy oil passage in steering gear.	Replace sealing parts. Replace gear assembly.
Unstable running.	Wheel bearing not properly adjusted. Stuck or damaged control valve in steering gear. Front wheel alignment not properly. Excessive steering gear play. Play at suspension and linkage ball joint.	Readjust. Replace gear assembly. Readjust. Readjust backlash or replace gear assembly. Replace.
Noisy pump.	Lack of oil in oil pump. Hoses or oil filter clogged. Loose pulley. Belt noisy or slapping. Broken pump part.	Refill. Clean or, if necessary, replace. Repair. Readjust tension. Replace.

SPECIAL SERVICE TOOLS

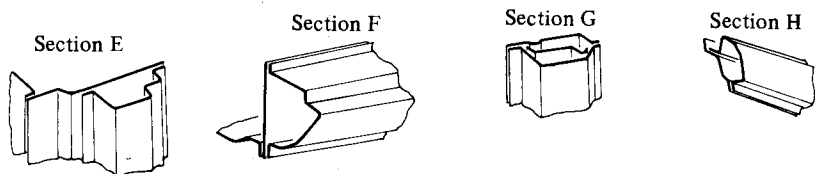
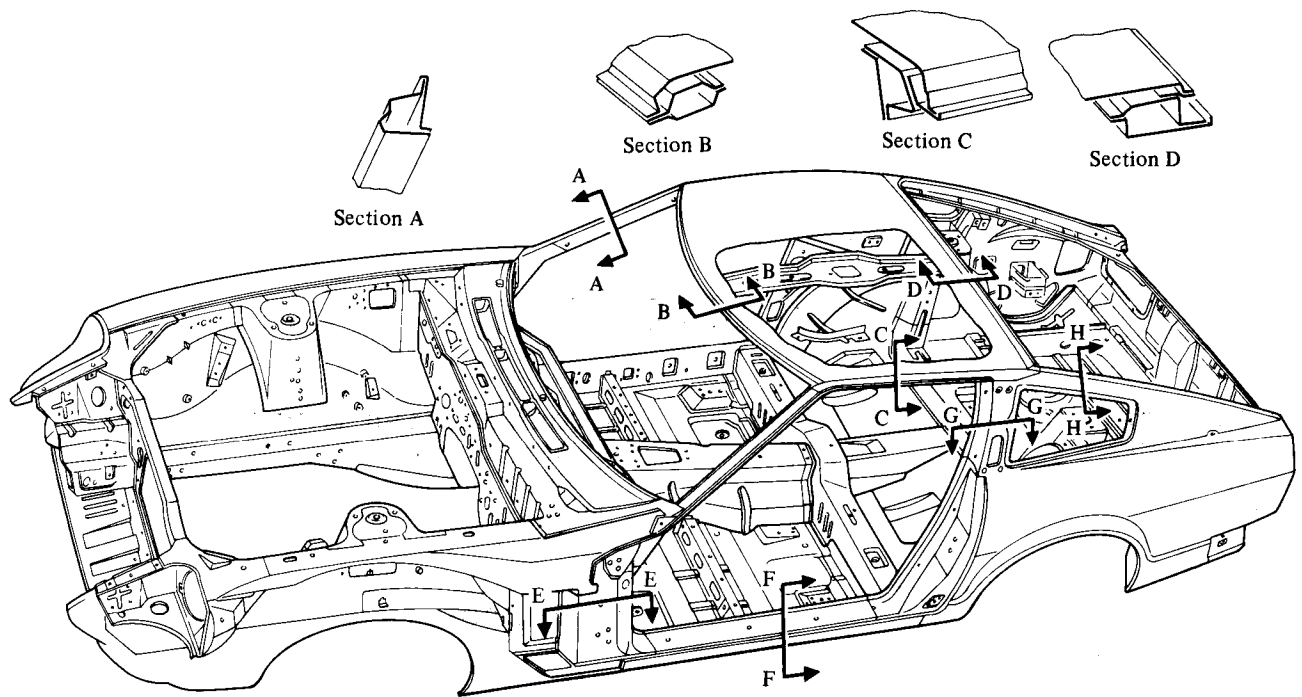
Tool number (Kent-Moore No.)	Tool name	Unit application	
		RP15L	IPRP15L
ST27180001 (J25726)	Steering wheel puller 	X	X
HT72520000 (J25730-A)	Ball joint remover 	X	X
ST3127S000 (See J25765)	Preload gauge		
① GG91030000 (J25765)	Torque wrench		
② HT62900000 (-)	Socket adapter (Useless)	—	X
③ HT62940000 (-)	Socket adapter (Useless)		
ST27091000 (J26357)	Pressure gauge 	—	X
KV48101600 (J28818)	Rear housing lock nut wrench 	—	X
KV48101700 (J28819)	Rear cover wrench 	—	X
KV48101800 (J28820)	Cylinder lock nut wrench 	—	X
KV48102100 (J28817)	Power steering stand 	—	X

SECTION BF

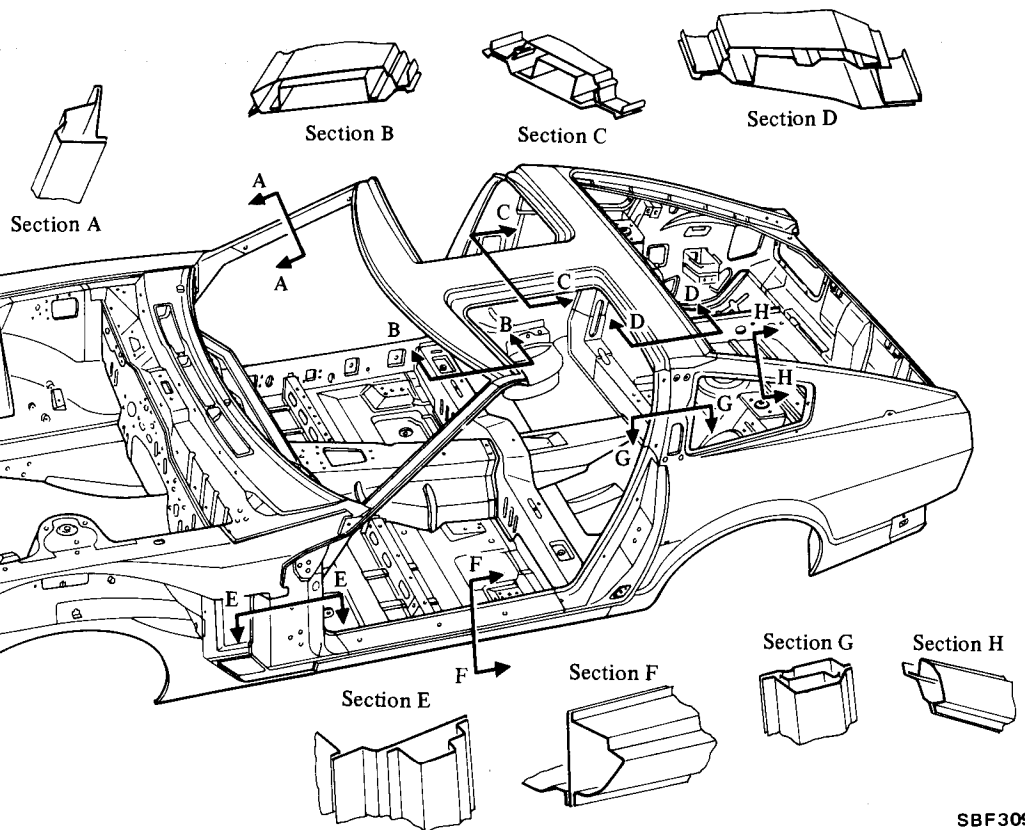
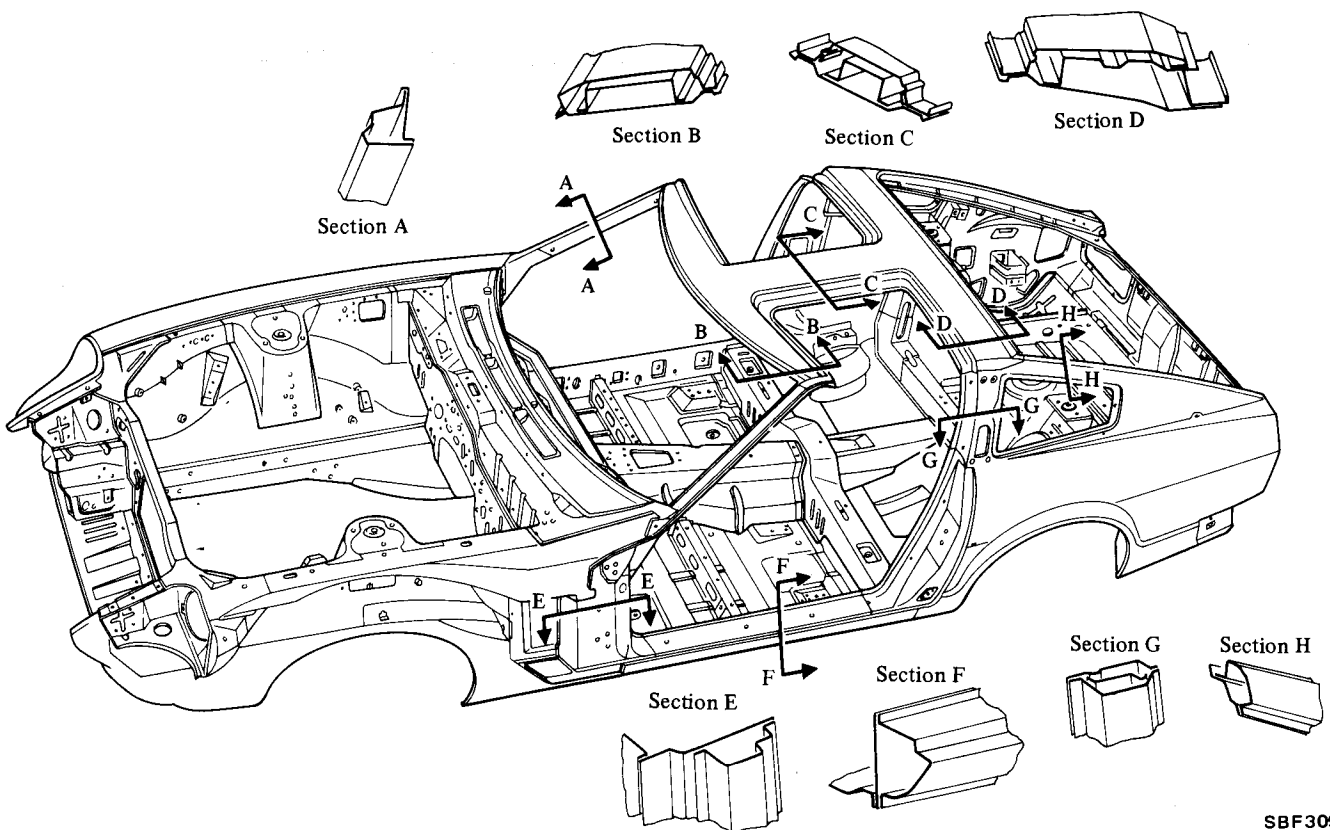
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BODY CONSTRUCTION

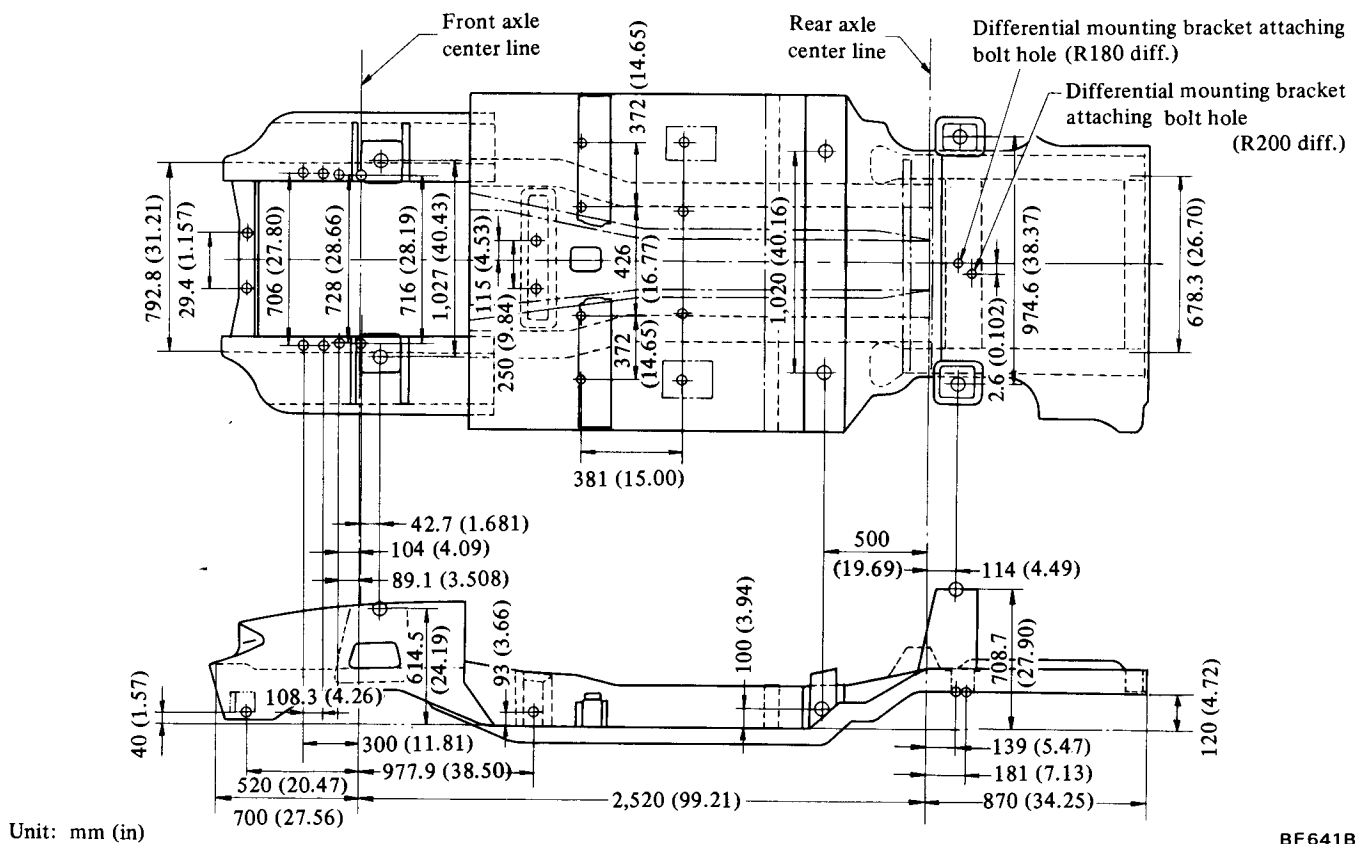
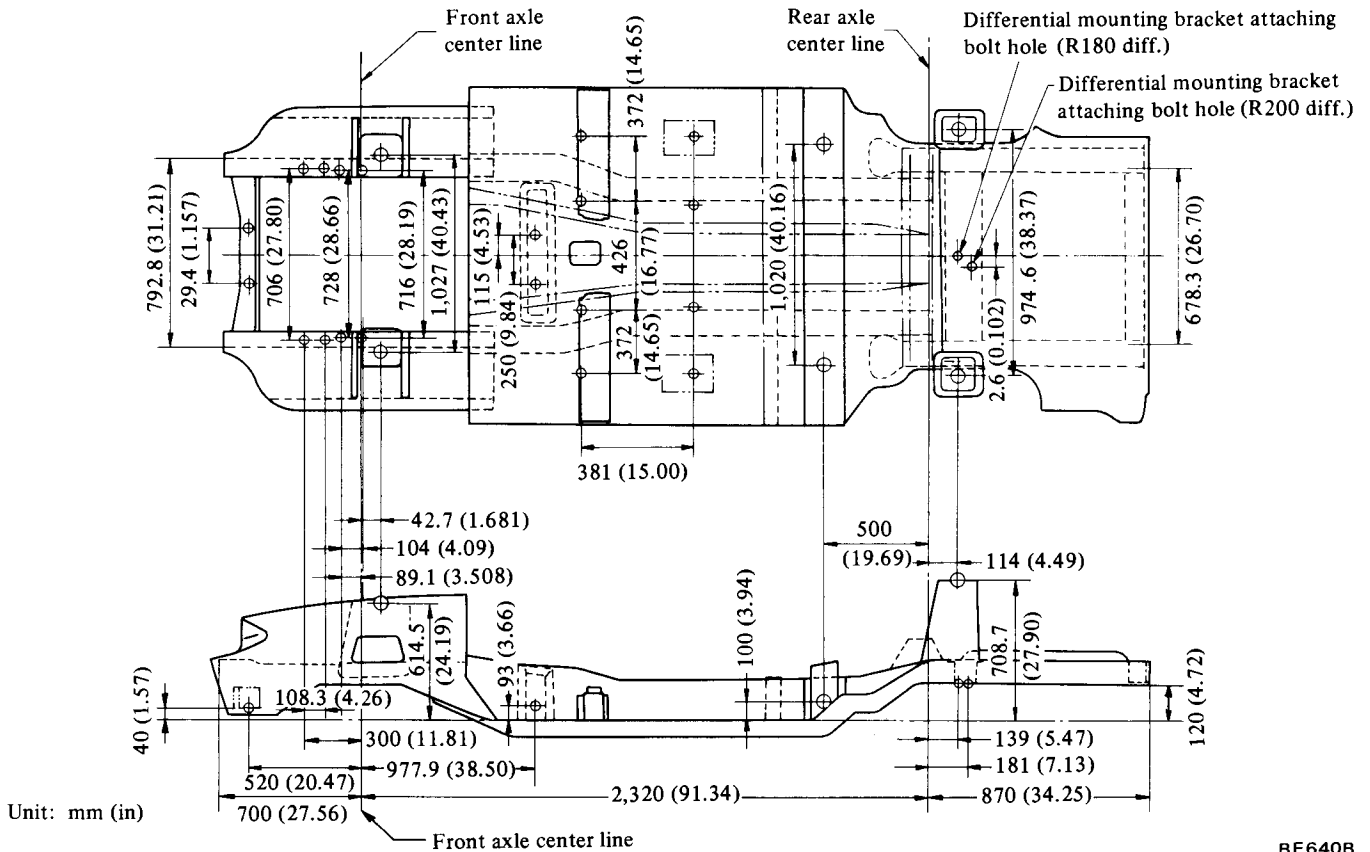


BF638B



SBF309

BODY ALIGNMENT



BUMPER

DESCRIPTION

The front and rear bumpers are installed on the car body through the strut-type, gas-and-oil-filled shock absorbers. These bumpers are so designed that when the car is involved in a

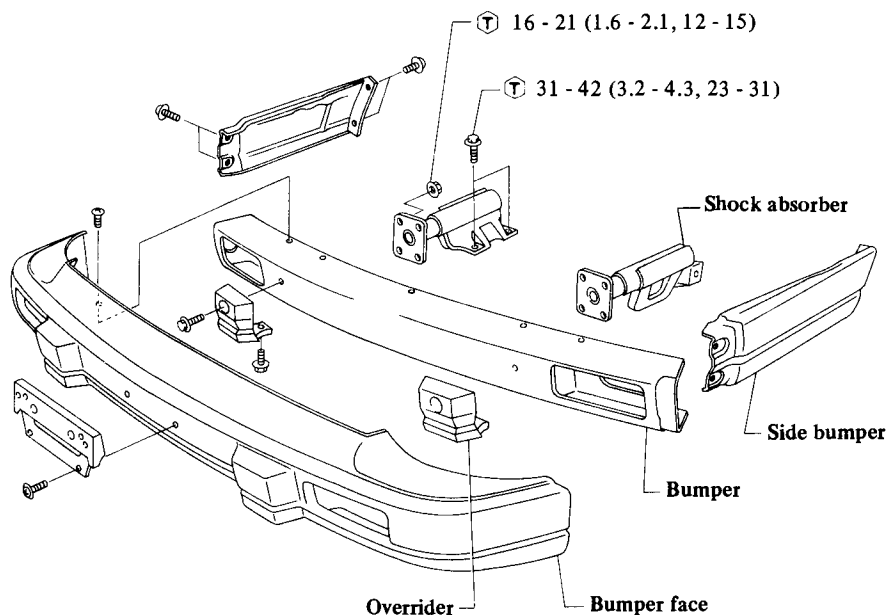
collision (solid barrier) at a speed of 8 km/h (5 MPH) or less, they retract to effectively absorb impact energy and to prevent car from damage.

The bumpers will be returned to their original positions upon absorbing impact energy.

CAUTION:

The shock absorber is filled with a high pressure gas and should not be disassembled, drilled or exposed to an open flame.

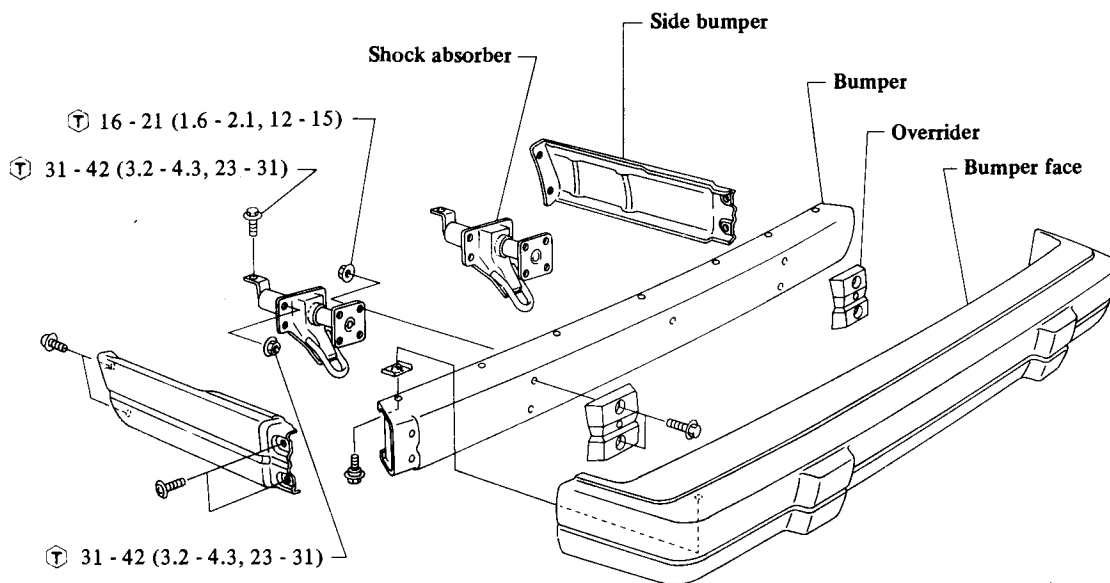
FRONT BUMPER



Ⓣ : N·m (kg·m, ft·lb)

SBF515A

REAR BUMPER



Ⓣ : N·m (kg·m, ft·lb)

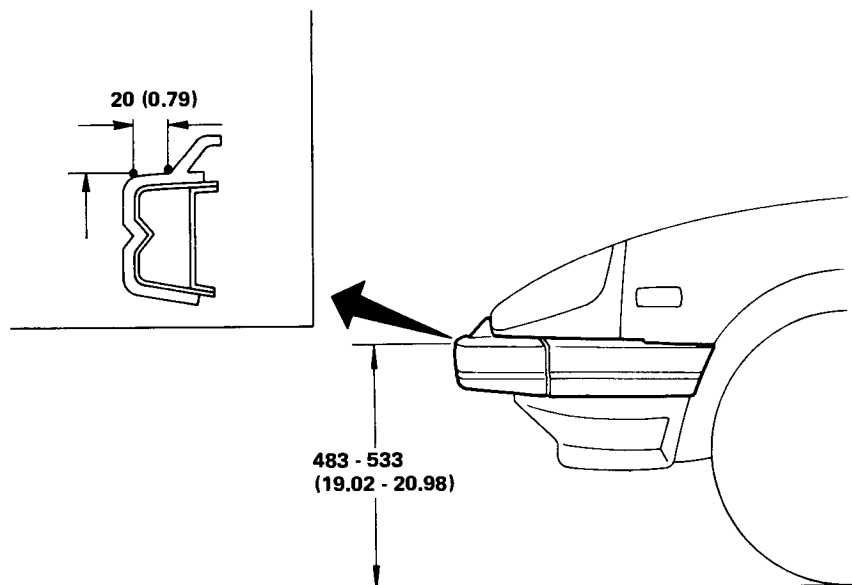
SBF516A

INSPECTION

BUMPER HEIGHT

Adjust bumper height so that distance from top edge to ground meets

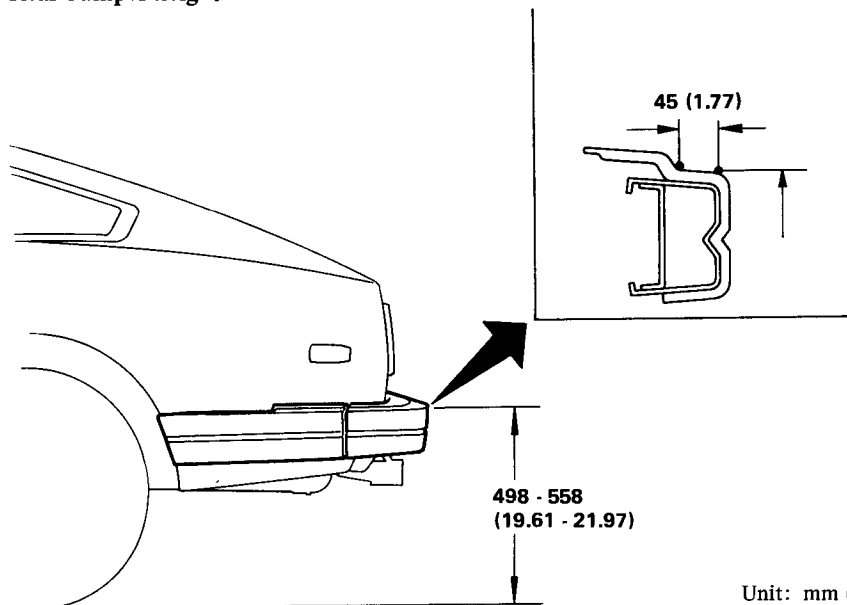
Front bumper height



Unit: mm (in)

SBF517A

Rear bumper height



Unit: mm (in)

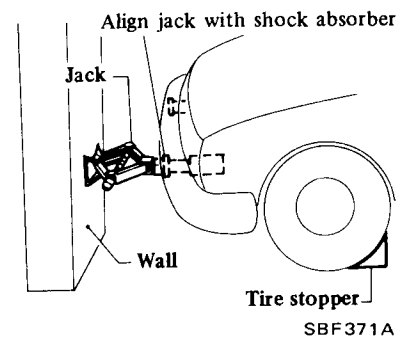
SBF518A

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.

specifications.

Place vehicle on a flat surface under curb weight conditions. Tires must be inflated to rated pressure.



SBF371A

- (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.

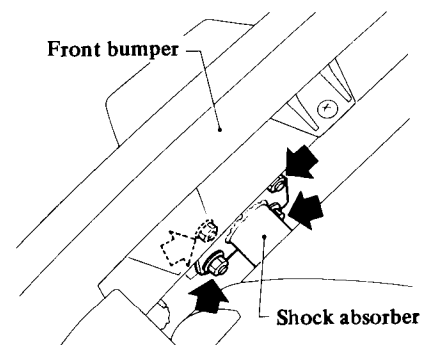
When replacing shock absorbers, make sure they are of the same type and rating, and manufactured by the same maker.

- (5) For rear bumper, use the same procedures as described for front bumper.

FRONT BUMPER

REMOVAL AND INSTALLATION

1. Disconnect front combination lamp harness connectors.
2. Open hood, and then remove bumper from shock absorber.

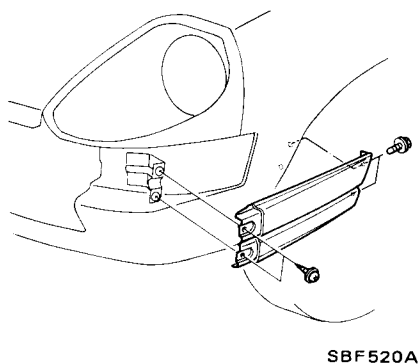


SBF519A

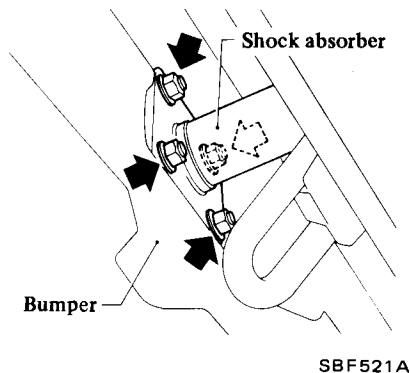
Apply parking brake and place tire stoppers securely.

- (2) Place a jack between bumper and wall; jack is positioned squarely with bumper directly in line with shock absorber to be checked.

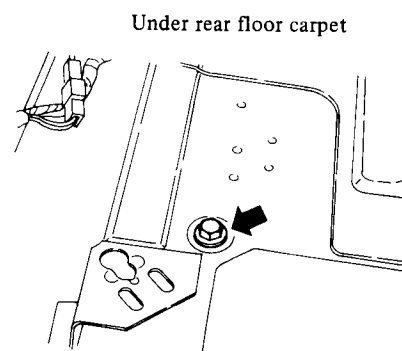
3. Remove side bumper from fender.



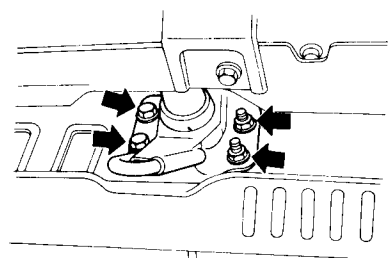
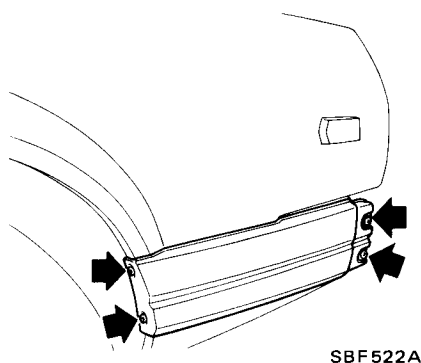
4. Remove shock absorber.
5. Install in the reverse order of removal, and adjust bumper height.



3. After removing rear carpet and padding, remove shock absorber.



2. Remove side bumper.



BF650B

REAR BUMPER

REMOVAL AND INSTALLATION

1. Remove bumper from shock absorber.

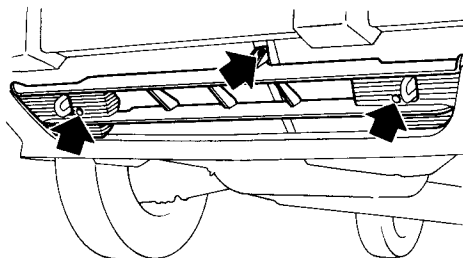
4. Install in the reverse order of removal, and adjust bumper height.

RADIATOR GRILLE

CAUTION:

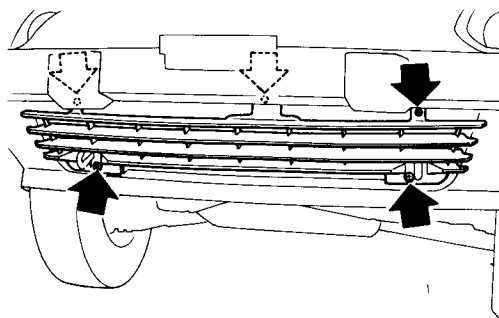
- a. Radiator grille is made of plastic, so do not use excessive force.
b. Take care to keep any oil away from radiator.

Model equipped with turbocharger



SBF523A

Model not equipped with turbocharger

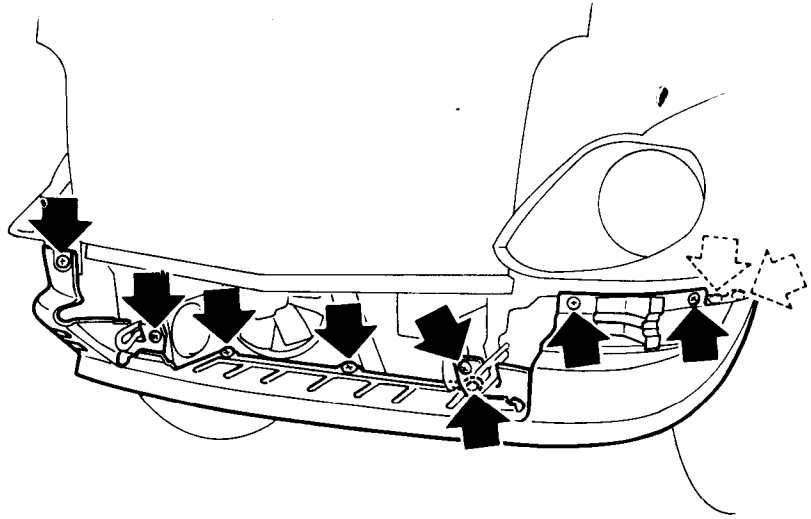


SBF524A

FRONT APRON

REMOVAL AND INSTALLATION

1. Remove bumper and side bumper.
2. Remove radiator grille.
3. Remove front apron.
4. Installation is in the reverse order of removal.

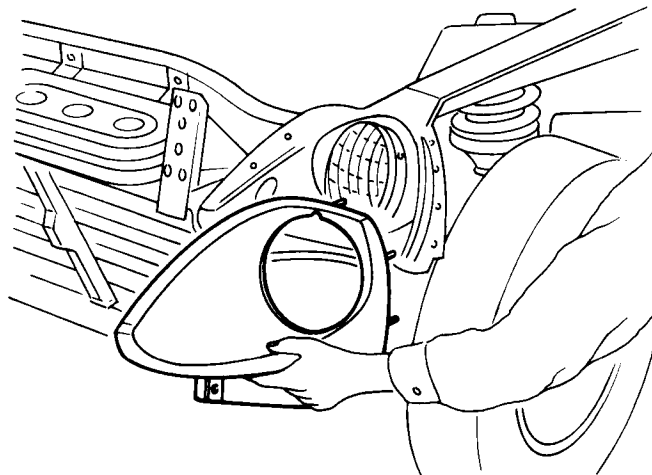


SBF525A

HEADLAMP CASE

REMOVAL AND INSTALLATION

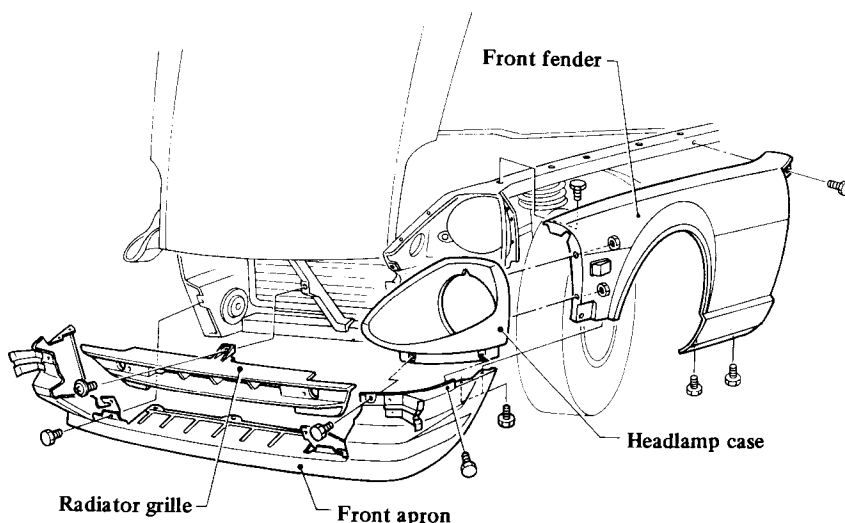
1. Remove front apron and side apron. Refer to Front Apron and Side Apron for removal.
2. Remove headlamp.
3. Remove inner fender protector.
4. Remove screws securing headlamp case to front fender. Then remove headlamp case.
5. Installation is in reverse order of removal.



BF653B

FRONT FENDER

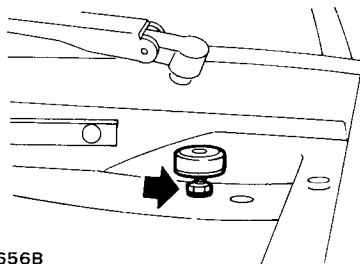
REMOVAL AND INSTALLATION



SBF526A

1. Remove inner fender protector.
2. Remove headlamp case. Refer to Headlamp Case for removal.
3. Disconnect side marker lamp harness at connector. Then remove front fender.
4. Installation is in reverse order of removal.

2. Loosen hood bumper lock nuts and lower bumpers until they do not contact rear of hood when hood is locked.



BF656B

HOOD

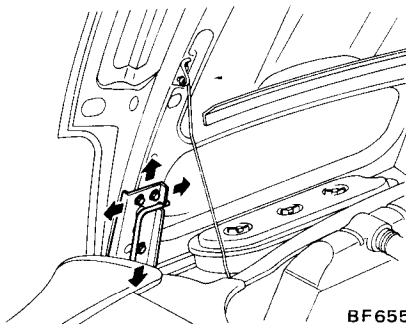
ADJUSTMENT

Hood can be adjusted with bolts attaching hood to hinge and hood to hood lock, and hood bumpers. Adjust hood for an even fit between front fenders.

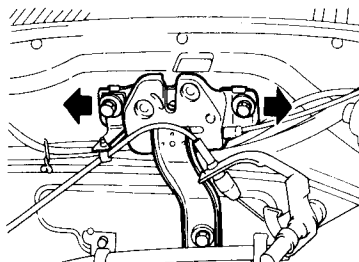
Adjust hood as follows:

1. Adjust hood fore and aft and from side to side by loosening bolts attaching hood to hinge and repositioning hood.

3. Adjust hood lock to set striker at center of hood lock, and tighten hood lock securing bolts temporarily.



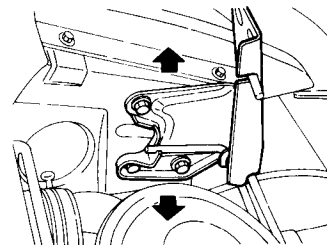
BF655B



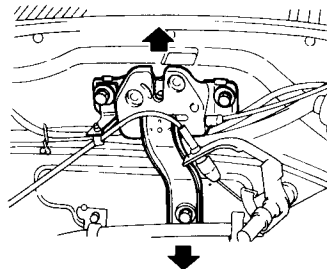
BF657B

4. Adjust hood up and down by loosening hood hinge to body and hood lock to body attaching bolts to obtain a flush hood with fender.

Front side

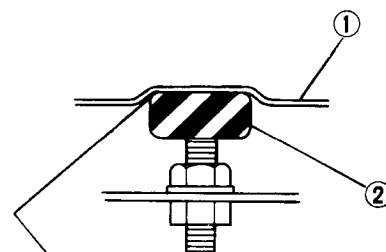


Rear side



BF658B

5. Raise bumpers until they contact rear of hood when hood is locked.



Be sure to contact this portion.

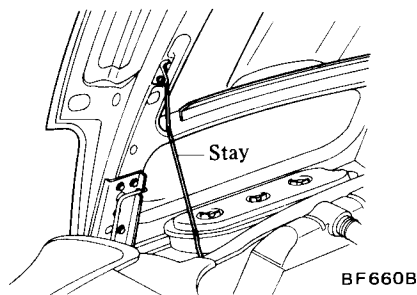
- 1 Hood
- 2 Hood bumper rubber

BF659B

6. Tighten hood hinge and hood lock securing bolts after proper adjustment has been obtained.

CAUTION:

When opening hood, be sure to use hood stay as shown in figure.



REMOVAL AND INSTALLATION

1. Open hood and protect body with covers to prevent scratching painted surface.
2. Mark hood hinge locations on hood for proper reinstallation.
3. Holding both sides of hood, unscrew bolts securing hinge to hood, and remove hood. This operation requires two men.
4. Installation is in reverse order of removal.

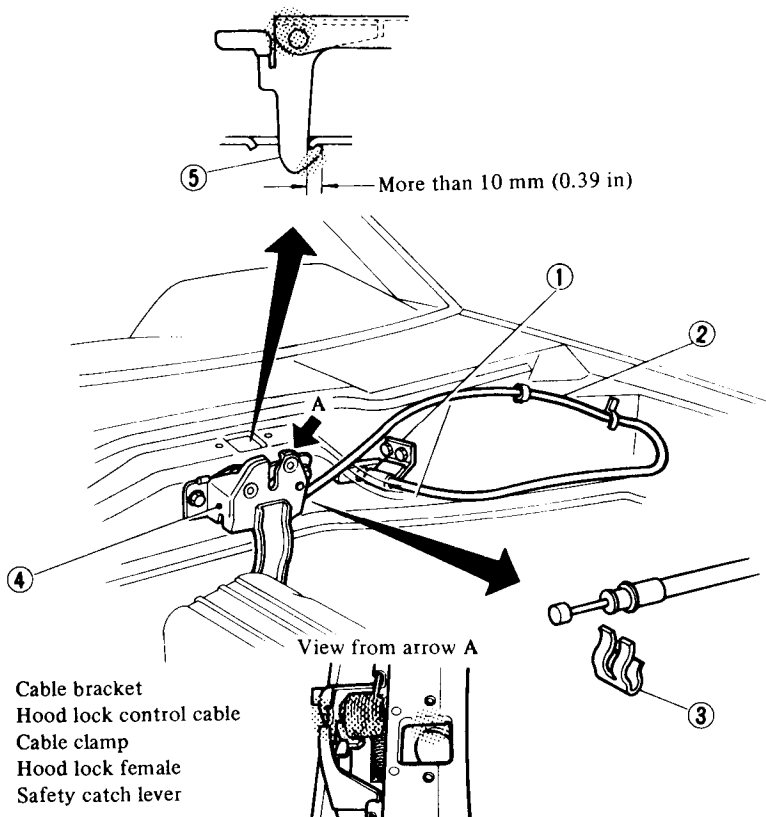
Ⓣ : Hood to hinge securing bolt
8 - 11 N·m
(0.8 - 1.1 kg-m,
5.8 - 8.0 ft-lb)

HOOD LOCK CONTROL

REMOVAL AND INSTALLATION

1. Disconnect control cable from hood lock.
2. Remove instrument lower cover and then remove cable bracket securing bolts and cable clip; draw cable out through passenger compartment.
3. Remove hood lock.
4. Install hood lock control in reverse order of removal, referring to Hood Adjustment.
5. Check hood lock control operation. Make sure safety catch lever retains body properly when hood lock is disengaged.

- a. Lubricate safety catch lever, return spring, lift spring and hood lock inserting portion into striker as shown in figure.
- b. Inspect safety catch lever, return spring and, lift spring for deformation, fatigue or rusting.

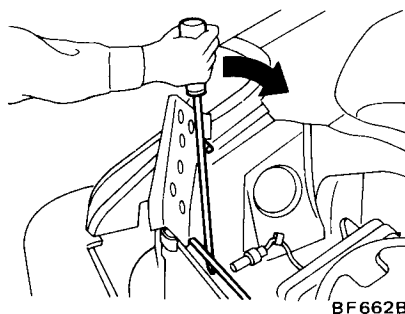


BF661B

TORSION BAR

REMOVAL AND INSTALLATION

1. Open engine hood and protect body with covers to prevent scratching painted surface.
2. Support hood and remove each torsion bar by disengaging end of torsion bar from hood hinge. Use a suitable screwdriver.



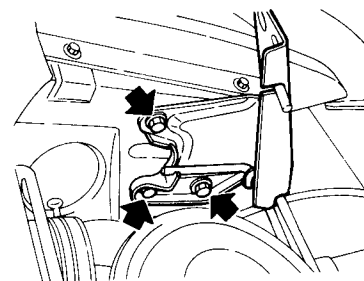
3. Installation is in reverse order of removal.

Note: Lubricate sliding surface of torsion bar.

HOOD HINGE

REMOVAL AND INSTALLATION

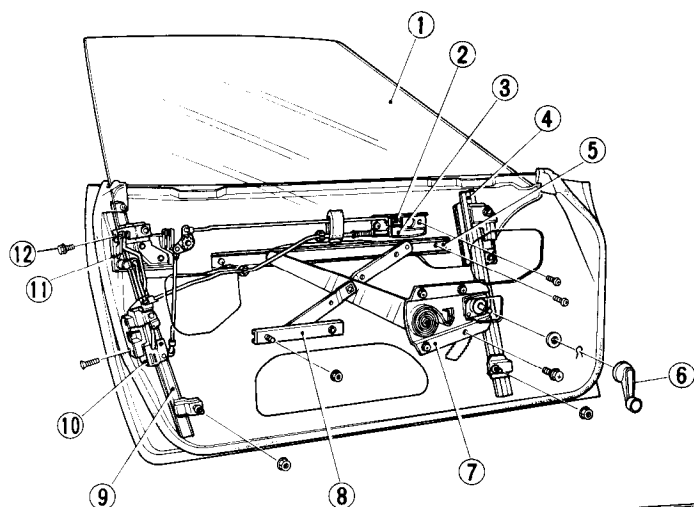
1. Open hood and protect body with covers to prevent scratching painted surface.
2. Remove hood. Refer to Hood for removal.
3. Remove torsion bars. Refer to Torsion Bar for removal.
4. Remove hinge.



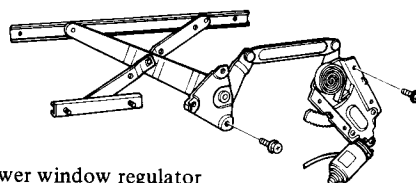
5. Installation is in reverse order of removal.

DOORS

DOOR



- 1 Door glass
- 2 Door lock knob
- 3 Door inside handle
- 4 Front guide rail assembly
- 5 Guide channel A
- 6 Regulator handle
- 7 Regulator assembly
- 8 Guide channel B
- 9 Rear guide rail assembly
- 10 Door lock assembly
- 11 Door outside handle
- 12 Rear guide rail upper securing bolt



Power window regulator

BF664B

ADJUSTMENT

Proper door alignment can be obtained by adjusting door hinge and door lock striker.

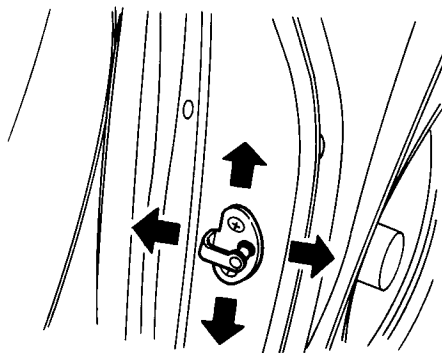
Door hinge and striker can be moved up and down and fore and aft in enlarged holes by loosening attaching bolts.

Door should be adjusted for an even and parallel fit with the door opening and surrounding body panels.

CAUTION:

Be careful not to distort or mar door and surrounding body panels when adjusting.

1. Remove front fender. Refer to Front Fender for removal.
2. Adjust door fore and aft and up and down to provide proper fit to body opening by loosening attaching bolts.
3. Adjust door lock striker up and down or in and out by loosening attaching bolts until it aligns with door lock.



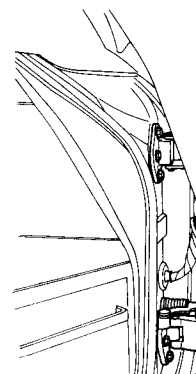
BF666B

REMOVAL AND INSTALLATION

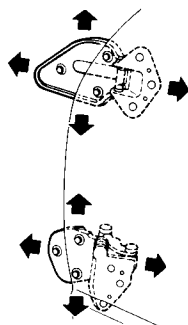
1. Remove instrument lower cover.
2. Remove side dash trim and disconnect power window and door mirror harness at connector.
3. Open door fully and support it with a stand or jack.

Place a rag between door and stand or jack to protect door panel from being scarred.

4. Remove door from hinges.



BF667B



BF665B

4. Install front fender. Refer to Front Fender for installation.

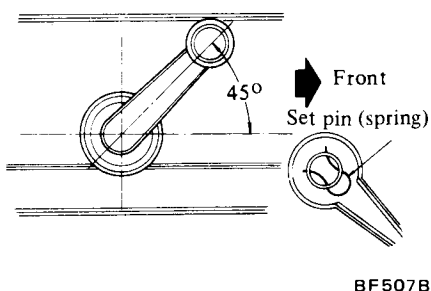
5. Installation is in reverse order of removal.

Apply grease to sliding surfaces of levers and springs.

DOOR GLASS AND REGULATOR

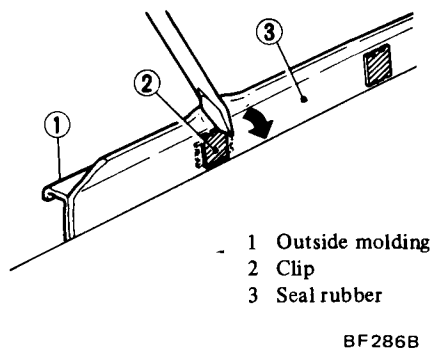
Removal and installation

1. Remove regulator handle by prying out set pin.



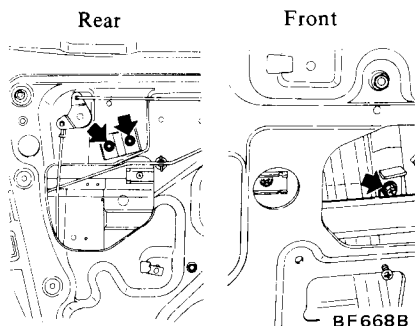
2. Remove arm rest, door inside handle escutcheon, power window switch escutcheon (if so equipped), door finisher and sealing screen.

3. Lower door glass as far as possible with regulator handle or power window switch on. Using suitable tool, turn outside molding retaining clips 90°. Then remove.

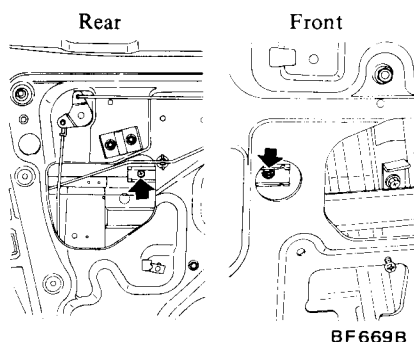


Clips are made of resin; do not apply excessive force to them.

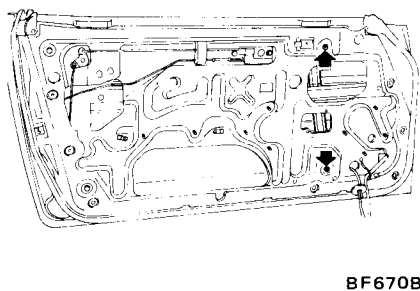
4. Raise door glass with regulator handle or power window switch on until regulator to glass attaching screws appear at access holes in door inside panel. Then remove front and rear upper stopper bolts.



5. Holding door glass by hand, remove regulator to glass attaching bolts. Then raise door glass and draw it upwards.

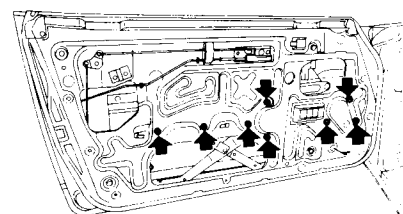


6. Remove front guide rail assembly through large access hole in door panel.

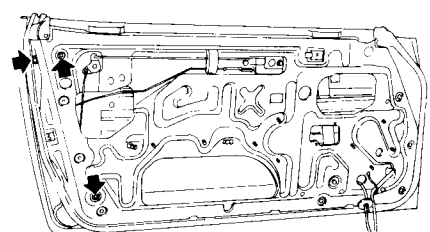


7. In models with power windows, disconnect harness connector. Then

remove regulator assembly with motor through large access hole in door panel.



8. Remove rear guide rail assembly through large access hole in door panel.



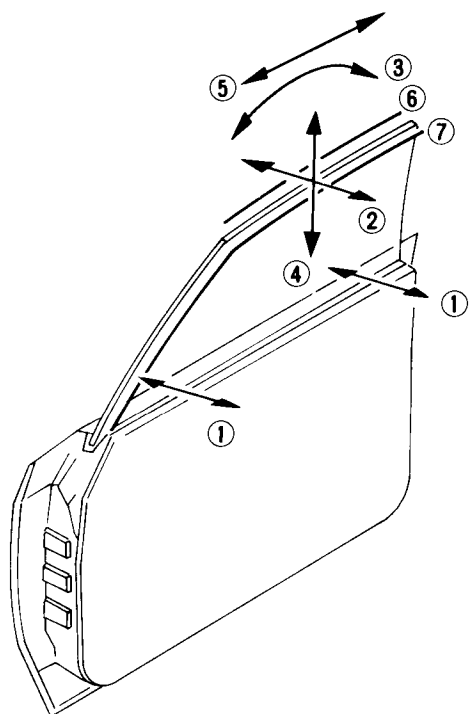
9. Installation is in reverse order of removal.

Apply grease to sliding surfaces of regulator and guide channel.

Adjustment

Before adjusting door window glass, check body side weatherstrip to be sure it is installed properly. Improper installation may cause water or dust leaks.

Proper window glass adjustment can be performed as follows: See figure.

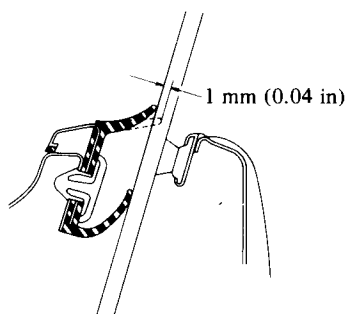


- 1 In-out adjustment (at waist area)
- 2 In-out adjustment (upper side of glass)
- 3 Tilt adjustment (upper side of glass)
- 4 Glass upper stop adjustment
- 5 Glass fore and aft adjustment
- 6 Range of glass upper stop adjustment
- 7 Range of in-out adjustment (upper side of glass)

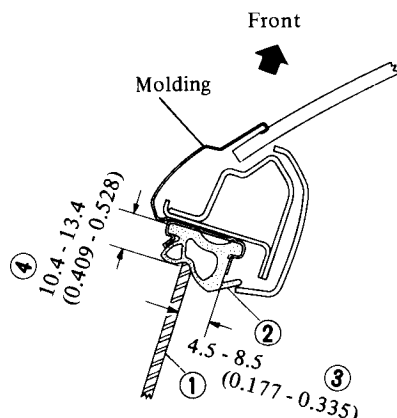
BF 211B

In-out adjustment (At waist area)

1. With door glass in up position and the door closed, loosen rear guide rail upper securing bolt. See figure. Adjust front and rear upper adjusting bolts so that glass will push molding upper seal by 1 mm (0.04 in).
2. After adjusting clearance, tighten upper adjusting bolts.



BF 673B

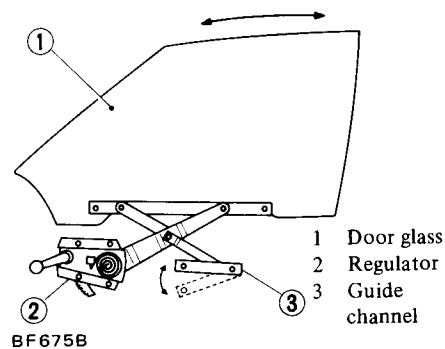


- 1 Door glass
- 2 Body side weatherstrip
- 3 In-out adjustment (Upper side of glass)
- 4 Fore and aft adjustment

Unit: mm (in)
BF 674B

Tilt adjustment (Upper side of glass)

1. Loosen, front and rear upper stopper securing bolts and front and rear guide rail adjusting nuts.
2. Adjust door regulator so that upper side of glass is parallel with body side weatherstrip.



BF 675B

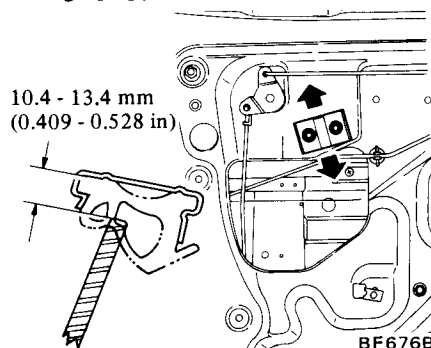
3. After adjusting, tighten adjusting nuts and bolts.

Fore and aft adjustment

Loosen front and rear guide rail adjusting bolts. Adjust door glass so that it is at position shown in figure.

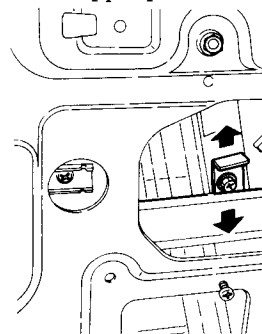
Glass upper stop adjustment

1. Adjust rear height of glass by changing upper rear stopper position.



BF 676B

2. Adjust front height of glass, same as rear upper stopper, by changing upper front stopper position.



BF 677B

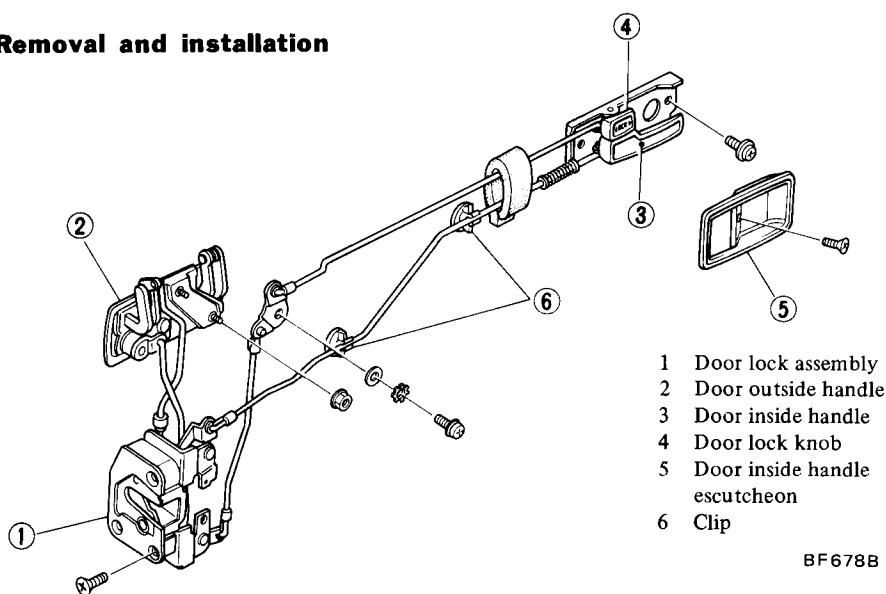
In-out adjustment (Upper side of glass)

With lower adjusting bolts, adjust upper edge of glass as shown in figure.

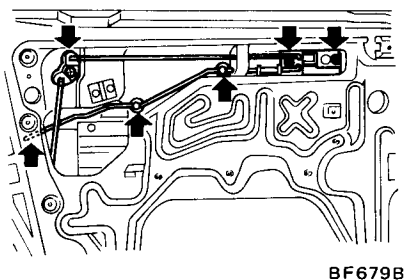
After entire adjustment is made, make sure that each adjustment is within the specified limit.

DOOR LOCK AND LOCK CONTROL

Removal and installation



1. Remove door glass. Refer to Door Glass for removal.
2. Remove door inside handle attaching screws. Disengage knob rods from rod holders on bell crank and door lock. Then remove door inside handle assembly.

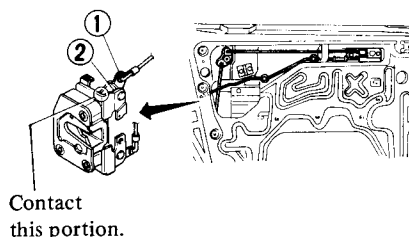


4. Remove door outside handle.
5. Installation is in reverse order of removal.

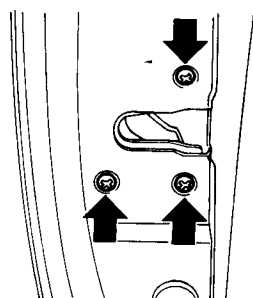
Apply grease to sliding surfaces of levers and springs.

Adjustment

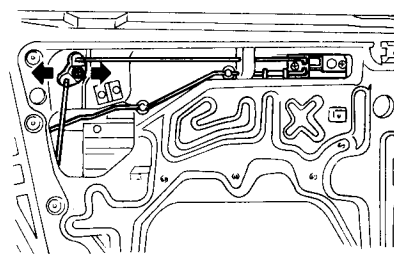
1. With door inside handle locked, adjust door inside handle so that lock side inside lever can touch lock base plate. After adjustment is made, secure door inside handle.



3. Loosen bell crank attaching screw. Disconnect key rod from door lock. Then remove door lock assembly together with bell crank.



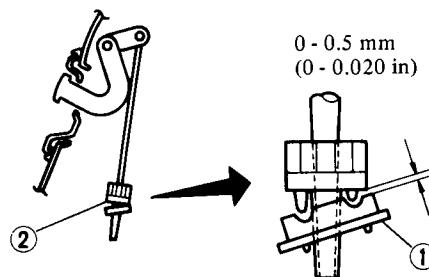
2. With lock knob in lock position, adjust bell crank so that play of lock knob is minimum. Then secure bell crank.



3. Adjust door outside handle rod as follows:

Door outside handle adjustment can be accomplished by adjusting the clearance between door lock lever and adjusting nut (nylon) located on door outside handle rod.

To adjust door outside handle, turn adjusting nut clockwise or counter-clockwise to obtain a clearance of 0 to 0.5 mm (0 to 0.020 in). See figure.



BF683B

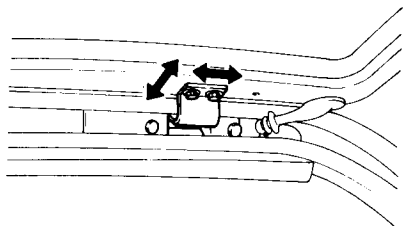
BODY REAR END

BACK DOOR

ADJUSTMENT

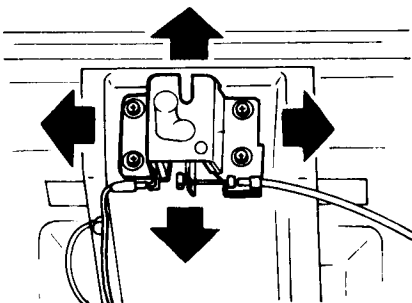
Back door can be adjusted with bolts attaching back door to back door hinge and back door lock.

1. Loosen bolts attaching back door to back door hinge.
2. To make side-to-side adjustment, move back door to left or right as required to obtain an equal clearance between back door and rear fender on both sides.
3. To make fore-and-aft adjustment, move back door in fore-and-aft direction as required to obtain an equal clearance between back door and roof.



BF684B

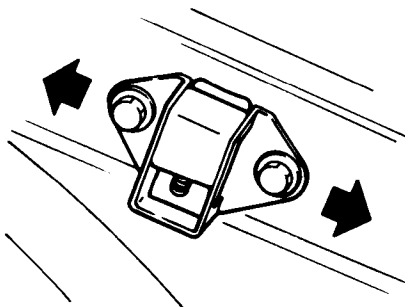
4. After alignment is properly made, tighten bolts securely.
5. To obtain a snug fit between back door and weatherstrip, loosen down stopper securing screws. Loosen back door lock attaching bolts enough to move lock, working lock up or down and from side to side as required.



BF685B

6. After desired adjustment is obtained, tighten back door lock attaching bolts securely.

7. Adjust down stopper to set with hollow of back door, then tighten down stopper securing screws.



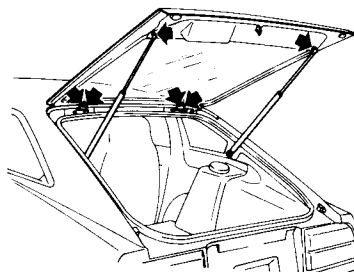
BF686B

REMOVAL AND INSTALLATION

1. Open back door.
2. Mark hinge locations on body for proper reinstallation.
3. Support back door by hand and remove back door to back door stay bolts. Remove rear roof rail trim and disconnect rear defogger and rear window wiper harness connector and hose.
4. Support back door by hand and remove back door to back door hinge attaching bolts. Then remove back door. This operation requires two men.

CAUTION:

Place rags between roof and upper end of back door to avoid damaging painted surfaces.

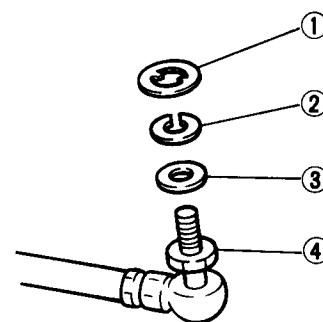


BF687B

5. Installation is in reverse order of removal.

Before securing back door stay to car body with bolts, make sure parts shown in figure are properly assembled.

- ⓧ : Back door stay retaining bolt
19 - 25 N·m
(1.9 - 2.5 kg-m,
14 - 18 ft-lb)



- 1 Stopper ring
- 2 Spring washer
- 3 Spacer rubber
- 4 Stay stud

BF688B

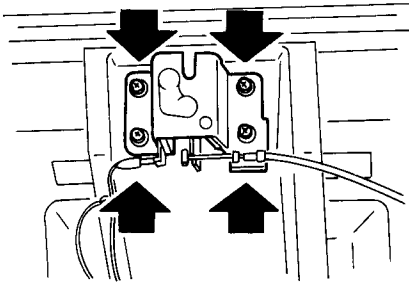
CAUTION:

- 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.

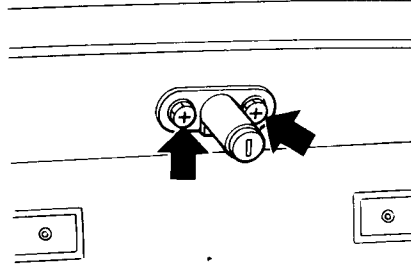
BACK DOOR LOCK AND LOCK CYLINDER

Removal and installation

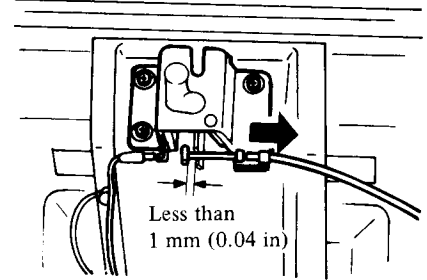
1. Open back door.
2. Remove luggage rear finisher.
3. Remove back door lock from rear panel.



BF689B



BF690B



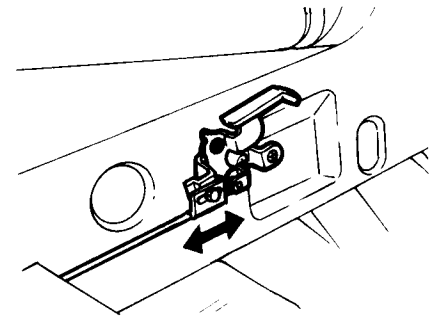
BF692B

4. Remove license lamp case and then remove lock cylinder.

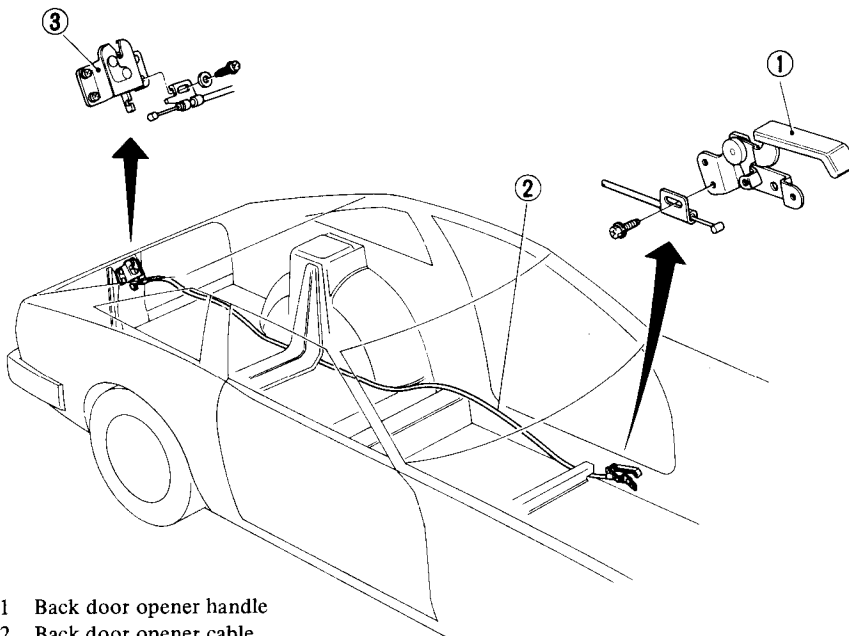
5. Installation is in reverse order of removal. Adjust back door lock, referring to Back Door for adjustment.

2. Adjust cable front clamp and tighten.

BACK DOOR OPENER



BF693B



BF691B

- 1 Back door opener handle
- 2 Back door opener cable
- 3 Back door lock

ADJUSTMENT

1. After adjusting back door, adjust cable rear clamp so that clearance between cable end and locking lever is

less than 1 mm (0.04 in) with back door locked. Then tighten clamp securing bolt.

REMOVAL AND INSTALLATION

1. Open back door and door.
2. Loosen lap-shoulder belt securing bolt and remove seat belt plate.
3. Remove instrument lower cover and side dash trim, then remove kicking plate and turn up floor carpet.
4. Remove rear seat, referring to Rear Seat for removal.
5. Remove front side body trim and wheel house trim.
6. Remove rear panel finisher, body side rear finisher and padding.
7. Remove back door lock.
8. Disconnect back door lock opener cable from back door lock.
9. Remove back door opener handle with cable.
10. Installation is in reverse order of removal.

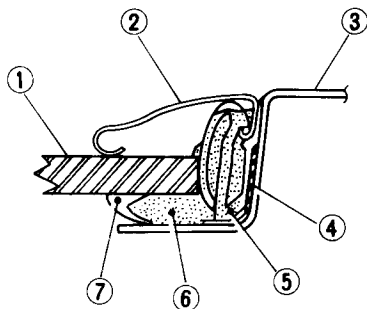
WINDSHIELD AND WINDOW GLASS

WINDSHIELD GLASS

A pre-mixed, one-part sealant to cement windshield glass to windshield opening is available.

After using this sealant, it is highly recommended that the car should remain stationary for about 24 hours so that the sealant can cure well.

Upper and lower windshield moldings are installed with a continuous plastic molding fastener.



- 1 Windshield glass
- 2 Windshield molding
- 3 Body
- 4 Double-faced adhesive tape
- 5 Molding fastener
- 6 Sealant
- 7 Dam

BF694B

REMOVAL

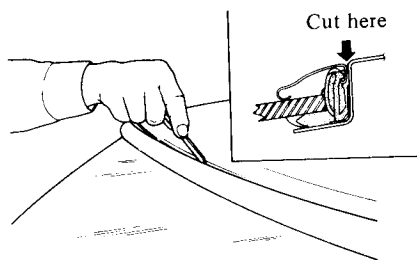
1. Protect hood, front fenders, instrument panel and front seats with covers.

2. Remove windshield wipers, front pillar garnishes and windshield garnish.

Refer to Roof Trimming for removal.

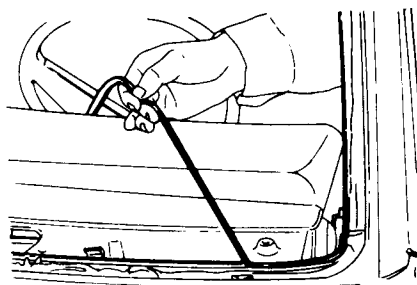
3. Remove front pillar moldings.

4. With a sharp cutting knife, cut off caulking material attached to upper and lower moldings. Then remove moldings.



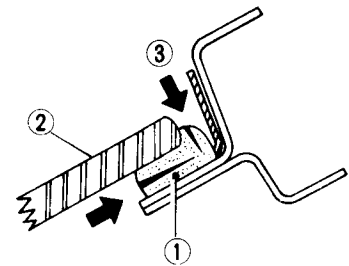
BF695B

5. Reaching from inside car, strip dam rubber from around windshield glass.



BF288B

6. With a sharp cutting knife, cut off caulking material along edge of entire window opening.



- 1 Adhesive caulking material
- 2 Glass
- 3 Knife cut

BF331B

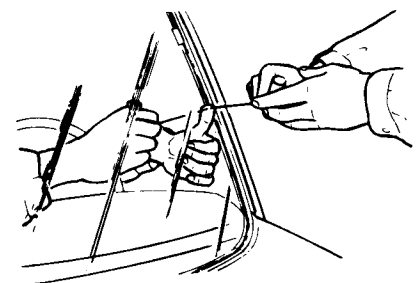
7. Cut off caulking material around entire perimeter of glass as follows:

(1) Using a knife, cut through part of caulking material.

(2) Secure one end of steel music wire [0.5 mm (0.020 in) in diameter] to a piece of wood that can serve as a handle.

Using long nose pliers, insert other end of wire through caulking material at edge of glass; then, secure that end of wire to another wood handle.

(3) With the aid of an assistant, carefully cut (pull wire) through caulking material around entire perimeter of window using a sawing motion.



BF357B

8. From inside car, push glass up and out of window opening.

9. Using a razor blade or sharp scraper, remove caulking material along entire edge of windshield opening, leaving it about 1.0 to 2.0 mm (0.039 to 0.079 in) thick.

If residual sealant is silicone, remove all traces of it.

CAUTION:

- a. Use Genuine Nissan Sealant Kit "72891Y1625" or equivalent. Sealant kit consists of Primer-A, Primer-E, dam, caution label and sealant which is made from silicone. Using this kit, proceed to operations described in removal and installation.
- b. Do not use sealant if it is more than six-months old.
- 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.

CAUTION:

a. When body painted surface is scratched, be sure to repair with paint.

b. Identification of used adhesive material can be accomplished as follows:

1) Cut a small piece of excess sealant from glass or windshield opening flange.

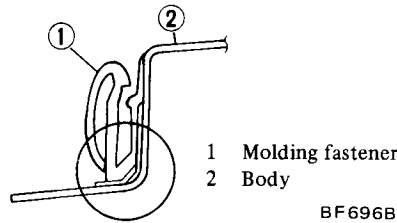
2) Stick small piece of sealant on the end of knife or the like, and hold it over flame from match or lighter until it ignites.

● Polysulfide burns with a clear flame and a very small amount of white smoke or no smoke and its odor is very objectionable (heavy sulfur dioxide).

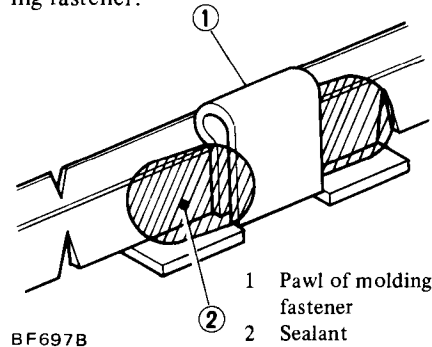
● Polyurethane burns with a dirty flame and emit black smoke and very little odor.

● Silicone glows with little or no flame and emits white smoke and very little odor.

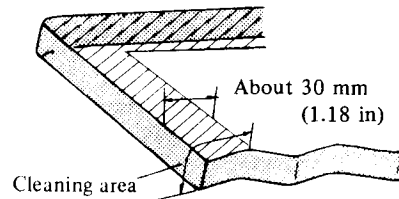
Burnt residue is white ash.



(3) Apply glass sealant beside molding fastener.



3. Clean glass surface where the sealant will be applied and dam with non-lead gasoline.



INSTALLATION

1. Clean contacting face of body with non-lead gasoline.

CAUTION:

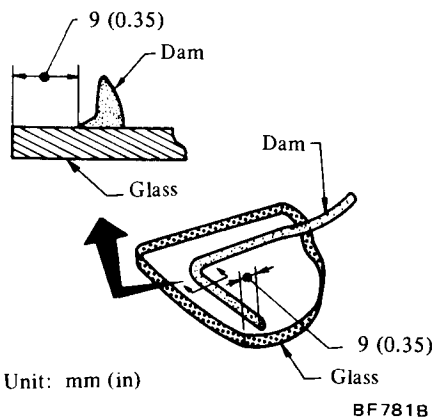
Do not allow oil, grease or water to get on clean surfaces from dirty hands or tools.

2. Install molding fasteners on upper and lower windshield opening as follows:

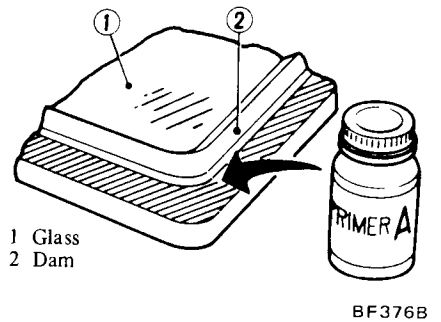
(1) Heat molding fastener and contacting face of body up to about 40°C (104°F) using a heat gun.

(2) Attach molding fastener to body and press it more than 490 kPa (5 kg/cm², 71 psi) using a suitable roller.

Note: Make certain that molding fastener does not come off from body, as shown below.



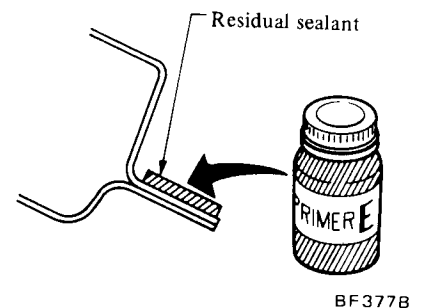
5. With sponge furnished with Primer A, apply a light coat of Primer to cleaned area of glass.



CAUTION:

Do not apply Primer A to glass opening flanges.

6. With sponge furnished with Primer E, apply a light coat of Primer to original caulking material left on glass opening flange.

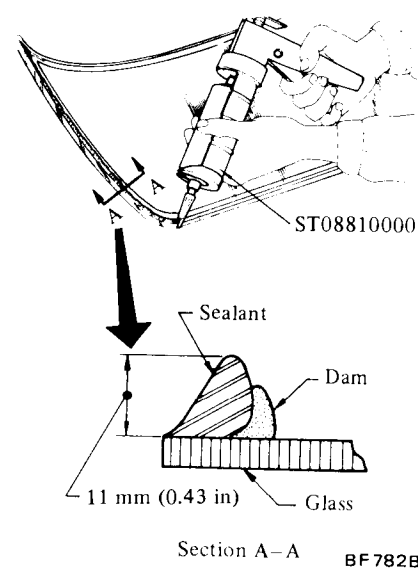


If residual sealant is silicone, remove all traces of it.

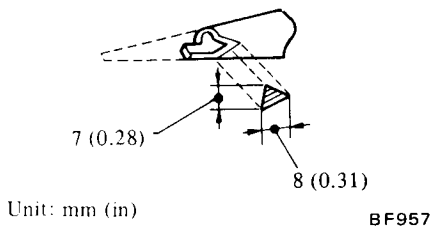
CAUTION:

Allow Primers to dry for 10 to 15 minutes before proceeding to the next step.

7. Insert cartridge in Caulking Hand Gun ST08810000 and place smooth, continuous bead on glass 11 mm (0.43 in) above glass surfaces.



Cut off nozzle end of cartridge as shown below.

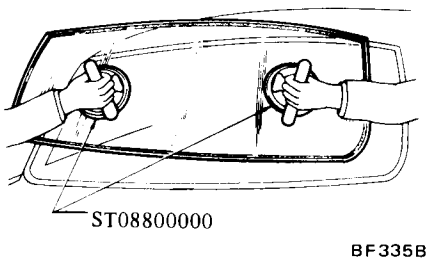


Pierce sealing film with needle; install cartridge on hand gun.

CAUTION:

Sealant starts to harden 15 minutes after it is applied; therefore, windshield glass should be installed in windshield opening in body within 15 minutes of applying sealant.

8. Support windshield glass with Sucker ST08800000.
9. Install windshield glass on opening flange so that clearances between windshield glass and body are about 7 mm (0.28 in).



10. Apply pressure on glass to aid in seating on plate.
11. Wipe excess caulking material off molding fasteners, edges of glass, and body.
12. Remove protective covers.
13. Water test immediately using a cold water spray.

Do not direct stream of water at fresh adhesive material. Allow water to spill over edges of glass. If leaks are encountered, use Caulking Hand Gun to work in additional caulking material at leak point.

14. Install all previously removed parts.

Reference: Period required for sealant to dry to desired hardness.

Unit: days

Relative humidity %	90	50	25
Temperature °C (°F)			
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 caulking material and body or between glass and caulking material, determine extent of leak by pushing glass outwards.

After installing, attach caution label to glass surface.



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:

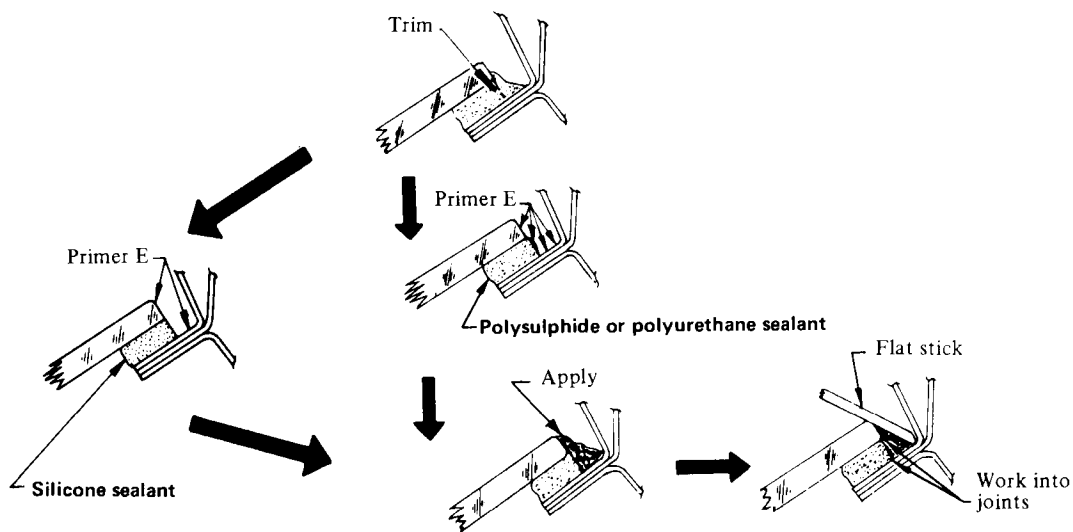
Advise the user of the fact that car should not be driven on rough roads or surfaces until sealant has properly vulcanized.

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.



BF498B

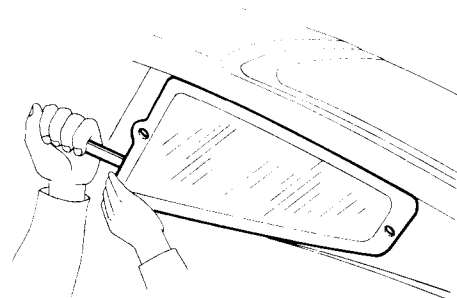
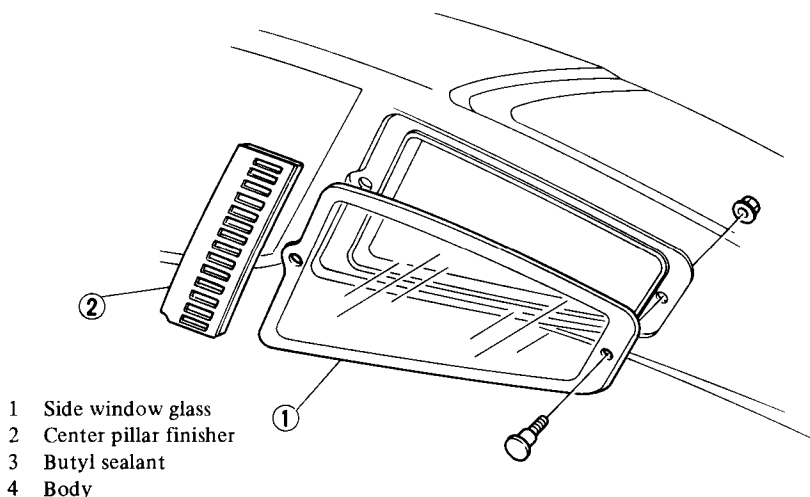
SIDE WINDOW GLASS (2 seater)

DESCRIPTION

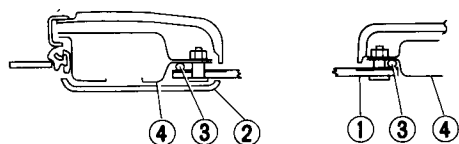
The side window glass is butyl-sealed all around its periphery and is retained with two bolts.

4. Using a knife, cut off butyl sealant around entire periphery of glass.

It is advisable to start cutting butyl sealant at front portion of window glass while pulling glass outward.



BF790B



BF699B

5. Remove side window glass.
6. Using a rag dampened with unleaded gasoline, remove any trace of butyl sealant from car body.

REMOVAL

CAUTION:
Do not attempt to pry moldings glued to the rear side window glass.

1. Remove center pillar finisher.
2. Remove front body side trim.
3. Remove side window glass retaining bolts.

INSTALLATION

1. Clean contacting surfaces of body and side window glass with a rag dampened with unleaded gasoline.

CAUTION:

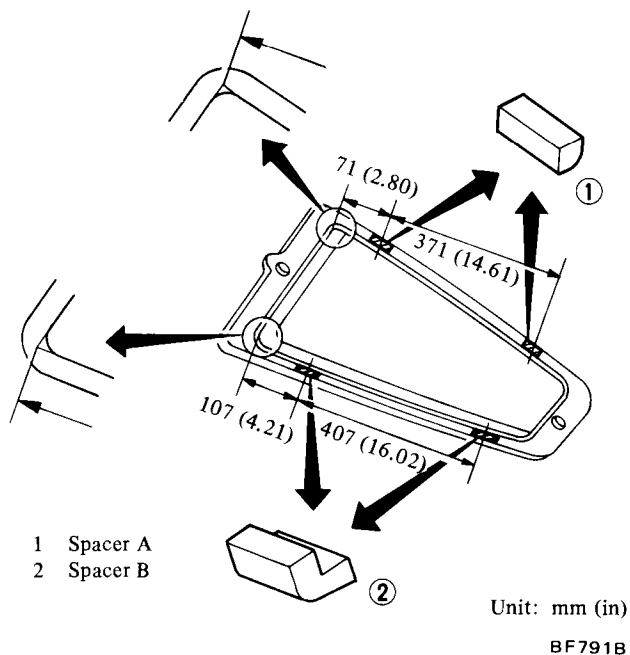
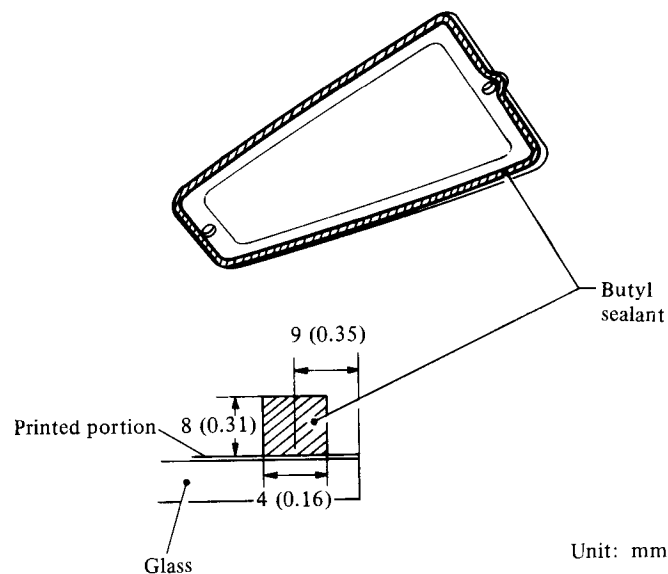
Do not allow oil, grease or water to get on clean surfaces.

2. Attach butyl sealant around entire periphery of side window glass so that inner edge is at specified distance from printed black area on glass. See Fig. BF-78.

- Do not touch surfaces of butyl sealant which contact with side window glass with hands, as this will reduce sealing effects.
- Always affix a continuous bead of butyl sealant. Be sure to overlap one end of butyl bead approximately 10 mm (0.39 in) over the other end. A break can cause water leakage.

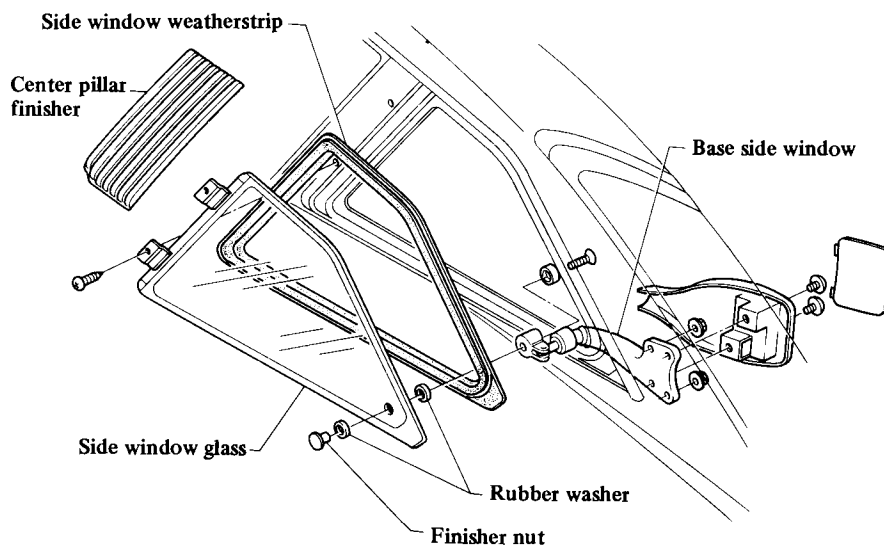
3. Install 4 spacers on side window opening. See figure.

Do not confuse spacers A and B and glass location each other. They differ in shape.



- Position side window glass in opening flange of side window.
- Using a heat gun, heat butyl sealant on inner side of side window to approximately 80°C (176°F), and apply hand pressure to glass.
- Tighten bolts and nuts securing side window glass.
- Install all previously removed parts in the order of removal.

SIDE WINDOW GLASS (2+2 seater)

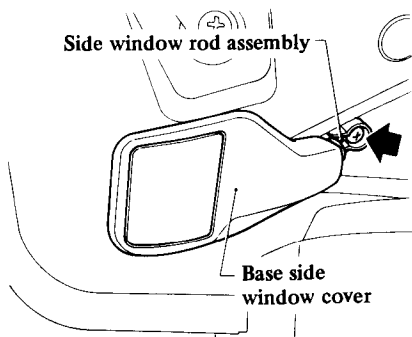


SBF527A

SIDE WINDOW

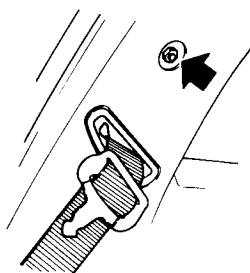
Removal and installation

1. Remove side window rod assembly.



SBF528A

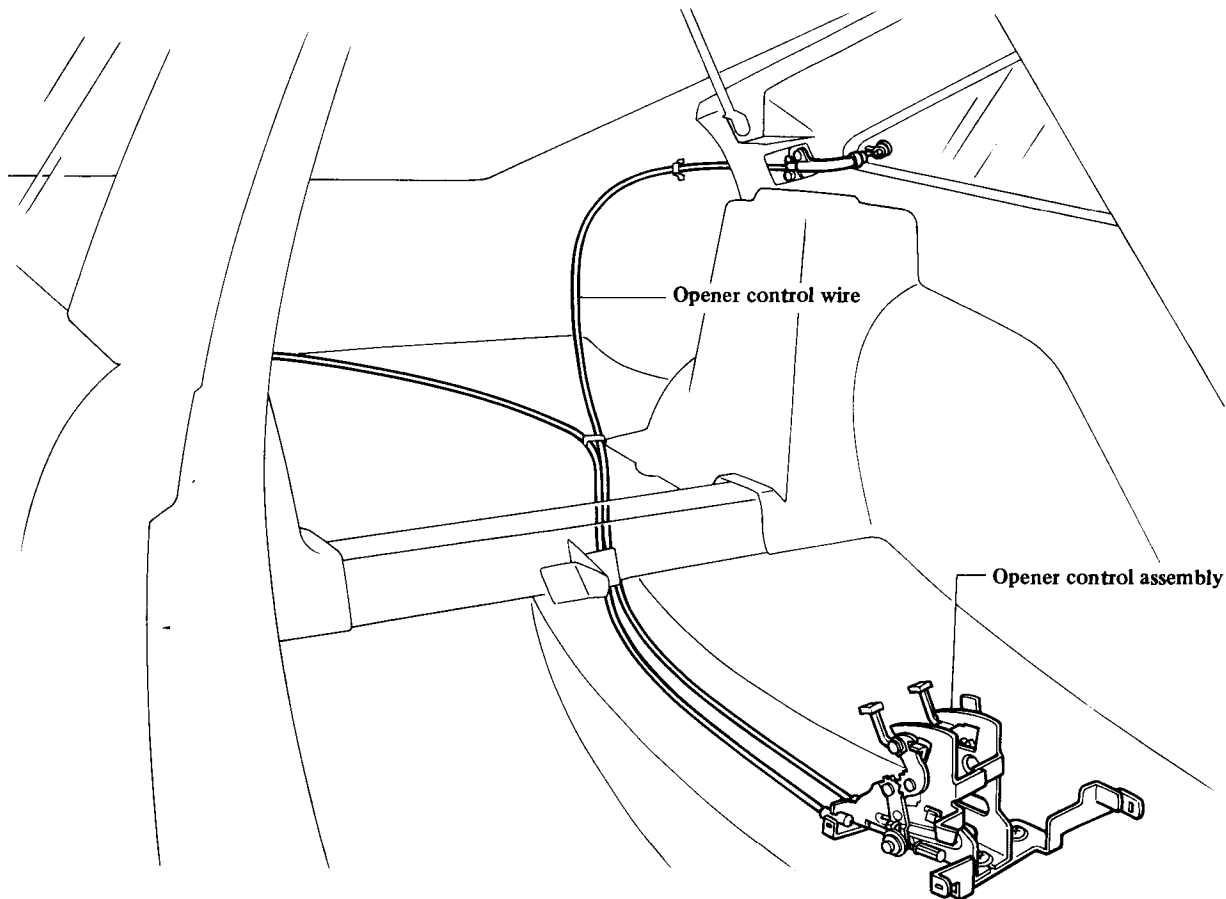
2. Remove center pillar finisher by loosening nut.



BF701B

3. Loosen screws attaching side window hinge and remove side window assembly.
4. Installation is in the reverse order of removal.

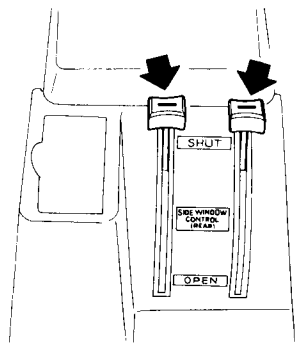
SIDE WINDOW OPENER



SBF529A

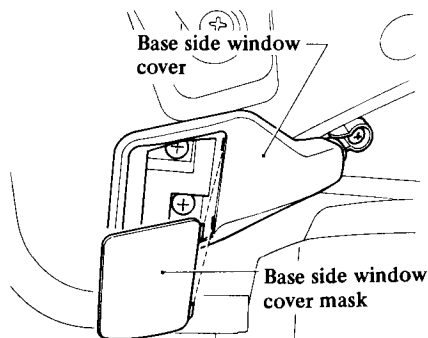
Removal and installation

1. Remove front seats and rear cushion, then remove seatback with rear carpet.
2. Take out rear floor padding.
3. Remove opener control knob, then remove console box.



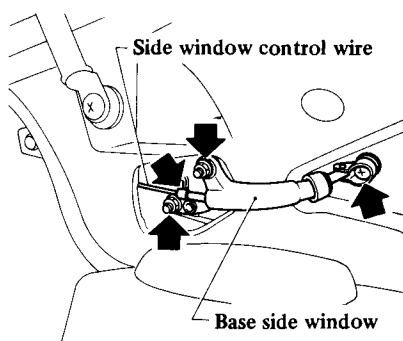
SBF530A

4. Remove base side window cover mask, then remove cover mask.



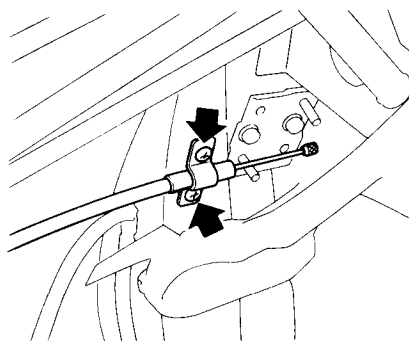
SBF531A

5. Remove base side window.



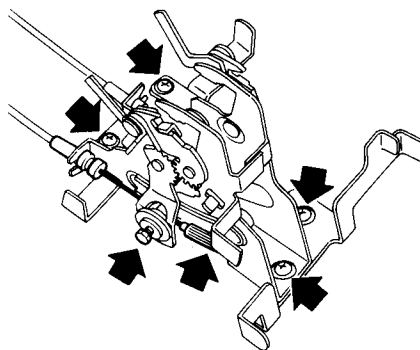
SBF532A

6. Remove rear panel finisher and rear body side trim, then remove control wire clamp.



SBF533A

7. Remove opener control assembly attaching screws and wire clamps, then draw out side window control wire.

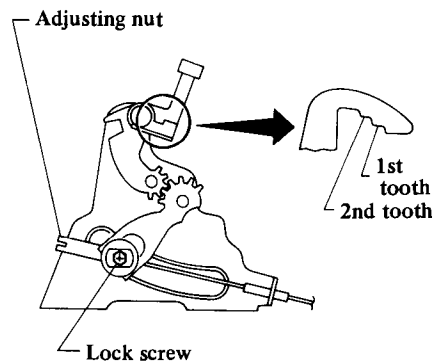


SBF534A

8. Installation is in the reverse order of removal.

After installation, make sure that side window opens smoothly.

Adjustment

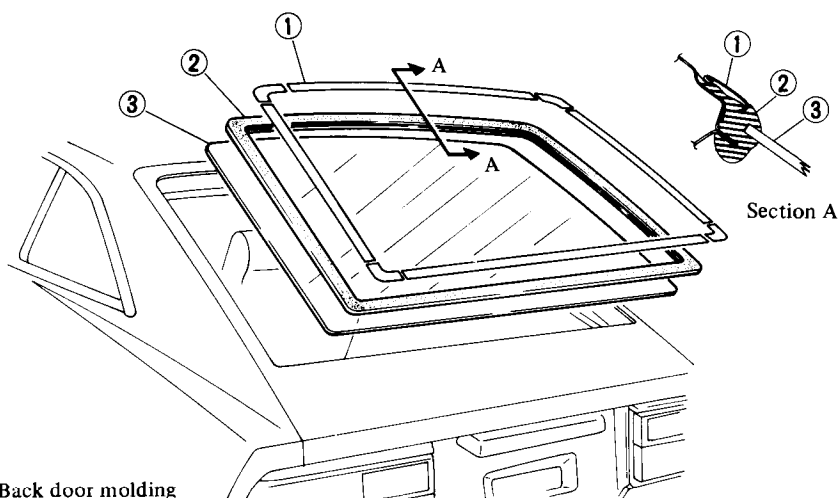


SBF535A

1. Set control lever stopper at 1st tooth.
2. Fully close side glass by turning adjusting nut and tighten lock screw securely.

When wire elongates to such an extent that stopper must be locked at 2nd tooth, loosen lock screw and turn adjusting nut so that stopper engages with 1st tooth. Tighten lock screw securely.

BACK DOOR GLASS

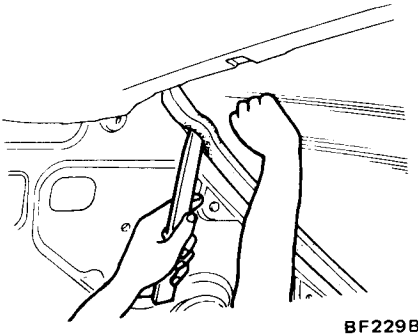


- 1 Back door molding
- 2 Weatherstrip
- 3 Back door glass

BF702B

REMOVAL

1. Place protective covers on back door and rear fenders.
2. Remove rear roof rail trim, rear panel finisher, rear body side trim and front body side trim. Then disconnect rear window defogger harness at connector.
3. Remove back door molding by prying out molding.
4. Attach two Suckers ST08800000 to glass beforehand for convenience in lifting out back door glass.
5. From inside passenger compartment, apply hand pressure to edges of back door glass and remove weatherstrip lip from body flange, starting from top to sides. Use a conventional screwdriver covered with cloth or other suitable tool and carefully put weatherstrip over body flange.



BF229B

6. After back door weatherstrip is free from body flange, with aid of a helper, carefully remove back door glass with Suckers ST08800000.

INSTALLATION

It is important that back door opening in body be checked thoroughly before installation of back door glass.

Procedure below includes checking of back door opening in body.

1. Check back door weatherstrip and back door opening in body for any irregularities.
2. Stick Suckers ST08800000 on back door glass. With aid of a coworker, carefully position glass in opening in body.

CAUTION:

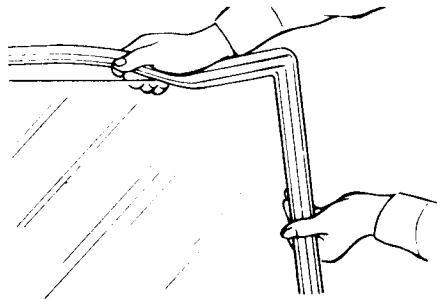
Care should be exercised to make certain glass does not strike body metal during installation. Edge chips can lead to future breaks.

3. With back door glass supported and centered in opening in body, check relationship between glass and opening around entire perimeter of glass.

- (1) Entire inside surface of glass should be in contact with opening.
- (2) Curvature of glass should conform to that of opening.
- (3) Mark any section of opening to be reformed. Remove glass and reform opening as required.

4. Install back door glass as follows:

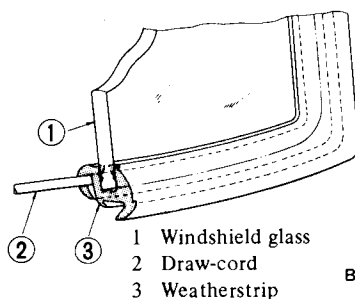
- (1) Install back door weatherstrip to glass.



BF647

- (2) Insert a strong cord in groove of weatherstrip where opening flange fits.

Insert cord so that its ends are at bottom center of glass.



BF648

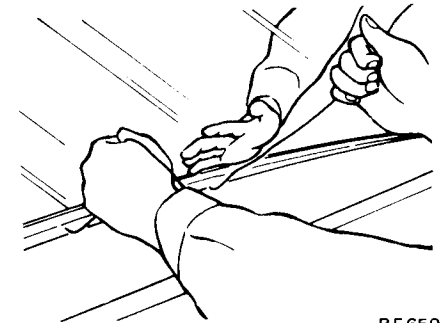
- (3) With aid of a helper, carefully position and center back door glass in opening in body, supporting it with Sucker ST08800000.

- (4) When glass and weatherstrip are properly positioned in opening, slowly pull ends of cord with a coworker pushing glass from outside, starting from lower center of back door glass to seal lip of weatherstrip on opening flange.

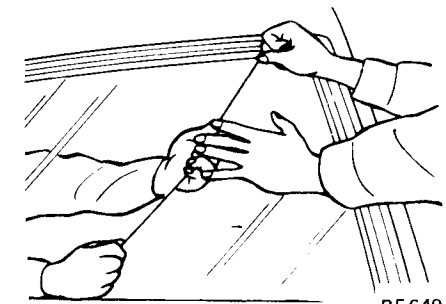
Cord should be pulled first across bottom of glass, then up each side and finally across top.

- (5) Carefully tap around back door glass to assist in seating weatherstrip on flange.

Never tap or hammer at glass to position.



BF650



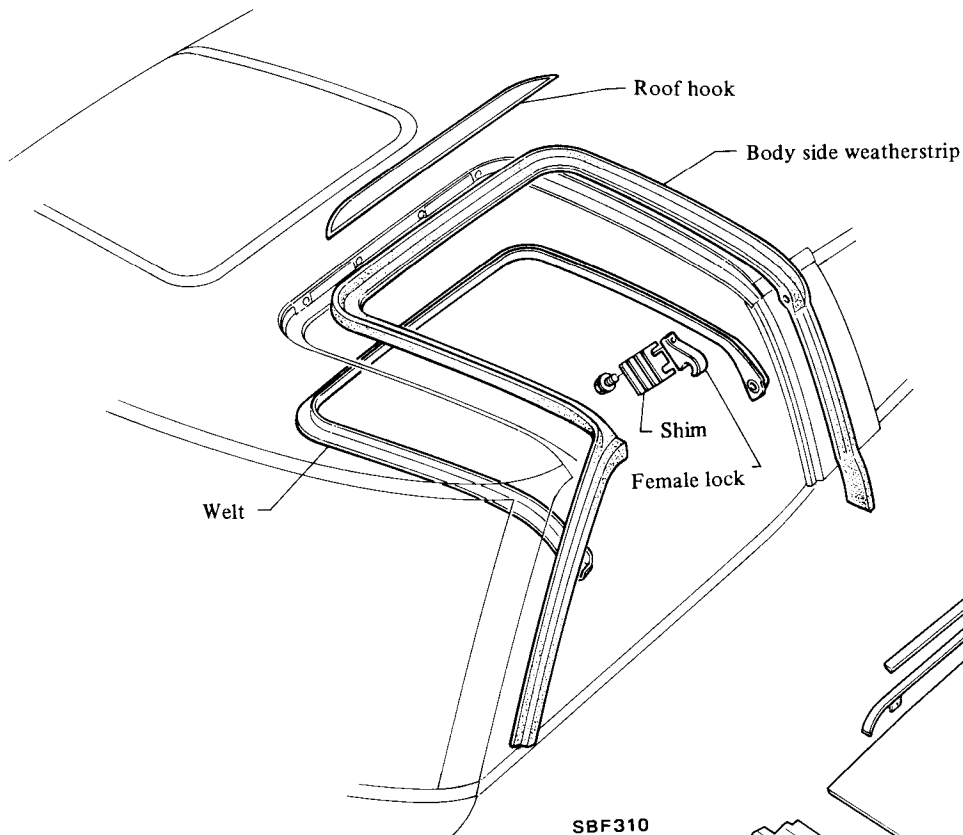
BF649

5. Install all previously removed parts.

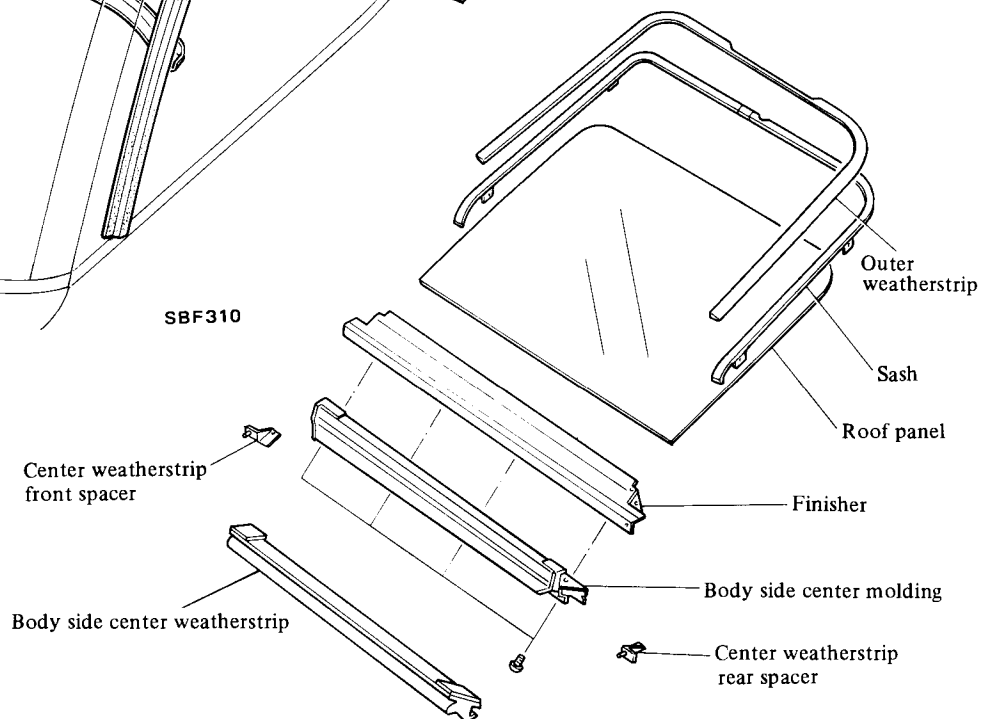
T-BAR ROOF

CONSTRUCTION

BODY SIDE



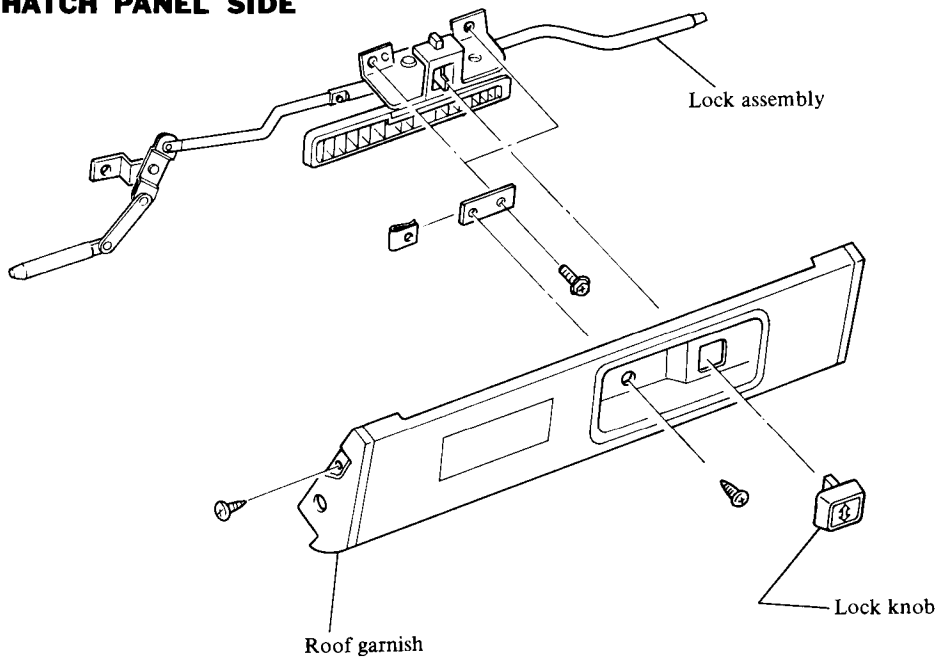
HATCH PANEL SIDE



Use a urethane, one-liquid adhesive agent to attach body side weatherstrips.

LOCK MECHANISM

HATCH PANEL SIDE



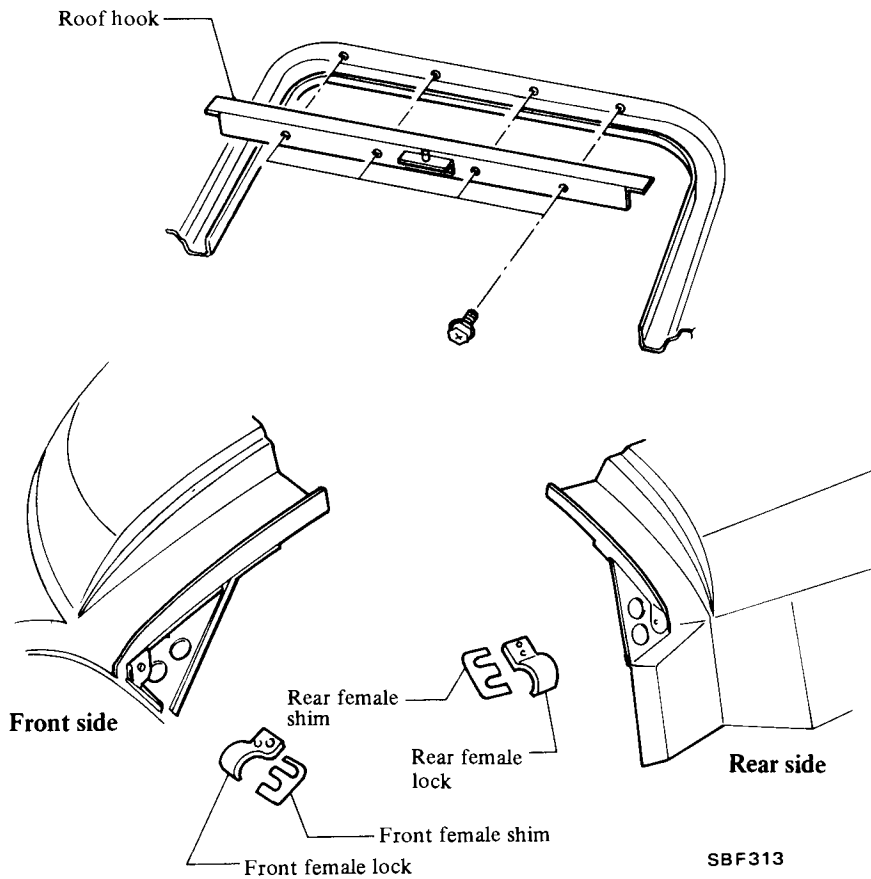
SBF312

Adjustment

Adjust height of hatch panel so that it is flush with body roof. To adjust, add or remove shim(s) between female and car body. Do not use more than five shims in one place.

1. Remove roof welt.
2. Add shim(s) when hatch panel is lower than body roof.
3. Remove shim(s) when hatch is higher than body roof.

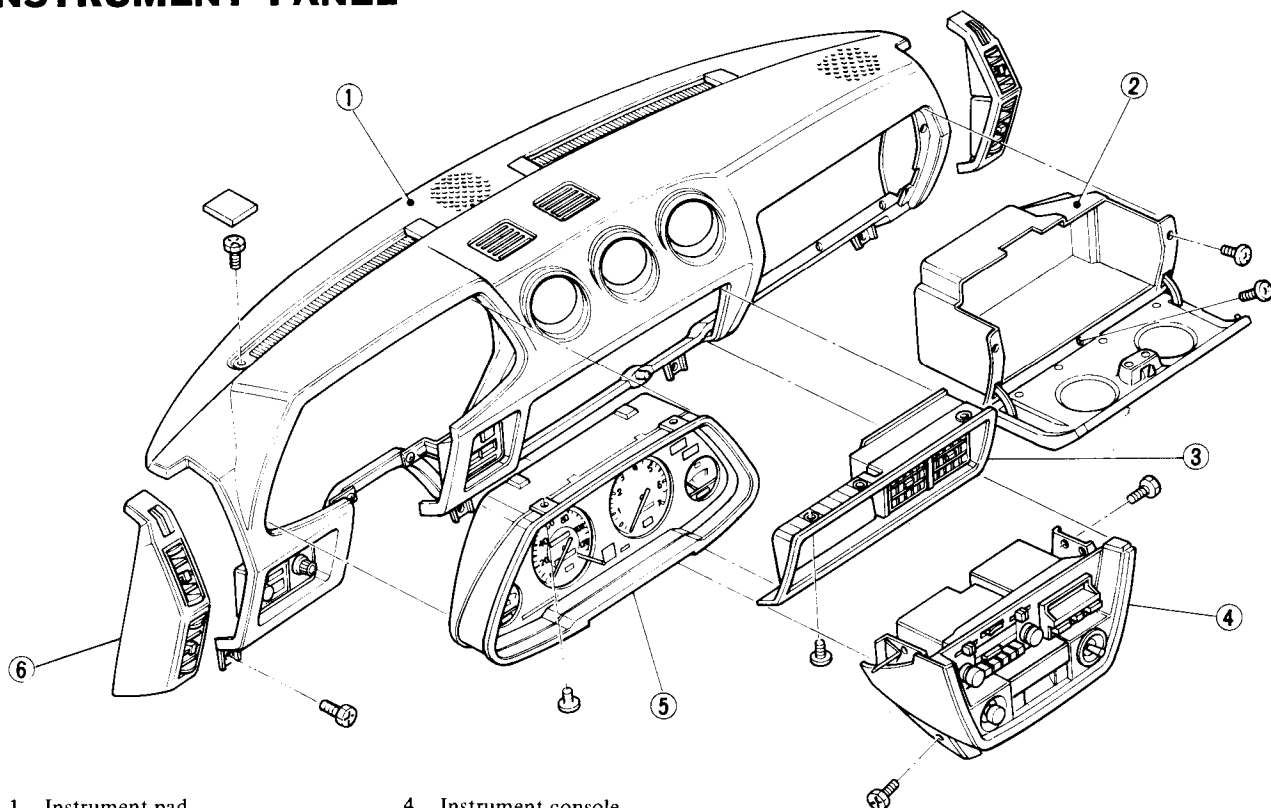
BODY SIDE



SBF313

INTERIOR

INSTRUMENT PANEL



- 1 Instrument pad
- 2 Glove box
- 3 Instrument center ventilator

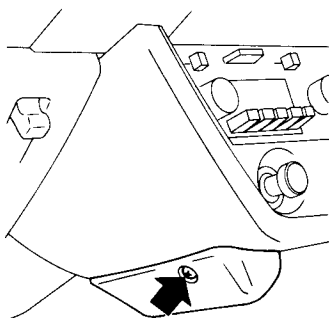
- 4 Instrument console
- 5 Combination meter
- 6 Side ventilator

BF 703B

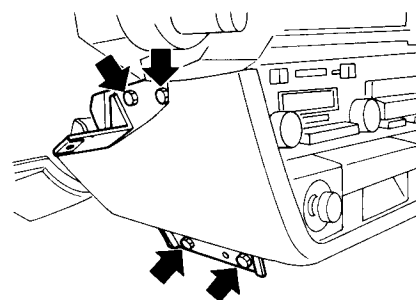
REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove horn pad, steering wheel and shell cover. Refer to Steering Wheel (Section ST) for removal.
3. Remove combination switch.
4. Remove instrument lower covers. Disconnect step lamp harness at connector and air conditioner vacuum tube.

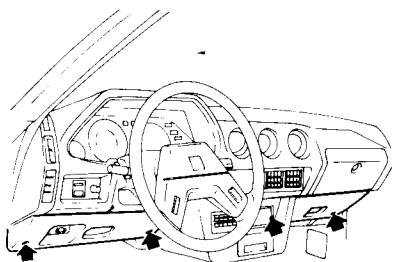
5. Remove instrument console bracket covers.



BF 705B



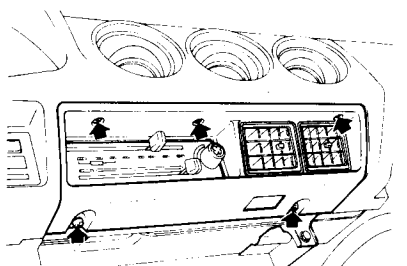
BF 706B



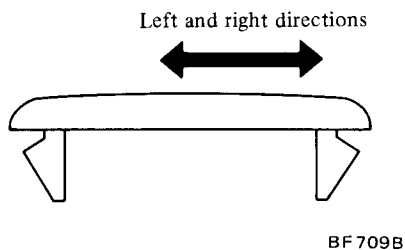
BF 704B

7. Remove instrument center ventilator.

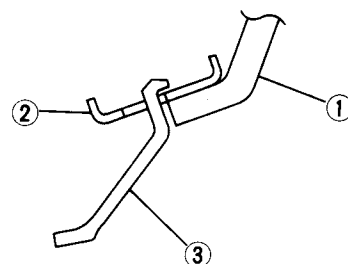
6. Remove instrument console.



BF 707B



BF 709B

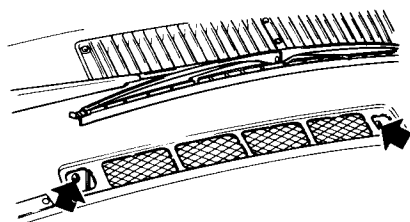


- 1 Pad
 - 2 Panel
 - 3 Instrument lower cover
- BF 710B

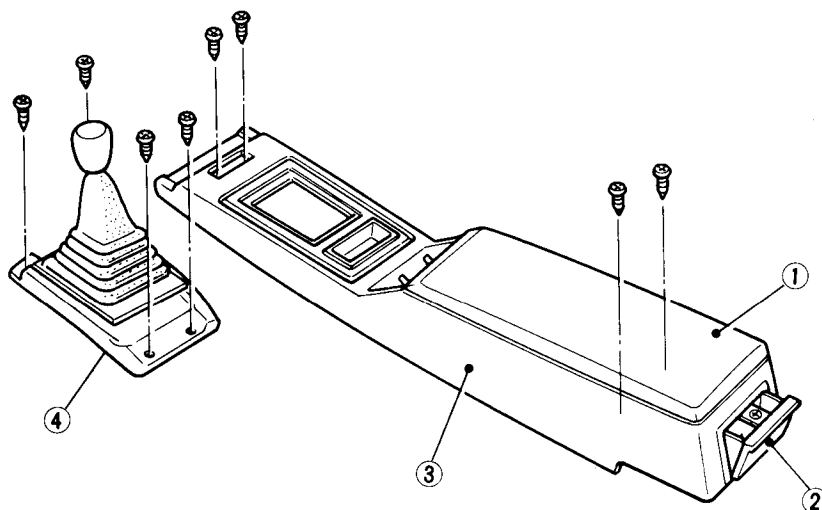
(3) When installing instrument lower cover, insert upper part of cover into instrument panel.

8. Remove heater control securing screws.
9. Remove speedometer cable intermediate connector.
10. Remove glove box lid.
11. Remove glove box attaching screws and remove pins in side box. Then lower upper face of box and remove glove box.
12. Remove instrument upper plugs and 4 instrument panel upper securing screws.

CONSOLE BOX



BF 708B



- 1 Console box lid
- 2 Ash tray
- 3 Console box
- 4 Control lever assembly

BF 711B

13. Remove instrument panel lower securing bolt as shown in figure.
14. Disconnect instrument harness connectors.
15. Remove instrument panel in horizontal direction while lifting heater control slightly.
16. Installation is in reverse order of removal, paying attention to following points.

- (1) When installing instrument panel, securely insert panel edge into instrument panel upper welt.
- (2) Be sure to install instrument upper plug as shown in figure.

1. Remove console box securing screws and disconnect outside mirror harness, at connector.
2. Remove console box.

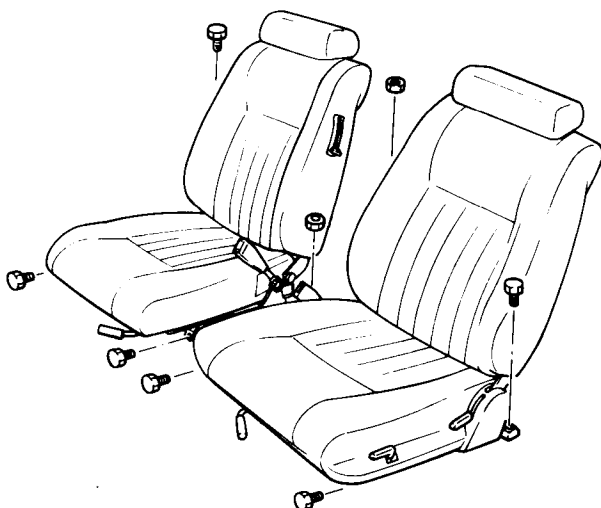
3. Remove control lever rubber boot.
4. Installation is in reverse order of removal.

SEAT

REMOVAL AND INSTALLATION

Front seat

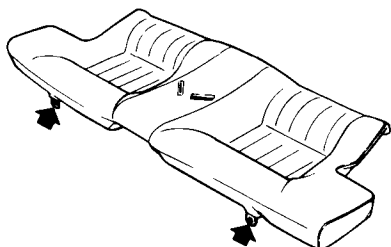
Front seat can be removed easily by removing attaching nuts and bolts.



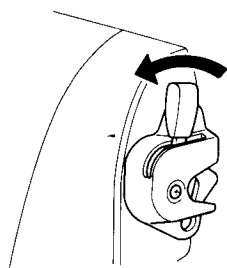
BF712B

Rear seat

Remove rear seat cushion. Then remove rear seat back by removing bolts and unlocking lock knob.



BF713B



BF714B

SEAT BELT

DESCRIPTION

The front seat belts are a three-point type consisting of an inner lap and an outer lap-shoulder belt.

This lap-shoulder belt is provided with an Emergency Locking Retractor which locks the belt by detecting car deceleration.

This retractor serves to restraint the belt securely in case of emergency, as in a collision or sudden stop of the car, thus protecting the seat occupant against serious injury. Under normal condition, the belt can be freely pulled out.

The inner lap belt is combined with a buckle. The buckle on drivers seat includes a switch which is used as a seat belt warning device.

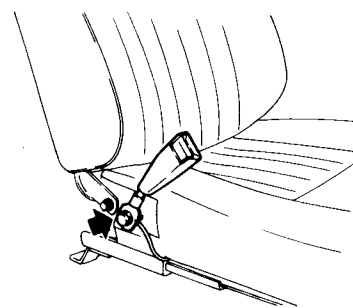
The rear seat belt is a two-point type and includes an automatic belt locking-retracting device.

CAUTION:

1. In conformity with MVSS No. 302, be sure to remove the thin polyethylene covers from seat belts at:
 - 1) Pre-delivery service
 - 2) Parts replacements
2. If the car is collided or overturned, replace the entire belt assembly, regardless of nature of accident.
3. If the condition of any component of a seat belt is questionable, do not have seat belt repaired, but replaced as a belt assembly.
4. If webbing is cut, frayed, or damaged, replace belt assembly.
5. Do not spill drinks, oil, etc. on inner lap belt buckle. Never oil tongue and buckle.
6. Use a NISSAN genuine seat belt assembly or equivalent.

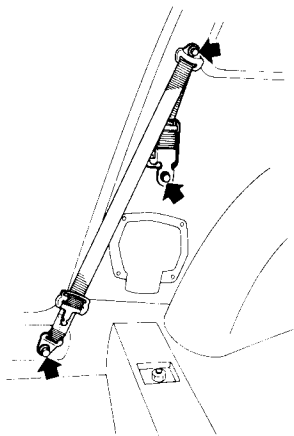
REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Loosen bolt attaching inner lap belt.



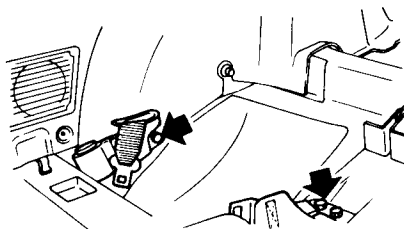
BF715B

3. On driver's seat, disconnect seat belt warning device harness connector and remove inner lap belt.
4. Remove front side body trims.
5. Remove lap-shoulder belt with Emergency Locking Retractor.



BF716B

6. Remove seat cushion, then remove rear seat belts.



BF717B

7. Install front and rear seat belts in reverse order of removal.

Ⓙ : 24 - 31 N·m
(2.4 - 3.2 kg-m,
17 - 23 ft-lb)

INSPECTION OF SEAT BELT SWITCH

The contacts of seat belt switch are normally closed. When tongue latches buckle, the tip end of tongue pushes push rod to open the switch contacts.

1. Disconnect battery ground cable.
2. Disconnect seat belt switch wire harness.
3. Check seat belt switch for proper operation, using a test light. The light should go out when tongue of outer lap belt latches buckle, and go on when it unlatches buckle. Replace belt assembly if necessary.

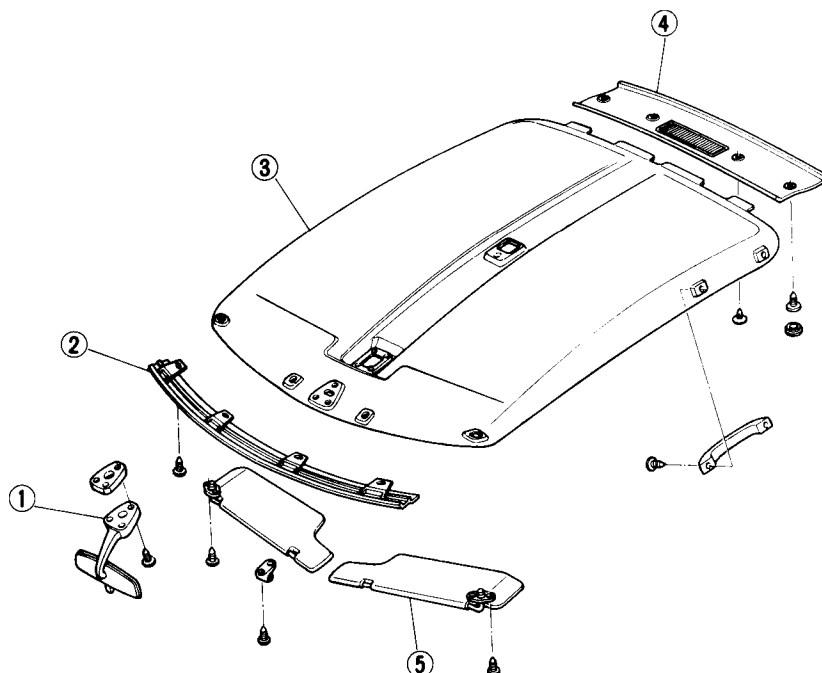
When checking seat belt switch operation, make sure that power is held below 16 volts and 13 mA.

TRIM AND MOLDING

ROOF TRIMMING

REMOVAL AND INSTALLATION

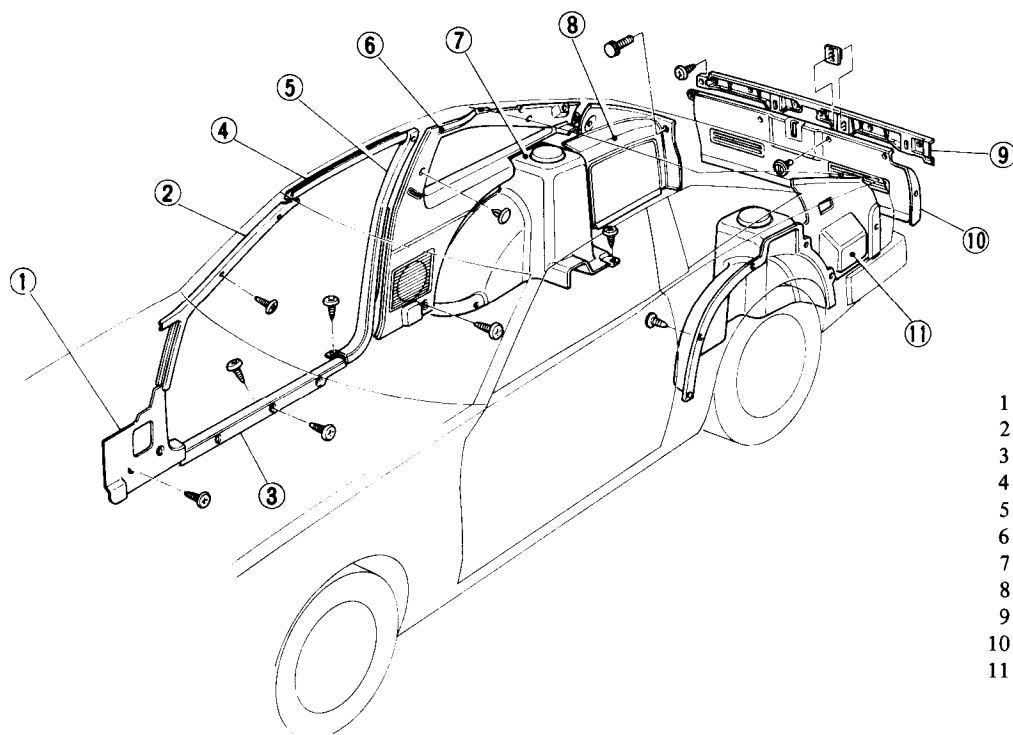
1. Remove roof rail rear finisher.
2. Remove assist grips, coat hangers, roof welt (T-bar roof model), sun visors, inside mirror, body side welt and pillar garnish lock. Then remove head lining.
3. Installation is in reverse order of removal.



- 1 Inside mirror
- 2 Windshield garnish
- 3 Headlining
- 4 Rear roof rail trim
- 5 Sun visor

BF718B

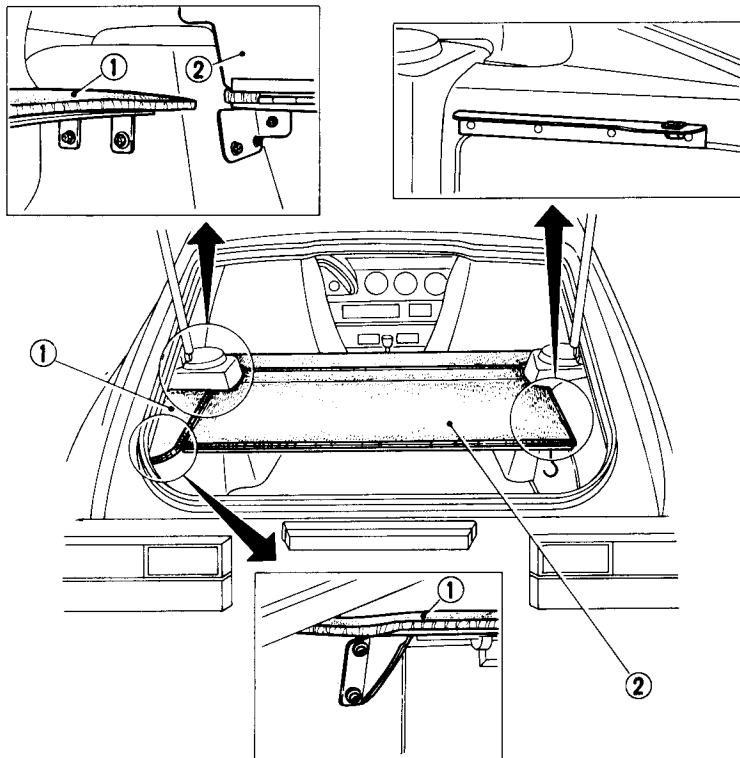
BODY SIDE TRIM AND MOLDING



- 1 Dash side trim
- 2 Front pillar garnish
- 3 Kicking plate
- 4 Side body welt
- 5 Lock pillar garnish
- 6 Front body side trim
- 7 Wheel house trim
- 8 Space saver spare tire cover
- 9 Rear finisher support
- 10 Rear panel finisher
- 11 Rear body side trim

BF719B

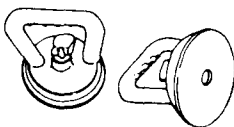
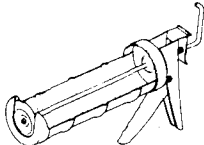
TONNEAU COVER



- 1 Side tonneau cover
- 2 Center tonneau cover

BF720B

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name
ST08800000 (-)	Sucker 
ST08810000 (-)	Caulking hand gun 

HEATER & AIR CONDITIONER

SECTION HA

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HA-78

Refer to Section MA (Heater and Air Conditioner) for:

- CHECKING REFRIGERANT LEVEL
- CHECKING REFRIGERANT LEAKS

Refer to Section MA (Basic Mechanical System) for:

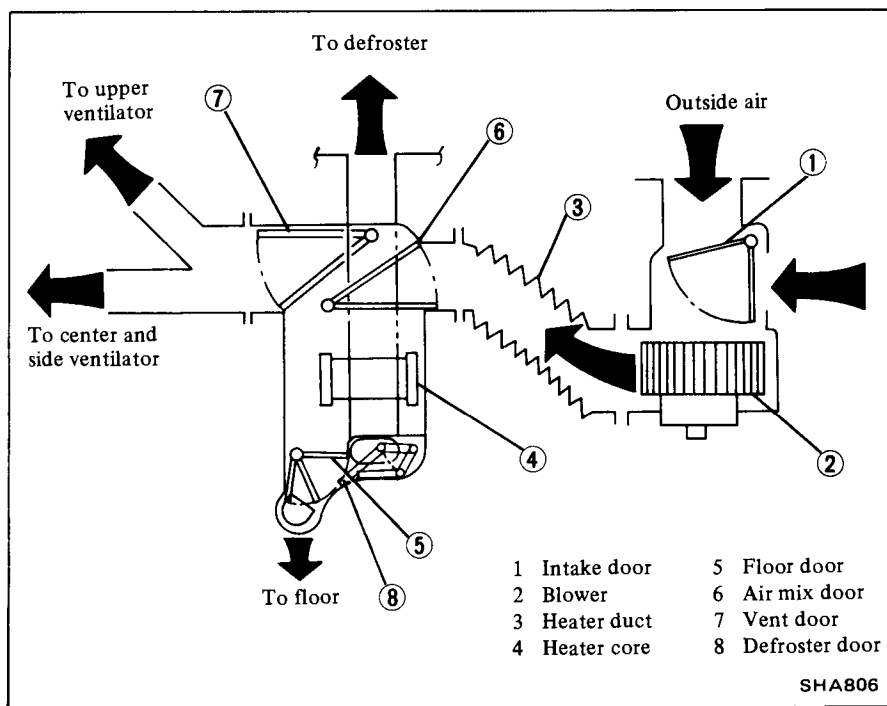
- CHECKING AND ADJUSTING DRIVE BELTS

DESCRIPTION (Heater)

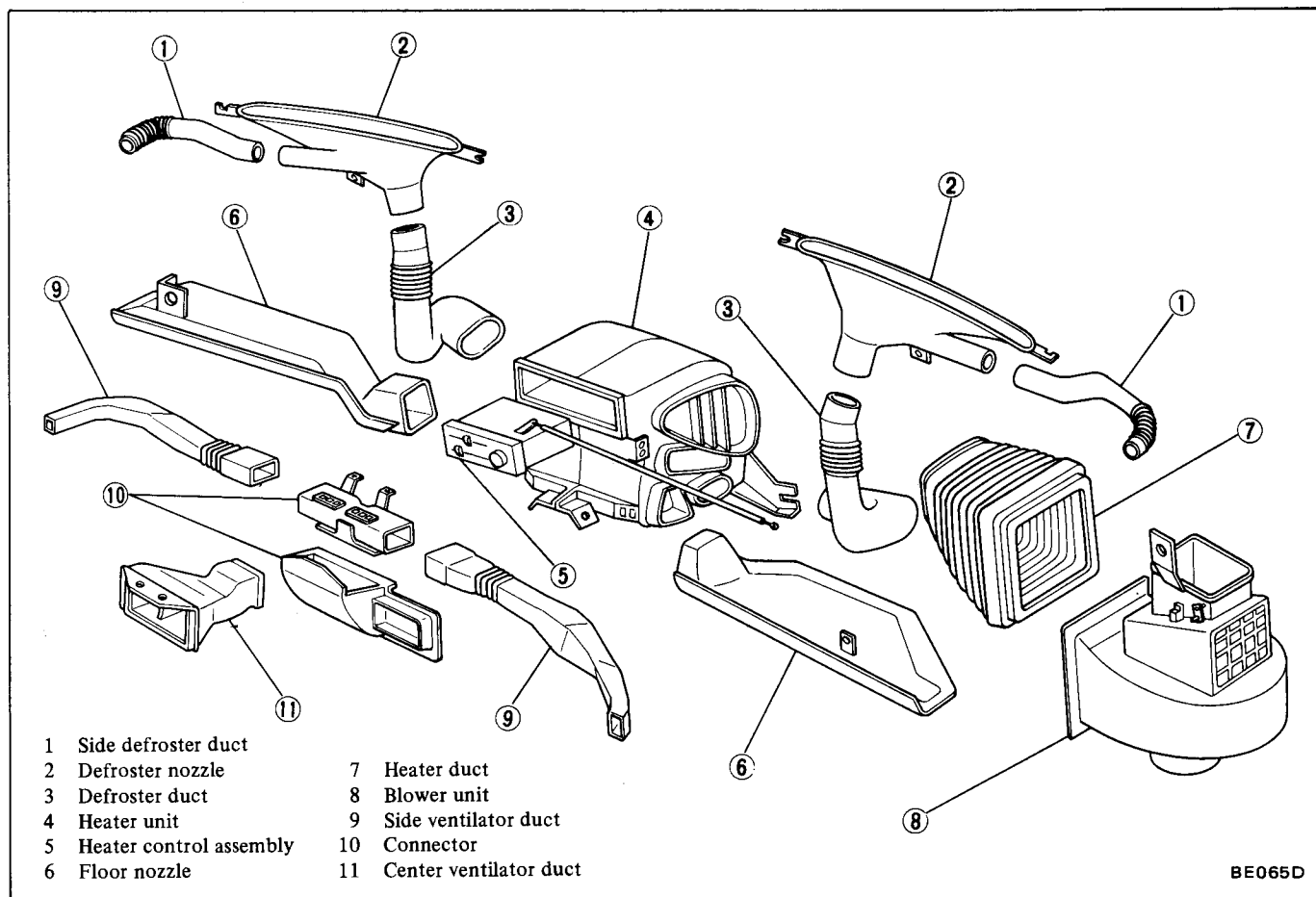
HEATER SYSTEM

Outside air drawn in through the cowl top grille is directed through the air intake box to the heater unit by the fan. The heater unit includes an air mix door which controls the air temperature, and a ventilation door and floor door which change the distribution of air flow. The intake door inside the intake box shuts out the outside air when the heater is off.

The heater controls, consisting of two levers and one knob, are located in the middle portion of the instrument panel. They are the **MODE** lever which selects the air outlet, the **TEMP** lever which controls the temperature and the **FAN** switch knob which regulates air flow with the fan.

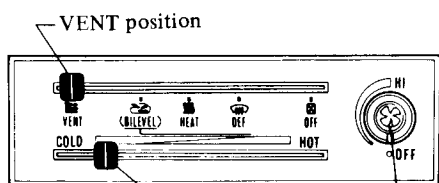


HEATER COMPONENTS



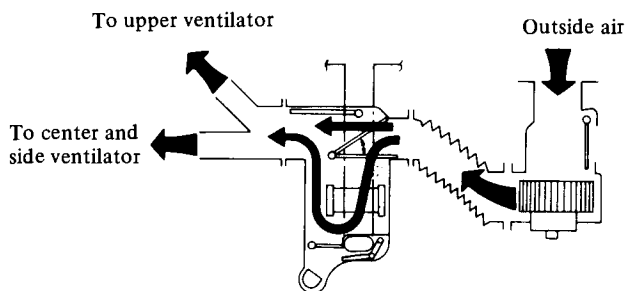
AIR FLOW

VENTILATING

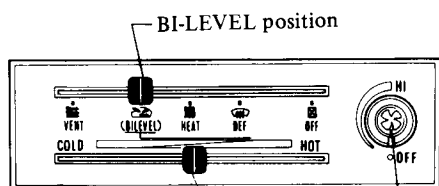


Move the lever to the desired temperature.

Turn the knob to the desired air flow.

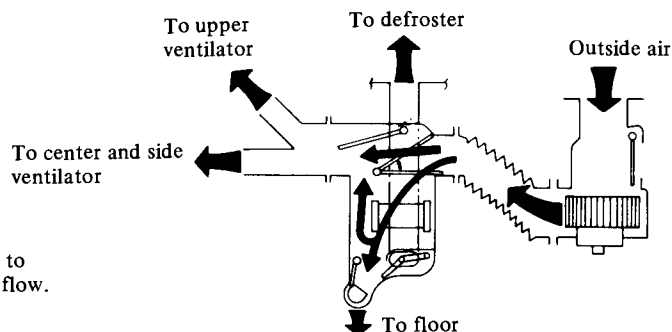


BI-LEVEL

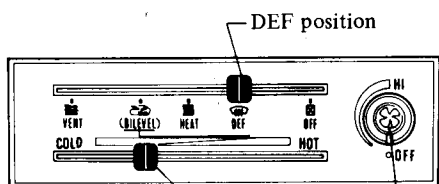


Move the lever to the desired temperature.

Turn the knob to the desired air flow.

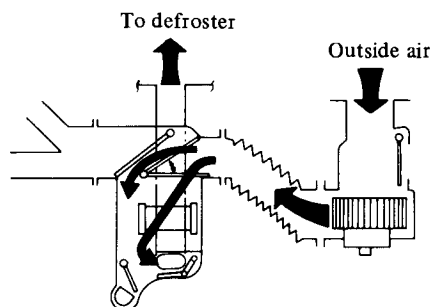


DEFROSTING

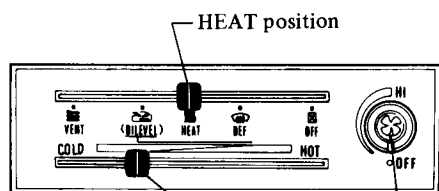


Move the lever to the desired temperature.

Turn the knob to the desired air flow.

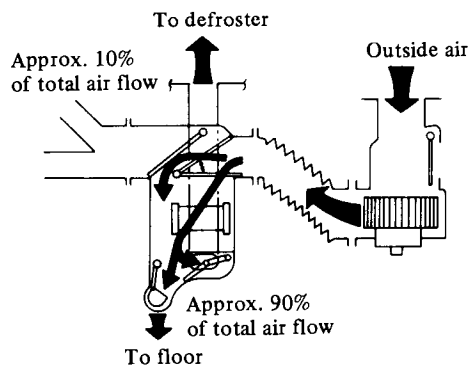


HEATING

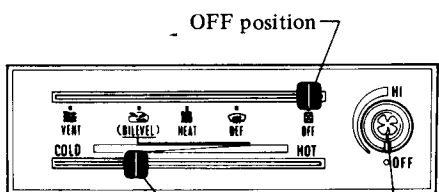


Move the lever to the desired temperature.

Turn the knob to the desired air flow.

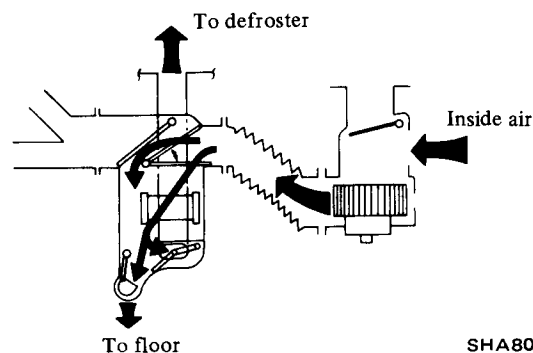


RECIRCULATING



Move the lever to the desired temperature.

Turn the knob to the desired air flow.



SERVICE PROCEDURES (Heater)

REMOVAL AND INSTALLATION

HEATER CONTROL ASSEMBLY

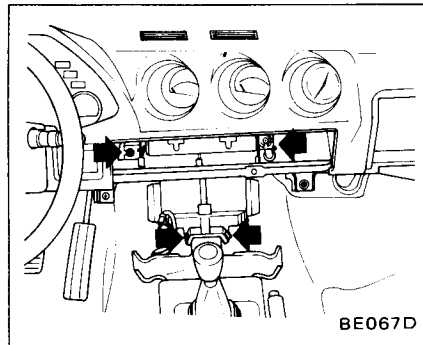
1. Disconnect battery ground cable.
2. Remove instrument lower covers, floor nozzles and defroster ducts.
3. Remove instrument console. Refer to Section BF.
4. Remove instrument center ventilator.
5. Disconnect door control cables and rod at each door.
6. Remove heater control assembly by loosening attaching screws.
7. Install heater control assembly in the reverse order of removal. After installing heater control assembly, control cables and rod must be adjusted by referring to Adjusting Heater Control.

HEATER UNIT

1. Disconnect battery ground cable.
2. Set TEMP lever to max. HOT position and drain engine coolant.
3. Remove instrument lower covers, floor nozzles, defroster ducts instrument console and instrument center ventilator.

Refer to Section BF.

4. Remove glove box. Refer to Section BF.
5. Remove heater duct.
6. Disconnect control cables and rod from heater unit.
7. Remove heater control assembly by loosening attaching screws.
8. Disconnect inlet and outlet heater hoses from passenger compartment.
9. Remove blower assembly. Refer to Blower Assembly.
10. Remove bolts attaching heater unit and then remove heater unit.

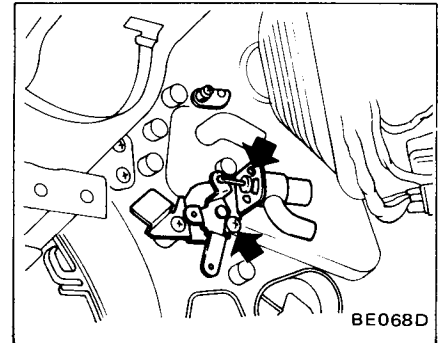


11. Install heater unit in the reverse order of removal. After installing heater unit, adjust control cable by referring to Heater Control Adjustment.

WATER COCK

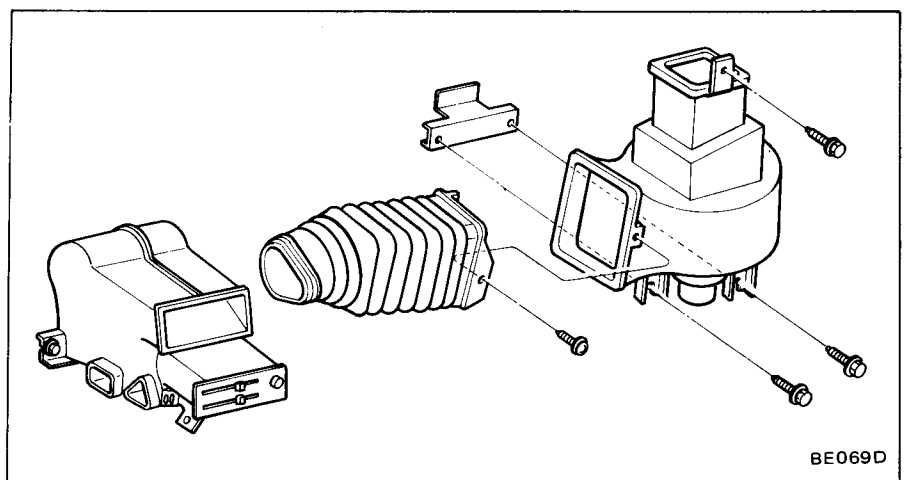
1. Disconnect battery ground cable.
2. Remove instrument lower cover, floor nozzle and defroster duct on the right side.
3. Drain engine coolant.
4. Remove heater duct.
5. Disconnect outlet and inlet hoses, and loosen clamp of hose connecting water cock to heater unit.
6. Disconnect temperature control cable and air-mix door rod from water cock lever.
7. Remove water cock by loosening retaining screws.

8. Install in the reverse order of removal. After installing water cock, adjust control cable and rod by referring to Heater Control Adjustment.



BLOWER ASSEMBLY

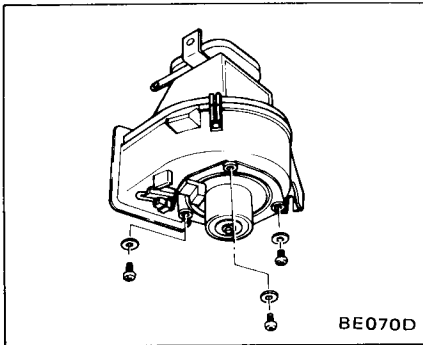
1. Disconnect battery ground cable.
2. Remove instrument lower cover and glove box.
3. Remove floor nozzle, defroster duct and side defroster duct on the right side.
4. Remove heater duct.
5. Disconnect wire harness at blower motor harness connector.
6. Disconnect control cable at blower assembly by removing clip.
7. Remove bolts securing blower assembly and then remove blower assembly.



8. Installation is in the reverse order of removal.

BLOWER MOTOR

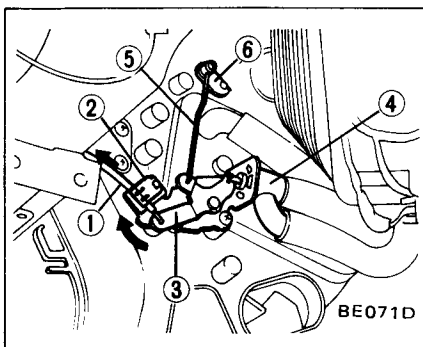
1. Disconnect battery ground cable.
2. Remove instrument lower cover and floor nozzle on the right side.
3. Disconnect wire harness at blower motor harness connector.
4. Remove blower motor attaching screws, and then remove blower motor with fan.



5. Installation is in the reverse order of removal.

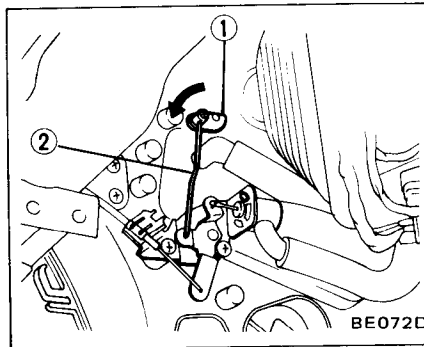
HEATER CONTROL ADJUSTMENT**TEMPERATURE CONTROL CABLE**

1. Set temperature lever in maximum cold position.
2. Temporarily tighten control rod mounting screw.
3. Push water cock lever in the direction of arrow (to closing side), and press temperature control cable outer case in the direction of arrow (to temperature lever side). While doing so, secure outer case with clip.



- | | |
|---|----------------------|
| 1 Temperature control cable outer cable | 4 Water cock |
| 2 Clip | 5 Rod |
| 3 Water cock lever | 6 Air-mix door lever |

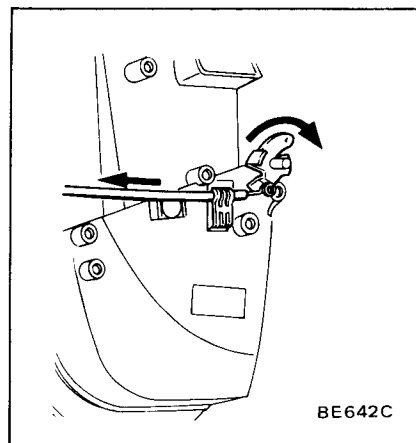
4. Set temperature lever in maximum HOT position, and tighten securely control rod to air-mix door lever while pushing the lever in the direction of arrow.



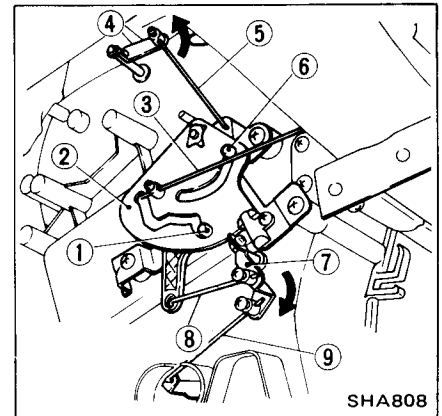
- | |
|----------------------|
| 1 Air-mix door lever |
| 2 Rod |

AIR INTAKE DOOR

1. Set MODE lever at OFF position.
2. Push air intake door lever in direction of arrow (to shut out outside air flow), and press air intake door control cable outer case in direction of arrow. While doing so, secure outer case with clip.

**AIR CONTROL ROD, VENTILATION DOOR ROD, FLOOR DOOR ROD AND DEFROSTER DOOR ROD**

1. Set MODE lever at VENT position.
2. Bring link into contact with stoppers A and B and secure air control rod.



- | |
|--------------------------|
| 1 Stopper A |
| 2 Link |
| 3 Air control rod |
| 4 Ventilation door lever |
| 5 Ventilation door rod |
| 6 Stopper B |
| 7 Floor door lever |
| 8 Floor door rod |
| 9 Defroster door rod |

3. Under this condition, push up on ventilation door lever in direction of arrow and secure ventilation door rod.
- Then push floor door lever in direction of arrow and secure floor door rod.
4. Set MODE lever at DEF position.
5. Open defroster door fully and secure defroster door rod.

DISASSEMBLY AND ASSEMBLY OF HEATER UNIT

1. Remove heater unit.
2. Remove water cock.
3. Remove clips securing right and left heater case, then separate heater case.
4. Take out heater core.
5. Assemble heater unit in the reverse order of disassembly.

INSPECTION

Inspect all parts of heater for damage. Refer to Trouble Diagnoses and Corrections. For electrical system, check wiring, fan switch and fan motor for continuity.

If fan motor fails to rotate, check following items.

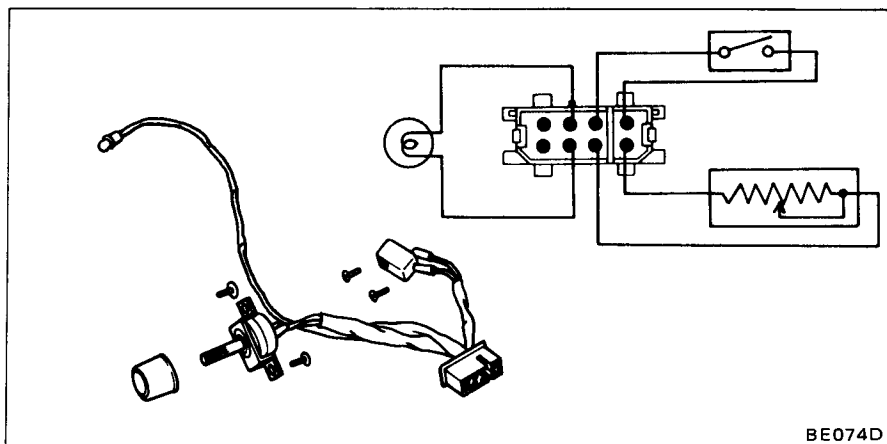
1. Fuse and fusible link.
2. To check for burned out fuse, follow same procedure as for ordinary fuses using a circuit tester or test lamp.
3. Loose wire connection.

BLOWER MOTOR POWER SUPPLY

1. Disconnect blower motor harness to connect main harness.
2. Connect one test lamp lead wire to “LB” wire terminal in connector of main harness for blower motor and the other to ground.
3. Turn ignition switch to “ACC” position. Test lamp should go on.

FAN SWITCH

Test continuity through fan switch with a test lamp or ohmmeter.



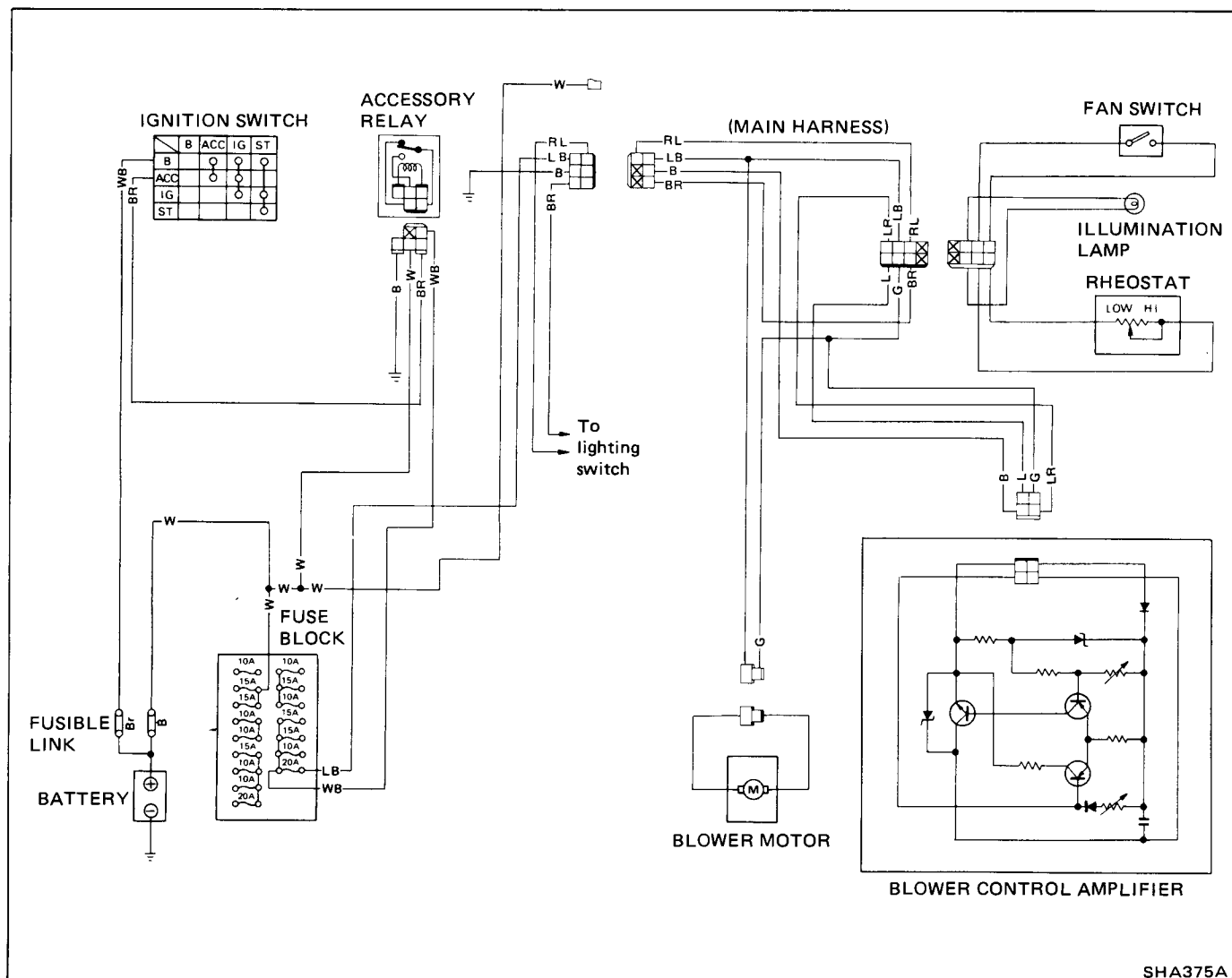
BE074D

BLOWER MOTOR

1. Disconnect lead wire at 2-pole type connector.
2. Test continuity between lead wires. Continuity should exist.

ELECTRICAL CIRCUIT (Heater)

WIRING DIAGRAM



SHA375A

TROUBLE DIAGNOSES AND CORRECTIONS (Heater)

Condition	Probable cause	Corrective action
Insufficient heating performance. No heated air discharged.	Cooling water temperature too low. Heater core plugged. Insufficient cooling water level. Malfunctioning air mix door. Malfunctioning water cock.	Check thermostat. Replace as necessary. Clean. Refill. Adjust control cable. Adjust control cable.
Insufficient air flow to floor.	Blower motor speed too low. Malfunctioning floor door.	Check motor terminal voltage. Repair poor connection and discontinuity. Replace motor if necessary. Replace blower control amplifier if necessary. Adjust control cable.
Insufficient defrosting performance. Cold air discharged.	Refer to "No heated air discharged".	
Insufficient air flow to defroster.	Malfunctioning floor door (or faulty seal). Defroster nozzle plugged. Leak at defroster duct-to-nozzle connection.	Adjust control cable. Clean. Correct.
Heated air discharged with lever in VENT.	Water cock not operating properly. Mode door not operating properly (or seal damaged).	Adjust control cable. Adjust control cable.
Blower motor does not run.	Fuse melted. Motor wire connector disconnected. Faulty switch. Faulty motor. Faulty blower control amplifier.	Correct cause and replace. Correct. Replace. Check and correct. Replace.
Control lever drags.	Inner wire rubbing against outer case end. Control cable bent excessively. Malfunctioning doors, door levers, etc.	Adjust control cable. Correct. Check and correct.
Outside air comes in with fan in OFF.	Air intake door not operating properly. Control cable out of adjustment.	Repair or replace. Adjust control cable.
Noise from blower motor.	Loose bolt in blower motor.	Check and tighten loose bolts.

GENERAL SERVICE (Air conditioner)

REFRIGERANT R-12

The refrigerant used in the air conditioner is generally called "Refrigerant-12 (R-12)". No other refrigerant than the above refrigerant should be used.

Note: Exercise care when handling refrigerant as it is stored under high pressure.

COMPRESSOR OIL

The "SUNISO 5GS" refrigeration lubricant should be used to assure the successful compressor operation. Use of oils other than recommended or mixing of the oil with other oils would cause chemical reaction or lead to lowered viscosity or deficient lubrication.

GENERAL SERVICE INSTRUCTIONS

If dirt, water or air enters the air conditioner system, it will be seriously affected. Be sure to observe the following:

1. Always keep the working place clean and dry and free from dirt and dust. Wipe water off from the line fittings with a clean cloth before disconnecting.
2. Have all necessary tools in preparation beforehand and have tools clean and dry.
3. Handling plug when the system line is disconnected.
4. Handling compressor oil

For details, refer to each description in this manual.

SAFETY 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.
- The above precautions are essential in handling of Refrigerant-12, and their strict observation requires sufficient training. Therefore, it is of first importance that any other personnel should not be allowed to handle the refrigerant.

EVACUATING AND CHARGING SYSTEM

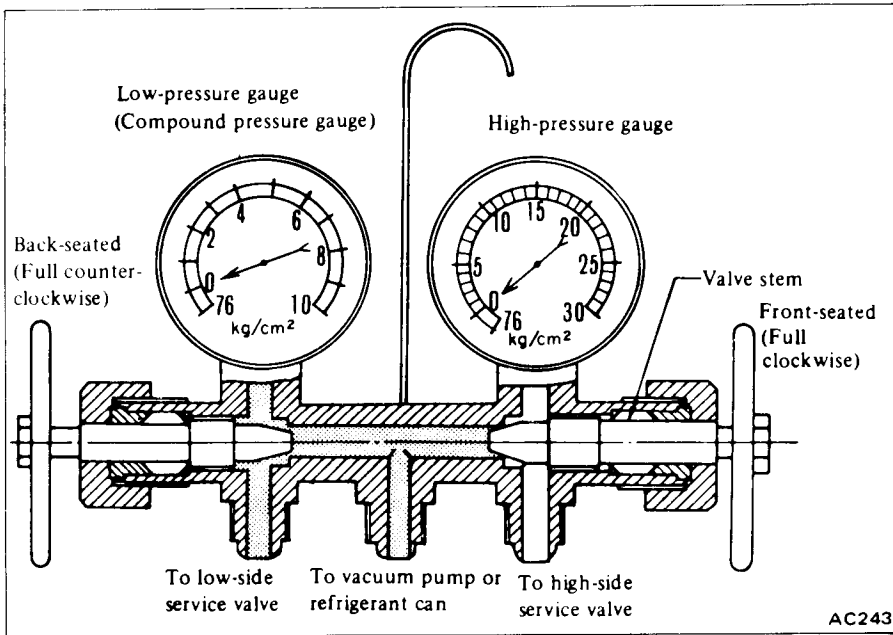
During servicing, use caution to keep air from getting into refrigerant. When air enters the system, all refrigerant must be evacuated from system prior to charging new refrigerant. Air in refrigerant has the following deleterious effects:

1. Since the condensation temperature of the air is extremely low, the air will not be condensed when refrigerant gas is condensed in the condenser, and the air will thus remain in gaseous form. Consequently, the effective thermal transmission area of condenser for refrigerant gas will be reduced and refrigerant gas to be condensed will be reduced. The pressure rise will become proportional to the volume of the air in system.
2. When air and refrigerant are mixed in system, a chemical reaction will be produced and hydrochloric acid which will adversely affect the aluminum, copper, iron, and other materials in system may be generated.

HANDLING MANIFOLD GAUGE

The pressure at the high- and low-sides of system should be measured when evacuating and charging refrigerant and when diagnosing trouble in the system. The manifold gauge is used for these purposes. A manifold gauge has two pressure gauges; a low pressure gauge and a high pressure gauge. These gauges are connected to the high- and low-side service valves of system through flexible charging hoses. The construction of manifold gauge is shown in the figure.

When valve stem is fully screwed, the valve is front-seated and valve path and the center path are blocked. When valve stem is backed off, the paths are opened.



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. The refrigerant gas will be discharged since check valve is open when pressing charging hose onto service valve.
3. Next, loosen the connection fitting of charging hose at manifold gauge side for 2 to 3 seconds to purge any air inside charging hose by the pressurized gas in system.

Disconnection from service valve

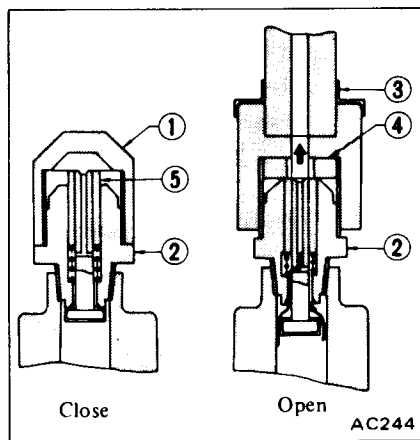
1. Fully close both valves of manifold gauge.
2. Disconnect two charging hoses from service valves. At this time, the gas will be discharged until check valve is closed. Therefore, disconnect hose quickly.

WARNING:

Work with fingers protected with cloth against frostbite by refrigerant.

HANDLING SERVICE VALVE

An automatic check valve is built into service valve. When this valve presses against the connection fitting, that is, when charging hose is connected to service valve, the valve is open. When charging hose is disconnected, the valve is closed automatically. Always observe the following usage precautions:



- | | |
|-----------------|---------------|
| 1 Cap | 4 Packing |
| 2 Service valve | 5 Check valve |
| 3 Charging hose | |

1. Always install valve cap after using service valve.

When high speed operation is performed without valve cap, a negative

pressure will gradually build up at the low pressure side of system and air may be sucked in. In addition, dirt and dust will easily enter the valve resulting in foreign matter entering the system.

CAUTION:

Do not over-tighten valve cap.

2. Check valve will be half opened during connection and disconnection of charging hoses and refrigerant will be forcefully discharged. Therefore, connect and disconnect charging hoses quickly while pressing flare nut of charging hose against service valve.

WARNING:

Work with fingers protected with cloth against frostbite by refrigerant.

3. Since close contact between the thread of valve cap and the thread of service valve will prevent gas leakage, keep these areas clean and free of scratches and damage.
4. Since packing of charging hose will be lost during long use, always check packing prior to installing charging hose.

HANDLING CAN TAP

A wide variety of can taps are available. The following procedures apply to conventional can taps.

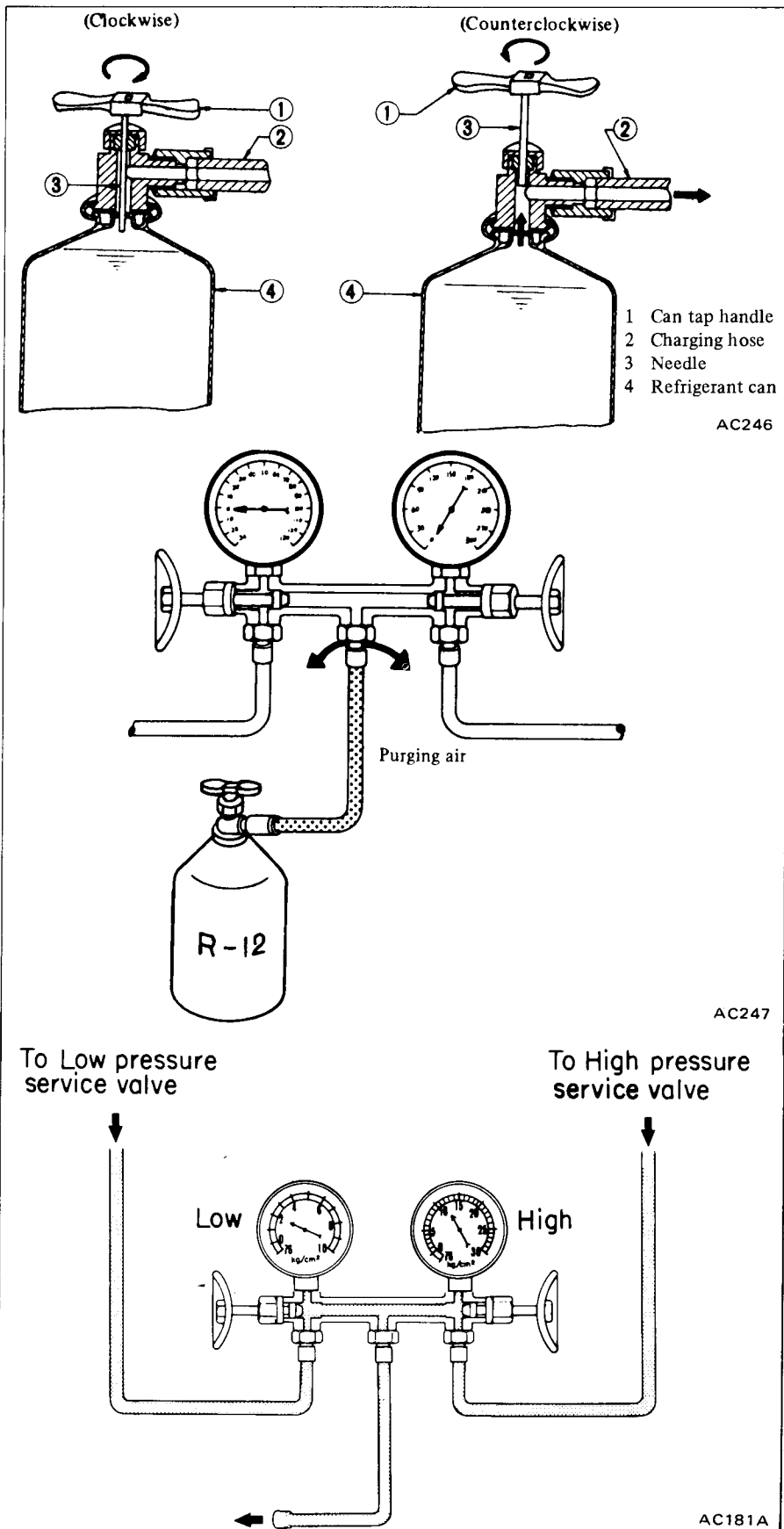
For the correct usage, refer to the manufacturer's instructions.

1. Connect charging hose to the center fitting of manifold gauge. At this time, confirm that both stems are fully turned in (front-seated).
2. Turn can tap handle fully counter-clockwise so that the needle is pulled up.
3. Attach can tap to refrigerant can firmly.
4. Turn can tap handle fully clockwise to make a hole in refrigerant can.
5. Turn the handle fully counter-clockwise to raise the needle. Refrigerant gas will flow up to the center

fitting of manifold gauge.

6. Loosen the connection at the

center fitting of manifold gauge for a few seconds to purge air inside charging hose.



DISCHARGING SYSTEM

The pressurized refrigerant gas inside system must be discharged to a pressure approaching atmospheric pressure prior to evacuating refrigerant inside system. This operation should be also made to permit safe removal when replacing system components.

1. Close high- and low-pressure valves of manifold gauge fully.
2. Connect two charging hoses of manifold gauge to their respective service valves.

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 slightly and slowly discharge refrigerant from system.

WARNING:

Protect fingers with cloth against frostbite by refrigerant when connecting the charging hose to the service valve or disconnecting it therefrom.

Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.

EVACUATING SYSTEM

1. Connect high- and low-pressure charging hoses of manifold gauge to their respective service valves of system and discharge refrigerant from system. Refer to Discharge System.
2. When refrigerant has been discharged to a pressure approaching atmospheric pressure, connect center charging hose to a 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.

Elevation m (ft)	Vacuum of system* kPa (mmHg, inHg)
0 (0)	94.6 (710, 28)
300 (1,000)	91.3 (685, 27)
600 (2,000)	88.0 (660, 26)
900 (3,000)	84.6 (635, 25)

*: 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, immediately charge system with refrigerant and repair the leak 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 Heater and Air Conditioner (Section MA) for inspection.

(3) Discharge refrigerant again, and then evacuate system.

CHARGING REFRIGERANT

1. Install manifold gauge to system. Refer to Handling Manifold Gauge.

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.

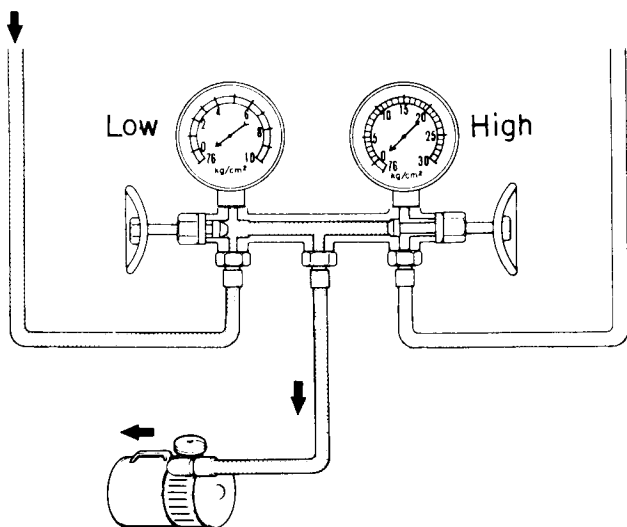
CAUTION:

- Be sure to purge air from the high- and low-pressure charging hoses.
- If air is mixed with refrigerant gas in system, evacuation of system should be performed. Refer to Evacuating System.

First step

To Low pressure service valve

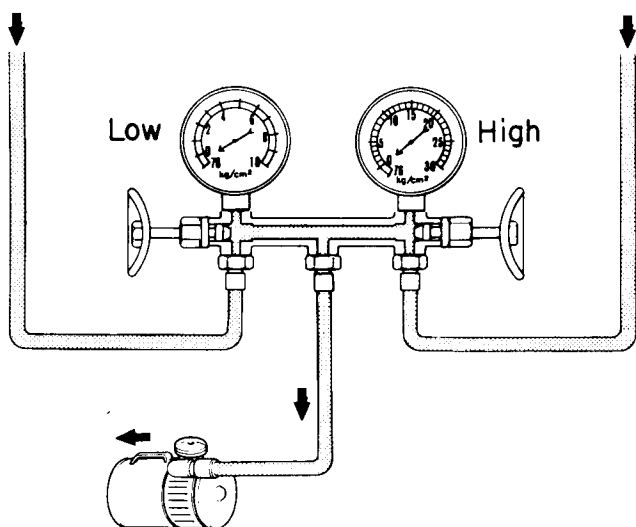
To High pressure service valve



Second step

To Low pressure service valve

To High pressure service valve



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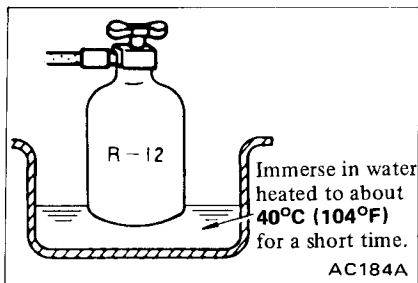
6. When pressure inside system has dropped to 94.6 kPa (710 mmHg, 27.95 inHg), fully close both of valves of manifold gauge and stop vacuum pump. Let stand it for 5 to 10 minutes in this state and confirm that the reading does not rise.

a. The low-pressure gauge reads lower by 3.3 kPa (25 mmHg, 0.98 inHg) per a 300 m (1,000 ft) elevation. Perform evacuation according to the following table.

2. Attach center charging hose of manifold gauge to refrigerant can through can tap. Break seal of refrigerant can to allow refrigerant to enter manifold gauge. Loosen charging hose at the center fitting of manifold gauge and purge air from inside charging hose. Refer to Handling Can Tap.
3. Open high- and low-pressure

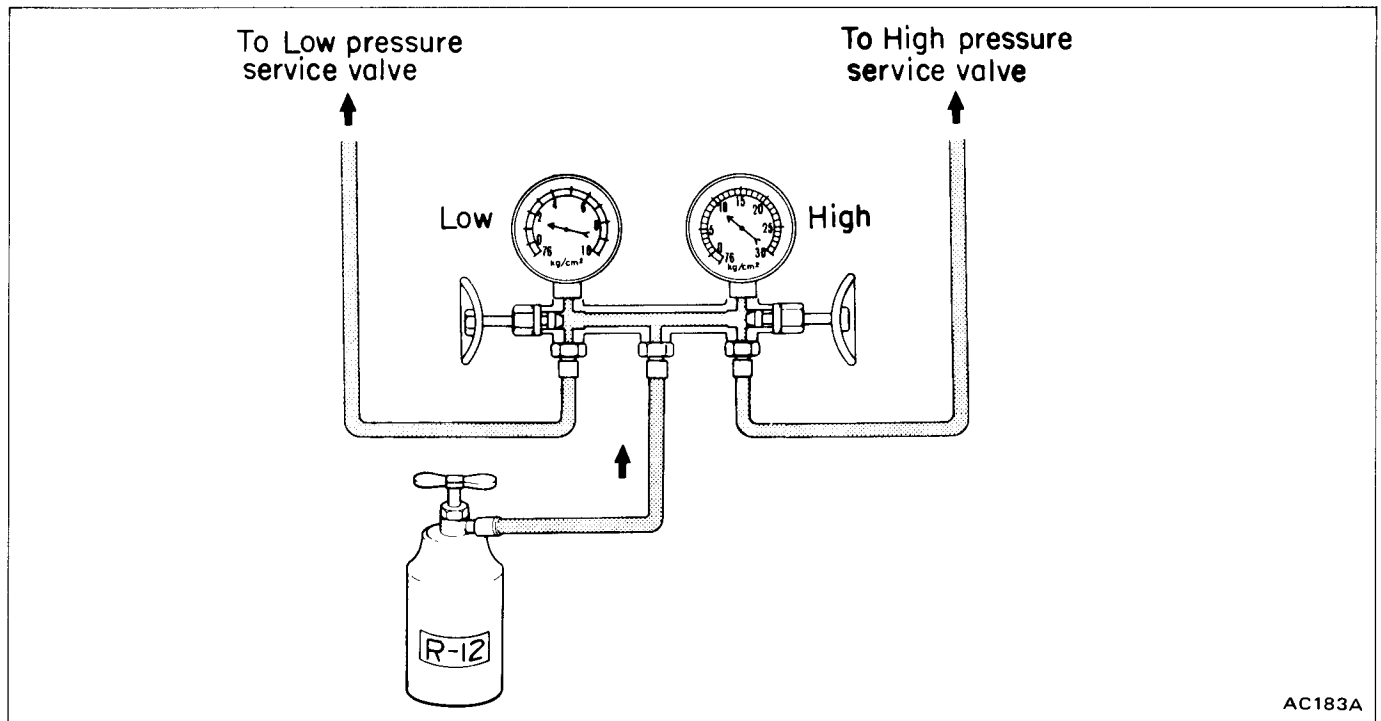
valves of manifold gauge and charge refrigerant into system.

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.



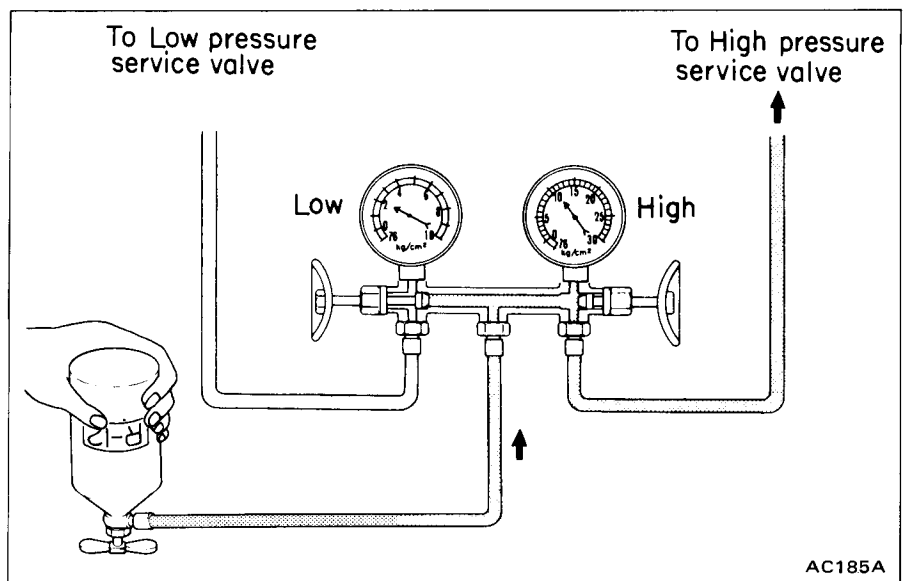
WARNING:

- a. Under any circumstances the refrigerant can must not 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.



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, but not through low pressure (suction) service valve. After completion of charging, the compressor should always be turned several times manually.



4. If 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 the Temperature lever and Fan switch at maximum cool and maximum speed respectively.

(4) Charge refrigerant while controlling low-pressure gauge reading at 275 kPa (2.8 kg/cm², 40 psi) or less by turning in or out low-pressure valve of manifold gauge.

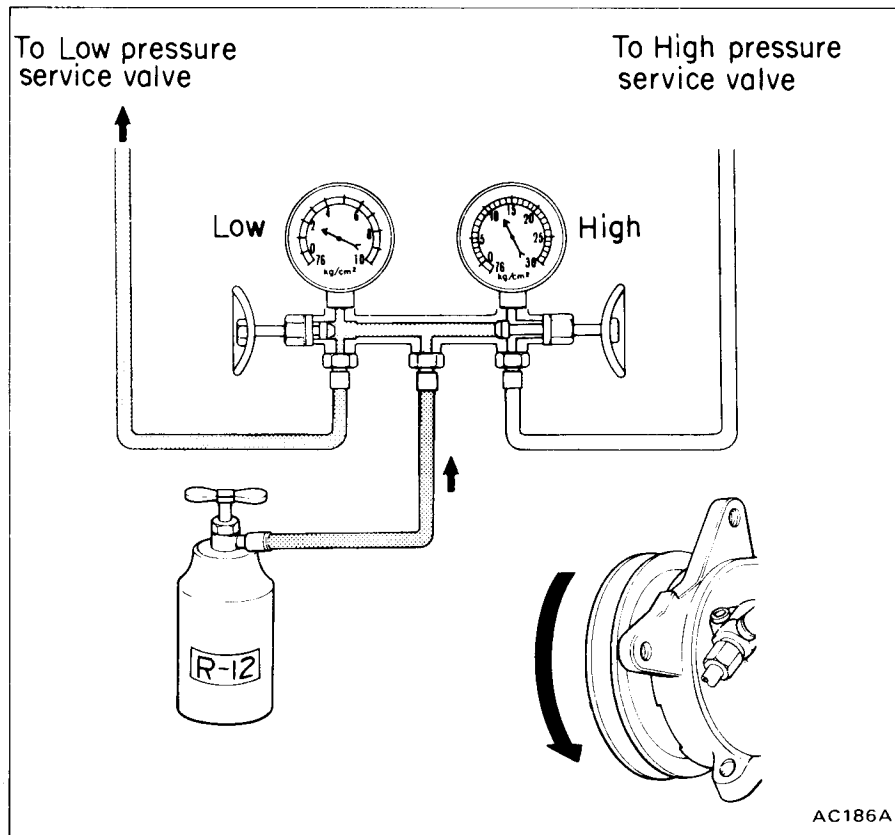
WARNING:

Never charge refrigerant through high pressure side (discharge side) of system since this will force refrigerant back into refrigerant can and can may explode.

Refrigerant capacity:

0.8 - 1.0 kg
(1.8 - 2.2 lb)

The presence of bubbles in sight glass of receiver drier is an unsuitable method of checking the amount of refrigerant charged in system. The state of the bubbles in sight glass should only be used for checking whether the amount of charged refrigerant is small or not. The amount of charged refrigerant can be correctly judged by means of discharge pressure. Refer to Heater and Air Conditioner (Section MA) for inspection.

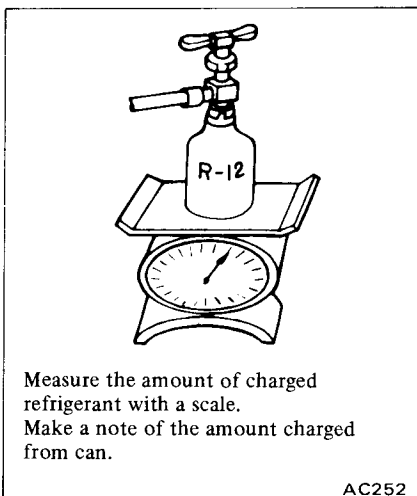


AC186A

5. When refrigerant can is empty, fully close both valves of manifold gauge and replace refrigerant can with a new one.

Before opening manifold gauge valve to charge refrigerant from new can, be sure to purge air from inside charging hose.

6. Charge the specified amount of refrigerant into system by weighing charged refrigerant with scale. Overcharging will cause discharge pressure to rise.



AC252

7. After the specified amount of refrigerant has been charged into system, close manifold gauge valves. Then detach charging hoses from service valves of system. Be sure to install valve cap to service valve.

8. Confirm that there are no leaks in system by checking with a leak detector.

Refer to Heater and Air Conditioner (Section MA) for inspection.

Conducting a performance test prior to removing manifold gauge is a good service operation. Refer to Performance Test.

COMPRESSOR OIL LEVEL CHECK

A completely sealed system will be free from compressor oil leakage. As long as the system operates satisfactorily, a compressor oil level check is unnecessary. Because of its structure, 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.

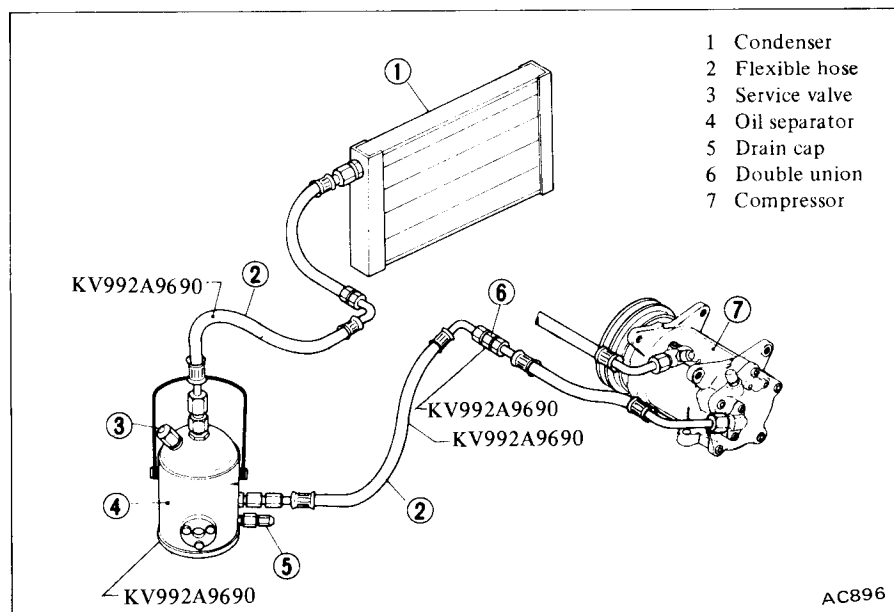
CAUTION:

- The oil should not be transfused from a container into another, as the failure will possibly cause moisture to mix with the oil.
- The used oil should not be returned into a container.
- The oil should not be used if its state of preservation is not clear enough.

Checking and adjusting (Using oil separator)

The Oil Separator Kit KV992A9690 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:

- Discharge air conditioning system. Refer to Discharging System.
- Using two special flexible hoses and double union in Oil Separator Kit KV992A9690, connect oil separator between compressor discharge side and condenser.



- Evacuate and charge system. Refer to General Service for evacuating and charging system.
- Fully open all windows or all doors of car.
- Operate compressor at engine idling with air conditioner set for maximum cooling and high fan speed.

Never allow engine speed to exceed idling speed.

- 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 cases, 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.

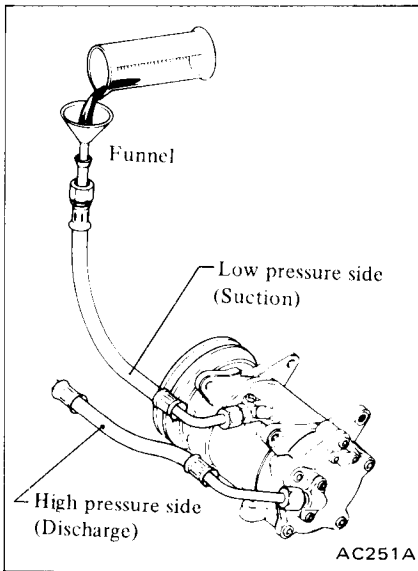
- Discharge system. Refer to General Service for discharging system.
- Disconnect oil separator, two flexible hoses and double union from system.
- Connect refrigerant lines to original positions.
- Disconnect low flexible hose from compressor suction valve.
- Add oil from compressor suction valve.

Amount of oil to be added:

120 ml

(4.1 US fl oz, 4.2 Imp fl oz)

- Oil remains unremoved in the system about 30 ml (1.0 US fl oz, 1.1 Imp fl oz).
- 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 two flexible

hoses 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.

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 the old compressor.	
Replacement of evaporator		Add amount of oil shown in right column.	70 (2.4, 2.5)
Replacement of receiver dryer (liquid tank)		Oil need not be added.	—
Replacement of accumulator		Add amount of oil shown in right column.	30 (1.0, 1.1)
Replacement of condenser	There is no sign of oil leakage from condenser.	Oil need not be added.	—
	There are evi- dences 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 evi- dences 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 evi- dences 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 (compressor shaft) two or three times to completely drain the oil.

When replacing two or more of the parts indicated in the above chart, follow each instruction under the proper charging method column for the proper amount of oil to be added.

– Example –

When replacing the evaporator and compressor, drain all oil out of the new compressor and then charge the compressor with the total amount of oil [70 mL (2.4 US fl oz, 2.5 Imp fl oz) for the evaporator and the same amount of oil as was in the old compressor.]

If total amount of oil to be added exceeds 150 mL (5.1 US fl oz, 5.3 Imp fl oz), add 150 mL (5.1 US fl oz, 5.3 Imp fl oz).

The method of adding oil is the same as in the case of using the oil separator. Oil is added into the compressor. Refer to the figure on page HA-15.

PERFORMANCE TEST

The cooling performance of the air conditioner changes considerably with changes in surrounding conditions. Testing must be performed using the correct method. This test is used to judge whether system is operating correctly and can also be used as a guide in checking for problems.

1. Park the car indoors or in the shade.

2. Open all the windows of the car fully. However, close the doors.

3. Open the hood.

4. Connect manifold gauge to high- and low-side service valves of the system. Refer to Handling Manifold Gauge.

5. Set air lever to AIR-CON RECIRC position.

6. Set temperature lever to maximum cold position.

7. Set blower to its highest speed.

8. Start the engine and hold engine speed at 1,500 rpm.

9. After the air conditioner has been operated for about 10 minutes, measure system pressures at high-pressure (discharge) side and low-pressure (suction) side.

10. Measure the temperature of discharge air at the center outlet grille.

11. Measure the temperature and humidity of the evaporator intake air at the recirculating air inlet of the evaporator.

12. Measure the temperature and humidity of the ambient air at a point 1 m (3.3 ft) front of condenser. However, a dry bulb and wet bulb must not be placed in direct sunlight.

13. Check for any abnormalities by comparing the test results with standard pressure. Refer to Performance Chart.

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 Trouble Diagnoses and Corrections.

REFRIGERANT LEAKS

If leaks are noticeable, leaky parts should be repaired. Then system should be filled with refrigerant.

CAUTION:

Do not operate compressor with refrigerant level excessively low.

If this caution is neglected, a burnt compressor will result since heavy loss of refrigerant usually indicates heavy loss of compressor oil.

If system has been exposed to atmosphere for an extended period of time, receiver drier must be replaced. If leaks are slight and no air is present in system, add refrigerant as necessary.

To detect leaks, refer to Heater and Air Conditioner (Section MA). Here is how leaks are stopped.

1. Check torque on the connection fitting and, if too loose, tighten to the proper torque. 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.

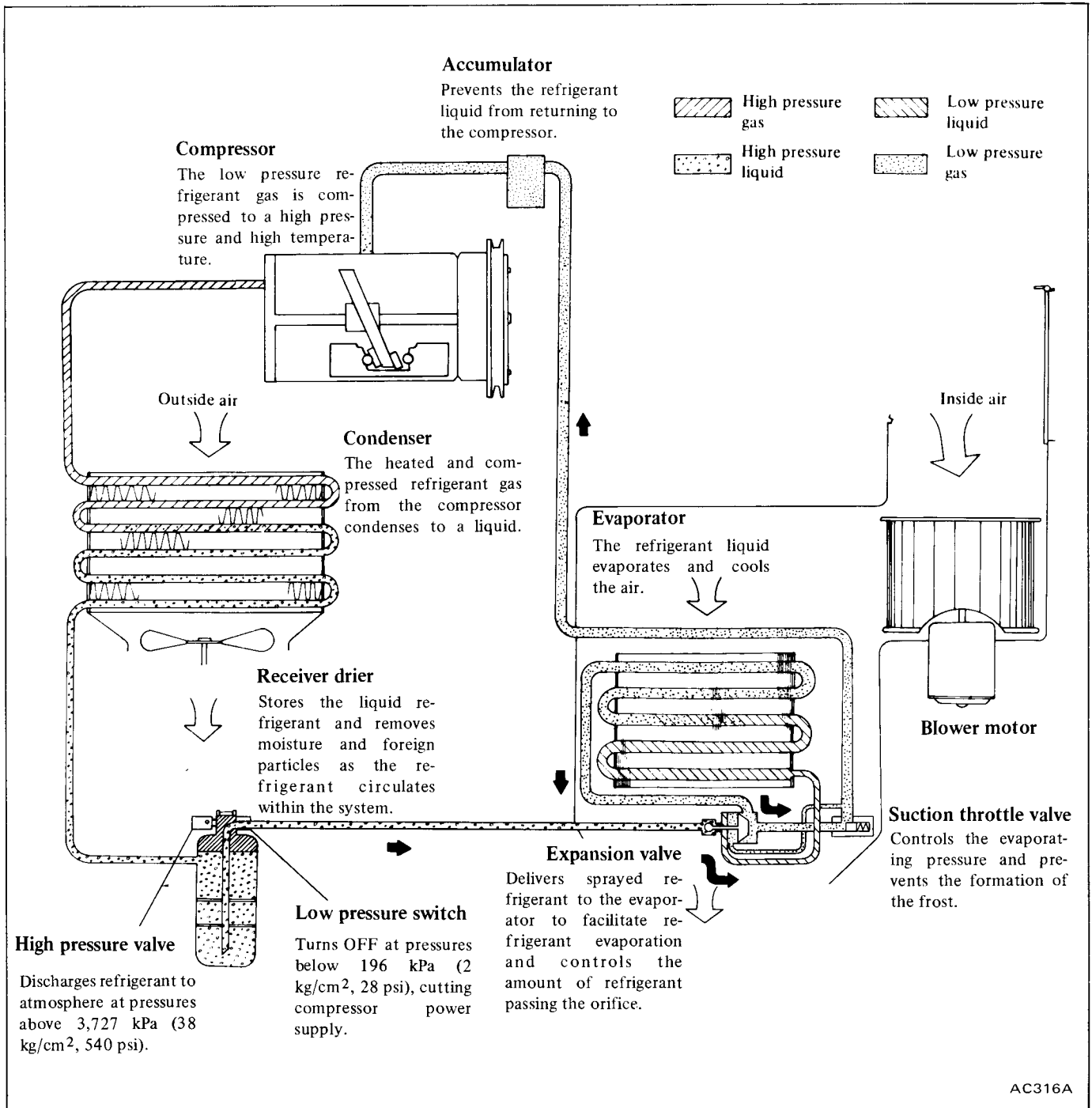
DESCRIPTION (Manual air conditioner)

REFRIGERATION SYSTEM

If you were to paint your finger with alcohol, your finger would feel cold. This is because the liquid alcohol takes heat away from your finger while it evaporates. If a quickly evaporating liquid such as alcohol is placed

in a container inside a box, the temperature inside the box will drop. This is because the alcohol is evaporated absorbing the heat from the air inside the box. If the gaseous alcohol is collected and cooled with cold water, it will be changed back into a liquid by absorption of its heat by the cold water.

The cooler operates on this principle. The liquid used is the refrigerant R-12. The heat inside the passenger compartment is absorbed by changing the refrigerant from a liquid to a gas and then dissipated to the outside by changing the refrigerant from a gas back to a liquid.



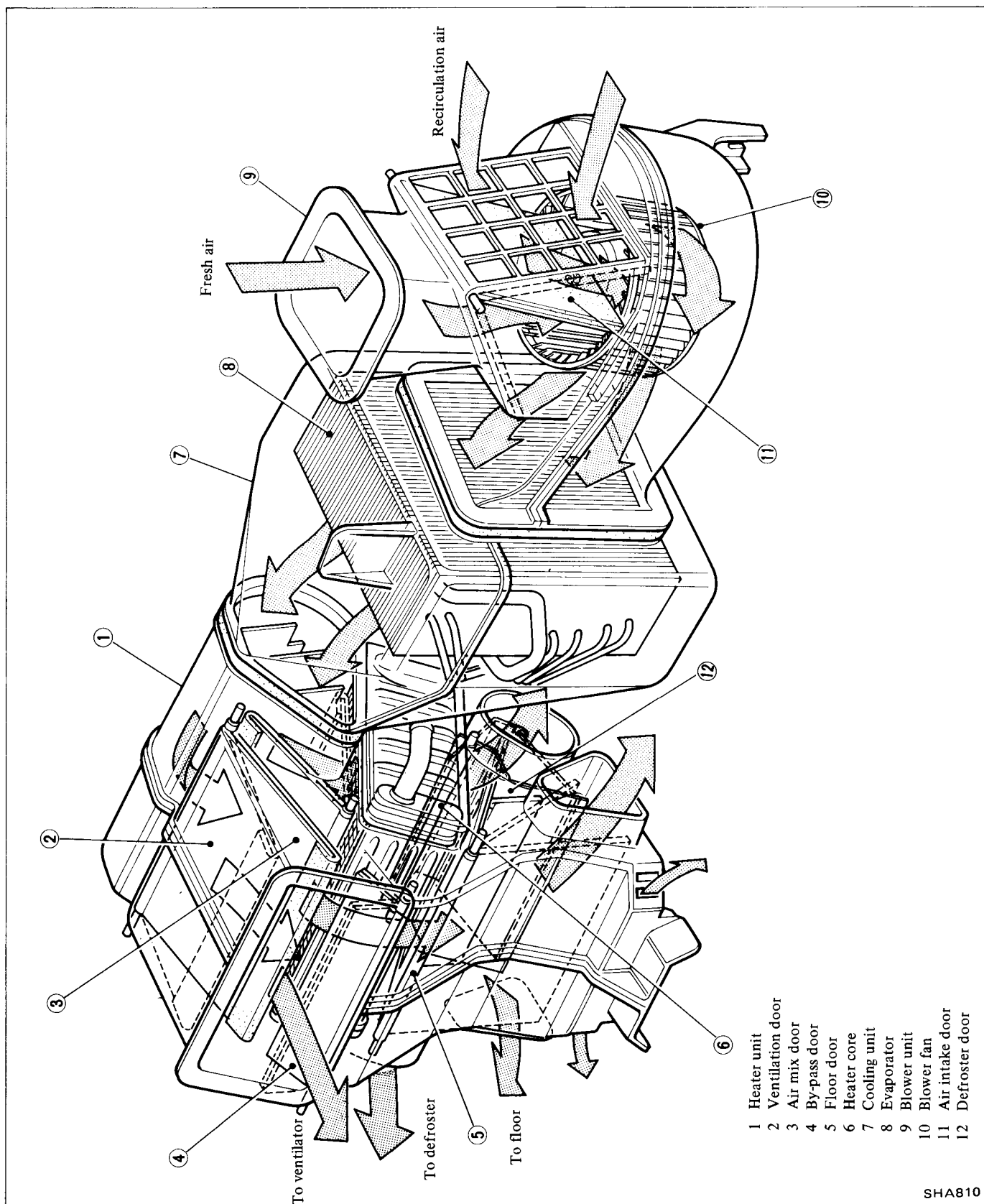
OUTLINE OF AIR CONDITIONER

The air conditioner is a combined unit of an evaporator, heater and

blower and provides heating and cooling functions. In addition, it has bi-level and ventilation functions. Its control system consists of a mechani-

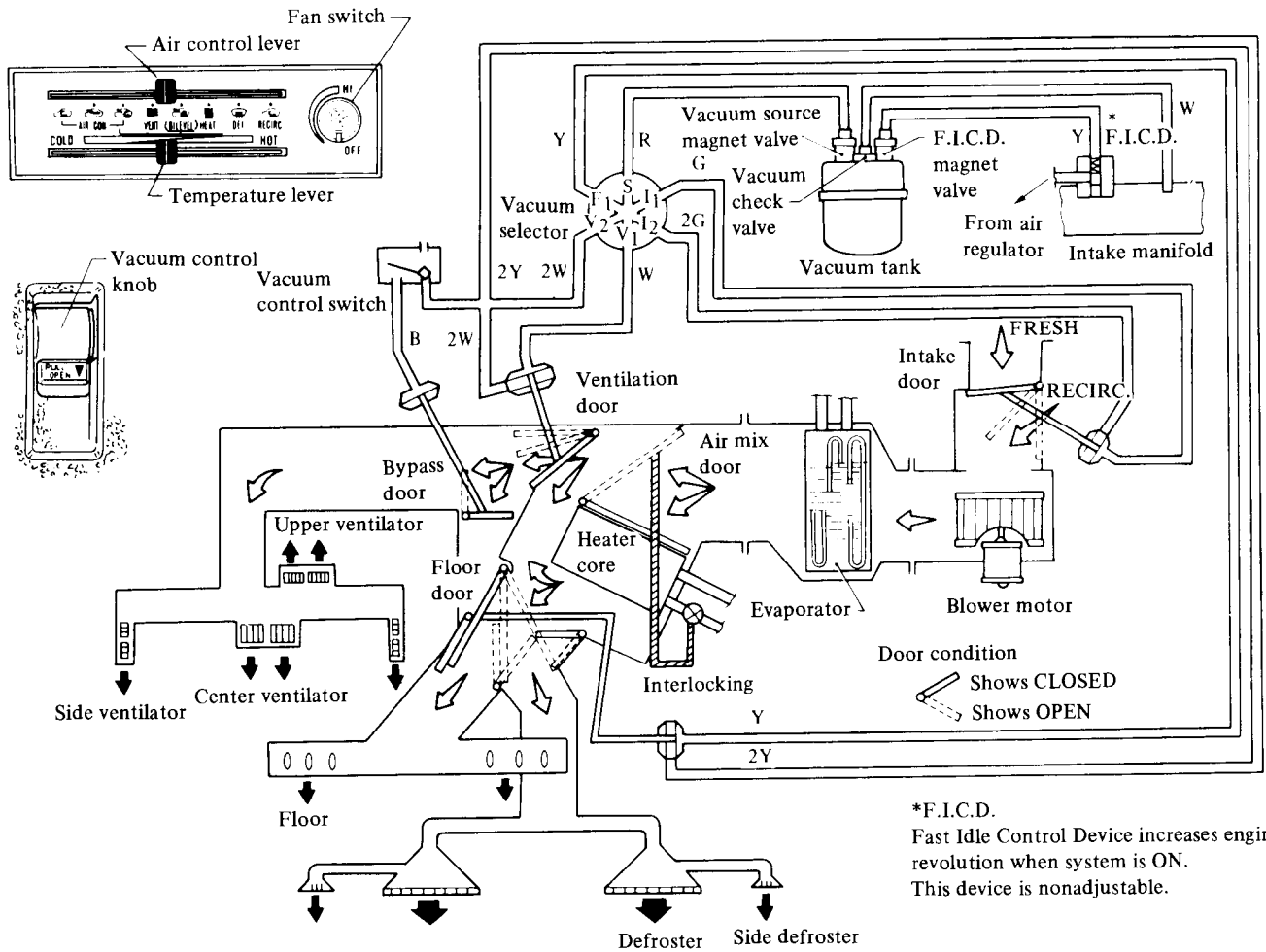
cal system using cables and engine vacuum.

The air conditioning unit is installed in the passenger compartments.



SHA810

AIR FLOW AND VACUUM SYSTEM



Air control lever position		Vacuum connection						Door position					Compressor and F.I.C.D.	Air flow distribution		
		S	I ₁	I ₂	V ₁	V ₂	F ₁	Intake Door	Air Mix Door	Ventilation Door	Bypass Door	Floor Door		Defroster	Ventilator	Floor
AIR-CON.	RECIRC	O	—	—	—	—	—	CLOSED	OPEN (Temperature lever on HOT); CLOSED (Temperature lever on COLD)	OPEN	*1 OPEN *2 CLOSED	OPEN	ON	0%	85%	15%
															100%	0%
	FRESH	O	—	—	—	—	—	½ OPEN		OPEN	*1 OPEN *2 CLOSED	OPEN	ON	0%	85%	15%
															100%	0%
	B/L	O	—	—	—	—	—	OPEN		½ OPEN	CLOSED	CLOSED	ON	0% *4	50% *3	50% *3
VENT		O	—	—	—	—	—	OPEN		OPEN	*1 OPEN *2 CLOSED	OPEN	OFF	0%	85%	15%
															100%	0%
B/L		O	—	—	—	—	—	OPEN		½ OPEN	CLOSED	CLOSED	OFF	0% *4	50% *3	50% *3
HEAT		O	—	—	—	—	—	OPEN		CLOSED	CLOSED	CLOSED	OFF	20%	0%	80%
DEF		O	—	—	—	—	—	OPEN		CLOSED	CLOSED	½ OPEN	OFF	100%	0%	0%
RECIRC		O	—	—	—	—	—	CLOSED		CLOSED	CLOSED	CLOSED	OFF	20%	0%	80%

*1 Vacuum control knob is pulled out.

*2 Vacuum control knob is not pulled out.

*3 Temperature lever: Center position

*4 When fan switch is in low position

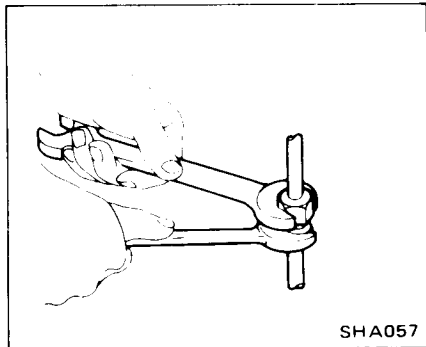
SERVICE PROCEDURES (Manual air conditioner)

PRECAUTIONS FOR REMOVAL AND INSTALLATION

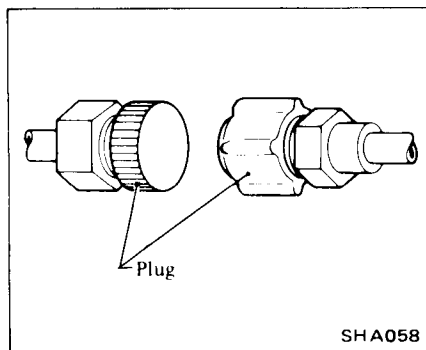
When replacing refrigerant cycle components, observe the following:

CAUTION:

- When disconnecting or connecting tubes, be sure to use two wrenches on both tubes.



- After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.



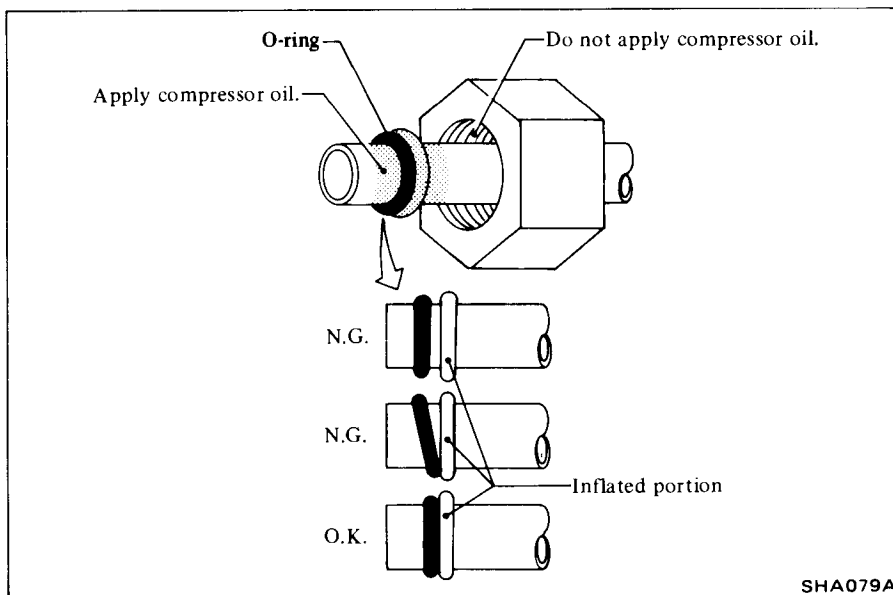
- Compressed air must never be used to clean dirty line. Clean with refrigerant gas.
- Do not reuse used O-ring.

1. Disconnect battery ground cable.
2. Before starting work, be sure to discharge system.

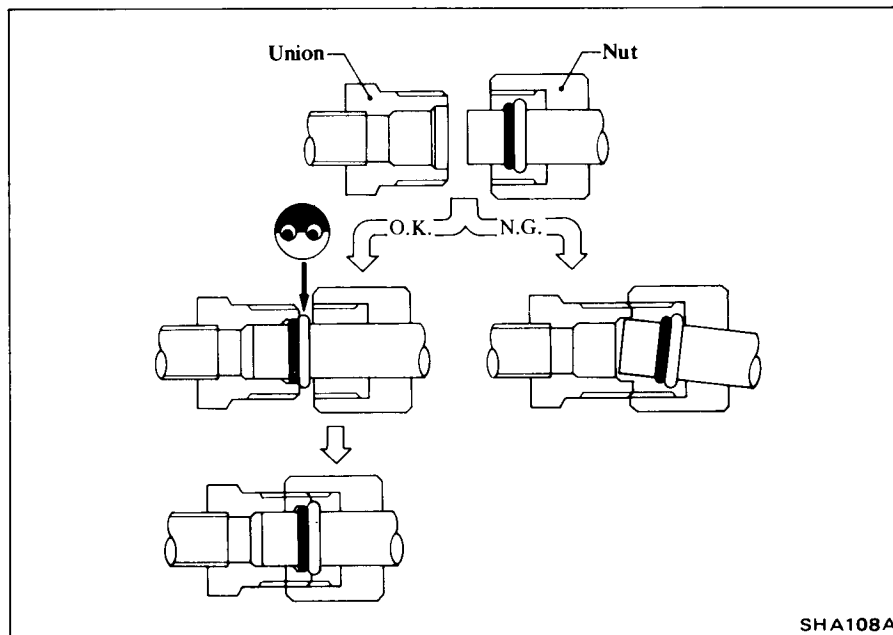
WARNING:

Gradually loosen discharge side hose fitting, and remove it after remaining pressure has been released.

- 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.

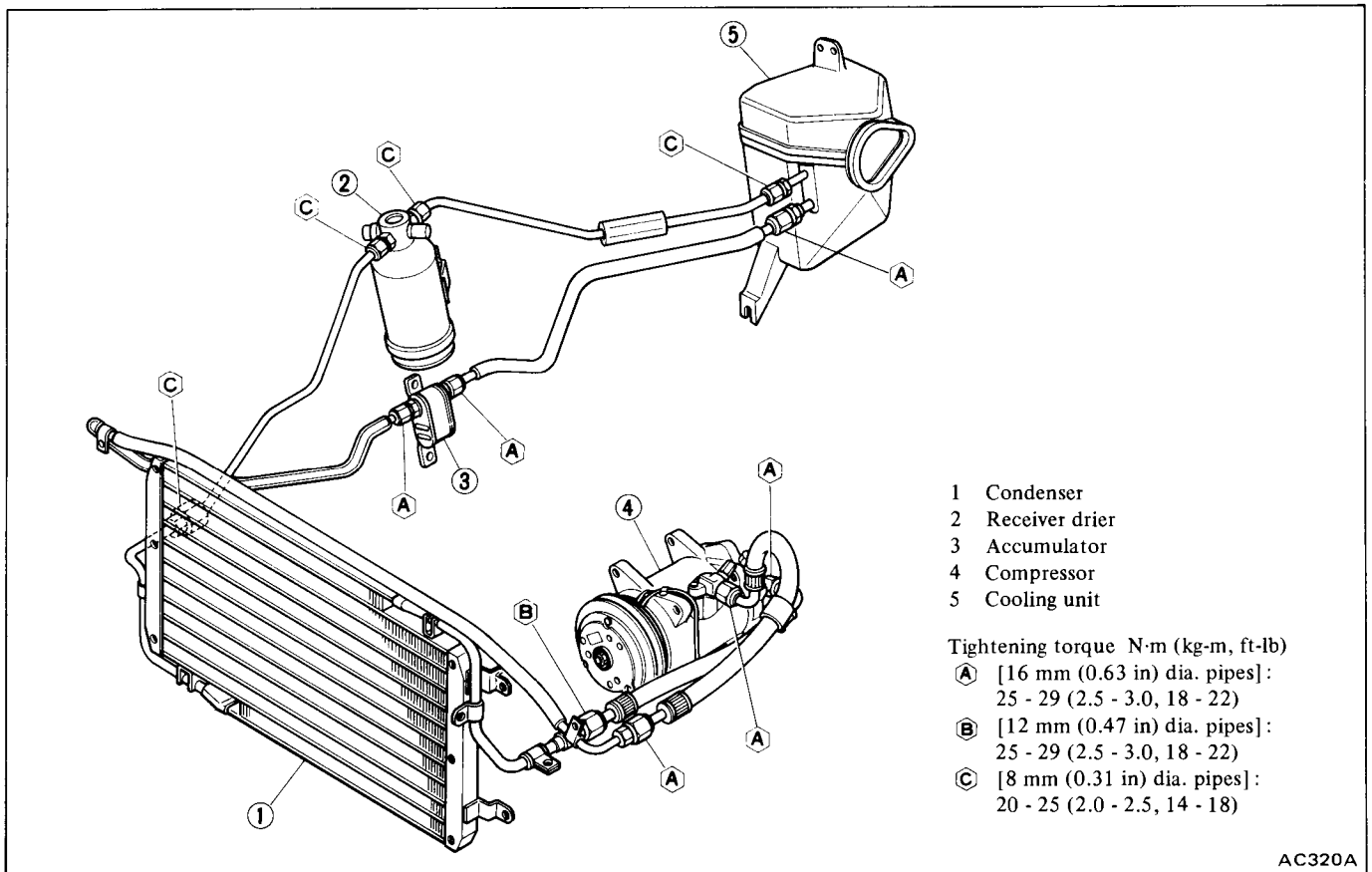


- After inserting tube into union until O-ring is no more visible, tighten nut to specified torque.



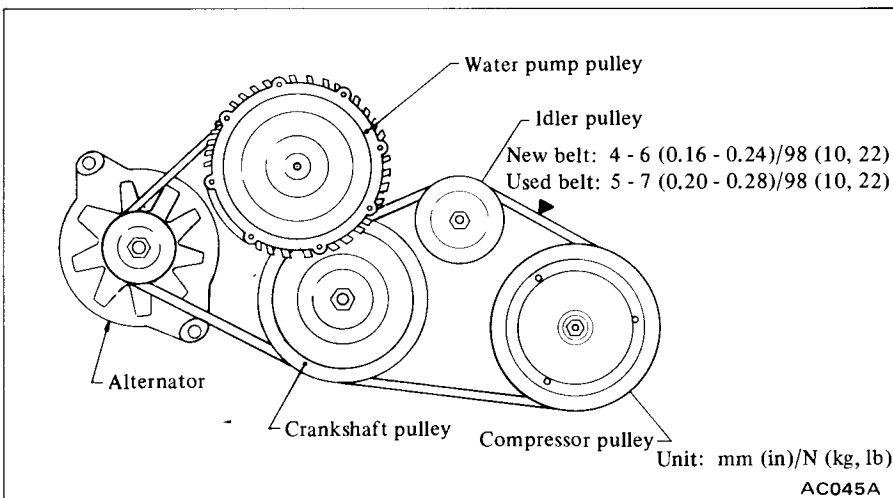
- After connecting line, conduct leak test and make sure that there is no leak from connections.

REFRIGERANT LINES



IDLER PULLEY AND COMPRESSOR DRIVE BELT

ADJUSTMENT OF BELT TENSION

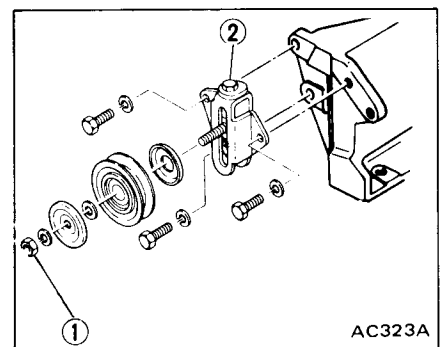


Specified compressor belt tension is 4 to 6 mm (0.16 to 0.24 in) (new belt) and 5 to 7 mm (0.20 to 0.28 in) (used belt) when thumb pressure of 98 N (10 kg, 22 lb) is applied midway between idler pulley and compressor pulley.

HA-22

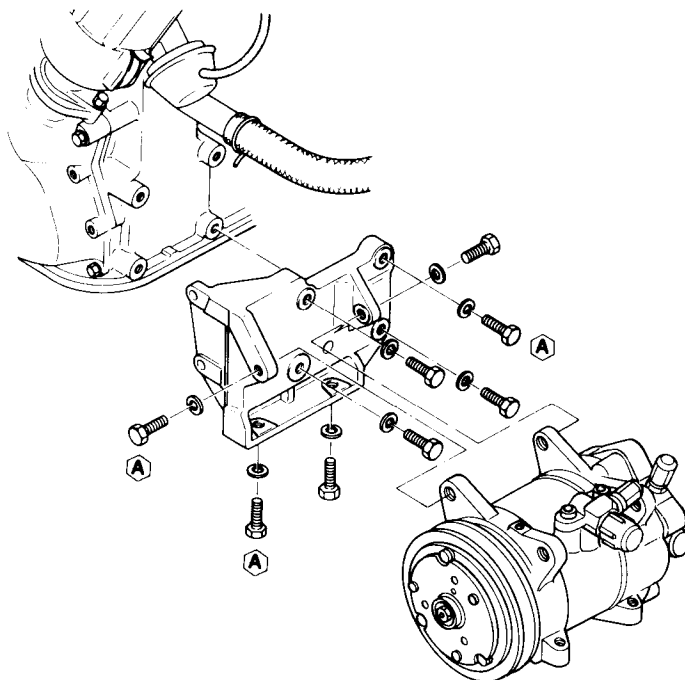
1. Loosen idler pulley lock nut and then adjust pulley by turning adjusting bolt.
2. After adjustment, tighten idler pulley lock nut.

REMOVAL AND INSTALLATION



1. Loosen idler pulley lock nut.
2. Loosen pulley adjusting bolt fully and remove lock nut and pulley.
3. Remove bracket mounting bolts. Remove bracket.
4. Install bracket and pulley in the reverse order of removal.
5. Adjust compressor belt tension.

COMPRESSOR



Tightening torque

Ⓐ: 44 - 54 N·m (4.5 - 5.5 kg-m, 33 - 40 ft-lb)

AC324A

REMOVAL

1. Operate compressor, if possible, at engine idling speed with air conditioner controls set for maximum cooling and high blower speed for 10 to 15 minutes with all windows open to return oil into compressor.
2. Discharge system. Refer to Discharging System.
3. Disconnect battery ground cable.
4. Loosen idler pulley lock nut and loosen tension adjusting bolt fully. Remove compressor drive belt.
5. Disconnect compressor clutch wire at connector.
6. Remove high and low flexible hoses from compressor.

WARNING:

Gradually loosen discharge side hose fitting, and remove it after remaining pressure has been released.

CAUTION:

Be sure to immediately put plug in flexible hose and compressor openings.

7. Remove two bolts mounting compressor's top side.
8. Jack up front of car and remove under cover.
9. Holding compressor, remove bolts mounting compressor's lower side.
10. Remove compressor with compressor clutch facing up.

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.

INSTALLATION

Install in the reverse order of removal, observing the following:

1. Determine quantity of oil to be charged into compressor by referring to Compressor Oil Level Check in General Service.
2. Check tightening torque of bolt securing compressor bracket. Retighten bolts if necessary. Refer to above figure.
3. Compressor plugs and flexible hose plugs should be kept in place until preparation of connection is completed.
4. Upon installation of compressor, turn compressor clutch by hand a few turns.
5. For tightening torque on refrigerant line fittings, refer to Refrigerant Line.

When connecting high and low flexible hoses to compressor, install new O-ring into connection.

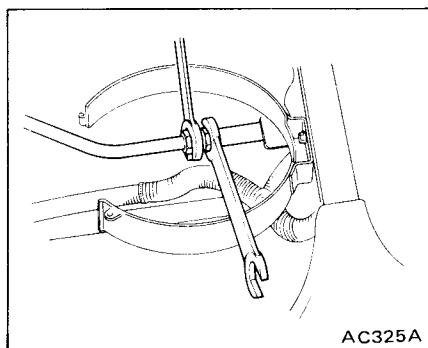
6. Provide a clearance of more than 10 mm (0.39 in) between low pressure hose and high-pressure hose at compressor side.
7. For compressor drive belt tension, refer to Idler Pulley and Compressor Drive Belt.

8. Evacuate and recharge system. Refer to Evacuating System and Charging Refrigerant in General Service.
9. Conduct leak test and make sure that there is no leak from connections.

CONDENSER

REMOVAL

1. Disconnect battery ground cable.
2. Discharge system. Refer to General Service for discharging system.
3. Remove air flow meter duct.
4. Remove canister.
5. Disconnect refrigerant lines from condenser.



CAUTION:

- a. Use wrench to fix union on condenser, and then loosen flare nut of refrigerant line with another wrench.
- b. Plug up all openings in condenser and system.

6. Remove condenser tube clamp
7. Remove air cleaner and duct.
8. Remove four mounting bolts, then remove condenser from car.

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:

Do not clean condenser with steam. Be sure to use cold water or compressed air.

INSTALLATION

Install condenser in the reverse order of removal, observing the following:

1. Keep plugs in place until immediately before connecting work is started.
2. For tightening torque on line connections, refer to Refrigerant Line.

When connecting line, install new O-ring into connection.

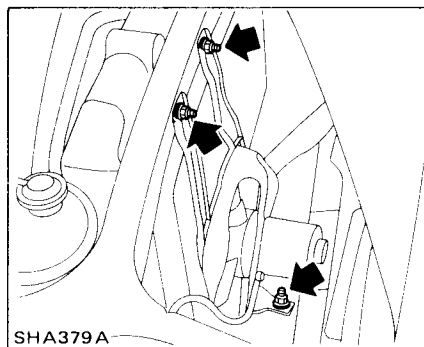
3. Determine quantity of oil to be charged into compressor by referring to Compressor Oil Level Check in General Service.
4. For evacuating and charging system, refer to General Service.
5. Conduct leak test and make sure that there is no leak from connections.

CONDENSER FAN (Turbo-charged model only)

REMOVAL AND INSTALLATION

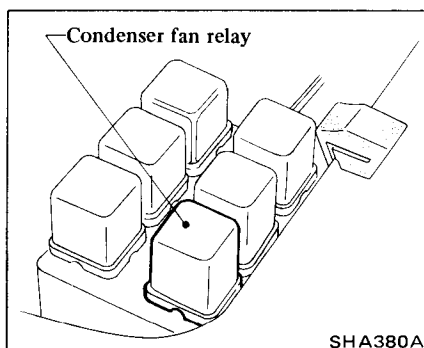
1. Disconnect battery ground cable.
2. Remove air cleaner duct R.H.

3. Disconnect condenser fan fixing nuts.



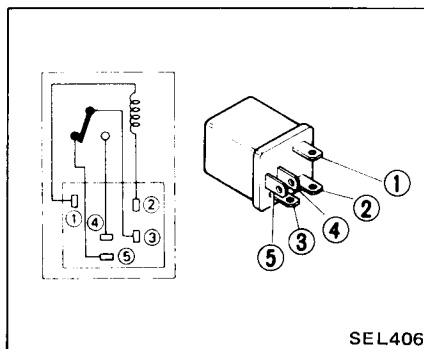
4. Disconnect harness connector, and remove condenser fan.
5. Installation is in the reverse order of removal.

CONDENSER FAN RELAY (Turbo-charged model only)

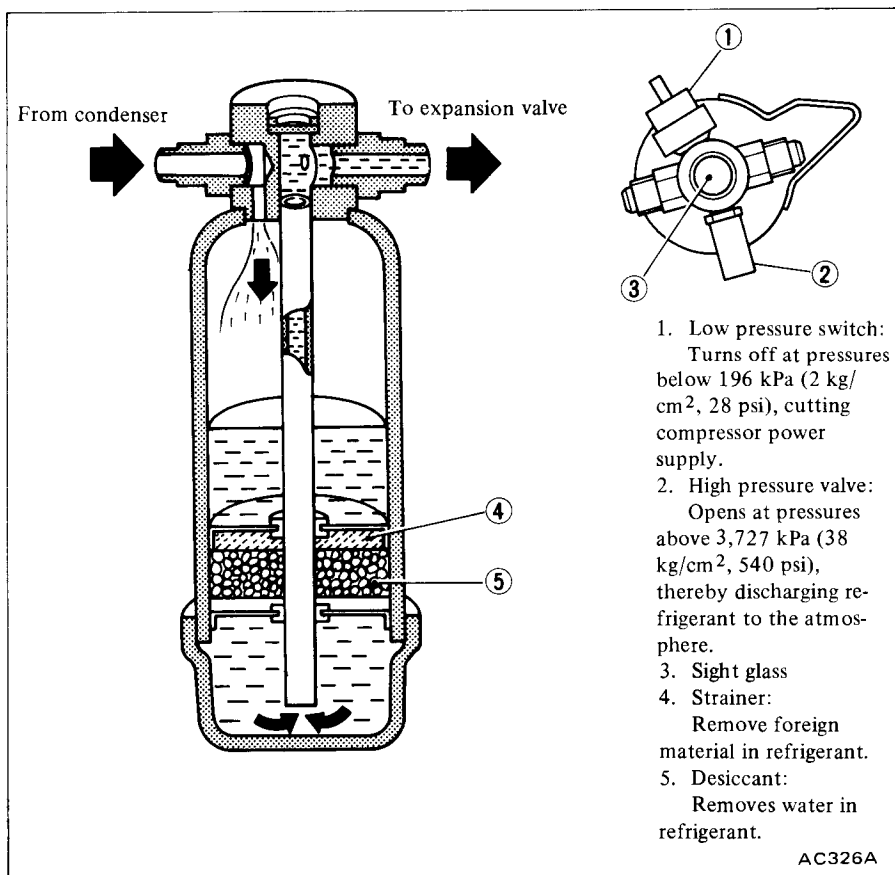


INSPECTION

Test continuity of relay with ohmmeter or test lamp.

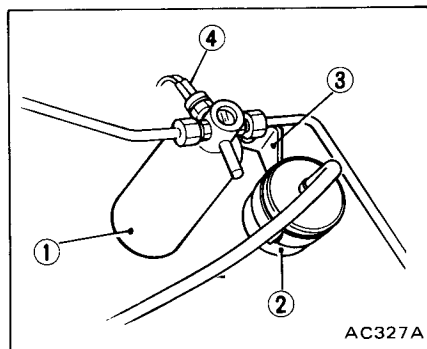


RECEIVER DRIER



REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Discharge system. Refer to Discharging System in General Service.
3. Remove low pressure switch leads.
4. Remove fuel filter and bracket.



- 1 Receiver drier
- 2 Fuel filter
- 3 Fuel filter bracket
- 4 Low pressure switch leads

5. Disconnect refrigerant lines from receiver driver.

CAUTION:

Plug all openings to prevent entrance of dirt and moisture.

6. Remove receiver drier mounting screws. Remove receiver drier.
7. Install receiver drier in the reverse order of removal. With plugs taken off immediately before connecting work is started, connect line and receiver drier. For tightening torque, refer to Refrigerant Line.

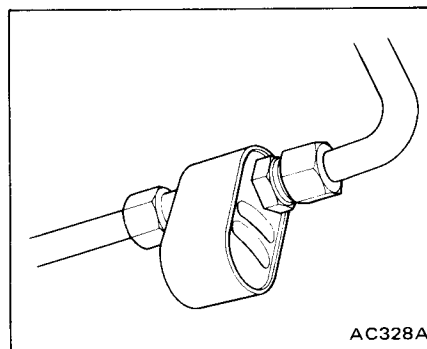
When connecting line, install new O-ring into connection.

8. For evacuating and charging system, refer to General Service.
9. Conduct leak test and make sure that there is no leak from connections.

INSPECTION

Check receiver drier for leaks or damage. If necessary, replace.

ACCUMULATOR



REMOVAL

1. Disconnect battery ground cable.
2. Discharge system. Refer to General Service for discharging system.
3. Disconnect refrigerant lines from accumulator.

CAUTION:

- a. Use wrench to fix union on condenser, and then loosen flare nut of refrigerant line with another wrench.
- b. Plug up all openings in accumulator and system.

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.

INSTALLATION

Install accumulator in the reverse order of removal, observing the following:

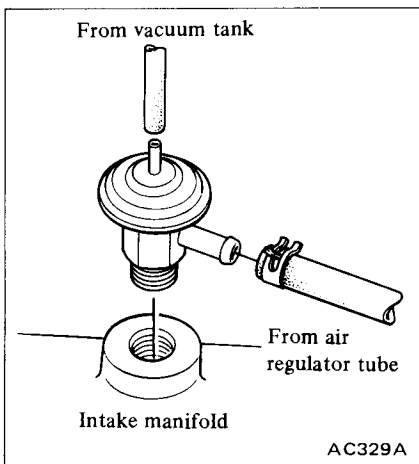
1. Keep plugs in place until immediately before connecting work is started.
2. For tightening torque on line connections, refer to Refrigerant Line.

When connecting line, install new O-ring into connection.

3. Determine quantity of oil to be charged into compressor by referring to Compressor Oil Level Check in General Service.
4. For evacuating and charging system, refer to General Service.
5. Conduct leak test and make sure that there is no leak from connections.

FAST IDLE ACTUATOR

Being a non-adjustable type, this fast idle actuator requires no adjustment.



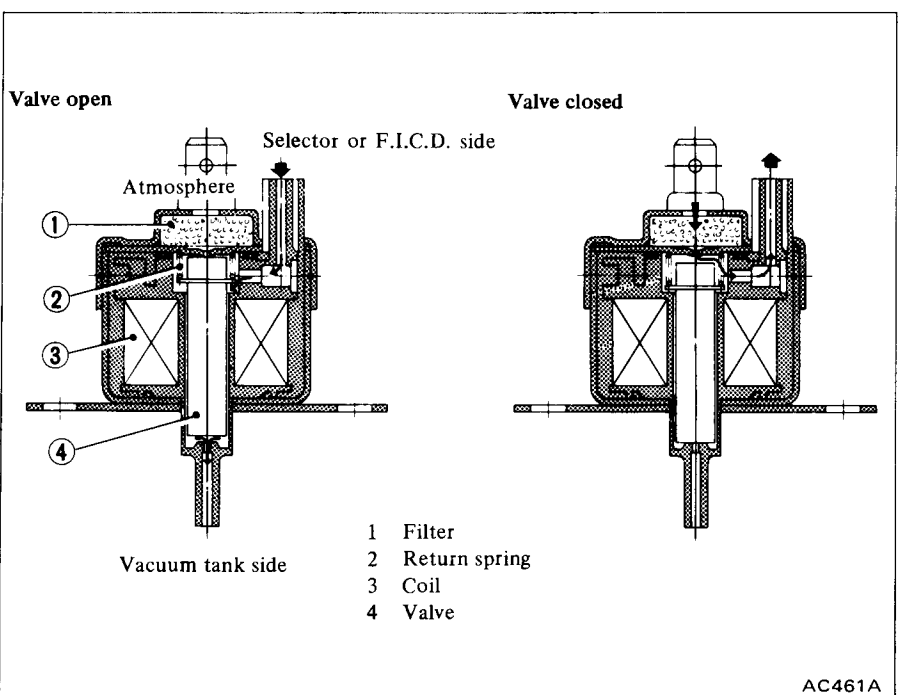
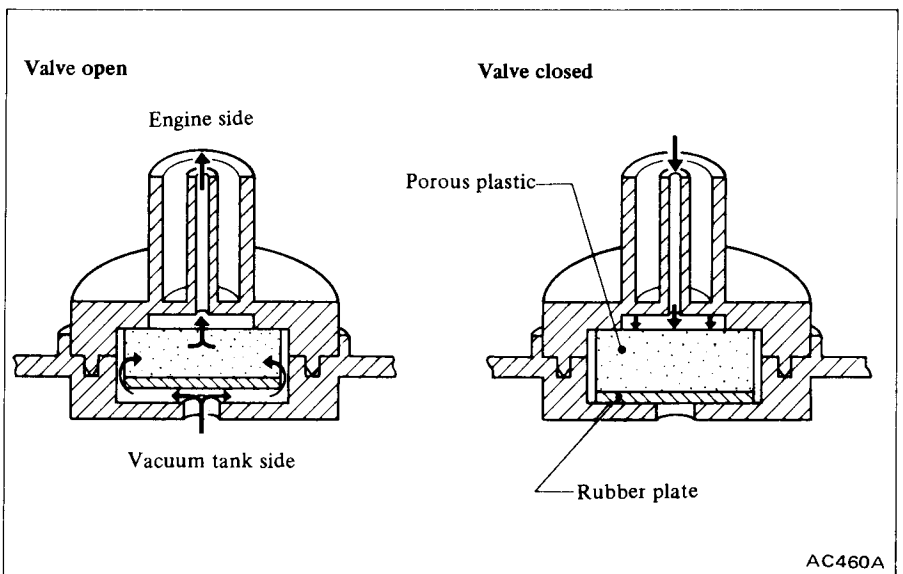
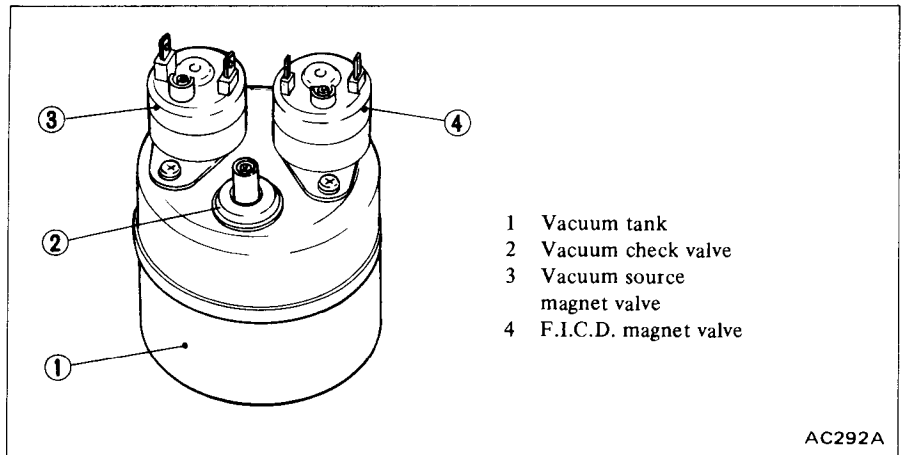
REMOVAL AND INSTALLATION

1. Remove vacuum hoses from actuator.
2. Remove actuator.
3. Install actuator in the reverse order of removal.

INSPECTION

1. Remove actuator. Refer to Removal and Installation.
2. Install vacuum hose from vacuum tank.
3. Plug hole in intake manifold and hose to air regulator tube.
4. With air conditioner on, set engine to idling speed.
5. Make sure that air regulator side of actuator is open to intake manifold side.
6. Remove vacuum hose and make sure that air regulator side is closed to intake manifold side.

VACUUM TANK



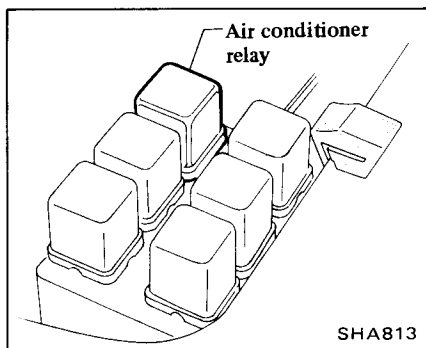
REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove vacuum hose and wire at connector.
3. Remove vacuum tank with bracket.
4. Remove vacuum tank from bracket.
5. Install vacuum tank in the reverse order of removal.

INSPECTION

1. Check vacuum tank for leak.
2. Check vacuum check valve and magnet valves.

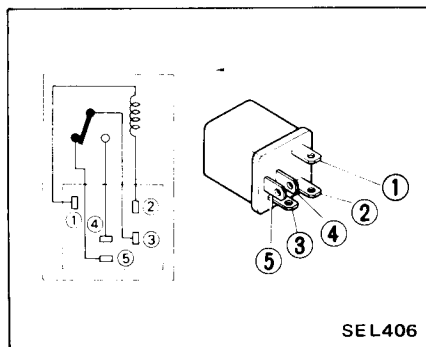
AIR CONDITIONER RELAY



INSPECTION

Test continuity of relay with ohmmeter or test lamp. In testing compressor relay, there must be continuity between ① and ②.

When 12V direct current is applied to ①-②, ③-④ normally close (with air control lever moved to AIR-CON position, fan switch in ON and ignition switch in ON or ACC position).



COOLING UNIT

REMOVAL

1. Disconnect battery ground cable.
2. Discharge refrigerant from system. Refer to General Service.
3. Loosen flare nuts at each connection of inlet and outlet pipes of evaporator.

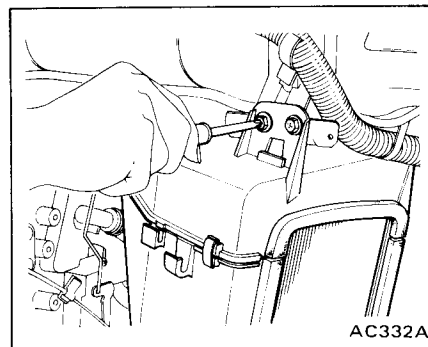
CAUTION:

Immediately plug up all openings to prevent entrance of dirt and moisture.

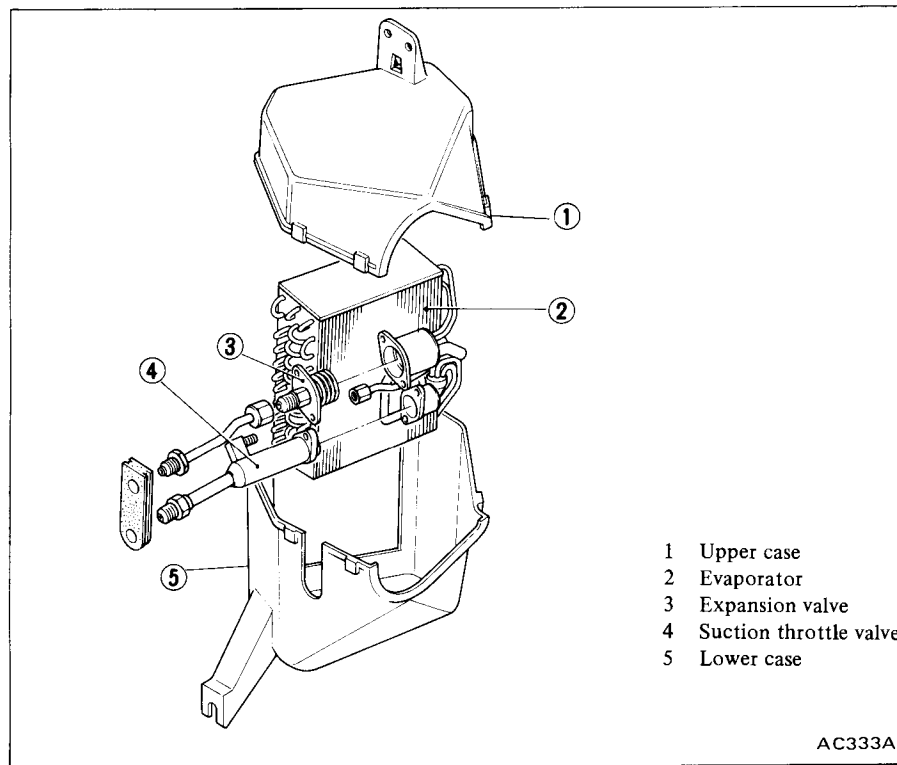
4. Remove heater unit.
5. Remove defroster duct on passenger's side.

senger's side.

6. Remove mounting bolt and then remove cooling unit from dash panel.



DISASSEMBLY AND ASSEMBLY



- 1 Upper case
- 2 Evaporator
- 3 Expansion valve
- 4 Suction throttle valve
- 5 Lower case

INSPECTION

In case evaporator core, suction throttle valve or expansion valve shows gas leaking, repair or replace it with a new one as necessary.

Dirt and nicotine accumulation on evaporator case will go bad and smell. This means that you have to remove them from time to time to assure healthful fresh air inside car.

INSTALLATION

Install evaporator in the reverse order of removal, observing the following:

1. When replacing evaporator with new one, determine quantity of oil to be charged into compressor by refer-

ring to Compressor Oil Level Check in General Service.

2. Evaporator case should be installed as close as possible to heater unit and blower assembly.

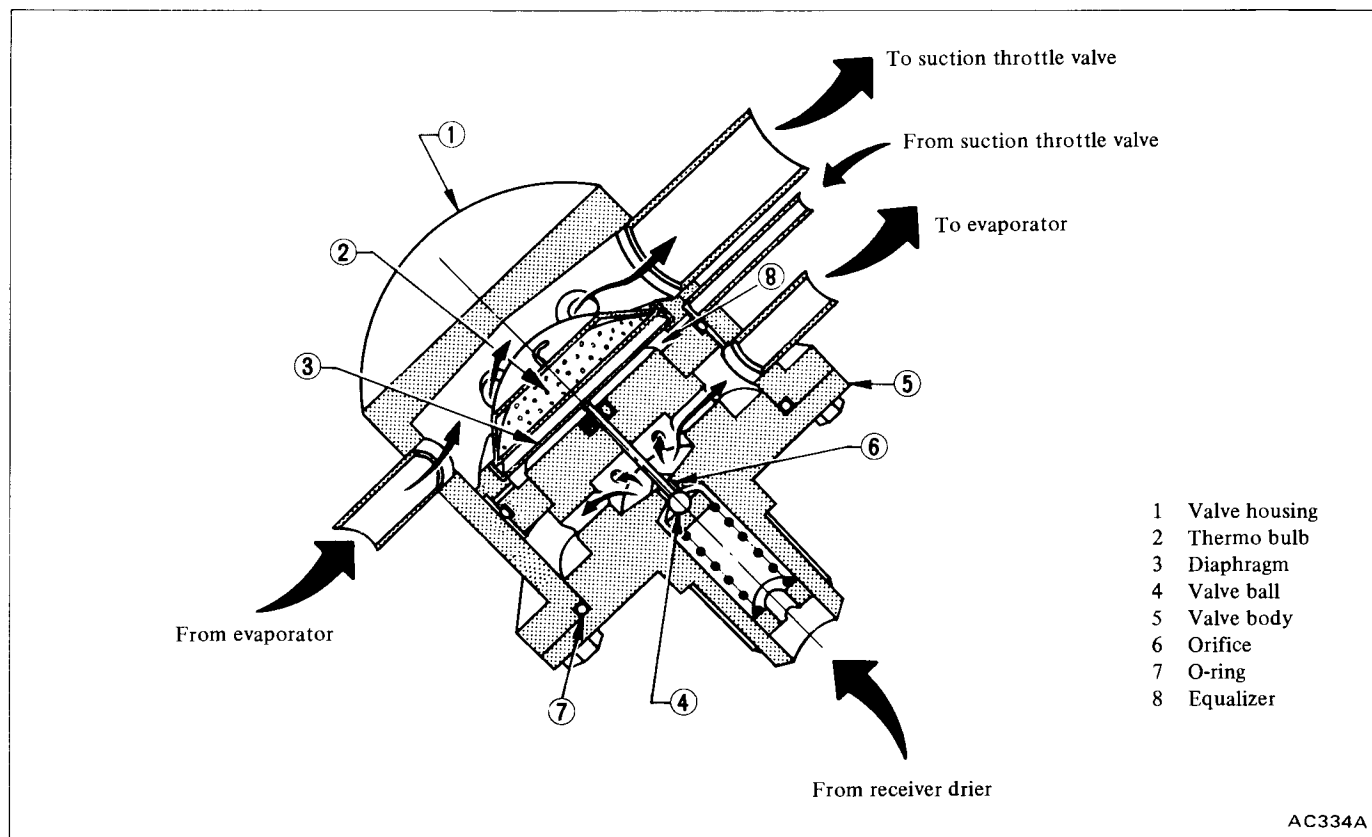
3. Connect line and evaporator. For tightening torque, refer to Refrigerant Line.

When connecting line, install new O-ring into connection.

4. As to evacuating and charging system, refer to section concerned in General Service.

5. Conduct leak test and ensure that there is no gas leak from connection.

EXPANSION VALVE



The expansion valve restricts the flow of liquid refrigerant as it passes through it and delivers sprayed refrigerant to the evaporator to facilitate refrigerant evaporation.

The refrigerant within the thermo bulb changes in pressure through the super heat condition of vaporized refrigerant gas which comes out of the evaporator, causing the deflection of the diaphragm. The lift of the ball valve attached to the diaphragm is changed by the deflection of the diaphragm, thus controlling the amount of refrigerant passing the orifice.

Expansion valve is equipped with

an adjusting screw. However, since the screw is set properly at the factory, adjustment is unnecessary. If expansion valve is damaged, replace with new one.

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove evaporator. Refer to Cooling Unit.
3. Loosen flare nuts, and remove expansion valve from evaporator and inlet pipe.

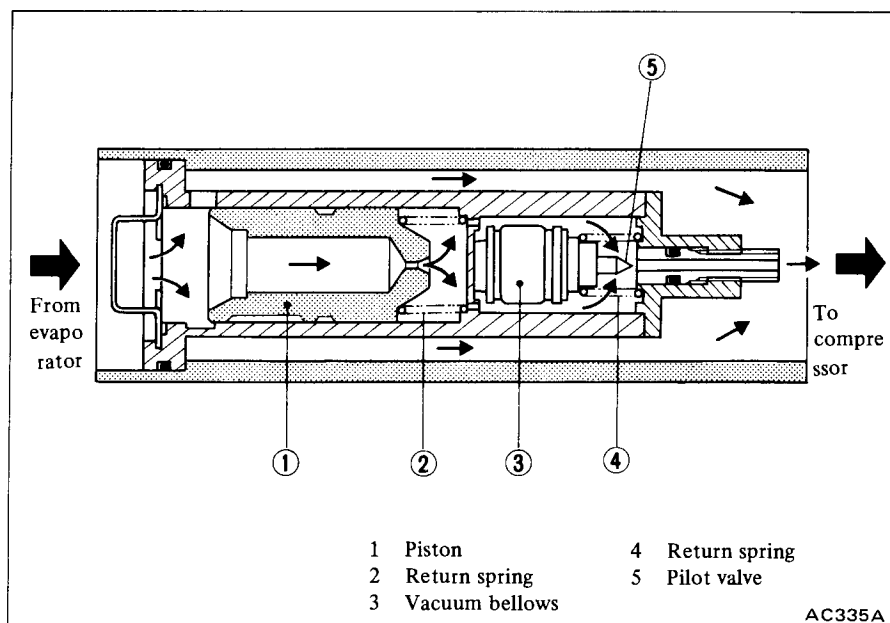
CAUTION:

Plug all openings to prevent entrance of dirt and moisture.

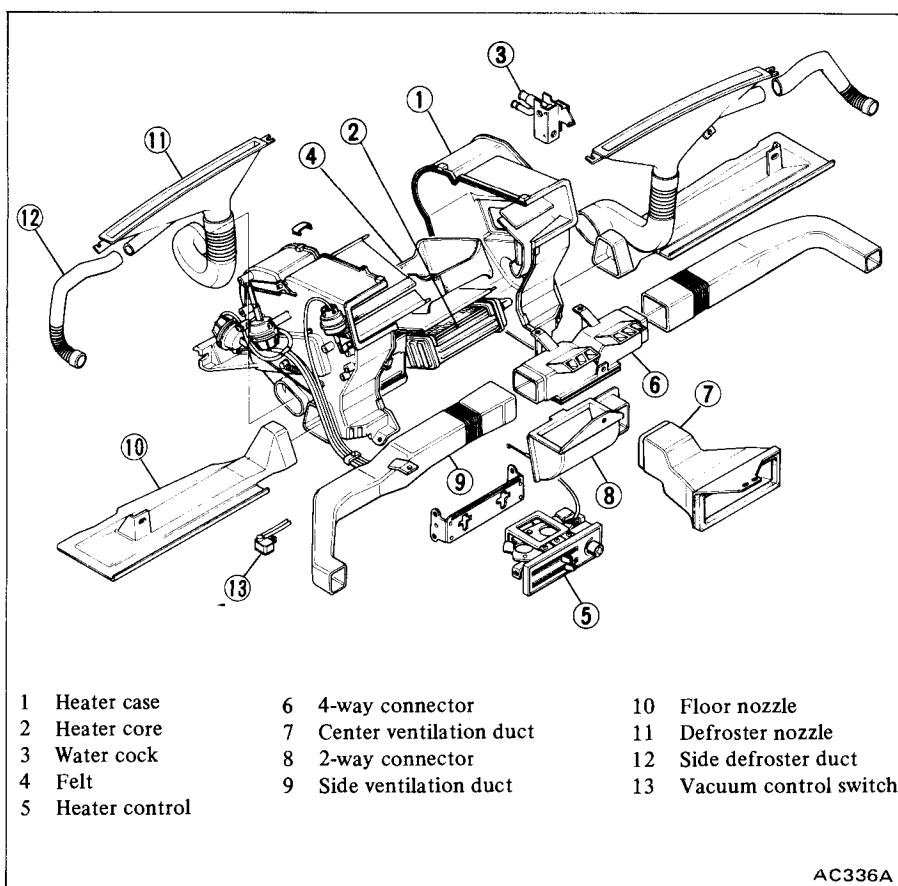
4. Loosen fixing nut.
5. Installation is in the reverse order of removal.

SUCTION THROTTLE VALVE

This device makes it possible to use air conditioning in locations having a wide range of temperatures throughout the year. When operating the cooler in cold weather, frost will form on the fins of the evaporator. The suction throttle valve is used to prevent the formation of this frost.

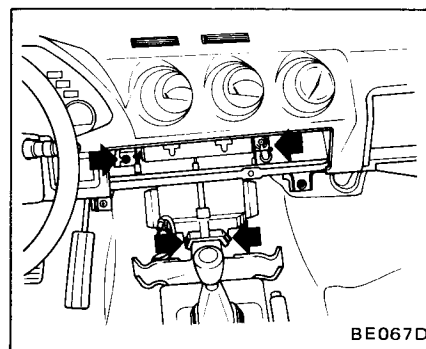


HEATER UNIT



REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Set TEMP lever to max. HOT position and drain engine coolant.
3. Remove blower unit, cooling unit and heater control.
4. Remove instrument lower cover and floor nozzle on driver's side.
5. Disconnect inlet and outlet heater hoses.
6. Remove attaching bolts and then remove heater unit.

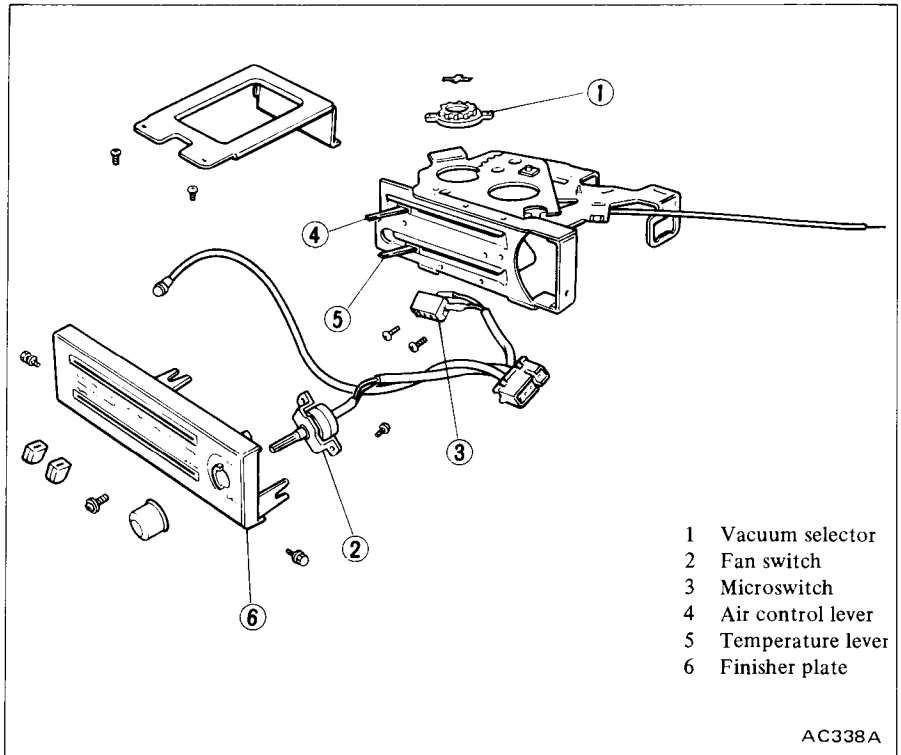


7. Install heater unit in the reverse order of removal.

DISASSEMBLY AND ASSEMBLY

1. Remove heater unit. Refer to Heater Unit Removal and Installation.
2. Remove water cock.
3. Remove clips securing right and left heater cases, then separate heater cases.
4. Take out heater core.
5. Assemble heater unit in the reverse order of removal.

DISASSEMBLY AND ASSEMBLY



HEATER CONTROL

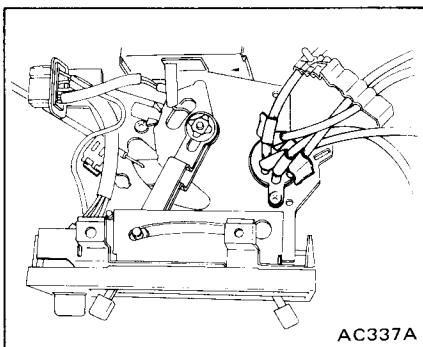
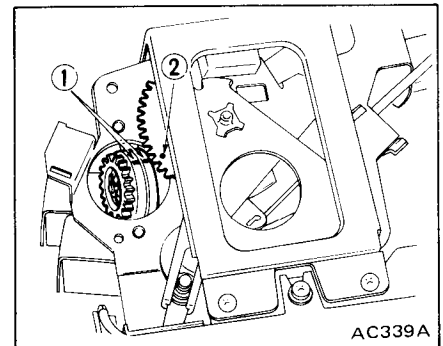
REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove instrument lower covers.
3. Remove instrument console. Refer to Section BF.
4. Remove instrument center ventilator and duct.
5. Disconnect water cock control cable.
6. Disconnect wiring connector and vacuum hoses, or remove vacuum selector with hoses.

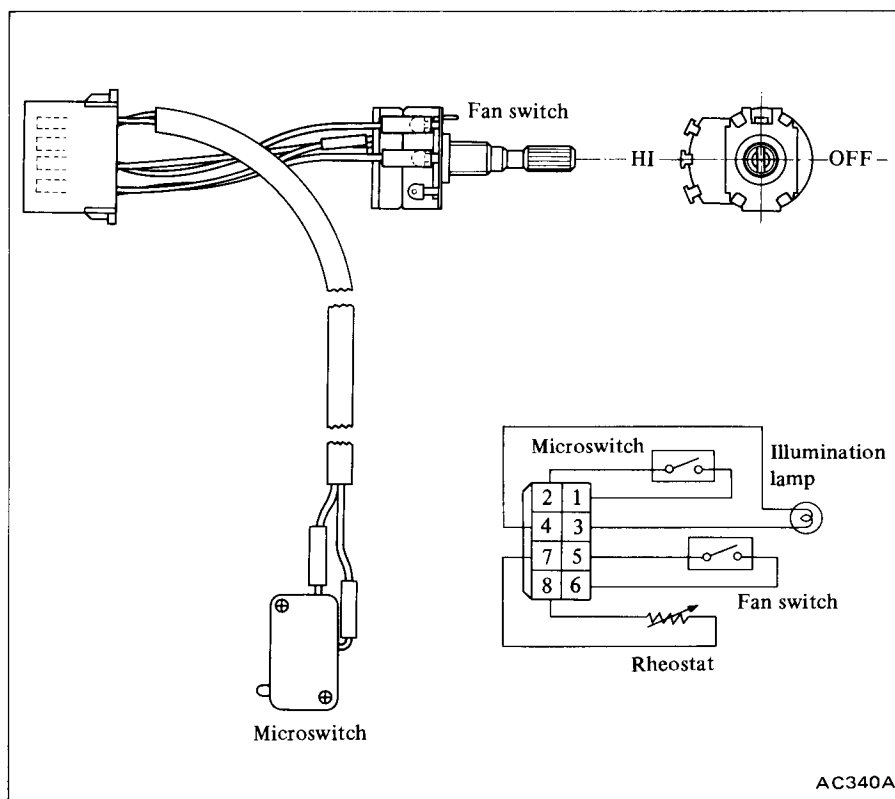
When removing vacuum hose, put a mark on each hose or mark color to prevent erroneous installation.

7. Remove heater control assembly by loosening attaching screws.
8. Install heater control assembly in the reverse order of removal. After installing heater control assembly, control cables and rod must be adjusted by referring to Adjusting Temperature Control Cable.

When installing vacuum selector, align upper and lower slits of vacuum selector with hole in air control lever.



INSPECTION



Fan switch

Check fan switch for continuity and measure resistance as follows.

With fan switch in OFF position:

Connector pins 5 and 6 are OFF.

With fan switch in ON position:

Connector pins 5 and 6 are ON.

With fan switch in OFF position:

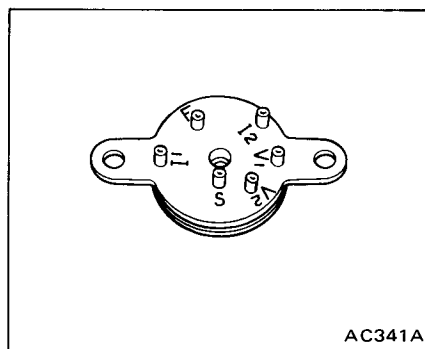
Resistance across pins 7 and 8 is 0 k Ω .

With fan switch in Max. HI position:

Resistance across pins 7 and 8 is about 1.1 k Ω .

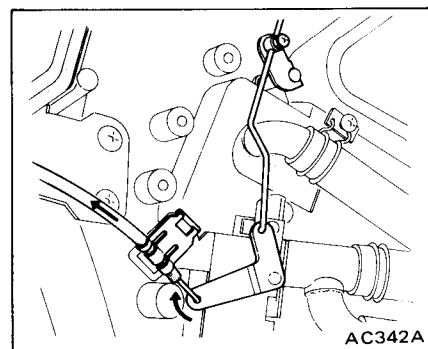
Vacuum selector

Make sure that continuity exists with vacuum selector connected as shown on page HA-10.

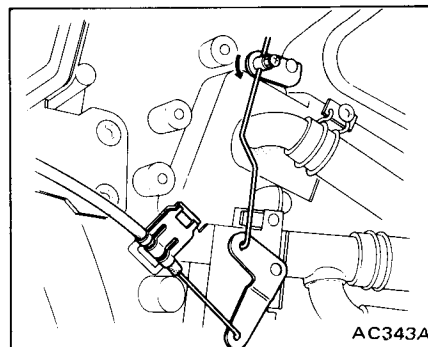


Adjusting temperature control cable

1. Set temperature lever in maximum cold position.
2. Temporarily tighten control rod mounting screw.
3. Push water cock lever in the direction of arrow (to closing side), and press temperature control cable outer case in the direction of arrow (to temperature lever side). While doing so, secure outer case with clip.



4. Set temperature lever in maximum HOT position, and tighten securely control rod to air-mix door lever while pushing lever in direction of the arrow.



Microswitch

Check microswitch for continuity as follows.

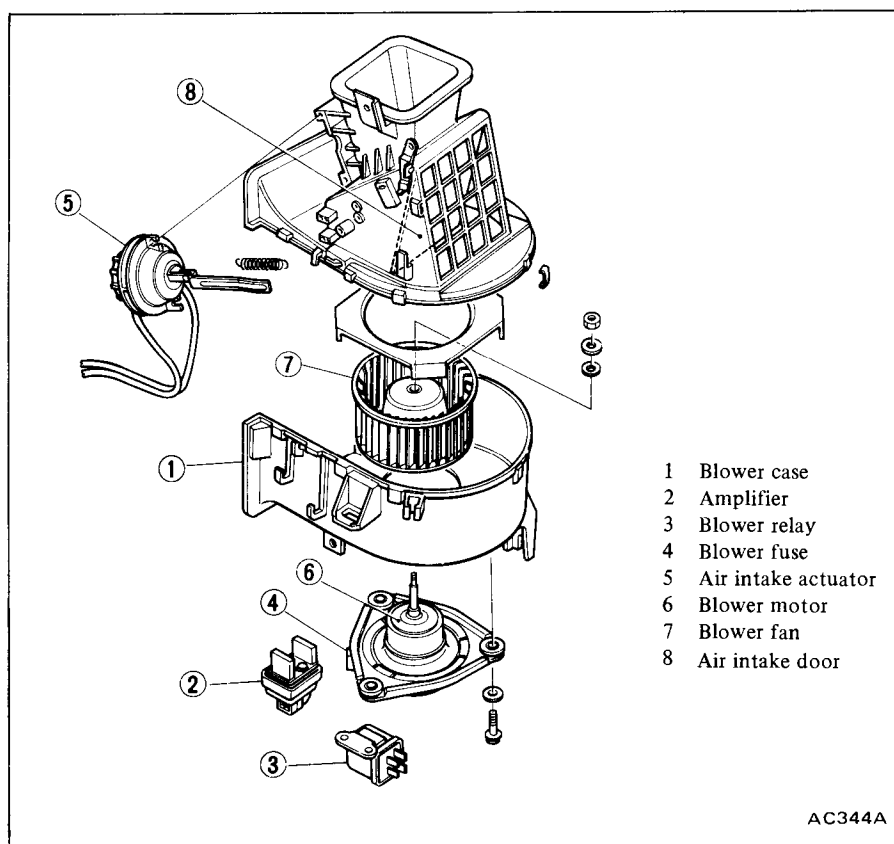
With air control lever in AIR-CON position:

Connector pins 1 and 2 are ON.

With air control lever in a position other than AIR CON:

Connector pins 1 and 2 are OFF.

BLOWER UNIT



REMOVAL AND INSTALLATION

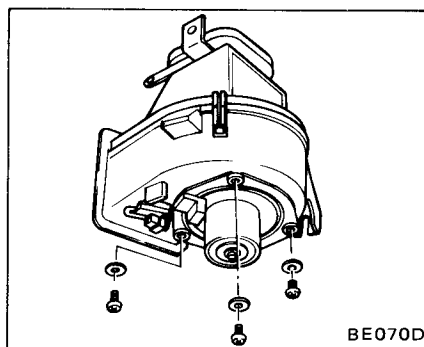
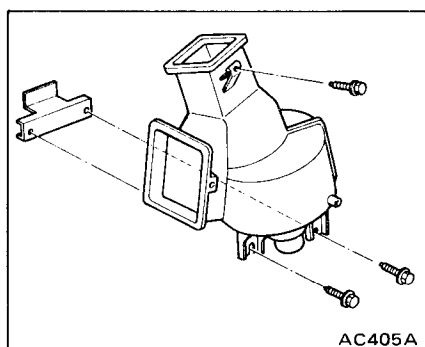
1. Disconnect battery ground cable.
2. Remove instrument lower cover on passenger's side and glove box.
3. Remove floor nozzle, defroster duct and side defroster duct on passenger's side.
4. Disconnect wire harness at blower motor harness connector.
5. Disconnect two vacuum hoses.
6. Remove bolts securing blower assembly and then remove blower assembly.

7. Installation is in the reverse order of removal.

BLOWER MOTOR

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove instrument lower cover and floor nozzle on passenger's side.
3. Disconnect wire harness at blower motor harness connector.
4. Remove blower motor attaching screws, and then remove blower motor with fan.

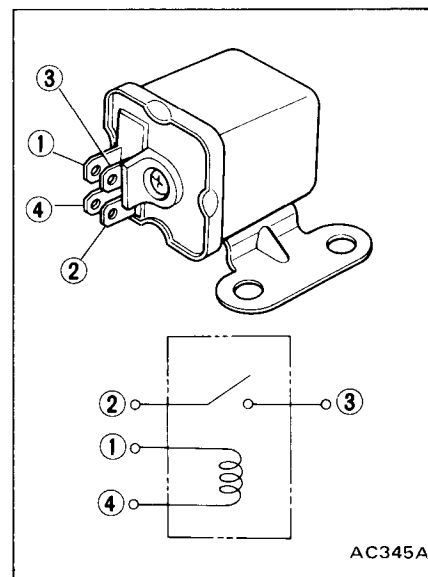


5. Installation is in the reverse order of removal.

BLOWER RELAY

INSPECTION

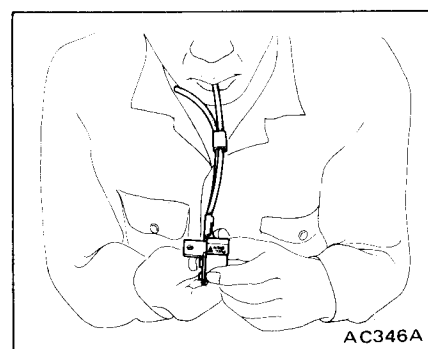
Test continuity of relay with ohmmeter or test lamp.



VACUUM CONTROL SWITCH

INSPECTION

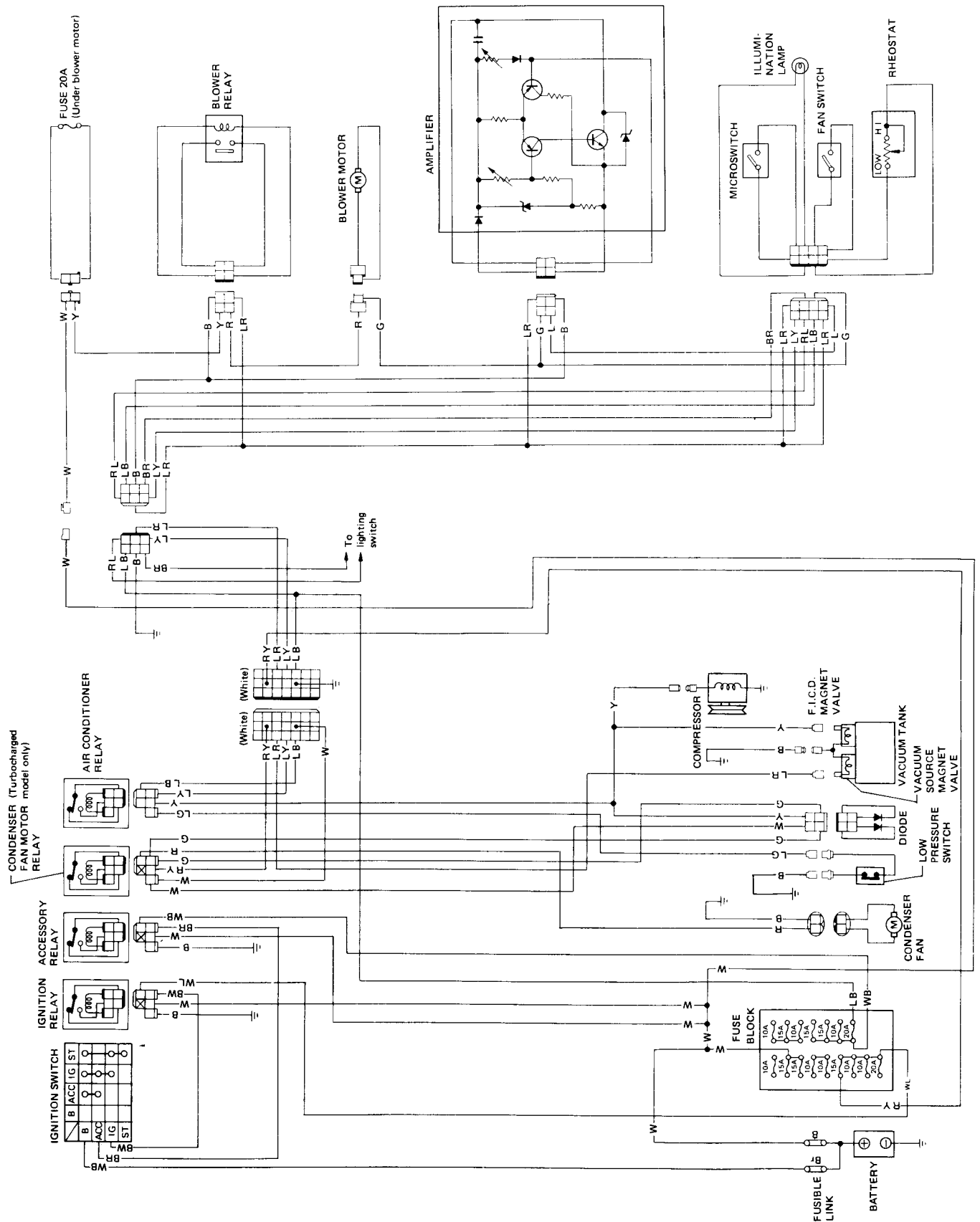
Make sure that air flows when the switch is pulled and that no air flows when the switch is pushed.



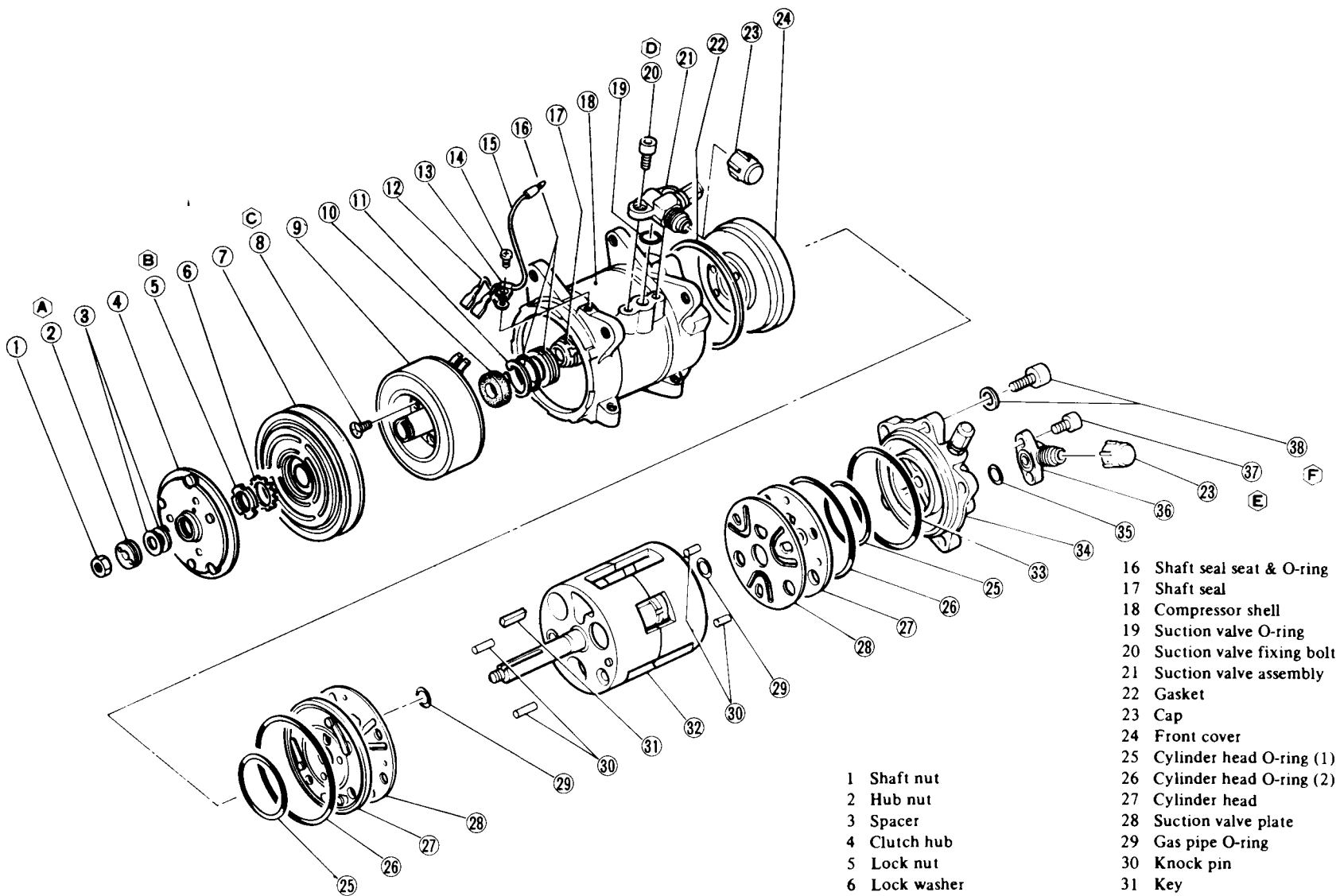
VACUUM HOSE DIAGRAM

Refer to Air Flow and Vacuum System of Description (Manual air conditioner).

ELECTRICAL DIAGRAM



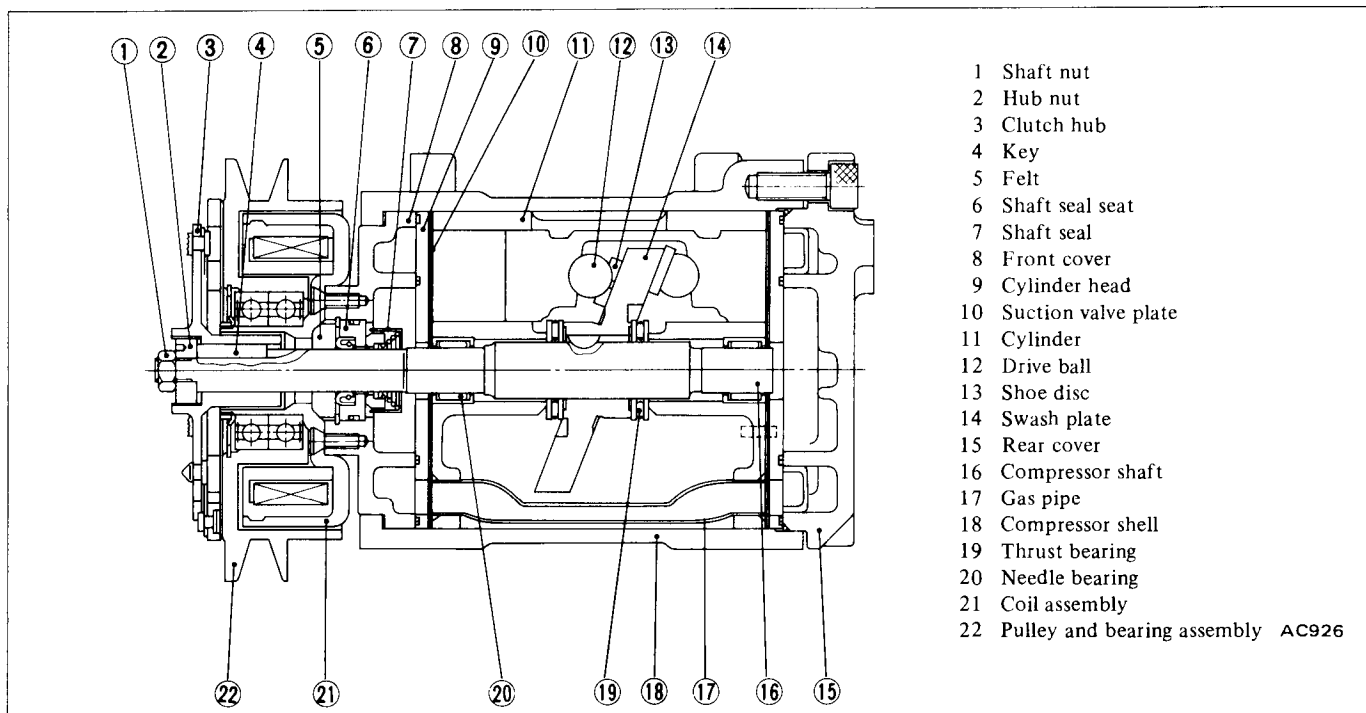
COMPRESSOR—Model MJ-167 (HITACHI make)



Tightening torque N·m (kg·m, ft·lb)

- Ⓐ 18 - 21 (1.8 - 2.1, 13 - 15)
- Ⓑ 25 - 27 (2.5 - 2.8, 18 - 20)
- Ⓒ 2.7 - 3.4 (0.28 - 0.35, 2.0 - 2.5)
- Ⓓ 17 - 18 (1.7 - 1.8, 12 - 13)
- Ⓔ 17 - 18 (1.7 - 1.8, 12 - 13)
- Ⓕ 19 - 21 (1.9 - 2.1, 14 - 15)

- 1 Shaft nut
- 2 Hub nut
- 3 Spacer
- 4 Clutch hub
- 5 Lock nut
- 6 Lock washer
- 7 Pulley and bearing assembly
- 8 Coil mounting screw
- 9 Coil assembly
- 10 Felt
- 11 Retainer ring
- 12 Earth wire
- 13 Wire clamp
- 14 Wire clamp screw
- 15 Lead wire
- 16 Shaft seal seat & O-ring
- 17 Shaft seal
- 18 Compressor shell
- 19 Suction valve O-ring
- 20 Suction valve fixing bolt
- 21 Suction valve assembly
- 22 Gasket
- 23 Cap
- 24 Front cover
- 25 Cylinder head O-ring (1)
- 26 Cylinder head O-ring (2)
- 27 Cylinder head
- 28 Suction valve plate
- 29 Gas pipe O-ring
- 30 Knock pin
- 31 Key
- 32 Cylinder assembly
- 33 Rear cover O-ring
- 34 Rear cover
- 35 Discharge valve O-ring
- 36 Discharge valve
- 37 Discharge valve fixing bolt
- 38 Rear cover fixing bolt and washer



DESCRIPTION

The MJ167 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.

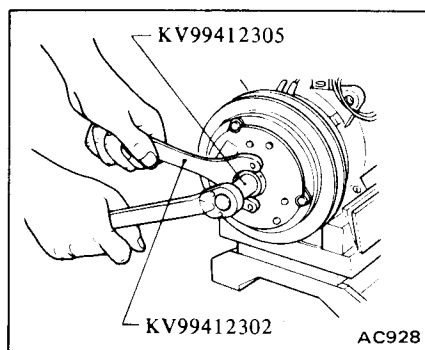
1. Clearance between clutch hub and pulley should be 0.5 to 0.8 mm (0.020 to 0.031 in) at all peripheral points.
2. Make sure that there is no oil or dirt on friction surfaces of clutch disc (clutch hub) and pulley. Remove any oil or dirt with a dry rag.
3. Make sure that terminal voltage at magnetic coil is above 10.5V.

REMOVAL

CAUTION:

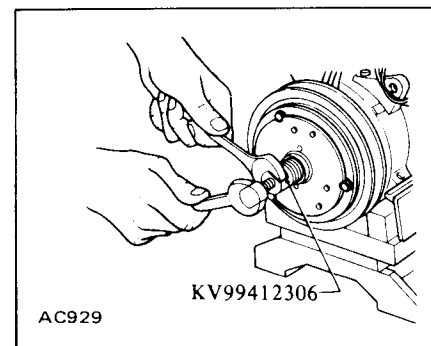
Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil will enter low pressure chamber.

1. Using Clutch Hub Wrench KV99412302, hold clutch hub. With suitable socket wrench, remove shaft nut from shaft.
2. Then, using Hub Nut Socket KV99412305, remove clutch hub nut. Remove spacers.

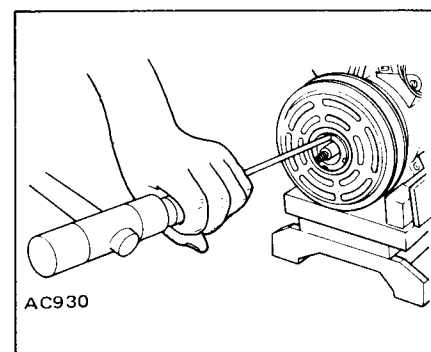


3. Using Clutch Hub Puller KV99412306, remove clutch hub. Thread tool into the bore of clutch

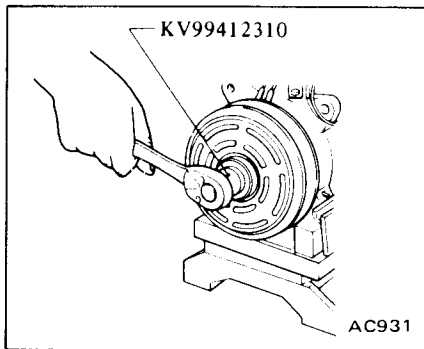
hub, hold tool with wrench, and then thread in center bolt.



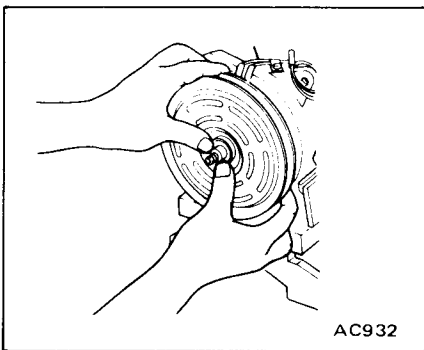
4. With an ordinary screwdriver, flatten lock washer tab.



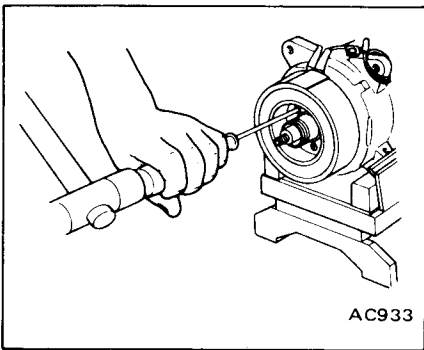
5. Using Lock Nut Socket KV99412310, loosen lock nut. Remove lock nut and lock washer.



6. Remove pulley and bearing assembly. When the assembly can not be removed by hand, use a puller and Puller Pilot KV99412312.



7. Using an impact tool, loosen six coil mounting screws. Use of the impact tool is advisable as screws have been caked.



8. Remove coil mounting screws and separate coil assembly.

INSPECTION

1. Check the friction surfaces of the 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 the friction surfaces should be cleaned with a suitable

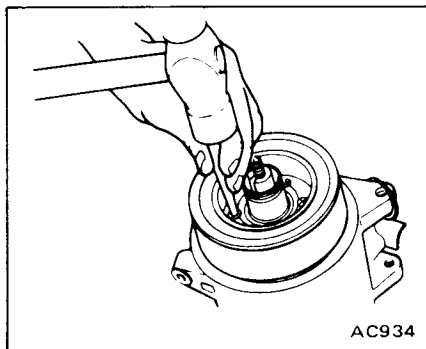
solvent and a dry rag.

3. Check coil for shorted or opened binding leads.

INSTALLATION

1. Using a Phillips screwdriver, tighten coil assembly mounting screws in an alternating pattern. After screws have been firmly tightened, punch-lock each at one location to prevent loosening.

ⓧ : Coil mounting screw
2.7 - 3.4 N·m
(0.28 - 0.35 kg·m,
2.0 - 2.5 ft-lb)



2. Using a plastic mallet, drive pulley and bearing assembly onto the neck of the installed coil assembly. 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. Position lock washer and lock nut in place. Using Lock Nut Socket KV99412310, tighten lock nut firmly. With lock washer tab and lock nut cutouts matched, bend the tab with the screwdriver. Proceed carefully to avoid bearing cage damage.

ⓧ : Lock nut
25 - 27 N·m
(2.5 - 2.8 kg·m,
18 - 20 ft-lb)

4. Fit key and clutch hub to the shaft. Select adjusting spacer which gives the correct clearance between the pulley and clutch hub. Coat hub nut with Locktite (equivalent to HI-LOCK FT-15B).

ⓧ : Hub nut
18 - 21 N·m
(1.8 - 2.1 kg·m,
13 - 15 ft-lb)

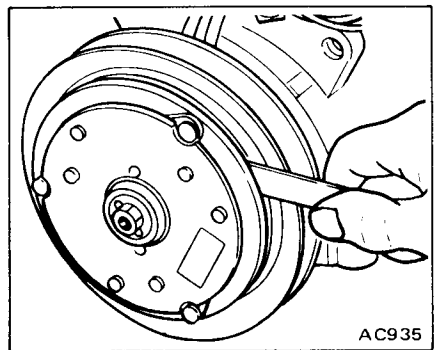
5. Coat shaft nut with Locktite (equivalent to HI-LOCK FT-15B).

ⓧ : 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.

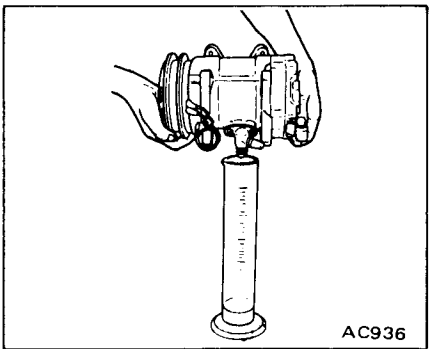


When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch some thirty times. Break-in operation raises the level of transmitted torque.

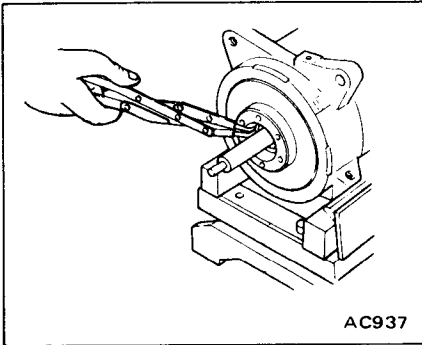
SHAFT SEAL

REMOVAL

1. Turn compressor upside down, and drain oil from suction valve.



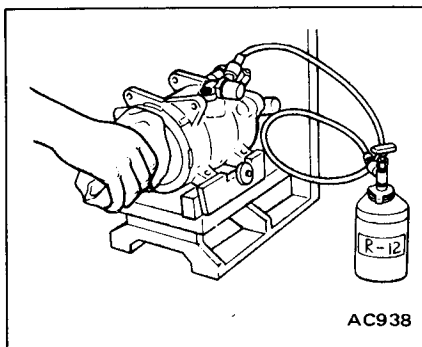
2. Remove clutch hub, pulley and bearing assembly, and coil assembly. Refer to Compressor Clutch for removal.
3. Remove felt.
4. Using snap ring pliers, compress and remove retainer ring.



5. Plug low and high pressure (suction and discharge) valve openings of compressor. Wrap rag around shaft. Apply pressure [196 to 490 kPa (2 to 5 kg/cm², 28 to 71 psi)] from low pressure (suction) service valve of compressor, and receive shaft seal seat in rag.

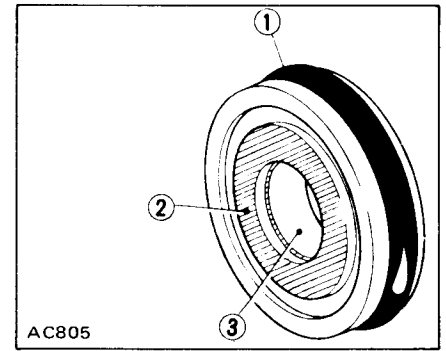
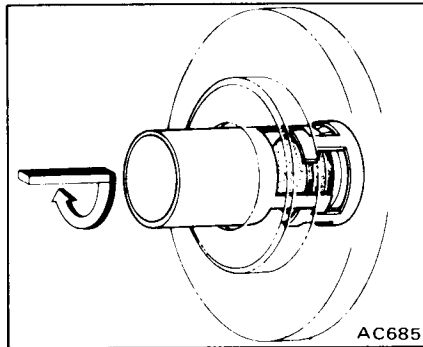
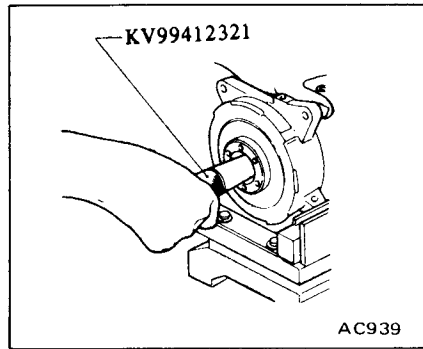
CAUTION:

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 KV99412321 through the open end of front cover. Depress the carbon seal and hook the tool at the case projection of shaft seal. Slowly pull out the tool, thereby removing shaft seal.



- 1 O-ring
- 2 Contact surface
- 3 Oil seal

INSTALLATION

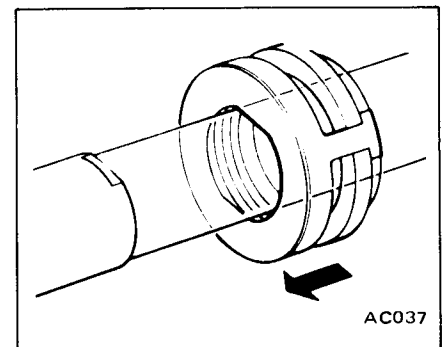
Do not reuse shaft seal and shaft seal seat.

CAUTION:

In placing a new seal kit on the workbench, make sure that the contact surface faces upward. Take necessary steps to avoid damage.

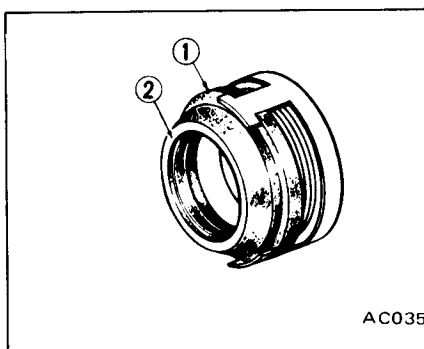
1. Make sure that the shaft seal contact surface is free of dirt and amply lubricated with compressor oil.
2. Cap Shaft Seal Pilot KV99412322 to the top end of compressor shaft.
3. Using Shaft Seal Remover & Installer KV99412321, insert shaft seal with shaft seal case and shaft cutout aligned.

Apply force to turn the seal somewhat to the left and right. Insure that shaft seal seats properly in the shaft cutout.



INSPECTION

1. Check the carbon seal surface of shaft seal for damage.



- 1 Carbon seal
- 2 Contact surface

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.

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 recommended multi-purpose grease (or compressor oil). Following this, push in shaft seal seat so that it seats properly at the land of front cover.

6. 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.

7. Install felt.

8. Install clutch hub and key 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 high and low pressure (discharge and suction) valve openings on

compressor with blind caps.

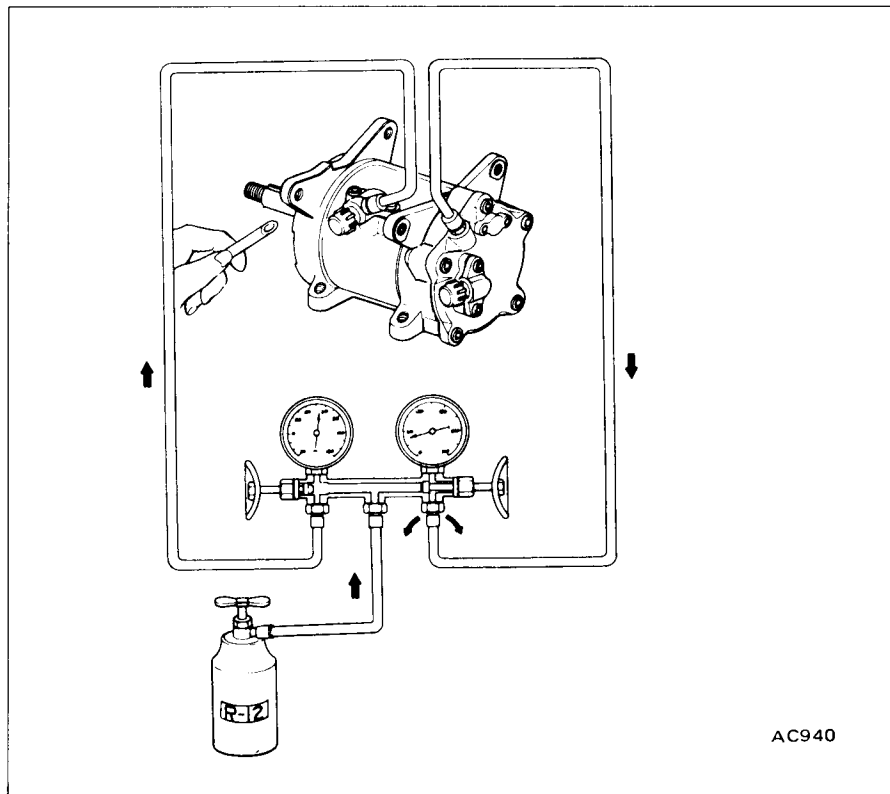
To plug low pressure (suction) valve, use cap to which seal rubber is fitted.

(2) Connect charging hoses in the lines between manifold gauge and high and low pressure (discharge and suction) service valves.

Connect refrigerant can to the middle hose of manifold gauge.

(3) Open valve of can tap, charge refrigerant through low pressure (suction) service valve and purge air from high pressure (discharge) service valve.

(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 valve, charge compressor with same amount of new oil as was drained before. Refer to Oil Level Check for required amount of oil.

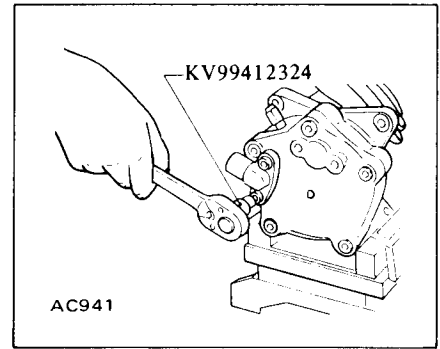
DISCHARGE VALVE

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 Allen Socket KV99412324, remove hex. socket head bolts.



2. Remove discharge valve.

3. Discard the old O-ring.

INSPECTION

1. Check for scratched seating surface of discharge valve and of rear cover.

2. Replace discharge valve which is scratched.

3. If a scratch is found on the groove of rear cover O-ring, replace rear cover.

INSTALLATION

Note: Do not reuse old O-ring.

1. Apply a coating of compressor oil to the groove of discharge valve and O-ring, and install these parts in their proper positions on rear cover.

2. Using Allen Socket KV99412324, secure discharge valve to rear cover with hex. socket head bolts.

Ⓙ : Discharge valve fixing bolt

17 - 18 N·m

(1.7 - 1.8 kg-m,

12 - 13 ft-lb)

3. Conduct a gas leak test. Refer to Shaft Seal for gas leak test.

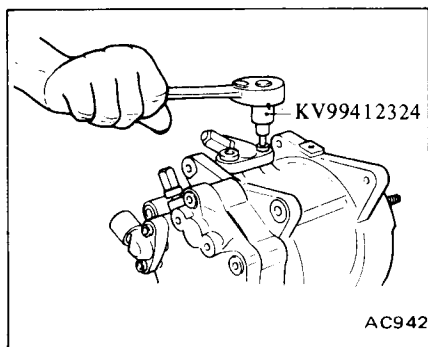
SUCTION VALVE

REMOVAL

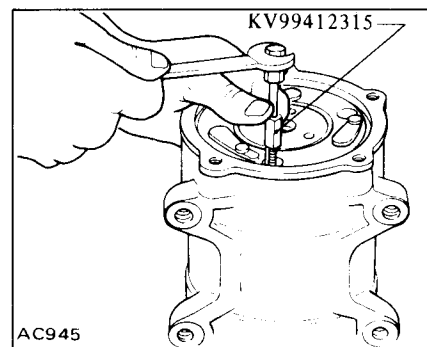
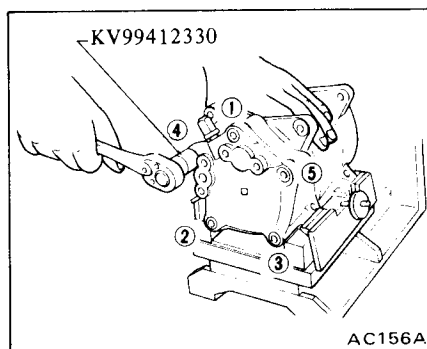
CAUTION:

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 Allen Socket KV99412324, remove hex. socket head bolts.
2. Remove suction valve.
3. Discard old O-ring.



Starting at the top, loosen all bolts one turn in an alternating pattern. Then remove bolts in turn.



INSPECTION

1. Check for scratched seating surface of suction valve and shell.
2. Replace suction valve which is scratched.
3. If a scratch is found on groove of shell O-ring, replace shell.

INSTALLATION

Do not reuse old O-ring.

1. Apply a coating of compressor oil to groove of suction valve and O-ring, and install these parts in their proper positions on shell.
2. Using Allen Socket KV99412324, secure suction valve to shell with hex. socket head bolts.

T : Suction valve fixing bolt
17 - 18 N·m
(1.7 - 1.8 kg·m,
12 - 13 ft·lb)

3. Conduct a gas leak test. Refer to Shaft Seal for gas leak test.

REAR COVER AND REAR CYLINDER HEAD

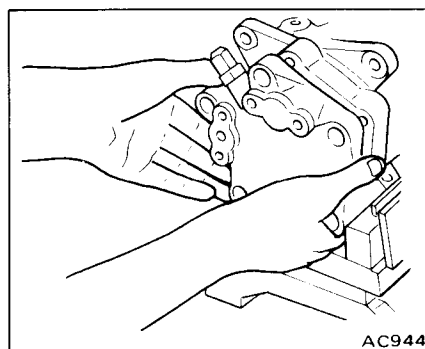
REMOVAL

1. Turn compressor upside down, and drain oil from suction valve.
2. Remove discharge valve.
3. Using Allen Socket KV99412330, remove rear cover mounting bolts.

4. Grasp rear cover and carefully separate it from compressor. Tap the flange lightly and alternately as required with a plastic mallet.

CAUTION:

Do not tap on the compressor shaft.



5. Remove three O-rings. Discard used O-rings.
6. Remove rear cylinder head, suction valve plate, two pins and O-ring. Carefully remove suction valve plate, avoiding deformation.
7. When removal proves difficult, use Cylinder Head Remover KV99412315. Insert this tool into hole in cylinder head. With the nut in firm contact with the back side of cylinder head, tighten the bolt slowly to break loose the head.

INSPECTION

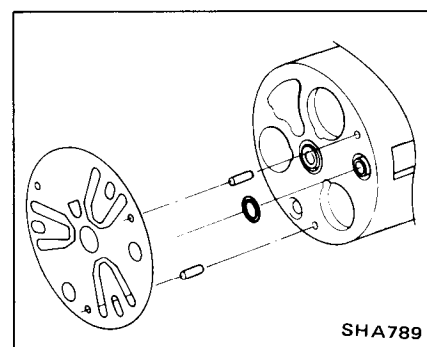
1. If replacement of low pressure (suction) service valve is necessary, replace rear cover with a new one.
2. Check suction valve plate and cylinder head for broken valves.

INSTALLATION

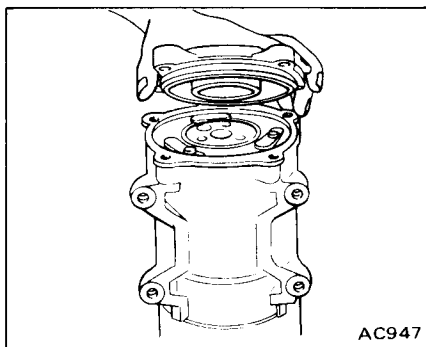
Do not reuse old O-ring.

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. Install suction valve plate, making sure that the three valves properly align with cylinder cutouts.



5. Assemble cylinder head and install three O-rings in their respective positions. Coat O-rings with ample amount of oil before installation.
5. Carefully fit rear cover to the rear of compressor.



6. 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)

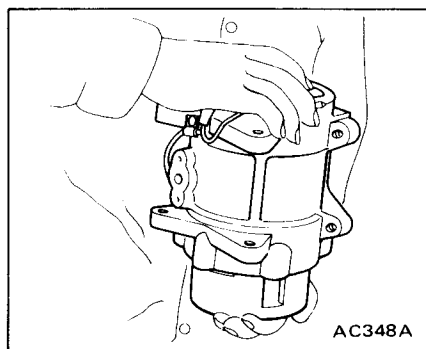
7. Install discharge valve. Refer to Discharge Valve for installation.
8. Upon completion of the above operation, conduct a leak test. Refer to Shaft Seal for gas leak test.
9. From suction valve, charge compressor with same amount of new oil as was drained before. Refer to Oil Level Check for required amount of oil.

FRONT COVER, FRONT CYLINDER HEAD AND CYLINDER

REMOVAL

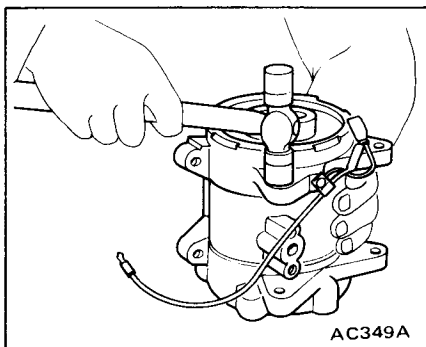
1. Turn compressor upside down, and drain oil from suction valve.
2. Remove compressor clutch assembly. Refer to Compressor Clutch.
3. Using snap ring pliers, remove shaft seal retainer ring. Then remove shaft seal seat. Refer to Shaft Seal. Removal of shaft seal is not absolutely necessary. It may be removed when

- cylinder assembly is removed from front cover. In fact, this approach facilitates work.
4. Remove discharge valve. Refer to Discharge Valve for removal.
 5. 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.
 6. Remove cylinder assembly from compressor shell.

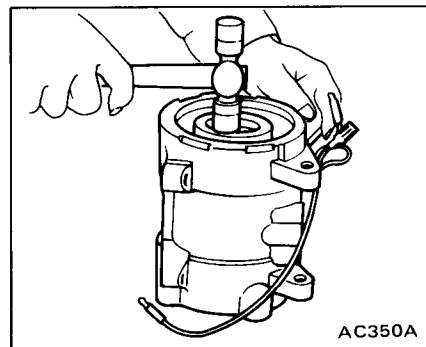


Do not drop cylinder assembly and scratch.

When cylinder does not drop from shell, top shell lightly with plastic mallet. Do not top compressor shaft.



7. Detach front cover from shell.



8. Remove shaft seal from the shaft.
9. 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:

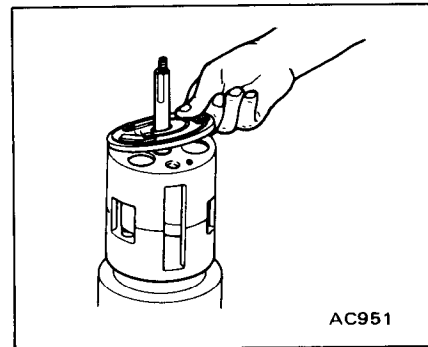
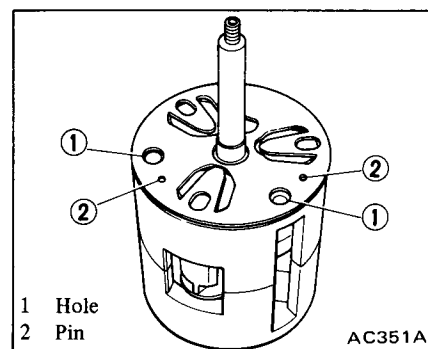
Do not deform suction valve plate when removing it.

INSTALLATION

Suction valve plates and cylinder heads are the same as those of front and rear.

Do not reuse old gasket and O-ring.

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 the cylinder cutouts. Install cylinder head.

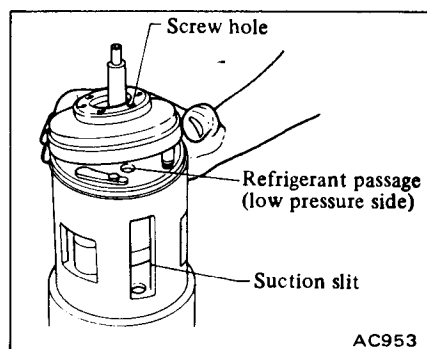
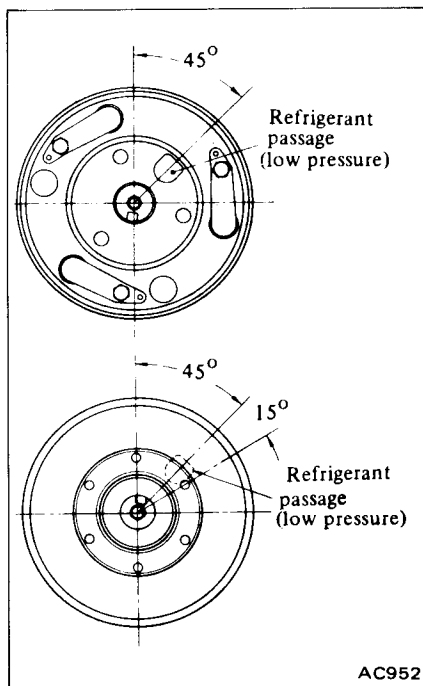


3. Align shaft seal with the shaft cutaway. Firmly seat shaft seal at the shaft land. Attempt to turn shaft seal to clockwise and counterclockwise, confirming that it is seated properly.

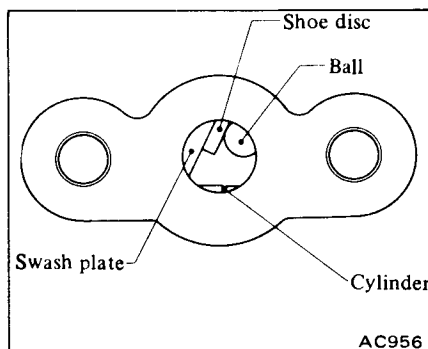
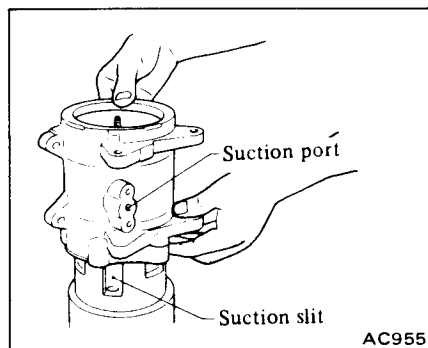
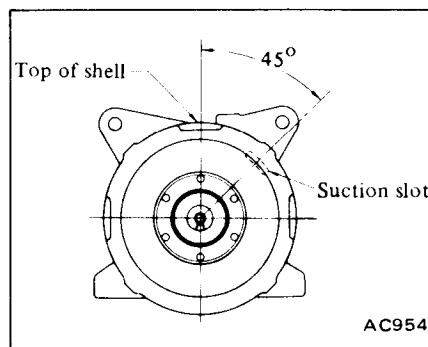
4. Install two O-rings on cylinder head. Coat O-rings with ample amount of oil before installation.

5. 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. See the illustration at step 12. For this purpose, install front cover on cylinder head so that angle between 5 mm (0.20 in) threaded hole in front cover and low pressure side refrigerant passage in cylinder head is about 45° .



6. 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.



7. 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.

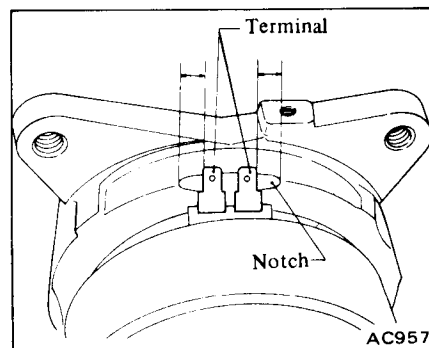
8. Continue with work up to installation of rear cover. Refer to Rear Cover and Rear Cylinder Head for installation.

9. Continue with work up to installation of discharge valve. Refer to Discharge Valve 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 valve, 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 (Manual air conditioner)

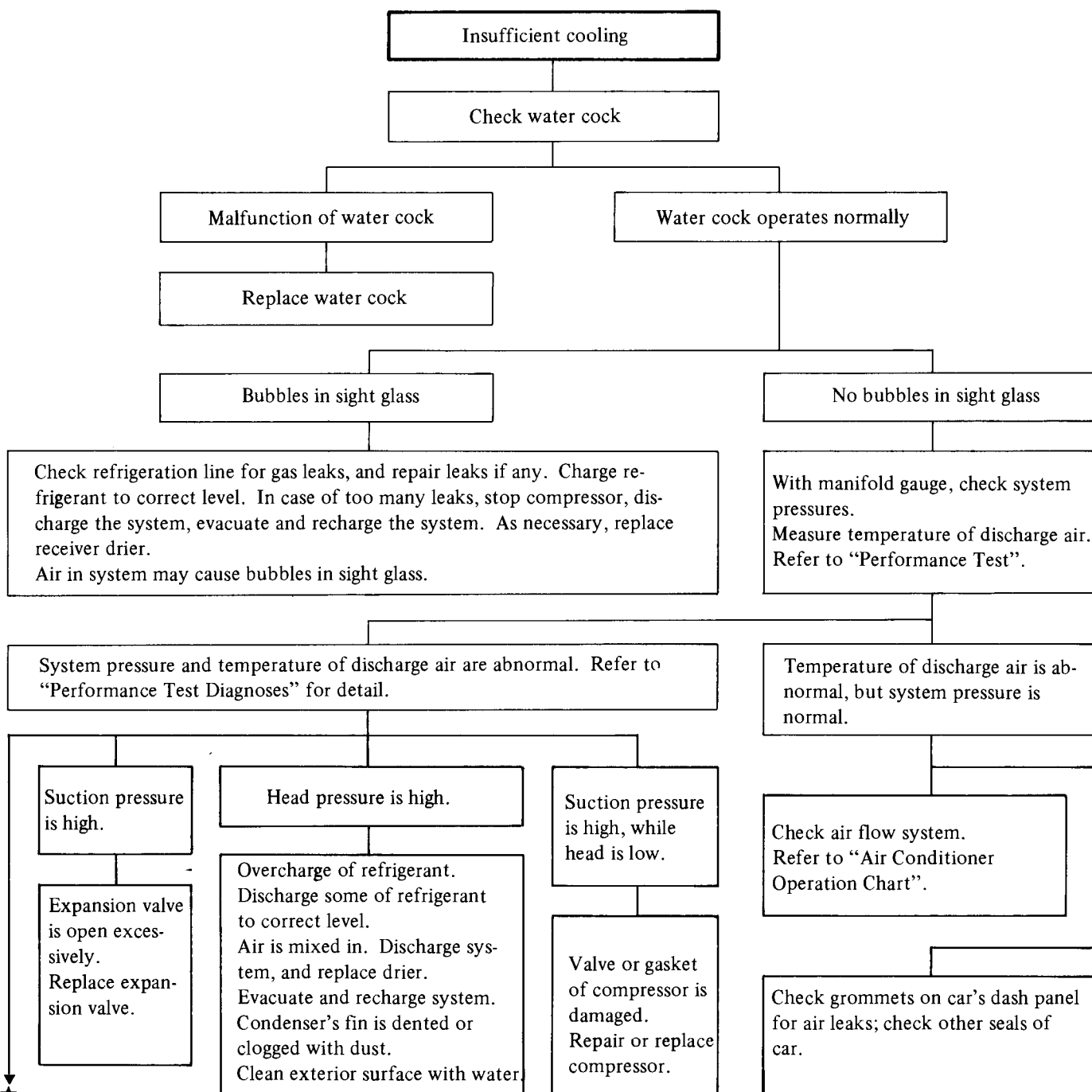
AIR CONDITIONER DIAGNOSES

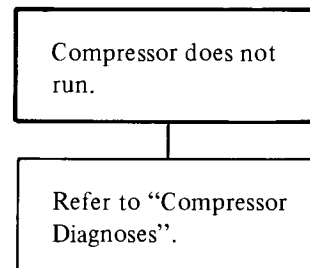
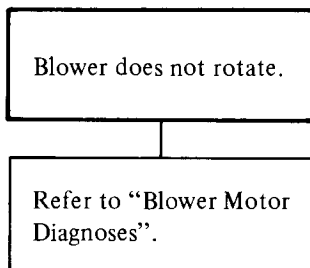
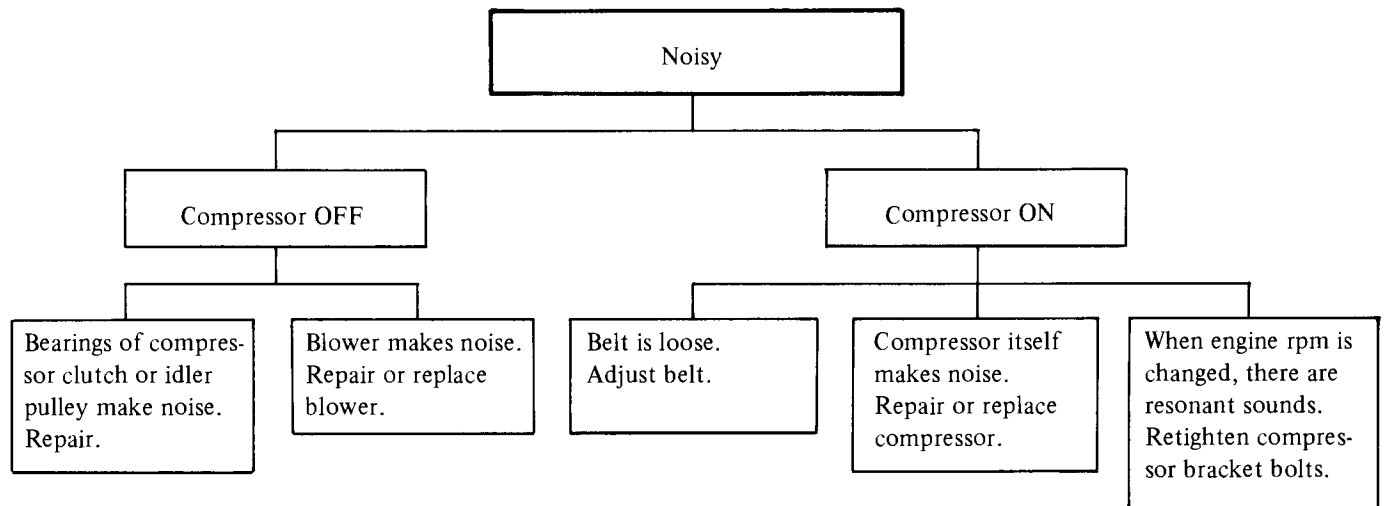
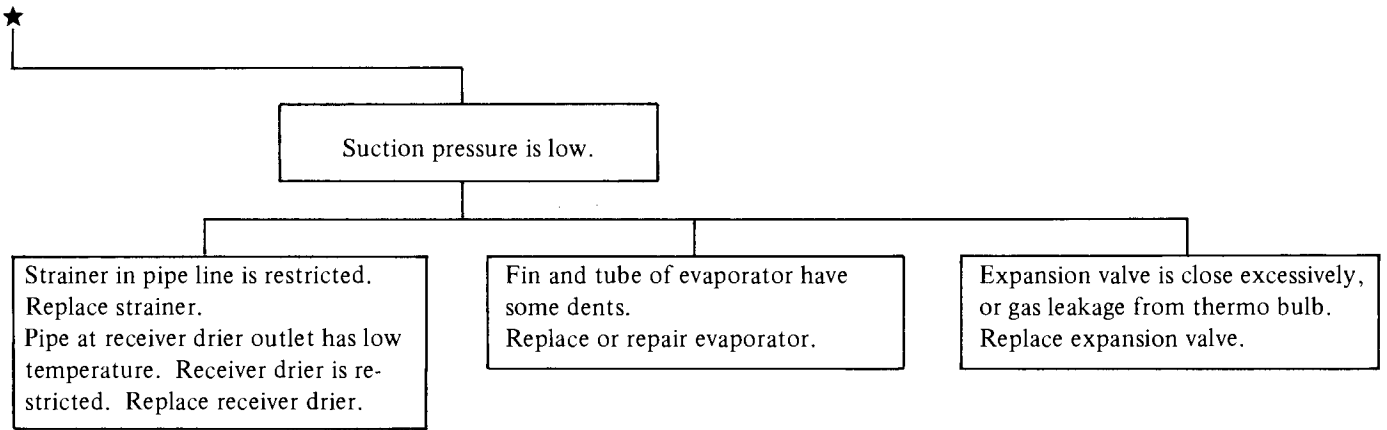
When insufficient cooling is noticed, check refrigerant line for gas leakage. If the amount of refrigerant is less than normal or there is no refrigerant in the system, check for the point of leakage as follows:

1. Charge refrigerant.
2. Start engine and operate air conditioning system.
Check connections and unit for gas leakage using a leak tester.

Extreme care should be taken at connections or unit locations where oil seepage or dust adhesion is noticed. Thoroughly clean the affected part and place soapy water over it to determine whether leakage is present.

3. Stop engine and leave it unattended for approximately 20 minutes. Repeat step 2 above.





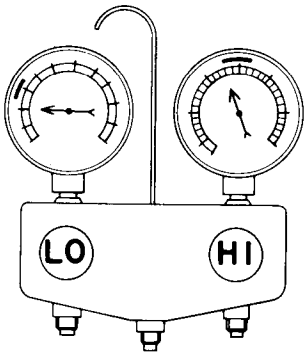
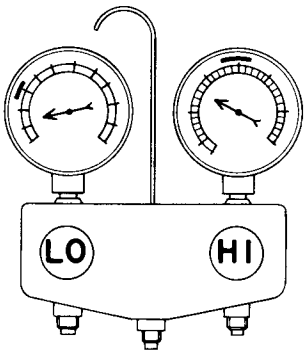
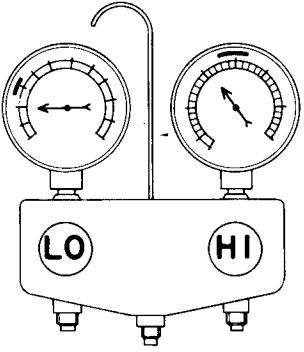
PERFORMANCE TEST DIAGNOSES

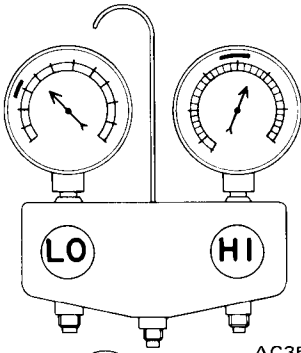
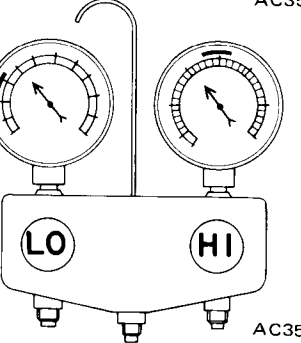
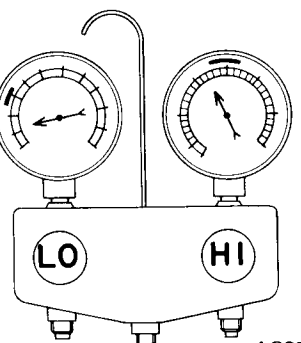
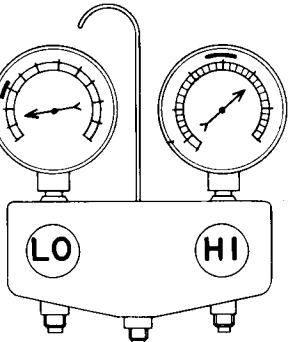
Of various conditions caused to the air conditioning system, the characteristics revealed on manifold gauge reading are shown in the following.

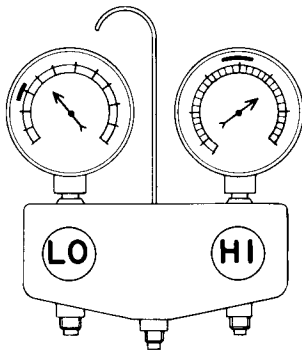
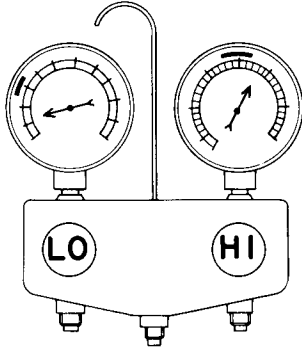
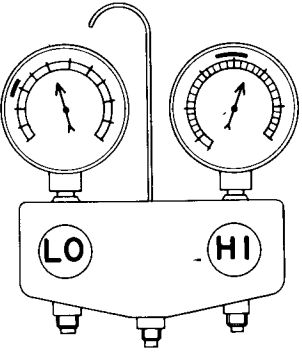
As to the method of a performance test, refer to the item of "Performance Test".

indicates a range based on the assumption that the air conditioning system is in good order. This range is described in PERFORMANCE CHART.

In the following table, the portion smeared with ink on each gauge scale

Condition	Probable cause	Corrective action
<div style="border: 1px solid black; padding: 2px;">INSUFFICIENT REFRIGERANT CHARGE</div>  <p>AC352A</p>	<p>Insufficient cooling. Bubbles appear in sight glass.</p>	<p>Refrigerant is small, or leaking a little.</p> <ol style="list-style-type: none"> 1. Leak test. 2. Repair leak. 3. Charge system. <p>Evacuate, as necessary, and recharge system.</p>
<div style="border: 1px solid black; padding: 2px;">ALMOST NO REFRIGERANT</div>  <p>AC353A</p>	<p>No cooling action. In sight glass appear a lot of bubbles or something like mist.</p>	<p>Serious refrigerant leak.</p> <ol style="list-style-type: none"> 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.
<div style="border: 1px solid black; padding: 2px;">FAULTY EXPANSION VALVE</div>  <p>AC354A</p>	<p>Slight cooling. Sweating or frosted expansion valve inlet.</p>	<p>Expansion valve restricts refrigerant flow.</p> <ul style="list-style-type: none"> • Expansion valve is clogged. • Expansion valve is inoperative. <p>Valve stuck closed. Thermal bulb has lost charge.</p> <p>If valve inlet reveals sweat or frost:</p> <ol style="list-style-type: none"> 1. Discharge system. 2. Remove valve and clean it. Replace it if necessary. 3. Evacuate system. 4. Charge system. <p>If valve does not operate:</p> <ol style="list-style-type: none"> 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.

Condition	Probable cause	Corrective action
 <p>AC355A</p>  <p>AC356A</p>	<p>Insufficient cooling. Sweated suction line.</p> <p>No cooling. Sweating or frosted suction line.</p>	<p>Expansion valve allows too much refrigerant through evaporator.</p> <p>Faulty expansion valve.</p> <p>Check valve for operation. If suction side does not show a pressure decrease, replace valve.</p> <ol style="list-style-type: none"> 1. Discharge system. 2. Replace valve. 3. Evacuate and replace system.
<p>FAULTY SUCTION THROTTLE VALVE</p>  <p>AC357A</p>	<p>Insufficient cooling. Frosted evaporator.</p>	<p>Suction throttle valve is inoperative.</p> <ol style="list-style-type: none"> 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.
 <p>AC358A</p>	<p>Insufficient cooling.</p>	<p>Suction throttle valve restricts refrigerant flow.</p> <ol style="list-style-type: none"> 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.

Condition	Probable cause	Corrective action
<div> AIR IN SYSTEM </div>  <p>AC359A</p> <p>Insufficient cooling. Sight glass shows occasional bubbles.</p>	<p>Air mixed with refrigerant in system.</p>	<ol style="list-style-type: none"> 1. Discharge system. 2. Replace receiver drier. 3. Evacuate and charge system.
<div> MOISTURE IN SYSTEM </div>  <p>AC360A</p> <p>After operation for a while, pressure on suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As warning of this, reading shows 39 kPa (0.4 kg/cm², 6 psi) vibration.</p>	<p>Drier is saturated with moisture. Moisture has frozen at expansion valve. Refrigerant flow is restricted.</p>	<ol style="list-style-type: none"> 1. Discharge system. 2. Replace receiver drier (twice if necessary). 3. Evacuate system completely. (Repeat 30-minute evacuating three times.) 4. Recharge system.
<div> FAULTY CONDENSER </div>  <p>AC361A</p> <p>No cooling action: engine may overheat. Bubbles appear in sight glass of drier. Suction line is very hot.</p>	<p>Condenser is often found not functioning well.</p>	<ul style="list-style-type: none"> ● Check fan belt and fluid coupling. ● Check condenser for dirt accumulation. ● Check engine cooling system for overheat. ● Check for refrigerant overcharge. <p>If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.</p>


Condition	Probable cause	Corrective action
<div> <p>HIGH PRESSURE LINE BLOCKED</p> </div> <div> </div> <div> <p>AC362A</p> </div> <p>Insufficient cooling. Frosted high pressure liquid line.</p>	<p>Drier clogged, or restriction in high pressure line</p>	<ol style="list-style-type: none"> 1. Discharge system. 2. Remove receiver drier or strainer and replace it. 3. Evacuate and charge system.
<div> <p>FAULTY COMPRESSOR</p> </div> <div> </div> <div> <p>AC363A</p> </div> <p>Insufficient cooling.</p>	<p>Internal problem in compressor, or damaged gasket and valve.</p>	<ol style="list-style-type: none"> 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.
<div> <p>TOO MUCH OIL IN SYSTEM (Excessive)</p> </div> <div> </div> <div> <p>AC364A</p> </div> <p>Insufficient cooling.</p>	<p>Too much oil circulates with refrigerant, causing the cooling capacity of the system to be reduced.</p>	<p>Refer to Oil Level Check for correcting oil level.</p>


BLOWER MOTOR DIAGNOSES

Test conditions

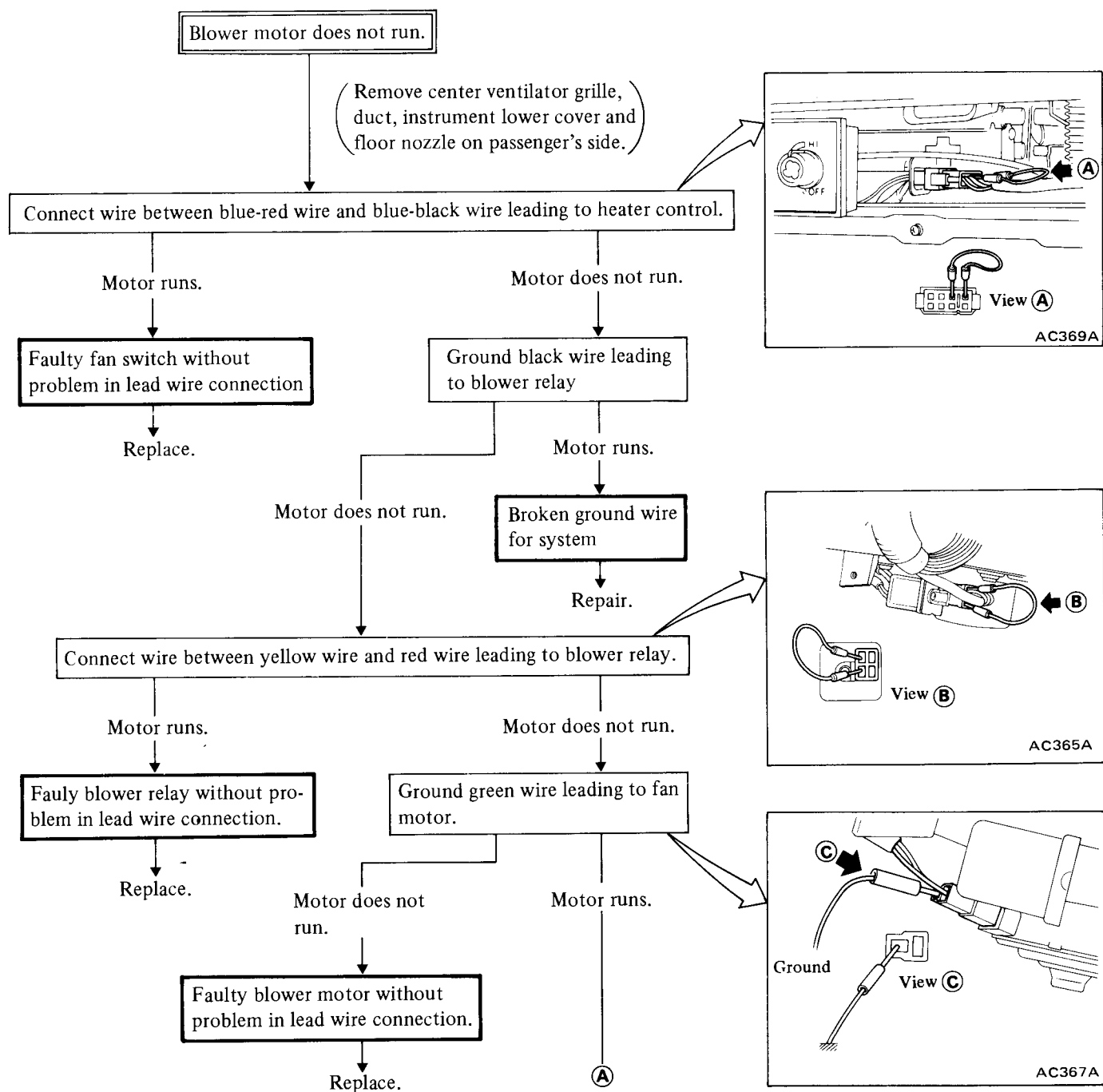
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Fusible link (Black)	: O.K.	
Fusible link (Brown)	: O.K.	
Ignition switch	: O.K.	
Accessory relay	: O.K.	
Fuse 20A (in fuse block)	: O.K.	
Fuse 20A (under blower motor)	: O.K.	
Position of ignition switch	: ACC	
Position of fan switch	: ON	

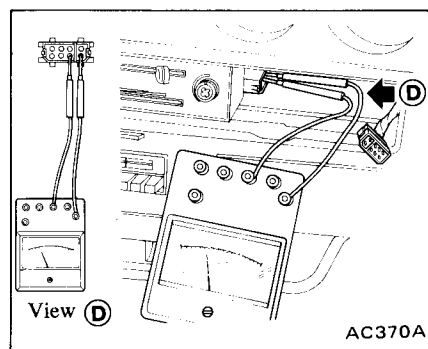
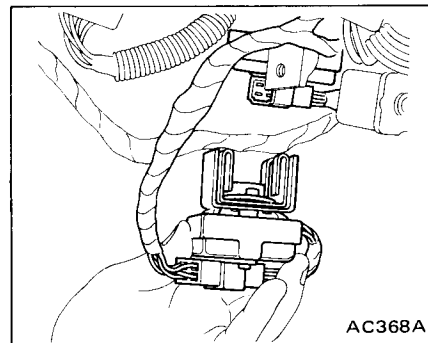
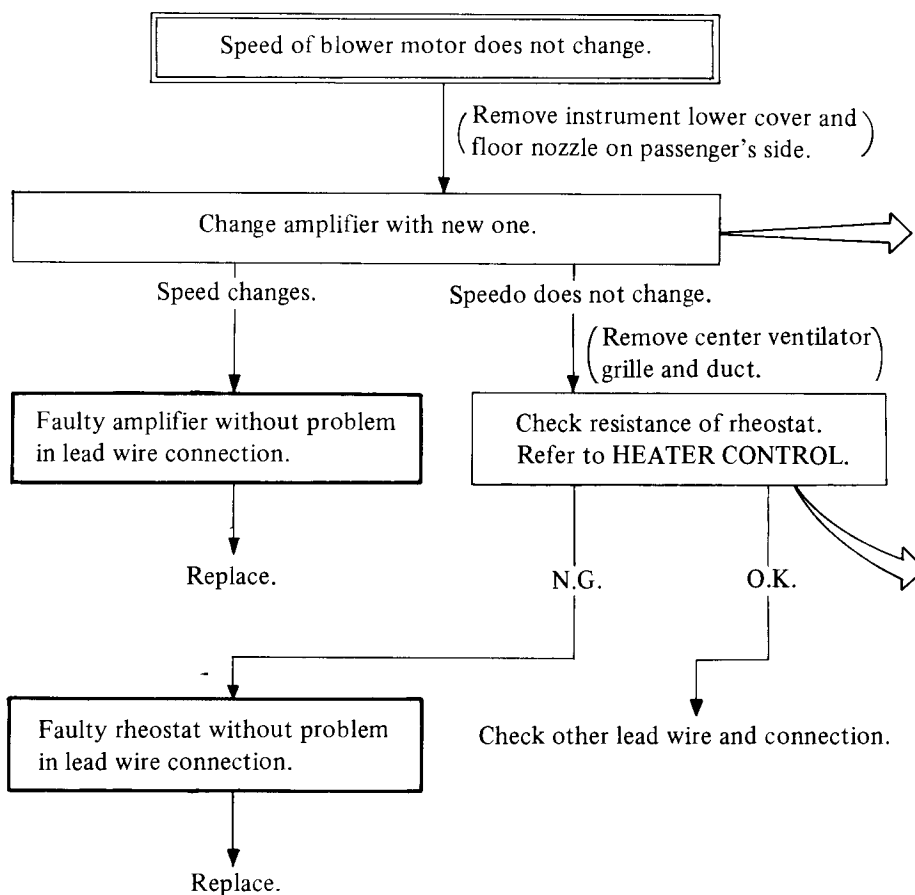
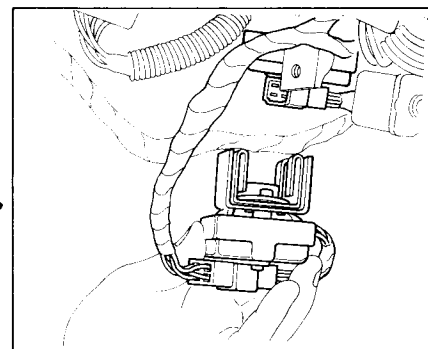
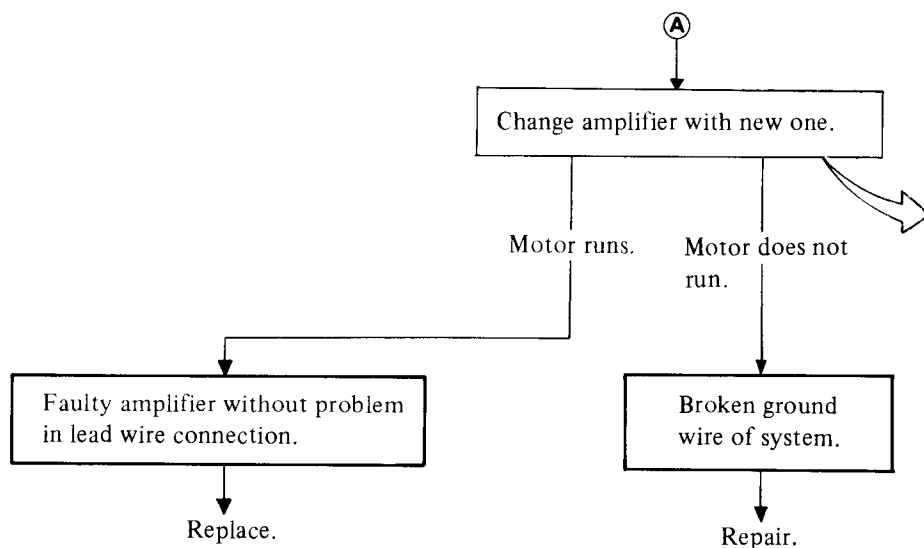
Quick check : Check that wiper, radio, stereo and power window operate.

 : Condition

 : Check

 : Probable cause








COMPRESSOR CLUTCH DIAGNOSES

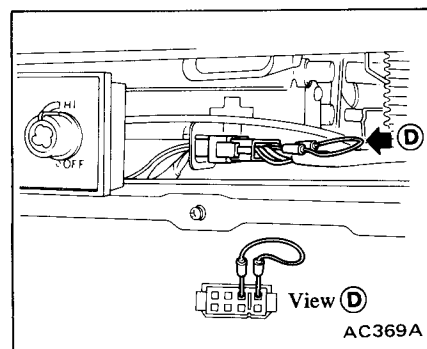
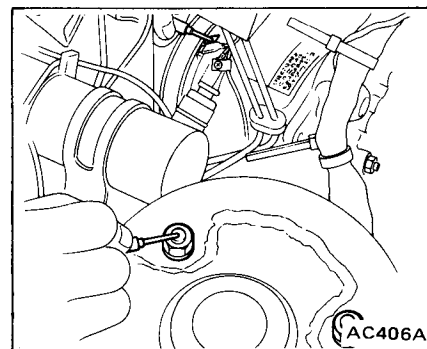
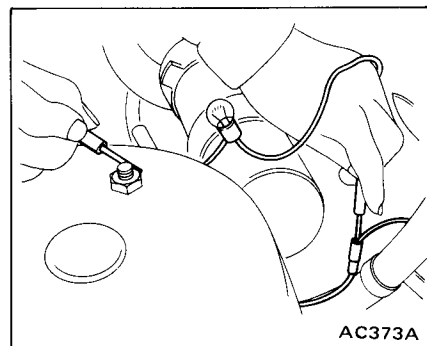
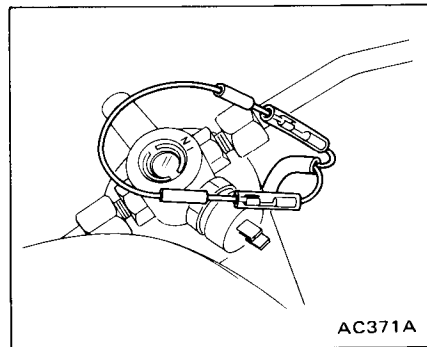
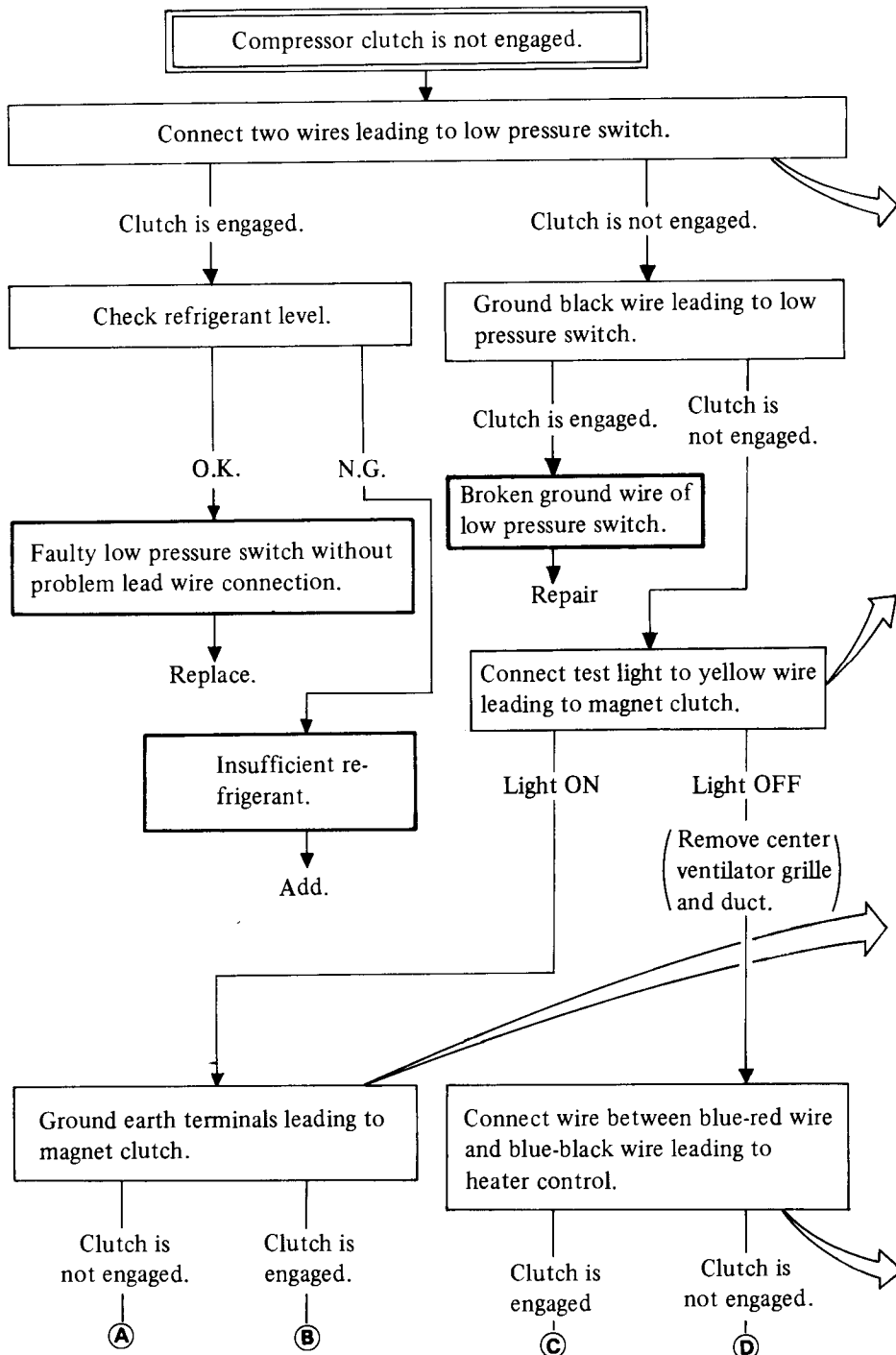
Test conditions

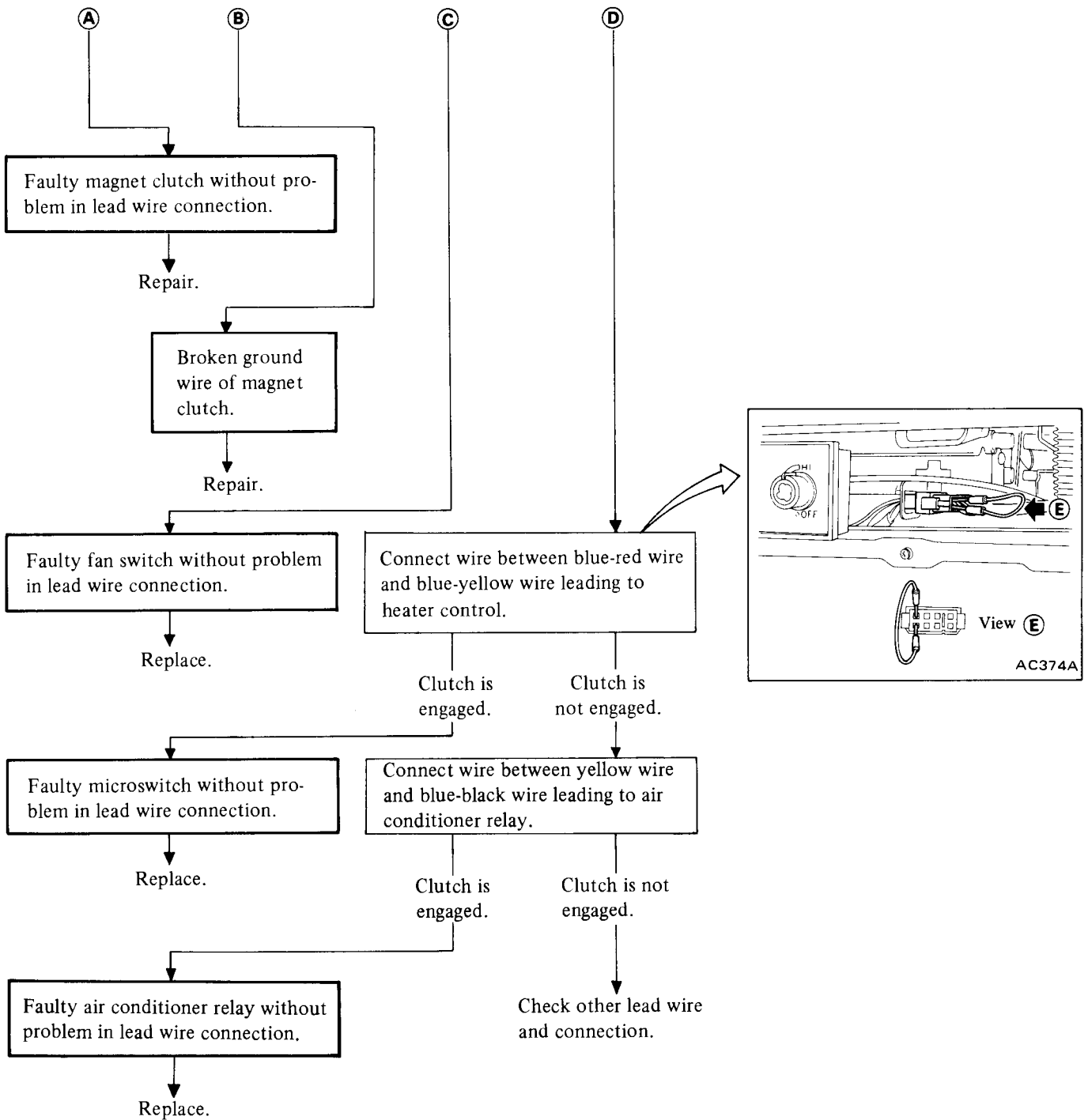
Battery : O.K.
 Fusible link (Black) : O.K.
 Fusible link (Brown) : O.K.
 Ignition switch : O.K.
 Accessory relay : O.K.
 Fuse 20A (in fuse block) : O.K.

Quick check : Check that wiper, radio, stereo and power window operate.

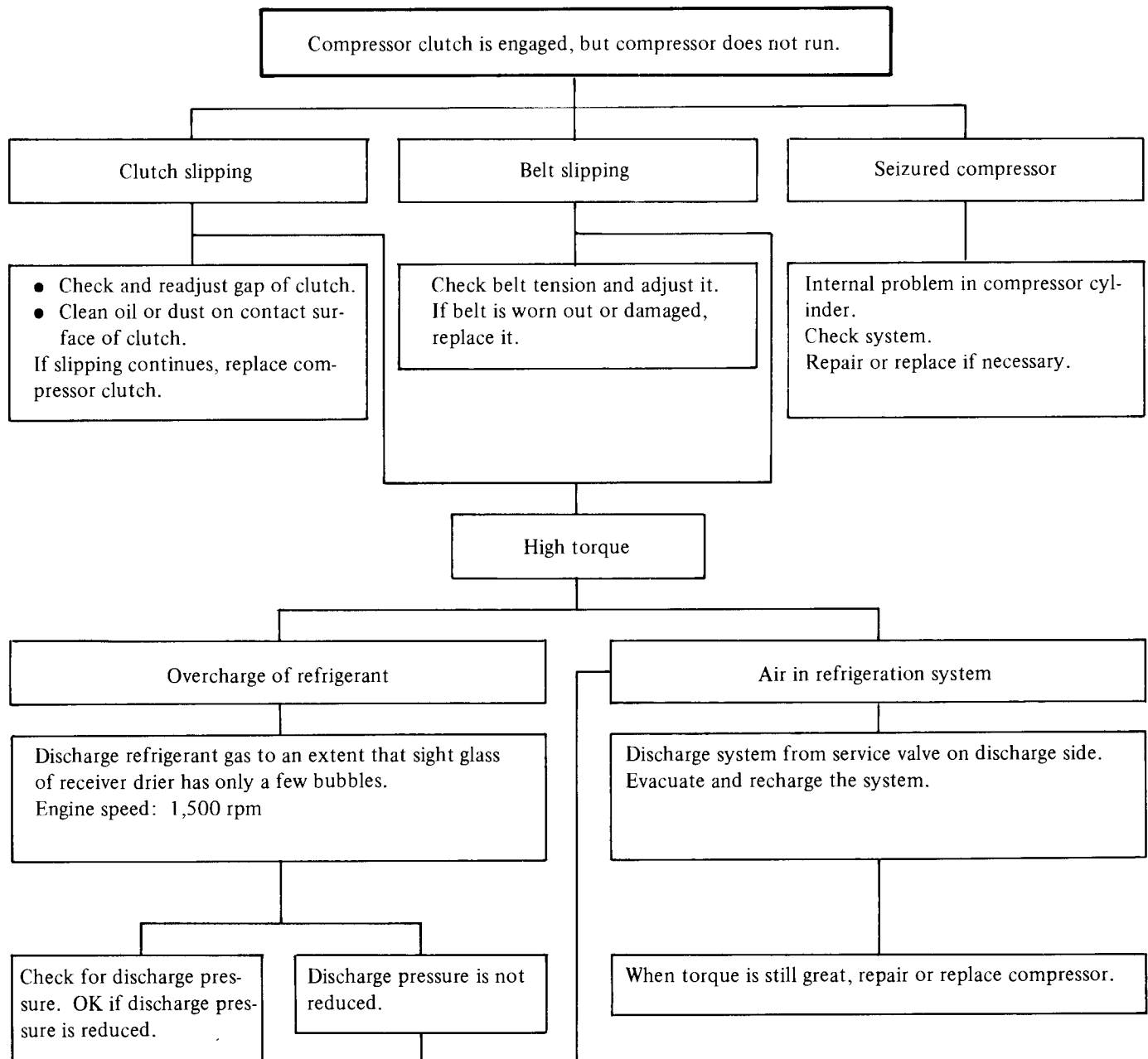
Position of ignition switch : ACC
 Position of fan switch : ON
 Position of air control lever : AIR-CON

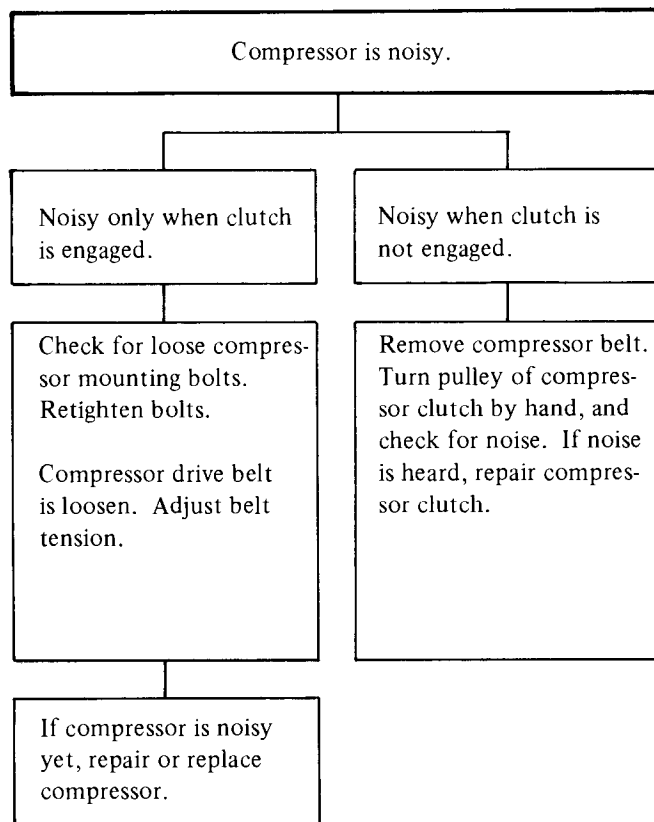
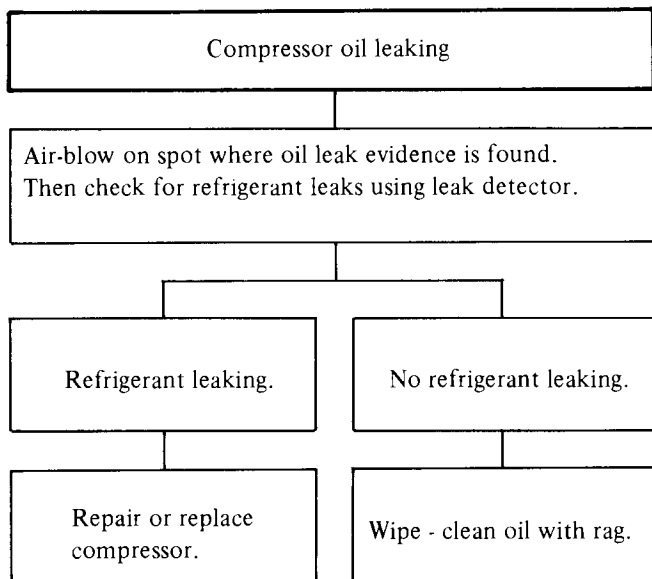
 : Condition
 : Check
 : Probable cause





COMPRESSOR DIAGNOSES








FAST IDLE CONTROL DEVICE DIAGNOSES

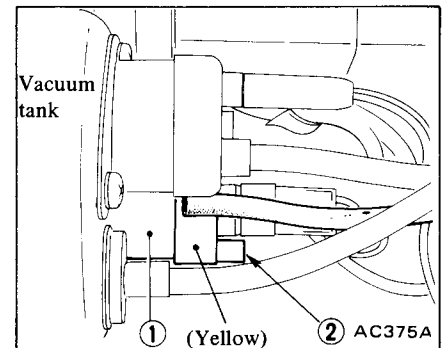
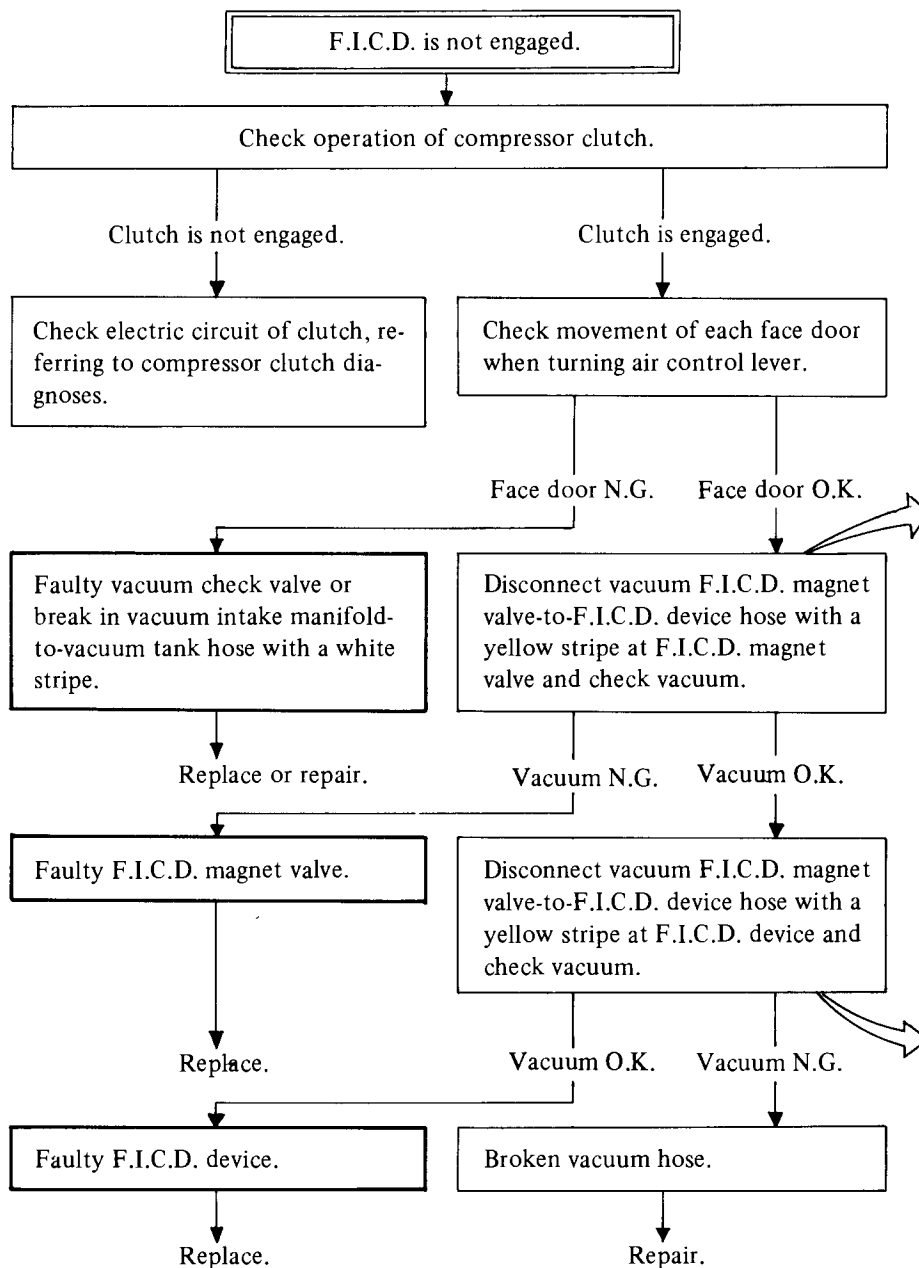
Test conditions

Battery : O.K.
 Fusible link (Black) : O.K.
 Fusible link (Brown) : O.K.
 Ignition switch : O.K.
 Accessory relay : O.K.
 Fuse 20A (in fuse block) : O.K.

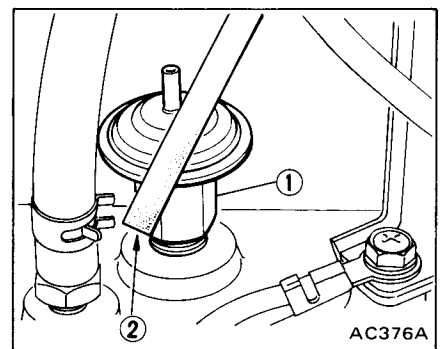
Quick check : Check that wiper, radio, stereo and power window operate.

Position of ignition switch : ON (Engine running)
 Position of fan switch : ON
 Position of air control lever : AIR-CON

 : Condition
 : Check
 : Probable cause



1 F.I.C.D. magnet valve
 2 Check vacuum



1 F.I.C.D. device
 2 Check vacuum

PERFORMANCE CHART

Test conditions

Test car location	: Indoors or in the shade (Outside wind velocity: Less than 2 m/sec)
Doors	: Closed
Door window	: Open
Hood	: Open
Air control lever	: AIR-CON RECIRC
Temperature lever	: Max. COLD
Fan switch	: Max. HI
Engine speed	: 1,500 rpm

Test reading

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 to 90	12 (54)	1.2 - 4.9 (34.2 - 40.8)
	15 (59)	1.6 - 5.4 (34.9 - 41.7)
	20 (68)	2.8 - 7.4 (37.0 - 45.3)
	25 (77)	5.2 - 11.0 (41.4 - 51.8)
	30 (86)	9.8 - 17.0 (49.6 - 62.6)
	35 (95)	16.4 - 24.0 (61.5 - 75.2)

Ambient air		Pressure high (Discharge side) kPa (kg/cm ² , psi)	Pressure low (Suction side) kPa (kg/cm ² , psi)
Relative humidity %	Temperature °C (°F)		
50 - 90	18 (64)	696 - 804 (7.1 - 8.2, 101 - 117)	73.6 - 117.7 (0.75 - 1.20, 10.7 - 17.1)
	20 (68)	716 - 843 (7.3 - 8.6, 104 - 122)	73.6 - 122.6 (0.75 - 1.25, 10.7 - 17.8)
	25 (77)	834 - 1,020 (8.5 - 10.4, 121 - 148)	88.3 - 152.0 (0.90 - 1.55, 12.8 - 22.0)
	30 (86)	1,030 - 1,226 (10.5 - 12.5, 149 - 178)	112.8 - 201.0 (1.15 - 2.05, 16.4 - 29.2)
	35 (95)	1,245 - 1,451 (12.7 - 14.8, 181 - 210)	147.1 - 255.0 (1.50 - 2.60, 21.3 - 37.0)
	40 (104)	1,461 - 1,687 (14.9 - 17.2, 212 - 245)	196.1 - 308.9 (2.00 - 3.15, 28.4 - 44.8)

DESCRIPTION (Auto air conditioner)

Parts described here are only those specially designed for use in the auto temperature type air conditioner. For the other component parts, refer to the section under the heading "Manual Type Air Conditioner".

SYSTEM OPERATION

The auto temperature control air conditioner consists of the following six systems:

- (1) System starting control
- (2) Compressor switching control

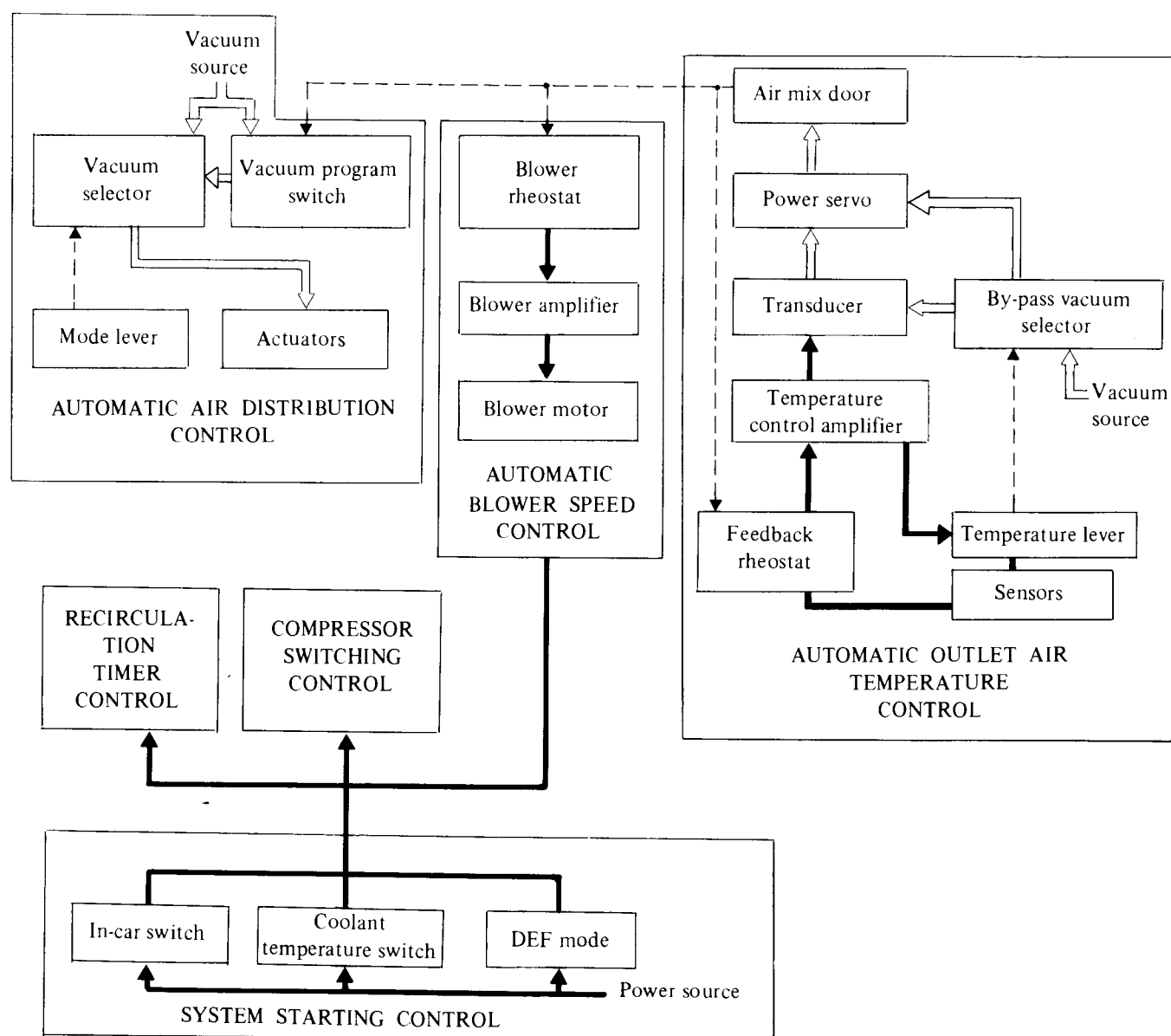
- (3) Automatic outlet air temperature control
- (4) Automatic blower speed control
- (5) Automatic air distribution control
- (6) Recirculation control

Each system is activated by an electrical circuit and/or a vacuum mechanism in order to set the positions of the control levers control switch and air mix door.

← : Vacuum connection

← : Electrical connection

← - - - : Link connection



FUNCTION AND OPERATION OF EACH UNIT

SYSTEM STARTING CONTROL

Coolant temperature switch

This switch keeps the blower OFF until coolant temperature rise over 50°C (122°F) so that interior air can be warmed up quickly, e.g., during the winter season.

In-car switch

This switch quickly activates the starting control system when the car's interior temperature is extremely high, e.g., during the summer season even if the coolant temperature switch is not activated.

COMPRESSOR SWITCHING CONTROL

Ambient switch

This switch is used to turn OFF the compressor when the ambient air temperature is low.

AUTOMATIC OUTLET AIR TEMPERATURE CONTROL

In-car sensor (Thermistor)

This switch is located in the instrument panel and registers a resistance value which varies with the car's interior temperature and the quantity of heat resulting from sunlight.

Ambient sensor (Thermistor)

This sensor is located behind the front bumper and registers a resistance value which varies with the surrounding temperature.

Temperature control rheostat (Variable resistor)

This rheostat registers a resistance value which varies with the temperature control lever position.

Feedback rheostat (Variable resistor)

This rheostat automatically changes its resistance value depending on the air mix door's position, in order to stabilize the power servo's operation.

Temperature control amplifier

This amplifier registers the total resistance value of the in-car sensor, ambient sensor, trimmer, temperature control rheostat and feedback rheostat, which are all connected in series, and then transmits a signal that corresponds to the total resistance value to the transducer.

Transducer

The transducer sends vacuum that is proportional to the current received from the temperature control amplifier to the power servo.

Power servo (Actuator)

The power servo activates in order to move the air mix door's position in proportion to the vacuum received from the transducer.

By-pass vacuum selector

By setting temperature lever at the hottest position, the vacuum does not pass through the transducer but is sent directly to the power servo. When it is set at the coldest position, the vacuum line will be blocked.

Vacuum lock valve

This valve serves to block the vacuum line when the source vacuum momentarily drops.

AUTOMATIC BLOWER SPEED

Blower control rheostat (Variable resistor)

This rheostat is activated in conjunction with the air mix door and registers a resistance value which varies with the air mix door's position.

Blower amplifier

This amplifier sends a voltage to the blower motor which is proportional to the blower control rheostat's resistance value.

AUTOMATIC AIR DISTRIBUTION CONTROL

Vacuum selector

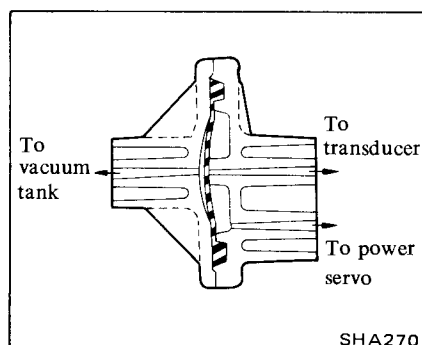
This selector selects the vacuum lines needed to open or close outlets in accordance with mode lever position.

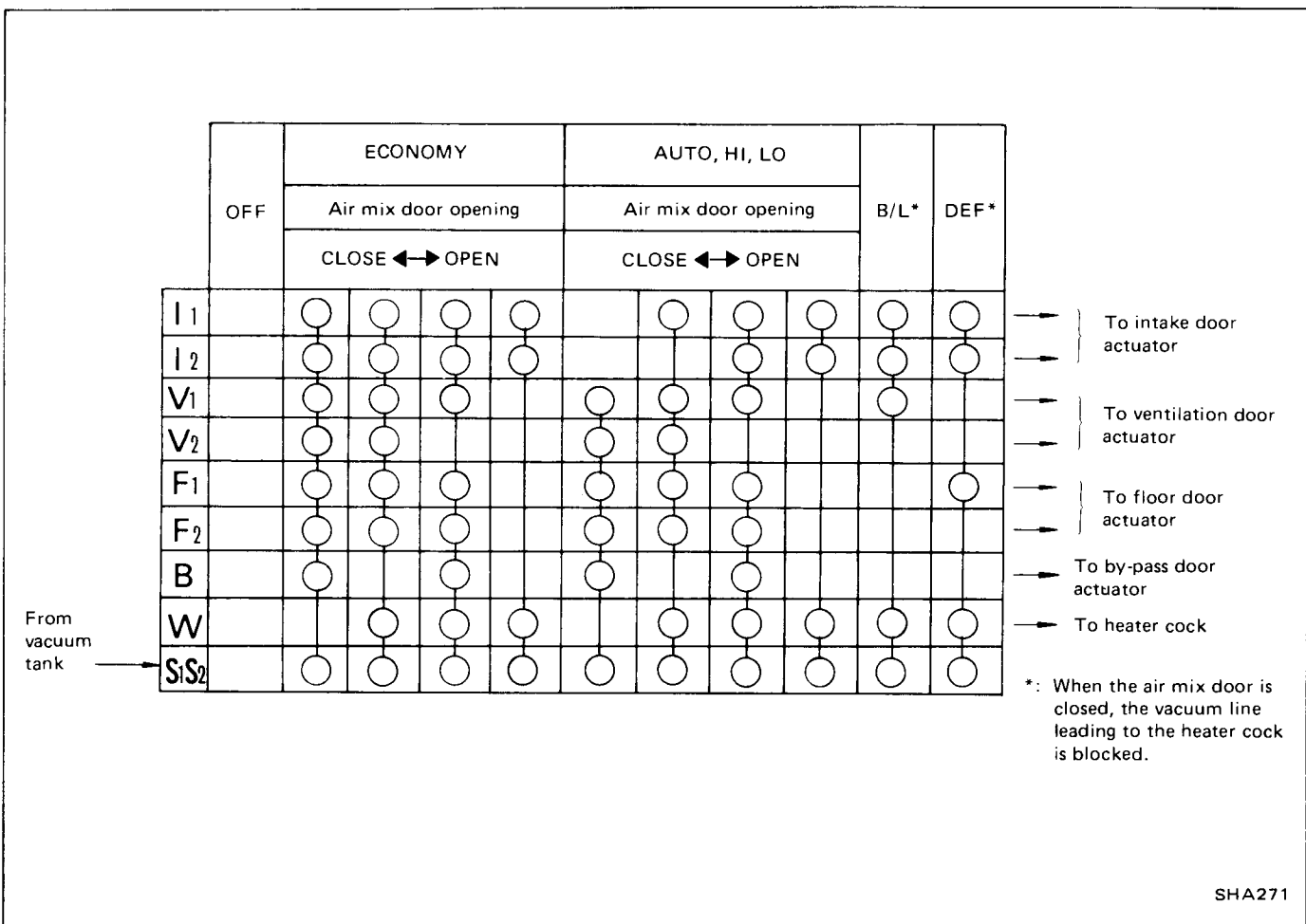
Vacuum program switch

This selector also selects the vacuum lines needed to open or close outlets in accordance with air mix door position.

Air valve and vacuum switch

The V_1' point of vacuum program switch and the V_1' point of vacuum selector are connected via air valve and vacuum switch for obtaining positive operation of the floor door.





RECIRCULATION CONTROL

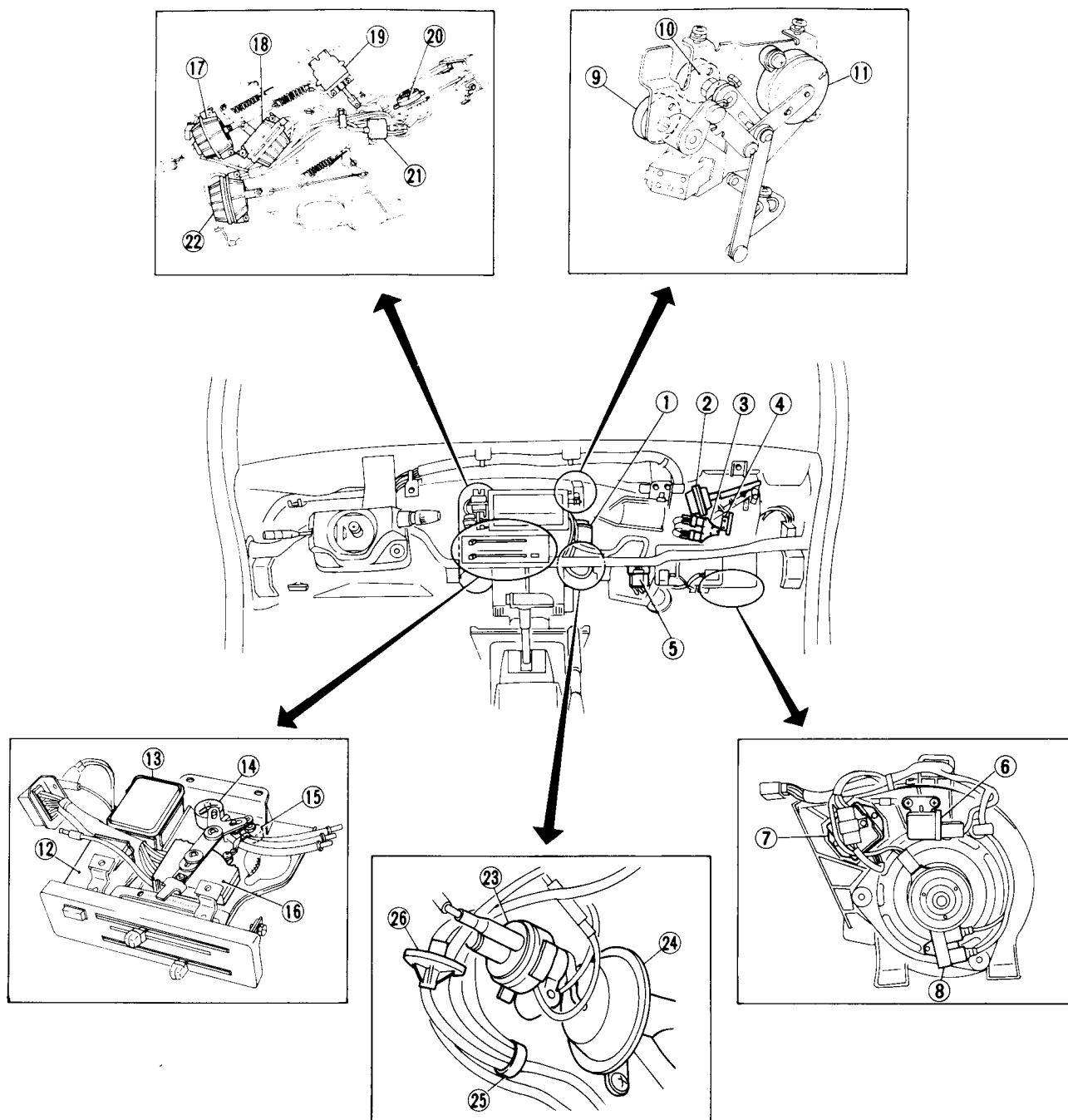
Recirculation timer

This timer is used to recirculate interior air. When its switch is depressed, the interior air will be recirculated for approximately 10 minutes. Depressing the switch again will stop the process.

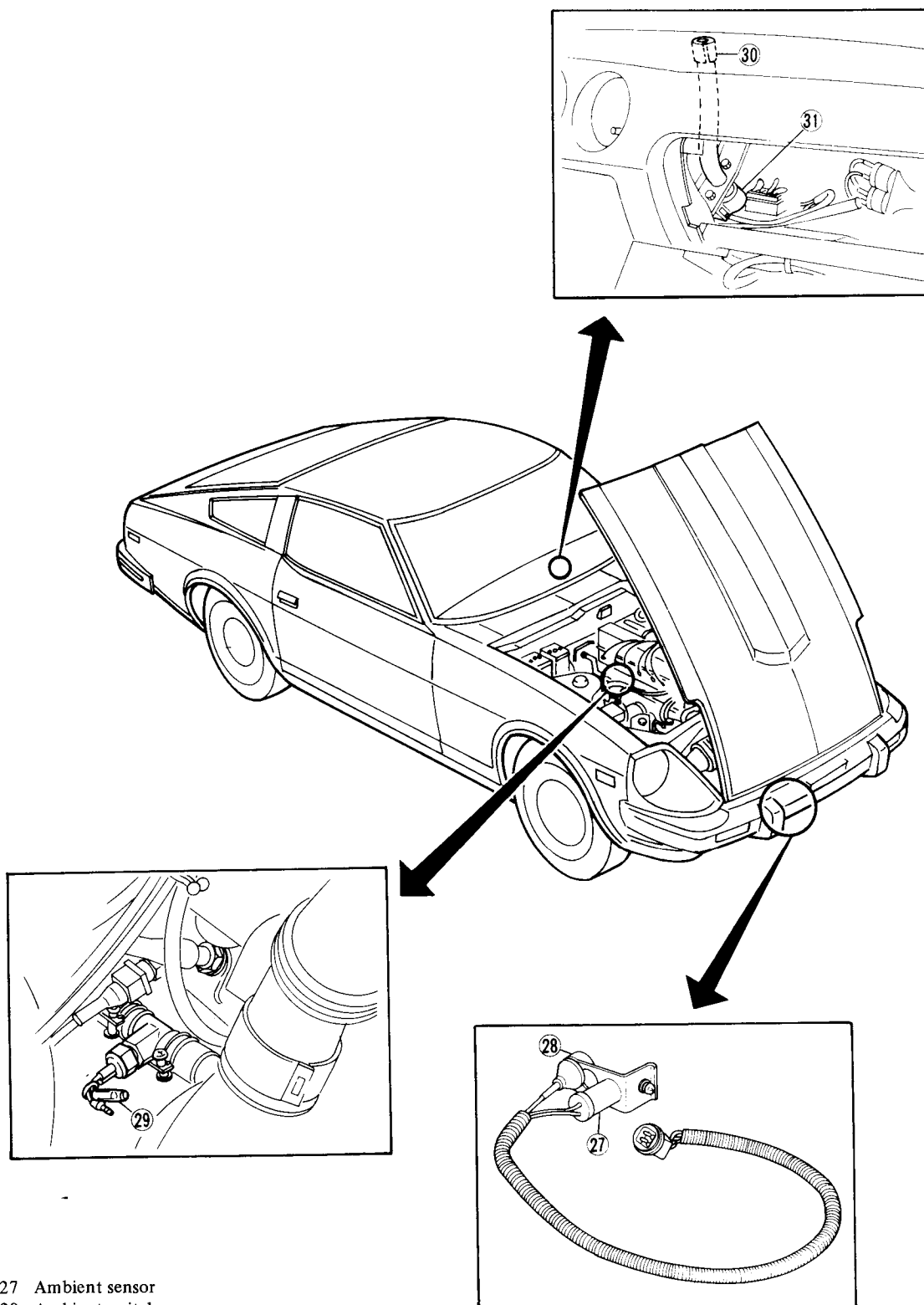
Air valve (Intake door)

This air valve is controlled by the recirculation timer switch. When the switch is depressed, current stops flowing through the air valve and it closes. This causes the intake door actuator's vacuum line to be blocked and sets the intake door in the recirculation position.

UNITS LOCATION



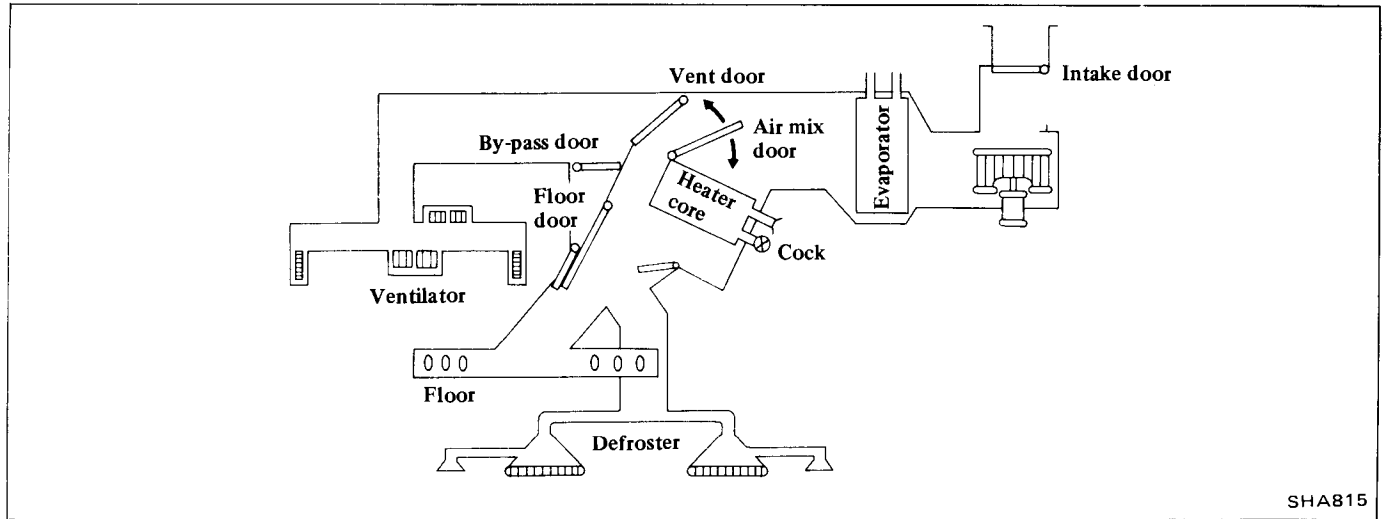
- | | | |
|---------------------------|----------------------------------|------------------------------|
| 1 Transducer | 11 Vacuum program switch | 21 Air valve (DEF clamp) |
| 2 Intake door actuator | 12 Recirculation timer | 22 Floor door actuator |
| 3 Air valve (Intake door) | 13 Temperature control amplifier | 23 Vacuum switch (DEF clamp) |
| 4 In-car switch | 14 By-pass vacuum selector | 24 Heater cock |
| 5 Check terminal | 15 Temperature control rheostat | 25 Vacuum divider |
| 6 Blower relay | 16 Program switch | 26 Vacuum lock valve |
| 7 Blower amplifier | 17 Power servo | |
| 8 Fuse (Blower motor) | 18 Ventilation door actuator | |
| 9 Blower control rheostat | 19 By-pass door actuator | |
| 10 Feedback rheostat | 20 Vacuum selector | |



- 27 Ambient sensor
- 28 Ambient switch
- 29 Coolant temperature switch
- 30 In-car sensor
- 31 Aspirator fan

AIR FLOW

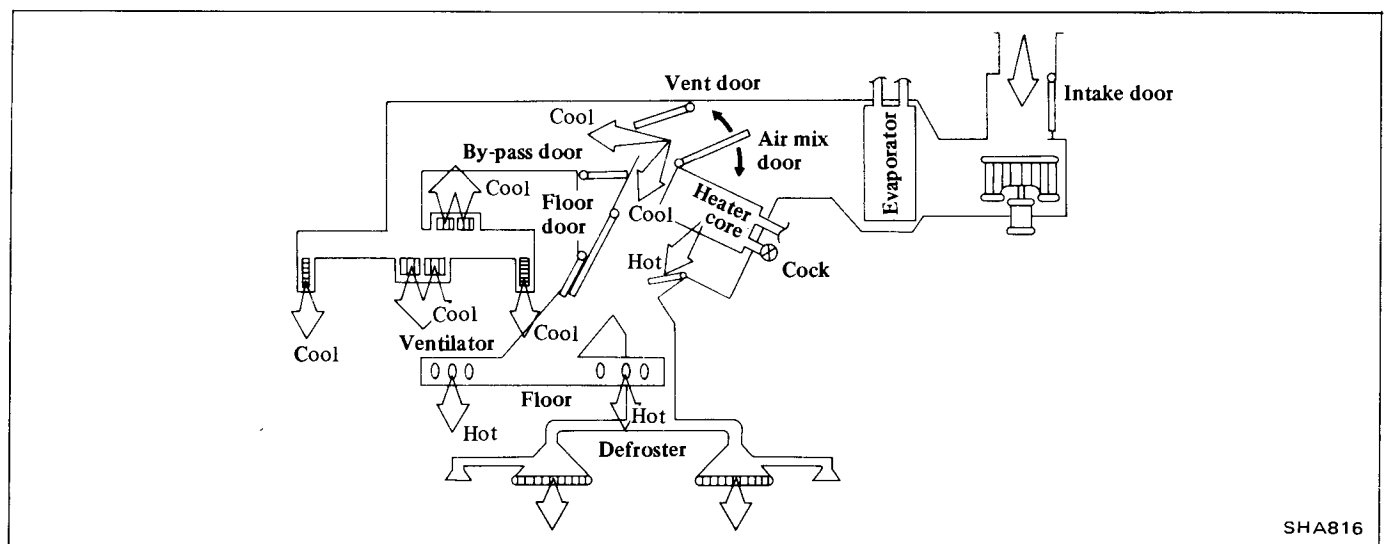
OFF MODE



Air mix* door	Blower	Door position				Heater cock	Compressor and F.I.C.D.
		Intake	Vent	By-pass	Floor		
CLOSE ↕ OPEN	OFF	CLOSE	CLOSE	CLOSE	CLOSE	CLOSE	OFF

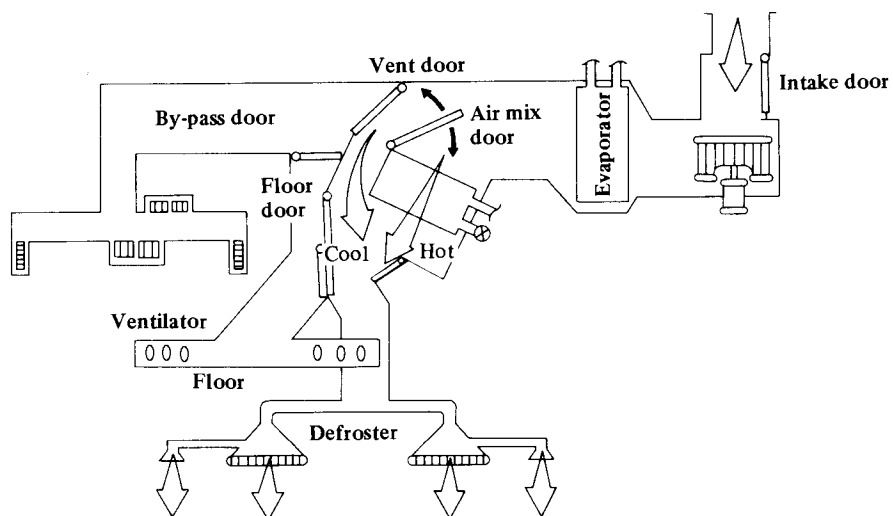
*: The air mix door operates in order to prevent any delay in the automatic temperature control system's operation.

BI-LEVEL MODE



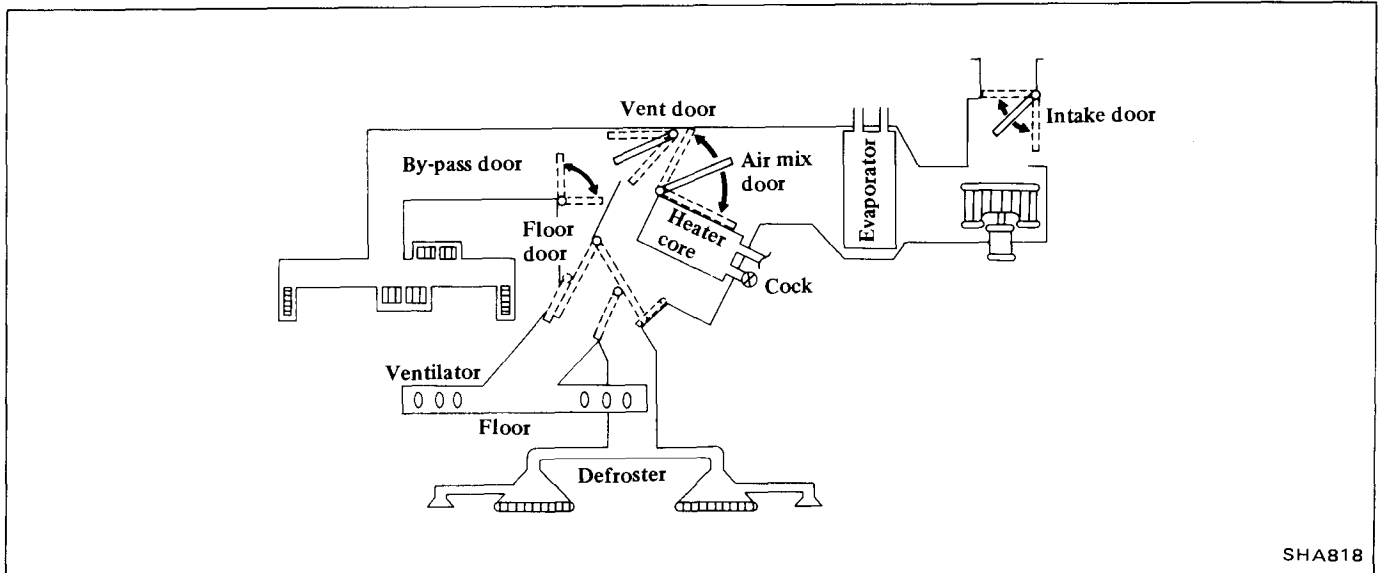
Air mix door	Blower	Door position				Heater cock	Compressor and F.I.C.D.
		Intake	Vent	By-pass	Floor		
CLOSE ↕ OPEN	HI ↑ LO ↓ HI	OPEN	1/2 OPEN	CLOSE	CLOSE	OPEN	ON

DEF MODE



SHA817

Air mix door	Blower	Door position				Heater cock	Compressor and F.I.C.D.
		Intake	Vent	By-pass	Floor		
CLOSE ↕ OPEN	HI	OPEN	CLOSE	CLOSE	1/2 OPEN	OPEN	ON

ECONOMY, LO, AUTO, HI MODE

Economy mode

Air mix door	Blower	Door position				Heater cock	Compressor and F.I.C.D.
		Intake	Vent	By-pass	Floor		
CLOSE ↑ ↓ OPEN	HI ↑ LO ↓ HI	OPEN	OPEN	OPEN	CLOSE	CLOSE	OFF
				CLOSE		OPEN	
			1/2 OPEN	OPEN	OPEN		
			CLOSE	CLOSE			

Auto, Hi, Lo mode

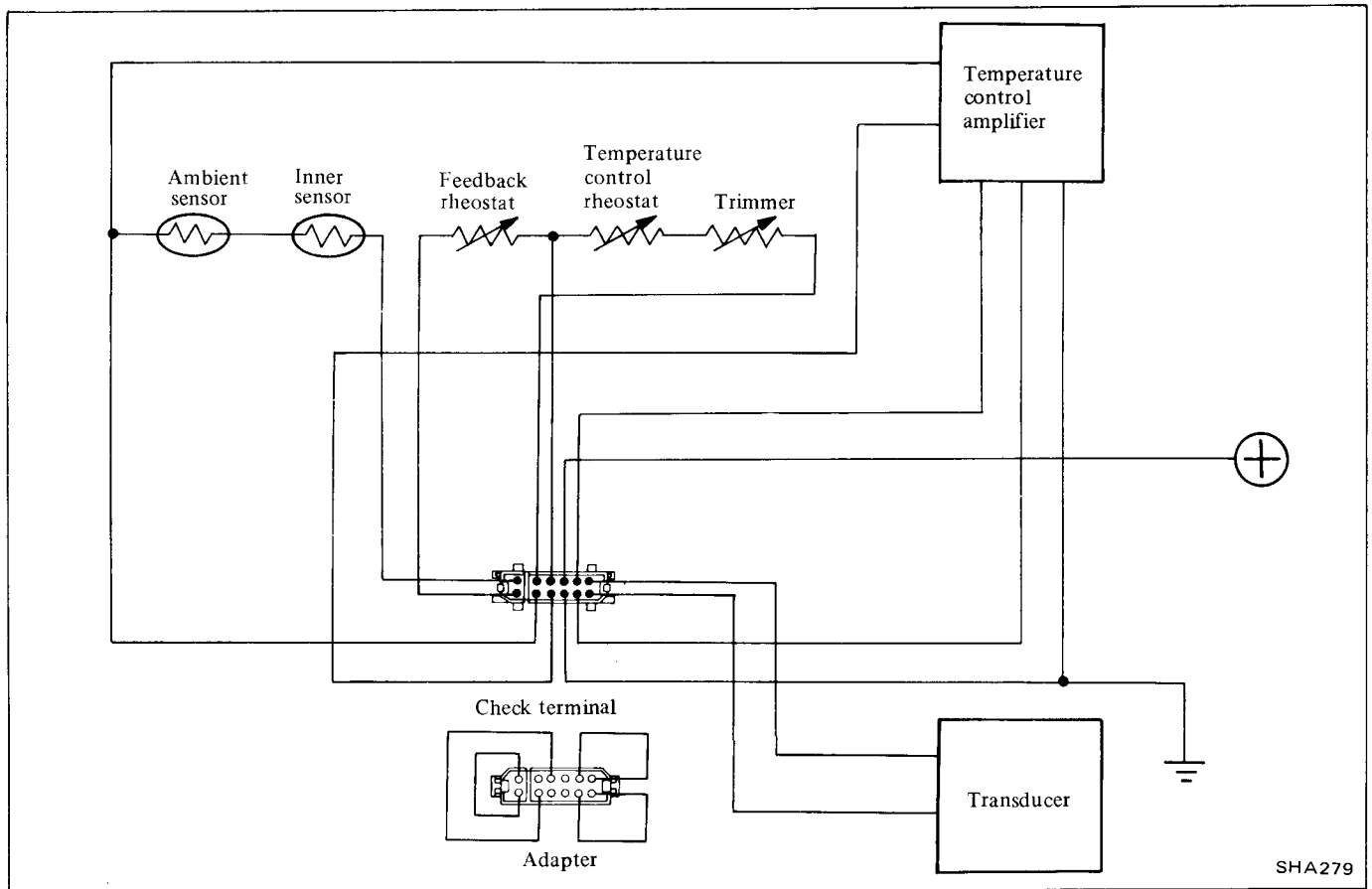
Air mix door	Blower *	Door position				Heater cock	Compressor and F.I.C.D.
		Intake	Vent	By-pass	Floor		
CLOSE ↑ ↓ OPEN	HI ↑ LO ↓ HI	CLOSE	OPEN	OPEN	CLOSE	CLOSE	ON
		1/2 OPEN		CLOSE			
		OPEN	1/2 OPEN	OPEN	OPEN	OPEN	
			CLOSE	CLOSE			

*: Blower speed is set at HI or LO when the system is operating in the HI or LO mode.

SERVICE PROCEDURES (Auto air conditioner)

INSPECTION OF "CHECK" TERMINAL

SCHEMATIC/CHECK TERMINAL

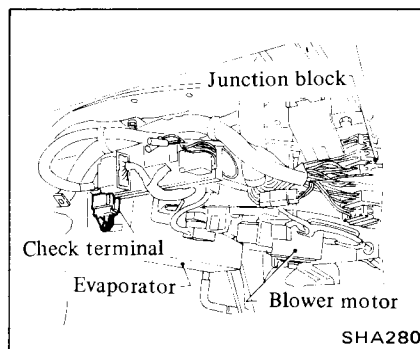


The "check" terminal is designed to allow the temperature control amplifier, transducer, ambient sensor, in-car sensor, feedback rheostat, and trimmer to be inspected without the instrument panel being removed.

Electrical system inspection can be performed by using the AUTOMATIC TEMPERATURE CONTROL AIR CONDITIONER TESTER (J28810).

If the tester is not available, use the following procedures.

Location



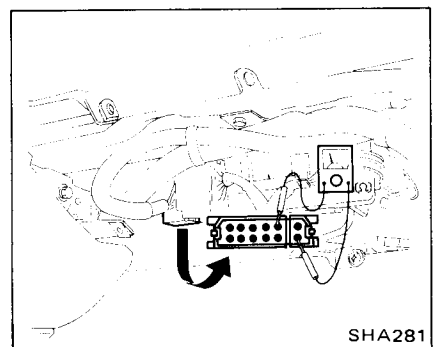
The "check" terminal will be accessible after the right-hand instrument lower cover and right-hand floor nozzle are removed.

(1) CHECKING AMBIENT SENSOR AND IN-CAR SENSOR

1. Open car door(s) to equalize in-

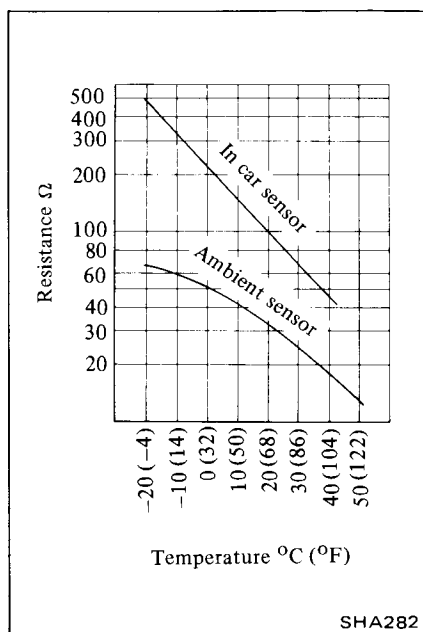
terior and exterior air temperatures.

2. Remove adapter.
3. Turn ignition switch to "ACC", and set mode lever at "OFF".
4. Set a circuit tester in "ohm" range, and contact test probes to terminals (+) and (–) as shown, and measure resistance values.



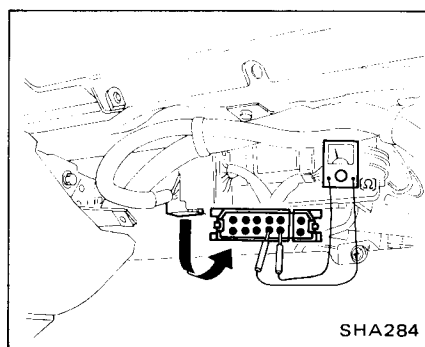
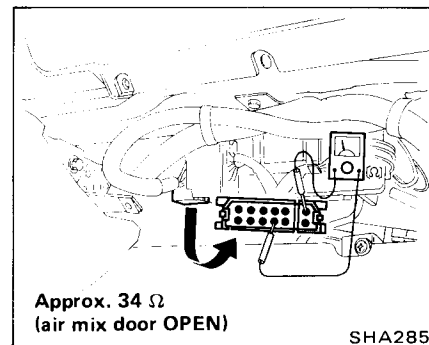
Temperature		Resistance
°C	°F	
4	40	Approx. 230 Ω
10	50	Approx. 190 Ω
16	60	Approx. 160 Ω
21	70	Approx. 130 Ω
27	80	Approx. 110 Ω
32	90	Approx. 90 Ω

If measured values do not agree with values set forth in the above chart, check for an open circuit in harness, ambient sensor and/or in-car sensor.



(2) CHECKING TEMPERATURE CONTROL RHEOSTAT AND TRIMMER

1. Remove adapter.
2. Set both ignition switch and mode lever in OFF.
3. Set a circuit tester in "ohm" range, and contact test probes to terminals, as shown below.



3. Start engine, and set mode lever in AUTO and temperature control lever below 20°C (65°F) (coldest).

Circuit tester indication:
Approx. 75 Ω
(air mix door CLOSE)

Temperature lever		Resistance
°C	°F	
20	65	Approx. 60 Ω
25	75	Approx. 92 Ω
30	85	Approx. 124 Ω

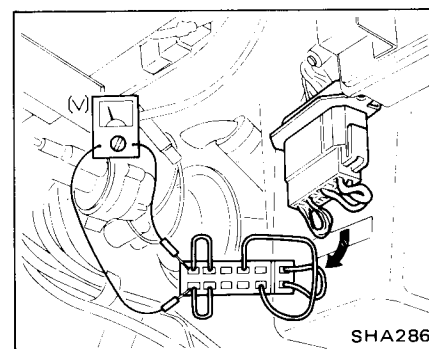
Observe tester indicator to ensure its reading smoothly varies with temperature control lever's movement.

CAUTION:

Do not attempt to adjust trimmer control during this procedure.

(4) CHECKING TEMPERATURE CONTROL AMPLIFIER

1. With adapter in place, set mode lever in OFF.
2. Set a circuit tester in "VOLT" range, and connect test probes, (+) and (-) to correct terminals, reaching behind adapter, as shown.



The circuit tester indicator should register a total resistance value for ambient sensor and in-car sensor. If ambient temperature is greater or lower than the values indicated in the chart, use the graph to determine the correct temperature.

(3) CHECKING FEEDBACK RHEOSTAT

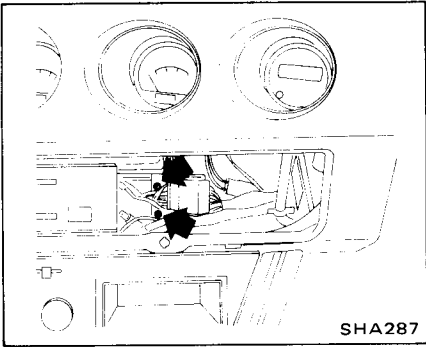
1. Remove adapter.
2. Turn ignition switch OFF. Set a circuit tester in "ohm" range and contact test probes to terminals, as shown.

3. Set ignition switch in ACC, and mode lever in AUTO and move temperature control lever left and right.
Read tester **immediately** after setting mode lever in AUTO.

Circuit tester indication:
20°C (65°F) setting
Approx. 2.5 V
30°C (85°F) setting
Approx. 7.0 V

2. Remove connector attaching bolts.

3. Remove connector and check connector's terminals using a circuit tester and the following chart.

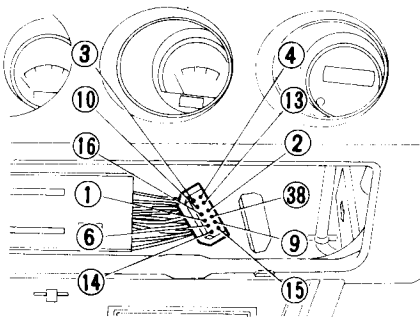


UNIT INSPECTION

PROGRAM SWITCH

Inspection

1. Remove instrument center ventilator and duct.



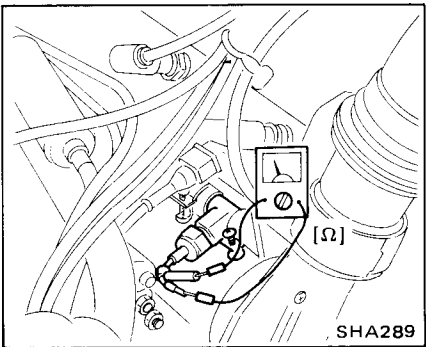
	OFF	ECON	LO	AUTO	HI	B/L	DEF
②		○	○	○	○	○	○
⑬		○	○	○	○	○	
⑩		○	○	○	○	○	
⑯							○
①			○	○	○	○	○
⑥							○
⑭		○		○		○	
⑮		○			○	○	○
⑨		○	○	○	○	○	○
③⑧			○				

③, ④ are for illumination lamp

SHA809

COOLANT TEMPERATURE SWITCH

Inspection



Water temperature below approx.
50°C (122°F):
Infinity ($\infty \Omega$)

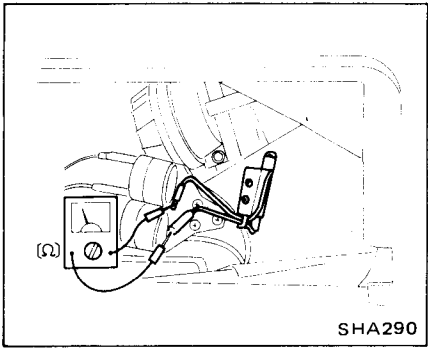
After sufficient warm up of engine:
0 Ω

IN-CAR SWITCH

Location

The in-car switch is situated behind the glove box, and is accessible after the glove box is removed.

Inspection

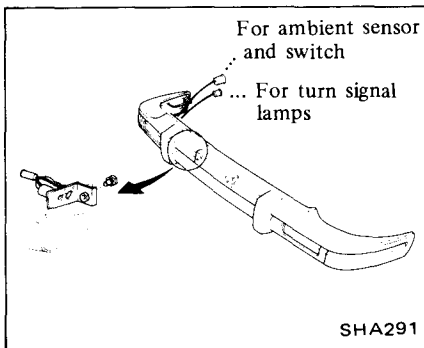


Interior temperature
above 25°C (77°F):
0 Ω
Interior temperature
below 25°C (77°F):
Infinity (∞ Ω)

AMBIENT SWITCH AND AMBIENT SENSOR

Location

Both the ambient switch and ambient sensor are attached to the front bumper's back.



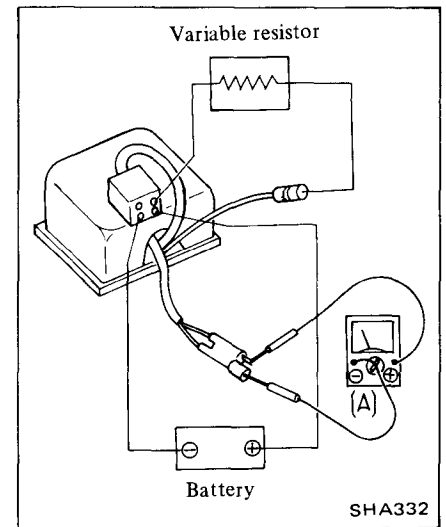
Ambient switch:
Above 6°C (43°F)
0 Ω
-4°C - 6°C (25°F - 43°F)
0 Ω or ∞ Ω
Below -4°C (25°F)
∞ Ω

Ambient sensor:

Temperature		Resistance
°C	°F	
4	40	Approx. 47 Ω
10	50	Approx. 42 Ω
16	60	Approx. 37 Ω
21	70	Approx. 33 Ω
27	80	Approx. 29 Ω
32	90	Approx. 26 Ω

TEMPERATURE CONTROL AMPLIFIER

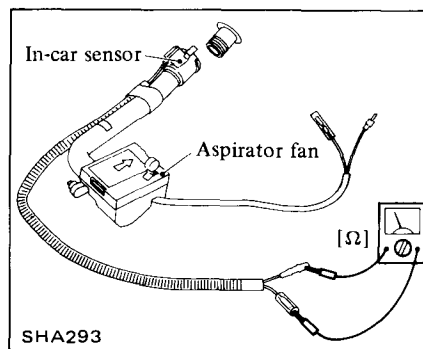
Inspection



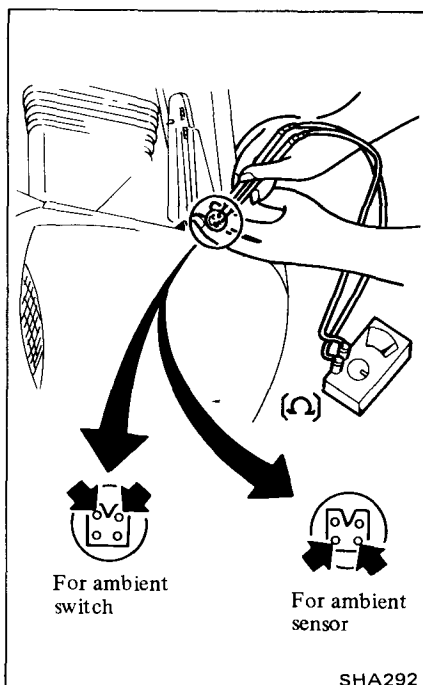
Variable resistor (Ω)	Tester indication (A)
250	0.3
270	0.1

IN-CAR SENSOR

Inspection



Inspection

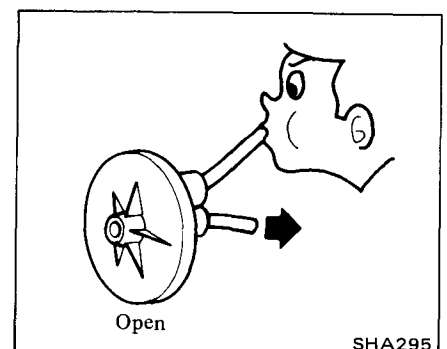


Temperature		Resistance
°C	°F	
4	40	Approx. 183 Ω
10	50	Approx. 148 Ω
16	60	Approx. 123 Ω
21	70	Approx. 97 Ω
27	80	Approx. 81 Ω
32	90	Approx. 64 Ω

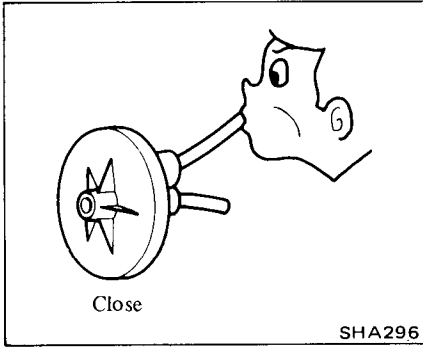
VACUUM LOCK VALVE

Inspection

1. Check to be sure that the valve opens by blowing air through port of transducer side.



- Check to be sure that the valve closes by inhaling air through port of transducer side.



TRANSDUCER

Inspection

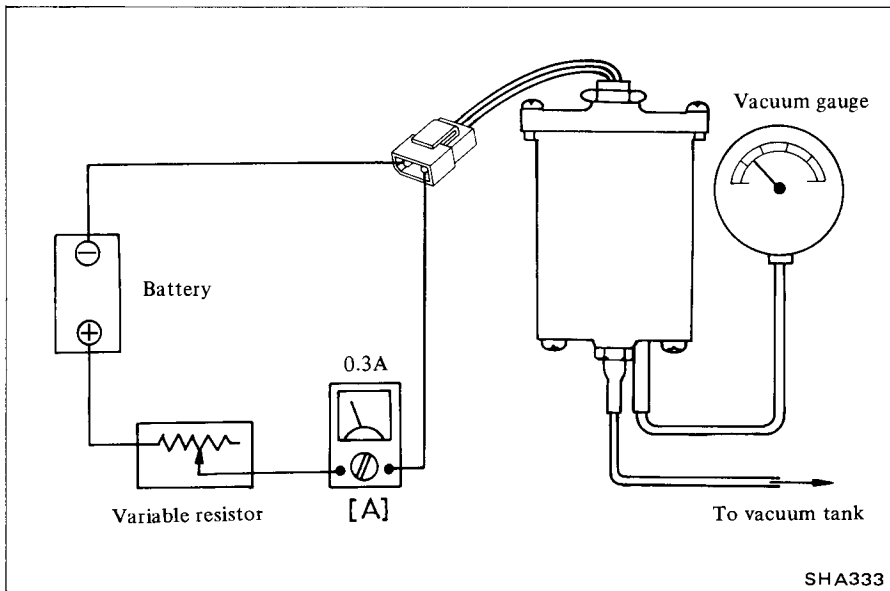
- Measure the resistance between terminals.

Circuit tester indication:

Approx. 25 Ω

- Check to be sure that output vacuum of transducer is proper.
 - Disconnect vacuum hose and connect vacuum gauge.
 - Using about 15 Ω (5 W) resistor, apply 0.3 A direct current between terminals.

This check should be performed with the transducer installed on car.



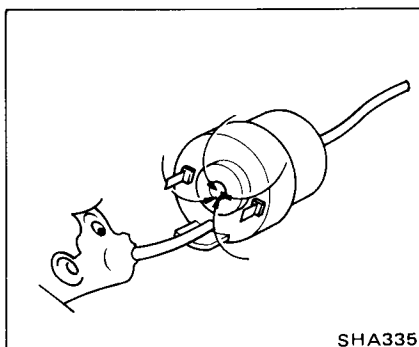
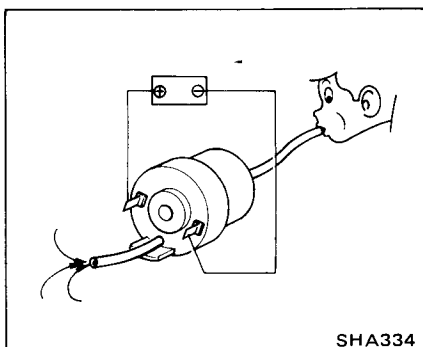
Vacuum gauge indication:

–26.7 kPa

(–200 mmHg, –7.87 inHg)

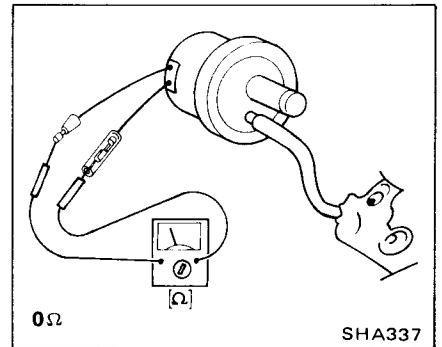
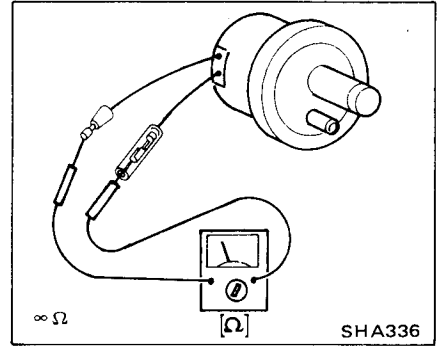
AIR VALVE

Inspection



VACUUM SWITCH

Inspection

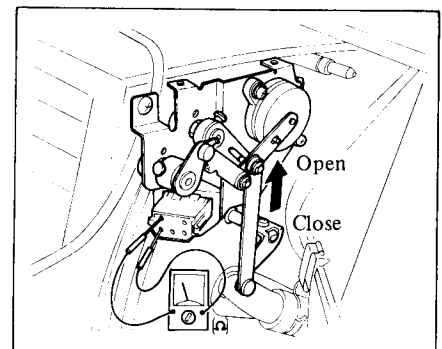


BLOWER CONTROL RHEOSTAT

Location

The blower control rheostat is situated at the right side of heater unit, and is accessible after instrument panel is removed.

Inspection



Circuit tester indication:

Air mix door OPEN or CLOSE

Approx. 1,000 Ω

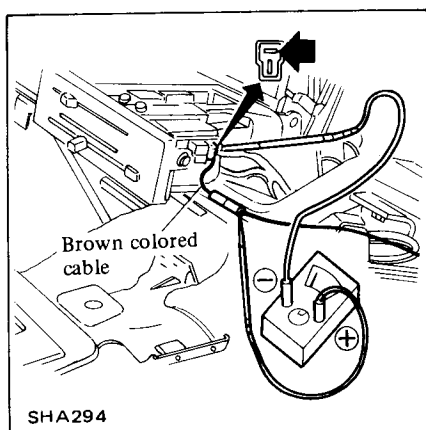
Air mix door 1/2 OPEN

Approx. 100 Ω

RECIRC TIMER

Inspection

1. Remove instrument center ventilator.
2. Disconnect connector from re-circulation timer.
3. Reaching behind connector receptacle, connect test probes, (+) and (–), and attach connector in its re-circulation timer position.
4. Turn ignition switch ON, and set mode lever at any position other than DEF.



Circuit tester indication:
 Recirculation switch "OFF"
 0 V
 Recirculation switch "ON"
 About 12 V

TRIMMER

Adjustment

1. Measure the deviation between setting temperature and interior actual temperature.

2. Turn trimmer clockwise or counterclockwise with a thin blade screw driver.

- In case actual temperature is higher than setting temperature:

Turning direction	Deviation				
	1°C (1.8°F)	2°C (3.6°F)	3°C (5.4°F)	4°C (7.2°F)	5°C (9°F)
	$\theta = 30^\circ$	$\theta = 60^\circ$	$\theta = 90^\circ$	$\theta = 120^\circ$	$\theta = 150^\circ$

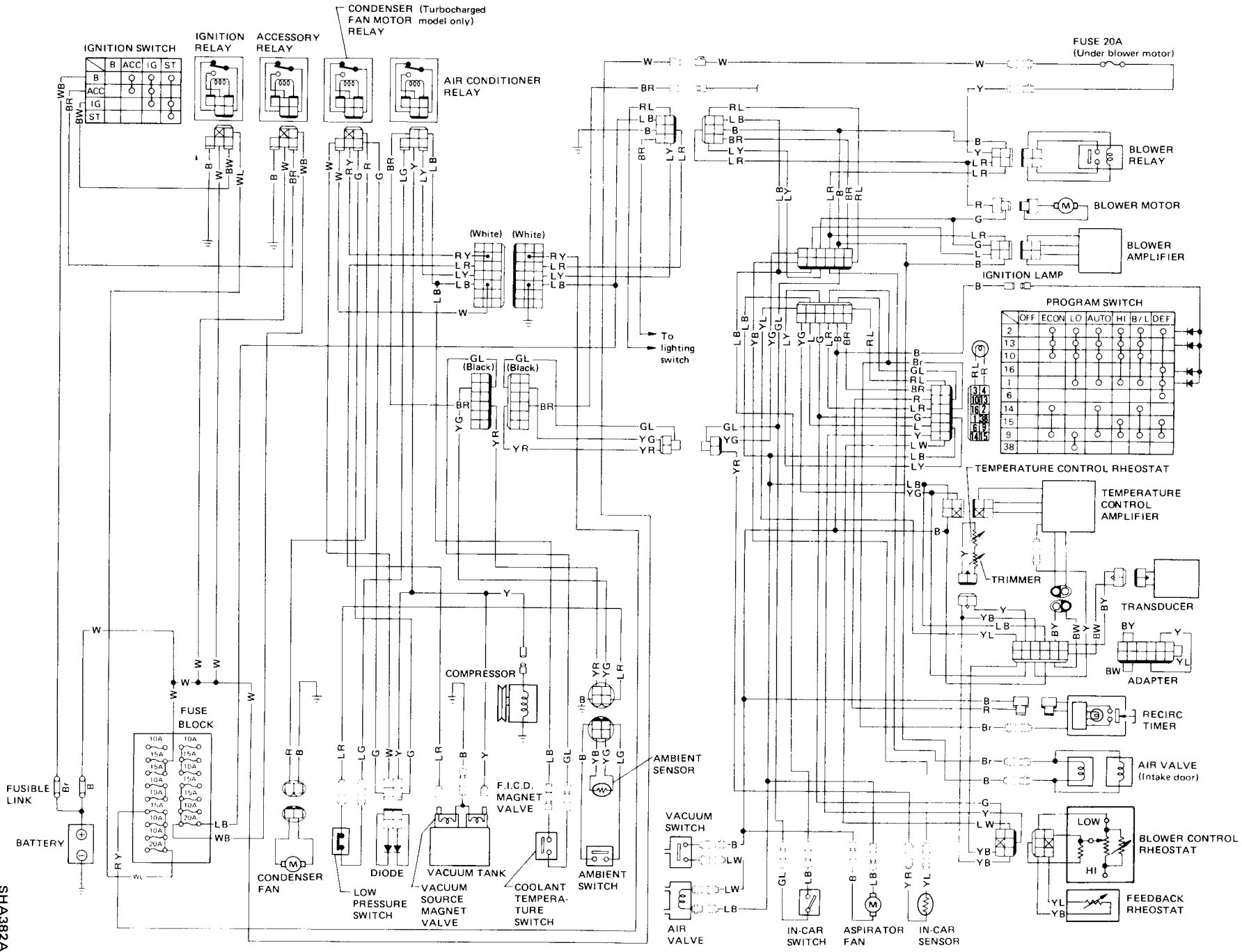
- In case actual temperature is lower than setting temperature:

Turning direction	Deviation				
	1°C (1.8°F)	2°C (3.6°F)	3°C (5.4°F)	4°C (7.2°F)	5°C (9°F)
	$\theta = 30^\circ$	$\theta = 60^\circ$	$\theta = 90^\circ$	$\theta = 120^\circ$	$\theta = 150^\circ$

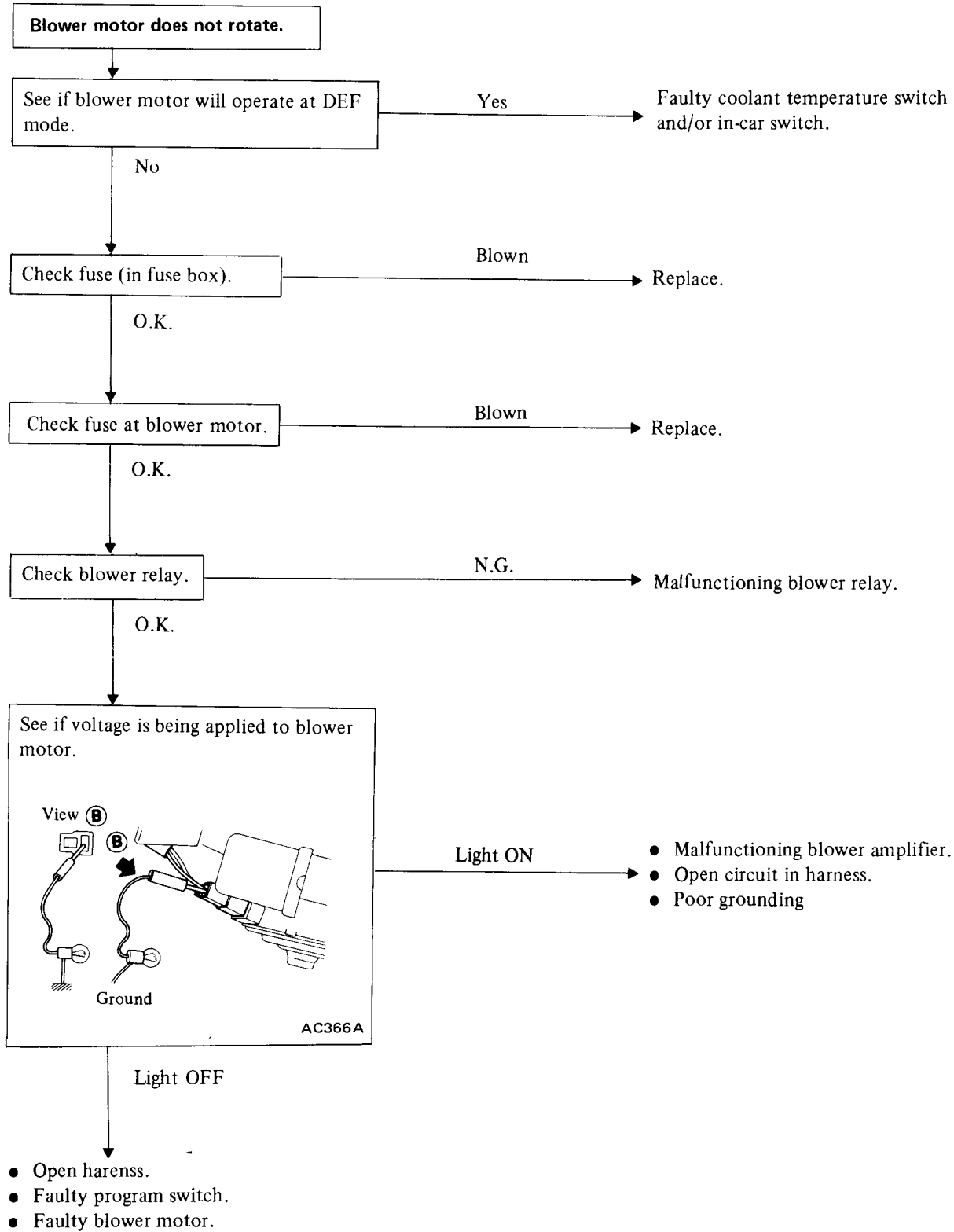
CAUTION:

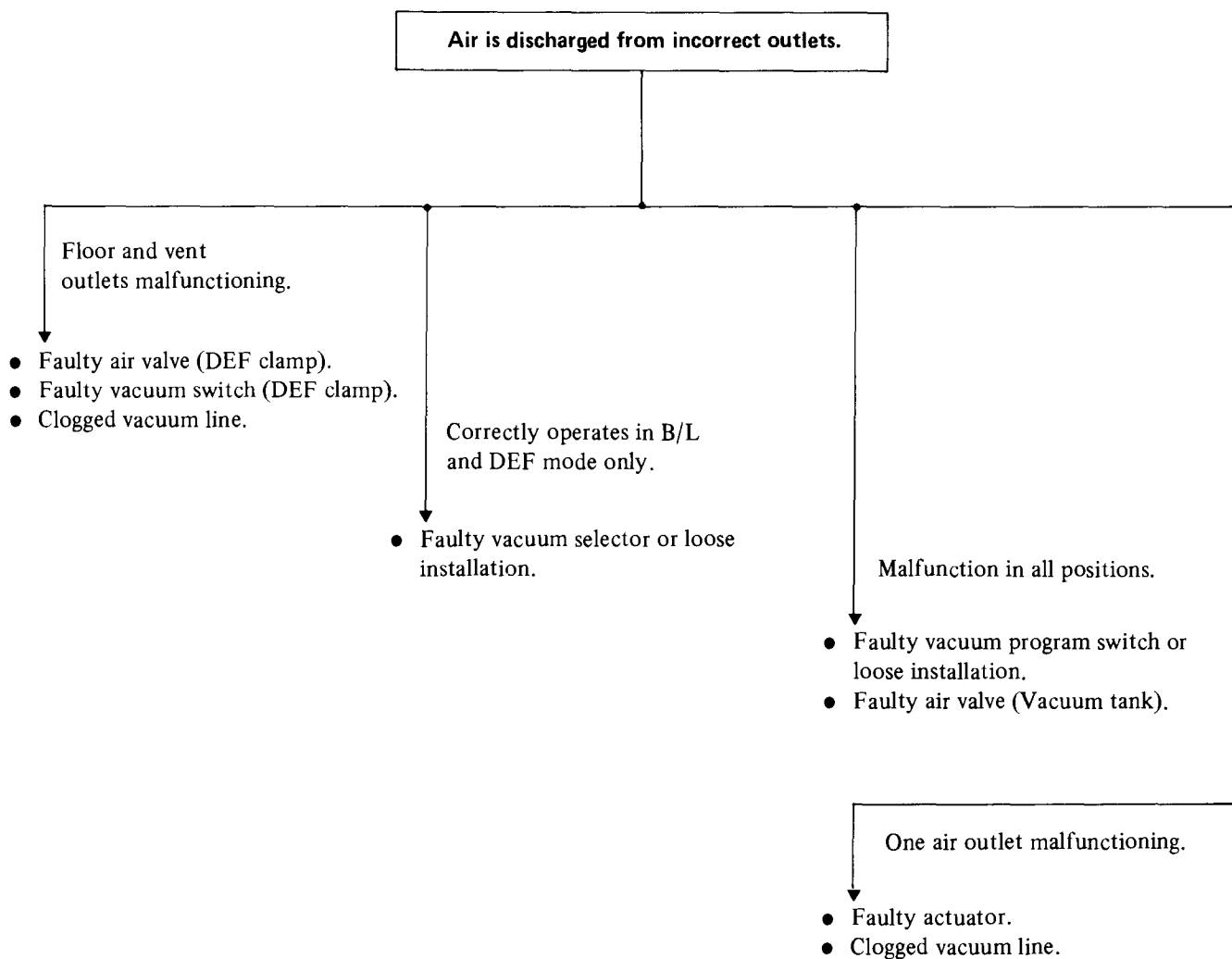
Do not turn trimmer more than 150 degrees.

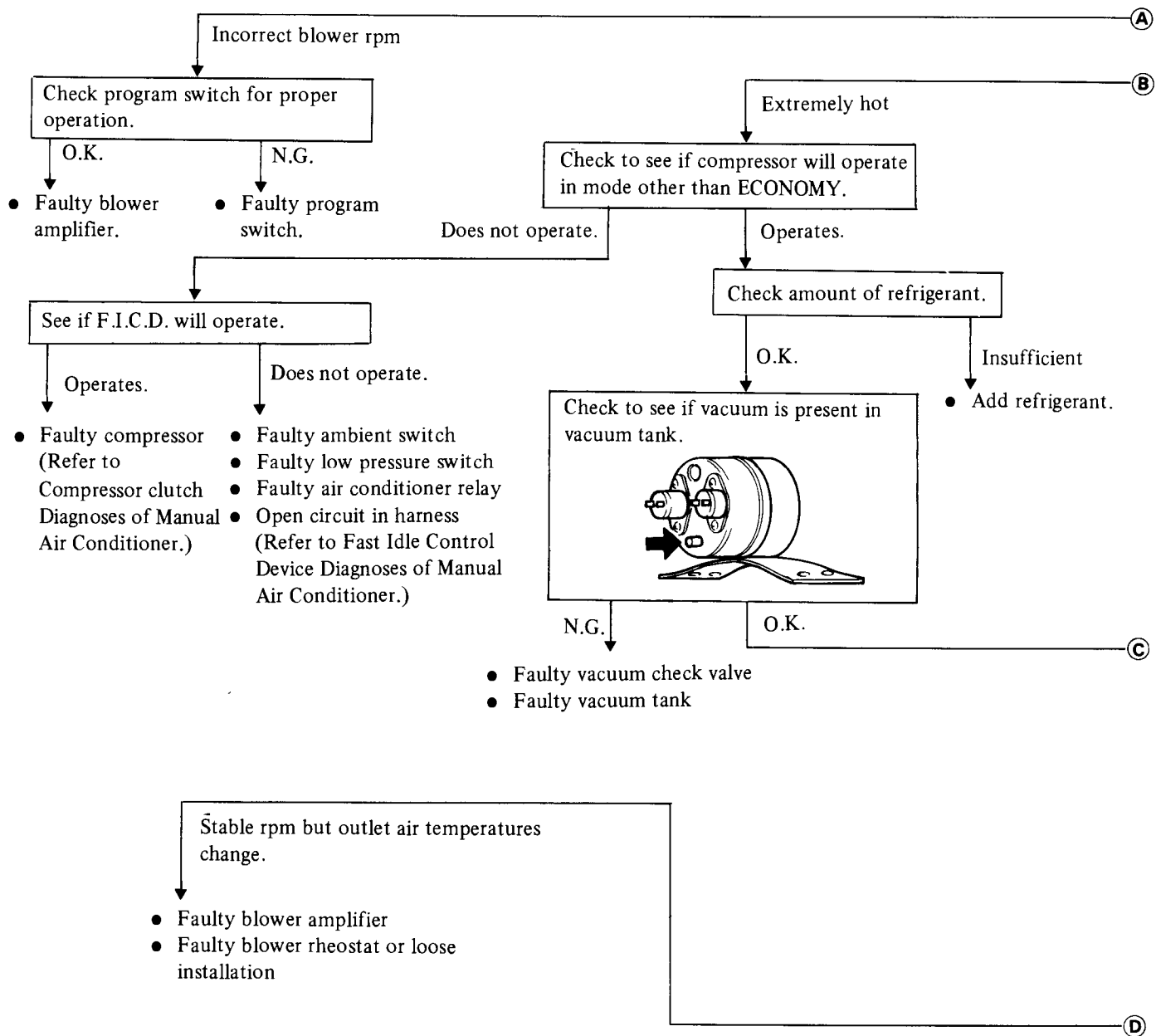
ELECTRICAL DIAGRAM

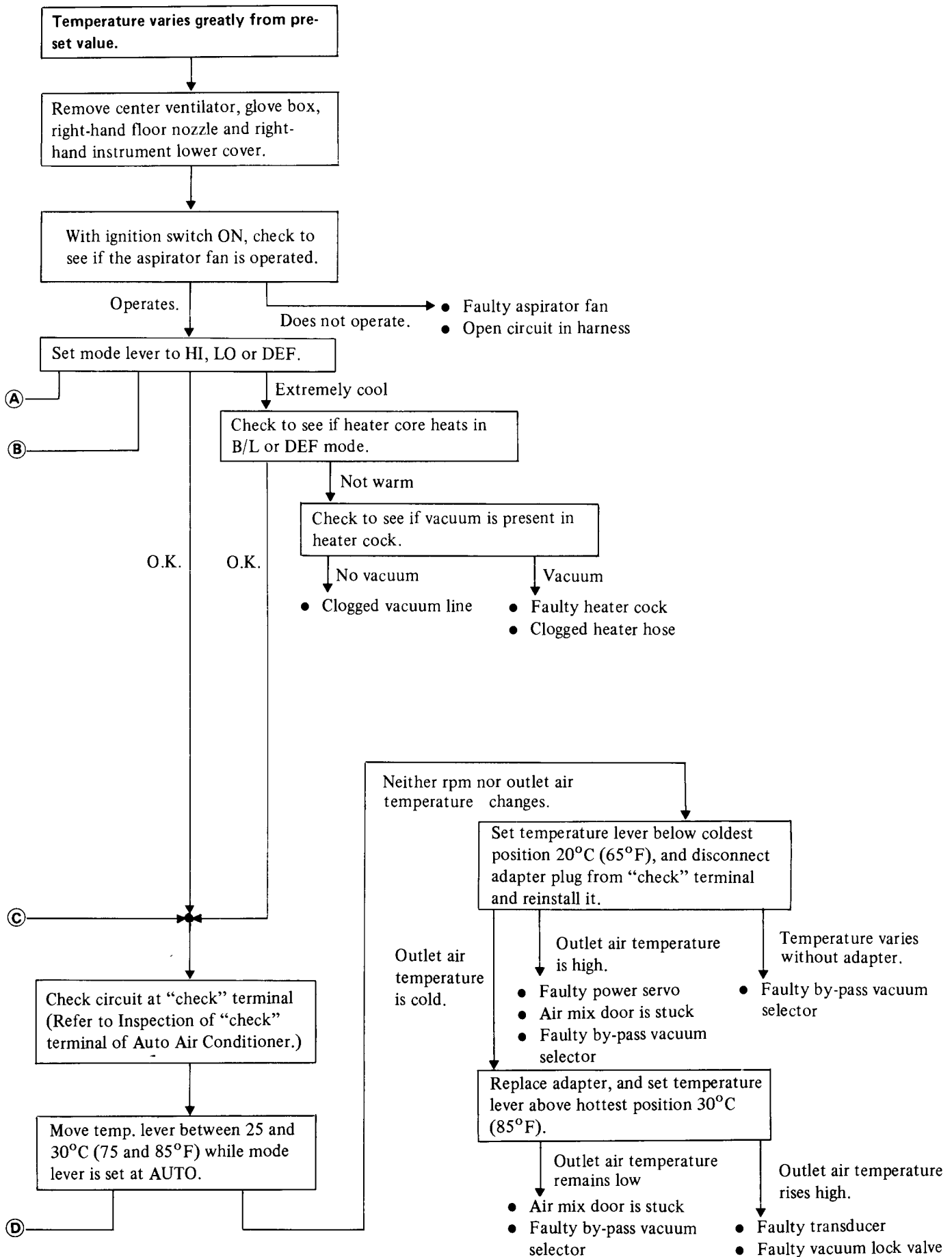


TROUBLE DIAGNOSES



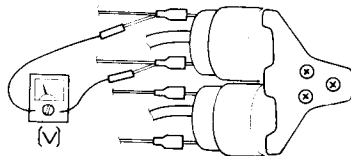






System cannot be shifted from outside to inside air (recirculation) mode or vice versa.

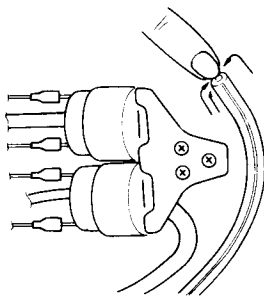
Measure terminal voltage across air valve (intake door) when recirculation switch is ON and OFF.



ON ... 0 Volt
OFF ... 12 Volts

0 or 12 volts (regardless of recirculation switch position)

Remove vacuum tube and check to see if a vacuum is present in air valve.



Check recirculation timer.

N.G.

Replace.

O.K.

- Faulty program switch

Vacuum

No vacuum

- Intake door is stuck.
- Intake door actuator malfunctioning.

Look for pinched or deformed vacuum tube.

N.G.

Replace.

- Vacuum selector or vacuum program switch malfunctioning

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

GENERAL SPECIFICATIONS

COMPRESSOR

Model	MJ167
Type	Swash plate
Displacement cm ³ (cu in)/rev.	167 (10.19)
Cylinder bore x stroke mm (in)	37.2 x 25.7 (1.465 x 1.012)
Direction of rotation	Clockwise (Viewed from drive end)
Type of driving belt	A type

LUBRICATING OIL

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)

ENGINE IDLING SPEED

Transmission	When A/C is OFF	When A/C is ON	
		Except turbo-charged model	Turbo-charged model
Manual rpm	700±100	Approximately 820	Approximately 750
Automatic rpm	700±100 at "D" range	Approximately 820 in "N" range	Approximately 750 in "N" range

INSPECTION AND ADJUSTMENT

BELT TENSION

	New	Used
Fan belt/Applied pressure mm (in)/N (kg, lb)	4 - 6 (0.16 - 0.24)/ 98 (10, 22)	5 - 7 (0.20 - 0.28)/ 98 (10, 22)

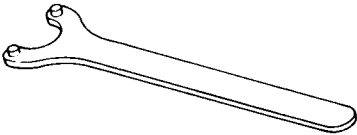
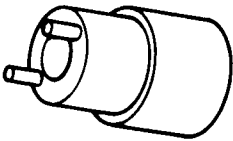
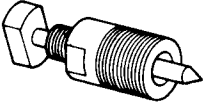
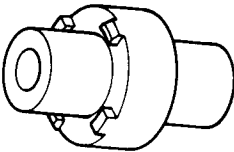
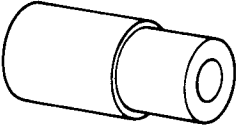
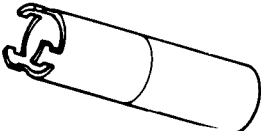
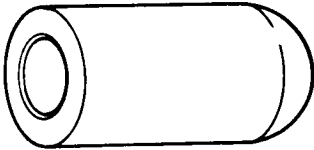


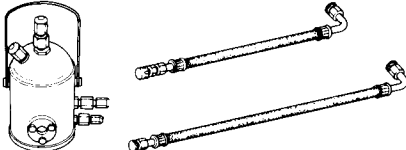
COMPRESSOR

Clutch hub to pulley clearance mm (in)	0.5 - 0.8 (0.020 - 0.031)
---	---------------------------

TIGHTENING TORQUE

Unit		N·m	kg·m	ft·lb
Compressor bracket to cylinder block		44 - 54	4.5 - 5.5	33 - 40
Compressor to compressor bracket		44 - 54	4.5 - 5.5	33 - 40
Refrigerant line connection				
Outside diameter of pipe	8 mm (0.31 in)	20 - 25	2.0 - 2.5	14 - 18
	12 mm (0.47 in)	25 - 29	2.5 - 3.0	18 - 22
	16 mm (0.63 in)	25 - 29	2.5 - 3.0	18 - 22
Compressor				
Shaft nut		19 - 21	1.9 - 2.1	14 - 15
Lock nut		25 - 27	2.5 - 2.8	18 - 20
Clutch hub nut		18 - 21	1.8 - 2.1	13 - 15
Clutch coil screw		2.7 - 3.4	0.28 - 0.35	2.0 - 2.5
Rear cover bolt		19 - 21	1.9 - 2.1	14 - 15
Discharge valve bolt/Discharge connector bolt		17 - 18	1.7 - 1.8	12 - 13
Suction valve bolt/Suction connector bolt		17 - 18	1.7 - 1.8	12 - 13

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.)	Tool name	
KV99412302 (J 24878-1)	Clutch hub wrench	
KV99412305 (J 24878-2)	Hub nut socket	
KV99412306 (J 24878-3)	Clutch hub puller	
KV99412310 (J 24878-4)	Lock nut socket	
KV99412312 (J 25472)	Puller pilot	
KV99412321 (J 26067)	Shaft seal remover and installer	
KV99412322 (J 25473)	Shaft seal pilot	
KV99412330 (-)	Allen socket	
KV99412315 (-)	Cylinder head remover	
KV992A9690 (-)	Oil separator kit	

ELECTRICAL SYSTEM

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STEREO	EL- 62	DEVICE (A.S.C.D.)	EL-111
REAR WINDOW DEFOGGER	EL- 62	DESCRIPTION	EL-111
REMOTE-CONTROL DOOR MIRROR	EL- 66	FUNCTION AND OPERATION	EL-113
REAR WINDOW SYSTEM	EL- 67	REMOVAL AND INSTALLATION	EL-113
HEADLAMP CLEANER	EL- 68	COMPONENT PARTS INSPECTION	EL-115
POWER DOOR LOCK	EL- 69	WIRING DIAGRAM AND TROUBLE	
CIRCUIT DIAGRAMS AND		DIAGNOSES	EL-119
TROUBLE DIAGNOSES	EL- 71	LOCATION OF ELECTRICAL UNIT	EL-124
LIGHTING SYSTEM	EL- 71	WIRING	EL-125
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Refer to Section EF (Engine Fuel) for:

- **EFI SYSTEM**

Refer to Section EC (Emission Control System) for:

- **EMISSION CONTROL SYSTEM**

Refer to Section HA (Heater & Air Conditioner) for:

- **HEATER**
- **AIR CONDITIONER**

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 diagrams 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 car (ground)].

Remembering this basic rule will make it a lot easier to troubleshoot

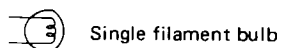
electrical problems.

WIRING DIAGRAMS

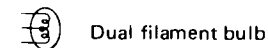
There are several wiring diagrams and schematics illustrating each electrical circuit in the S130. Accurate diagnosis of electrical problems requires that you effectively use and interpret these diagrams. Since they have a special language, i.e., symbols, codes and abbreviations, let's review the following chart.

ELECTRICAL SYMBOLS AND ABBREVIATIONS

SYMBOLS



Single filament bulb



Dual filament bulb



Fuse



Fusible link



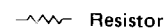
Diode



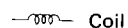
Motor



Transistor



Resistor



Coil



Variable resistor



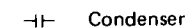
Thermistor



Reed switch



Circuit breaker



Condenser



Switch (Normally open)



Switch (Normally closed)



Ground



No connection between wires



Connection between wires

CONNECTORS



Pin-type connector (Male)



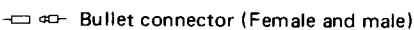
Pin-type connector (Female)



Plain-type connector (Male)



Plain-type connector (Female)



Bullet connector (Female and male)



Plain connector (Female and male)

WIRE COLOR CODING

B = Black	Y = Yellow
W = White	Lg = Light Green
R = Red	Br = Brown
G = Green	Gr = Gray
L = Blue	

In case of color coding with Tracers, Base Color is given first, followed by the Tracer Color:

Example: LW = Blue w/White Tracers

ABBREVIATIONS

- Ⓓ 2 seater models
- Ⓔ 2+2 seater models
- Ⓙ GL models
- Ⓖ Deluxe models
- Ⓟ Turbocharger models
- Ⓠ Non-turbocharger models

To trace a problem in any electrical circuit, several types of diagrams can be used.

Fusible Link Supply Routing & Fuse Block Circuit Supply Routing (Refer to pages EL-6, 7). This diagram is helpful in identifying specific problems in the power supply portion of the electrical circuits. For example, let's say a car has inoperative instrument meter lights. A quick check proves that all other lights in the car are operative. The power supply diagram shows that there cannot be a problem between the battery, ignition relay, ignition switch or 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.

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.

Complete Wiring Diagram (Fold-out page). The complete wiring diagram 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. The charts on the back of the car wiring diagram, illustrates how and when these instruments should be used.

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, use 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 stated 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 various wiring diagrams in the service manual.

Study the simplified schematic to develop an understanding of how the circuit is supposed to work. Then use the circuit wiring diagram, harness layout illustration, fusible link supply routing & fuse block circuit supply routing, and car wiring diagram. Get an idea of how the circuit is laid out in the car 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.

BODY ELECTRICAL WIRING

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

DESCRIPTION

Cables are covered with color-coded vinyl for easy identification. In the wiring diagram, colors are indicated by one or two alphabetical letters.

It is recommended that the battery be disconnected before performing any electrical service other than bulb or fuse replacement.

In addition to fuses, a fusible link

has been installed to protect wiring. The fusible link functions almost the same as a fuse, though its characteristics are slightly different than normal fuses.

CABLE COLORS

Cable colors are generally used as shown in the following table.

Circuit system	Color
Starting and ignition system	B (Black)
Charging system	W (White)
Lighting system	R (Red)
Signal system	G (Green)
Instrument system	Y (Yellow)
Others	L, Br, Lg (Blue), (Brown), (Light green)
Grounding system	B (Black)

The main cable of each system is generally coded with a single color. These colors are represented by such letters as G, W, or Br. Minor items of each circuit's terminal are coded with a two-tone color as follows:

BW : Black with white stripe
LgR : Light green with red stripe

INSPECTION

Inspect all electrical circuits, referring to wiring or circuit diagrams. Circuits should be tested for continuity or short circuit with a conventional test lamp or low reading voltmeter. Before inspecting circuit, ensure that:

1. Each electrical component part or cable is securely fastened to its connector or terminal.

2. Each connection is firmly in place and free from rust and dirt.
3. No cable covering shows any evidence of cracks, deterioration or other damage.
4. Each terminal is at a safe distance away from any adjacent metal parts.
5. Each cable is fastened to its proper connector or terminal.
6. Each grounding bolt is firmly planted.
7. Wiring is kept away from any adjacent parts with sharp edges or high temperature parts (such as exhaust pipe).
8. Wiring is kept away from any rotating or working parts: fan pulley, fan belt, etc.
9. Cables between fixed portions and moving parts are long enough to withstand shocks and vibratory forces.

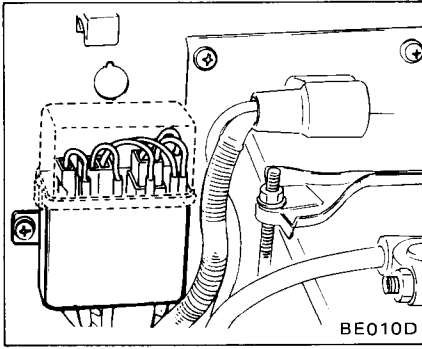
a. Before starting to inspect and repair any part of electrical system or other parts which may lead to a short circuit, be sure to turn ignition switch "OFF" and then disconnect cables at battery terminals as follows:

Disconnect cable at negative (–) terminal, and then disconnect cable at positive (+) terminal.

Before connecting cables to battery terminal, be sure to clean terminals with a rag. Fasten cable at positive (+) terminal, and then ground cable at negative (–) terminal. Apply grease to top of these terminals to prevent rust from developing on them.

- b. Never use a screwdriver or service tool to conduct a continuity test. Use test leads.**
- c. Never ground an open circuit or circuits under no load. Use a test lamp (12V-3W) or circuit tester as a load.**

FUSIBLE LINK

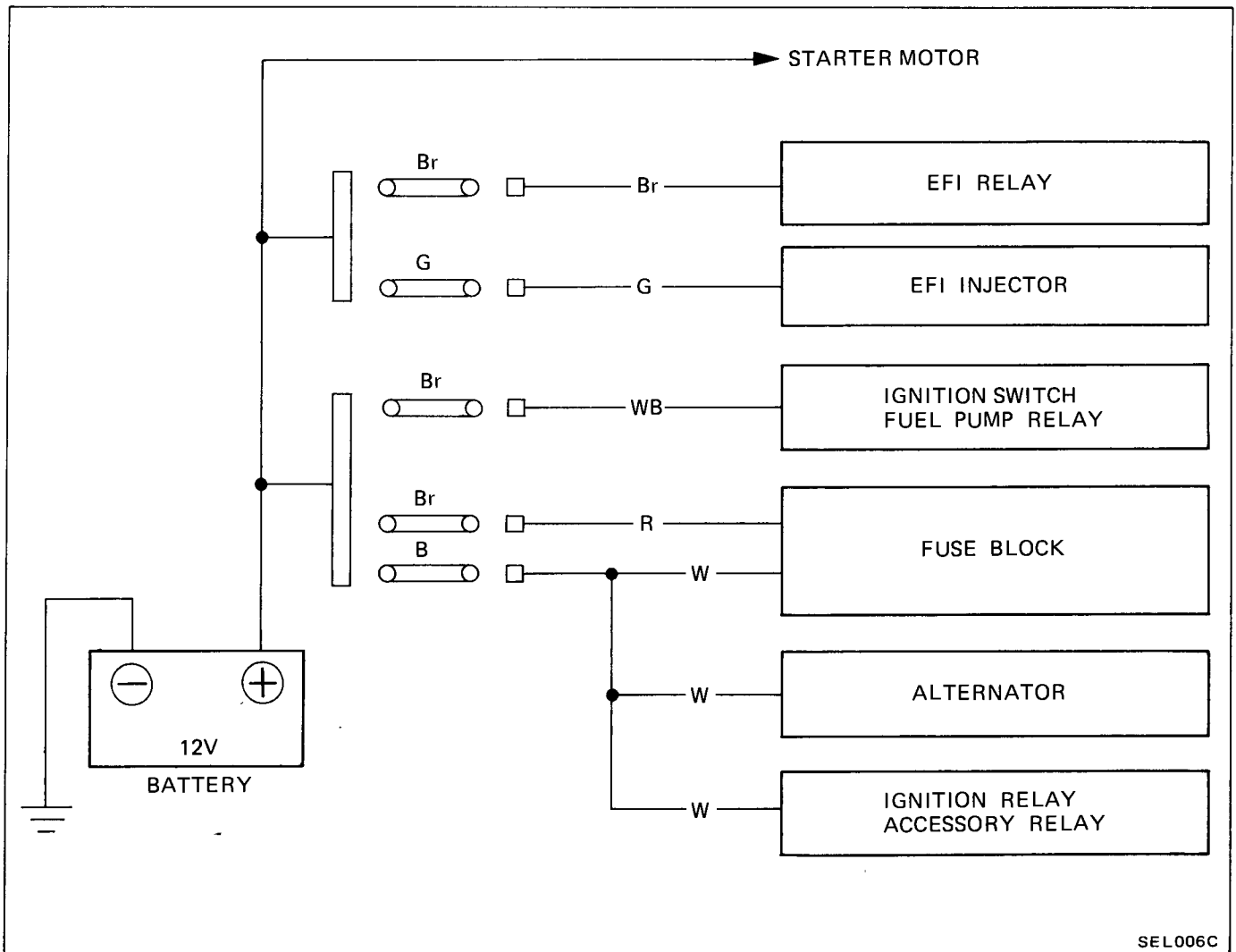


CAUTION:

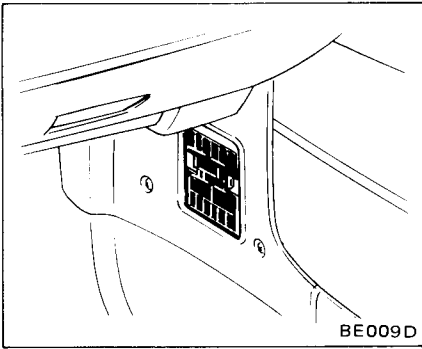
- If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of problem.
- Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken with this link to ensure 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, as required, to conduct continuity test. This continuity test can be performed in the same manner as for any conventional fuse.

FUSIBLE LINK SUPPLY ROUTING



FUSE



The fuse box is installed on the side wall under the dash board.

When, for one reason or another, fuse has melted, use systematic procedure to check and eliminate cause of problem before installing new fuse.

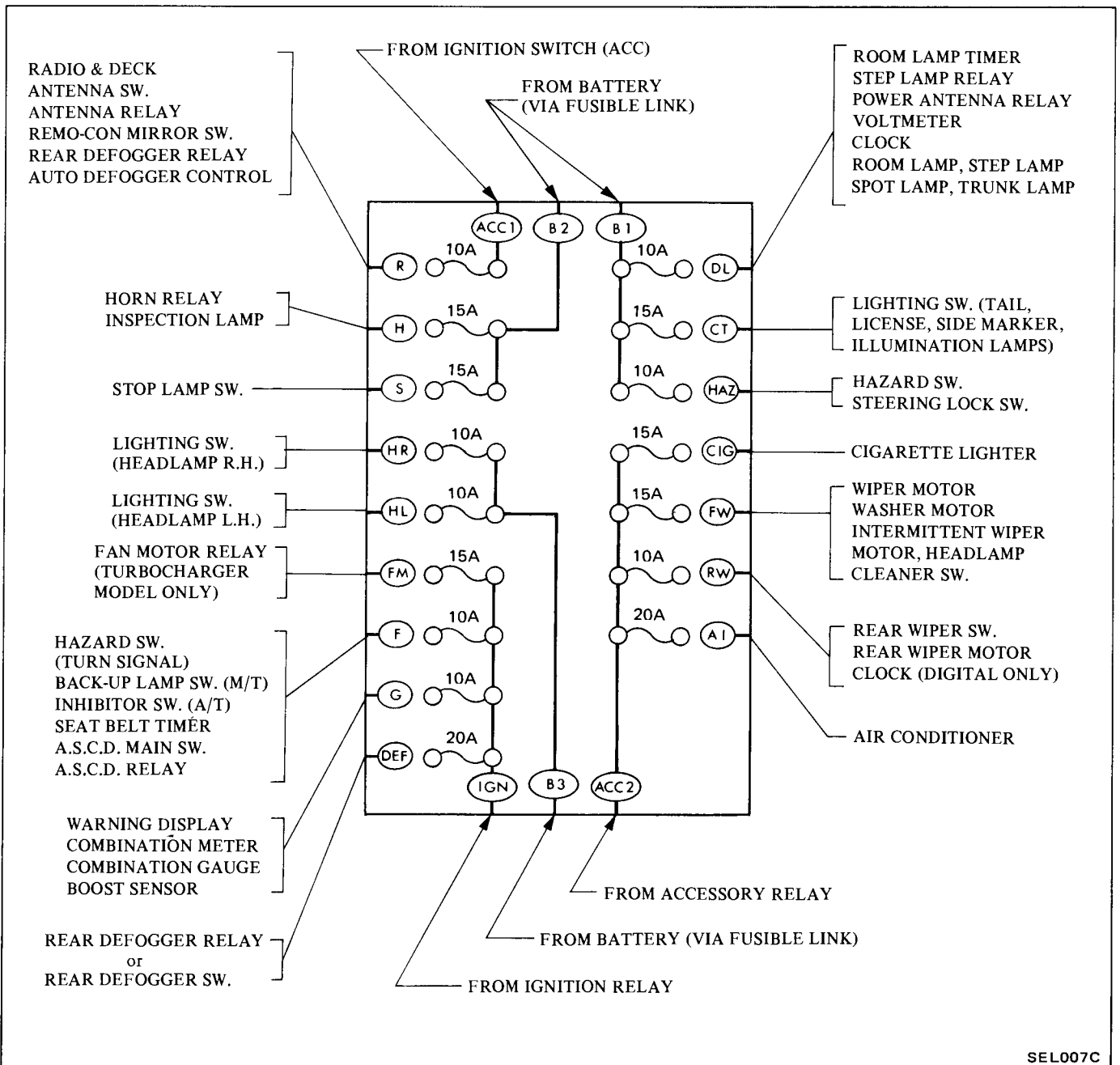
a. If fuse is blown, be sure to eliminate cause of problem before installing new fuse.

b. Use fuse of specified rating. Never use fuse of more than specified rating.

c. Check condition of fuse holders. If much rust or dirt is found thereon, clean metal parts with fine-grained sandpaper until proper metal-to-metal contact is made.

Poor contact in any fuse holder will often lead to voltage drop or heating in the circuit and could result in improper circuit operation.

FUSE BLOCK CIRCUIT ROUTING



SEL007C

BATTERY

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

WARNING:

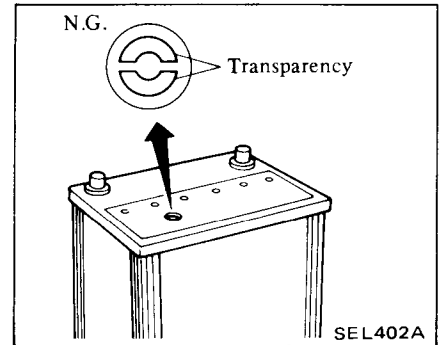
Never touch positive and negative terminals at the same time with bare hands. This could result in injury.

CAUTION:

- If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
- If the battery cables are disconnected, they should be tightly clamped to the battery terminals to secure a good contact.

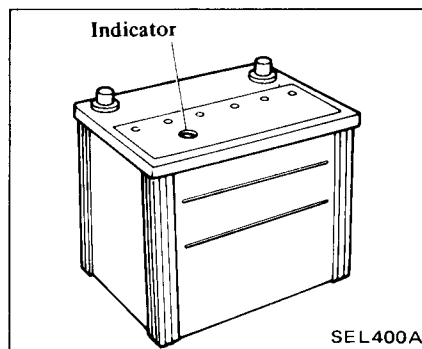
CAUTION:

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.



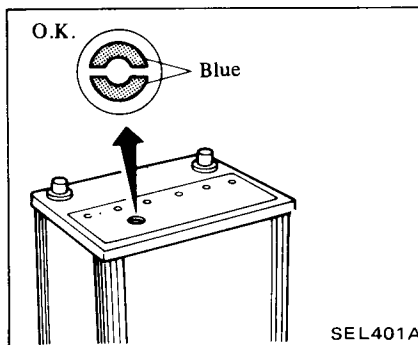
CONDITION CHECK

Battery condition can be checked using indicator on battery.



Good condition

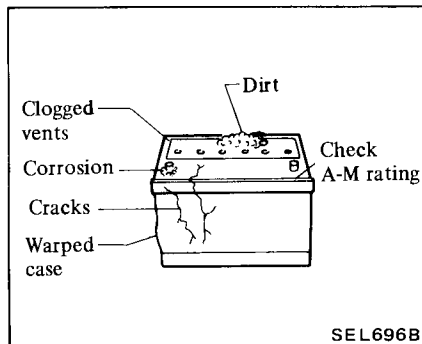
When blue indicator is shown, battery is properly charged.



Lack of charge condition

When transparent indicator is shown, battery is not charged and requires recharging.

VISUAL INSPECTION



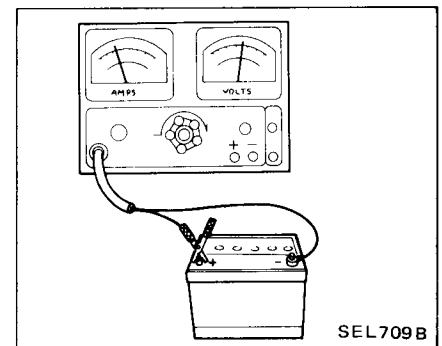
- Check battery rating against that of original factory equipment.
- Check for cracks and warpage of the case.
- Make sure cables are clean and tight.
- Check acid level.
- Make sure vents are not clogged.
- Make sure top of battery is clean.

CLEANING

Use a stiff brush and a common baking soda and water solution to clean the battery surface, terminals and cable ends.

TEST

BATTERY CAPACITY TEST



- Check battery rating against that of original factory equipment.
- 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.)
- 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.

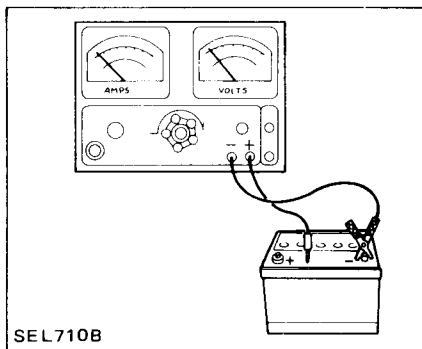
THREE-MINUTE CHARGE TEST

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.

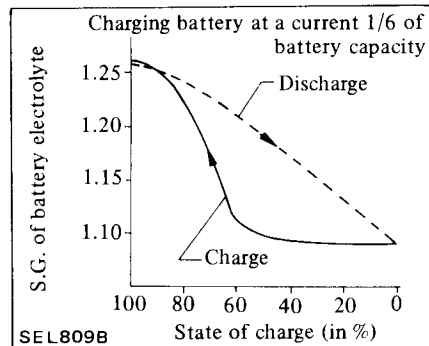
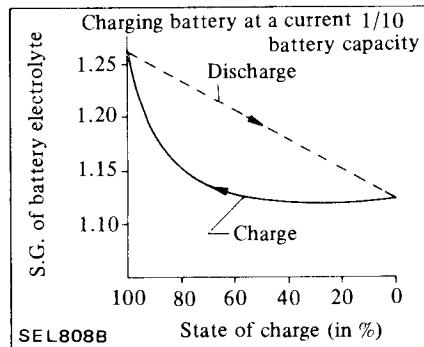
1. Disconnect battery ground cable.
2. Insert test light in series between cable end and the negative battery post.
3. With all switches and systems off the test light should not be lit.
4. If the light is lit begin disconnecting fuses and units until the light goes out. **The clock is designed to run 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 for approximately 45 minutes. **Never charge more than 45 minutes.**

CAUTION:

Charging the battery at a current of more than 10 amperes 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.

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

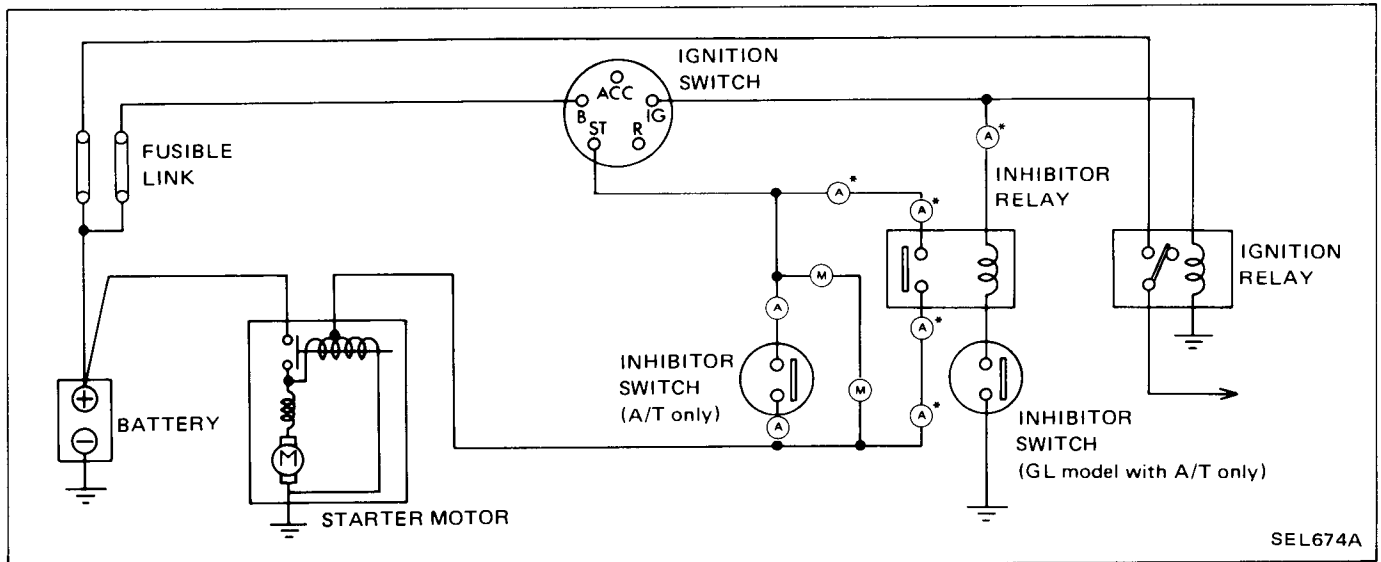
BATTERY

	N60MF	N70ZMF
	Maintenance free type	
Applied model	U.S.A.	Canada
Capacity V-AH	12-60	12-70

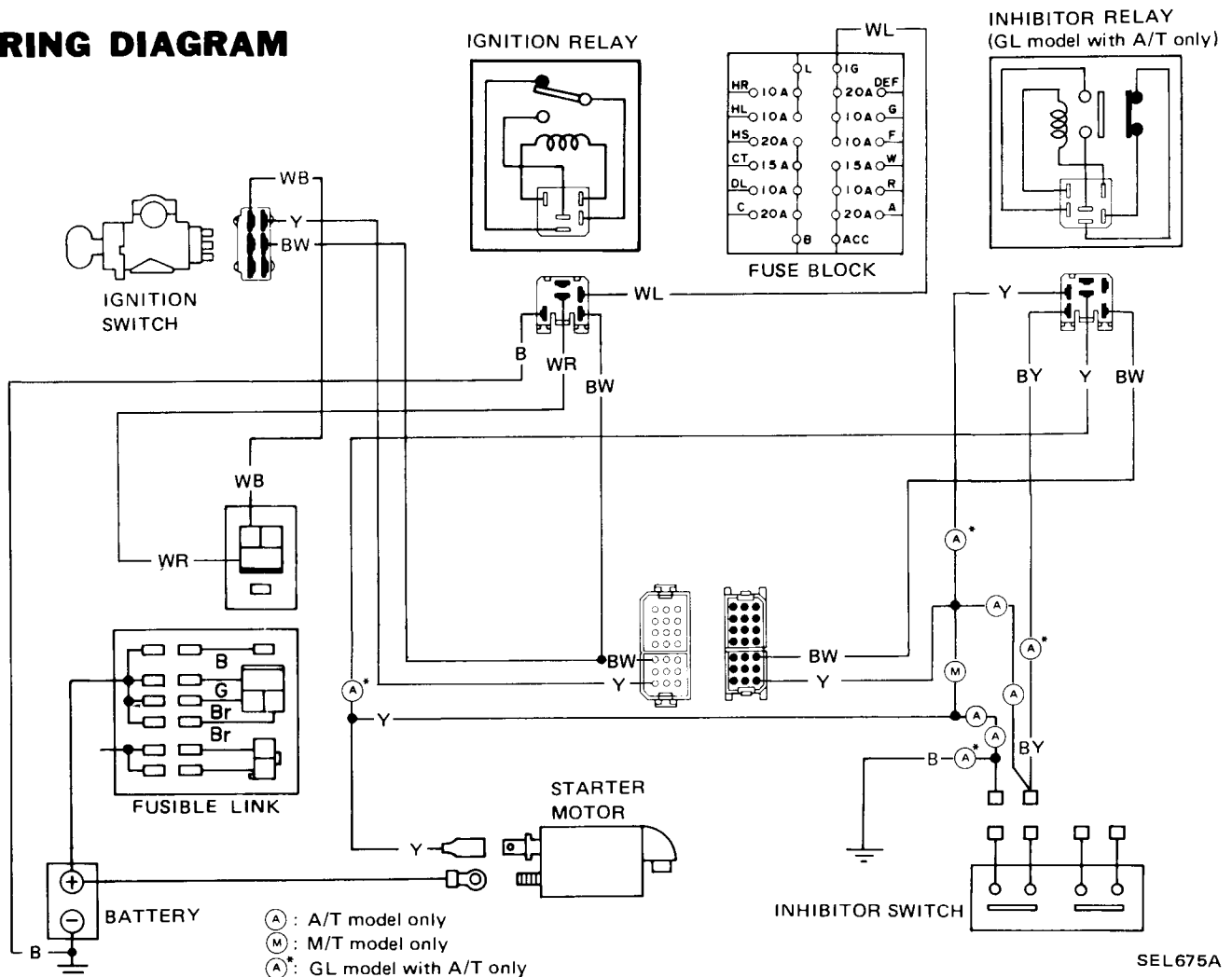
STARTING SYSTEM

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

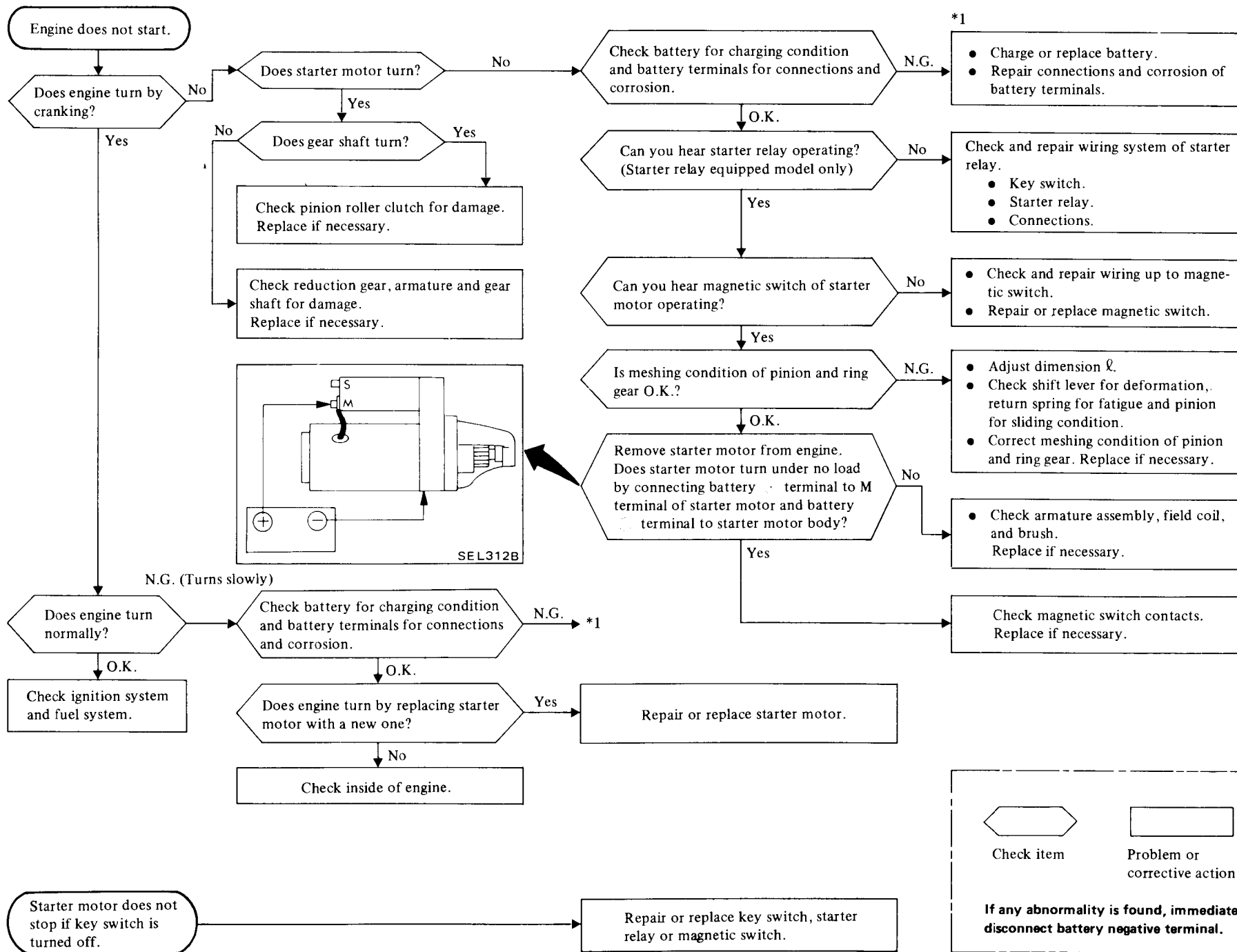
SCHEMATIC



WIRING DIAGRAM

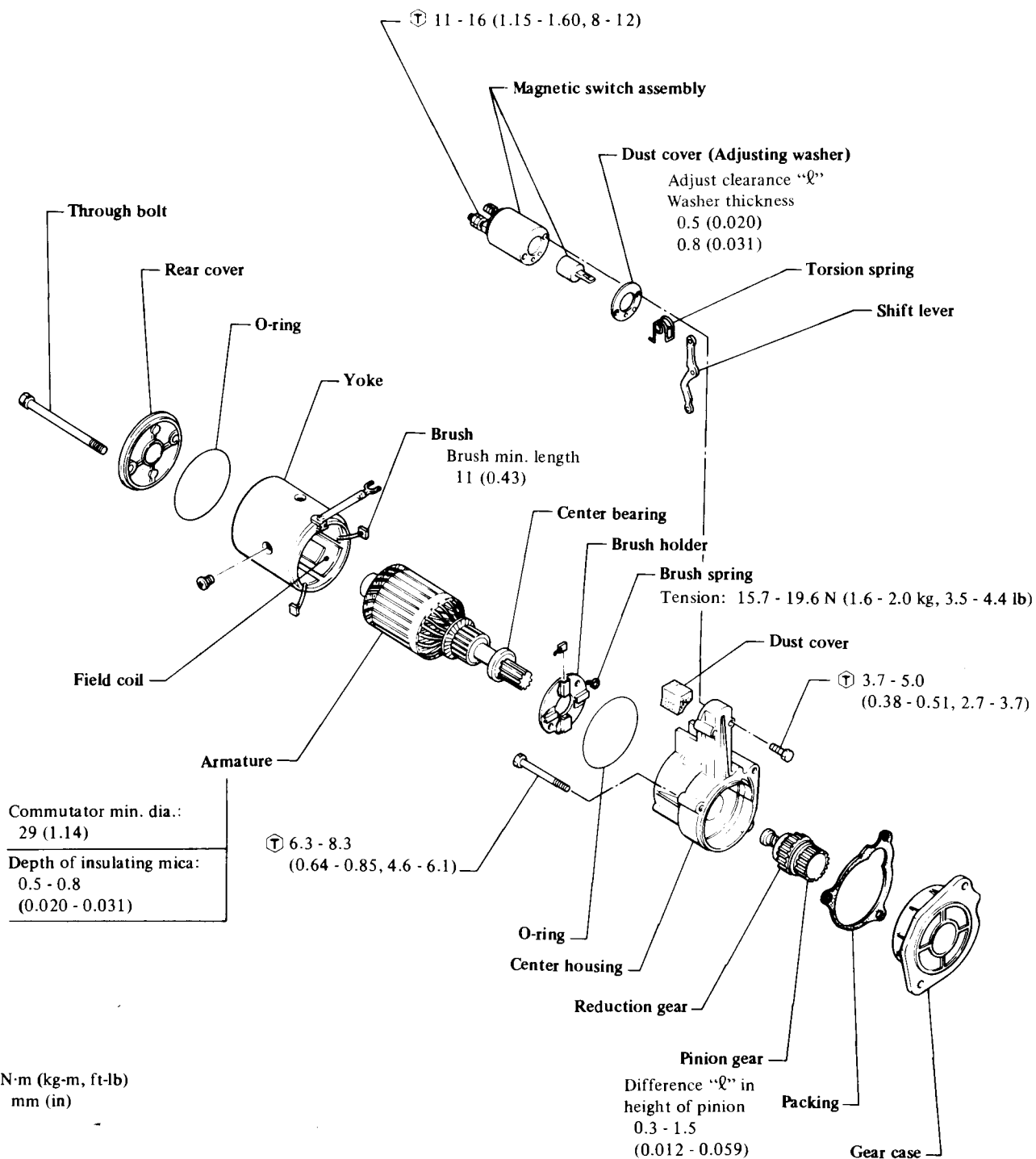


STARTING SYSTEM TROUBLE-SHOOTING



STARTER MOTOR

Reduction gear type



DISASSEMBLY

Reduction gear type

1. Remove magnetic switch assembly.
2. Remove torsion spring.
3. Remove through bolts and rear cover.

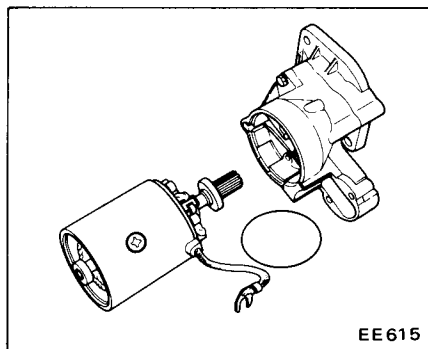
CAUTION:

Be careful not to damage O-ring.

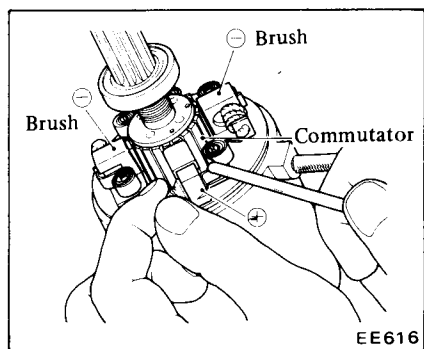
4. Remove yoke, armature and brush holder as an assembly from center housing.

CAUTION:

Be careful not to knock brush, commutator or coil against any adjacent part.



5. Remove center housing.
6. Remove pinion gear.
7. Lift up brush springs.
8. Remove brushes from brush holder.

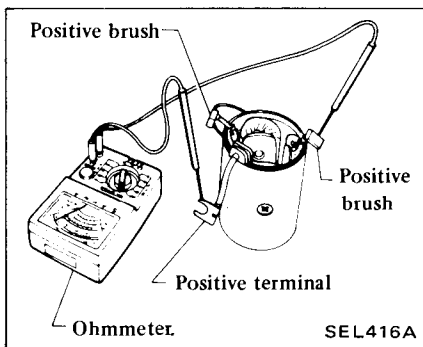


9. Remove brush holder.
10. Remove yoke.

INSPECTION

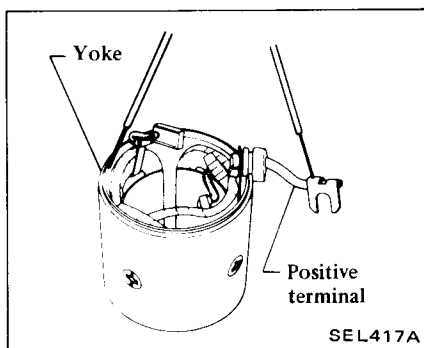
Field coil

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 the surface condition of brush contact.

- Loose contact ... Replace.

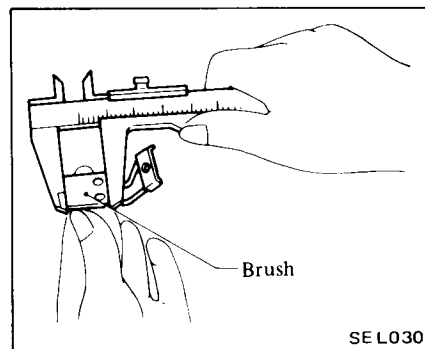
Check wear of brush.

Minimum length of brush:

Reduction gear type:

11 mm (0.43 in)

- Excessive wear ... Replace.



Brush spring

Check brush spring tension.

Spring tension:

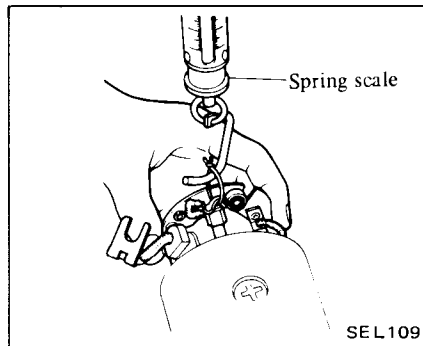
Reduction gear type

15.7 - 19.6 N

(1.6 - 2.0 kg,

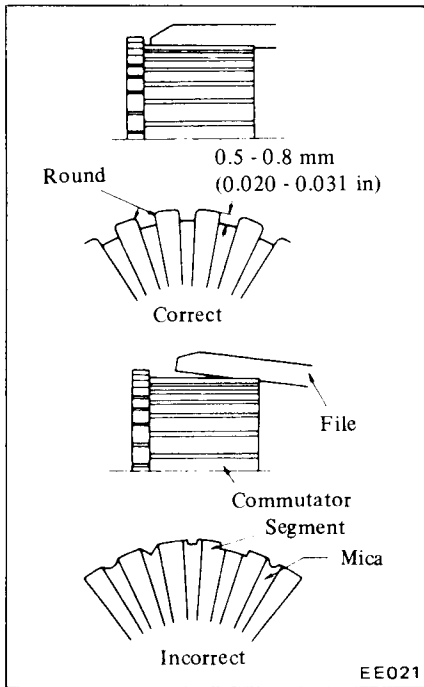
3.5 - 4.4 lb)

- Not in the specified value. ... Repair or replace.



Armature assembly

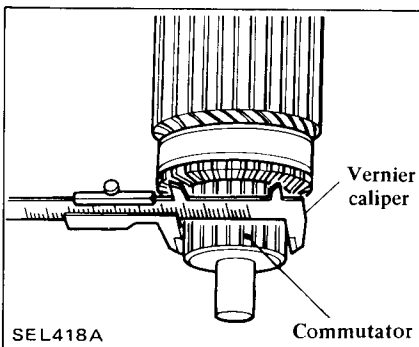
1. Check commutator surface.
 - Rough ... Sand lightly with No. 500 sandpaper.
2. Check depth of insulating mica from commutator surface.
 - Less than 0.2 mm (0.008 in) ... Undercut to 0.5 - 0.8 mm (0.020 - 0.031 in)



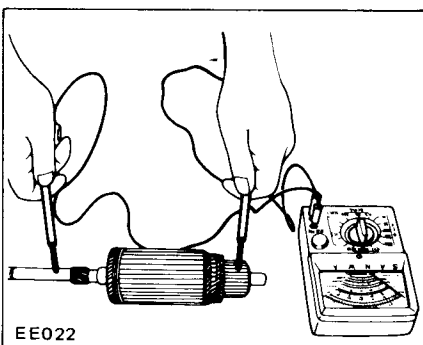
3. Check diameter of commutator.
Commutator minimum diameter:

Reduction gear type:
29 mm (1.14 in)

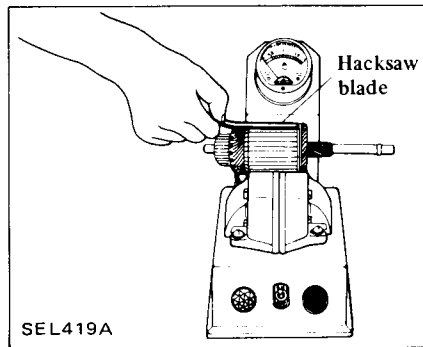
- Less than specified value ... Replace.



4. Insulation test (between each commutator bar and shaft).



- Continuity exists ... Replace.
5. Short test with armature tester (growler) and a piece of iron over armature core.



- Plate vibrates ... Replace.
6. Continuity test (between two segments side by side).
- No continuity ... Replace.

Over-running clutch assembly

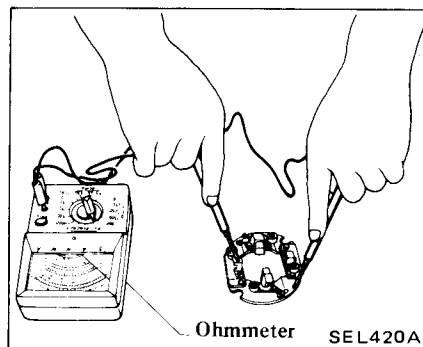
1. Inspect smooth sliding of pinion gear.
 2. Inspect pinion teeth.
- Abnormal resistance ... Repair.
 - Excessive rubbing ... Replace.

CAUTION:

Flywheel ring gear also must be inspected.

Brush holder

Insulation test (between negative side of brush holder and another positive side).



- Continuity exists ... Replace.

Ball bearing (Reduction gear type)

Holding outer race with finger, rotate bearing.

- Any play or bind ... Replace.

Magnetic switch assembly

1. Continuity test (between "S" terminal and switch body).

- No continuity ... Replace.
2. Continuity test (between terminals "S" and "M").
- No continuity ... Replace.

ASSEMBLY

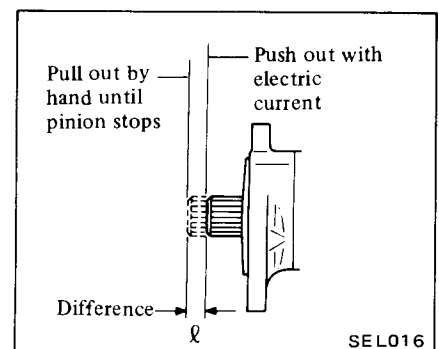
- Apply grease to gear case and rear cover bearing metal, and apply oil to pinion slightly.

(Reduction gear type)

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":

**0.3 - 1.5 mm
(0.012 - 0.059 in)**



- Not in the specified value ... Adjust by adjusting washer(s).

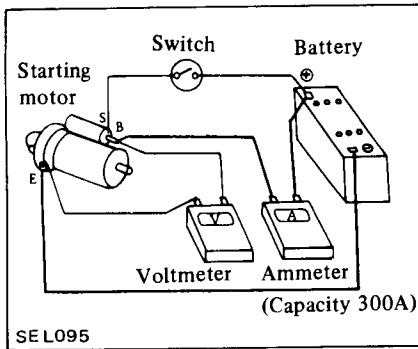
Adjusting washer thickness:

**0.5 mm (0.020 in)
0.8 mm (0.031 in)**

TESTING

Performance test

No-load test



Specifications

Refer to S.D.S.

Diagnosis of test

1. Low speed with no-load and high current draw.

- (1) Tight, dirty or worn bearings.
- (2) Bent armature shaft or loosened field probe.

(3) Shorted armature coil.

(4) A grounded armature of field coil.

2. Failure to operate with high current draw.

(1) A grounded or open field coil.

(2) Burned out commutator bar.

- Weak brush spring tension
- Thrust out of mica in commutator
- Loose contact between brush and commutator.

3. Low current draw and low no-load speed.

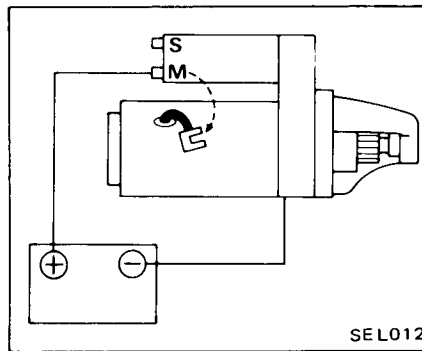
(1) Loose connections.

(2) Dirty commutator.

(3) Burned out commutator bar.

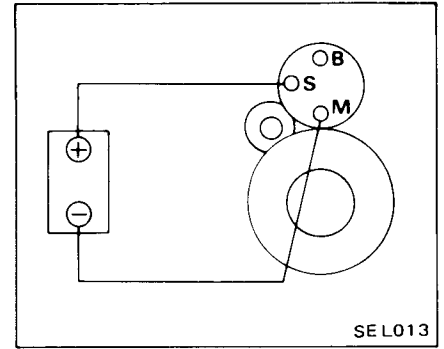
Magnetic switch returnability

1. Disconnect lead wire from terminal "M" of magnetic switch.
2. Connect terminal "M" and positive \oplus terminal of battery with a jumper lead wire.
3. Connect starter motor body and negative \ominus terminal of battery with a jumper lead wire.
4. Pull pinion gear all the way out with your hands.
5. Release your hands from pinion gear.
6. If pinion gear returns to its original position, magnetic switch is properly functioning.



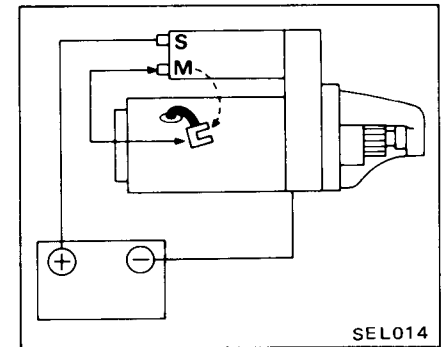
Series coil

1. Connect terminal "M" of magnetic switch and negative \ominus terminal of battery with a jumper lead wire.
2. Connect terminal "S" of magnetic switch and positive \oplus terminal of battery with a jumper wire.
3. With these connections having been made, if plunger is pulled in by force, series coil is properly functioning.



Shunt coil

1. Disconnect lead wire which connects terminal "M" of magnetic switch and starting motor terminal, and connect a jumper wire in its place.
2. Connect terminal "S" of magnetic switch and positive \oplus terminal of battery with a jumper wire.
3. Connect negative \ominus terminal of battery and starting motor body with a jumper wire. Plunger should be pulled in by force.
4. Disconnect jumper wire from terminal "M".
5. If plunger continues to be pulled in with jumper wire disconnected from terminal "M", shunt coil is properly functioning.



SERVICE DATA AND SPECIFICATIONS (S.D.S.)**STARTER MOTOR**

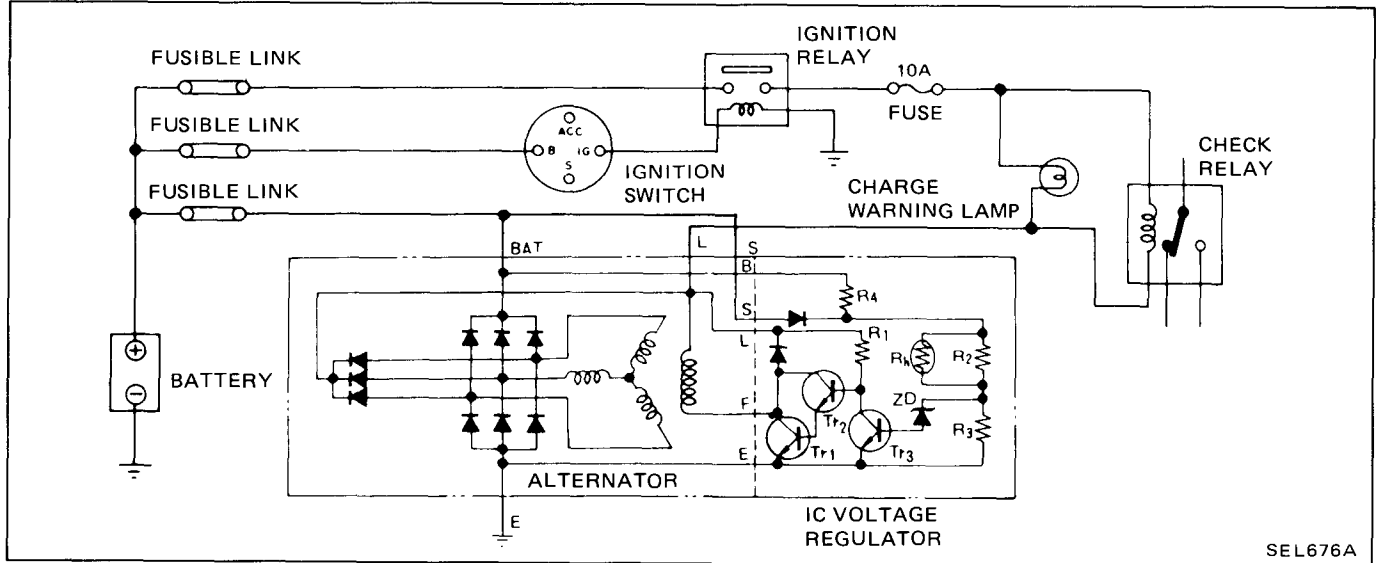
Type		S114-254D
Applied model		Reduction gear type
System voltage V		12
No load	Terminal voltage V	11
	Current A	Less than 100
	Revolution rpm	More than 3,900
Outer diameter of commutator mm (in)		More than 29 (1.14)
Minimum length of brush mm (in)		11 (0.43)
Brush spring tension N (kg, lb)		15.7 - 19.6 (1.6 - 2.0, 3.5 - 4.4)
Difference "Q" in height of pinion mm (in)		0.3 - 1.5 (0.012 - 0.059)

CHARGING SYSTEM

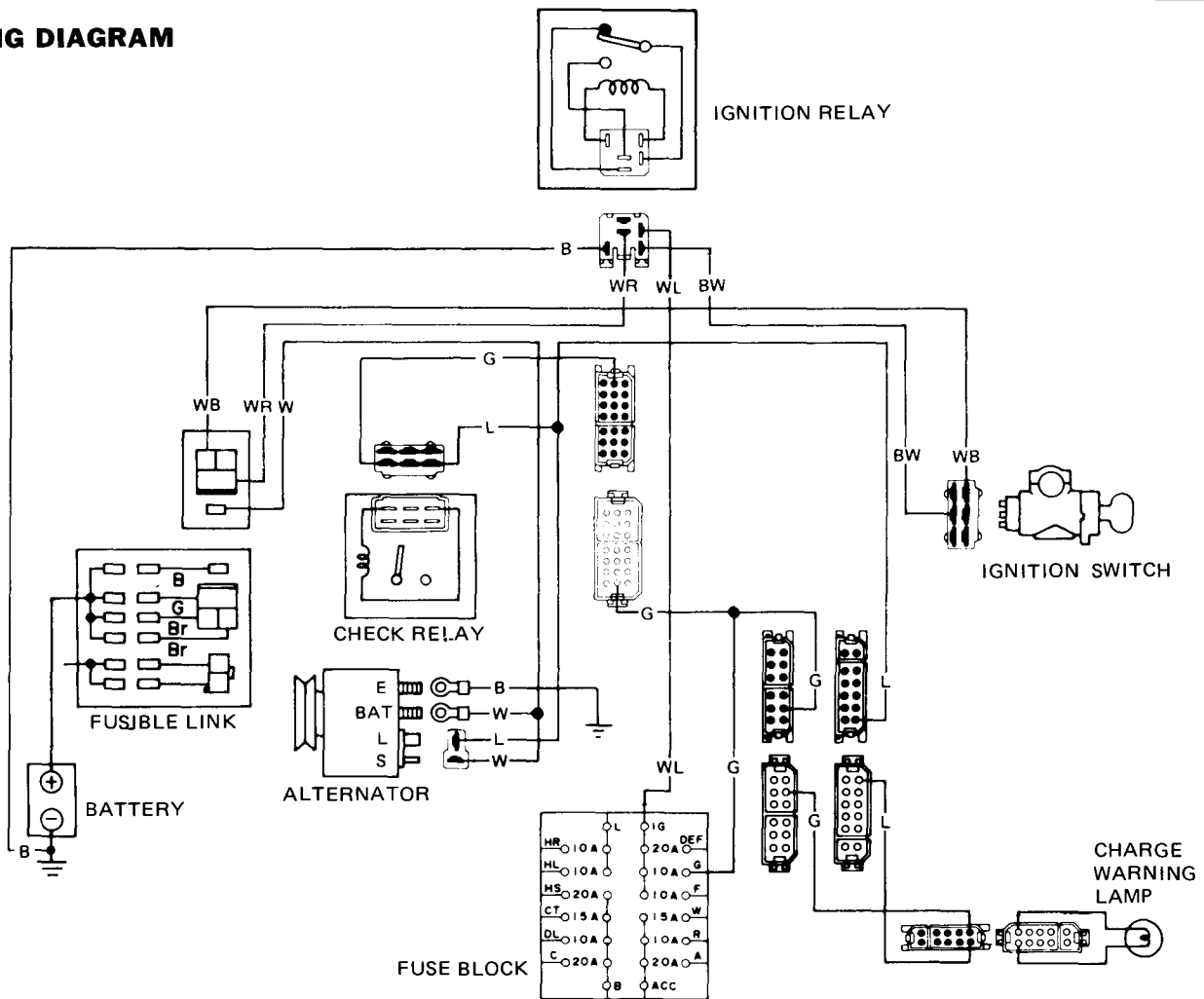
CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

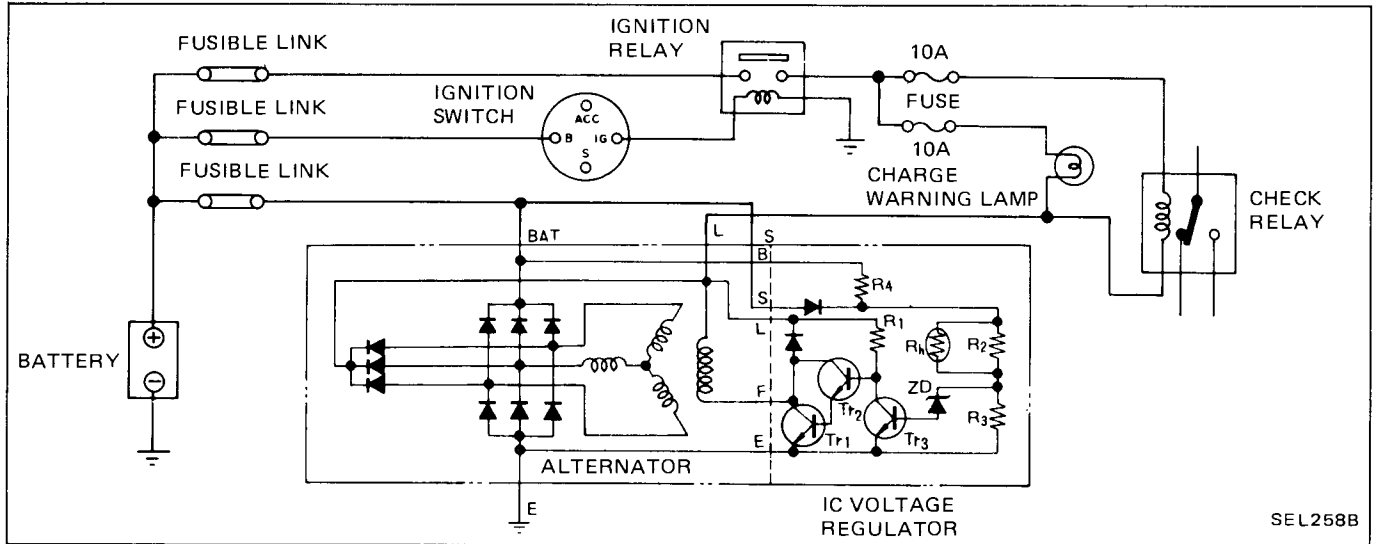
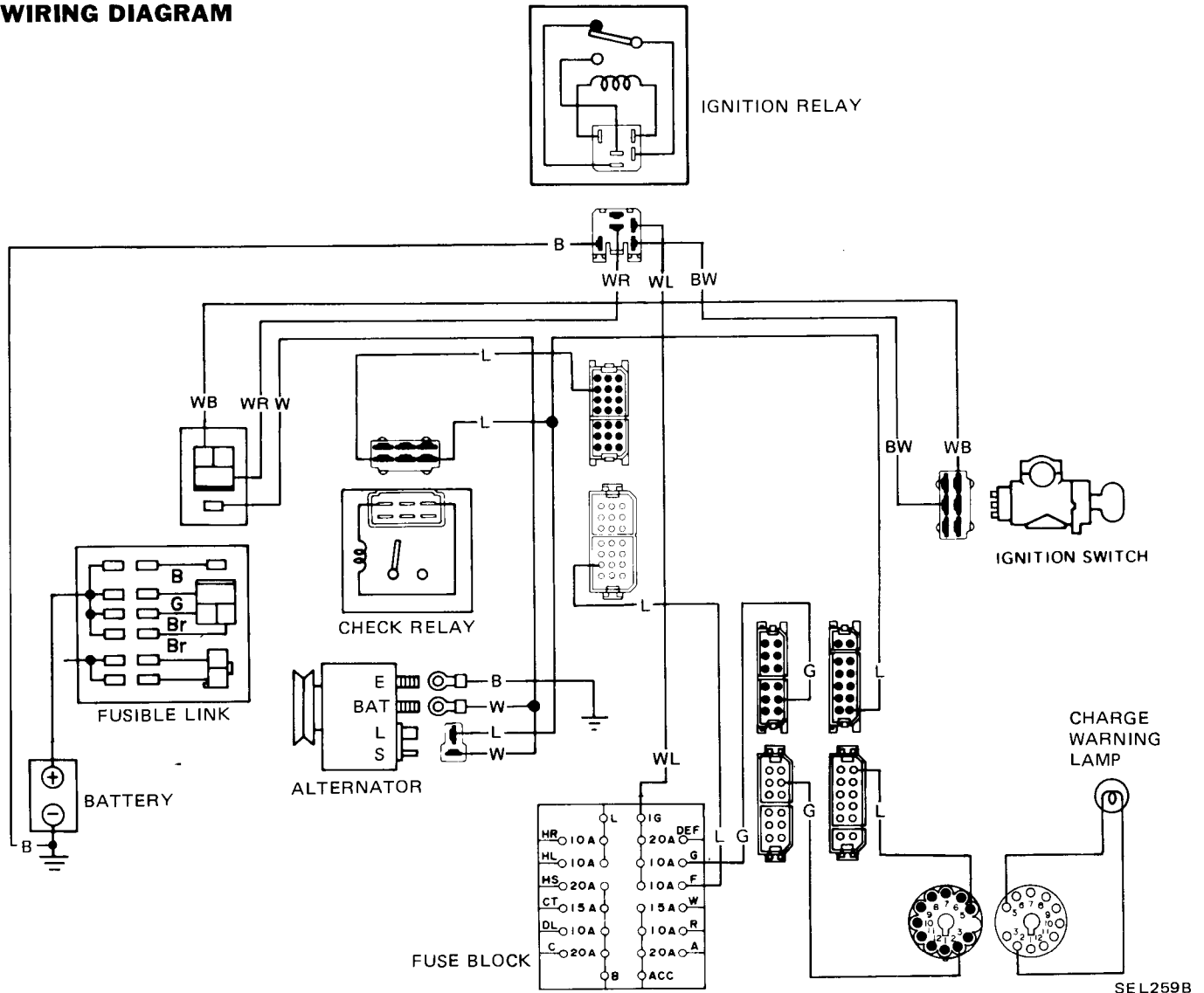
MODELS NOT EQUIPPED WITH TURBOCHARGER

SCHEMATIC



WIRING DIAGRAM



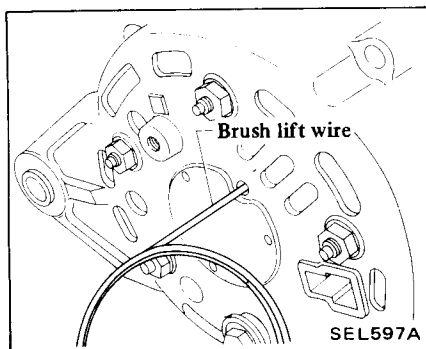
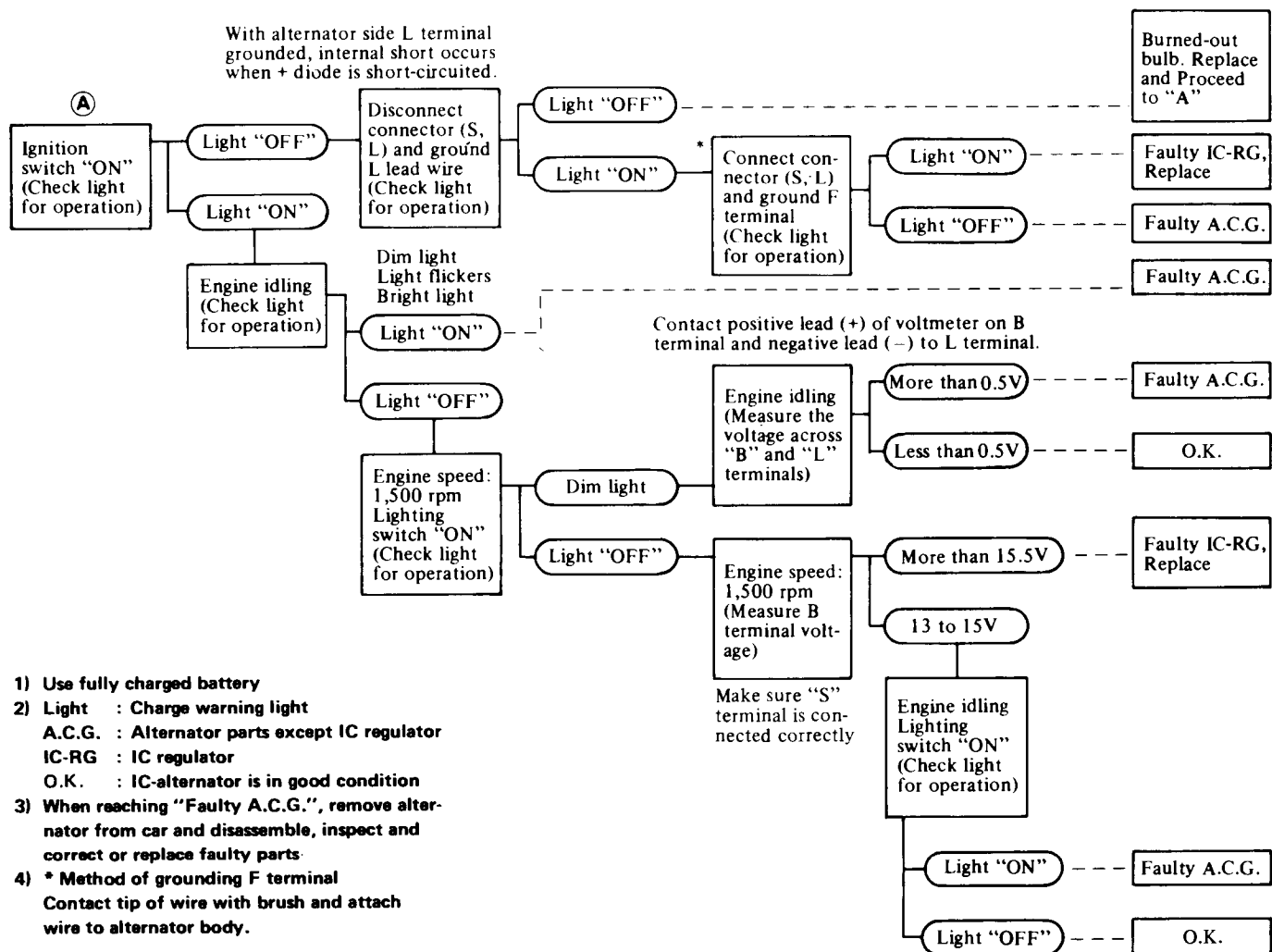
MODELS EQUIPPED WITH TURBOCHARGER**SCHEMATIC****WIRING DIAGRAM**

CHARGING SYSTEM TROUBLE-SHOOTING

Before conducting an alternator test, make sure that the battery is fully charged.

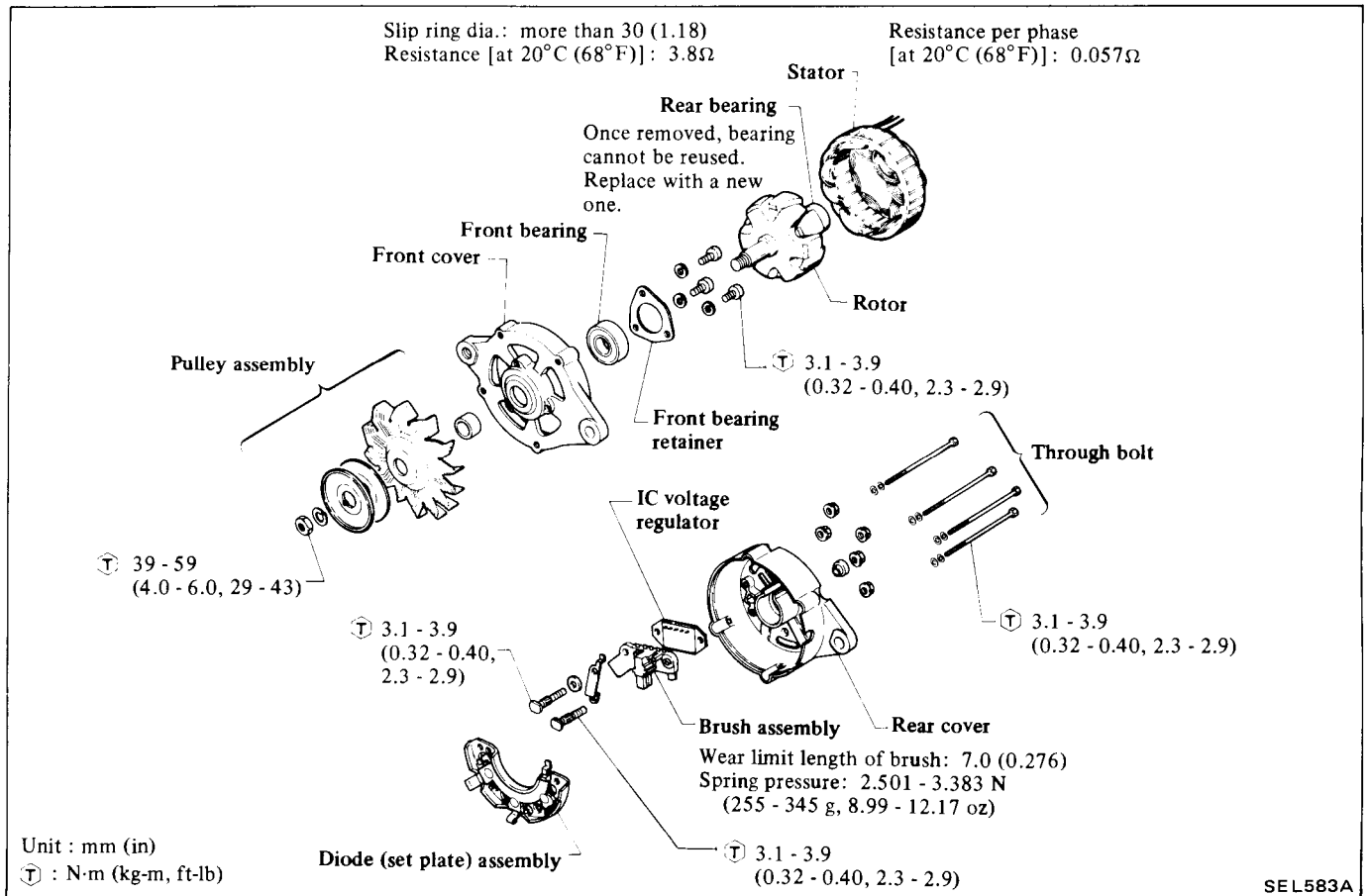
A 30-Volt voltmeter and suitable test probes are necessary for the test.

The alternator can be checked easily by referring to the Inspection Table.



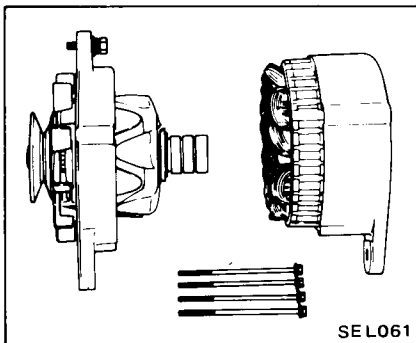
5) Terminals "S", "L", "BAT" and "E" are marked on rear cover of alternator.

ALTERNATOR

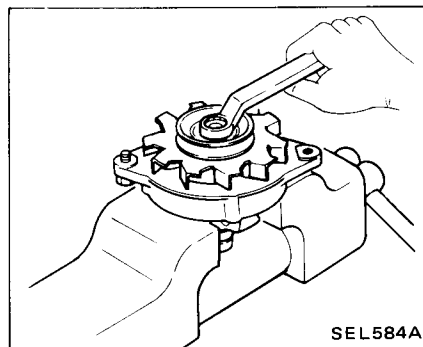


DISASSEMBLY

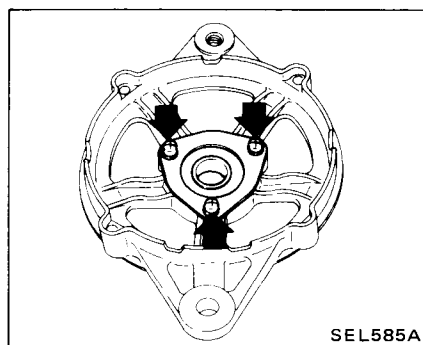
1. Remove through bolts.
2. Separate front cover from rear cover.



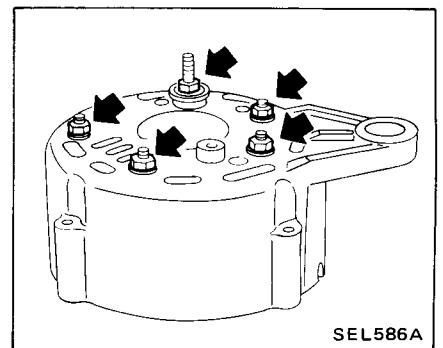
3. Remove pulley and fan.
 - (1) Place rear cover side of rotor in a vice.
 - (2) Remove pulley nut.



4. Remove setscrews from bearing retainer.



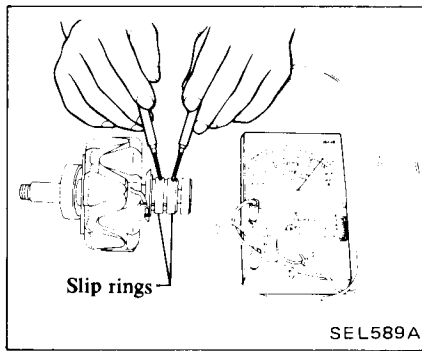
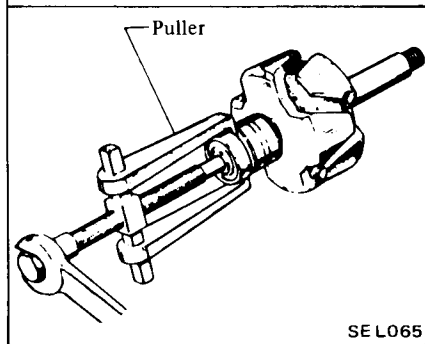
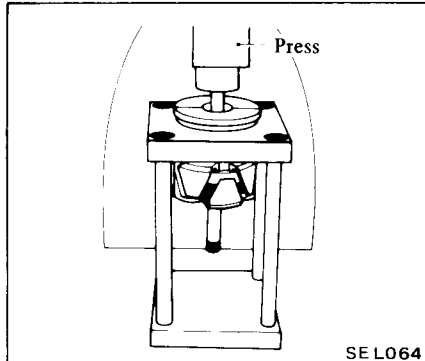
5. Remove attaching nuts and take out stator assembly.



Rotor

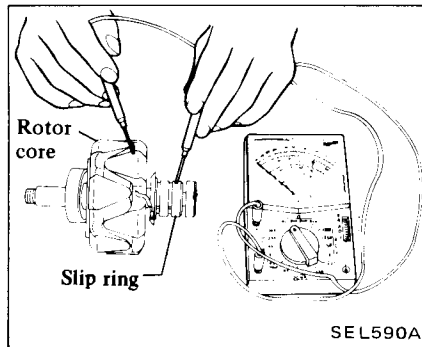
Pull rear bearing off from rotor assembly with a press or bearing puller.

Once removed, bearing cannot be reused. Replace with a new one.



- No continuity ... Replace rotor.

2. Insulation test



- Continuity exists ... Replace rotor.

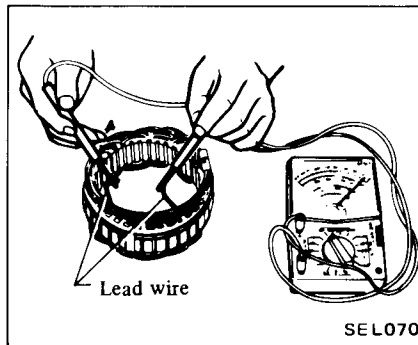
3. Check slip ring for wear.

Slip ring outer diameter
More than 30 mm (1.18 in)

If necessary, replace rotor assembly.

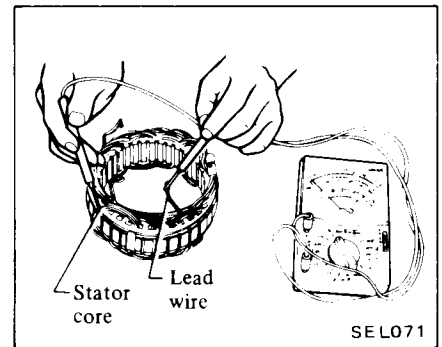
Stator

1. Continuity test



- No continuity ... Replace stator.

2. Insulation test



- Continuity exists ... Replace stator.

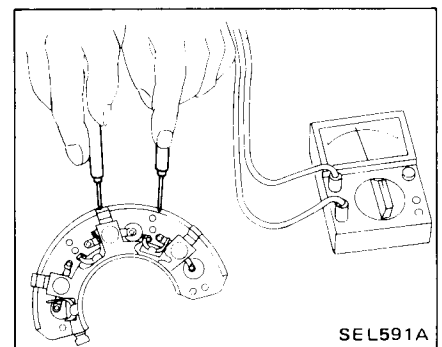
Diode

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 observed exactly opposite from the chart above.

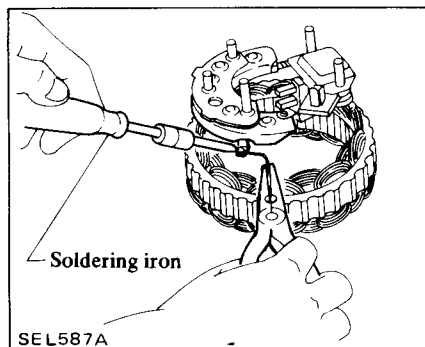
Positive diode



- Conduction test is N.G. ... Replace diode assembly.

Stator

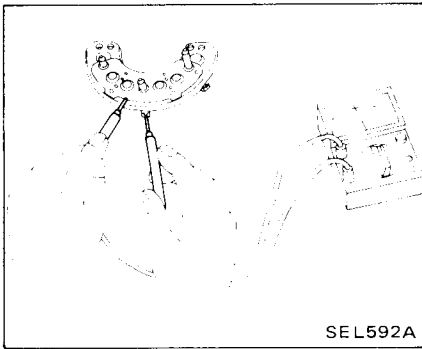
Disconnect stator coil lead wires from diode terminals.



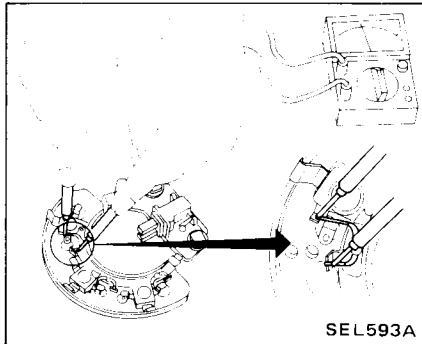
INSPECTION

Rotor

1. Continuity test.

Negative diode

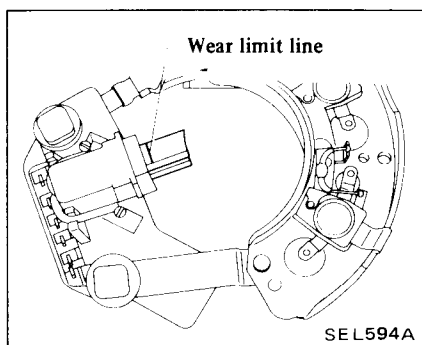
- Conduction test is N.G. ... Replace diode assembly.

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.

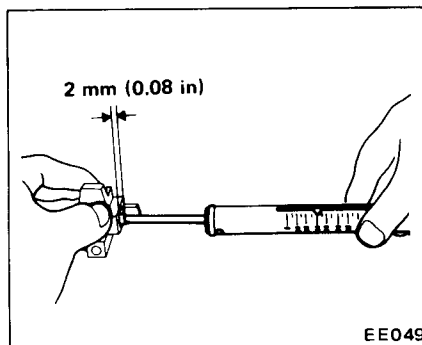


3. Check brush pig tail for damage.
 - Damaged ... Replace.
4. Check brush spring pressure.

Measure brush spring pressure with brush projected approximately 2 mm (0.08 in) from brush holder.

Spring pressure:
 2.501 - 3.383 N
 (255 - 345 g,
 8.99 - 12.17 oz)

When brush is worn, pressure decreases approximately 0.196 N (20 g, 0.71 oz) per 1 mm (0.04 in) wear.

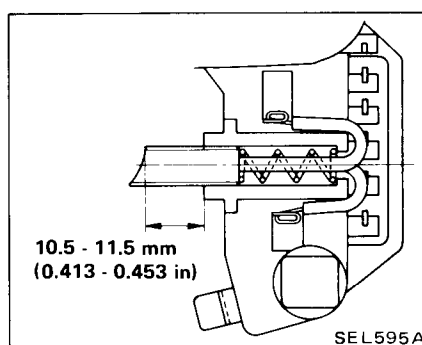


- Not in the specified value ... Replace brush assembly.

ASSEMBLY

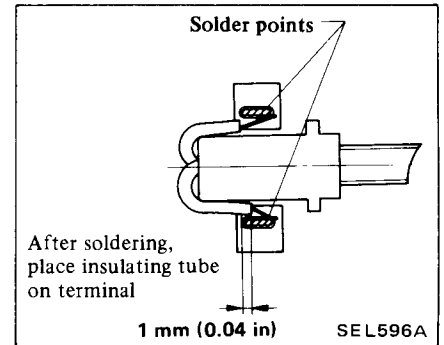
Assemble alternator in the reverse order of disassembly, noting the following:

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.

When soldering, be careful not to let solder adhere to insulating tube as it will weaken the tube and cause it to break.



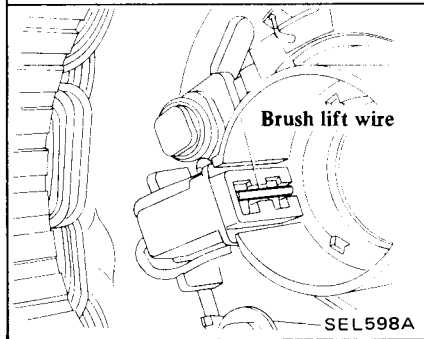
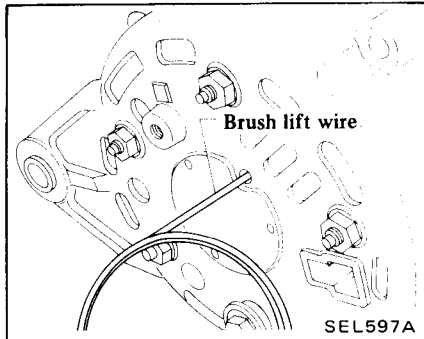
- Ⓣ : Brush holder
 3.1 - 3.9 N·m
 (0.32 - 0.40 kg·m,
 2.3 - 2.9 ft·lb)
- Diode and IC regulator
 3.1 - 3.9 N·m
 (0.32 - 0.40 kg·m,
 2.3 - 2.9 ft·lb)
- Bearing retainer
 3.1 - 3.9 N·m
 (0.32 - 0.40 kg·m,
 2.3 - 2.9 ft·lb)

3. Tighten pulley nut and make sure that deflection of V-groove is proper.

- Ⓣ : Pulley nut
 39 - 59 N·m
 (4.0 - 6.0 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 wire into brush lift hole from outside.



5. After installing front and rear sides of alternator, pull brush lift wire by pushing toward center.

Do not pull brush lift by pushing toward outside of cover as it will damage slip ring sliding surface.

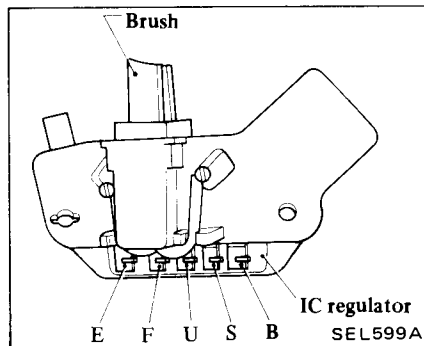
6. Tighten through bolts.

T : Through bolts
 3.1 - 3.9 N·m
 (0.32 - 0.40 kg·m,
 2.3 - 2.9 ft-lb)

IC VOLTAGE REGULATOR

DESCRIPTION

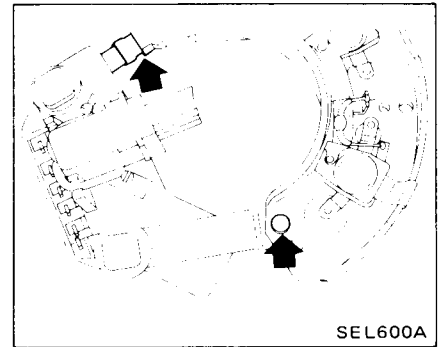
The regulator consists essentially of integrated circuits incorporating transistors. These transistors interrupt and admit current flow to the alternator rotor coil, thus maintaining its output voltage at a constant value. Unlike in a mechanical type regulator, an electronic relay employing transistors 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.



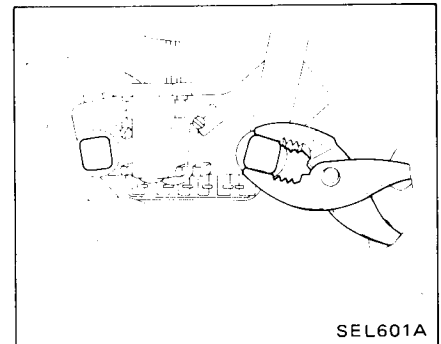
REPLACEMENT

Removal should be done only when IC regulator is being replaced.

1. Remove rivet and solder.

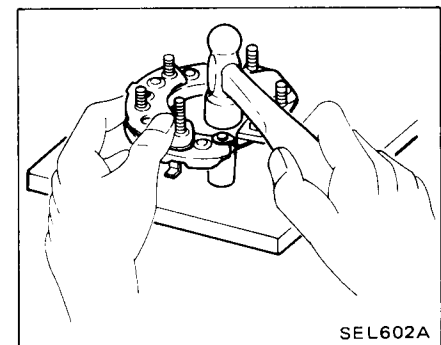


2. Remove the terminal's solder and take out bolts.



3. When installing the regulator, reverse order of removal, noting the 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**

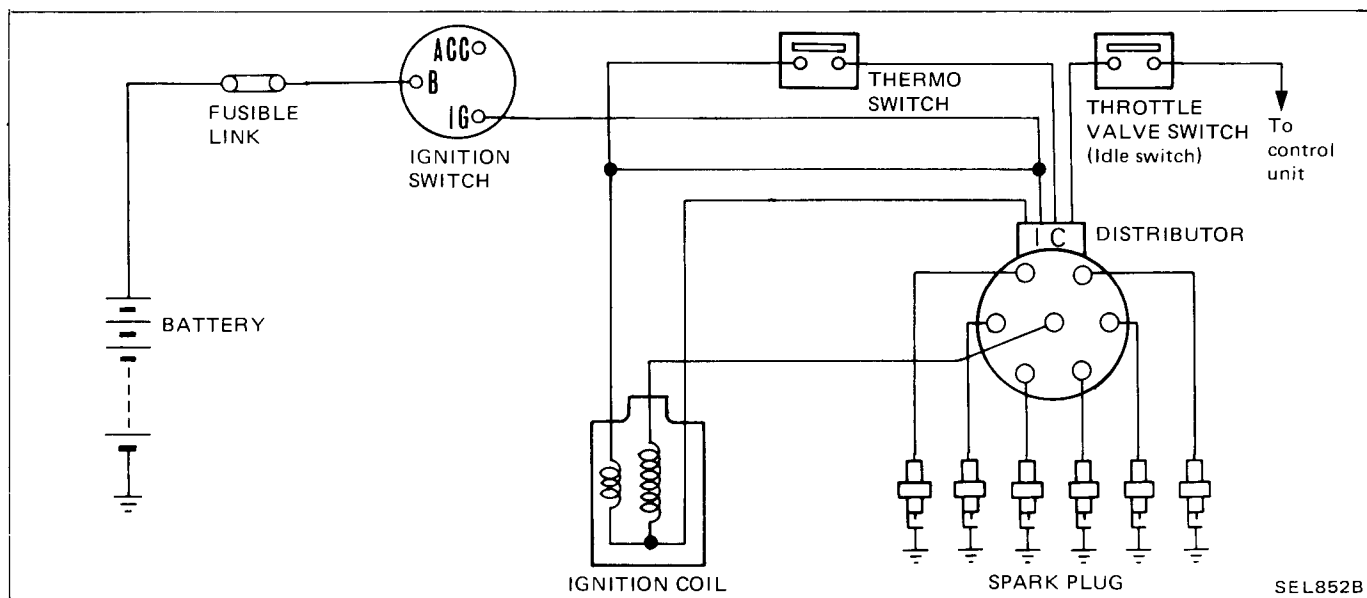
Type	LR160-82B	LR170-02B
Applied model	Not equipped with turbo-charger	Equipped with turbocharger
Nominal rating V-A	12 - 60	12 - 70
Ground polarity	Negative	
Minimum revolution under no-load (When 14 volts is applied) rpm	Less than 1,000	
Hot output current A/rpm	More than 50/2,500 More than 60/5,000	More than 50/2,500 More than 70/5,000
Pulley ratio	2.09	
Regulated output voltage V	14.4 - 15.0	
Wear limit length of brush mm (in)	More than 7 (0.28)	
Brush spring pressure N (g, oz)	2.501 - 3.383 (255 - 345, 8.99 - 12.17)	
Slip ring outer diameter mm (in)	More than 30 (1.18)	

IGNITION SYSTEM

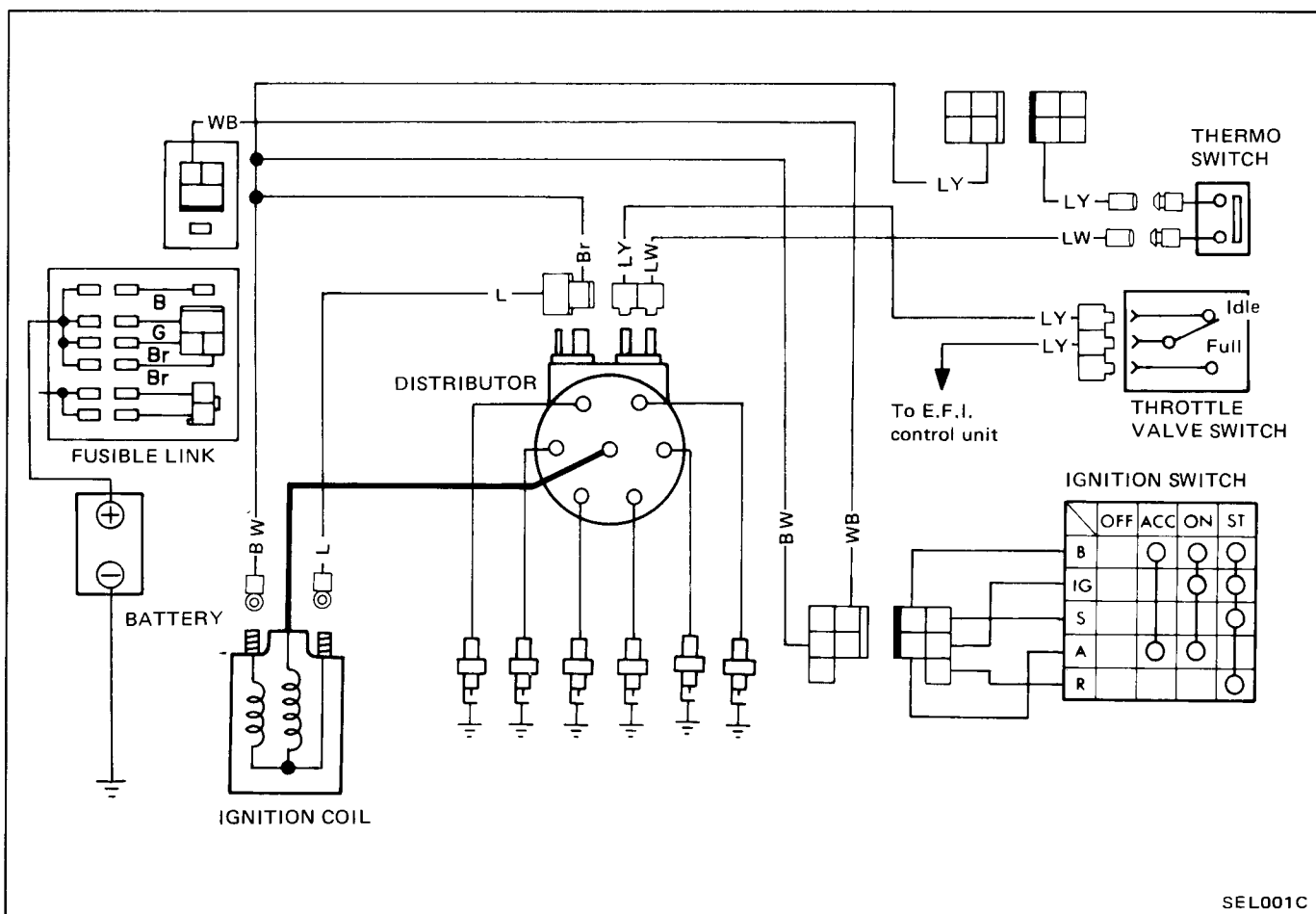
CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

MODELS NOT EQUIPPED WITH TURBOCHARGER

SCHEMATIC



WIRING DIAGRAM



CHECKING PROCEDURE**"No-start" condition****Sparking performance check**

1. Turn ignition switch to "OFF" position.
2. Disconnect EFI fusible link connector.

CAUTION:

Before disconnecting EFI fusible link connector, ensure that ignition switch is in "OFF" position.

3. Disconnect cold start valve harness connector.
4. Disconnect high tension cable from distributor.
5. Keeping high tension cable end 4 to 5 mm (0.16 to 0.20 in) away from engine block, rotate starter motor and check whether sparks occur across the clearance.

« JUDGMENT »

- Sparks occur.
IC ignition system O.K.

In this case, IC ignition system and component parts need not be checked beyond this.

- No spark occurs on sparks are intermittent

IC ignition system N.G.
Proceed with tests below.

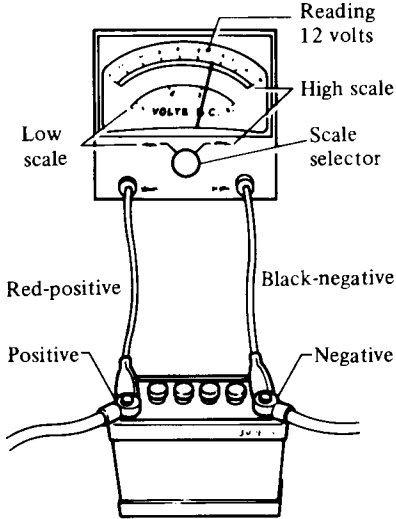
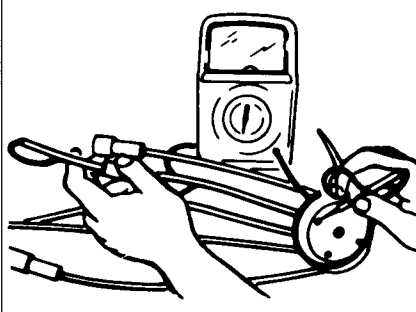
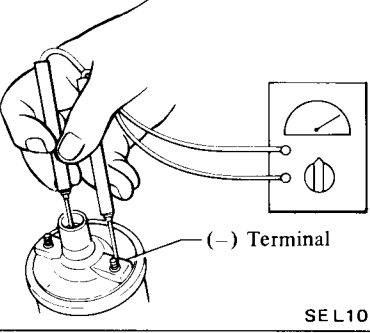
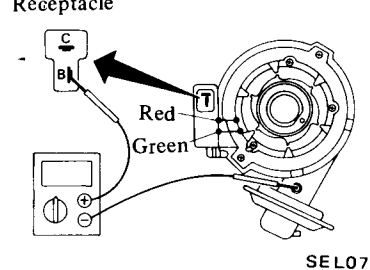
Manual testing of IC ignition system using a voltmeter

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

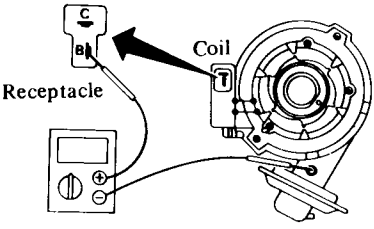
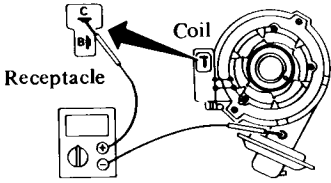
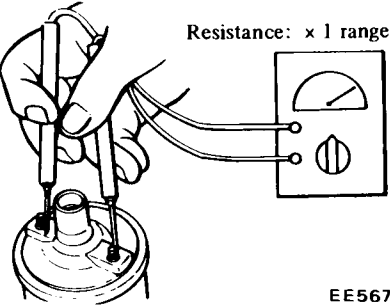
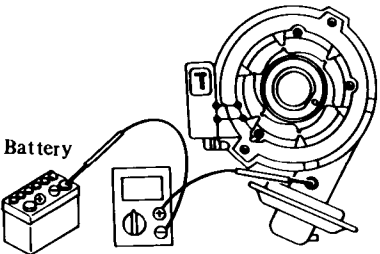
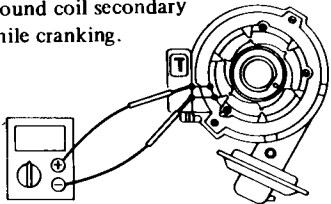
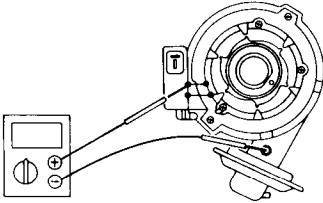


indicated. If a fault is found, correct the problem before continuing. If all tests indicate "OK" replace the IC Ignition Unit. DO NOT REPLACE THE UNIT UNTIL ALL TESTS HAVE BEEN COMPLETED AND INDICATE "OK".

1. When performing the following tests, use a multimeter 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.

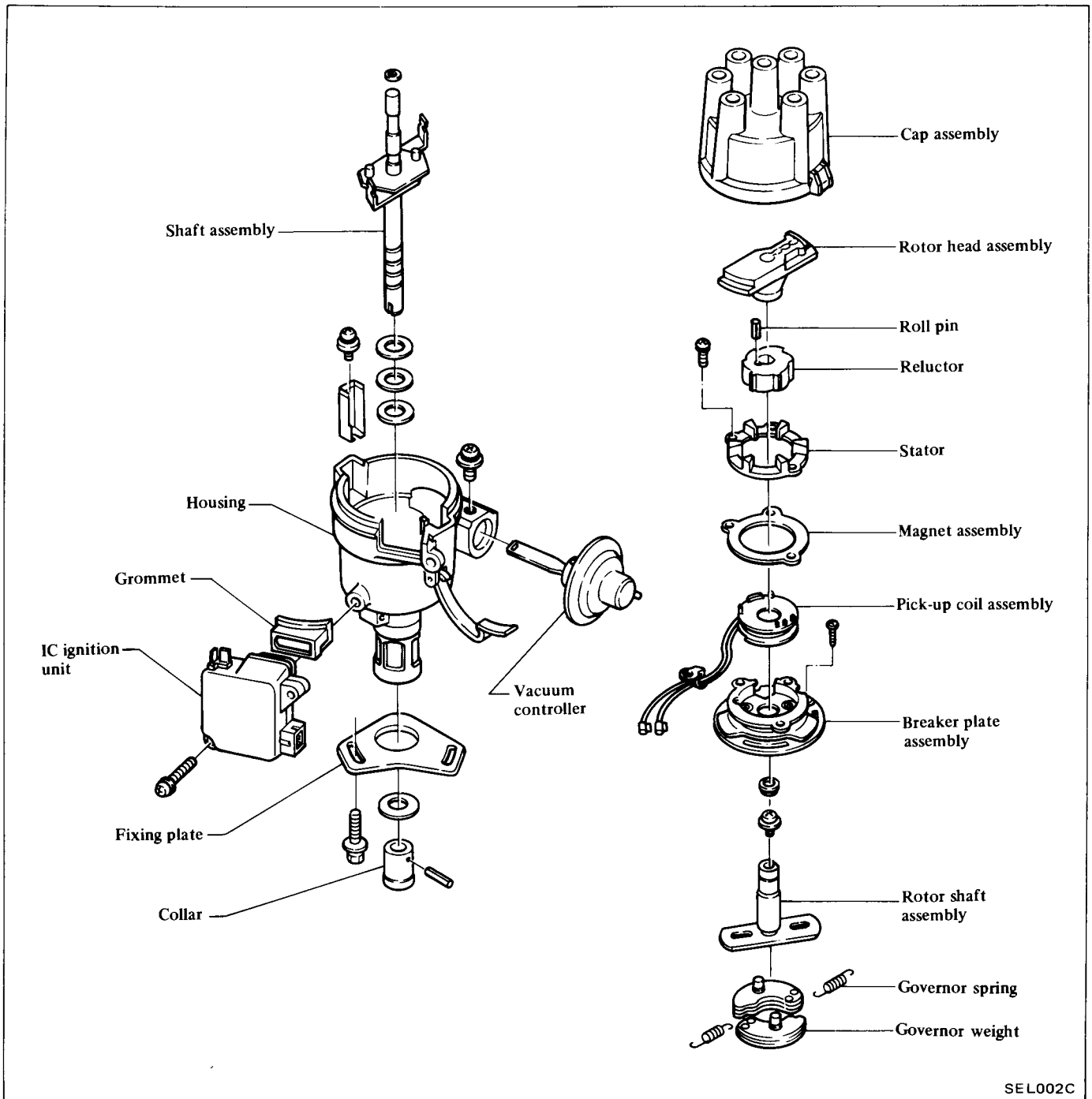
IC IGNITION SYSTEM TROUBLE-SHOOTING

TEST	TEST METHOD	CONDITIONS	RESULT	ACTION
1. Battery Voltage (no load)	 <p>SEL103</p>	1. Ignition key in "OFF" position.	* 11.5 - 12.5 volts	Proceed to Step 2.
2. Battery Cranking Voltage		2. Connect voltmeter as illustrated and set to appropriate scale. 3. Read and record battery voltage reading. Battery voltage	* Below 11.5 volts	Battery, charging system or starting system – Faulty. Refer to applicable sections in Service Manual to correct the situation.
3. Secondary Wiring	 <p>EF125</p>	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.
4. Ignition Coil Secondary Circuit		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.
5. Power Supply Circuit	 <p>SEL104</p>	1. Ignition key in "OFF" position.	* 8,200 - 12,400 ohms	Ignition coil secondary windings – O.K. Proceed to Step 5.
		2. Coil wire removed from coil. 3. Connect ohmmeter as illustrated.	* Resistance reading not between 8,200 - 12,400 ohms	Faulty ignition coil – replace
	 <p>SEL078</p>	1. Connect voltmeter as illustrated and set to appropriate scale.	* 11.5 - 12.5 volts	Proceed to Step 6.
		2. Turn ignition key to "ON" position.	* Below 11.5 volts	Check wiring from ignition switch to IC unit.

(Continued next page)

TEST	TEST METHOD	CONDITIONS	RESULT	ACTION
6. Power Supply Circuit (Cranking)	Ground coil output wire while performing test. 	<ol style="list-style-type: none"> 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. 	<p>* Voltage reading is less than 1 volt below battery cranking voltage and is greater than 8.6 volts.</p> <p>* Voltage reading is more than 1 volt below battery cranking voltage and/or is below 8.6 volts.</p>	<p>Proceed to Step 7.</p> <p>Check ignition switch and wiring from switch to IC unit.</p>
7. Ignition Primary Circuit		<ol style="list-style-type: none"> 1. Connect voltmeter as illustrated and set to appropriate scale. 2. Ignition key in "ON" position. 	<p>* 11.5 - 12.5 volts</p> <p>* Below 11.5 volts</p>	<p>Proceed to Step 9.</p> <p>Proceed to Step 8.</p>
8. Ignition Coil Primary Circuit		<ol style="list-style-type: none"> 1. Ignition key in "OFF" position. 2. Coil wire removed from coil. 3. Connect ohmmeter as illustrated. 	<p>* 0.84 - 1.02 ohms</p> <p>* Resistance reading not between 0.84 - 1.02 ohms.</p>	<p>Ignition coil primary winding O.K.</p> <p>Check ignition switch and wiring from ignition switch to coil and IC unit.</p> <p>Faulty ignition coil – replace.</p>
9. I.C. Unit Ground Circuit		<ol style="list-style-type: none"> 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. 	<p>* 0.5 volts or less</p> <p>* More than 0.5 volts</p>	<p>Proceed to Step 10.</p> <p>Check distributor ground, wiring from chassis ground to battery including battery cable connections.</p>
10. Pick-up Coil Resistance	Ground coil secondary while cranking. 	<ol style="list-style-type: none"> 1. Engine is at, or above, normal operating temperature. 2. Ignition key in "OFF" position. 3. Connect ohmmeter as illustrated and set to appropriate scale. 	<p>* Approximately 400 ohms</p> <p>* Ohmmeter reading substantially exceeds or falls below the 400 ohms specifications.</p>	<p>Proceed to Step 11.</p> <p>Check pick-up coil and wiring to it.</p>
11. Pick-up Coil Output	- Ground coil secondary while cranking. 	<ol style="list-style-type: none"> 1. Engine is at or above normal operating temperature. 2. Connect voltmeter and set to the low a.c. volt scale (0 - 5). 3. Turn key to "START" position and observe the needle movement while the engine is cranking. 	<p>* Needle Wavers </p> <p>* Needle steady </p>	<p>If "No Spark" condition still exists – replace IC ignition unit.</p> <p>Check physical condition of pick-up coil and reluctor.</p> <p>Check wiring and connections between pick-up coil and IC ignition unit.</p>

DISTRIBUTOR (IC type)



CHECKING AND ADJUSTMENT

Cap and rotor head

Check cap and rotor head for dust, carbon deposits and cracks.

Advance mechanisms

Specifications

Refer to S.D.S.

Vacuum advance mechanism mechanical parts

1. Check vacuum inlet for signs of leakages at its connection.
2. Check vacuum diaphragm for air leak.

If leak is found, replace vacuum controller assembly.

3. Inspect breaker plate for smooth moving.

If 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 as an assembly.

Centrifugal advance mechanical parts

When cause of engine malfunction is traced to centrifugal advance mechanical parts, use distributor tester to check its characteristics.

SEL002C

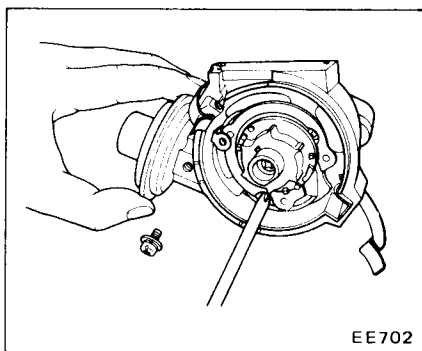
If nothing is wrong with its characteristics, conceivable causes are faulty or abnormal wear of driving part or others. So do not disassemble it.

In the event of improper characteristics, check closely rotor shaft assembly, governor weight and shaft.

If any of the above parts are malfunctioning, replace the parts.

DISASSEMBLY

1. Take off cap and rotor head.
2. Remove IC ignition unit.
3. Remove stator and magnet.
4. Remove vacuum controller.

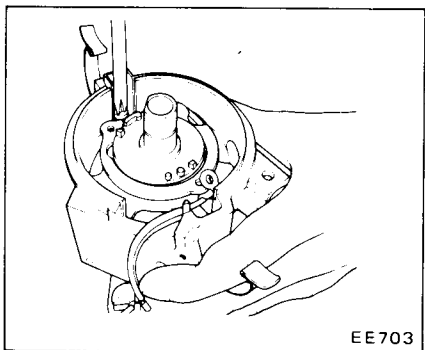


5. Using two pry bars or suitable puller, pry reluctor from shaft.

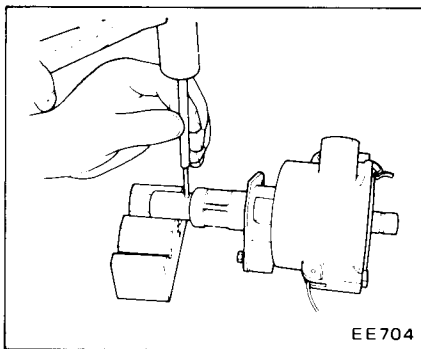
CAUTION:

When removing reluctor, be careful not to distort or damage the teeth.

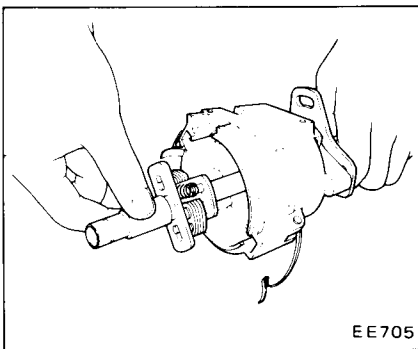
6. Remove roll pin.
7. Remove pick-up coil assembly.
8. Remove breaker plate assembly.



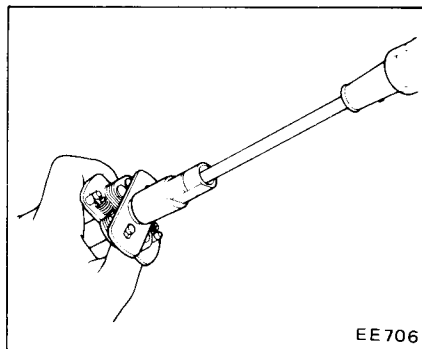
9. Punch knock pin out and remove pinion.



10. Remove rotor shaft and drive shaft assembly.



11. Mark rotor shaft and drive shaft. Remove packing from the top of rotor shaft and unscrew rotor shaft setscrew. Remove rotor shaft.



12. Mark one of the governor springs and its bracket. Also mark one of the governor weights and its pivot pins.

13. Carefully unhook and remove governor springs.

14. Remove governor weights. Apply grease to governor weights, after disassembling.

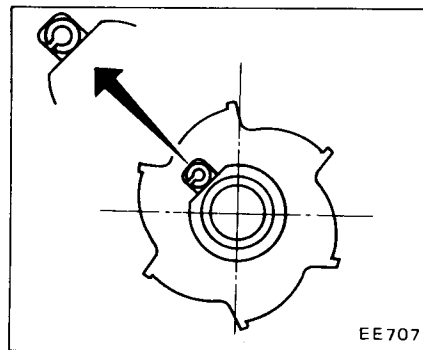
ASSEMBLY

To assemble, reverse the order of disassembly. Carefully observe the following instruction.

CAUTION:

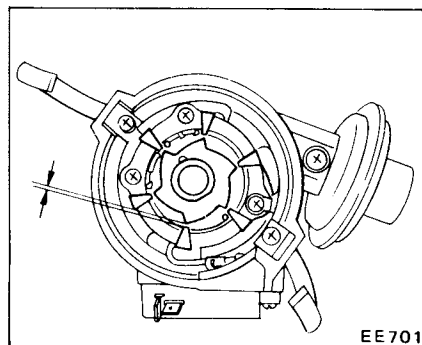
Before installing IC ignition unit, make sure mating surfaces of IC ignition unit and distributor are clean and free from dust, sand and moisture.

1. Align match marks so that parts are assembled to their original positions.
2. Ensure that reluctor is properly oriented when installing on shaft. Always drive in new roll pin as shown in Figure.

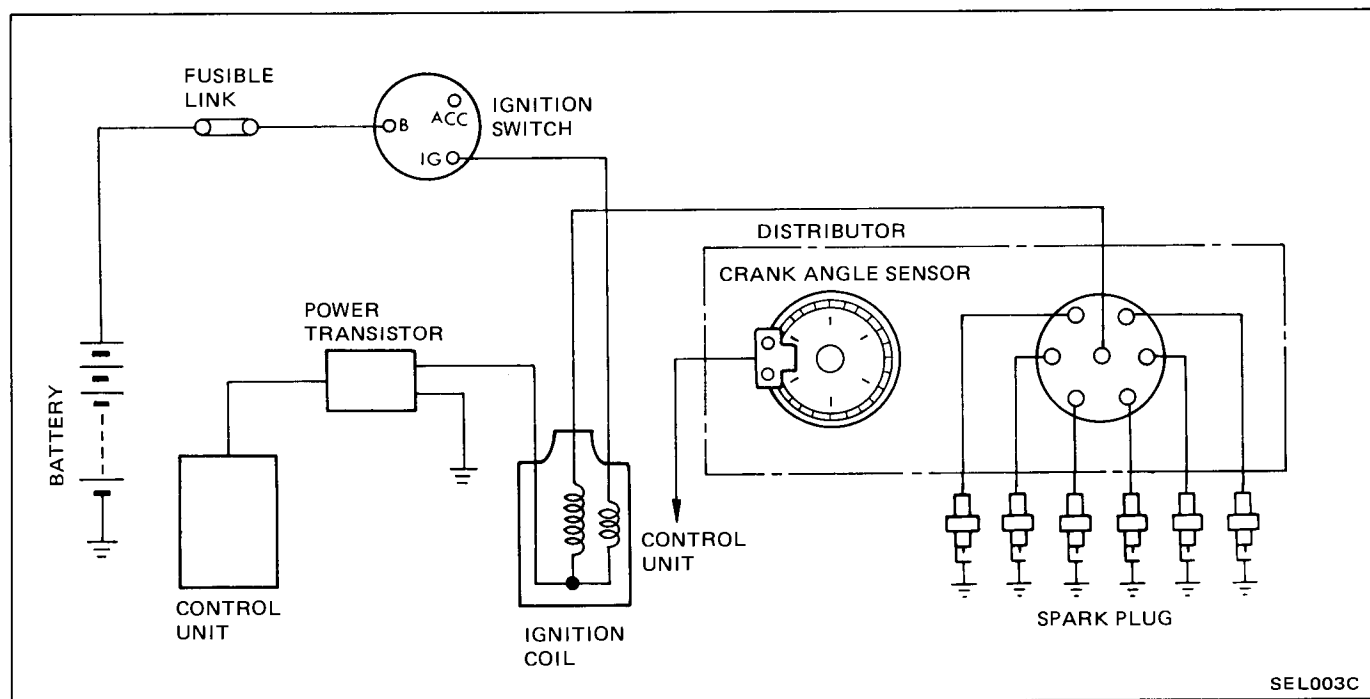


3. When installing pinion on shaft, be sure to install pinion gear correctly to position where it was installed.
4. Apply grease to the top of rotor shaft as required.
5. Check the operation of governor before installing distributor on engine.
6. properly center stator and reluctor before tightening.

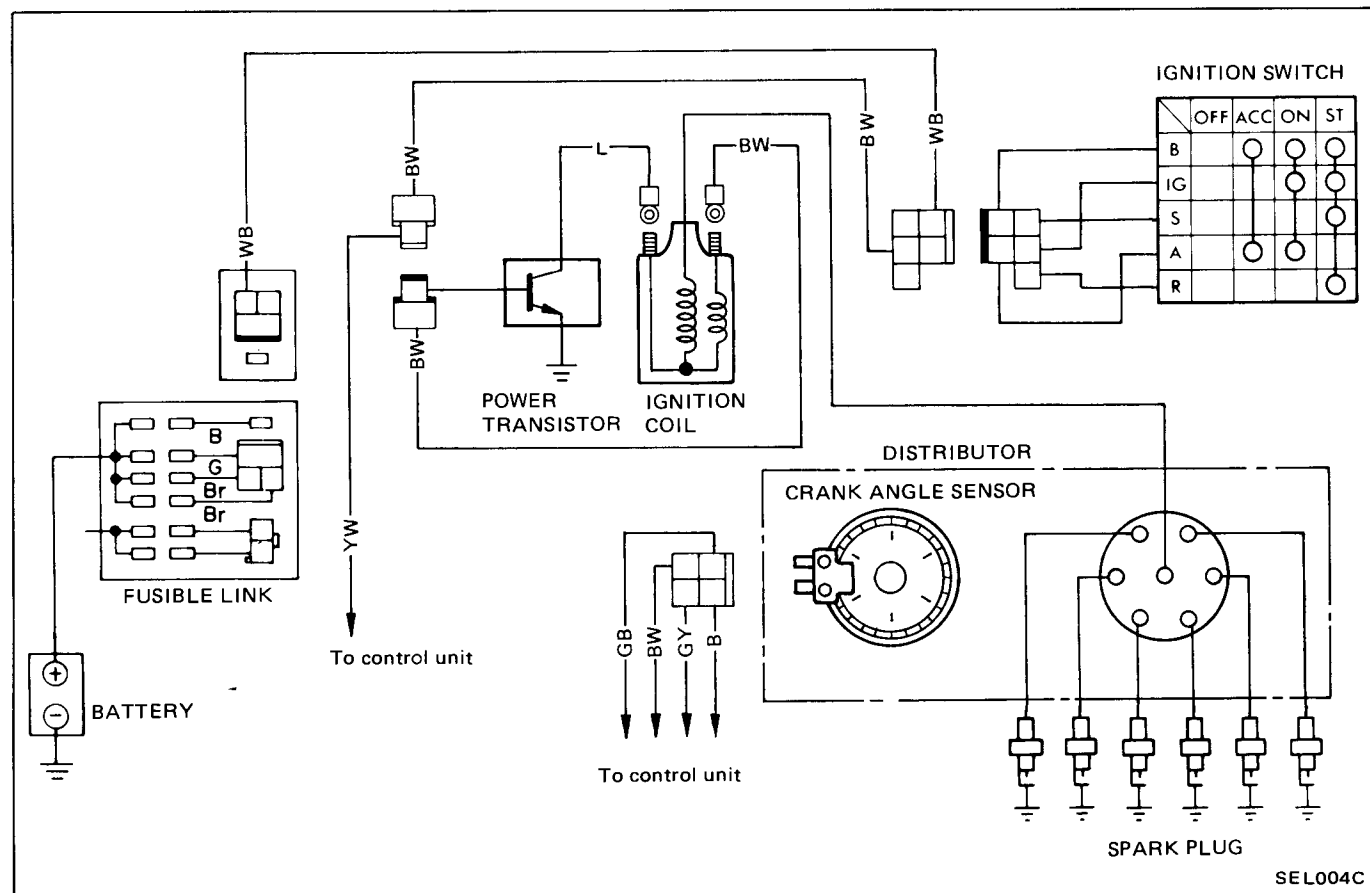
Standard air gap:
0.3 - 0.5 mm
(0.012 - 0.020 in)

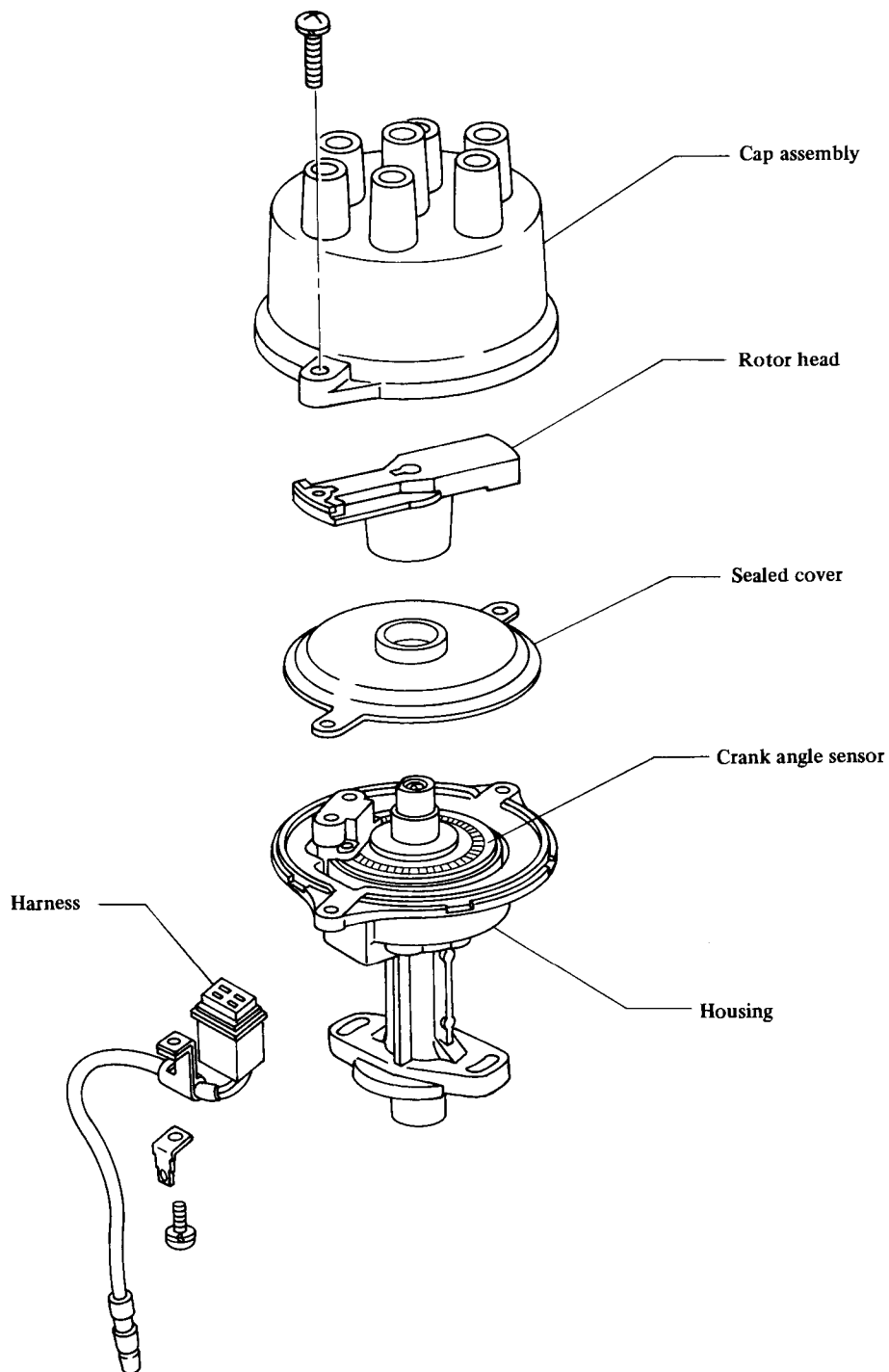


7. Adjust ignition timing after distributor is installed on engine.



WIRING DIAGRAM



DISTRIBUTOR

SEL005C

CHECKING**Cap and rotor head**

Check cap and rotor head for dust, carbon deposits and cracks.

DISASSEMBLY

Cap, sealed cover, rotor head, housing and harness can be disassembled (but not crank angle sensor).

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

DISTRIBUTOR

Type	D6K81-01	D6P81-02
Applied model	Without turbocharger	With turbocharger
Rotor head type	Without resistor	
Firing order	1 - 5 - 3 - 6 - 2 - 4	
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)	10 (0.39)	
Vacuum advance [Distributor degree/ distributor kPa (mmHg, inHg)]	0°/16.0 (120, 4.72) 5°/22.7 (170, 6.69) 5°/26.7 (200, 7.87) 15°/40.0 (300, 11.81)	—
Centrifugal advance [Distributor degree/ distributor rpm]	0°/500 8.5°/1,400	—

IGNITION COIL

Type	CIT-43	E12-45
Applied model	Without turbocharger	With turbocharger
Primary voltage V	12	12
Primary resistance [at 20°C (68°F)] Ω	0.84 - 1.02	0.63 - 0.77
Secondary resistance [at 20°C (68°F)] KΩ	8.2 - 12.4	7.0 - 8.6

SPARK PLUG

Destination		U.S.A.	Canada
Type	Standard	BP6ES-11, BPR6ES-11*	BPR6ES-11
	Hot	BP5ES-11* BPR5ES-11*	BPR5ES-11*
	Cold	BP7ES-11* BPR7ES-11*	BPR7ES-11*
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)	

* : Optional

ELECTRICAL UNIT OF LIGHTING SYSTEM

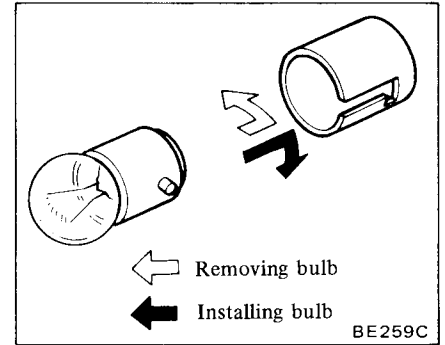
CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

BULBS

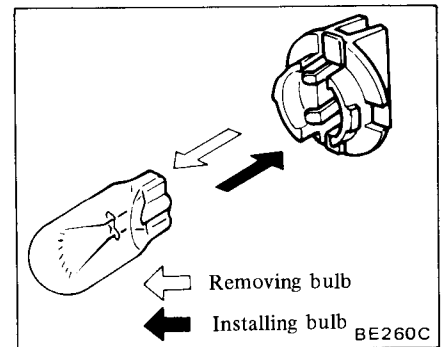
SPECIFICATIONS

Item	Wattage (W)	SAE trade number
Halogen head lamp	60/50	—
Front combination lamp		
Turn signal/Clearance	27/8	1157
Side marker lamp		
Front	3.4	158
Rear	3.4	158
Rear combination lamp		
Stop/Tail	27/8	1157
Turn	27	1156
Back-up	27	1156
License plate lamp	7.5	89
Interior lamp	10	—
Spot lamp	8	—
Door edge lamp	3	—
Step lamp	3.4	158
Luggage compartment lamp	5	—
Inspection lamp	8	—
Combination meter		
Illumination lamp	3.4	158
Warning lamp	3.4	158
Combination gauge		
Illumination lamp	2.7	161
Warning lamp	3.4	158
Ignition switch illumination lamp	1.4	—
Instrument console illumination lamp	1.4	—
Cigarette lighter illumination lamp	1.7	—
Heater (Air-con) control panel illumination lamp	1.7	—
Radio illumination lamp	2.5	—
Glove box lamp	3.4	—
Vanity mirror lamp	5	—
Cruise control switch lamp	1.4	—
Selector lever illumination lamp (A/T models)	2.7	161
Rear defroster indicator lamp	1.4	—

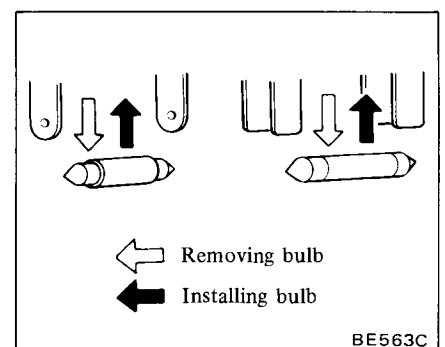
c. To replace bulb, push in on bulb, turn it counterclockwise and remove it from socket. Install new bulb in the reverse order of removal.



d. To replace wedge base type bulb, pull out bulb from socket. To install new bulb, push bulb into socket.



e. To replace bulb, pull out bulb from socket. To install new bulb, push bulb into socket.



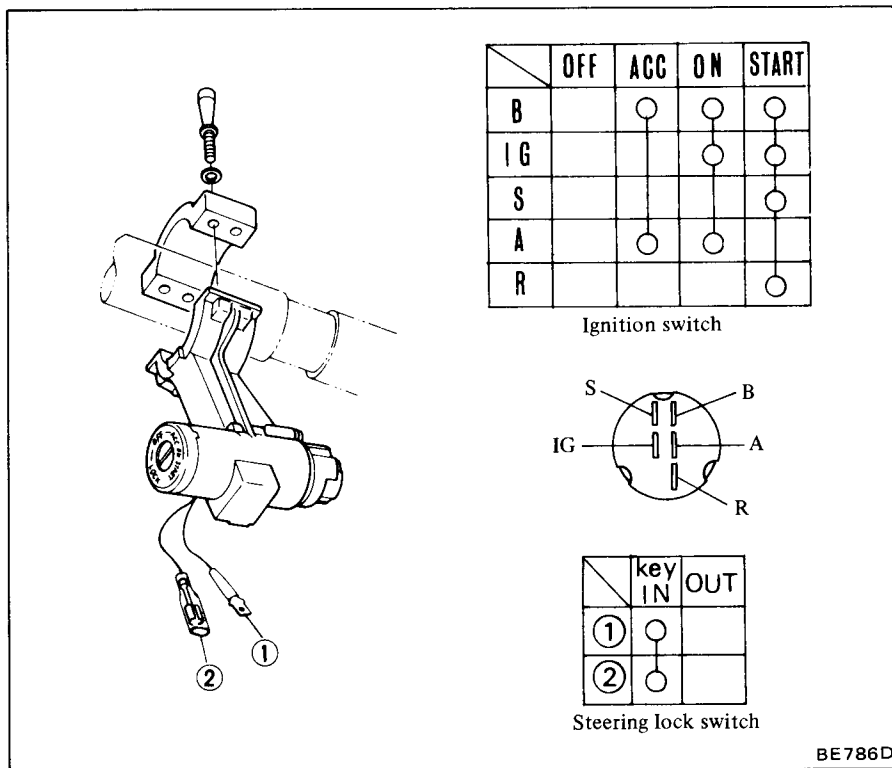
REMOVAL AND INSTALLATION

a. Before starting to work, be sure to turn ignition switch "OFF" and

then disconnect battery ground cable.

b. Installation is in the reverse order of removal.

IGNITION SWITCH



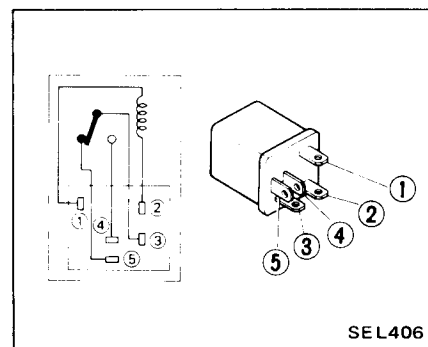
IGNITION RELAY AND ACCESSORY RELAY

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.

2. Remove instrument lower cover on the right side.
3. Remove glove box.
4. Remove connector bracket.
5. Disconnect harness connector.
6. Pull out relay from bracket.
7. Install relay in the reverse order of removal.

INSPECTION



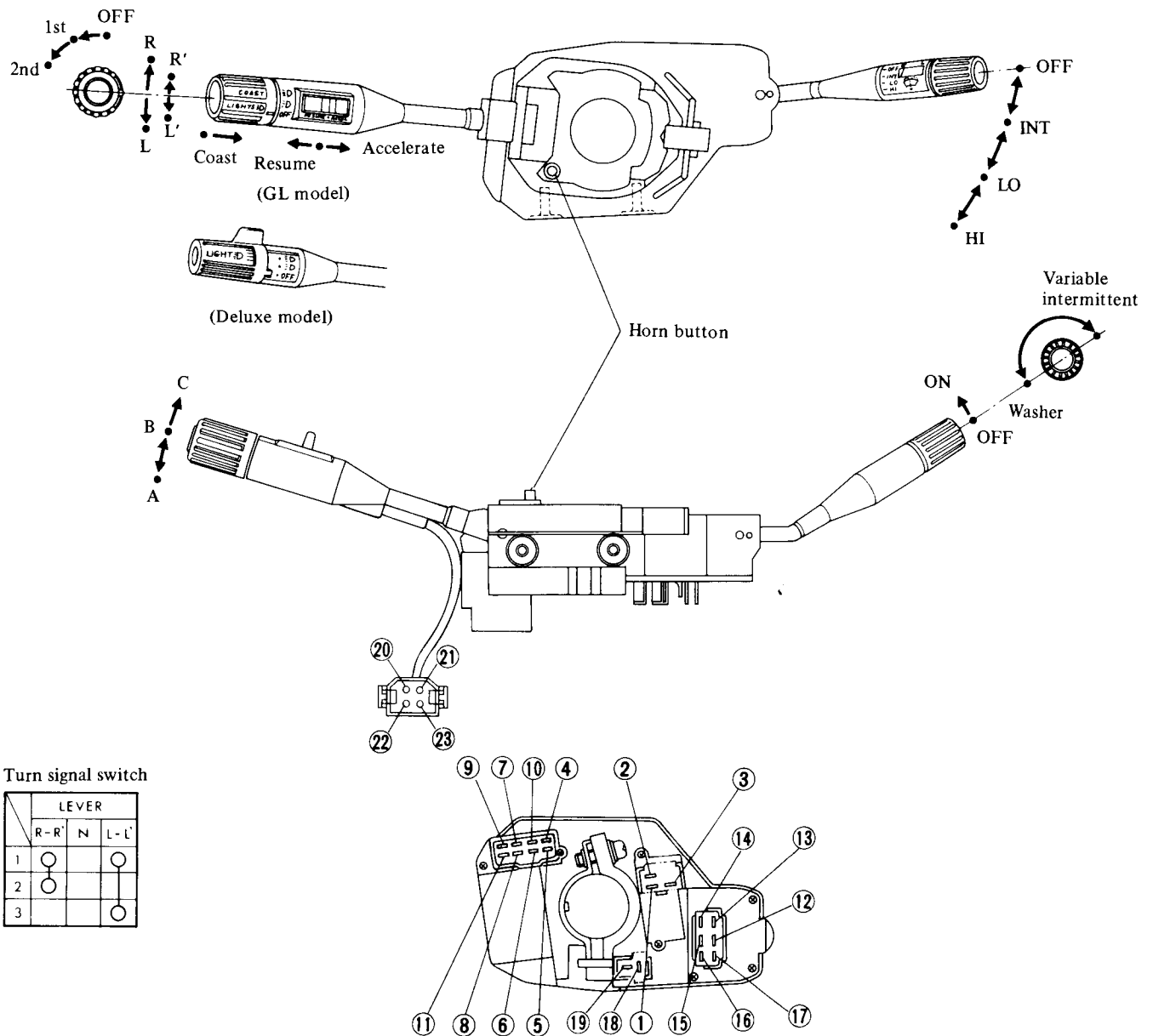
COMBINATION SWITCH

REMOVAL AND INSTALLATION

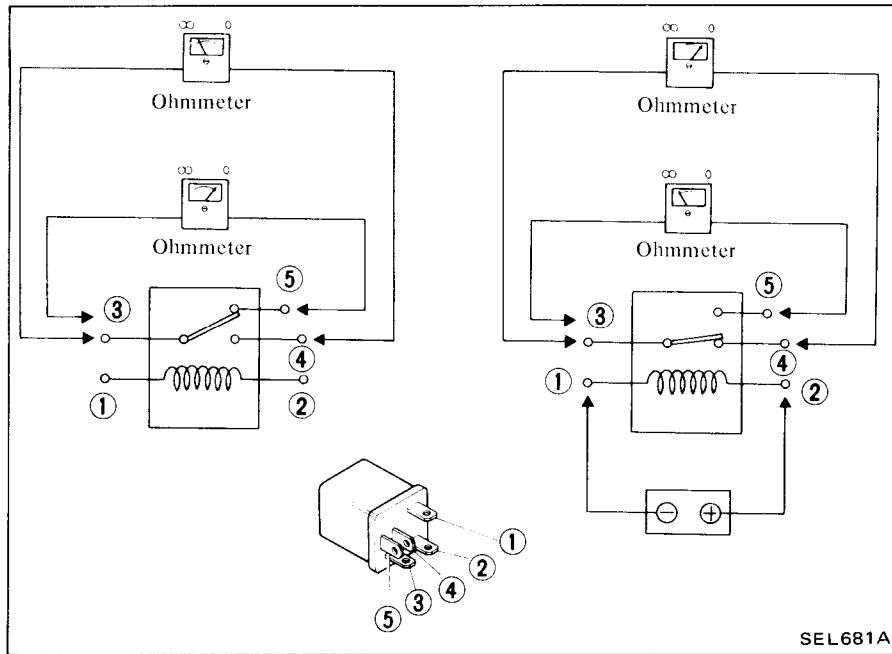
1. Disconnect battery ground cable.
2. Remove horn pad.
3. Remove steering wheel.
4. Remove steering column cover.
5. Disconnect combination switch wires at connector.
6. Loosen retaining screw and remove combination switch assembly.
7. Install combination switch in the reverse order of removal.

INSPECTION

Test continuity through switch with a test lamp or ohmmeter.



LIGHTING RELAY INSPECTION



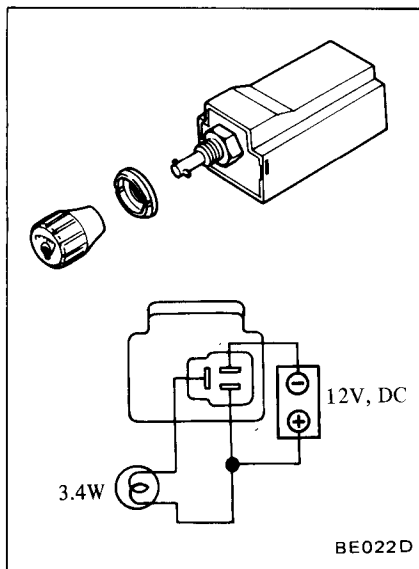
Before making headlamp aiming adjustment, observe the following instructions.

- Keep all tires inflated to correct pressures.
- Place car and tester on one and same flat surface.
- 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.

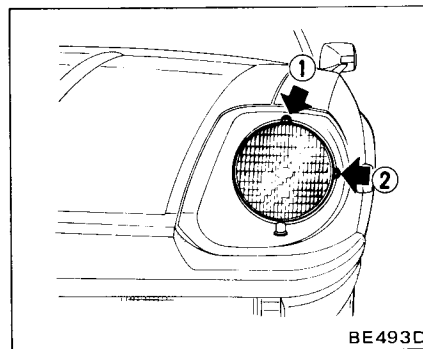
If any aimer is not available, aiming adjustment can be done as follows: Turn headlamp low beam on.

ILLUMINATION CONTROL RHEOSTAT INSPECTION

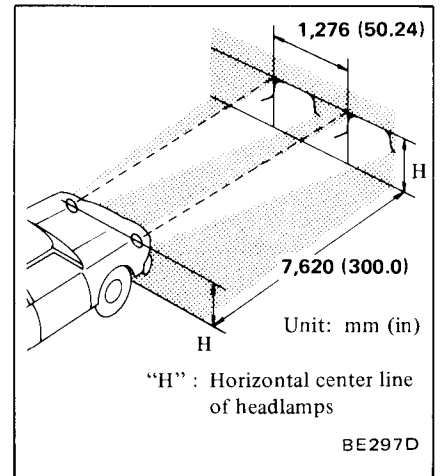


AIMING ADJUSTMENT

To adjust vertical aim, use adjusting screw on upper side of headlamp; and to adjust horizontal aim, use adjusting screw on side of headlamp.



- Vertical adjustment
- Horizontal adjustment



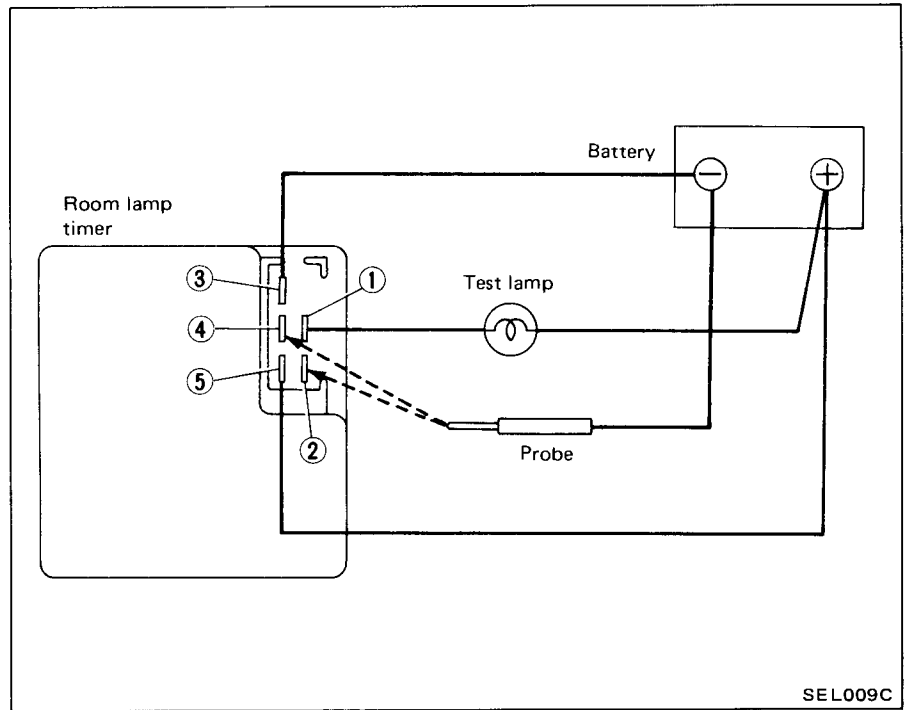
- Adjust headlamps so that upper edge of hot spot is equal in height to headlamp height and left edge of hot spot is equal in height to each center line of headlamps.
- Dotted lines in illustration show center of headlamp.

ROOM LAMP TIMER

Room lamp timer is located inside of left dash side finisher. Refer to page EL-124.

INSPECTION

1. Connect test lamp and test lead as shown in figure on the right.
2. Contact probe to terminal ② for 2 to 3 seconds.
3. When probe is released, test lamp comes on and diminishes in two seconds and goes out in approximately eight seconds.
4. Contact probe to terminal ④ for 2 to 3 seconds.
5. When probe is contacted, test lamp comes on. When probe is released, test lamp diminishes in two seconds and goes out in approximately eight seconds.



ELECTRICAL UNIT OF SIGNAL SYSTEM

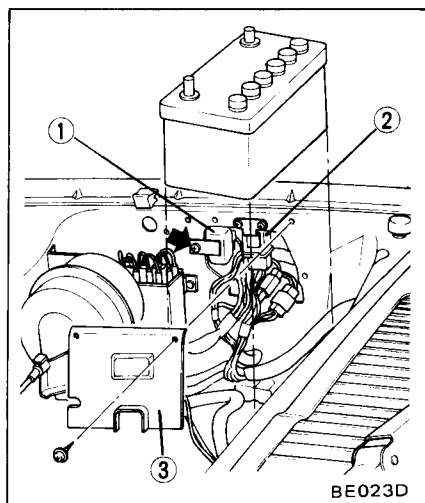
CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

TURN SIGNAL SWITCH

Refer to Combination Switch.

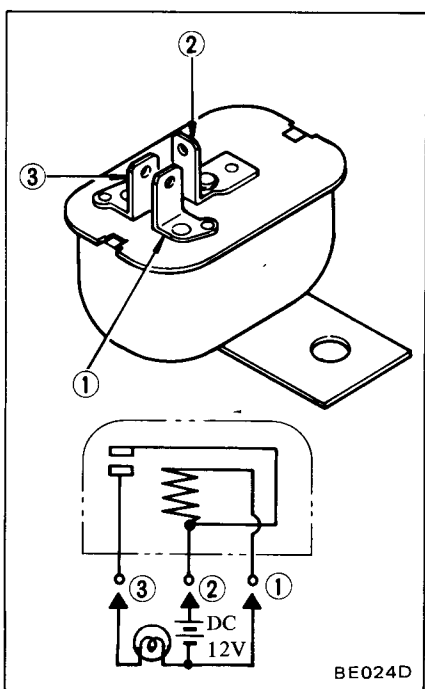
HORN RELAY

REMOVAL AND INSTALLATION



- 1 Horn relay
- 2 E.F.I. relay
- 3 Relay cover

INSPECTION

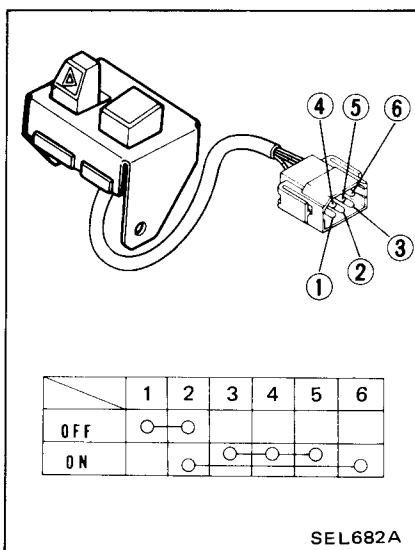


HAZARD SWITCH

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove instrument lower cover on the left side.
3. Remove upper steering column cover.
4. Disconnect harness connector, and then remove retaining screw.
5. Install hazard switch in the reverse order of removal.

INSPECTION

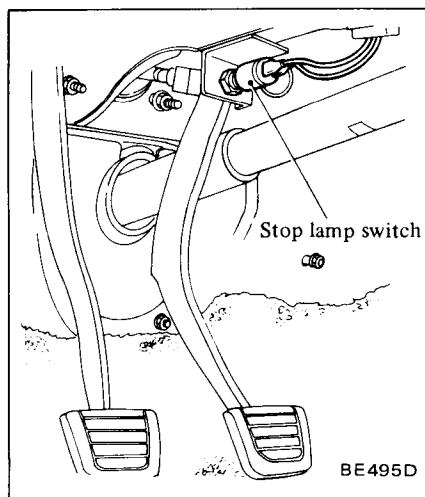


STOP LAMP SWITCH

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove instrument lower cover and assist floor nozzle.

3. Disconnect lead wires at connectors.
4. Loosen lock nut. Switch assembly can then be taken out by rotating switch.
5. Install in the reverse order of removal.



INSPECTION

Test continuity through stop lamp switch with a test lamp or ohmmeter. When plunger is pressed into switch assembly, stop lamp switch contacts are open. Contacts are closed when plunger is projected.

BACK-UP LAMP SWITCH

Back-up lamp switch is installed on transmission.

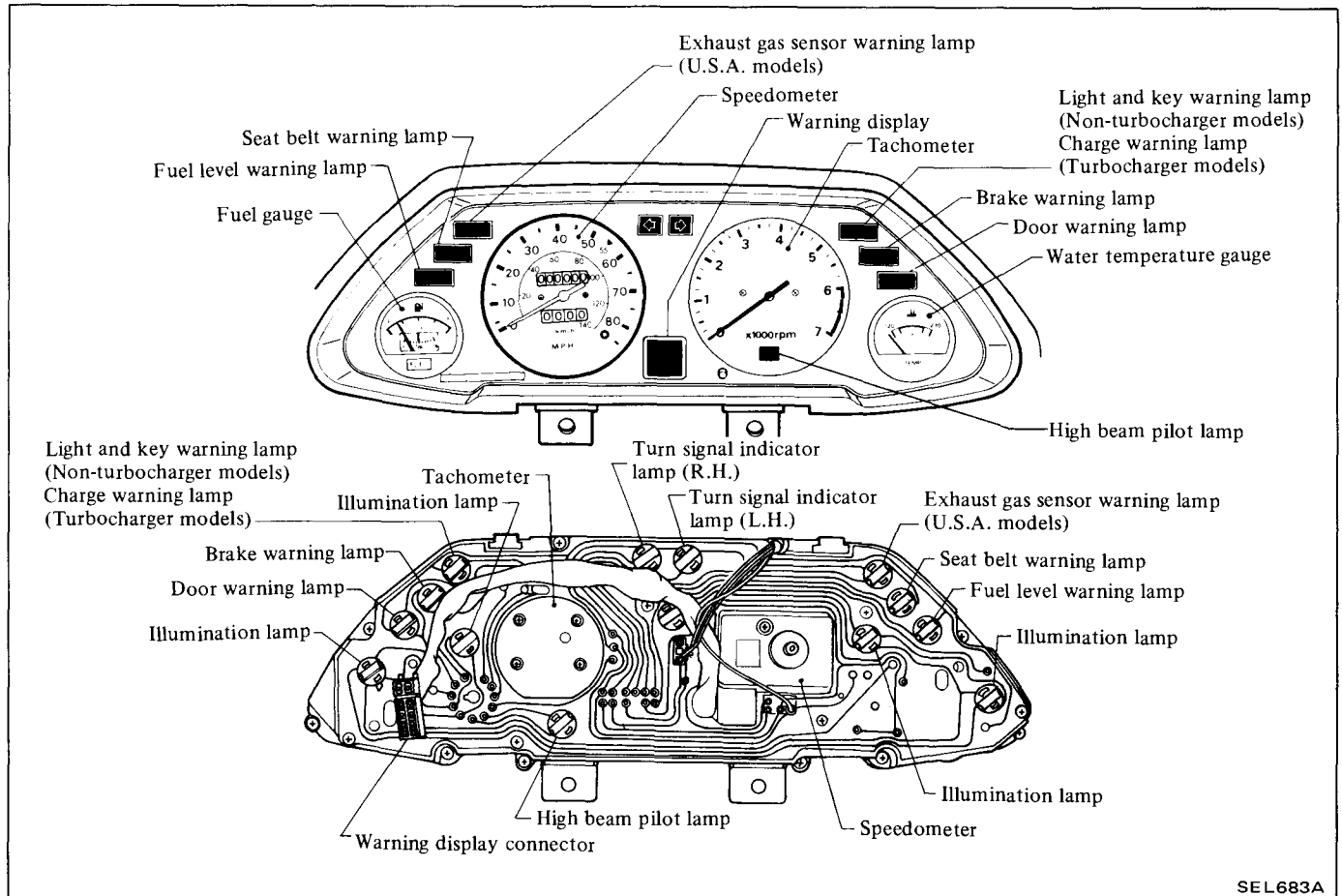
INSPECTION

When transmission lever is in "R" position, there should be continuity between two terminals.

METERS AND GAUGES

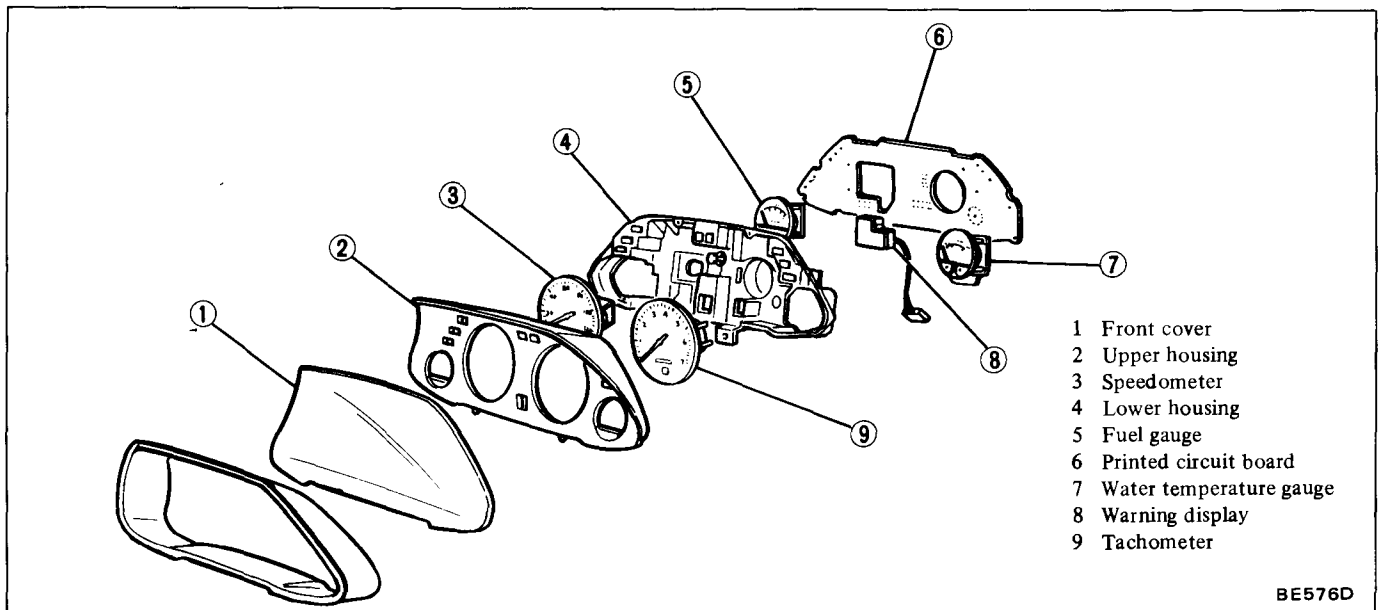
CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

COMBINATION METER



SEL683A

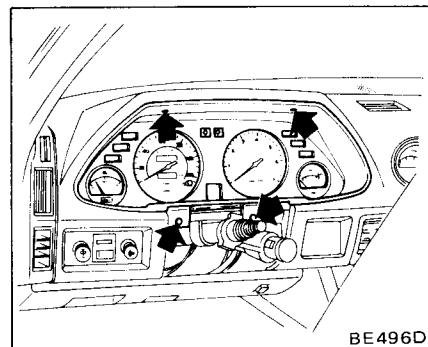
DISASSEMBLY AND ASSEMBLY

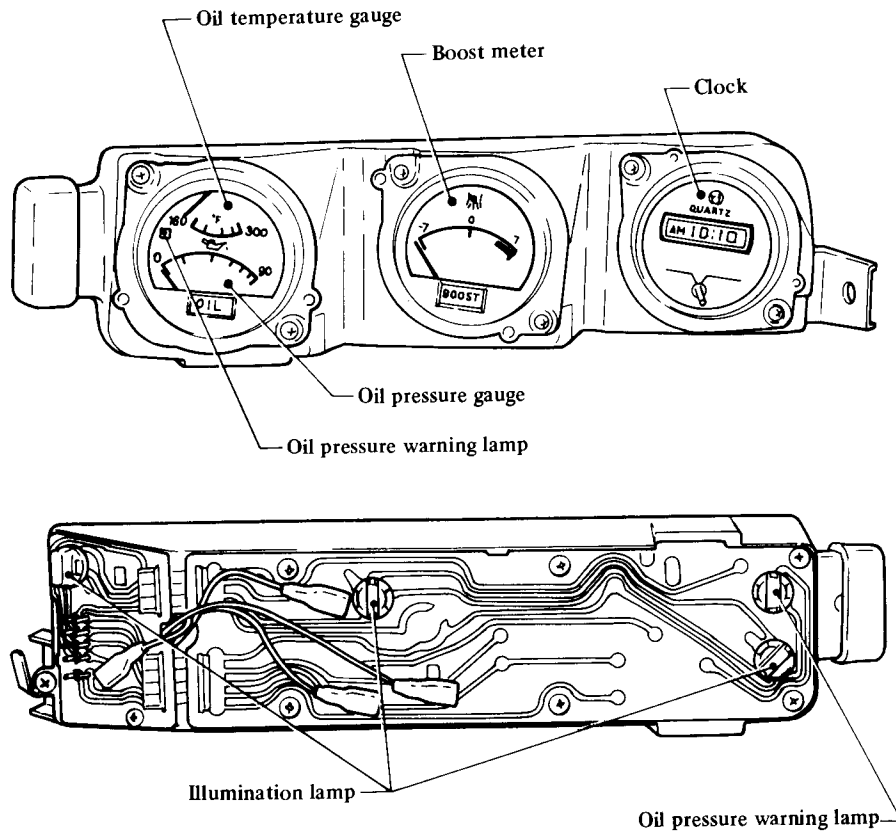


BE576D

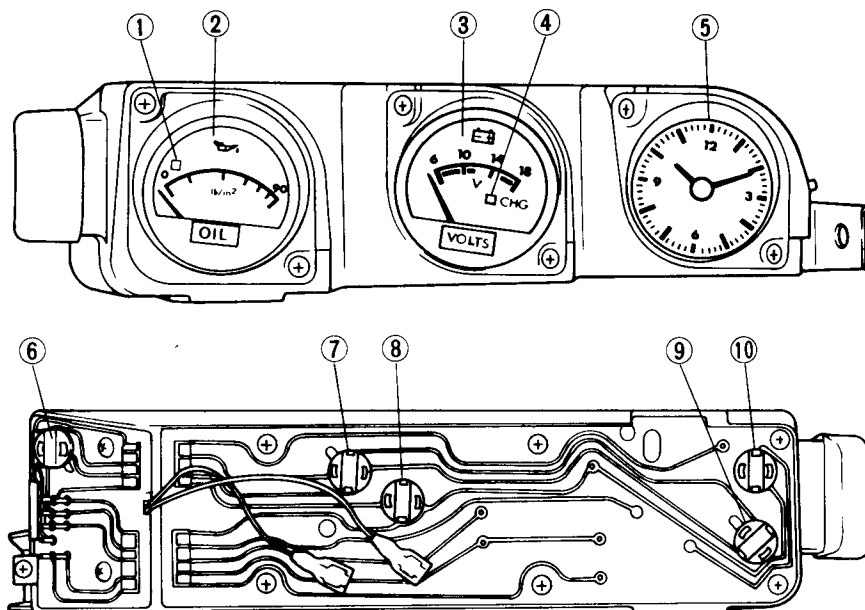
REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove steering wheel.
3. Remove steering column cover.
4. Remove instrument lower cover on left side.
5. Disconnect speedometer cable at intermediate connection.
6. Remove combination switch.
7. Remove combination retaining screws.
8. Carefully pull out combination meter and disconnect connector whose leads are connected to combination meter.
9. Install combination meter in the reverse order of removal.



COMBINATION GAUGE**Turbocharger models**

SEL268B

Non-turbocharger models

SEL540

DISASSEMBLY AND ASSEMBLY

Turbocharger models

Printed circuit board

Oil pressure and temperature gauge

Boost meter

Clock

SEL269B

Non-turbocharger models

1 Oil pressure gauge

2 Printed circuit board

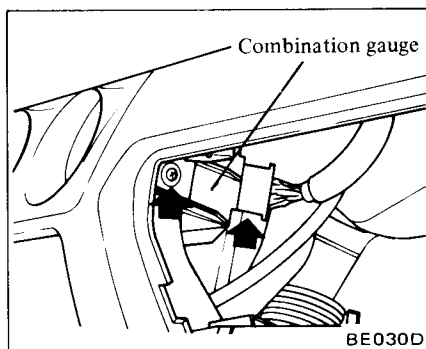
3 Voltmeter

4 Clock

BE031D

**REMOVAL AND
INSTALLATION**

1. Disconnect battery ground cable.
2. Remove glove box. Refer to Glove Box (Section BF) for removal.
3. Disconnect instrument harness connector and remove screw retaining combination gauge.



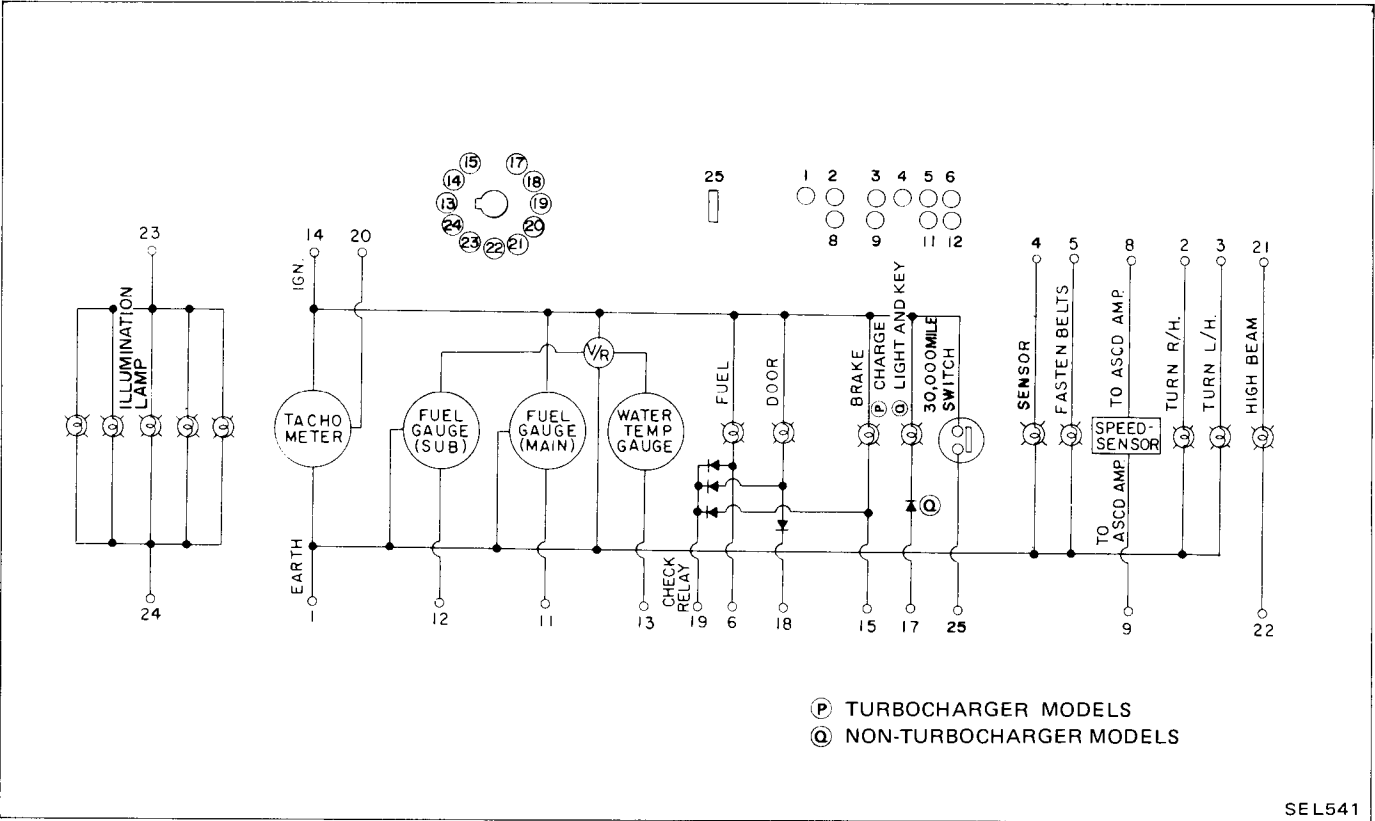
4. Pull out on combination gauge toward glove box while pushing out toward front of car.
5. Install combination gauge in the reverse order of removal.

CAUTION:

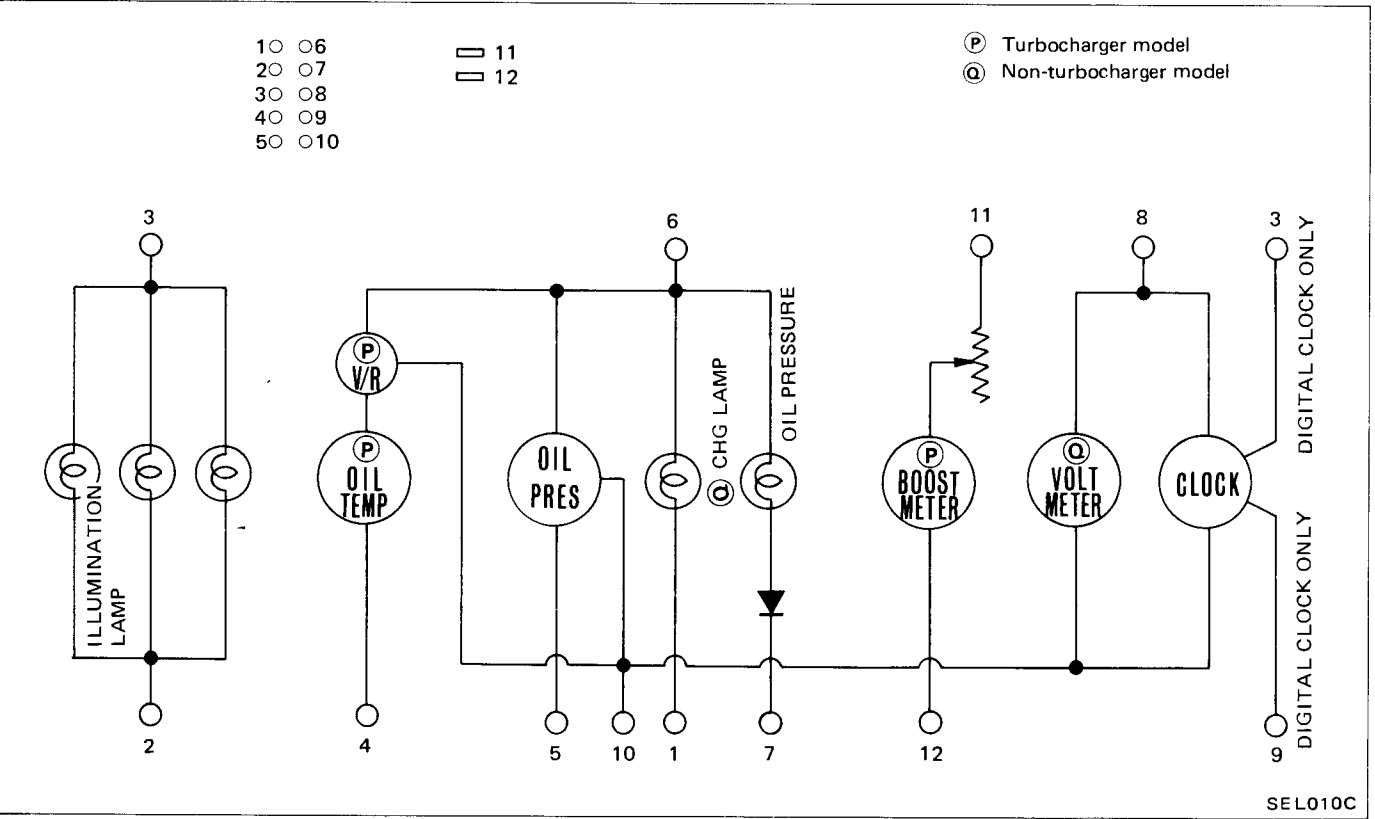
- a. Exercise care so as not to damage printed circuit.
- b. Be careful not to break clock knob.

SCHEMATIC

COMBINATION METER



COMBINATION GAUGE



WARNING SYSTEM

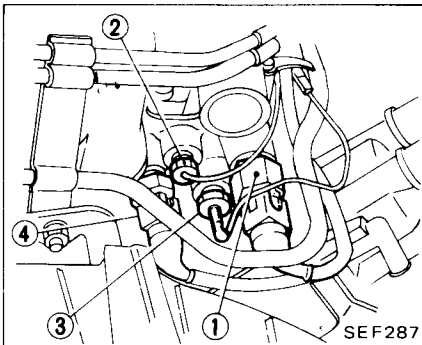
CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

WATER TEMPERATURE INDICATOR SYSTEM

REPLACEMENT

Gauge

Refer to Combination Gauge.



- 1 Thermotime switch
- 2 Water temperature sensing switch
- 3 Thermal transmitter
- 4 Water temperature sensor

Thermal transmitter

1. Disconnect lead wire from terminal.
2. Remove thermal transmitter by loosening it counterclockwise.
3. Install new thermal transmitter in the reverse order of removal.

Be sure to apply conductive sealer to threads prior to installing new thermal transmitter.

FUEL LEVEL WARNING SYSTEM

Fuel tank gauge unit

Fuel tank gauge unit is located on fuel tank. Refer to Fuel Tank Gauge Unit (Section FE) for removal and installation.

BRAKE WARNING SYSTEM

DESCRIPTION

The brake warning system consists of a warning light, parking brake switch and brake fluid level warning switch.

The warning light is used for both hand brake and brake fluid level switches.

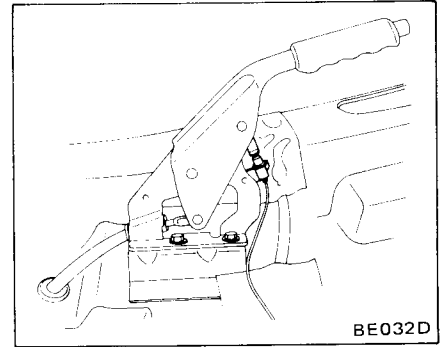
REPLACEMENT

Parking brake switch

The parking brake switch is mounted on lever support bracket.

To replace parking brake switch, disconnect lead wire at connector plug and pull switch assembly out of bracket.

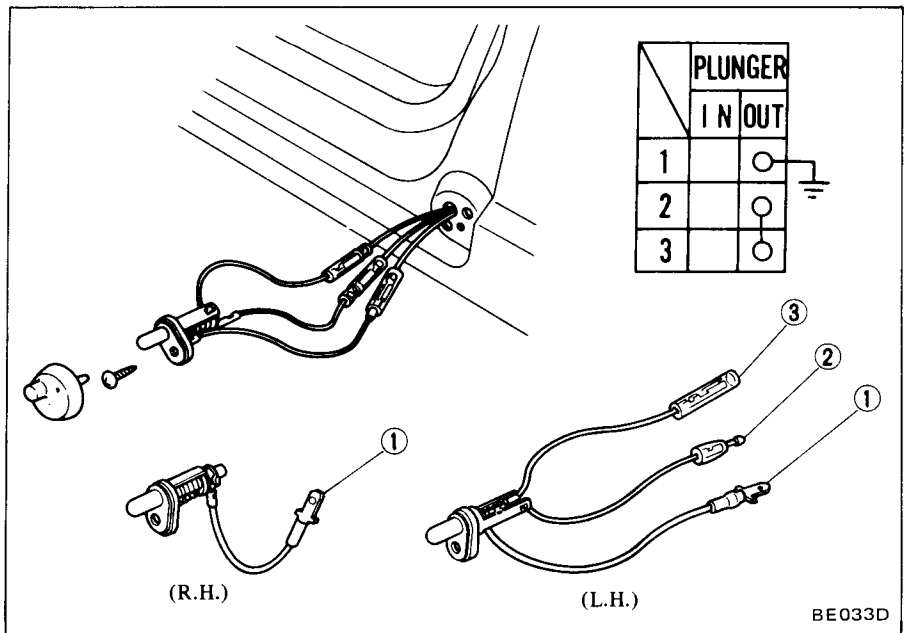
When plunger is pressed into switch assembly, parking brake switch contacts are open. Contacts are closed when plunger is projected.



Brake fluid level switch

Brake fluid level switch is built into brake master cylinder cap. The cap can be easily removed by twisting it after disconnecting lead wire terminals. Then replace cap.

DOOR SWITCH



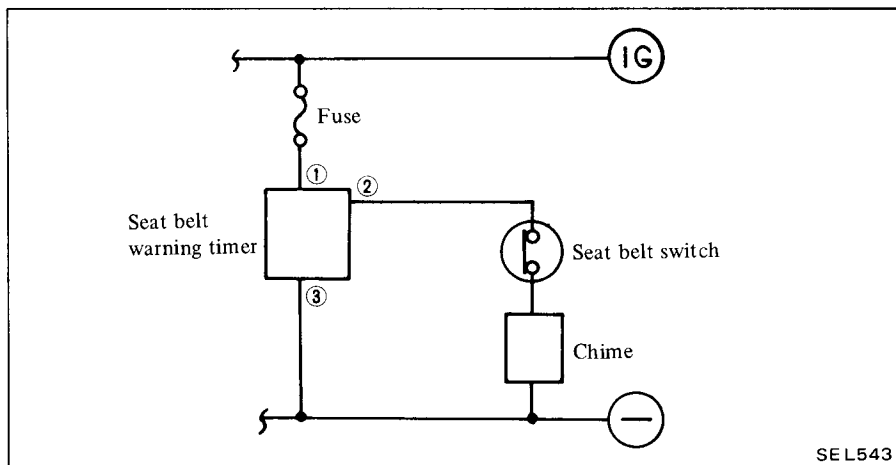
SEAT BELT WARNING SYSTEM

DESCRIPTION

This system consists of an ignition switch, a timer unit, a warning light, a driver's seat belt switch and a warning chime, and is designed to remind the

driver to buckle his seat belt.

When the ignition switch is turned to the "ON" position, the warning light comes on and remains on for 4 to 8 seconds. At the same time, the warning chime sounds for 4 to 8 seconds intermittently if the driver's seat belt is not fastened properly. The chime is also used as a theft warning chime.



REMOVAL AND INSTALLATION

Intermittent warning chime

1. Disconnect battery ground cable.
2. Remove instrument lower cover and assist floor nozzle on the left side.

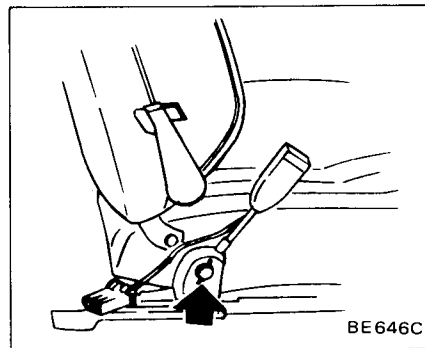
3. Disconnect chime wire connector.
4. Remove screws retaining chime assembly and then take out chime assembly.
5. Installation is in the reverse order of removal.

Seat belt warning timer

1. Disconnect battery ground cable.
2. Remove instrument lower cover and driver floor nozzle on the right side.
3. Remove glove box.
4. Disconnect wire connector.
5. Loosen screw retaining timer unit on dash side and then take out timer unit.
6. Installation is in the reverse order of removal.

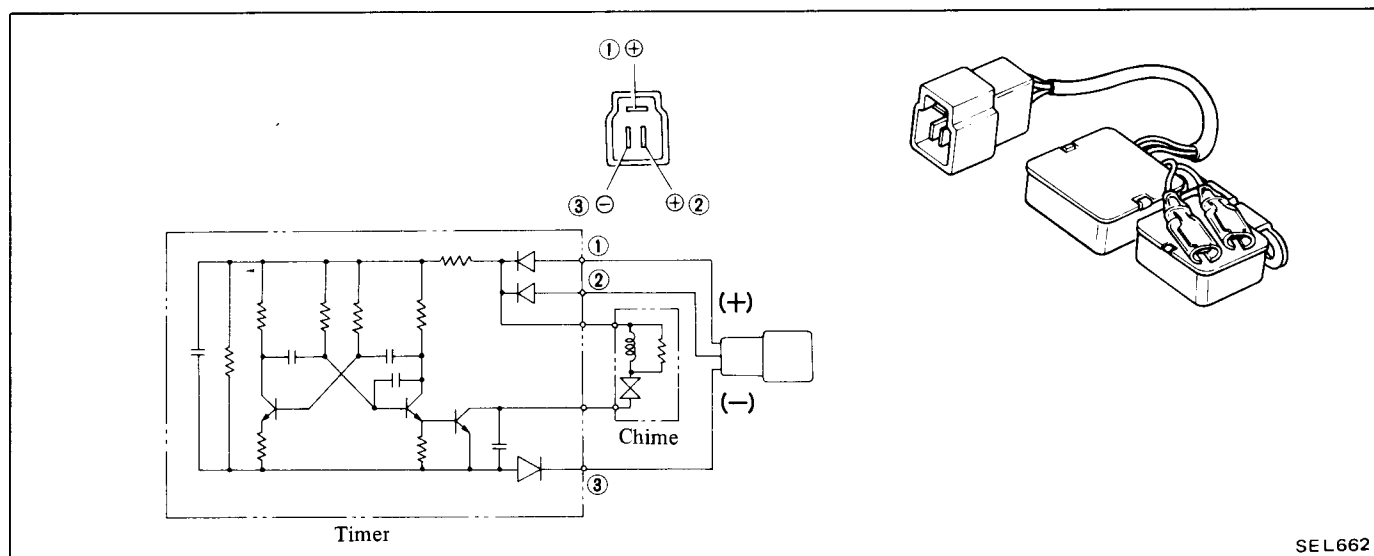
Seat belt switch

1. Disconnect battery ground cable.
2. Slide driver's seat all the way forward.
3. Disconnect harness connector.
4. Remove inner seat belt by removing securing bolt.
5. Install inner seat belt in the reverse order of removal.



INSPECTION

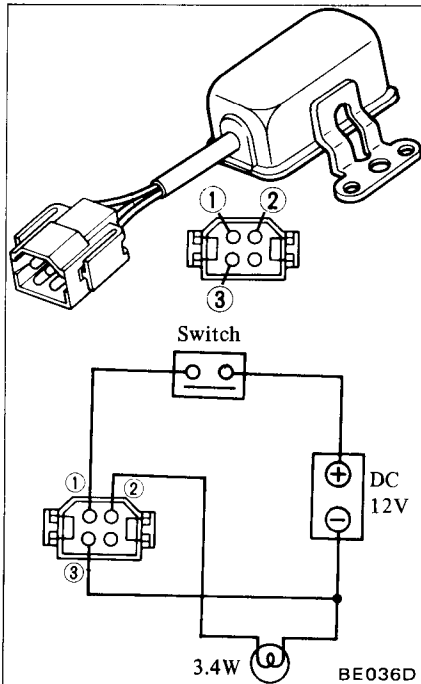
Intermittent warning chime



Apply 12V direct current between ①–③ or ②–③ and check whether chime sounds or not. The chime must sound when ①–③ and ②–③ are connected to power circuit.

Make sure that (–) negative terminal of power circuit is always connected to (3) terminal.

Seat belt warning timer



Seat belt switch

Test continuity through driver's seat belt switch with a test lamp or ohmmeter.

There should be continuity between two terminals when the seat belt is unfastened. Conversely there should not be continuity when fastened.

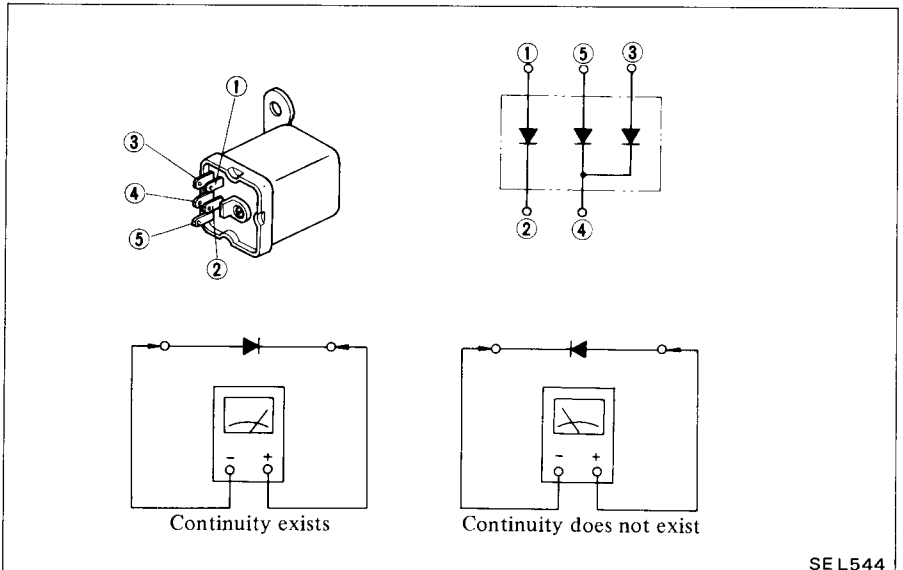
DIODE BOX

REMOVAL AND INSTALLATION

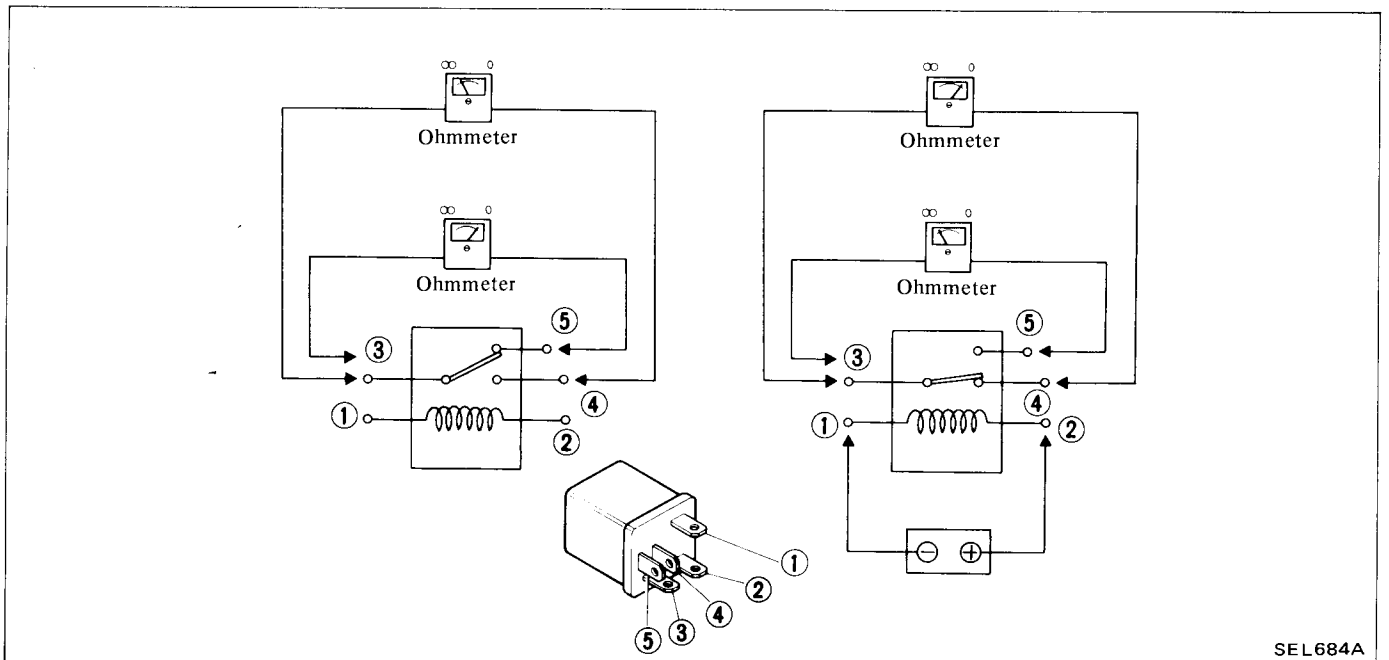
1. Disconnect battery ground cable.

INSPECTION

Test continuity of system with a test lamp or ohmmeter.



BULB CHECK RELAY



WARNING DISPLAY








DESCRIPTION

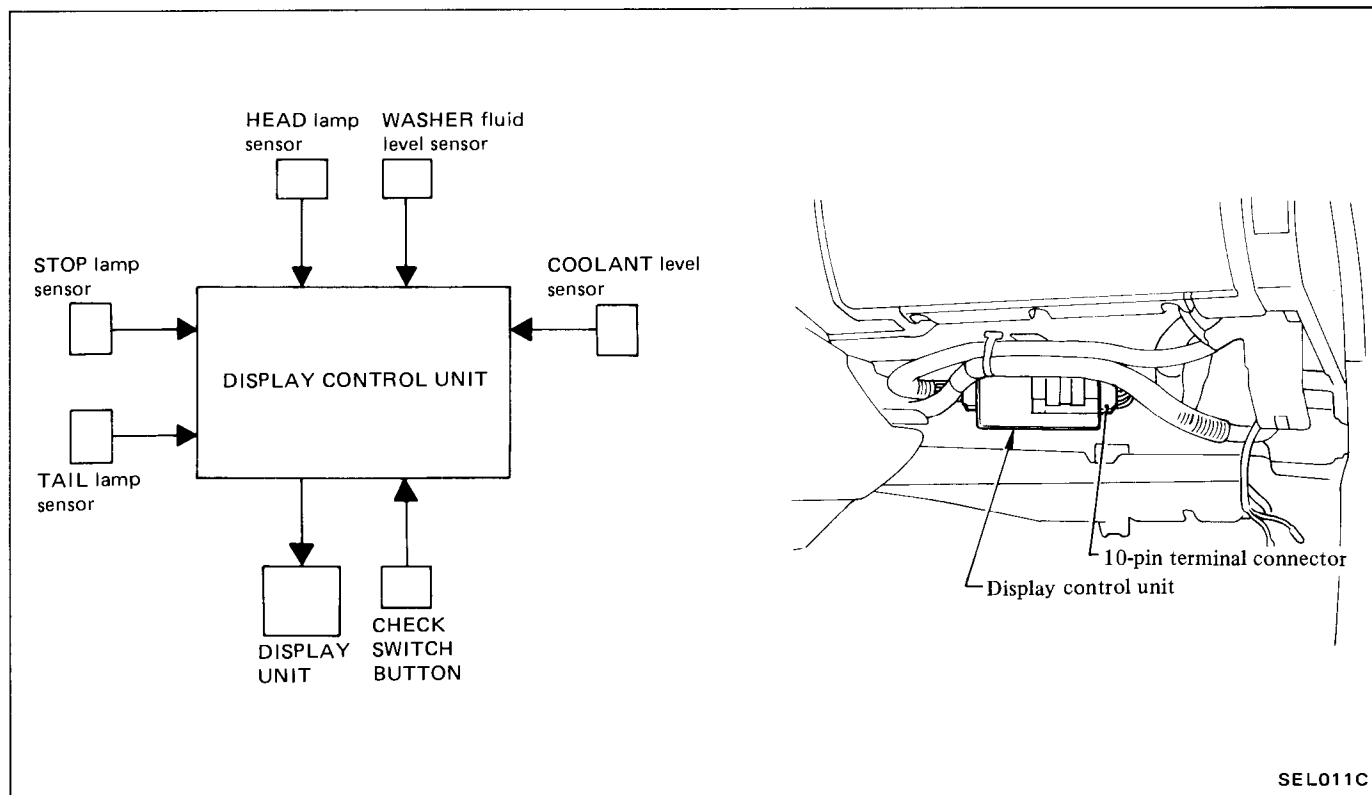
The warning display system consists of a warning indicator, a check switch,

a warning display control amplifier, and sensors which are arranged at each part of the car.

Pushing the check switch on the combination meter will indicate the following on the indicators.

Warning

Indication	Item	Warning
Red all over the surface 	Indication that there is a malfunction.	_____
OK 	Indication that there is no malfunction.	_____
STOP 	Burned-out stop lamp bulb warning.	Indicates that filaments in stop lamp bulbs are burned out more than one. (Broken harness circuit cannot be detected.)
HEAD 	Burned-out headlamp bulb warning.	Indicates that filaments in headlamp bulbs are burned out more than one. (Only one system is detected in case of broken harness circuits.)
TAIL 	Burned-out tail lamp bulb warning.	Indicates that filaments in tail lamp bulbs are burned out more than one. (Broken harness circuit cannot be detected.)
WASH 	Washer fluid level warning.	Indicates that washer fluid is less than specified level.
WATER 	Coolant level warning.	Indicates that engine coolant in radiator reservoir tank is less than specified level.

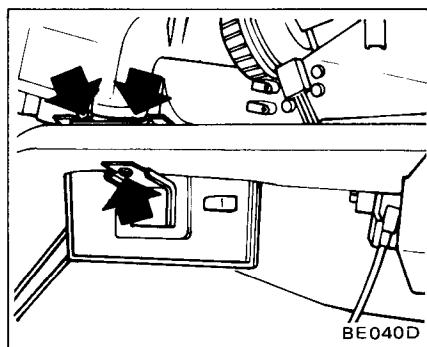


SEL011C

REMOVAL AND INSTALLATION

Display control unit

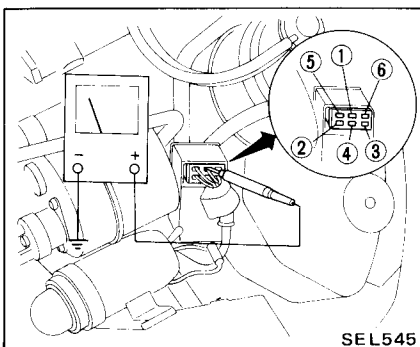
1. Disconnect battery ground cable.
2. Remove instrument lower cover on right side.
3. Remove glove box.
4. Disconnect wire connectors from display control unit.
5. Remove display control unit.
6. Installation is in the reverse order of removal.



INSPECTION

Headlamp sensor

1. Make sure all headlamp bulbs are normal and have specified rating.
2. Remove R.H. side instrument lower cover.
3. Disconnect 10-pin terminal harness connector from warning display amplifier.
4. Remove headlamp sensor with connecting harness connector.
5. Measure voltage at terminal ① by turning on lighting switch.



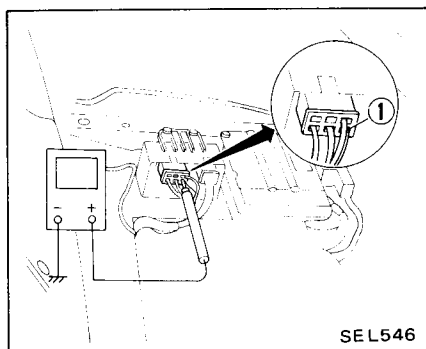
Voltmeter should register almost 0 volt.

6. Disconnect one of headlamp connectors or remove one of headlamp circuit fuses.
7. Measure voltage at terminal ① by turning on lighting switch.

Voltmeter should register approximately 12 volts.

Tail and stop lamp sensor

1. Make sure all tail and stop lamps are normal and have specified rating.
2. Remove R.H. side instrument lower cover.
3. Disconnect 10-pin terminal harness connector from warning display amplifier.
4. Remove front passenger seat.
5. Measure voltage at terminal ① by depressing brake pedal.



Voltmeter should register almost 0 volt during each inspection.

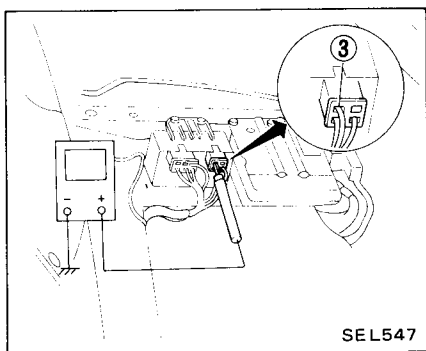
6. Disconnect one of stop/tail lamp bulbs.

Measure voltage at terminal ① by depressing brake pedal.

Then, measure voltage at terminal ③ by turning on lighting switch.

Voltmeter should register approximately 10 volts during each inspection.

Then, measure voltage at terminal ③ by turning on lighting switch.



Coolant level sensor

Before inspection, make sure that the coolant is filled to the correct level.

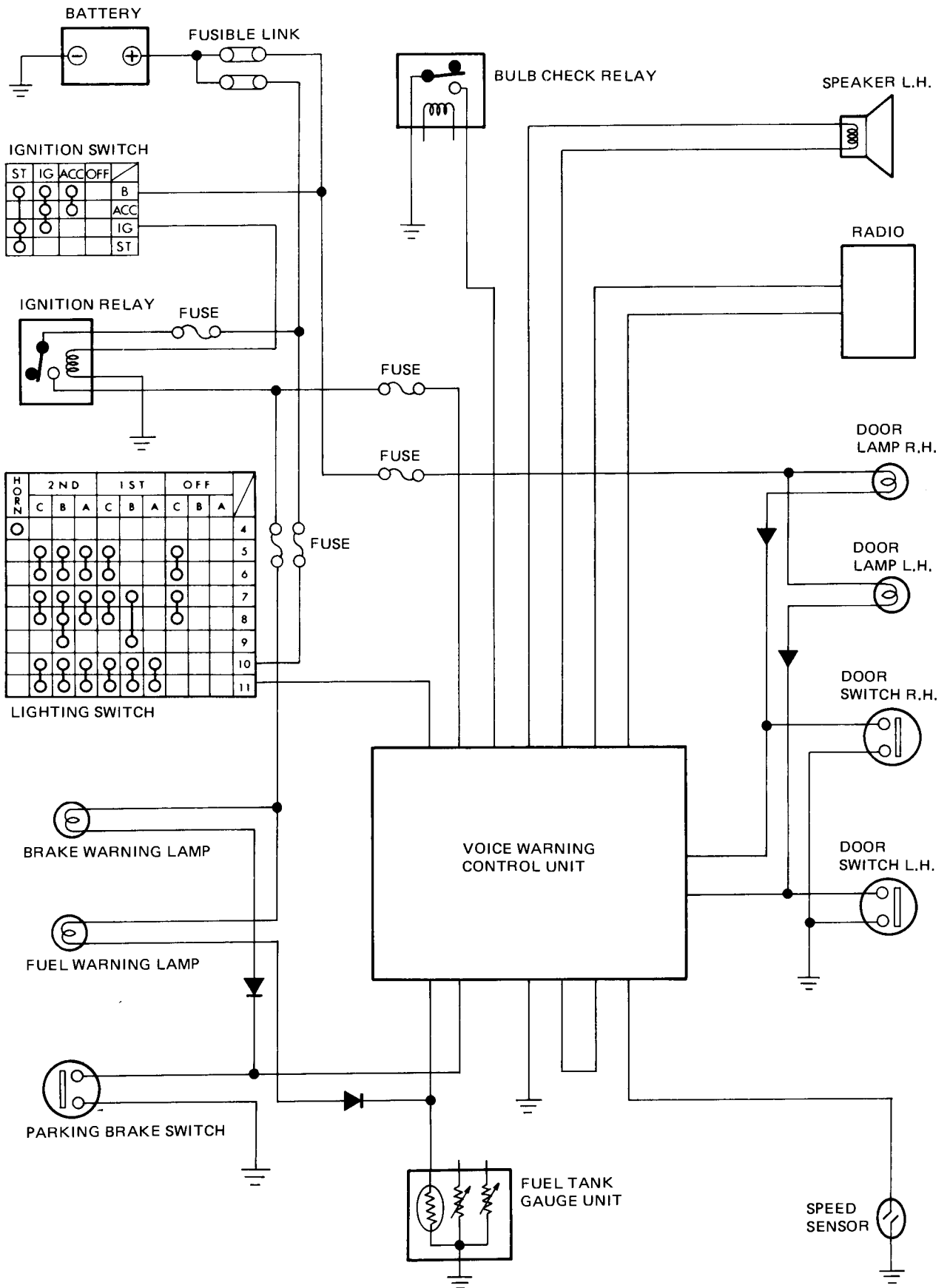
1. Disconnect sensor harness connectors.
2. There should not be continuity between two terminals of sensor.
3. There should be continuity between terminals when float has reached below low level by gradually lowering float with a suitable tool.

Washer fluid level sensor

Before inspection, make sure that washer fluid tank is full.

1. Disconnect sensor harness connectors.
2. There should not be continuity between two terminals of sensor.
3. There should be continuity between two terminals when fluid level sensor assembly is raised until it is out of washer tank.

VOICE WARNING



SEL012C

OPERATION

Item	Condition			Voice Warning
Left door	Ignition switch "ON"	Door switch L.H. is "ON". (Left door is open)	Speed switch is "ON". Car speed is more than 10 km/h (6 MPH).	"Left door is open".
Right door		Door switch R.H. is "ON". (Right door is open)		"Right door is open".
Parking brake		Parking brake switch is "ON".		"Parking brake is ON".
Fuel level		Fuel level less than 10ℓ (2-5/8 US gal, 2-1/4 Imp gal)	—	"Fuel level is low".
Light	Ignition switch "OFF"	Door switch L.H. is "ON". Left door is open.	Lighting switch is "ON".	"Lights are ON".

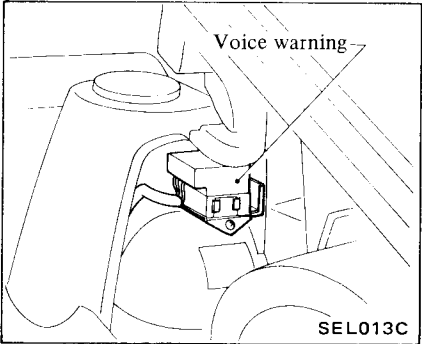
OPERATIONAL CHECK

Check to see that voice warning is given properly when items under "Condition" are as written.

If any or all of the voice warnings are not given properly, refer to the "Troubleshooting" chart.

VOICE WARNING DEVICE

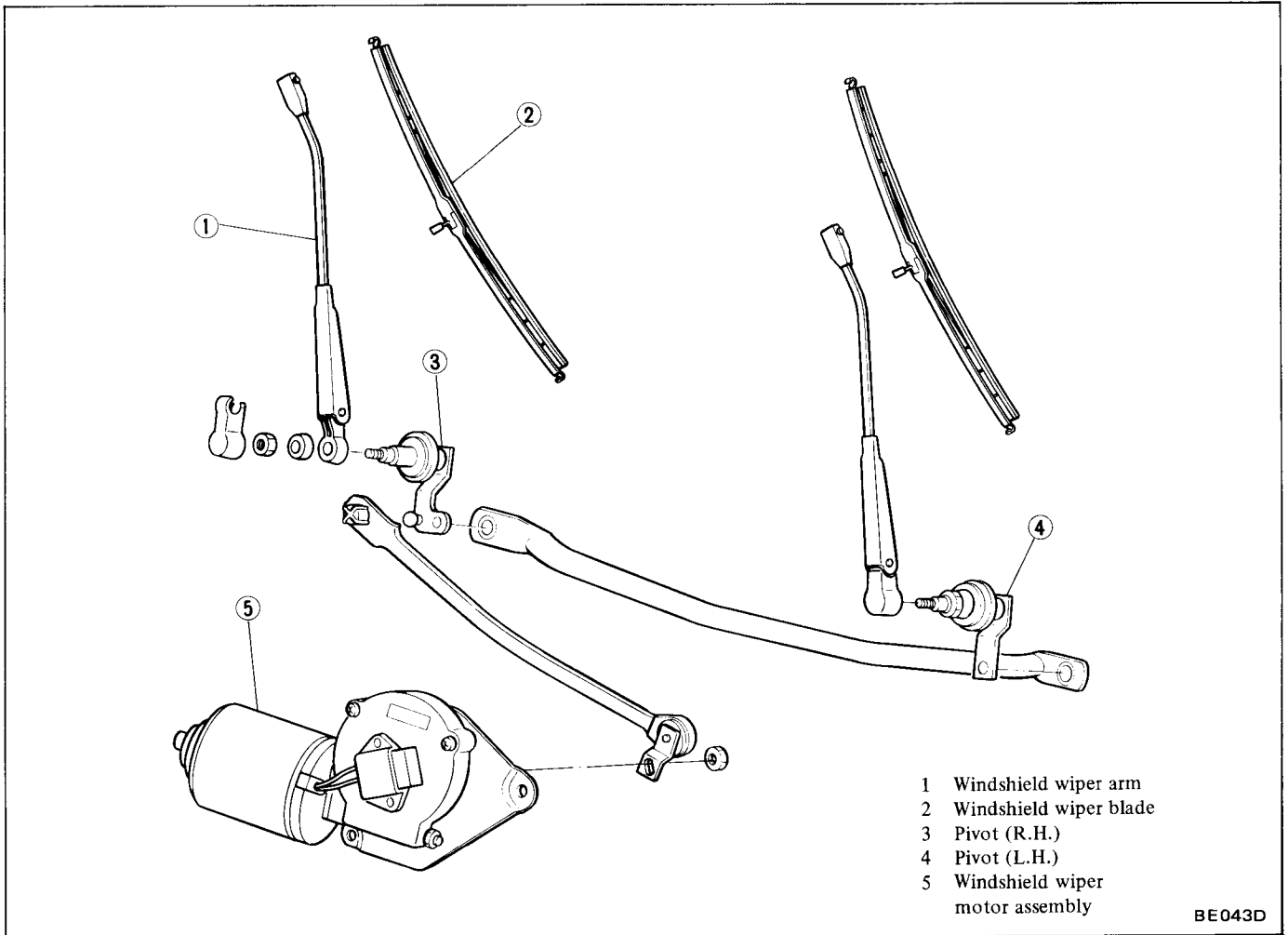
Location



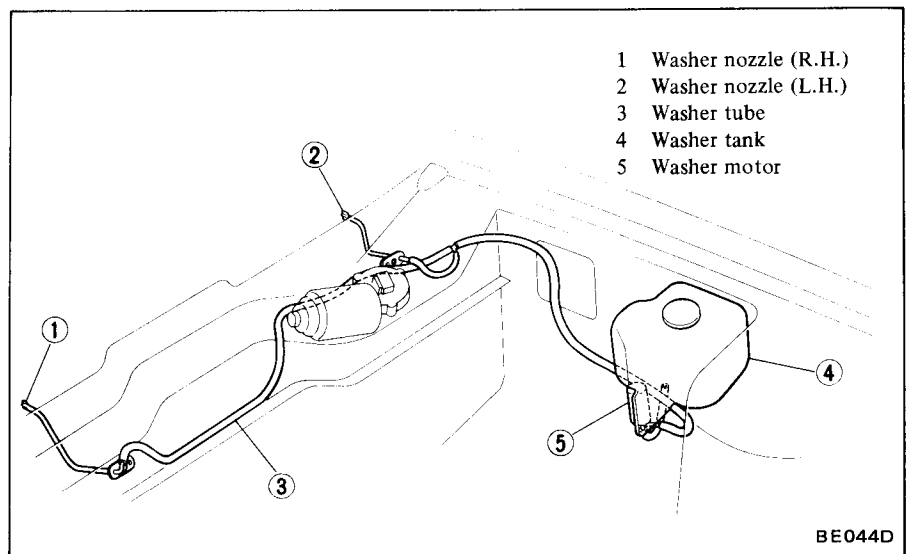
ELECTRICAL ACCESSORIES

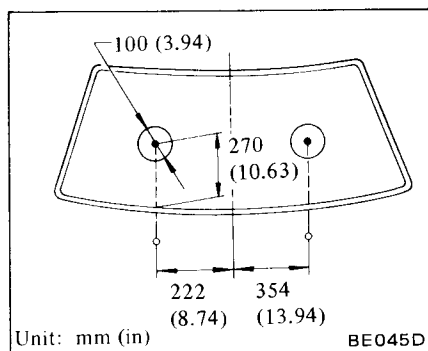
CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

WINDSHIELD WIPER AND WASHER



CAUTION:
Be careful not to bend linkage during removal.





CAUTION:

- Be sure to use only windshield washing solution. Never mix soap powder or detergent with solution.
- To avoid improper windshield washer operation, do not operate windshield washer continuously for more than 30 seconds or without washer fluid. Normally, windshield washer should be operated for 10 seconds or less at one time.

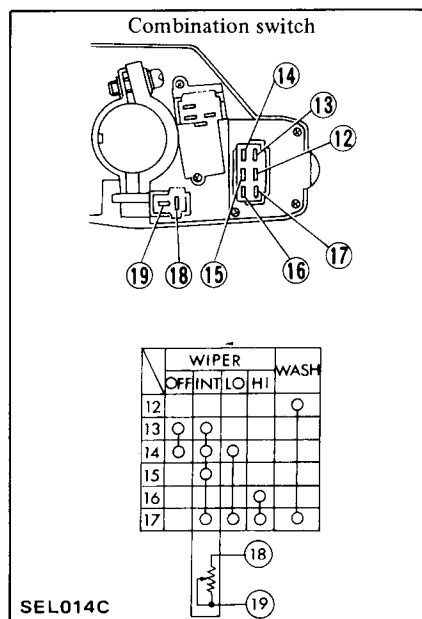
REMOVAL AND INSTALLATION

Wiper switch

Refer to Combination Switch on page EL-36.

INSPECTION

Wiper switch

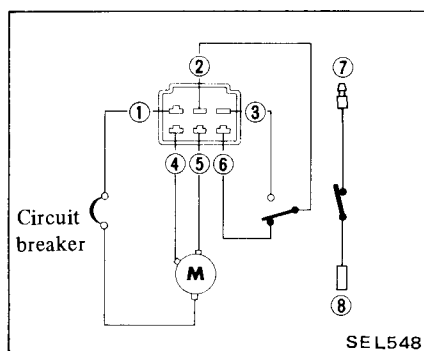


Wiper motor

1. There should be continuity at the following terminals:

- Between ① and ④, ① and ⑤.
- Securely connect positive terminal of a 12-volt DC power supply to terminal ① and ground terminal ④. Motor should run.
- Next, ground terminal ⑤. Do not ground terminal ④ this time. Motor should run.
- Ground either terminal ④ or ⑤ to keep wiper motor running.

Check continuity between terminals ② and ③, ② and ⑥, ⑦ and ⑧ respectively. Continuity should repeat "ON" and "OFF" periodically.

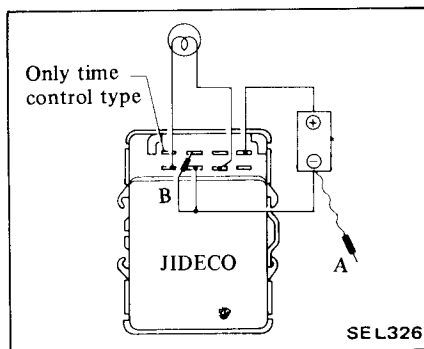


Intermittent amplifier (IC built-in)

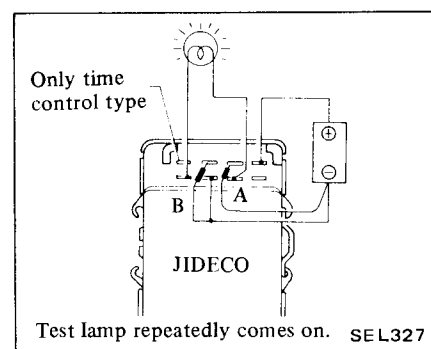
To check intermittent amplifier for proper operation, fabricate adapters shown below, and utilize the following procedures in the order listed. Failure to observe the order of these test procedures may lead to improper test results.

Be careful not to connect lead wires to incorrect terminals as this will damage transistors.

- Connect test lead wires.

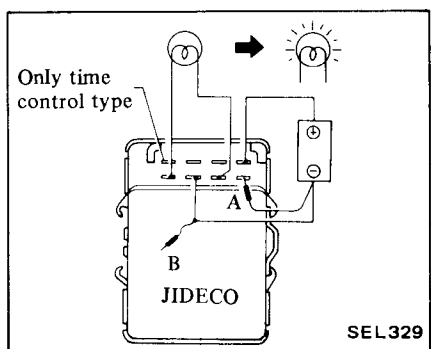
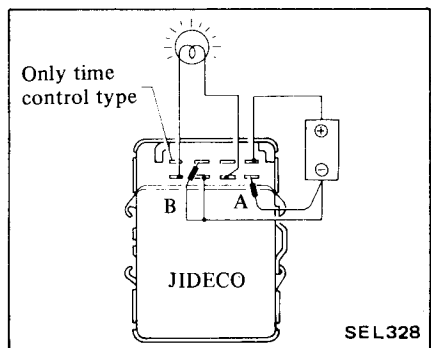


- Make sure that test lamp comes on when negative lead wire (A) is connected.



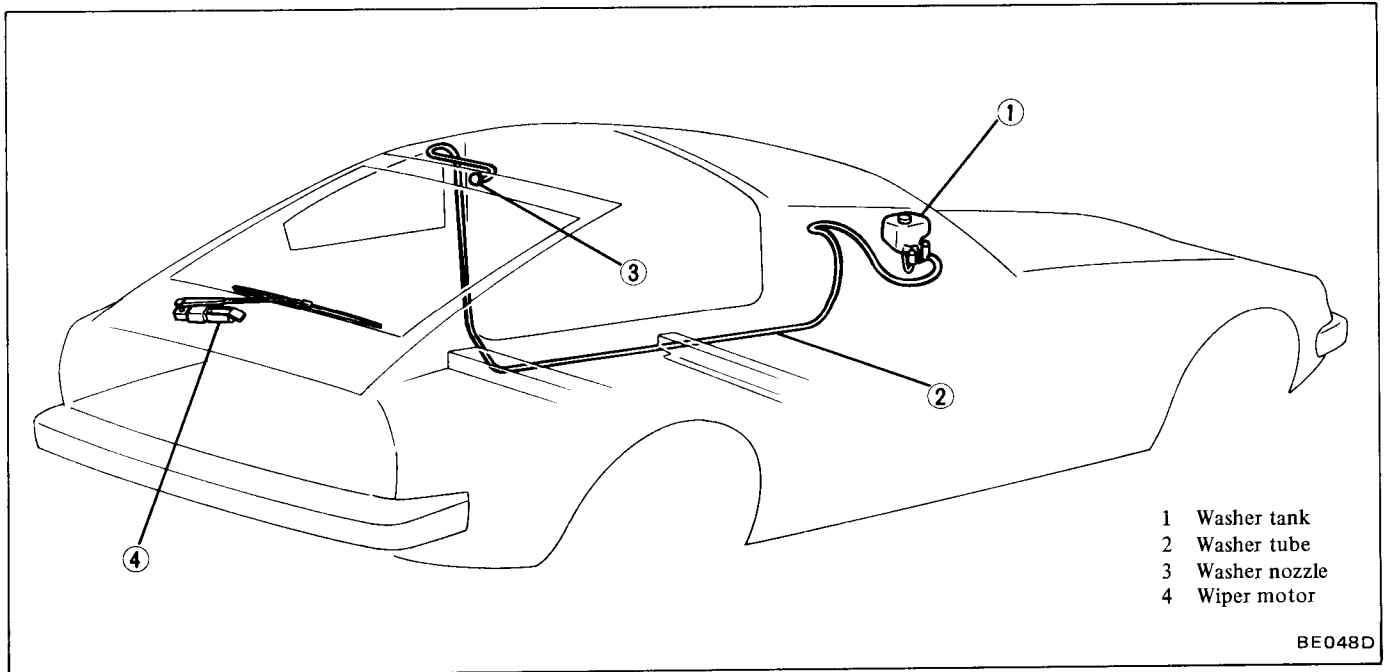
- Disconnect lead wire (B).

Test lamp should go out and come back on in a few seconds.



REAR WINDOW WIPER AND WASHER

REMOVAL AND INSTALLATION



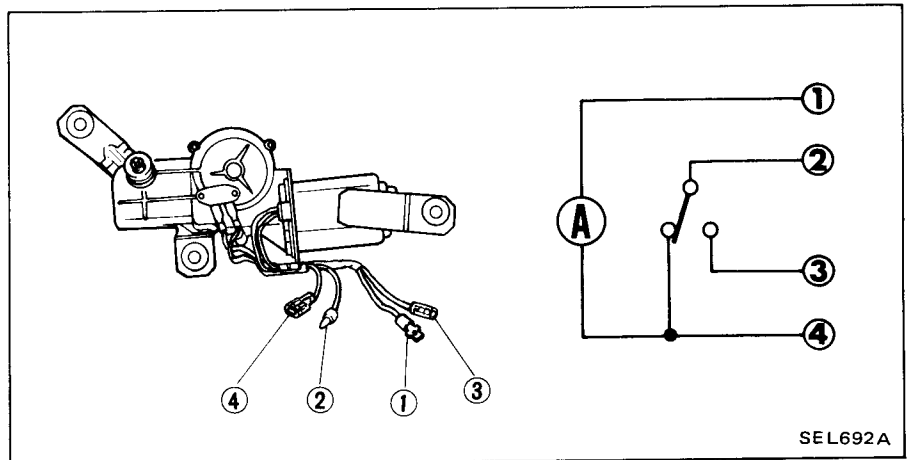
INSPECTION

Wiper motor

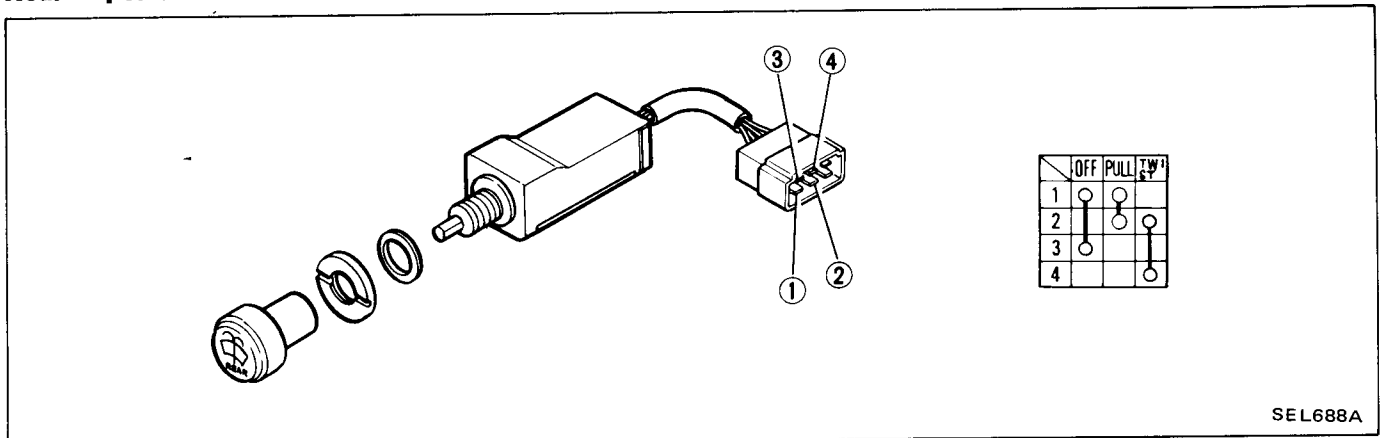
Inspect wiper motor as follows:

1. There should be continuity between terminals ① and ④.
2. Apply positive DC 12 volt to terminal ① and negative to terminal ④, and motor will rotate.

Check continuity between terminals ② and ③, and ② and ④. Continuity should repeat "ON" and "OFF" periodically.



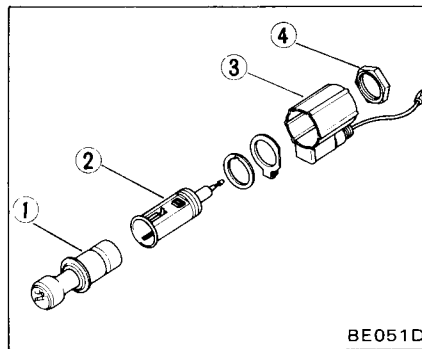
Rear wiper and washer switch



CIGARETTE LIGHTER

REMOVAL AND INSTALLATION

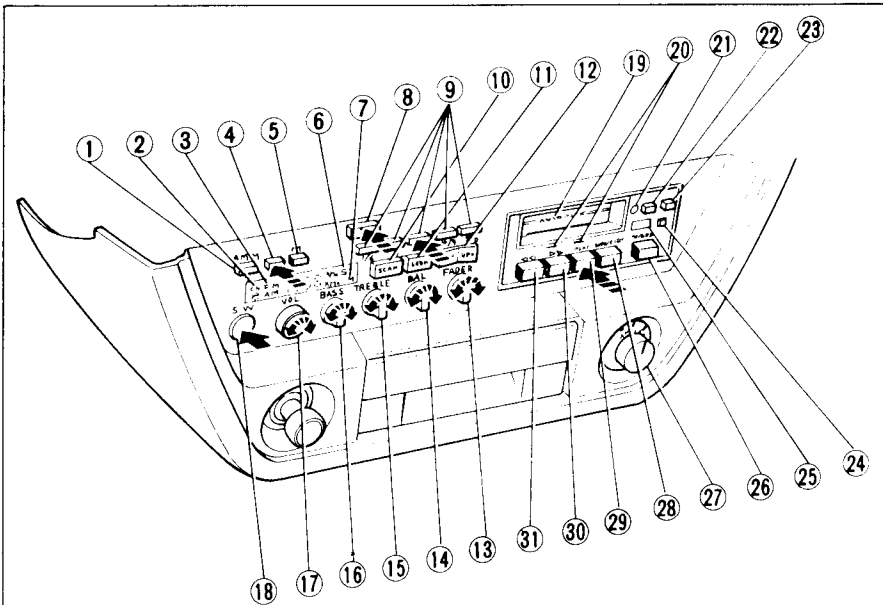
1. Disconnect battery ground cable.
2. Remove instrument under cover.
3. Remove instrument console.
4. Remove retaining nut at bottom of cigarette lighter.
5. Installation is in the reverse order of removal.



- | | |
|-----------|-----------------|
| 1 Lighter | 3 Housing cover |
| 2 Housing | 4 Retaining nut |

RADIO

DESCRIPTION



- | | |
|------------------------------------|-----------------------------|
| 1 AM-FM band selector | 16 BASS control knob |
| 2 Channel indicator | 17 Volume control knob |
| 3 AM-FM indicator | 18 Power ON-OFF switch |
| 4 Auto tuning sensitivity selector | 19 Tape door |
| 5 Memory button | 20 Tape operating indicator |
| 6 Stereo indicator | 21 Dolby indicator |
| 7 Memory indicator | 22 Dolby button |
| 8 Antenna height control button | 23 Tape selector |
| 9 Tuning pushbutton | 24 Reset button |
| 10 SCAN tuning switch | 25 Tape counter |
| 11 SEEK tuning switch | 26 Program select button |
| 12 Manual tuning switch | 27 Ambience control switch |
| 13 FADER control knob | 28 Stop and eject button |
| 14 BALANCE control knob | 29 Play button |
| 15 TREBLE control knob | 30 Fast forward button |
| | 31 Fast rewind button |

AD304

Audio radio

The radio features an automatic tuning system and five push buttons for station selection. Using the push buttons, it is possible to preset five FM stations and five AM stations. Other stations may be selected using the automatic or manual tuning switch. The ignition switch must be set at "ON", or "ACC". The stereo indicator remains lighted during FM stereo reception. The channel indicator indicates channel number of tuning push button and continues to glow during reception.

When receiving a stereo broadcast in mountainous areas, etc. where FM is weak, the radio will automatically change from stereo to monaural to prevent static from entering the radio. At this time, the stereo indicator shuts off.

When the AM-FM band selector is changed to AM or FM, the radio is automatically tunes in the previously selected station in the applicable band.

Automatic tuning

• SEEK tuning

When the SEEK tuning switch is pressed, an automatic seeking operation begins with low frequencies and proceeds to the higher frequencies. This seeking operation stops when any station is received, and the radio remains tuned in that station. The seeking operation can be restarted by pressing the switch again.

• SCAN tuning

When the SCAN tuning switch is pressed, scanning begins from low to high frequencies. When any station is received, the scan stops for five seconds. If nothing is done by the listener during this period, scanning starts again.

If the switch is again pressed during this five second period, the radio remains tuned to that station even after the switch is released. This scanning motion can be restarted by pressing the switch again.

All automatic tuning will continue if the broadcasting station is exceptionally weak. In such a case, set the auto tuning sensitivity selector button to the "DX" (pushed-in) position. For normal use, set the button in the "LOC" (pushed-in) position.

Manual tuning

When the UP or DOWN end of the manual tuning switch is momentarily pressed, AM frequency will increase or decrease in units of 10 kHz, and FM frequency in units of 0.2 MHz.

Scanning will continue as long as the switch is being pressed.

4-speaker balance control

Adjust the right and left speaker volume by turning the BALANCE control knob. Adjust the volume for the front and rear speakers by turning the FADER control knob.

Ambience control

The ambience control allows for a feeling of sound direction and distance and enables the listener to enjoy a full ambience effect from radio broadcasting. The ambience control switch provides the following functions:

Direct

When the control switch is in the center position, no ambience effect is obtained.

All

When the control switch is turned clockwise, the ambience effect will be sensed by all occupants of the car.

Driver

If the control switch is turned counterclockwise, the ambience effect is sensed only by the driver.

The ambience control provides maximum effect when the 4-speaker balance control is in the center position.

Setting the push buttons

Depending on the AM-FM band selector position, the desired AM stations can be set by using push buttons 1 through 5, and the FM stations by using push buttons 6 through 0.

1. Select the desired station by automatic or manual tuning.
2. Lightly press the desired station push button while also pressing the memory button. This will cause the previously memorized station to be cancelled and replaced by the newly selected station.
3. Other station selector buttons can be set to desired stations in the same manner.

- The memory indicator will remain lighted for five seconds after the memory button is pressed. If the push button is pressed during this period, the desired station can be set. If any other operations (such as manual tuning, seeking, scanning, band changeover and turning on and off power switch) are performed during this period, the memory of the station set already will be cancelled.
- When the battery cable is disconnected, when the radio is removed, or when the fuse in the power circuit blows, the memory will also be cancelled. In such a case, set the desired station.

Antenna

With the ignition switch set at "ON" or "ACC", the antenna will automatically extend, when the power switch of the radio is set at "ON".

The antenna will automatically retract when the power switch is off.

The antenna will also retract when the ignition switch is turned off with the power switch of the radio set at "ON".

CAUTION:

Before turning on power to the radio, make sure that there is no one near the antenna outlet and there is enough space for it to extend.

Setting antenna height

The antenna switch located on the radio permits the selection of antenna height in two stages.

When the power antenna is pushed once ("↗"), the antenna will extend to half height. When pushed again ("↘"), the antenna will extend to full height.

Stereo tape deck (Cassette)

Turn the ignition key to the "ON" or "ACC" position and insert the tape cassette gently through the tape door.

- To play the deck, push the play button. When playing, the channel indicator will come on.
- To select a program, push the program select button.
- To stop, push the stop and eject button.
- To remove the tape, stop the tape deck and push the stop and eject button.
- Make volume, tone and speaker balance adjustments, following the same procedures as the radio.
- To rapidly select a particular program, push the fast forward or rewind button.
- If the stereo tape deck is operated when the radio is turned "ON", the power supply for the radio will be automatically cut off. At the same time, the antenna will retract.
- When playing a tape recorded with a "Dolby" system, press the "Dolby" button. When the "Dolby" indicator comes on, high frequency tape noise will be reduced.
- When playing a high performance tape (metal tape or chrome tape), be sure to depress the tape selector button.
- Use the "Dolby" button and tape selector according to the tape you wish to hear. Incorrect changeover will diminish the sound quality.
- When the ignition key is turned "OFF" while playing the stereo tape deck, the stereo tape deck will stop and pinch roller will come off the tape.

REMOVAL AND INSTALLATION

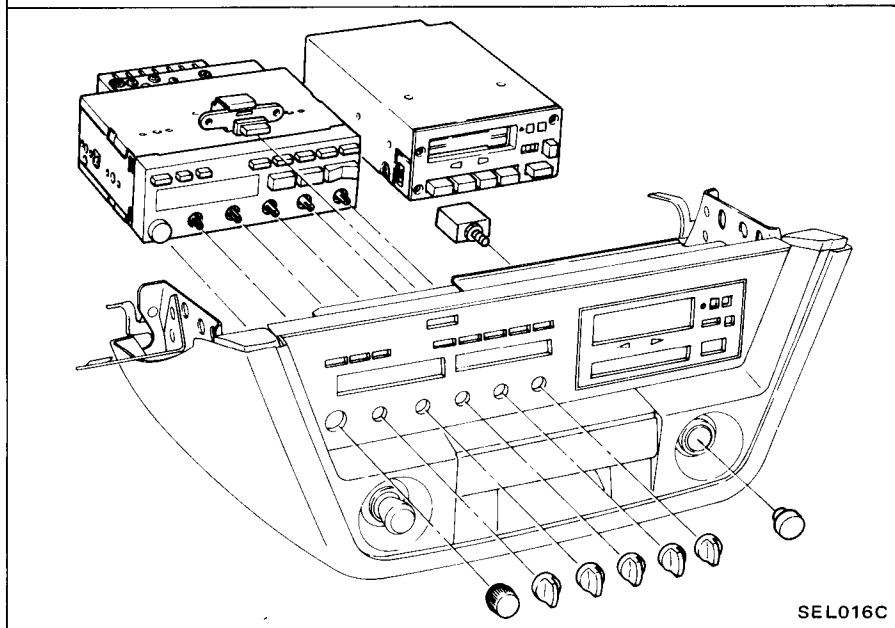
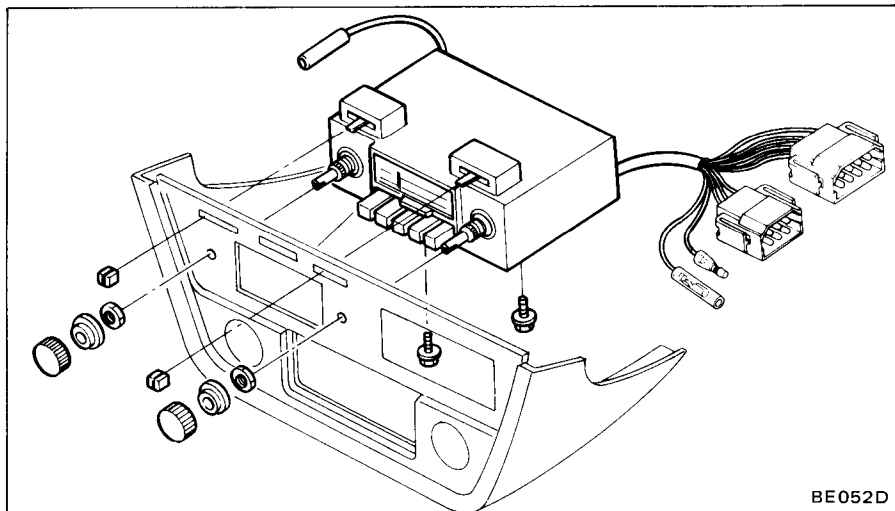
Radio receiver

1. Disconnect battery ground cable.
2. Remove instrument under cover.
3. Remove instrument console.
4. Pull out knob and dials on radio

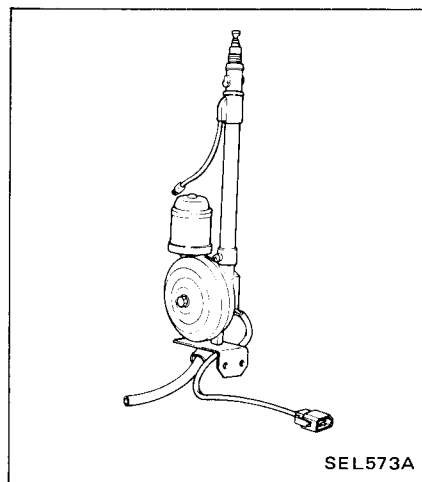
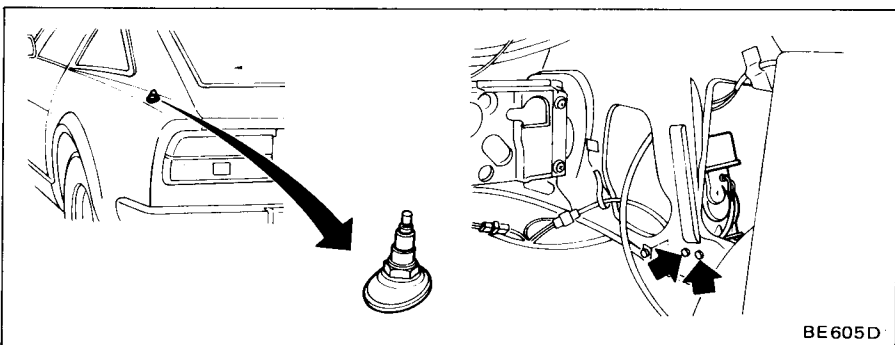
receiver and remove nuts retaining escutcheon to radio receiver.

5. Loosen screws retaining radio receiver. Radio receiver can then be taken out.

6. Installation is in the reverse order of removal.



Antenna



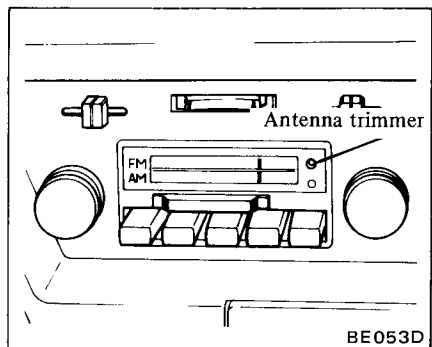
ADJUSTING ANTENNA TRIMMER

The antenna trimmer should be adjusted in the following cases:

- Fading and weak 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 strongest.



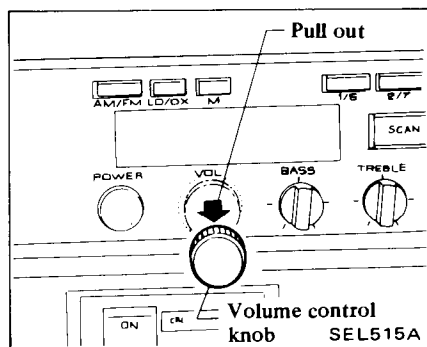
CAUTION:

Do not turn antenna trimmer more than one-half turn.

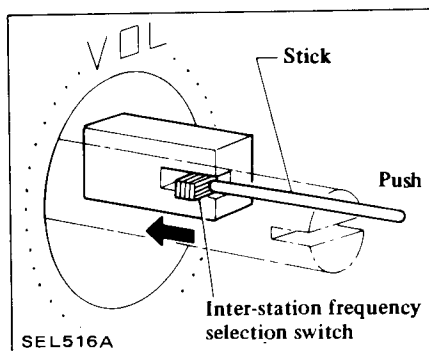
Changing inter-station frequency interval setting

Radio is preset at 10 kHz inter-station frequency intervals for AM reception. To set it at 9 kHz intervals, proceed as follows:

1. Remove volume control knob from radio.



2. Flip inter-station frequency selection switch to "9 kHz".



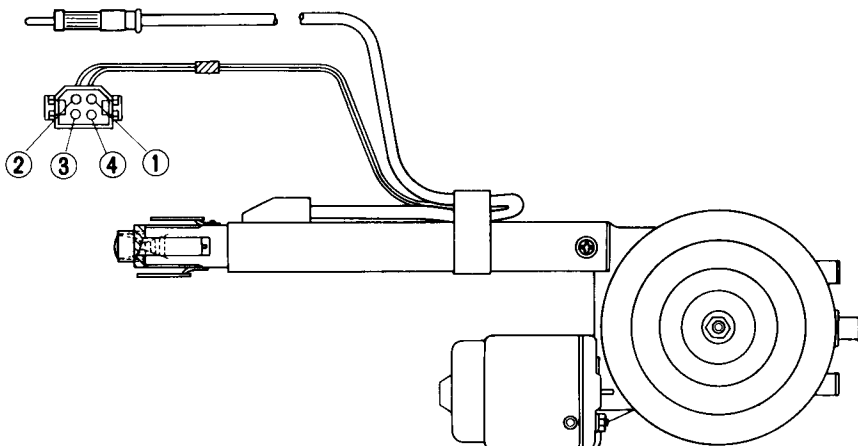
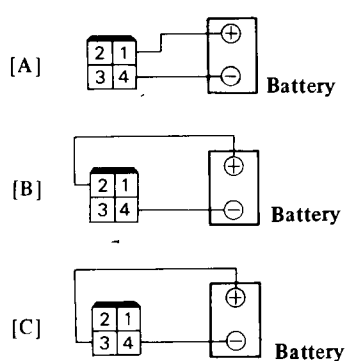
This switch is a depress-only type and once it is depressed, it does not retract. Do not depress unless it is for change-over use.

3. Replace volume control knob in its original position.

INSPECTION

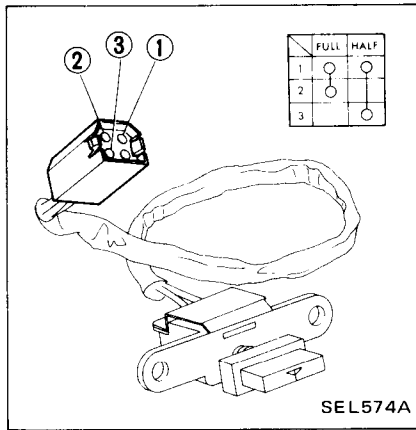
Power antenna motor

Antenna operation	Fully extended height	↑					
	Half extended height	↑					
	Fully retracted height	↓					
Checking measures		B	A	B	C	A	C



SEL645A

Power antenna switch



Power antenna timer

The inspection of the power antenna timer as a unit is difficult, so that it should be inspected as a power antenna system when it is installed on the car.

STEREO

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove instrument lower cover.
3. Remove instrument center console.
4. Remove radio receiver.
5. Remove screws securing stereo and remove stereo.
6. Installation is in the reverse order of removal.

REAR WINDOW DEFOGGER

DESCRIPTION

The electric rear window defogger system consists of a defogger switch, sensor and filaments in the rear window. The filaments and sensor are printed on the rear window. Heat from filaments keeps the rear window free of fog and frost.

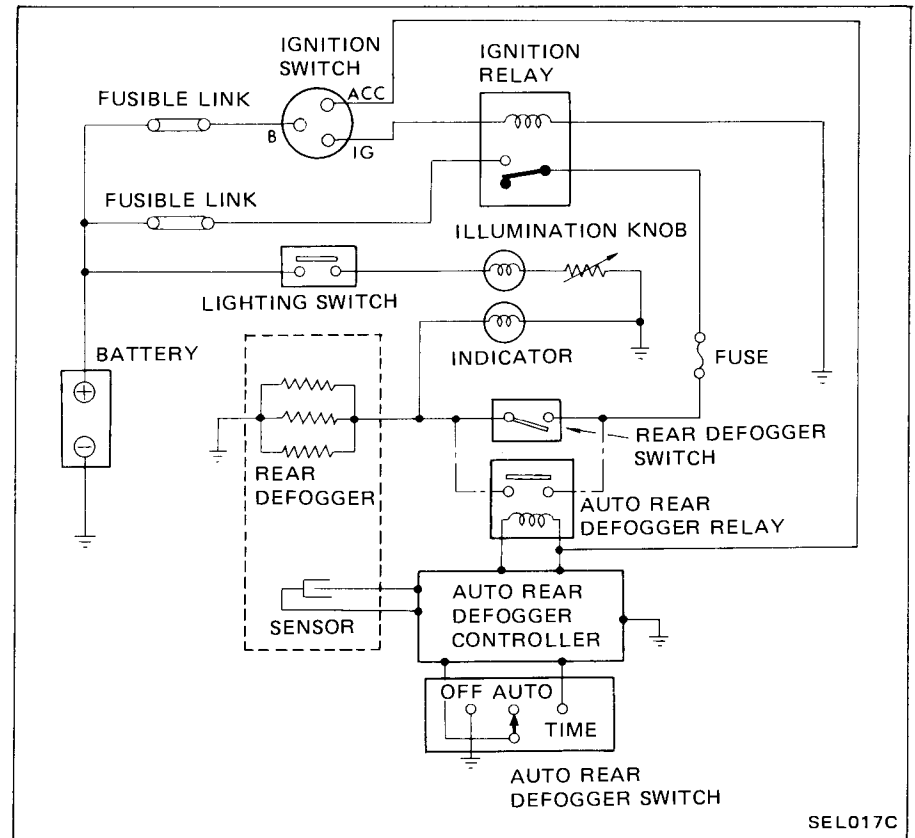
REMOVAL AND INSTALLATION

Defogger switch

1. Disconnect battery ground cable.
2. Remove defogger switch by prying it off with a screwdriver and pull it out.
3. Disconnect harness connector.
4. Install defogger switch in the reverse order of removal.

Rear window filaments and sensor

The filaments and sensor are printed inside the rear window glass. Therefore, the element cannot be removed.

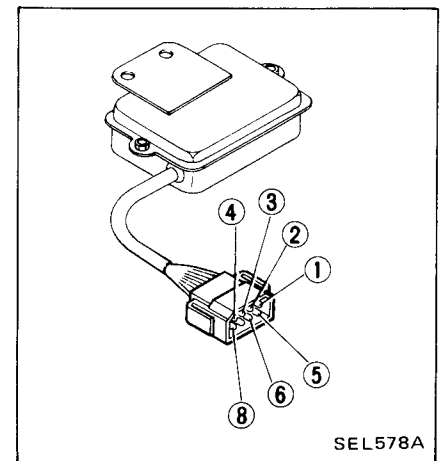


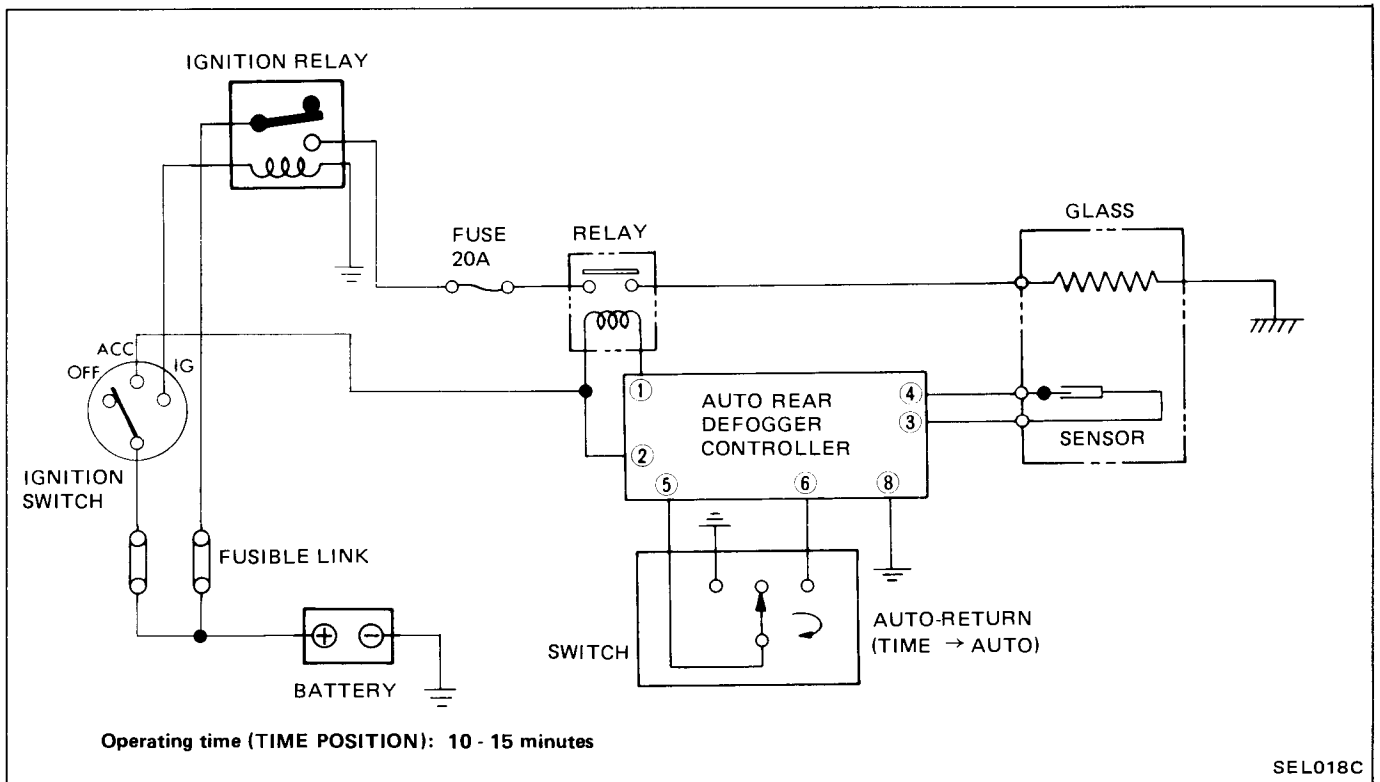
INSPECTION

Auto rear defogger unit

Location

Auto rear defogger unit is located under the left seat.

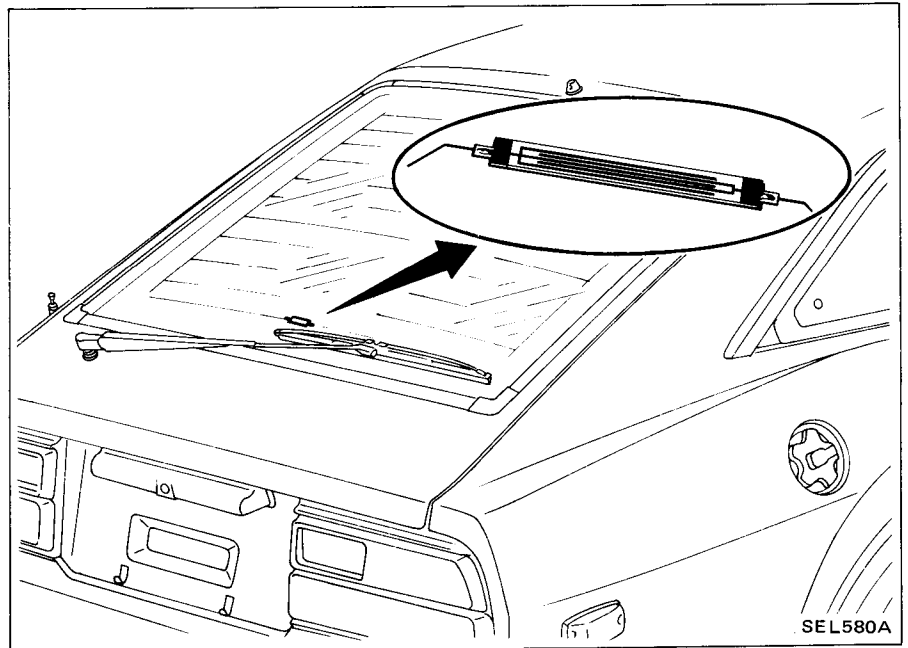




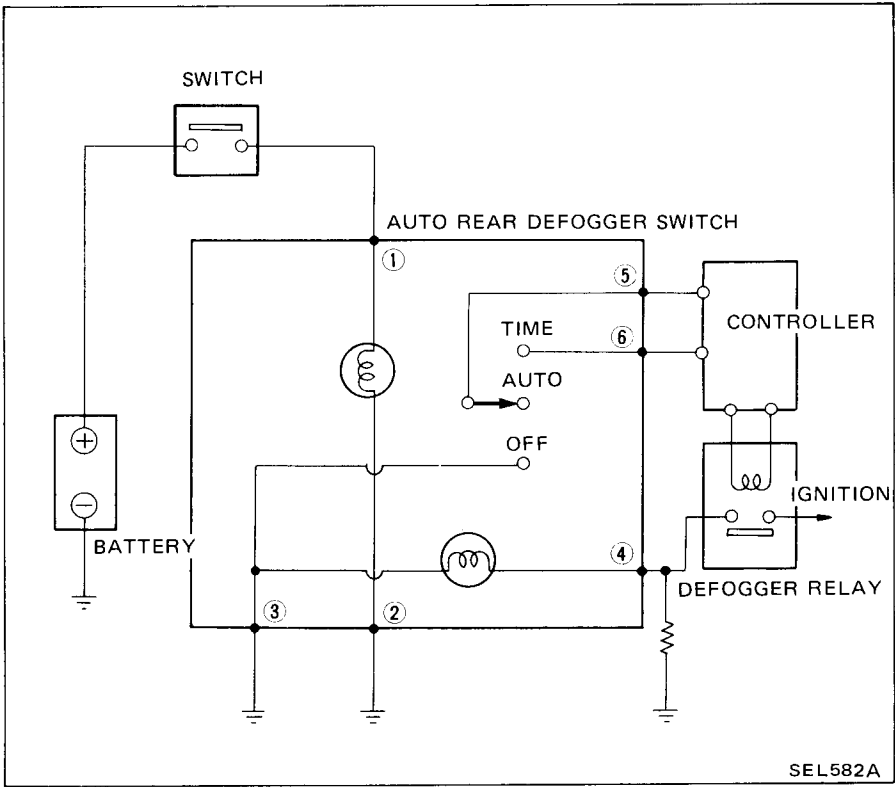
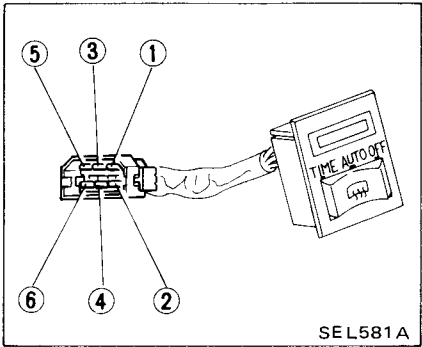
Auto rear defogger sensor

Location

Auto rear defogger sensor is located on the inside of the back window.

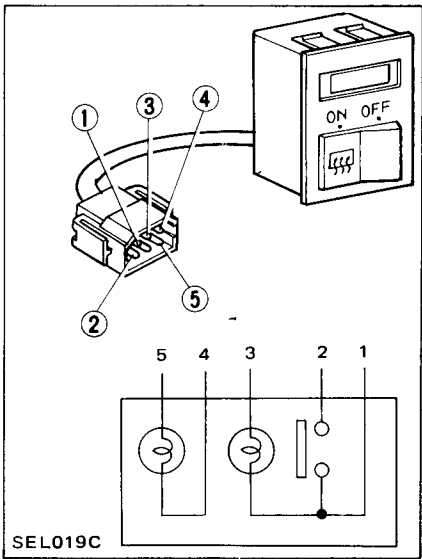


Auto rear defogger switch



Defogger switch

Test continuity of switch with test lamp or ohmmeter. Test must be carried out with switch at both "ON" and "OFF".

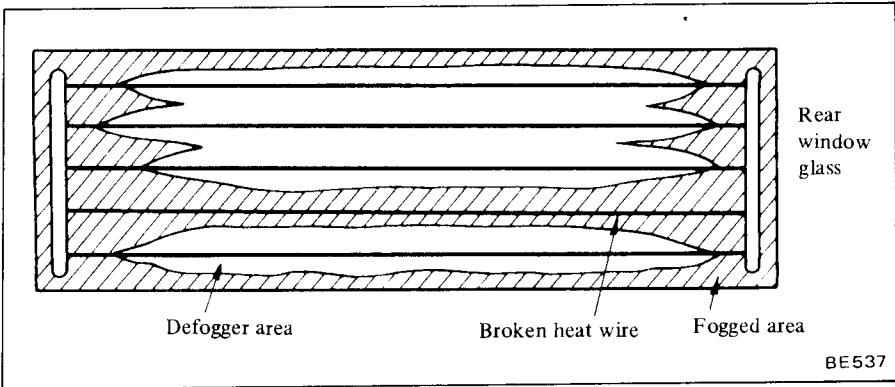


Rear window filaments

Rear window defogger filaments can be inspected for circuit breaks by one of three methods.

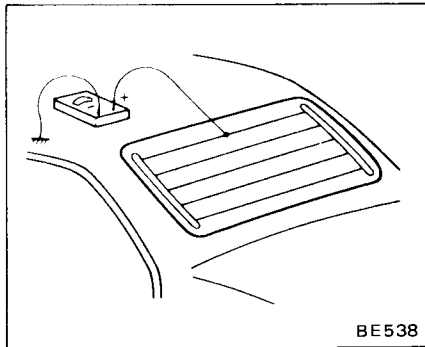
Method 1:

Start engine and turn on window defroster system. If area around a specified filament is not defogged, that line is broken.



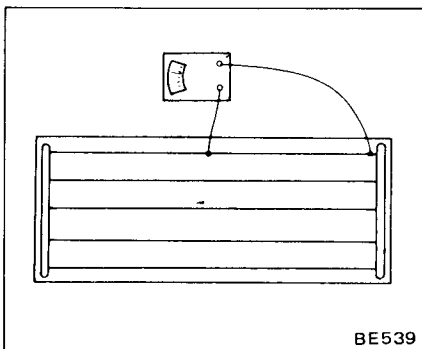
Method 2:

Start engine and turn on window defroster system. With a direct-current voltmeter setup as shown in figure below, check each heat wire for continuity. If meter indicates 12 volts or 0 on a specific wire, that line is broken. (Normal indication: 6 volts) a break in that line can then be detected by moving positive lead of meter along line until an abrupt variation in meter indication is encountered.

**Method 3:**

With an ohmmeter setup as shown in figure below, place one lead at one end of a heat wire and the other in the middle section of that wire. If meter registers, on a specific grid line, a value twice as much as on any other line, that line is broken.

A break in that line can then be located by an abrupt variation in meter indication as test lead moves along broken heat wire.

**FILAMENT MAINTENANCE****Repair equipment**

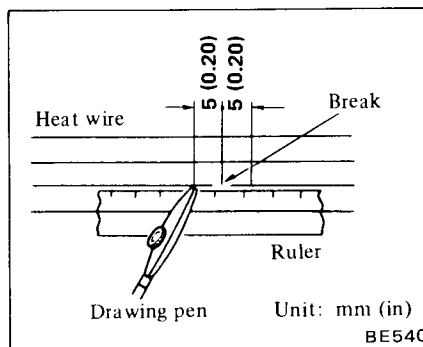
1. Conductive silver composition (Dupont No. 4817)
2. Ruler, 30 cm (12 in) long
3. Drawing pen
4. Heat gun
5. Alcohol
6. Cloth

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.

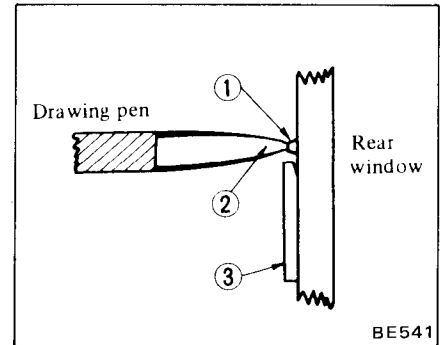
Shake silver composition container before use.

3. Place ruler on glass along broken line to be repaired. 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.

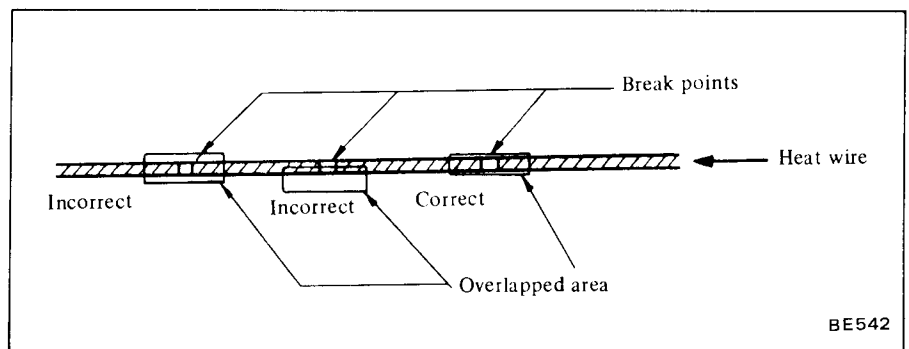


6. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.

After repair

Wipe repaired area clean with a soft, clean cloth.

Do not use a cleaning solvent containing much soapy water.



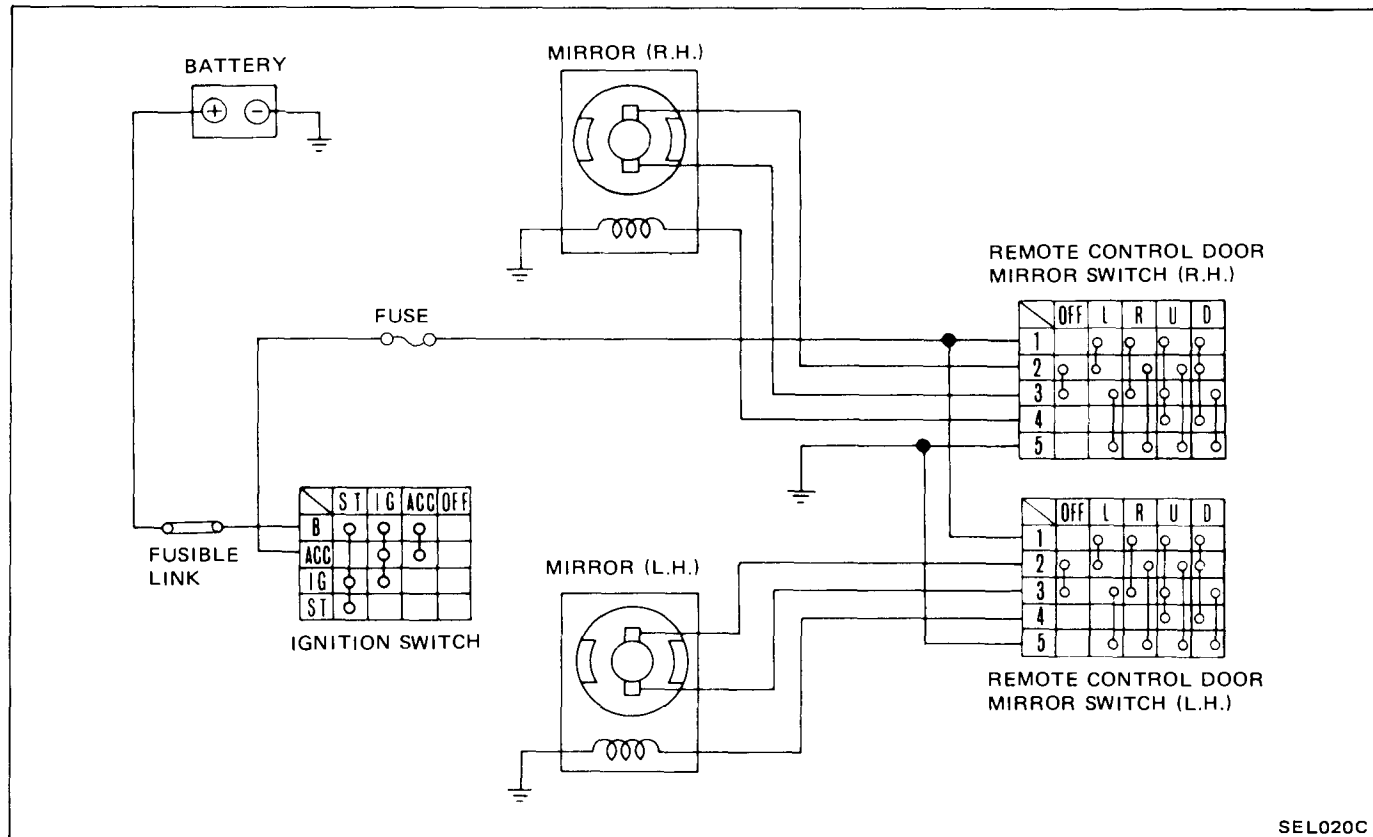
REMOTE-CONTROL DOOR MIRROR

DESCRIPTION

The remote-control door mirror

consists of a door mirror assembly and a control switch. The door mirror is

mounted on the door. The control switch is installed on the console box.



REMOVAL AND INSTALLATION

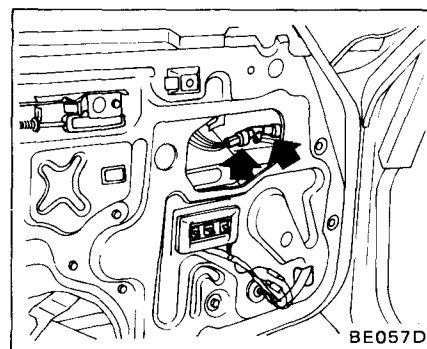
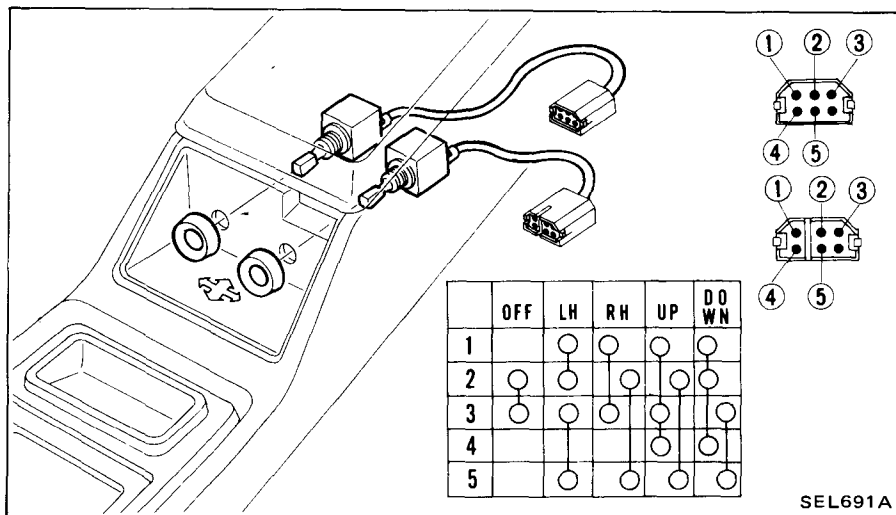
Control switch

1. Disconnect battery ground cable.
2. Loosen screws retaining console box, and disconnect wire connectors.

3. Remove ring nuts retaining switch of console box.
4. Switch body can be taken out from behind console box.
5. Installation is in the reverse order of removal.

Door mirror assembly

1. Disconnect battery ground cable.
2. Remove door finisher and sealing screen.
3. Disconnect harness connectors.
4. Remove nuts retaining mirror, and remove mirror with harness.



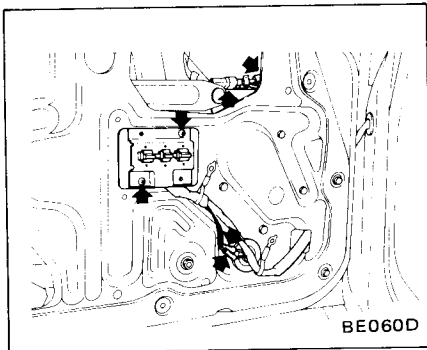
5. Installation is in the reverse order of removal.

POWER WINDOW SYSTEM

REMOVAL AND INSTALLATION

Power window main switch

1. Disconnect battery ground cable.
2. Remove instrument lower cover on left side.
3. Remove driver side door finisher and sealing screen.
4. Remove door glass and power window regulator. (Refer to Section BF.)
5. Disconnect connectors at dash side and disconnect remote-control mirror harness connectors located inside door.
6. Remove main switch with harness by loosening retaining screws.



7. Installation is in the reverse order of removal. After installation, adjust door glass. Refer to Door (Section BF) for adjustment.

Sub-switch

1. Disconnect battery ground cable.
2. Remove instrument lower cover on right side.
3. Remove passenger side door finisher and sealing screen.
4. Remove door glass and power window regulator.
5. Remove glove box.
6. Disconnect connectors at dash side and disconnect remote-control mirror harness connectors located inside door.

7. Remove sub-switch with harness by loosening retaining screws.
8. Installation is in the reverse order of removal. After installation, adjust door glass. Refer to Door Glass (Section BF) for adjustment.

Motor

1. Disconnect battery ground cable.
2. Remove regulator assembly with motor. Refer to Door Glass and

Regulator (Section BF) for removal and installation.

3. Separate motor from regulator.

4. Installation is in the reverse order of removal. After installation, adjust door glass. Refer to Door Glass (Section BF) for adjustment.

INSPECTION

Test continuity through switch with an ohmmeter.

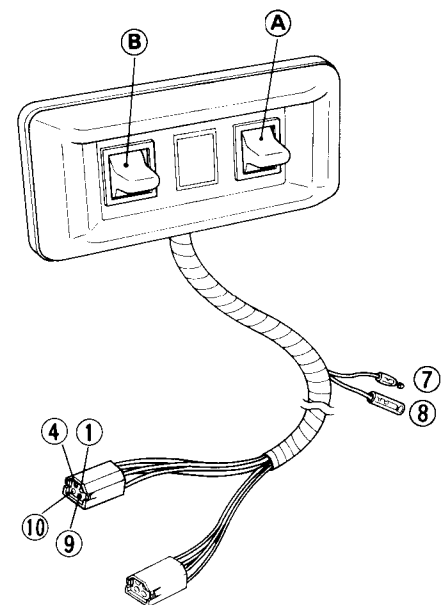
Main switch

(A) Driver side

	UP	N	DOWN
1	○		○
4	○	○	○
7	○	○	○
8	○	○	○

(B) Assist side

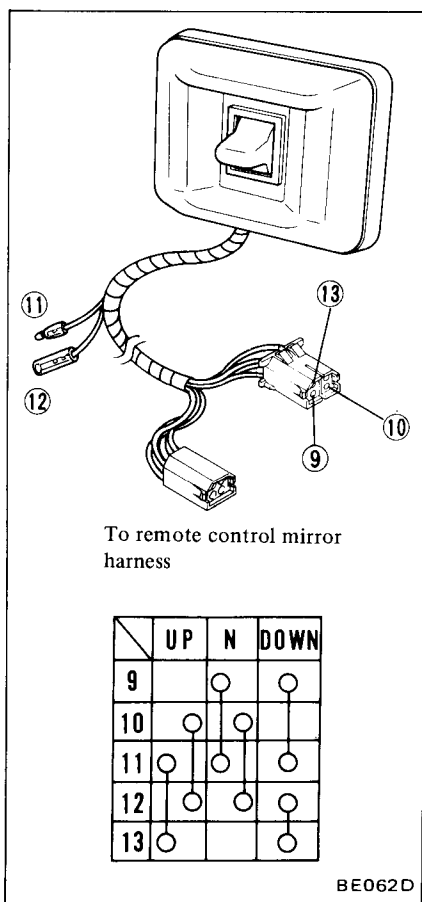
	UP	N	DOWN
1	○		○
4	○	○	○
9	○	○	○
10	○	○	○



To remote control mirror

SEL549

Sub-switch



Power window motor

Test as follows:

1. Apply DC 12 volt to motor terminal and make sure that motor rotates.
2. Then reverse polarity of DC 12 volt power supply and make sure that motor rotates reversely.

Circuit breaker

Test as follows:

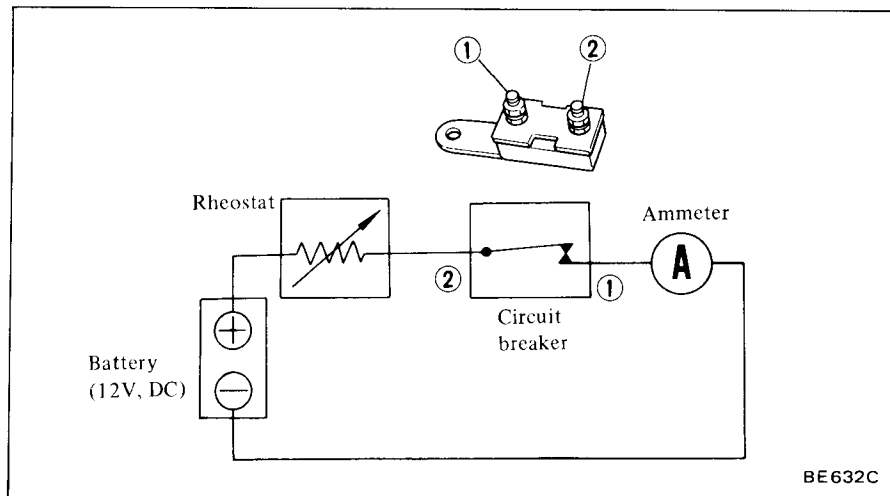
1. Set up a circuit as shown in figure

to the right.

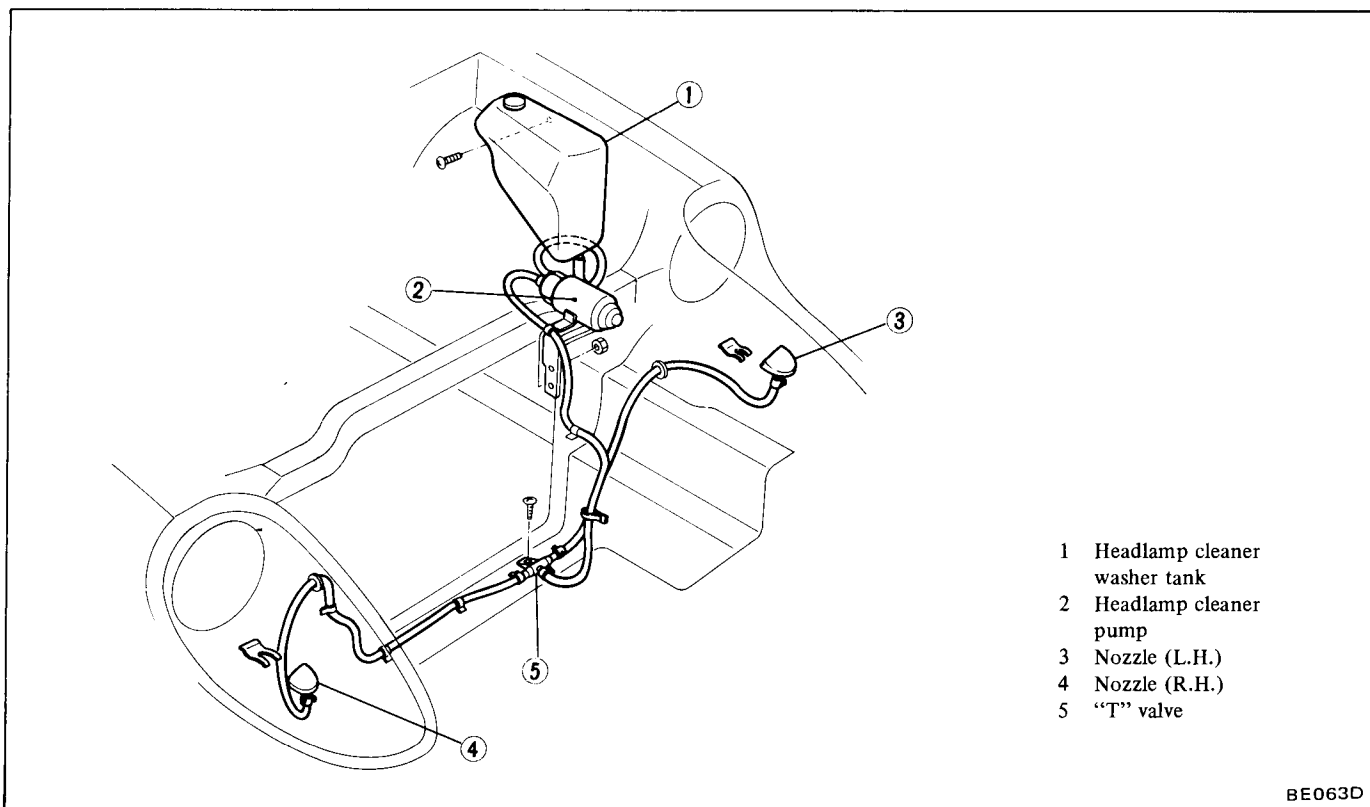
2. Gradually decrease rheostat resistance until ammeter indicates 30 amperes.
3. At this point connector reading should decrease to 0 ampere within between 13 and 35 seconds.

CAUTION:

Use rheostat of below 1 ohm and over 400 watt ratings.



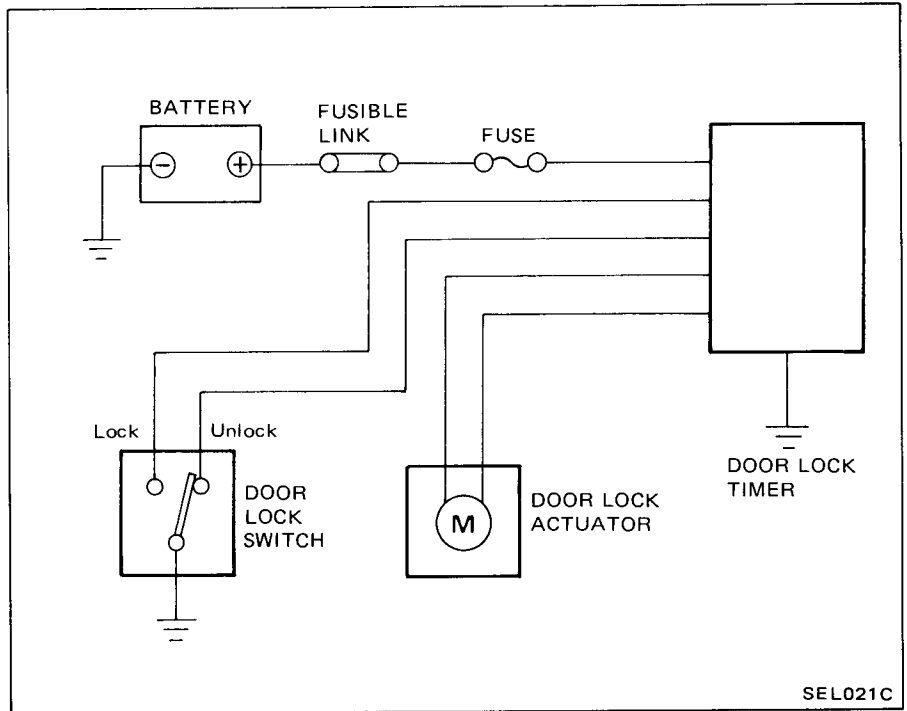
HEADLAMP CLEANER



POWER DOOR LOCK

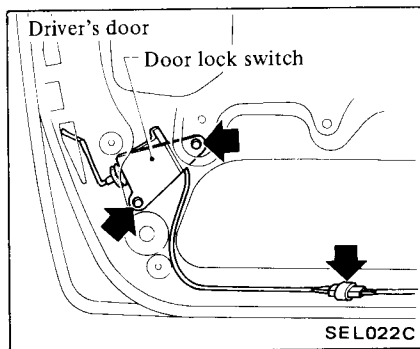
DESCRIPTION

The power door lock consists of a door lock switch, actuator and door lock timer. When the door lock knob or outer door handle key on the driver side is moved to “LOCK” or “UN-LOCK”, the front passenger door is locked or unlocked simultaneously. The front passenger door can be locked or unlocked manually and independently of the driver’s door.

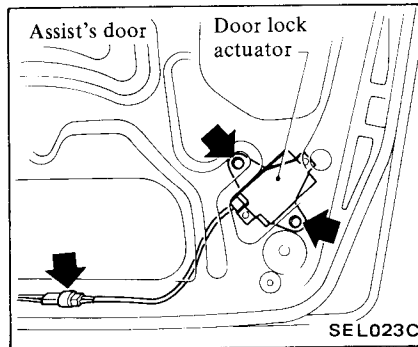


REMOVAL AND INSTALLATION

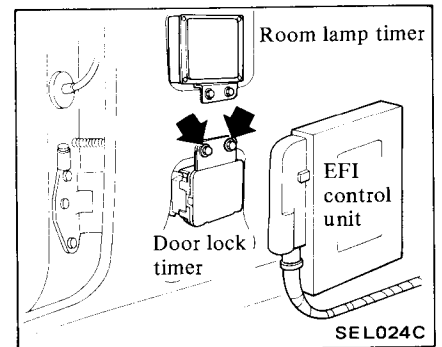
Door lock switch



Door lock actuator

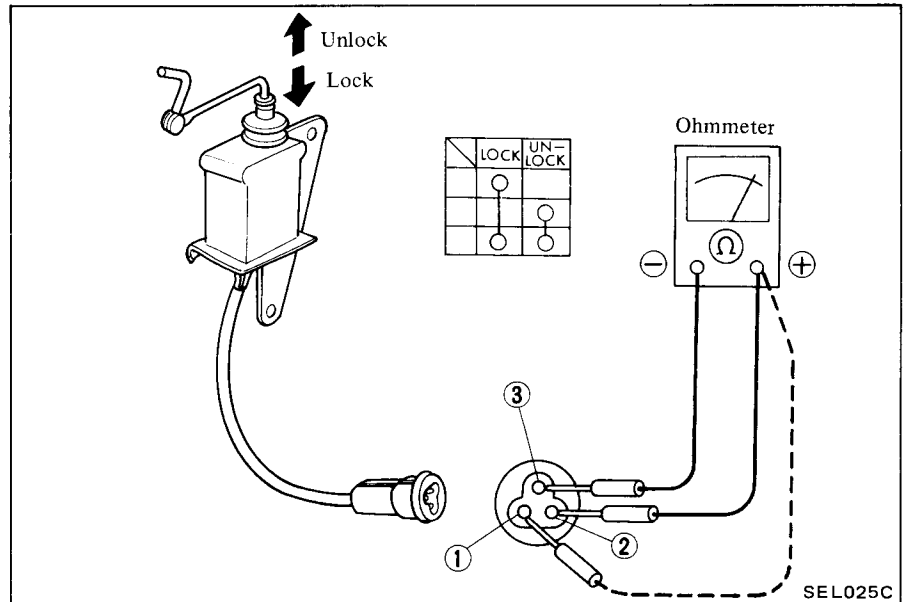


Door lock timer

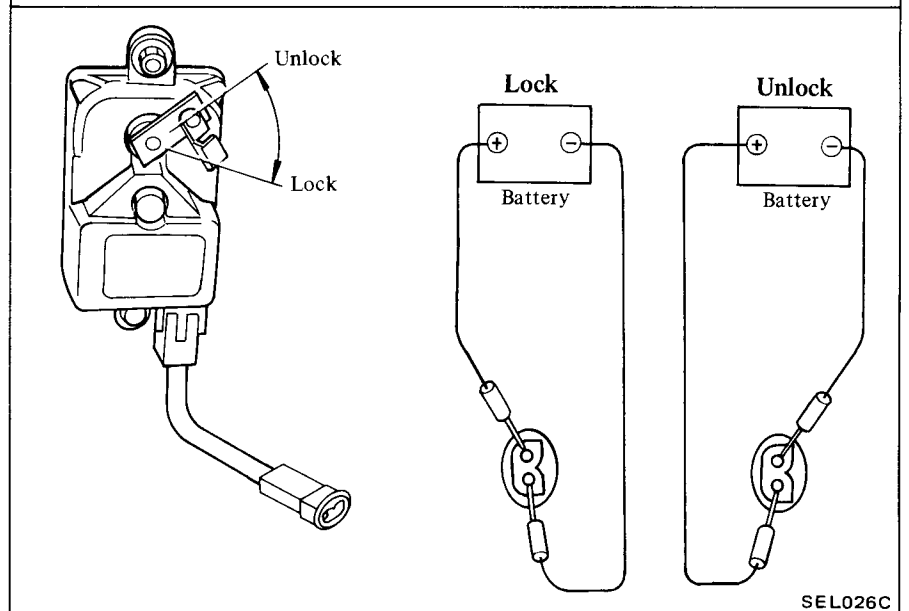


INSPECTION

Door lock switch

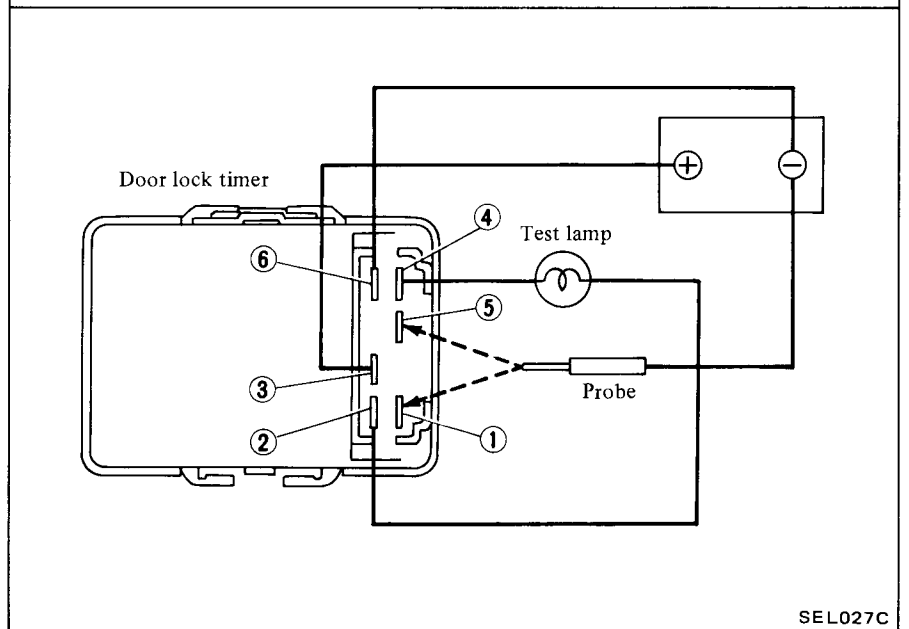


Door lock actuator



Door lock timer

1. Connect test lamp and test lead as shown in figure on the right.
2. Momentarily contact and release terminal ① with probe.
3. Momentarily contact and release terminal ⑤ with probe.
4. Ensure that, when probe contacts terminals in steps 2 and 3, test lamp comes on, then goes out in one to two seconds.

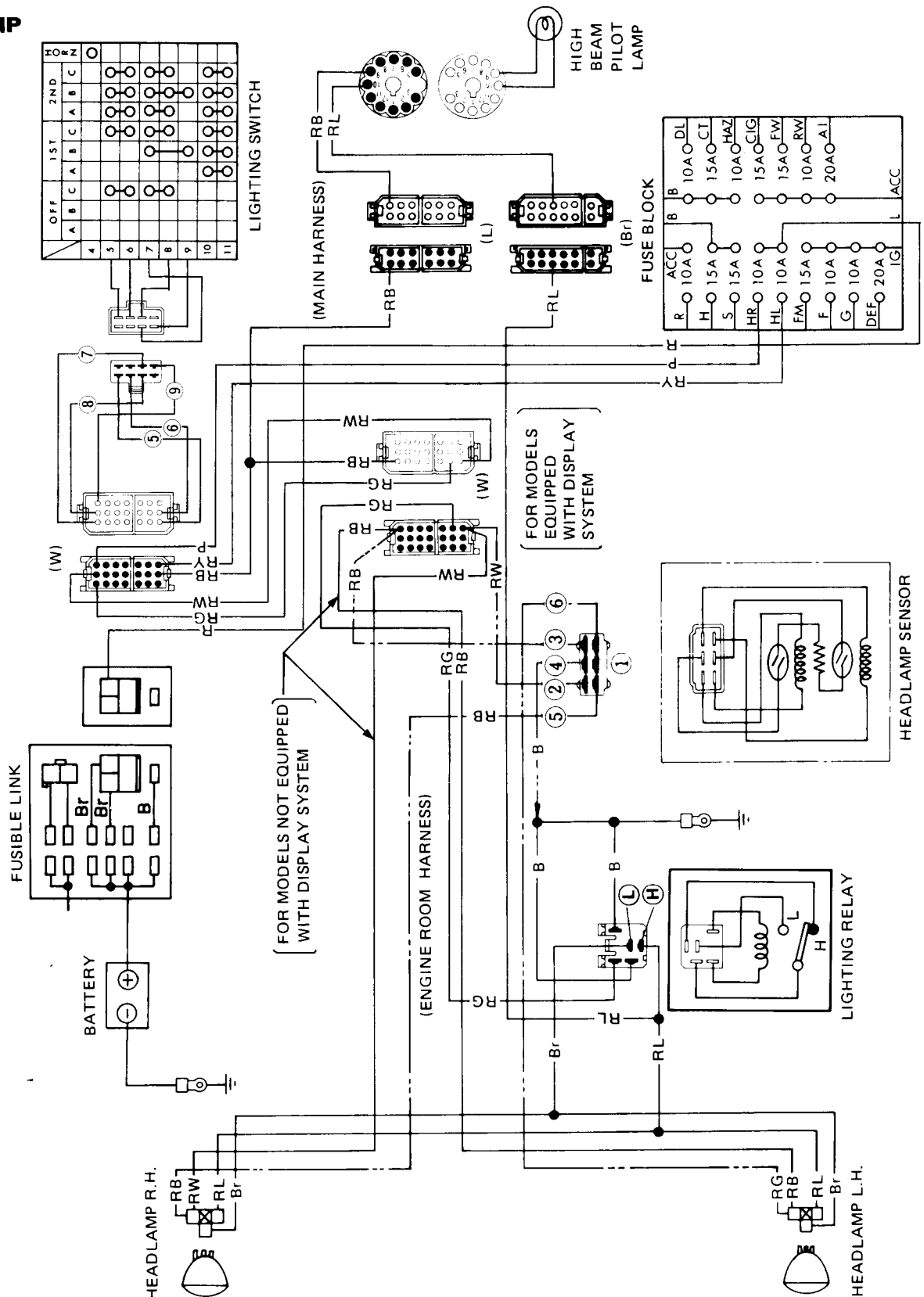


CIRCUIT DIAGRAMS AND TROUBLE DIAGNOSES

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

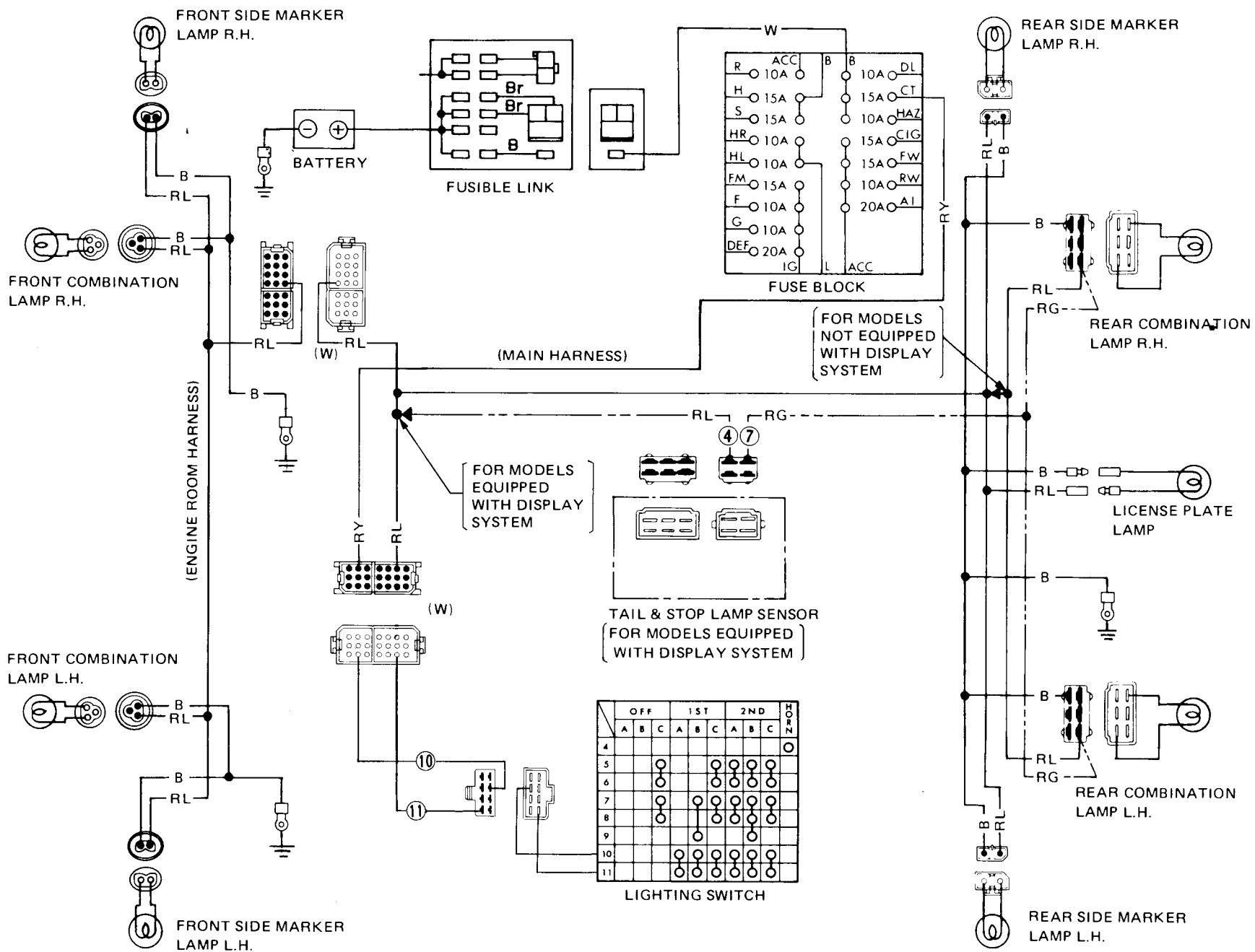
LIGHTING SYSTEM

HEADLAMP

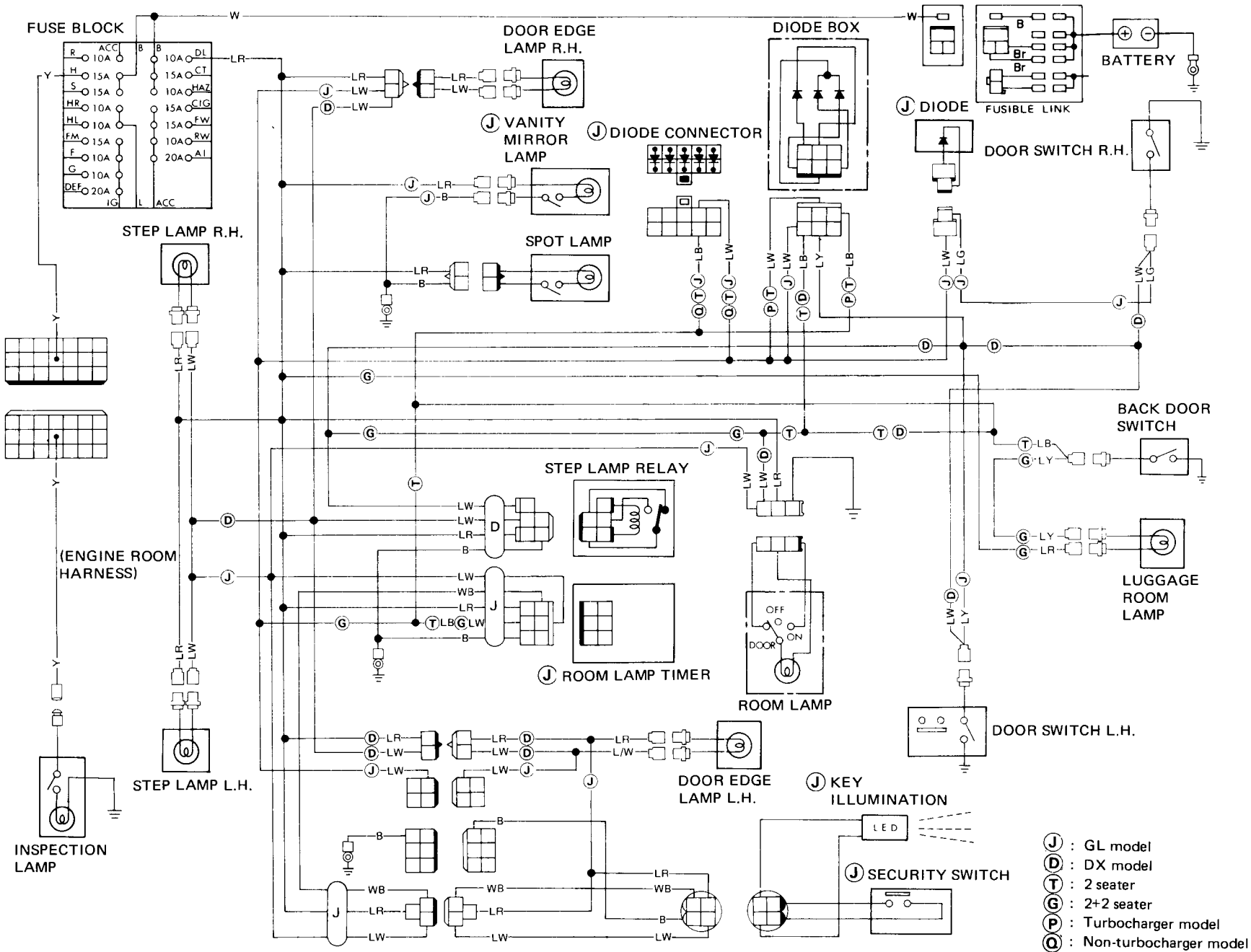


Condition	Probable cause	Corrective action
Headlamps do not come on either high or low beams.	<p>Burnt fusible link.</p> <p>Loose connection or open circuit.</p> <p>Faulty lighting switch. [High (low) beam comes on when ⑤ and ⑥, ⑦ and ⑧ (and ⑨) terminals of harness connector to combination switch are connected with test lead including 10A fuse]</p> <p>Faulty lighting relay. [High (low) beam comes on when lighting switch is set to “2nd” position and ④ (①) terminal of harness connector to lighting relay is grounded with test lead including 10A fuse].</p> <p>Faulty headlamp sensor. (For models equipped with display system) [R.H. (L.H.) beam comes on when lighting switch is set to “2nd” position, and ② and ⑤ (③ and ⑥) terminals of harness connector to headlamp sensor are connected with test lead including 10A fuse].</p>	<p>Correct cause and replace fusible link.</p> <p>Check wiring and/or repair connection.</p> <p>Replace if necessary.</p> <p>Replace if necessary.</p> <p>Replace if necessary.</p>
High beam cannot be switched to low beam or vice versa.	<p>Faulty lighting relay. [High (low) beam comes on when lighting switch is set to “2nd” position and ④ (①) terminals of harness connector to lighting relay are connected with test lead including 10A fuse].</p> <p>Faulty lighting switch. [High (low) beam comes on when ⑤ and ⑥, ⑦ and ⑧ (and ⑨) terminals of harness connector to combination switch are connected with test lead including 10A fuse]</p>	<p>Replace if necessary.</p> <p>Replace if necessary.</p>
Headlamps dim.	<p>Partly discharged or run-down battery.</p> <p>Inoperative charging system.</p> <p>Poor ground or loose connection.</p>	<p>Measure specific gravity of electrolyte and recharge or replace battery if necessary.</p> <p>Measure voltage at headlamp terminals. If it is less than 12.8V, check charging system for proper operation.</p> <p>Clean and/or tighten.</p>
Headlamp lights on only one side.	<p>Loose headlamp connection.</p> <p>Faulty headlamp beam.</p>	<p>Repair.</p> <p>Replace.</p>
One headlamp dim	Burnt fuse.	Correct cause and replace.

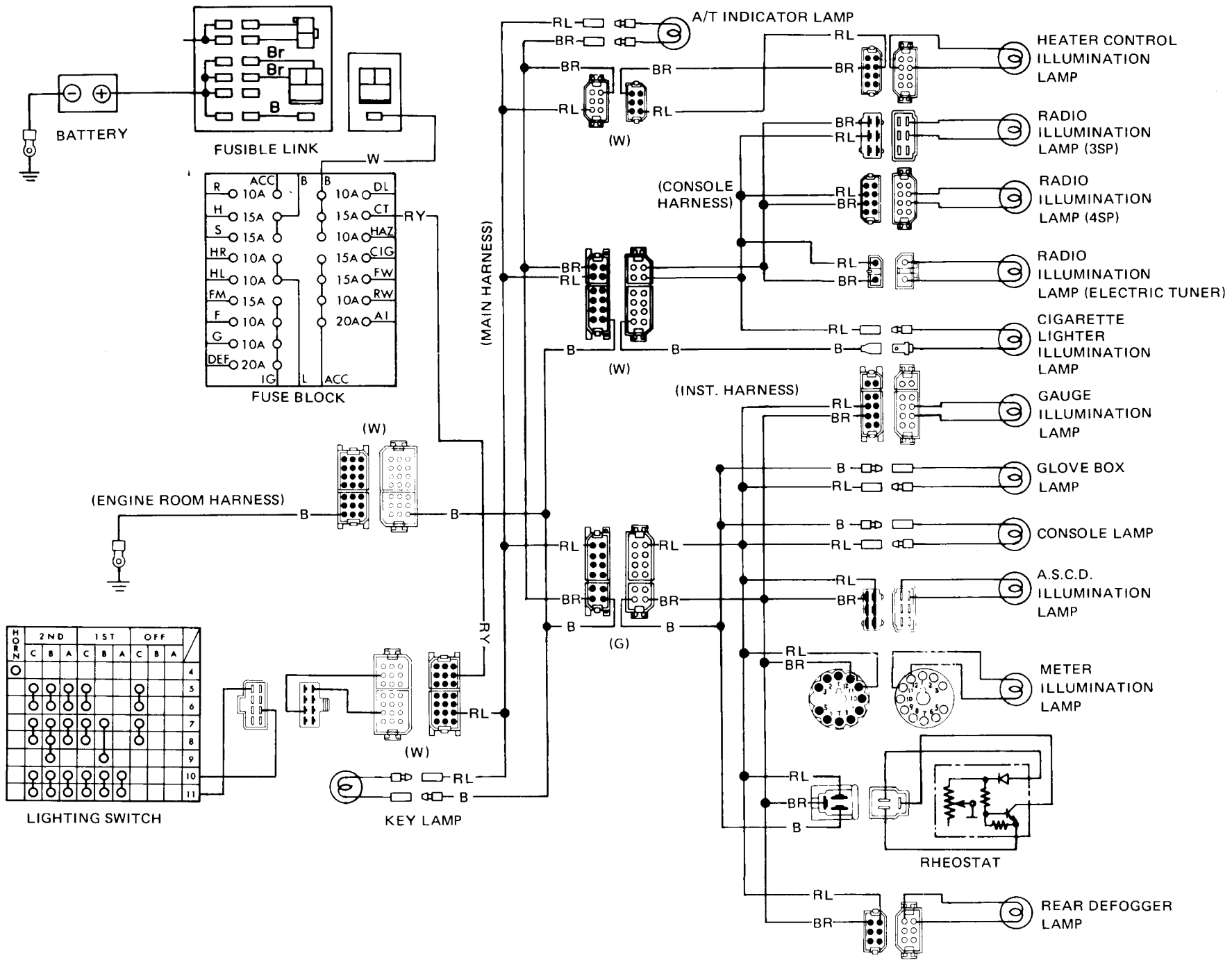
TAIL, CLEARANCE, SIDE MARKER AND LICENSE PLATE LAMP



Condition	Probable cause	Corrective action
Neither left nor right lamp lights.	Burnt fuse. Loose connection or open circuit. Faulty lighting switch. [Lamps light when ⑩ and ⑪ terminals of harness connector to combination switch are connected with test lead including 10A fuse].	Correct cause and replace. Check wiring and/or repair connection. Replace if necessary.
Neither side of tail lamp lights.	Faulty or loose connection of tail and stop lamp sensor. (For models equipped with display system) [Tail lamps light when ④ and ⑦ terminals of harness connector to tail and stop lamp sensor are connected with test lead including 10A fuse].	Check and repair or replace.
Lamp on only one side does not light.	Burnt bulb. Loose bulb. Loose connection to lamp.	Replace. Correct. Correct.

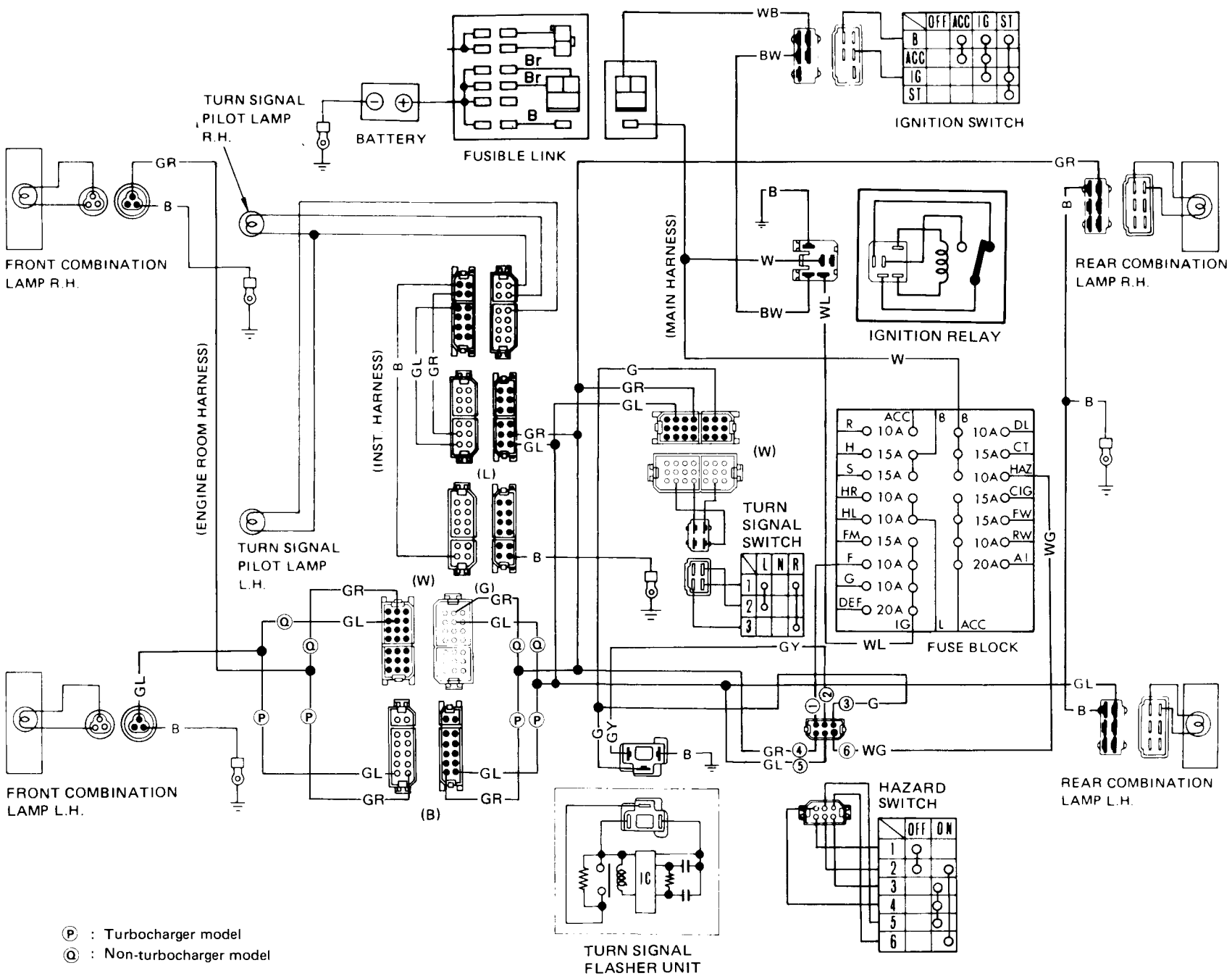
SECURITY (ROOM, STEP, DOOR EDGE), LUGGAGE ROOM, SPOT AND ILLUMINATION LAMPS

ILLUMINATION LAMP

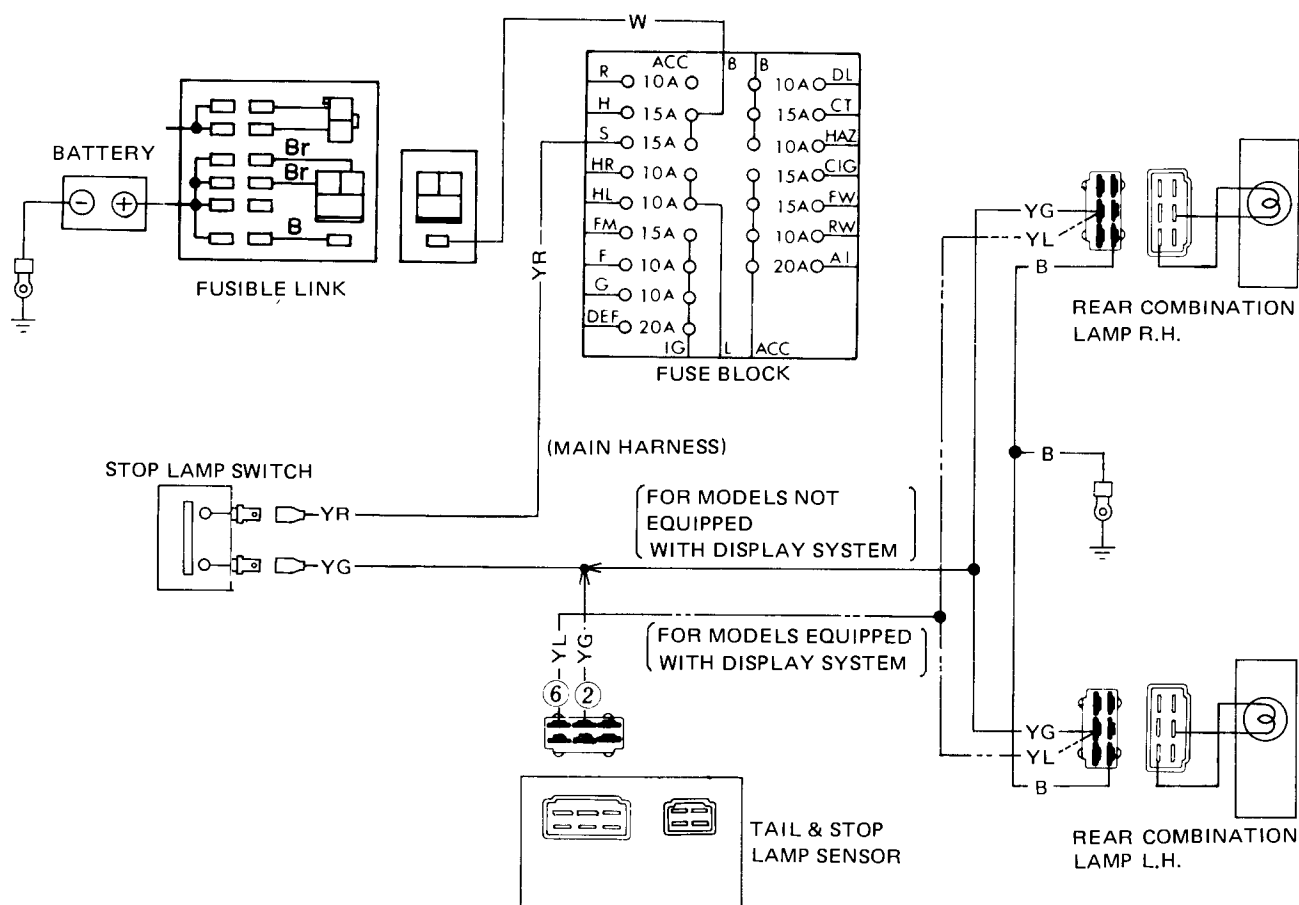


SIGNAL SYSTEM

TURN SIGNAL AND HAZARD WARNING LAMP



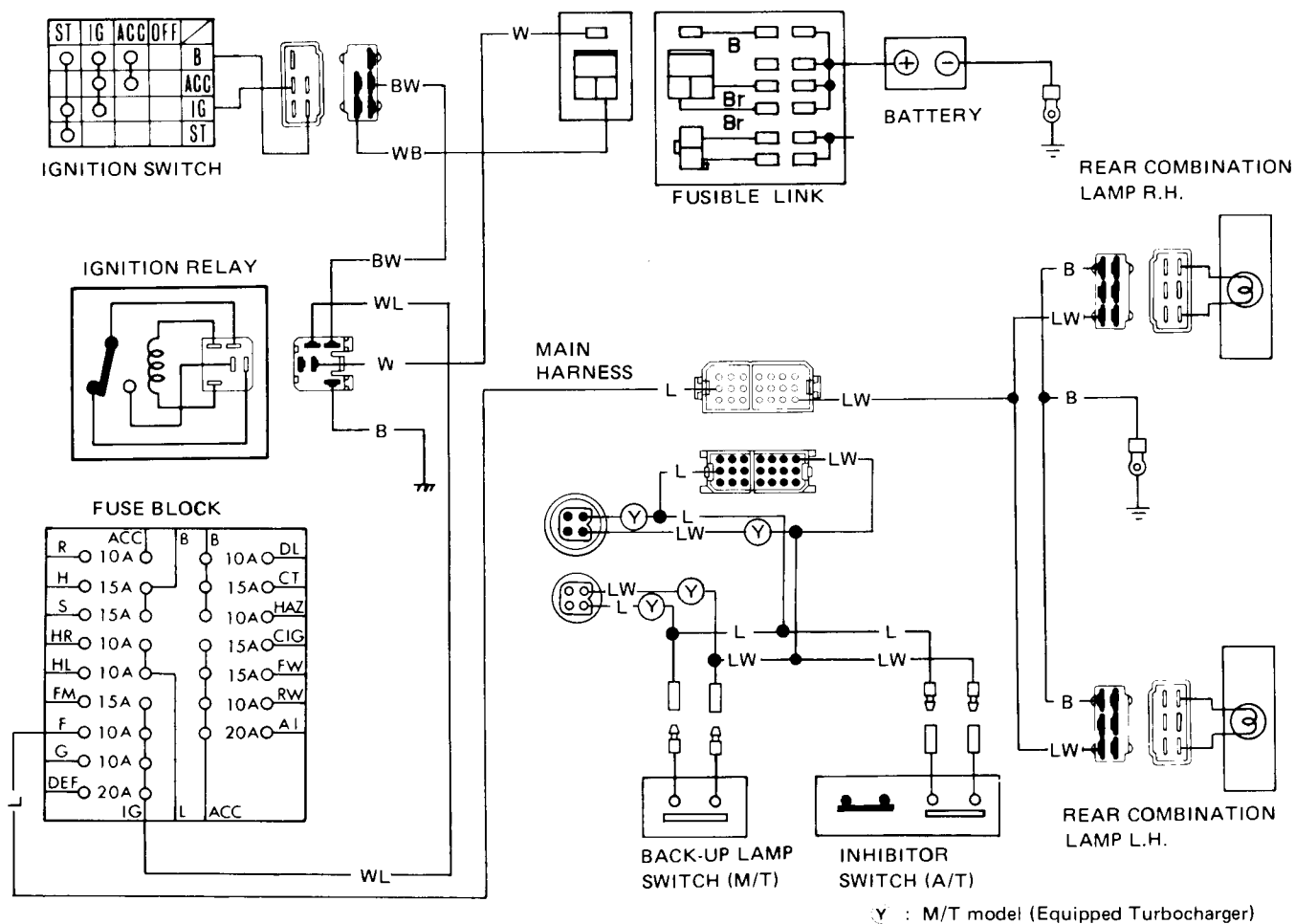
Condition	Probable cause	Corrective action
Turn signals do not operate. (Hazard warning lamps operate)	Burnt fuse. Loose connection or open circuit. Faulty flasher unit. Faulty turn signal switch. Faulty hazard switch. [Turn signals operate when ① and ② terminals of harness connector to hazard switch are connected with test lead including 10A fuse].	Correct cause and replace. Check wiring and/or repair connection. Replace. Conduct continuity test and replace if necessary. Replace if necessary.
Hazard warning lamps do not operate. (Turn signals operate)	Burnt fuse. Faulty hazard warning flasher unit. Faulty hazard switch. [Left (Right) side lamps operate when ③ and ⑤ (③ and ④) terminals of harness connector to hazard switch are connected with test lead including 10A fuse].	Correct cause and replace. Replace. Replace if necessary.
No flasher click is heard.	Burnt bulb. Loose connection.	Replace. Reconnect firmly.
Flashing cycle is too slow (Pilot lamp does not go out.), or too fast.	Bulb other than specified wattage being used. Burnt bulbs. Loose connection. Faulty flasher unit.	Replace with one specified. Replace. Repair. Replace.
Flashing cycle is irregular.	Burnt bulb. Loose connection. Bulbs other than specified wattage being used.	Replace. Repair. Replace with one specified.

STOP LAMP

SEL033C

Condition	Probable cause	Corrective action
Neither left nor right lamp lights.	Burnt fuse. Faulty stop switch. Faulty tail and stop lamp sensor (For models equipped with display system) [Stop lamps light when ② and ⑥ terminals of main harness connector to tail and stop lamp sensor are connected with test lead including 10A fuse]. Loose connection or open circuit.	Correct cause and replace. Conduct continuity test and replace if necessary. Replace if necessary. Check wiring and/or repair connection.
Lamp on only one side lights.	Burnt bulb. Loose bulb. Loose connection or open circuit.	Replace. Repair lamp socket. Check wiring and/or repair connection.

BACK-UP LAMP



SEL034C

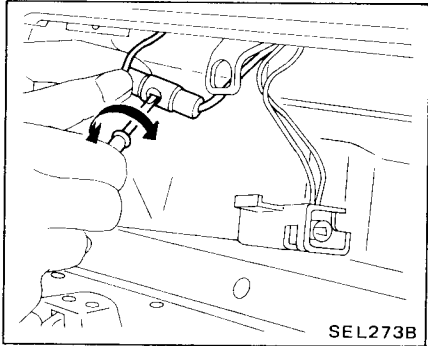
Condition	Probable cause	Corrective action
Neither left nor right lamp lights.	Faulty back-up lamp switch (M/T) or inhibitor switch (A/T). Burnt fuse. Loose connection or open circuit.	Conduct continuity test and replace if necessary. Correct cause and replace. Check wiring and/or repair connection.
Lamp on only one side lights.	Burnt bulb. Loose bulb. Loose connection or open circuit.	Replace. Repair lamp socket. Check wiring and/or repair connection.



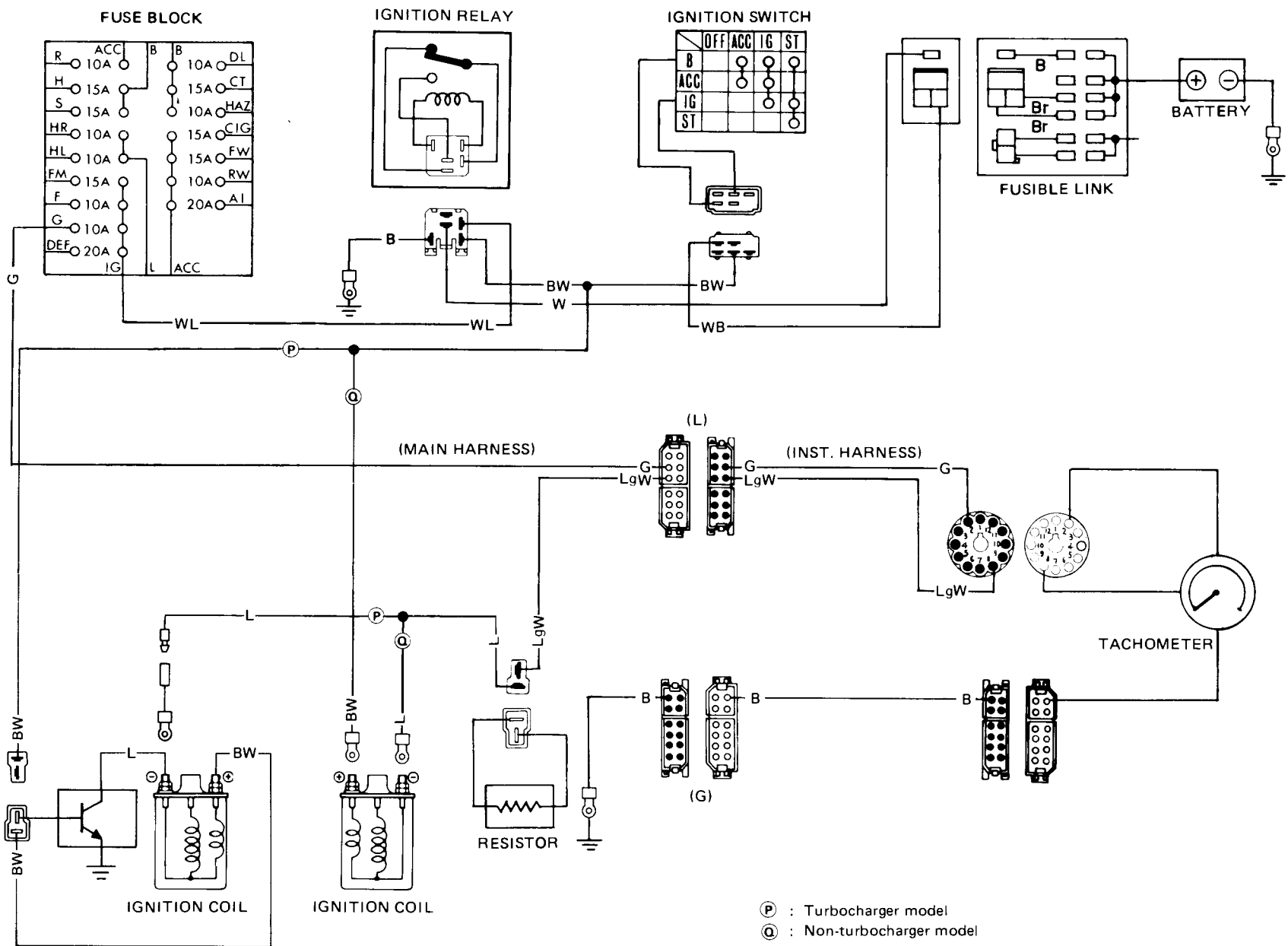
Condition	Probable cause	Corrective action
Neither high nor low horn operates.	<p>Burnt fuse.</p> <p>Faulty horn button contact. [Horn sounds when ④ terminal of inst. harness connector to combination switch is grounded.]</p> <p>Faulty horn relay. [Horn sounds when ① and ③ terminals of engine harness to horn relay are connected with a test lead including 10A fuse.]</p> <p>Loose connection or open circuit.</p>	<p>Correct cause and replace fuse.</p> <p>Repair horn button.</p> <p>Replace.</p> <p>Check wiring and/or repair connection.</p>
High (Low) horn does not operate.	<p>Faulty horn or loose horn terminal connection.</p> <p>Break in wire to horn.</p>	<p>Correct horn terminal connection or replace horn.</p> <p>Repair.</p>
Horn does not stop to sound.	<p>Short-circuited horn button and/or horn button lead wire. [When inst. harness is disconnected from combination switch, horn stops sounding.]</p> <p>Faulty horn relay.</p>	<p>Repair horn button or its wiring.</p> <p>Replace.</p>
Reduced volume and/or tone quality.	<p>Loose or poor connector contact. (Fuse, relay, horn and/or horn button.)</p> <p>Faulty horn.</p>	<p>Repair.</p> <p>Replace.</p>

[illegible]

Condition	Probable cause	Corrective action
Water temperature gauge		
Gauge does not operate.	Faulty thermal transmitter or loose terminal connection. (When yellow wire to thermal transmitter is grounded, gauge pointer fluctuates.) Faulty water temperature gauge.	Replace thermal transmitter or correct terminal connection. Replace 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.)	Replace thermal transmitter. Replace water temperature gauge.
Gauge does not operate accurately.	Faulty water temperature gauge. Loose or poor connection.	Replace water temperature gauge. Correct connector terminal contact.
Oil pressure gauge		
Oil pressure gauge does not operate.	Faulty oil pressure sending unit or loose terminal connection.	Replace oil pressure sending unit or correct terminal connection.
Gauge indicates only maximum pressure.	Faulty oil pressure gauge unit. (Gauge pointer returns to original position when ignition switch is turned off.) Faulty oil pressure gauge. (Gauge pointer indicates maximum pressure even after ignition switch is turned off.)	Replace. Replace.
Fuel level gauge		
Main (Sub) fuel level gauge does not operate.	Faulty fuel gauge tank unit. [Pointer deflects when fuel gauge tank unit yellow (yellow-blue) wire is grounded.] Faulty fuel level gauge. Loose connection or open circuit.	Replace fuel gauge tank unit. Replace. Check wiring and/or repair connection.
Pointer indicates only "F" ("¼") position.	Faulty fuel gauge tank unit. Faulty fuel level gauge.	Replace. Replace.
Fuel level gauge does not operate accurately.	Faulty fuel gauge tank unit. Faulty fuel level gauge. Poor or loose connection. Faulty gauge voltage regulator. (Gauge pointer fluctuates excessively)	Replace. Replace fuel level gauge. Correct connector terminal contact. Replace water temperature gauge (Sub).
Voltmeter		
Voltmeter does not operate, or abnormally indicates.	Faulty voltmeter. Loose or poor connection.	Replace. Check wiring and/or repair connection.

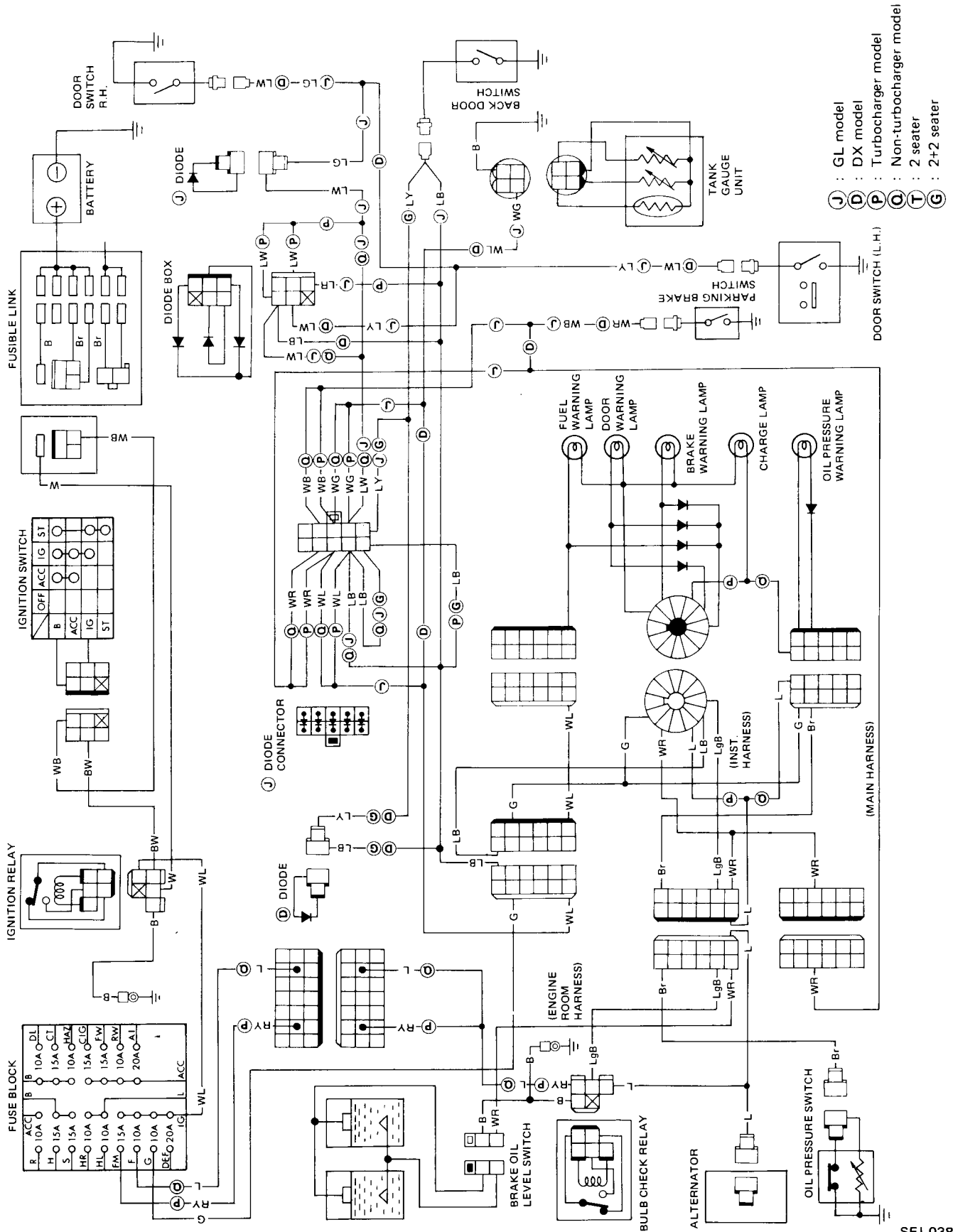
Condition	Probable cause	Corrective action
Oil temperature gauge Gauge does not operate, or does not give proper reading.	Faulty oil temperature gauge. Faulty oil temperature sensor. Loose or poor connection.	Replace. Replace. Check wiring and/or repair connection.
Boostmeter Boostmeter does not operate, or does not give proper reading.	Loose vacuum hose (between boost sensor and intake manifold). Faulty boostmeter. Faulty boost sensor. Loose or poor connection.	Repair. Replace. Replace. Check wiring and/or repair connection.
	Adjusting 0 kPa (0 mmHg, 0 inHg) point Use a screwdriver to adjust trimmer located on interior upper wall of glove compartment.	
		

TACHOMETER



SPEEDOMETER

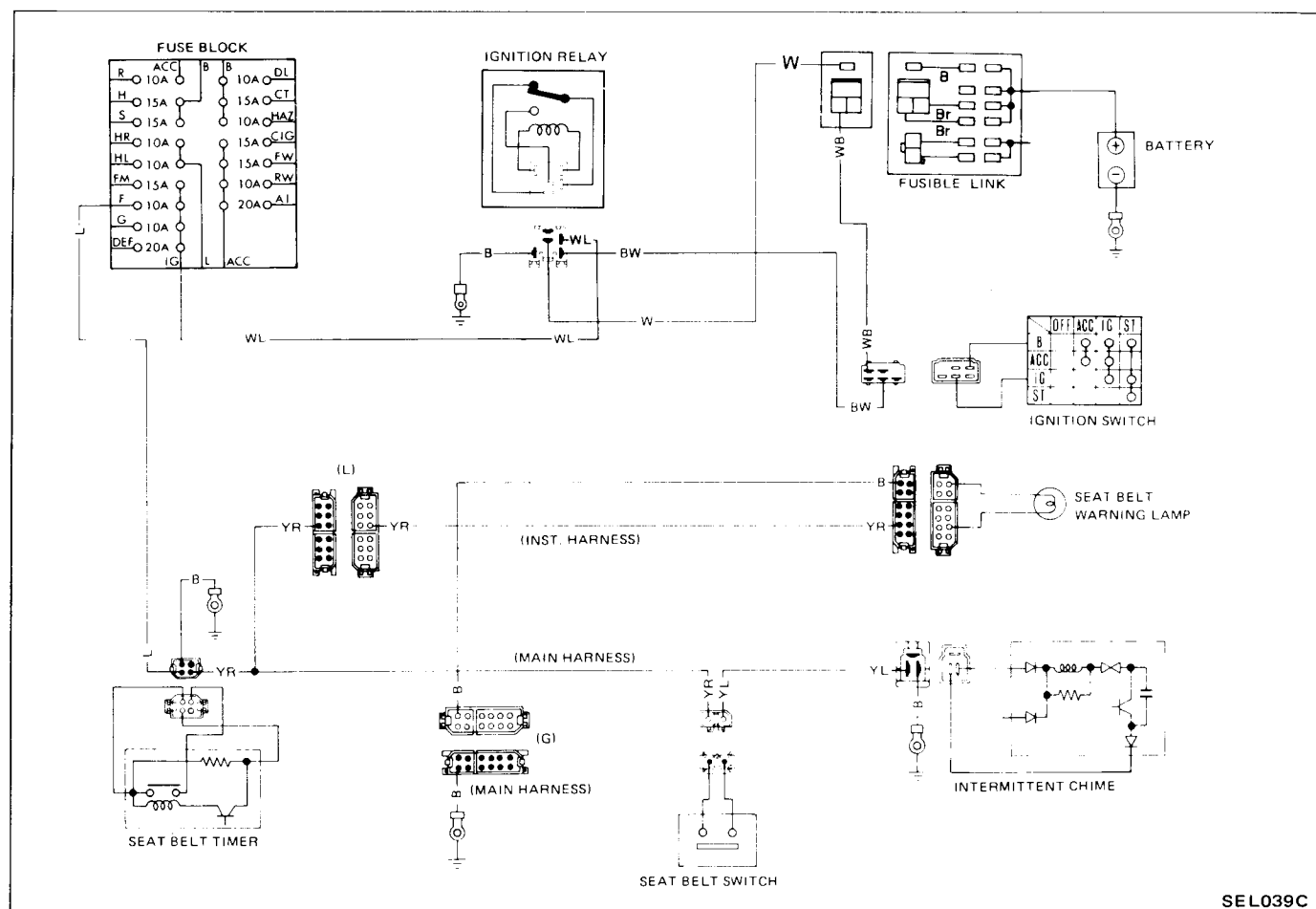
Condition	Probable cause	Corrective action
Neither speedometer pointer nor odometer operates.	Loose speedometer cable union nut. Broken speedometer cable No. 1 or No. 2. Damaged speedometer drive pinion gear (Transmission side). Faulty speedometer.	Retighten. Replace. Replace. Replace.
Unstable speedometer pointer.	Improperly tightened or loose speedometer cable union nut. Damaged speedometer cable. Faulty speedometer.	Retighten. Replace. Replace.
Unusual sound occurs in response to increase in driving speed.	Excessively bent or twisted speedometer cable inner wire or lack of lubrication. Faulty speedometer.	Replace or lubricate. Replace.
Inaccurate speedometer indication.	Faulty speedometer.	Replace.
Inaccurate odometer operation.	Improperly meshed second and third gear or worn gears. Faulty feeding due to deformed odometer and pinion carrier.	Replace speedometer. Replace speedometer.

WARNING SYSTEM**BRAKE, CHARGE, FUEL LEVEL, OIL PRESSURE AND DOOR WARNING**

SEL038C

Condition	Probable cause	Corrective action
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 board. Faulty bulb check relay. (When door and fuel warning lamps only do not glow.)	Replace bulb or correct. Correct connector terminal contacts. Replace. Replace.
Door, fuel level and charge warning lamp do not go out when engine is started.	Faulty bulb check relay or alternator.	Correct, adjust or replace.
Charge warning lamp Lamp does not go out when engine is started.	Faulty charging system.	Inspect charging system.
Oil pressure warning lamp Lamp does not light when ignition switch is set to "ON".	Faulty oil pressure switch or loose switch terminal connection. (When lead wire connected to switch is grounded, warning lamp lights.)	Replace or correct connection.
Lamp does not go out while engine is being operated.	Lack of engine oil. Oil pressure too low. Faulty oil pressure switch.	Check oil level and add oil as required. Inspect engine oil pressure system. Replace.
Brake warning lamp Lamp does not go out.	Faulty hand brake switch (When hand brake lever is released). Faulty brake fluid level switch (When brake fluid level is normal).	Replace. Replace.
Door warning lamp Lamp does not glow with door opened and engine running.	Faulty door switch.	Replace.
Fuel warning lamp Lamp does not glow when fuel is almost empty [below about 13.5 liters (3 $\frac{5}{8}$ US gal, 3 Imp gal)].	Faulty fuel tank gauge unit.	Replace.
Lamp does not go out with about specified volume of fuel.	Faulty fuel tank gauge unit.	Replace.

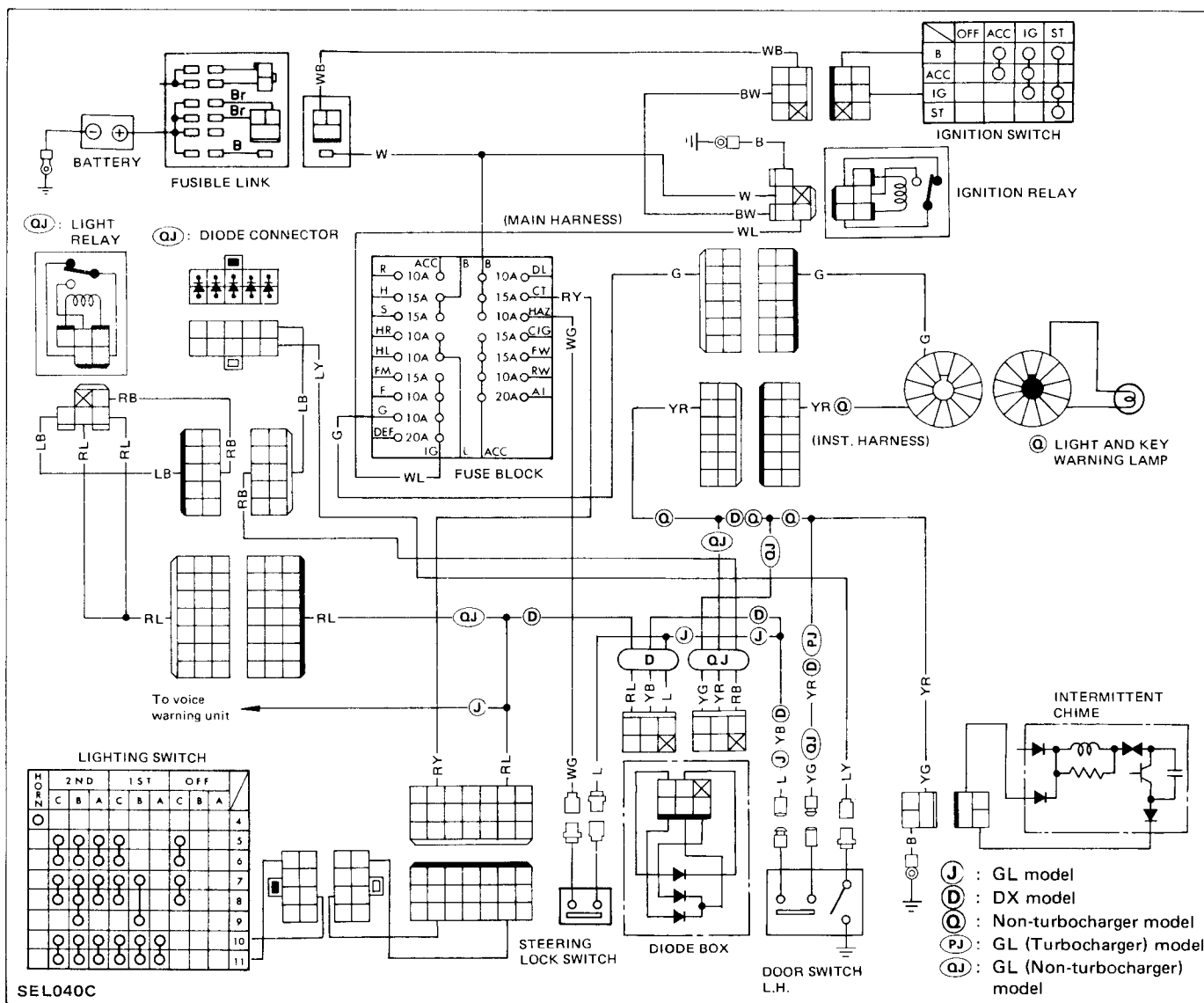
SEAT BELT WARNING



SEL039C

Condition	Probable cause	Corrective action
Seat belt Neither chime sounds nor warning lamp glows when ignition switch is turned to "ON" position. (Lamp should glow for 4 to 8 seconds. Chime should sound for 4 to 8 seconds without fastening seat belt).	Loose connection or open circuit. Faulty timer unit.	Correct connector terminal contacts. Replace.
Either chime or warning lamp does not operate when ignition switch is turned to "ON" position.	Burnt bulb. Loose connection or open circuit. Faulty seat belt switch. Faulty chime	Replace. Correct connector terminal contacts. Repair or replace. Replace.

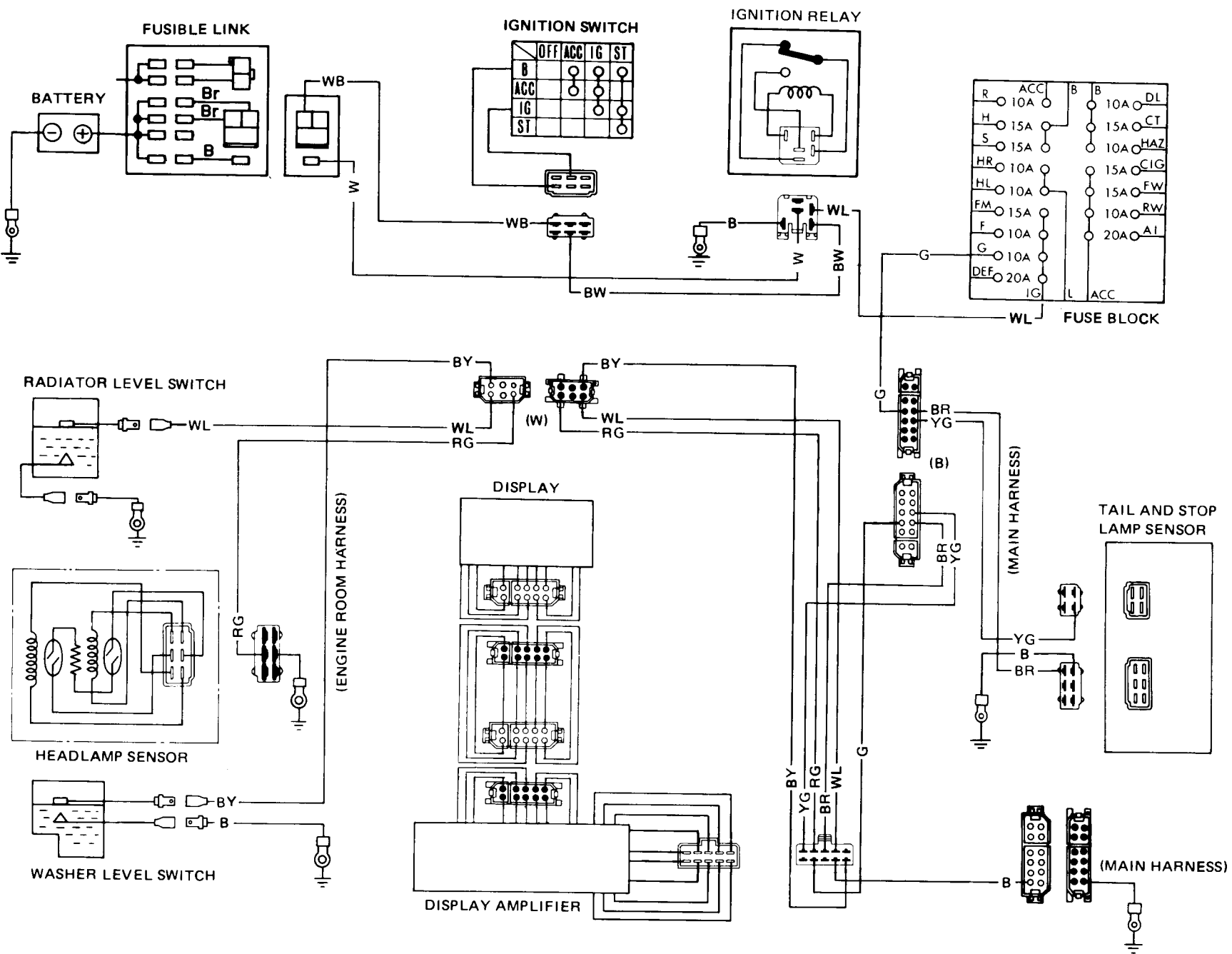
LIGHT AND KEY WARNING



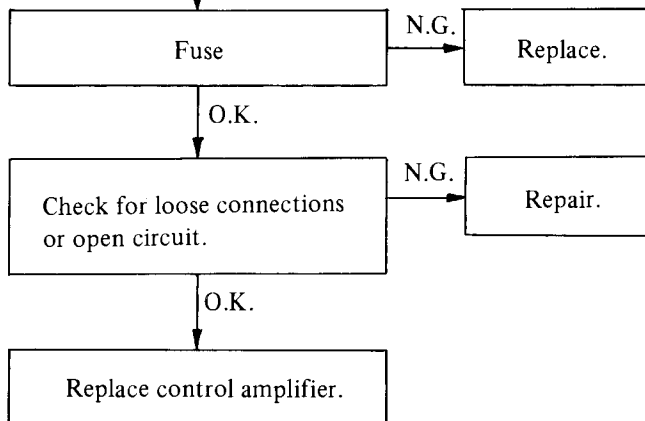
SEL040C

Condition	Probable cause	Corrective action
Light and key Neither chime sounds nor warning lamp glows with ignition key in ignition switch or lighting switch on, when driver side door is open.	Loose connection or open circuit. Faulty door switch. Faulty steering lock switch. Faulty lighting system. (Clearance lamp does not light).	Correct connector terminal contacts. Repair or replace. Repair or replace. Correct.
Either chime or warning lamps do not operate with proper condition.	Loose connection or open circuit. Burnt bulb. Faulty chime	Correct connector terminal contacts. Replace. Replace.

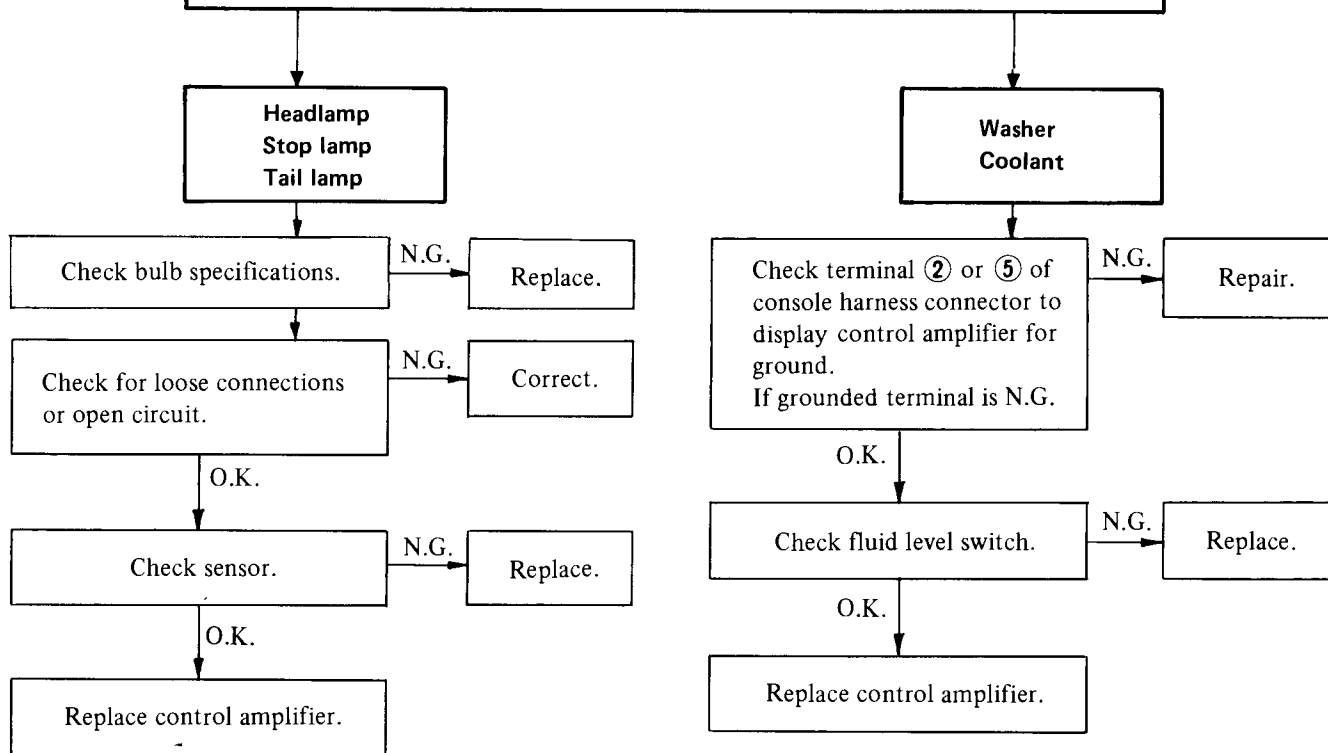
WARNING DISPLAY

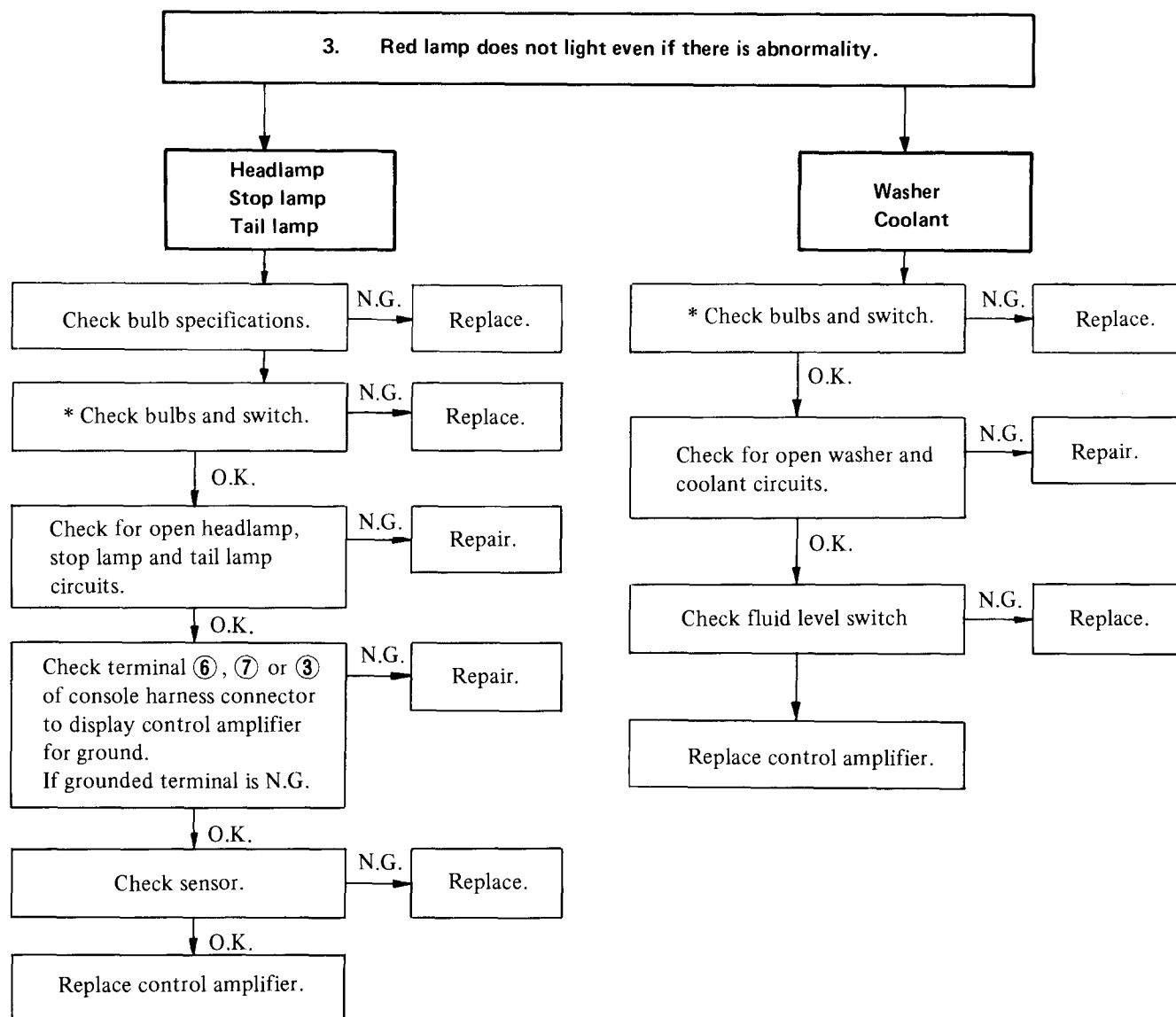


1. No warning is indicated with ignition switch "ON".

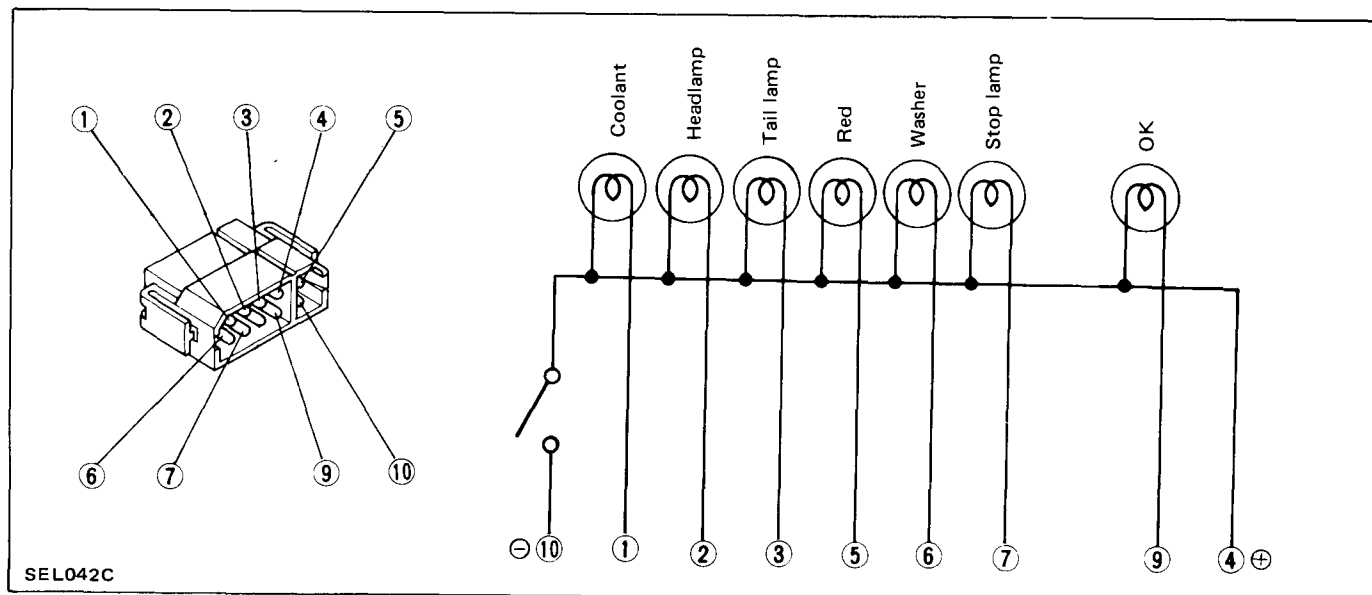


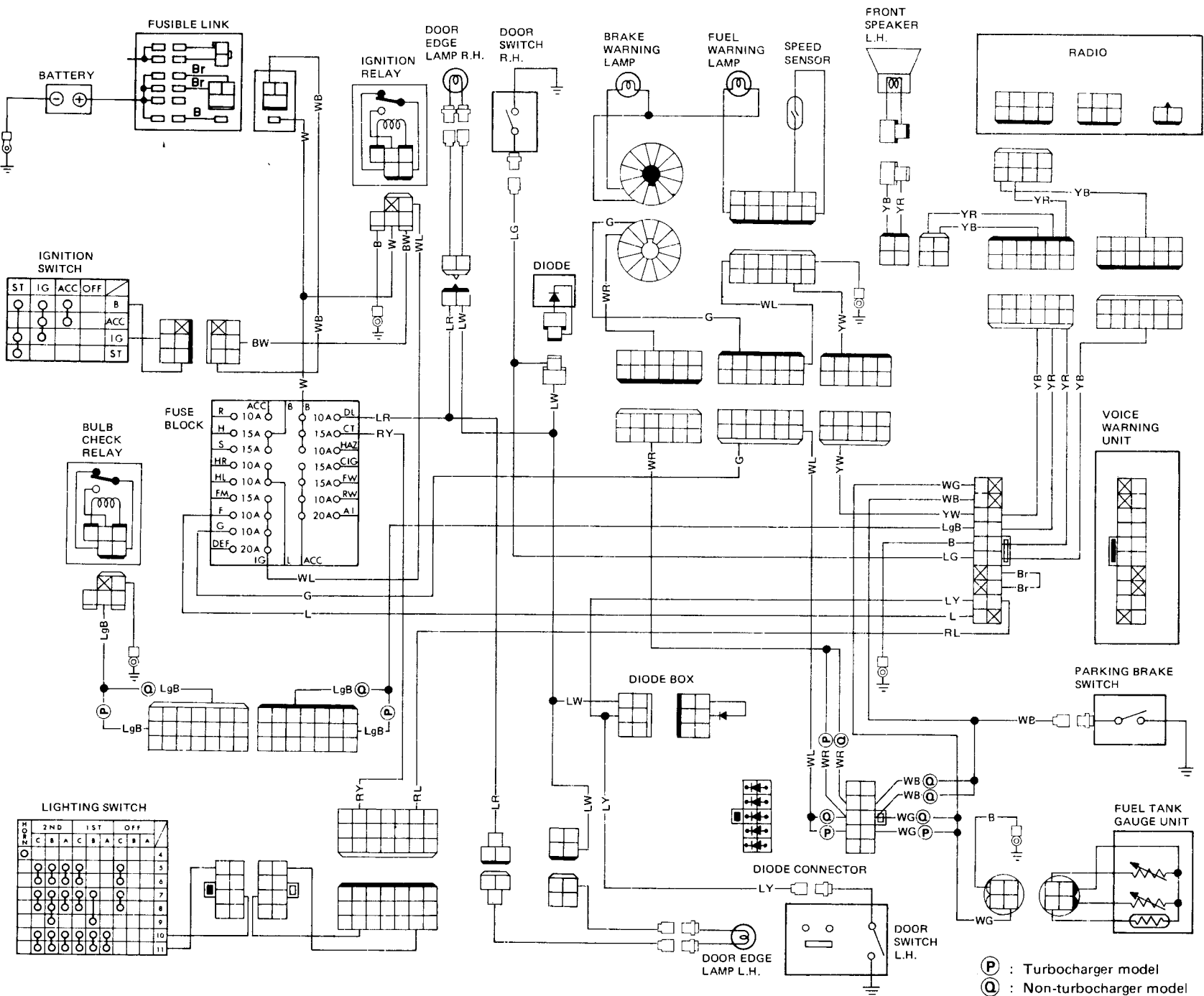
2. Red lamp lights even if there is no abnormality





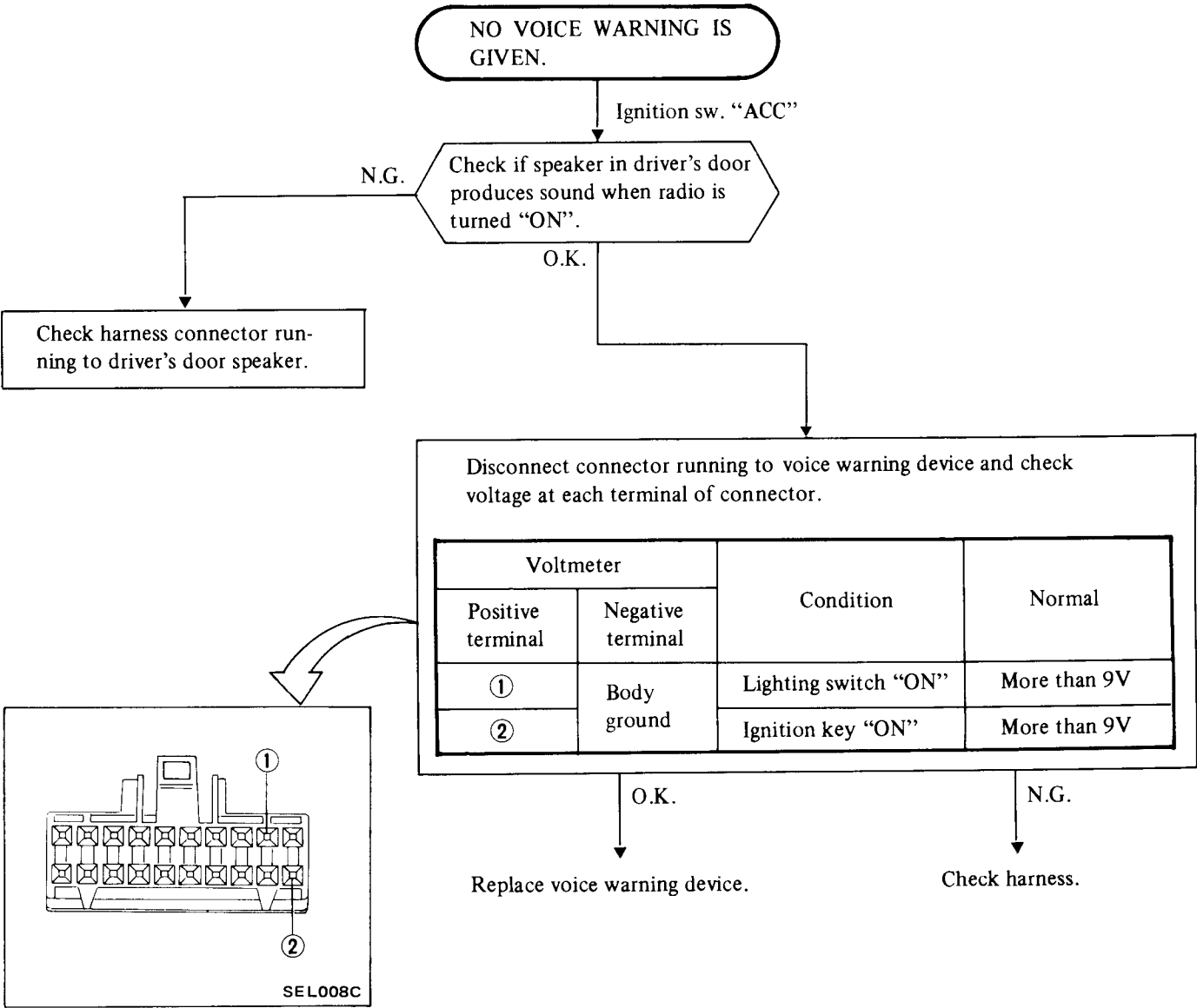
* Method of checking bulbs and switch

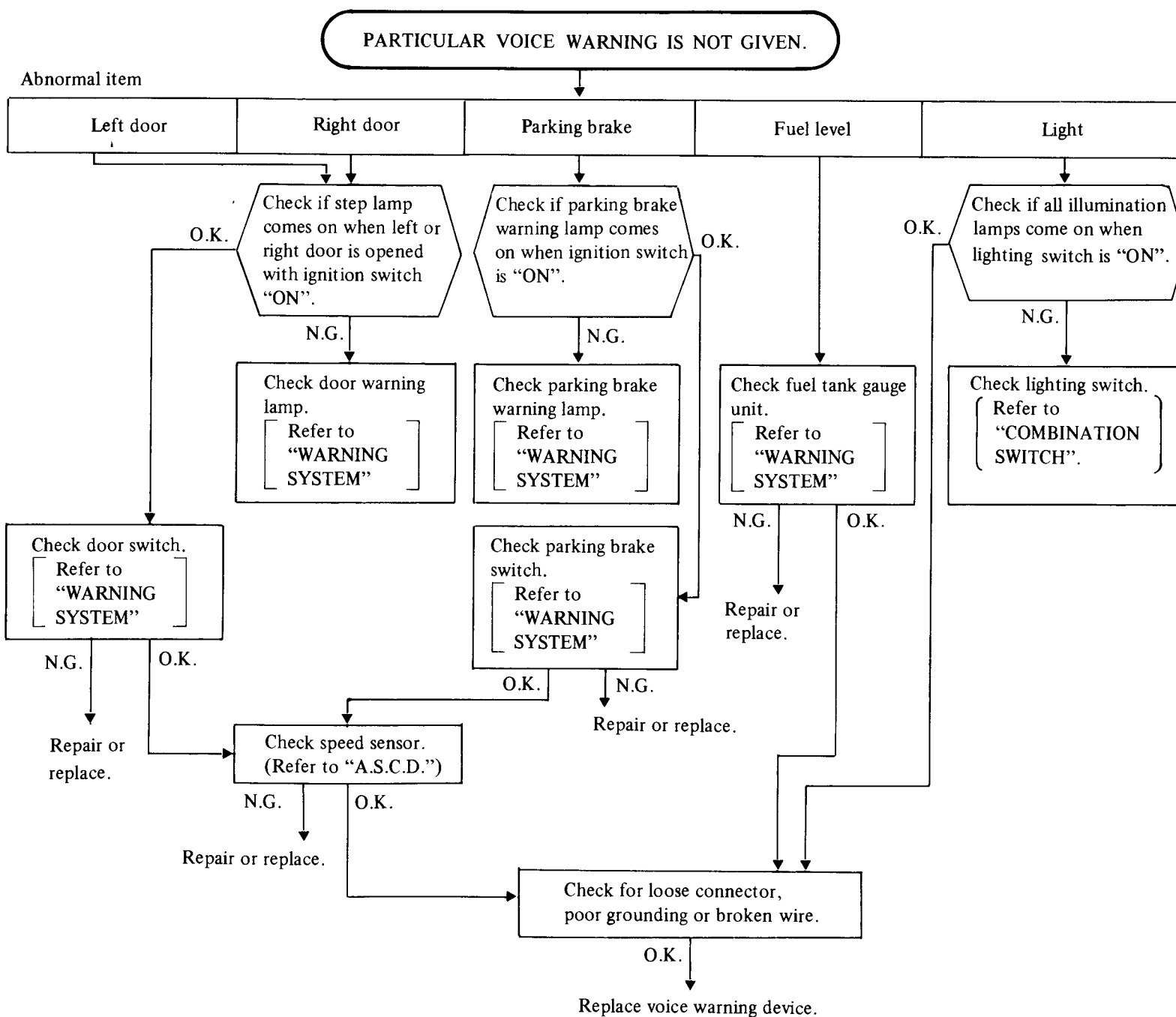




TROUBLE-SHOOTING

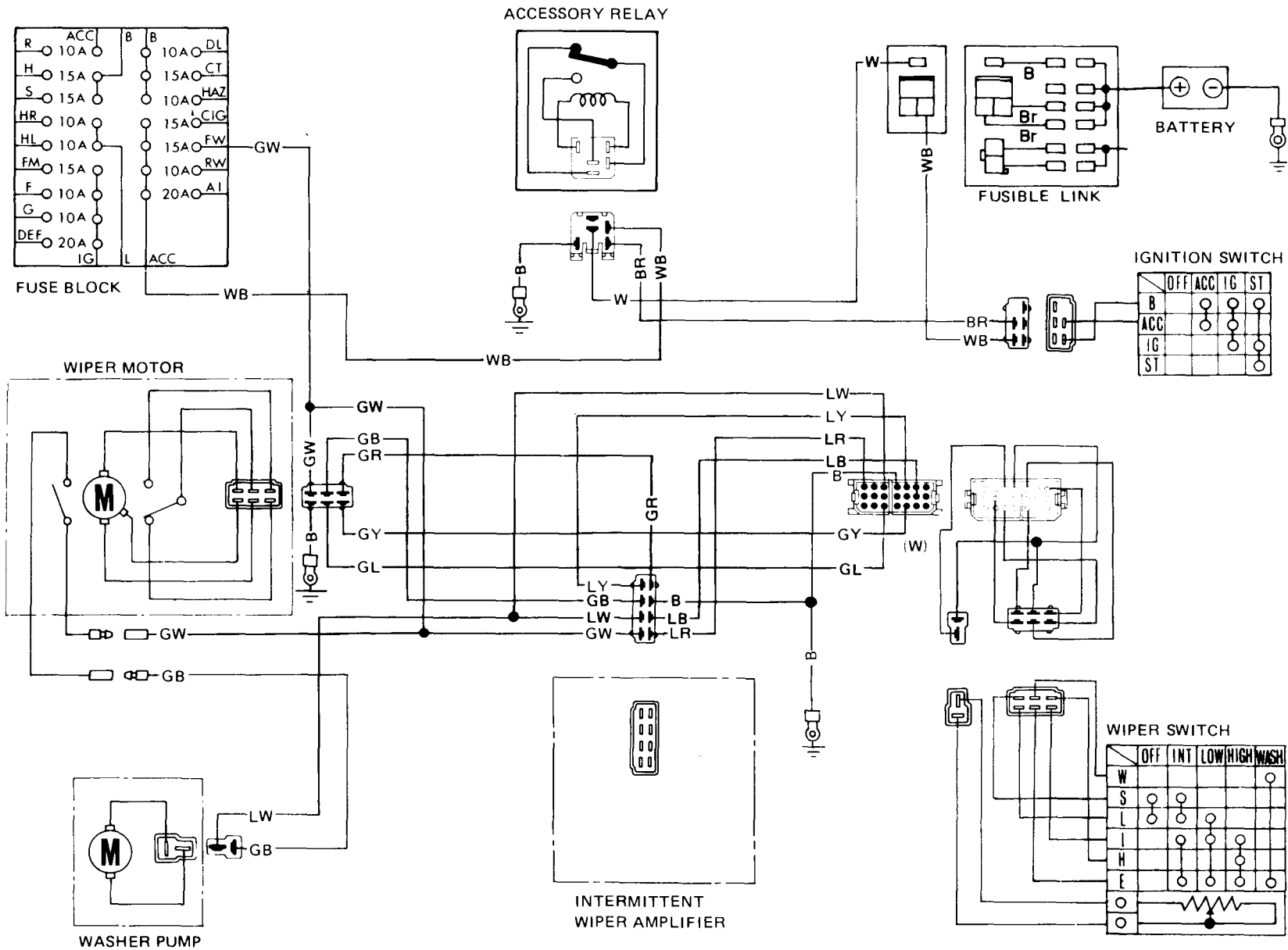
Prior to troubleshooting, perform operational checks.





ELECTRICAL ACCESSORY SYSTEM

WINDSHIELD WIPER AND WASHER



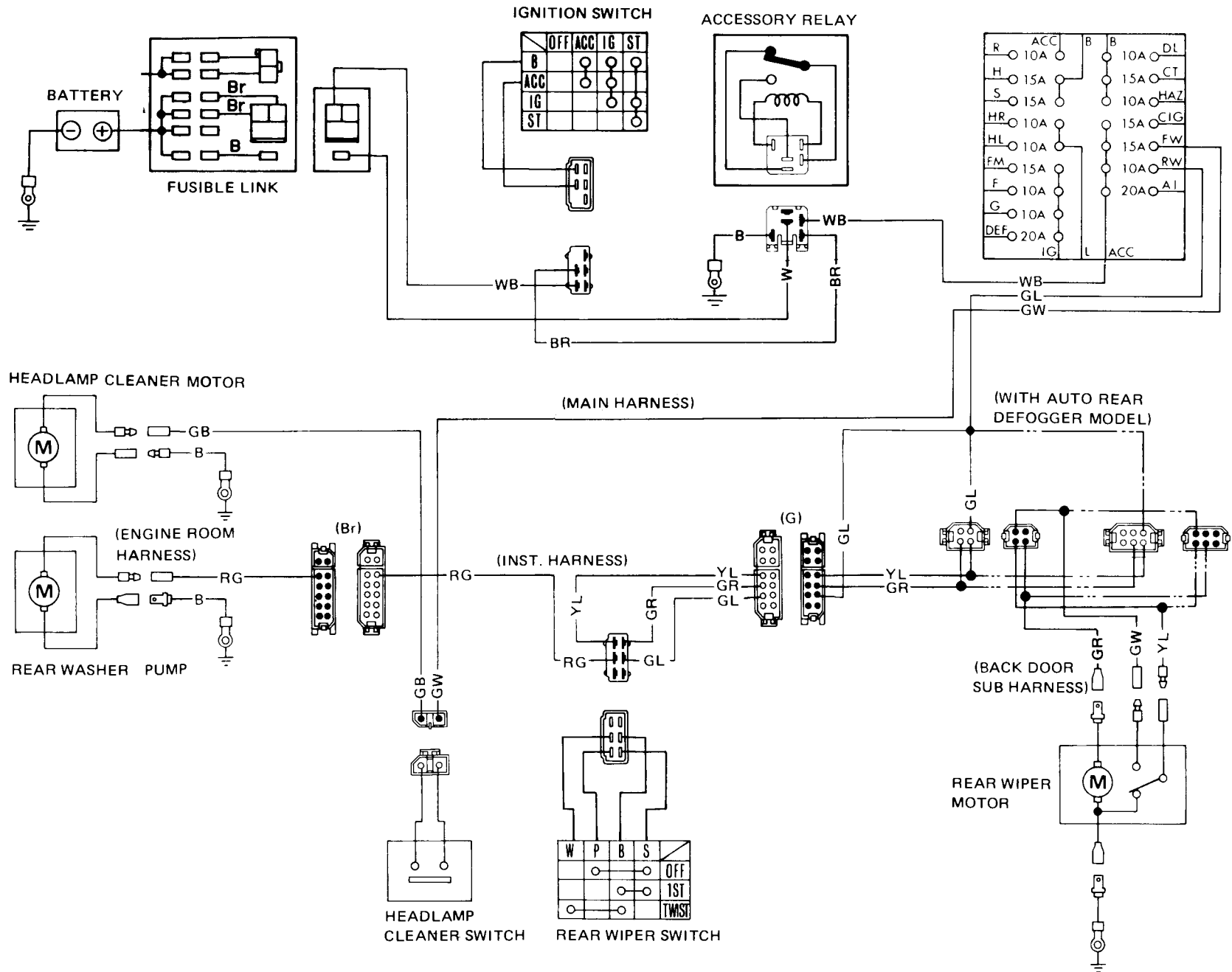
Condition		Probable cause		Corrective action
Windshield wiper does not operate.	Motor	Broken armature worn motor brush or seized motor shaft.		Replace motor.
	Power supply and cable	Blown fuse. Loose, open or broken wiring. Improper grounding.		Check short-circuit, burnt component inside motor or other part for operation, and correct problem. Correct. Correct.
	Switch	Improper switch contact.		Correct.
	Link	Foreign material interrupts movement of link mechanism. Disconnect link rod. Seized or rusted arm shaft.		Correct. Correct. Lubricate or replace arm shaft.
Windshield wiper operating speed is too slow.	Motor	Short-circuit of motor armature worn motor brush or seized motor shaft.		Replace motor or lubricate bearing with engine oil.
	Power supply and cable	Low source voltage.		Measure voltage, check other electrical parts for operation, and take corrective action for power supply if necessary.
	Link	Humming occurs on motor in arm operating cycle due to seized arm shaft.		Lubricate or replace.
	Switch	Improper switch contact.		Conduct continuity test, and replace if necessary.
Windshield wiper speed can not be adjusted correctly.		Motor	Motor brush for either low or high speed is worn.	Replace motor.
Windshield wiper does not stop correctly.	Stops anywhere.	Motor	Contaminated auto-stop relay contacts or improper contact due to foreign matter.	Remove auto-stop device cover, and clean contacts carefully so as not to deform relay plate.
	Does not stop.	Motor	Incomplete auto-stop operation (Contact is not interrupted.)	Remove auto-stop device cover, and correct relay plate bending.
Washer motor does not operate when pushing washer switch on.		Burnt fuse. Faulty switch. Faulty washer motor. Loosen or poor connection contact at motor or switch.		Correct cause and replace fuse. Replace. Replace. Repair.
Washer motor operate but washer fluid is not ejected.		Clogged washer nozzle.		Clean nozzle or replace.

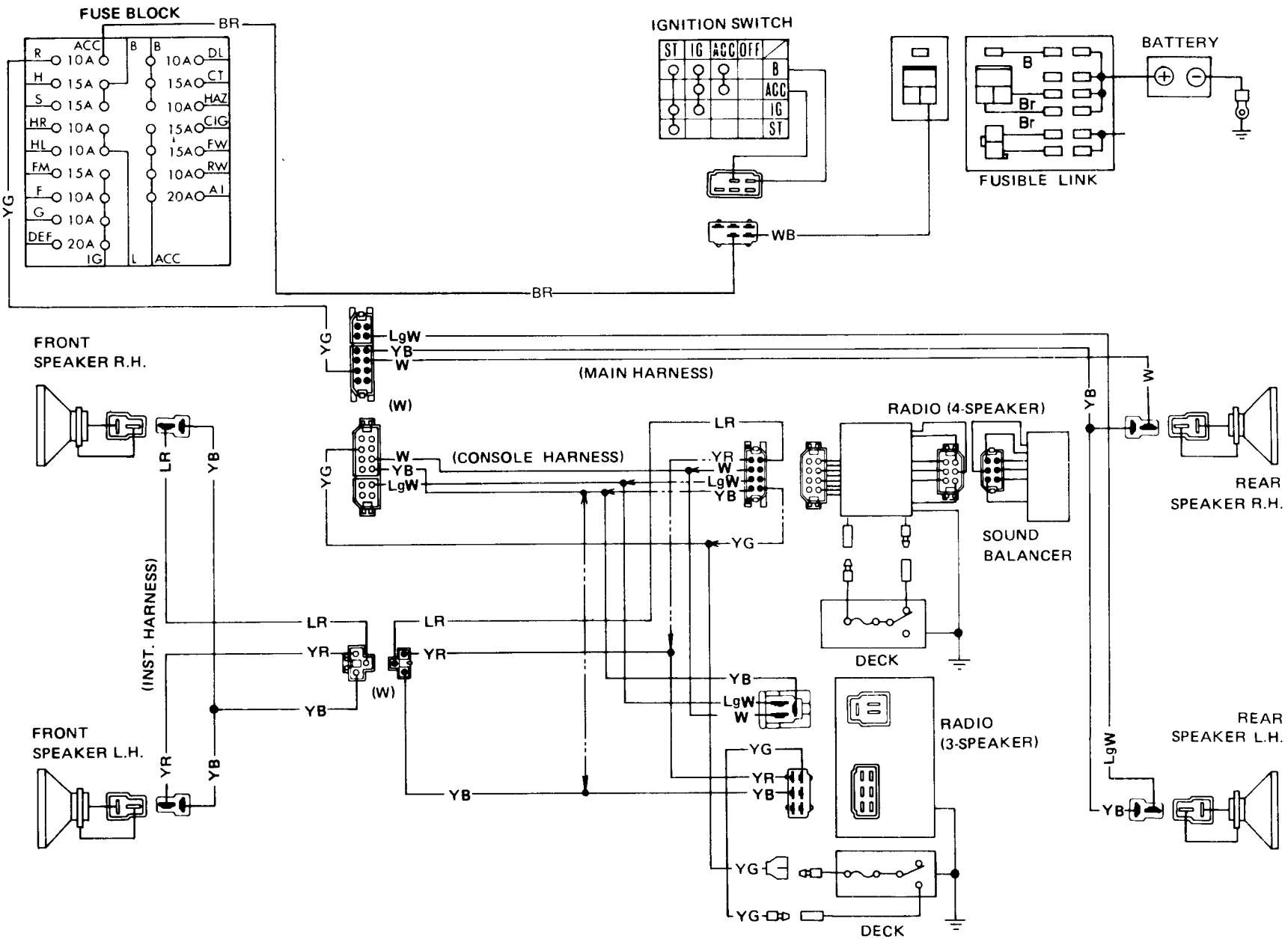
Intermittent windshield wiper**The sign for corrective action**

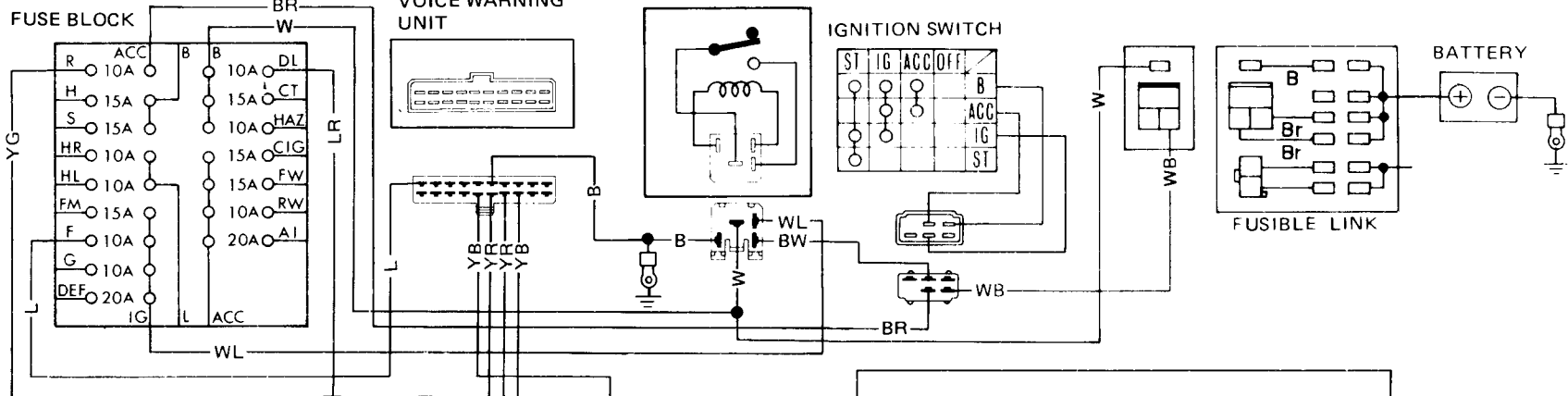
- A. Measure voltage across positive (+) and negative (–) terminals of intermittent amplifier with a circuit tester.
- B. Check continuity of all wiper switch positions.
- C. Check continuity of terminals of wiper motor, wiper switch and intermittent amplifier.
- D. Check continuity in wiper motor circuit.
- E. Alternator or battery is faulty.

Condition	Probable cause	Corrective action
Wipers do not operate intermittently but operates at Low and High speeds.	<ul style="list-style-type: none"> Line voltage below 10 volts Wiper switch faulty Wiring faulty Intermittent amplifier faulty 	A: Replace if necessary. B: Correct or replace if necessary. A,C: Repair or replace if necessary. Replace.
Intermittent speed is too short for proper wiping.	<ul style="list-style-type: none"> Line voltage too high Wiper motor (auto-stop mechanism) faulty Intermittent amplifier faulty 	A: Replace if necessary. D: Replace if necessary. Replace
Intermittent speed is too long for proper wiping.	<ul style="list-style-type: none"> Line voltage below 10 volts Wiper switch faulty Wiring faulty Intermittent amplifier faulty 	A: Replace if necessary. B: Correct or replace if necessary. A,C: Repair or replace if necessary. Replace.
Wipers do not shut off.	<ul style="list-style-type: none"> Wiper motor faulty Intermittent amplifier faulty 	D: Replace if necessary. Replace.
Wipers operate intermittently with wiper switch OFF.	<ul style="list-style-type: none"> Wiper switch faulty Wiring faulty Intermittent amplifier faulty 	B: Correct or replace if necessary. A,C: Repair or replace if necessary. Replace.
Intermittent speed is erratic.	<ul style="list-style-type: none"> Line voltage fluctuation excessive Wiper switch faulty Wiring faulty Wiper motor faulty Intermittent amplifier faulty 	E: Correct or replace if necessary. B: Correct or replace if necessary. A,C: Repair or replace if necessary. D: Replace if necessary. Replace.
Wipers make a complete wiping stroke only one time with wiper switch ON but do not continue operation.	<ul style="list-style-type: none"> Line voltage below 10 volts Intermittent amplifier faulty 	A: Replace if necessary. Replace.
Wiper motor is not interconnected when washer switch is depressed, but intermittent operation is normal.	<ul style="list-style-type: none"> Connections poor Intermittent amplifier faulty 	C: Repair or replace if necessary. Replace.
Wiper motor simultaneously operates (or: does not delay) when washer switch is depressed.	<ul style="list-style-type: none"> Intermittent amplifier faulty 	Replace.
Wipers do not make a complete wiping stroke when washer switch is first turned on and is quickly turned off.	<ul style="list-style-type: none"> Intermittent amplifier faulty 	Replace.

REAR WINDOW WIPER AND WASHER, AND HEADLAMP CLEANER





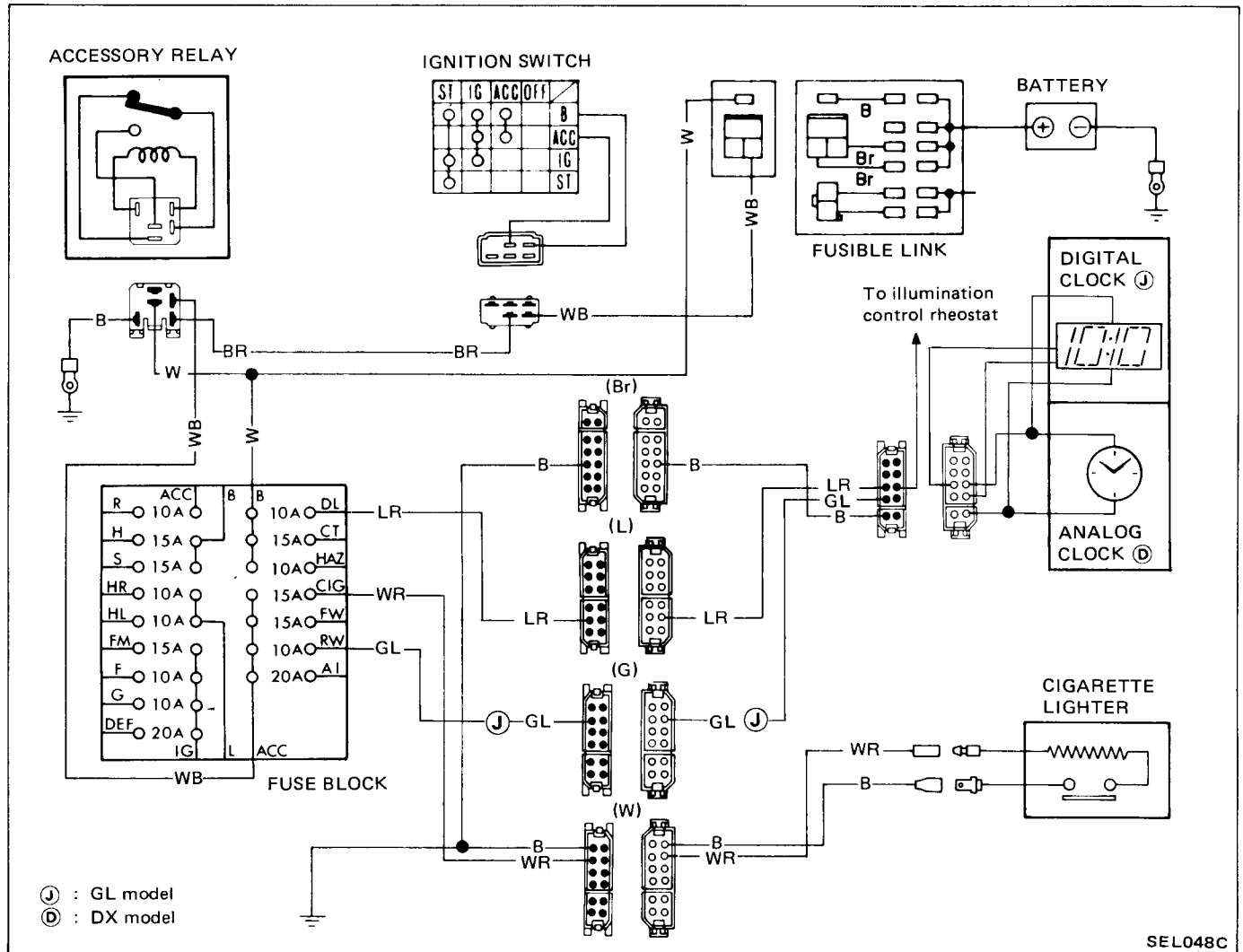


Noise prevention chart

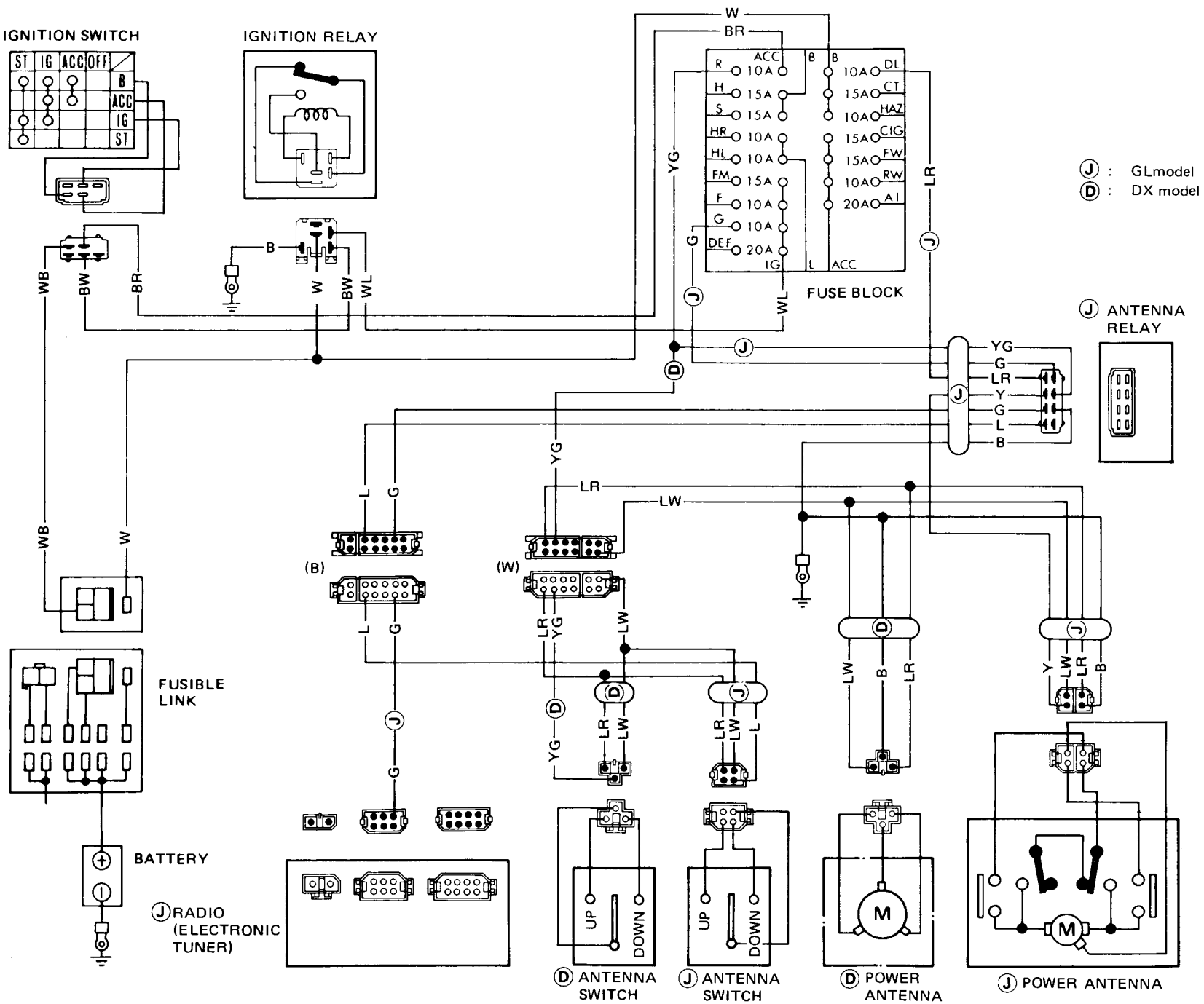
Position car in an open area away from steel buildings, run engine, extend antenna to its maximum length, set volume control to maximum and set dial at a median point where no broadcasting wave is received.

Condition	Probable cause	Corrective action
Ignition system Noise occurs when engine is operated.	High tension cable Ignition coil.	Install new high tension cable. Replace 0.5 μ F capacitor installed to primary side \oplus terminal of ignition coil with new ones. Be careful not to install capacitor to \ominus terminal or secondary terminal of ignition coil. This will result in improper engine operation.
Charging system Sound of alternating current present.	Alternator.	Replace 0.5 μ F capacitor installed to charging terminal B. Do not use a larger capacitor.

CIGARETTE LIGHTER AND CLOCK

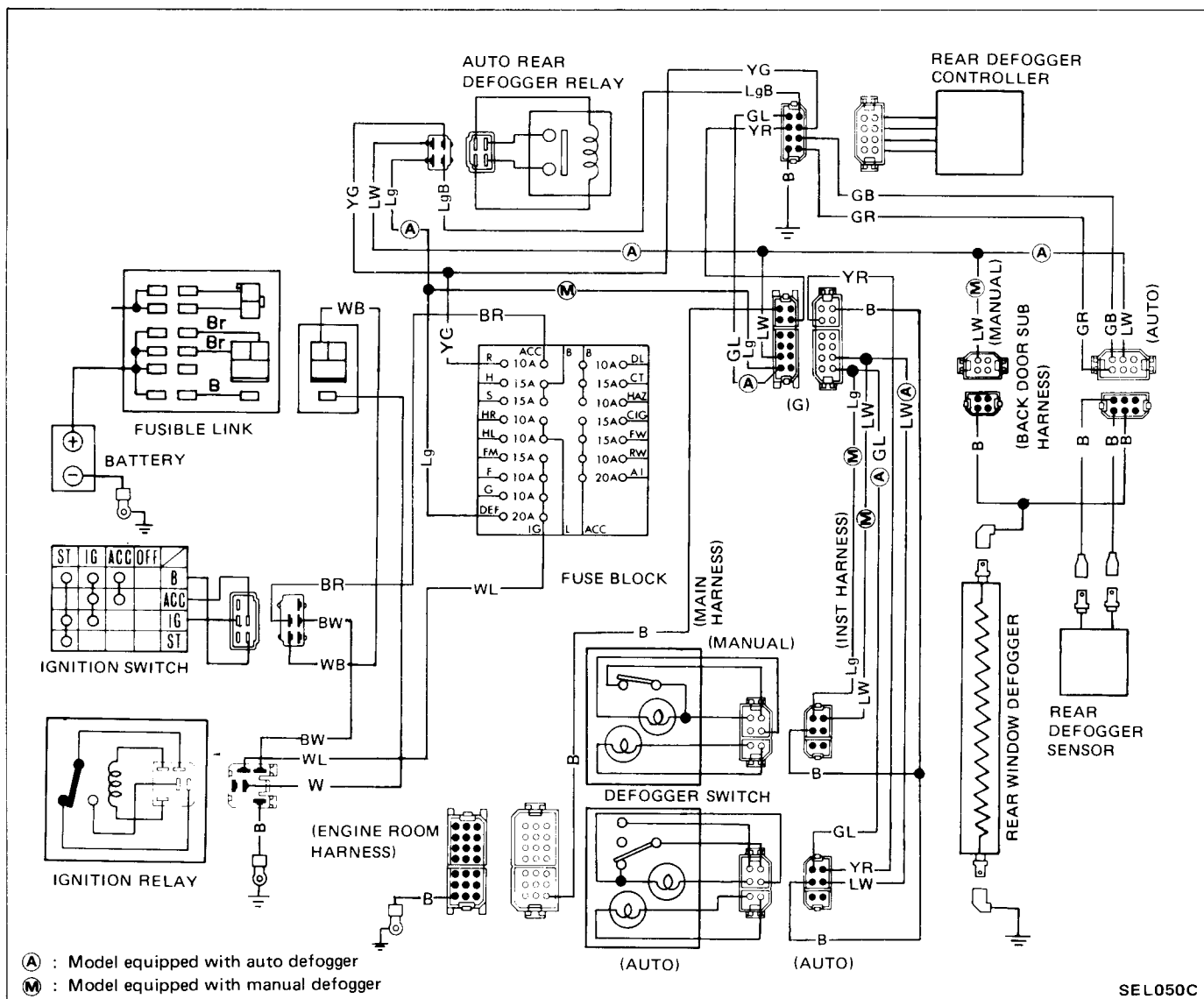


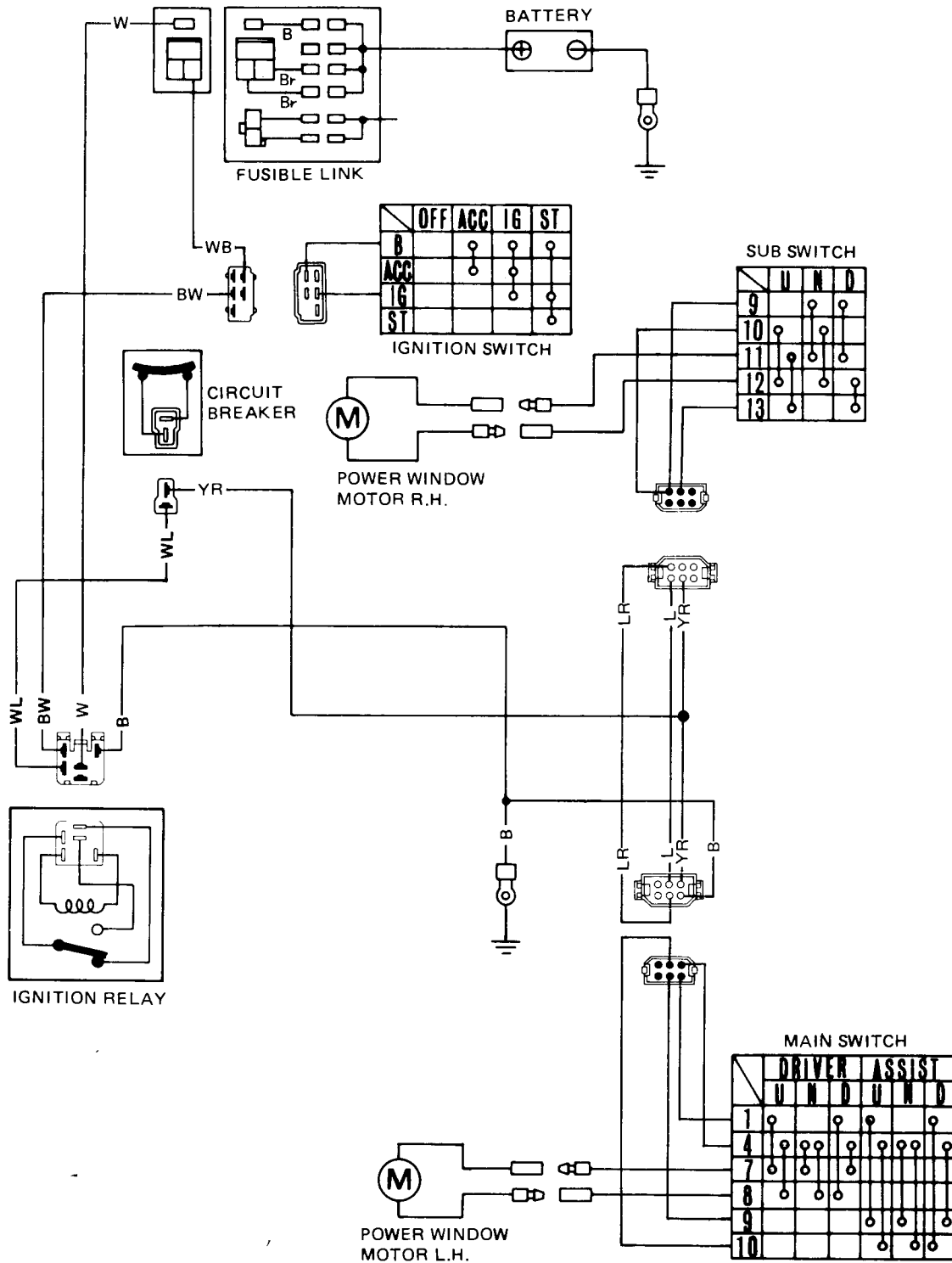
SEL048C



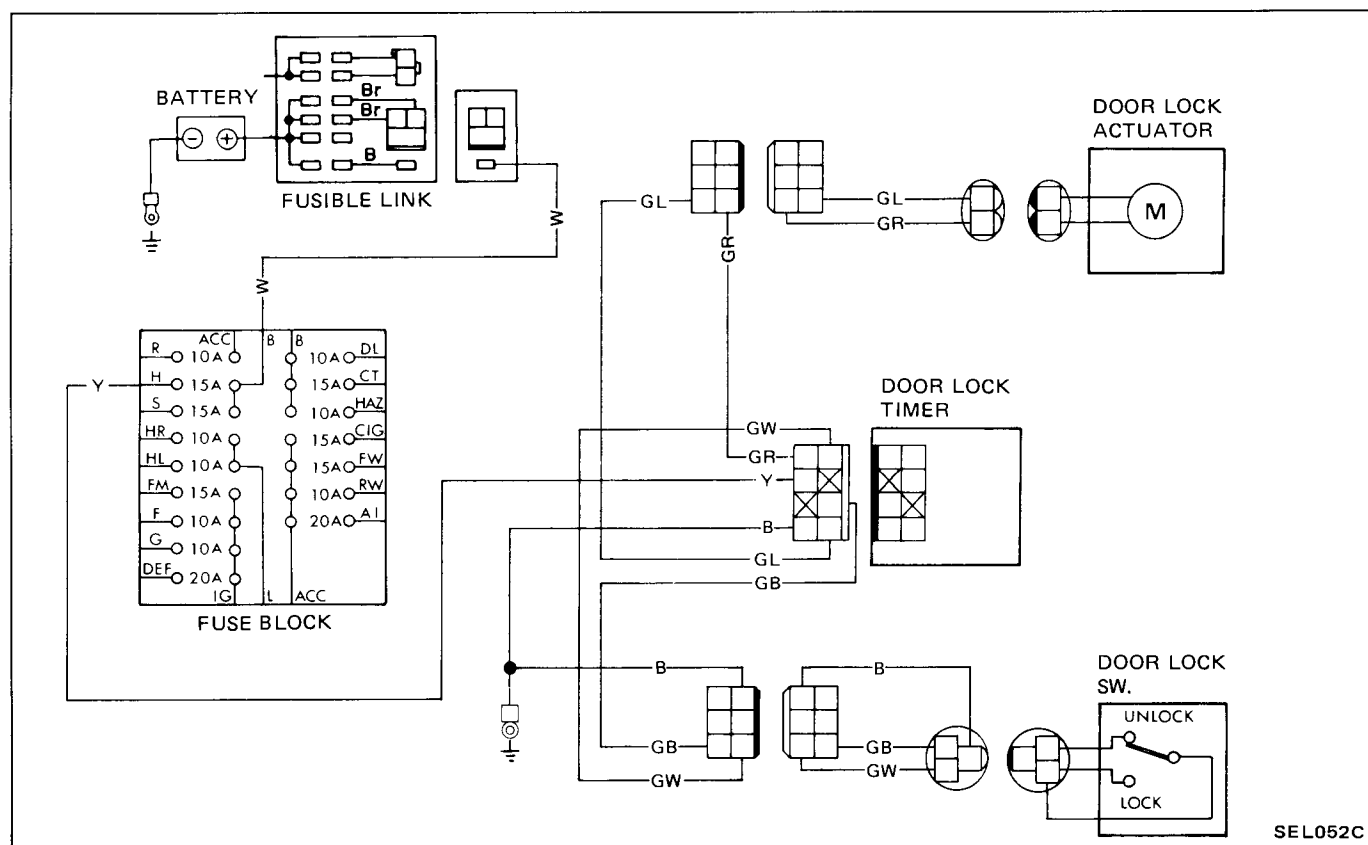
Condition	Probable cause	Corrective action
Antenna does not move up or down with antenna switch.	Burnt fuse.	Correct cause and replace.
	[Radio does not operate.]	
	Loose connection or open circuit.	Check wiring and/or repair connection.
	Faulty antenna switch.	Replace.
	Faulty antenna motor.	Replace.

REAR DEFOGGER



POWER WINDOW

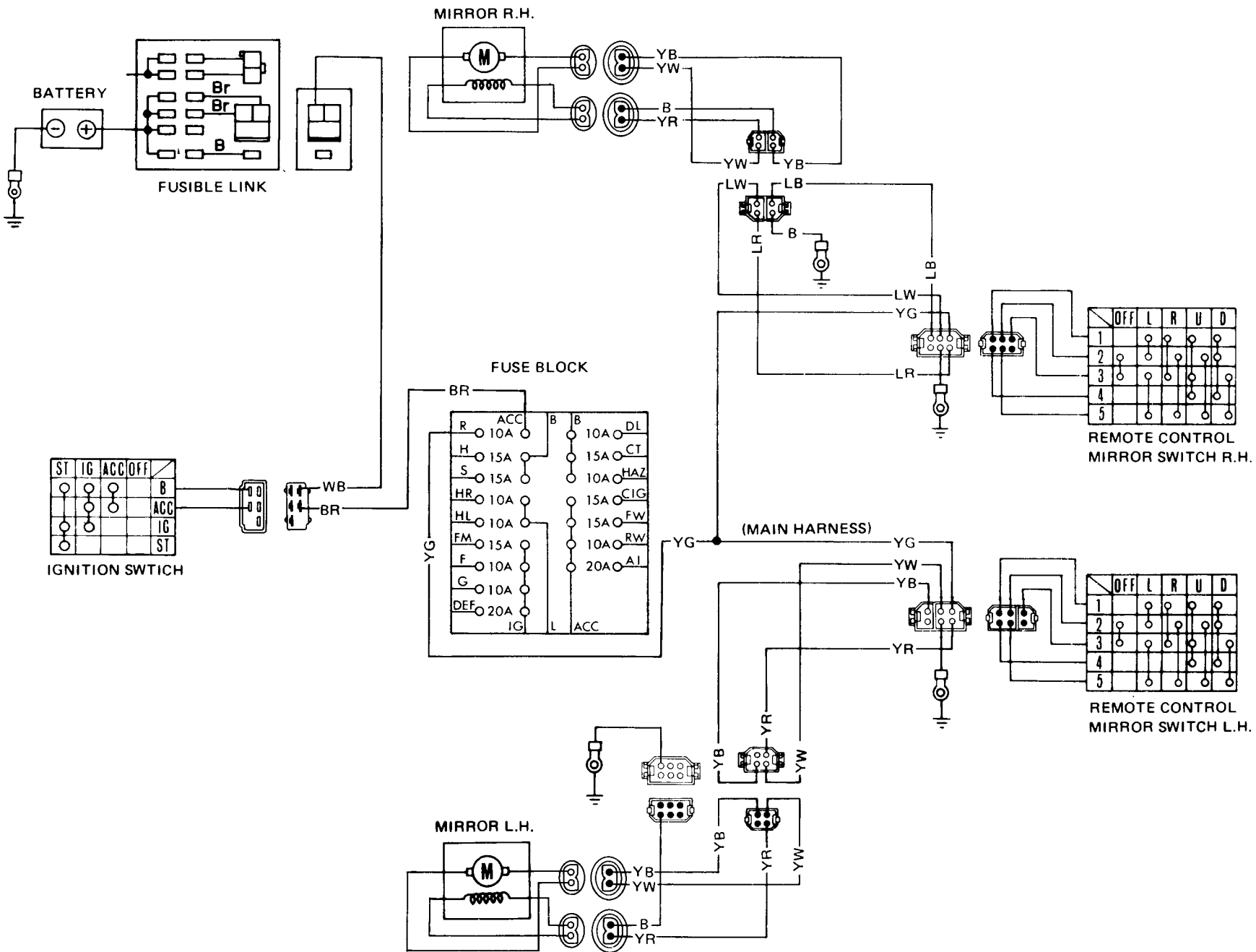
Condition	Probable cause	Corrective action
Neither left nor right window glass moves up and down.	Faulty circuit breaker. Loose connection or open circuit.	Replace. Check wiring and/or repair connection.
Driver side window glass does not move up and down.	Faulty power window main switch. [Window glass moves up (down) when ignition switch is set to “ON” position, and ① and ⑦, ④ and ⑧ (① and ⑧, ④ and ⑦) terminals of main switch are connected with test leads including 10A fuse]. Faulty power window motor. Loose connection or open circuit.	Replace. Replace. Check wiring and/or repair connection.
Assist side window glass does not move up and down.	Loose connection or open circuit. Faulty power window motor.	Check wiring and/or repair connection. Replace.

POWER DOOR LOCK

SEL052C

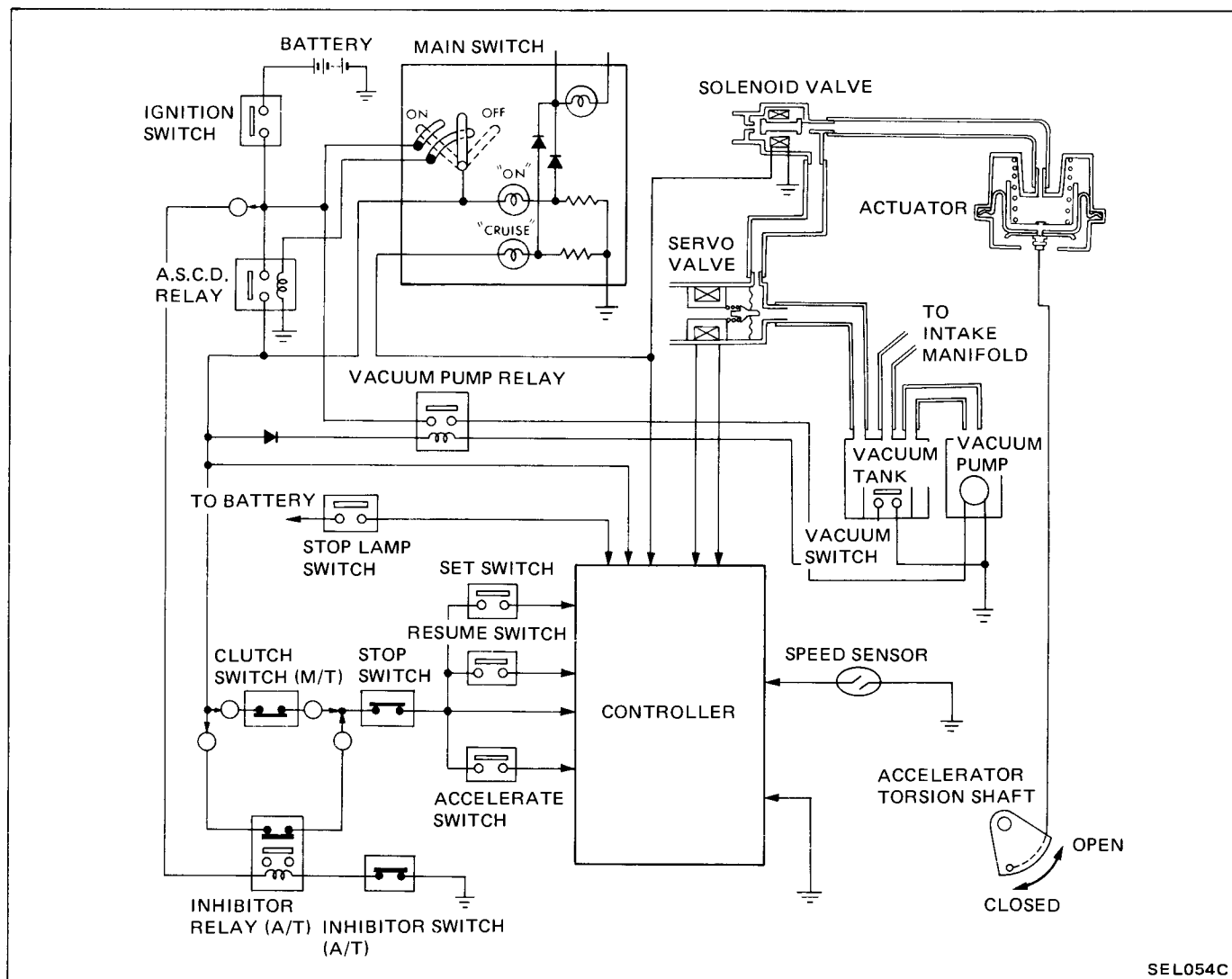
Condition	Probable cause	Corrective action
Assist side door can not be locked or unlocked.	Faulty door lock switch. Faulty door lock actuator. Faulty door lock timer. Loose connection or open circuit.	Replace. Replace. Replace. Check wiring and/or repair connection.

REMOTE-CONTROL DOOR MIRROR



AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.



DESCRIPTION

The Automatic Speed Control Device (subsequently referred to as "A.S.C.D.") is a combined unit of electronic circuits with vacuum mechanisms.

The A.S.C.D. controller generates

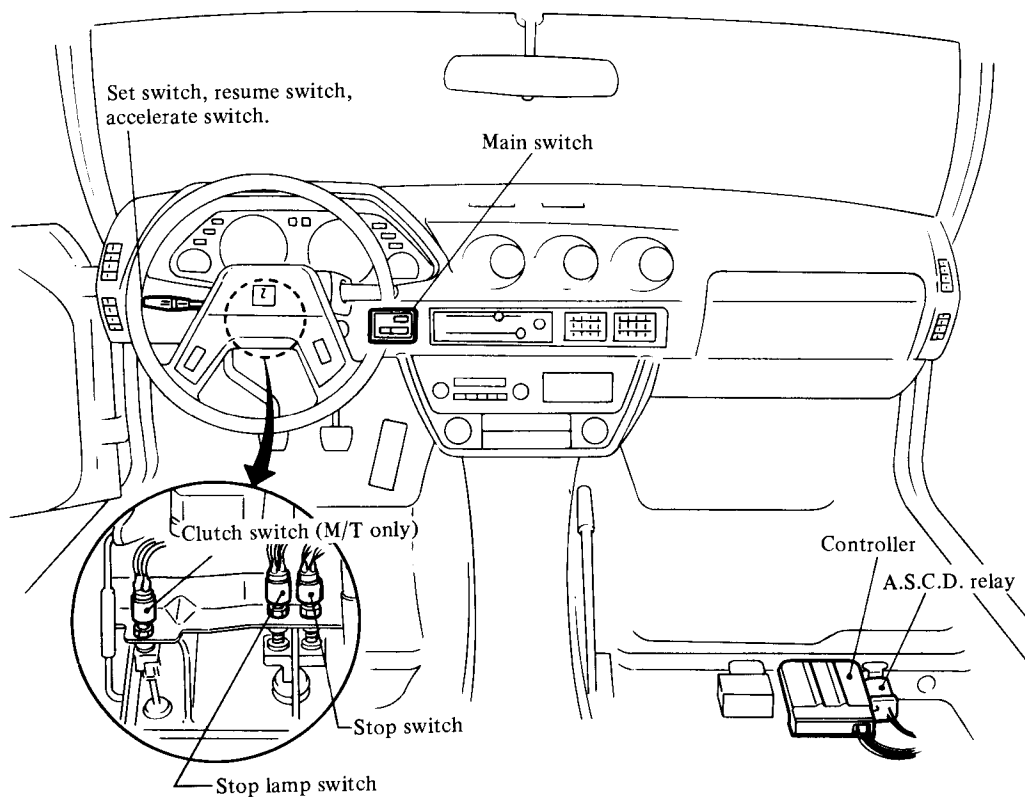
an electrical signal equivalent to the difference between the preset speed and the actual speed picked up by the speed sensor.

The servo valve converts this signal into corresponding vacuum and oper-

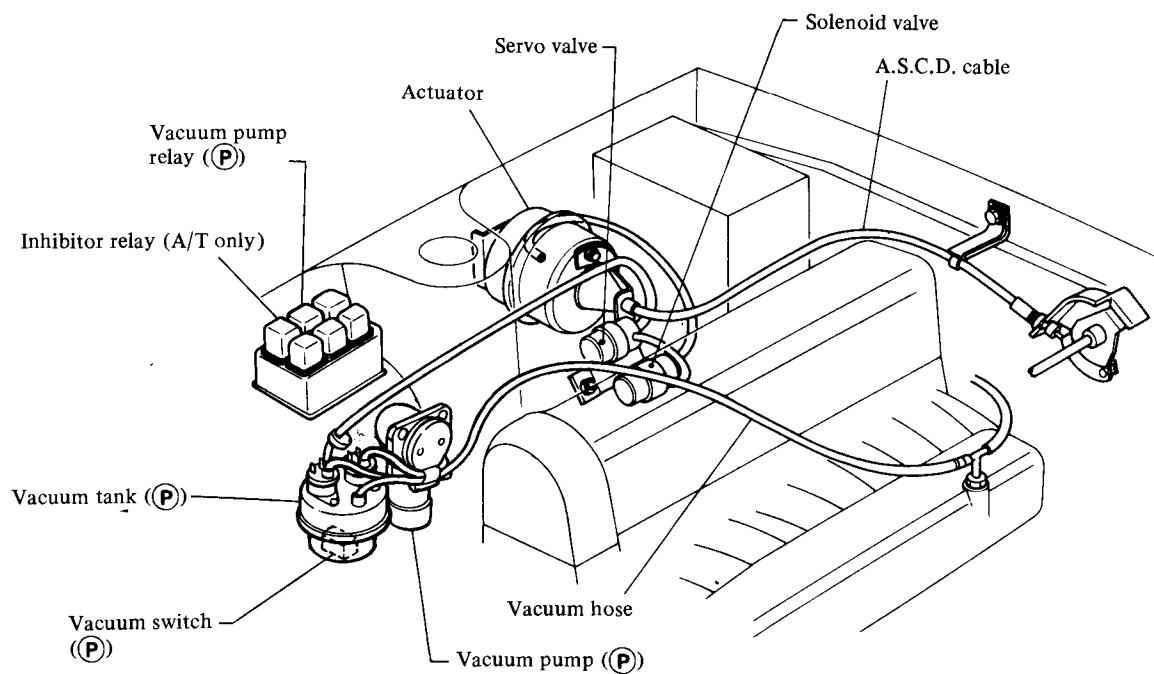
ates the actuator which adjusts the throttle valve opening.

The A.S.C.D. is capable of maintaining speeds within the range of approximately 60 to 120 km/h (37 to 75 MPH).

Speed sensor is incorporated in speedometer.



SEL663



(P) : Turbocharger models

SEL055C

FUNCTION AND OPERATION

MAIN SWITCH

When the main switch is turned ON with the ignition switch ON, the exciting coil of the relay will be energized and the relay will turn ON, thus supplying current to the system. Although the main switch automatically returns to its original position, the current is sent through the relay and fed to the exciting coil via the main switch; in this way, the relay will remain ON. When the ignition switch is turned off, the relay will also turn off. And the relay will remain inoperative until the main switch is turned ON, even if the ignition switch is set to ON.

SET SWITCH

The set switch has an ON-OFF switch type of circuit.

When the set switch is depressed, the CRUISE light illuminates. With the switch depressed, the controller cancels the preset car speed.

The controller will preset the car speed at which the car is running when the switch is released.

ACCELERATE & RESUME SWITCH

The accelerate & resume switch is designed to increase the set speed, or to return it to that speed at which the car was previously being driven before the set speed was cancelled by depression of the brake pedal, etc.

Depressing the "ACCEL" end of the switch causes the car speed to increase continuously; releasing it will set the car speed at that which the car is currently being driven. Depressing the "RESUME" end of the switch momentarily causes the car speed to automatically return to the set speed at which the car was being driven before the set speed was cancelled by depression of the brake pedal, etc. Keeping the "RESUME" end pressed causes the car speed to decrease; releasing it will return the car speed to that which the

car was being driven before it was released.

SPEED SENSOR (Contained in speedometer)

The speed sensor is an ON-OFF type sensor generating two pulses per revolution of the meter cable.

SERVO VALVE (Transducer)

The servo valve causes the vacuum valve and atmospheric valve to open or close according to the input current and adjusts the vacuum from the intake manifold.

CONTROLLER

The controller compares the preset speed with the actual car speed, and maintains the preset speed by increasing or decreasing the current flowing through the servo valve.

SOLENOID VALVE

The solenoid valve is the safety valve which shuts off the atmospheric passage to the vacuum line, when the system activates.

ACTUATOR

The actuator causes the throttle to open and close, by vacuum, through the servo valve.

STOP SWITCH

When the brake pedal is depressed, the stop switch cuts off the power supply to the A.S.C.D. circuit.

CLUTCH SWITCH (For manual transmission models)

This switch is also used to release the system. When the clutch pedal is depressed, this switch cuts off the power supply to the A.S.C.D. circuit.

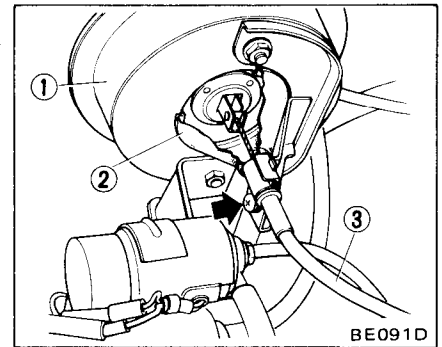
INHIBITOR RELAY (For automatic transmission models)

The inhibitor relay releases the A.S.C.D. system when the selector is set to "N" or "P" position.

REMOVAL AND INSTALLATION

A. S. C. D. CABLE

1. Disconnect cable from actuator.
- (1) Remove screw attaching cable bracket.
- (2) Remove rubber boots.



- 1 Actuator 3 Cable
2 Rubber boot

2. Loosen lock nut and remove cable from torsion shaft.
3. To install the cable, reverse the order of removal.

Adjustment

When installing, adjust A.S.C.D. cable as follows:

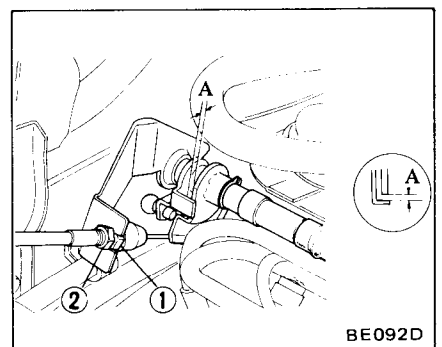
With throttle in idling conditions, adjust adjusting nut ① so that clearance "A" is specified value with no slack of cable.

Then tighten lock nut ②.

Clearance "A":

2 to 3 mm (0.08 to 0.12 in)

Do not increase tension of cable excessively, as this may cause throttle lever to rotate.



Exercise care when removing and installing wire, so as not to deform wire end.

TORSION SHAFT

Refer to Accelerator Linkage for removal (Section FE).

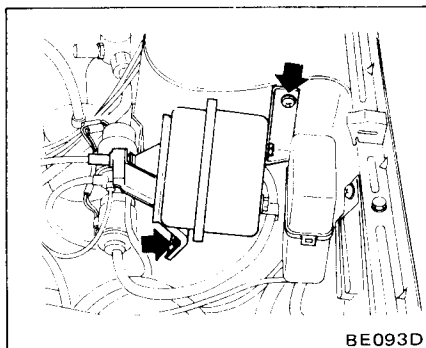
ACTUATOR

1. Disconnect battery ground cable.
2. Disconnect cable from actuator.

Refer to A.S.C.D. cable for removal.

3. Disconnect harness connector of servo valve and solenoid valve, and disconnect vacuum hose connecting intake manifold to servo valve.

4. Remove bolt attaching actuator to body.

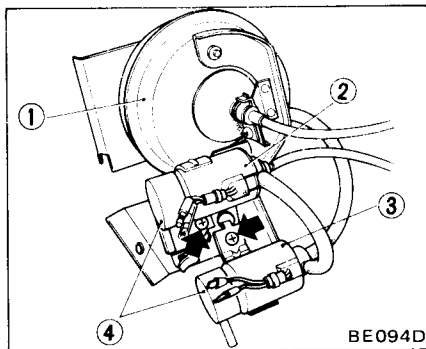


Actuator can then be taken out with servo valve and solenoid valve.

5. Disconnect vacuum hose from actuator and remove servo valve and solenoid valve.

6. To install actuator, reverse the order of removal.

SOLENOID VALVE AND SERVO VALVE



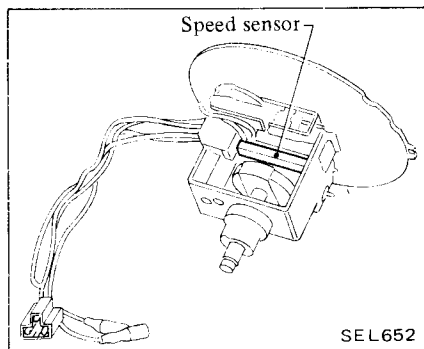
- | | |
|---------------|---------------------|
| 1 Actuator | 3 Solenoid valve |
| 2 Servo valve | 4 Water-tight cover |

1. Disconnect battery ground cable.
2. Disconnect harness connector and remove valve.
3. To install the valve, reverse the order of removal.

Install valve so that water drain of water-tight cover faces downward.

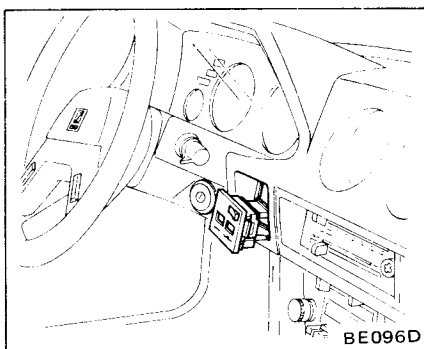
SPEED SENSOR

The speed sensor is built into the speedometer. It can only be removed and installed as an assembly.



MAIN SWITCH

1. Disconnect battery ground cable.
2. Push out main switch from behind instrument panel.
3. Remove harness connector.



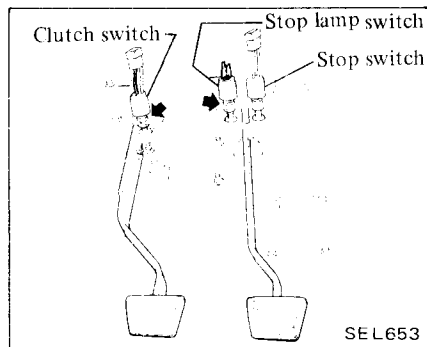
4. To install the switch, reverse the order of removal.

SET SWITCH AND ACCELERATE SWITCH & RESUME SWITCH

Remove switches as an assembly as they are built into combination switch.

Refer to Combination Switch for removal.

STOP LAMP SWITCH, STOP SWITCH AND CLUTCH SWITCH



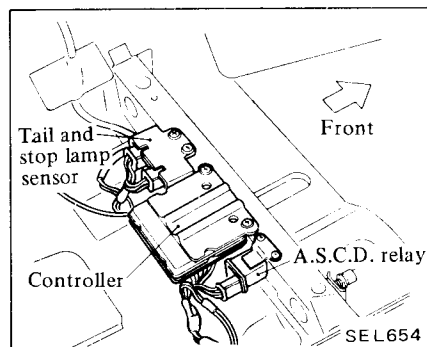
1. Disconnect battery ground cable.
2. Remove instrument panel L.H. lower cover and floor assist nozzle.
3. Loosen lock nut and remove switch.
4. To install switch, reverse the order of removal.

Adjustment

Refer to Brake Pedal or Clutch Pedal for adjustment (Section BR or CL).

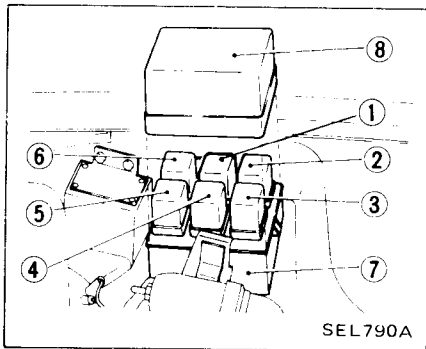
CONTROLLER AND A.S.C.D. RELAY

Controller and A.S.C.D. relay are located under the assist seat.



1. Disconnect battery ground cable.
2. Remove passenger seat.
3. Remove controller or A.S.C.D. relay.
4. To install controller or A.S.C.D. relay, reverse the order of removal.

INHIBITOR RELAY AND VACUUM PUMP RELAY (For A.S.C.D.)



- 1 Vacuum pump relay
- 2 Fan motor relay
- 3 Lighting relay
- 4 Bulb check relay
- 5 Air conditioner relay
- 6 Inhibitor relay
- 7 Relay bracket
- 8 Relay bracket cover

1. Disconnect battery ground cable.
2. Remove relay cover.
3. Remove relay from relay fixing board.
4. To install relay, reverse the order of removal.

COMPONENT PARTS INSPECTION

CAUTION:

- Do not disassemble component parts when checking as all of them are replaced as assemblies.
- When checking by using battery or circuit tester, be careful not to touch adjacent terminal at the same time. Extreme care must be taken in handling controller.

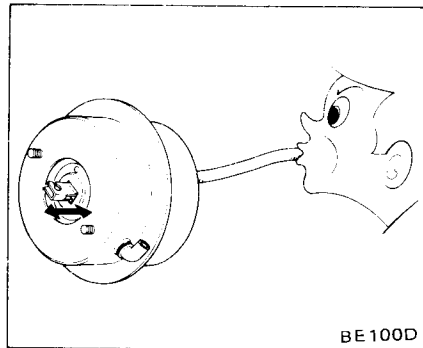
A. S. C. D. CABLE AND TORSION SHAFT

Visually check A.S.C.D. cable and torsion shaft for rust, damage or looseness.

ACTUATOR

1. Visually check actuator for damage or deformation.
2. Make sure that actuator moves smoothly without binding when diaphragm is pushed by hand.
3. Apply vacuum to actuator. If diaphragm moves to full position, it is normal.

Plug hose with vacuum applied. Make sure that actuator remains in full position.



CAUTION:

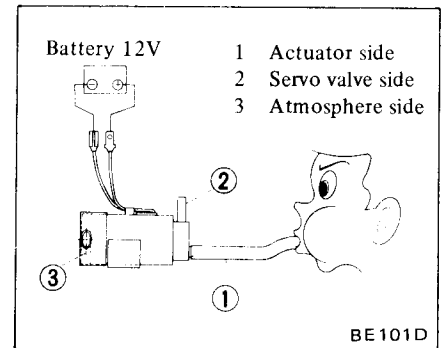
When checking actuator by applying vacuum, do not apply engine vacuum directly.

SOLENOID VALVE

1. Measure the resistance between terminals.

25 to 30 ohms O.K.

2. Check to be sure that the valve opens or closes by blowing air through port on actuator side.



	Normal condition	12V direct current is applied between terminals
Normal condition	Yes	Yes
Plug port at servo valve side with a finger.	Yes	No

Yes: Air flow should exist.

No: Air flow should not exist.

SERVO VALVE

1. Measure the resistance between terminals.

25 to 30 ohms O.K.

2. Check to be sure that output vacuum of valve is proper.

Note: This check should be performed with the valve installed on car.

CAUTION:

With servo valve connected to system, do not apply current to servo valve. Be sure to disconnect solenoid valve side vacuum hose.

- (1) Disconnect solenoid valve side vacuum hose at solenoid valve and connect vacuum gauge.
- (2) Start engine and warm up engine until water temperature indicator points to the middle of gauge.
- (3) Apply 0.3A direct current between terminals.

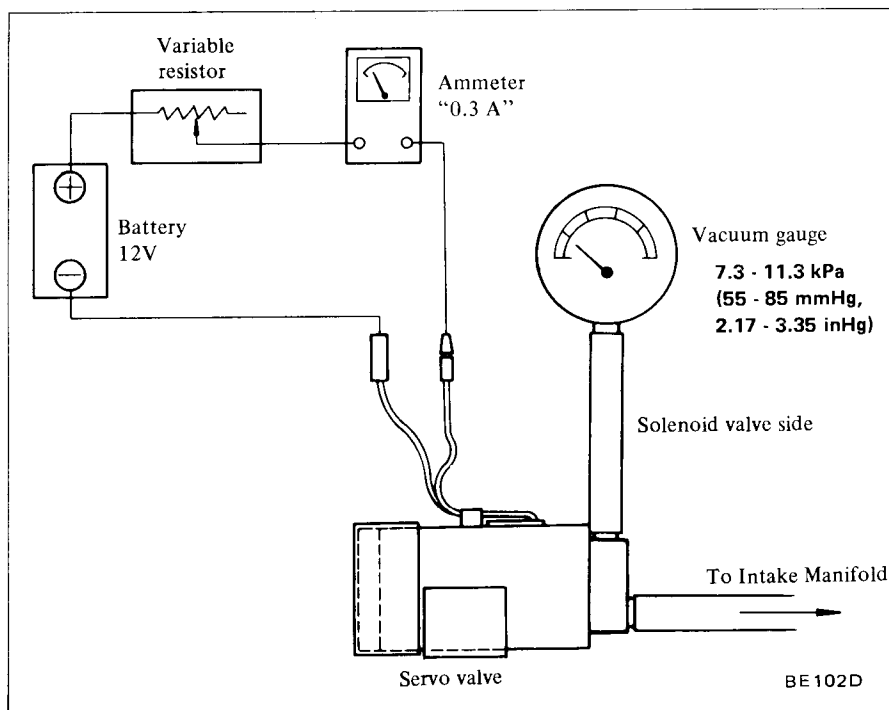
Using about 20 Ω -5W variable resistor, adjust so that a current of 0.3A will flow.

- (4) Read vacuum gauge.

7.3 - 11.3 kPa

(55 - 85 mmHg,

2.17 - 3.35 inHg) O.K.

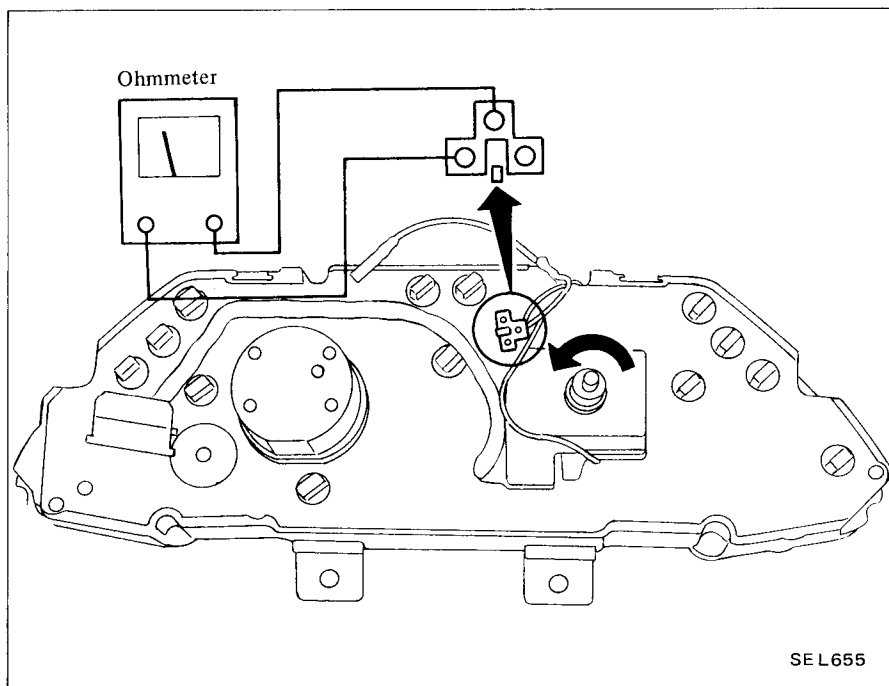


SPEED SENSOR

Inspection must be made with speed sensor installed to speedometer.

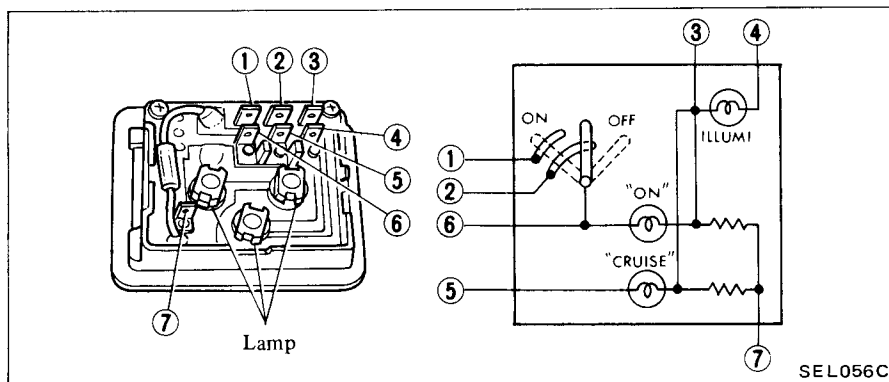
Turning speedometer slowly by hand, test continuity of speed sensor.

Continuity exists two times a turn O.K.



MAIN SWITCH

Test continuity through switch or light with an ohmmeter in accordance with the following chart.



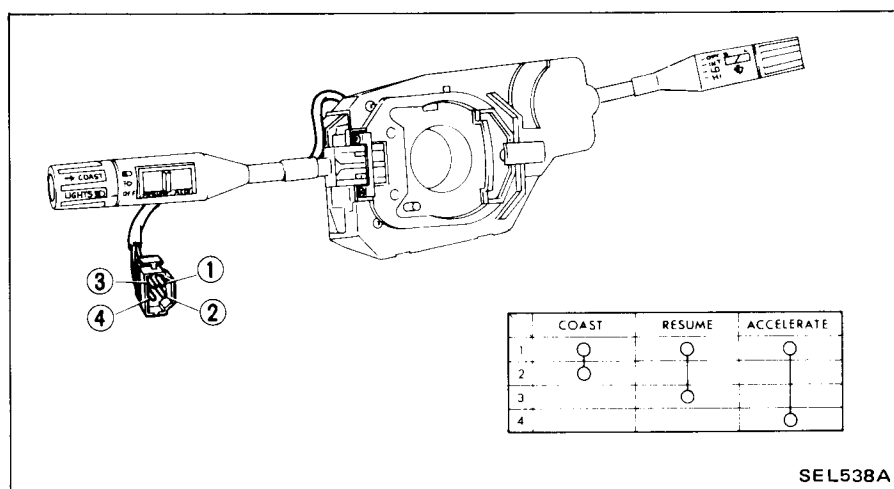
Switch position Check terminal	Normal	ON	OFF
① – ②	No	Yes	No
① – ⑥	No	Yes	No
② – ⑥	Yes	Yes	No
③ – ④	Yes	—	—
⑤ – ⑦	Yes	—	—
⑥ – ⑦	Yes	—	—

Yes: Continuity should exist.

No: Continuity should not exist.

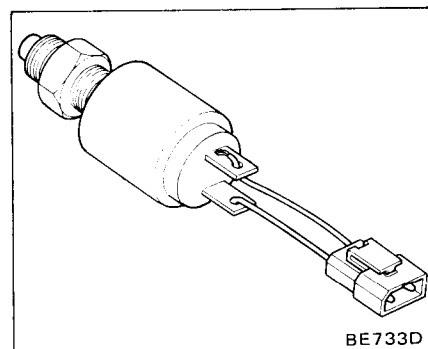
COAST SWITCH AND ACCELERATE & RESUME SWITCH

Test continuity through switch with an ohmmeter.



CLUTCH AND STOP SWITCH

Test continuity through switch with an ohmmeter.



CONTROLLER

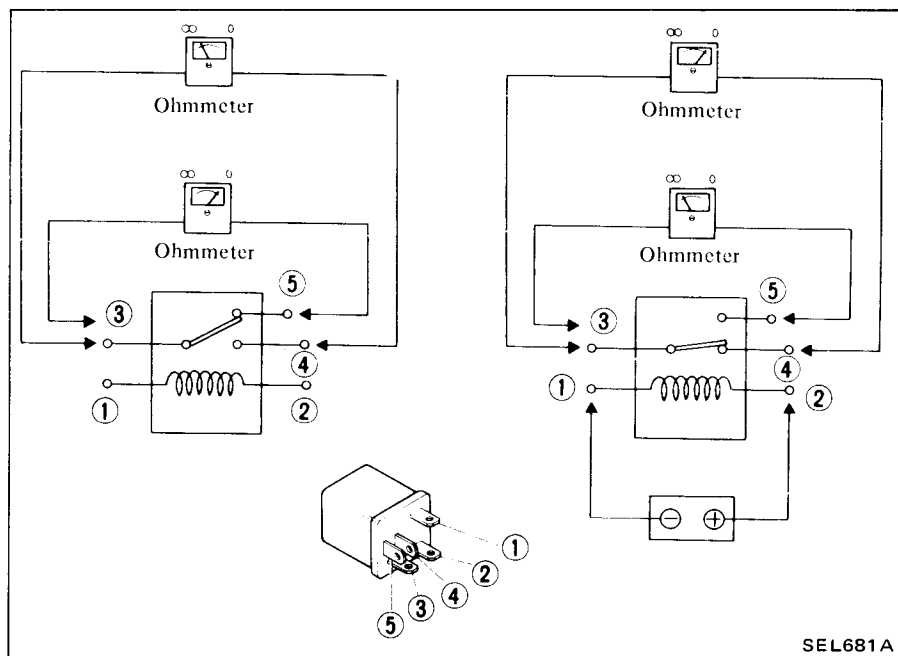
Controller must not be checked as a single part. Check controller for operation as a system, referring to Diagnosis.

CAUTION:

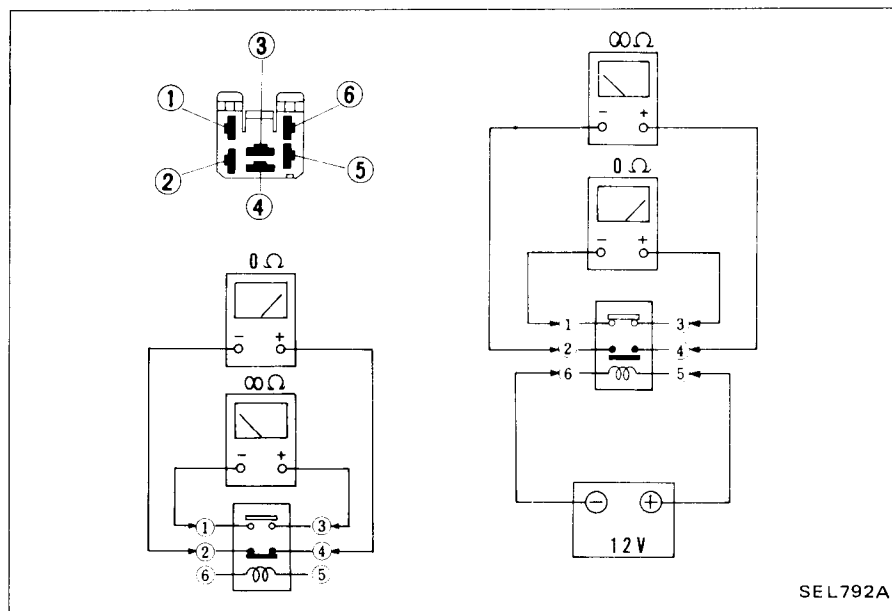
Do not touch the circuit tester probe to any unnecessary terminal on controller. Doing so could cause damage to controller.

- Handle controller carefully to avoid damage.
- Keep controller away from electric noise source to prevent A.S.C.D. system from malfunctioning and IC circuit, etc. from being degraded.

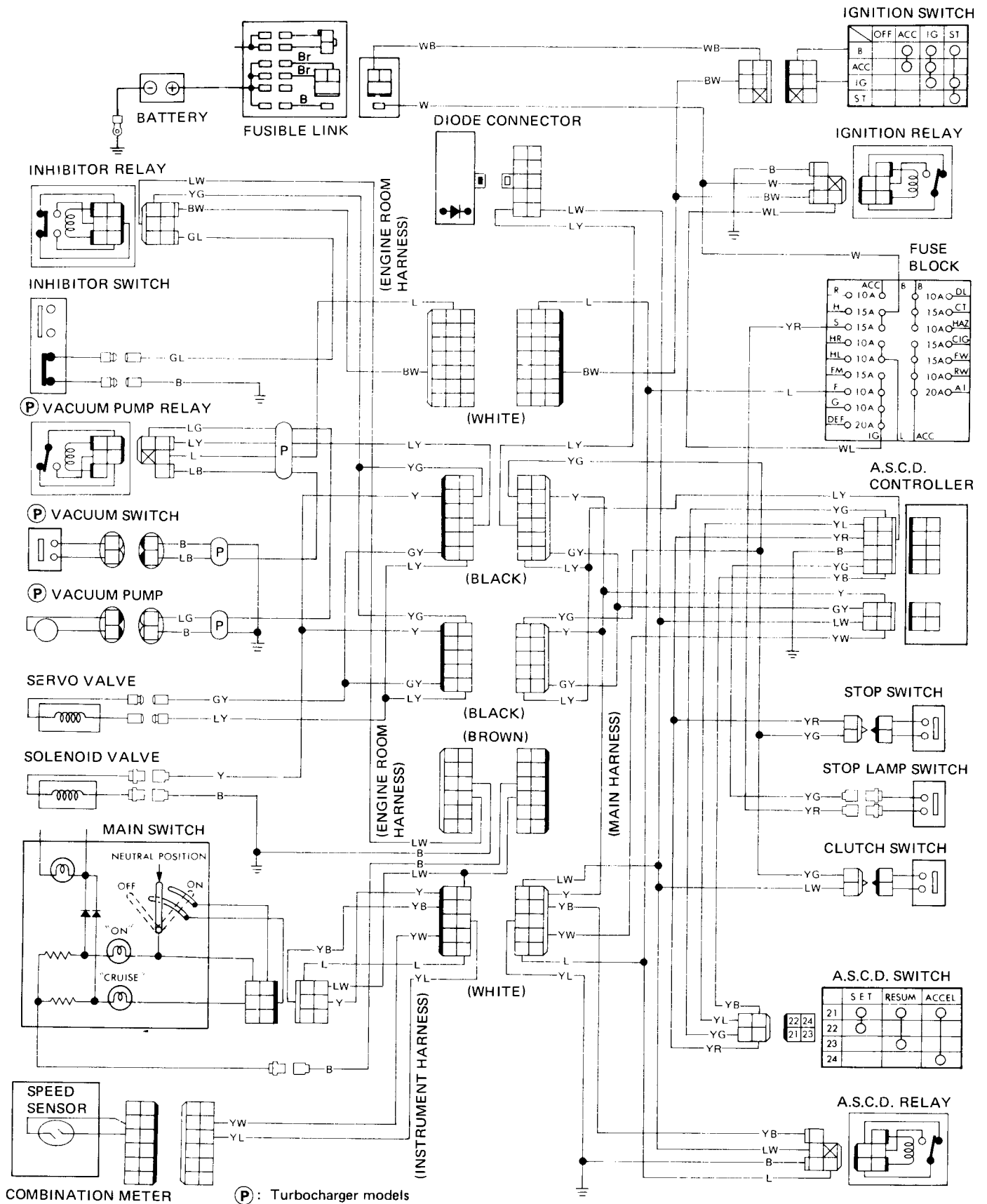
A.S.C.D. relay



Inhibitor relay (For A.S.C.D.)



WIRING DIAGRAM AND TROUBLE DIAGNOSES



TEST CONDITIONS

If a malfunction is found, be sure to check the following before performing the system test.

1. Turn signal operates. (Supply circuit is used in common with turn signal.)

2. All wiring harness connectors must be securely connected.

3. A.S.C.D. cable must be securely installed with proper adjustment.

4. Vacuum hoses must be properly attached with no abnormal conditions such as vacuum leakage, sharp bends or kinks.

DIAGNOSES**WARNING:**

All following system tests can be performed without running engine. Avoid making test while driving car or running engine.

Indicator light will not glow, even if "ON" button of main switch is depressed, with ignition switch ON.

Burnt bulb

Faulty main switch

Faulty A.S.C.D. relay

Cruise light illuminates when speed setting operation is made, but speed is not actually set.

When battery voltage (12V) is applied to the solenoid valve terminal, the following are possible:

1. With "A" closed, no suction possible at "B".
2. With "A" opened, suction begun at "B".

YES

NO

Faulty solenoid valve

Servo valve operates normally. (Refer to Servo Valve for Inspection.).

YES

NO

Faulty servo valve

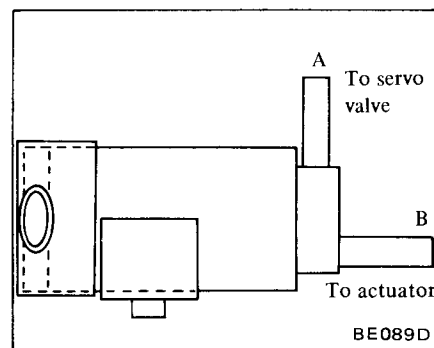
Actuator operates smoothly when actuator vacuum port is suctioned. (This operation must be performed with A.S.C.D. cable released.)

YES

NO

Faulty controller

Faulty actuator



Cruise lamp will not glow, even if set switch is depressed and released at proper car speed, with main switch ON. (Speed not set in system.)

With ignition switch and main switch ON, battery voltage (12V) is present between terminals ③ and ⑦, ⑩ and ⑦ of harness connector.

Set automatic transmission selector lever at any position other than "P" and "N" position.

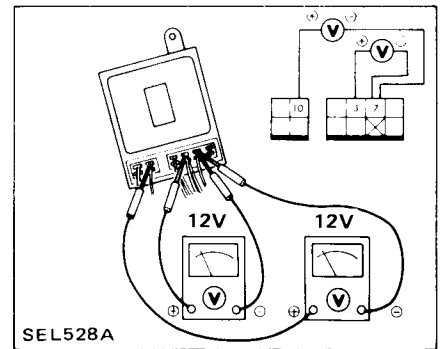
YES

NO

Open circuit.

Faulty or improperly adjusted stop switch.

Faulty inhibitor switch or inhibitor relay.

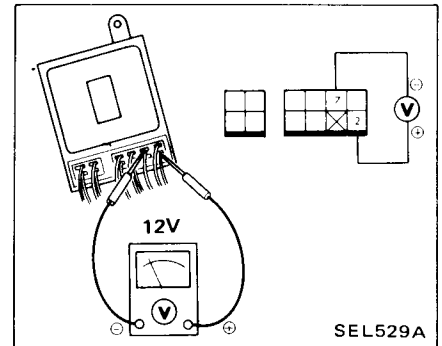


When set switch is depressed with ignition switch and main switch ON, battery voltage (12V) is present between terminals ② and ⑦ of harness connector.

YES

NO

Faulty set switch.



With ignition switch and main switch ON, manually rotate meter cable slowly to see if voltages across harness connector terminals ⑧ and ⑦ alternately change from 0 to 7 and vice versa.

YES

NO

Check the following parts.

- Controller
- Coast switch
- Servo valve
- Solenoid valve
- Actuator

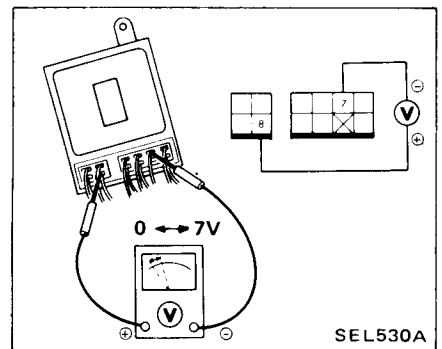
Only 7 volts remain present.

YES

NO

Faulty speed sensor.

Faulty speed sensor or controller.



Car will not accelerate when "ACCEL" end is depressed. (However, constant car speed can be maintained by A.S.C.D.)

With ignition switch, main switch and accelerate switch ON, battery voltage (12V) is present between terminals ⑫ and ⑦ of harness connector.

Set automatic transmission selector lever at "P" or "N" position.

YES

NO

Faulty accelerate & resume switch.

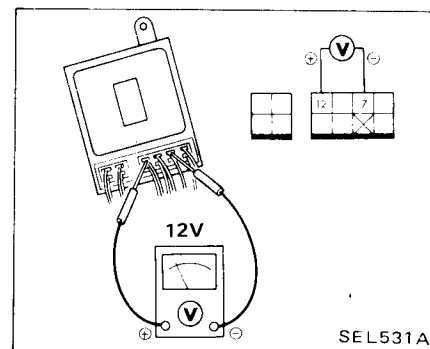
When only "ACCEL" end is "OFF", voltage across terminals ⑫ and ⑦ will be zero.

YES

NO

Faulty controller.

Faulty accelerate & resume switch.



Car will not decelerate when "RESUME" end remains ON, or car speed will not return to speed at which it was being driven before set speed was cancelled when "RESUME" end is depressed momentarily. (However, constant speed can be maintained by A.S.C.D.)

With ignition switch, main switch and resume switch ON, battery voltage (12V) is present between terminals ⑪ and ⑦ of harness connector.

Set automatic transmission selector lever at "P" or "N" position.

YES

NO

Faulty accelerate & resume switch.

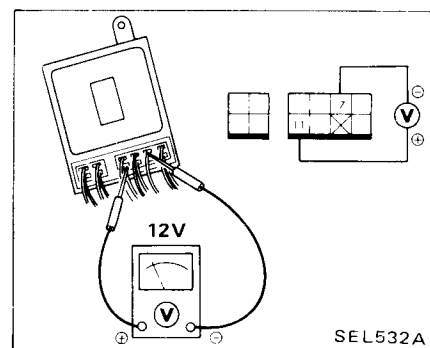
When only "RESUME" end is "OFF", voltage across terminals ⑪ and ⑦ will be zero.

YES

NO

Faulty controller.

Faulty accelerate & resume switch.

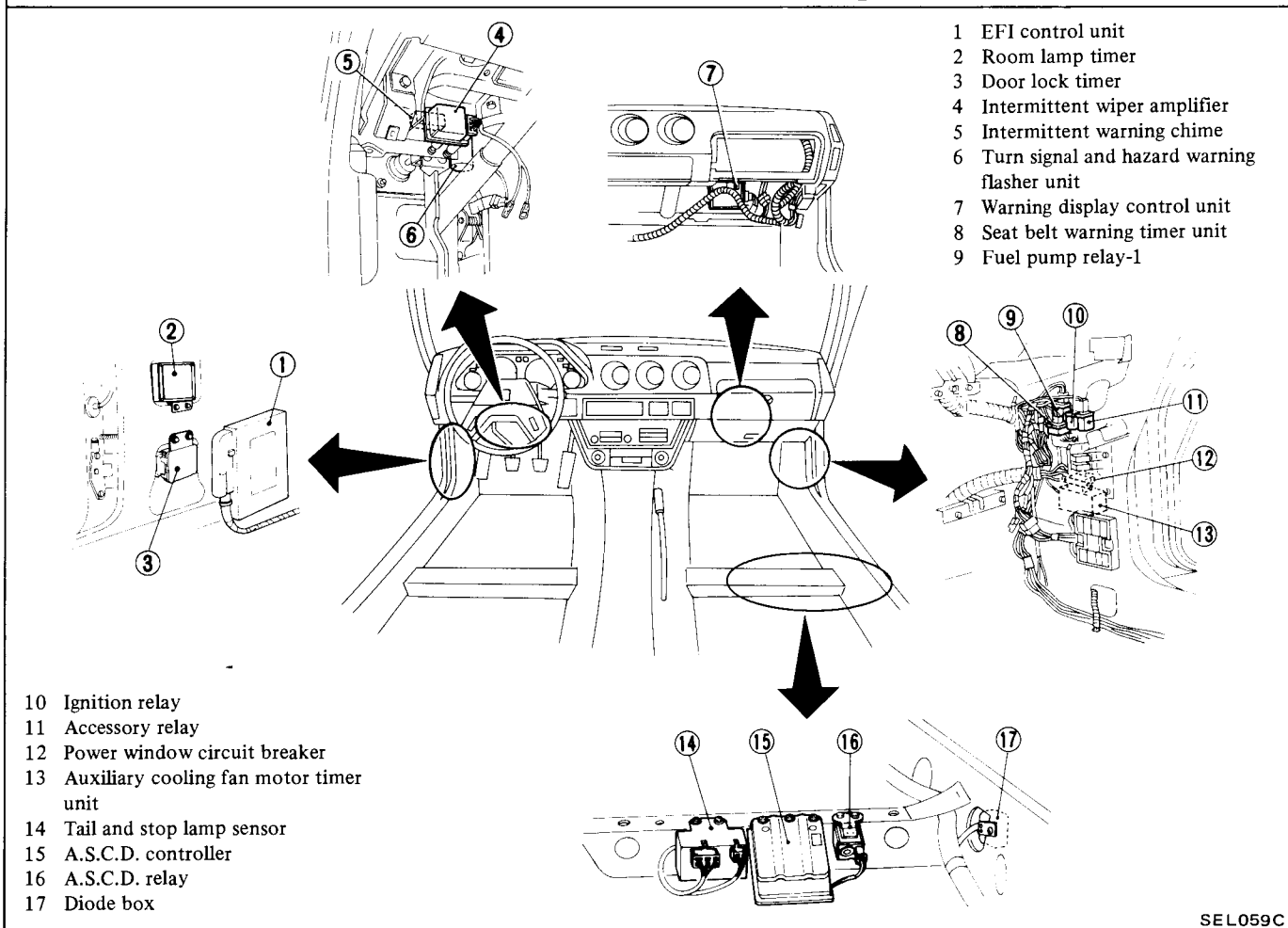
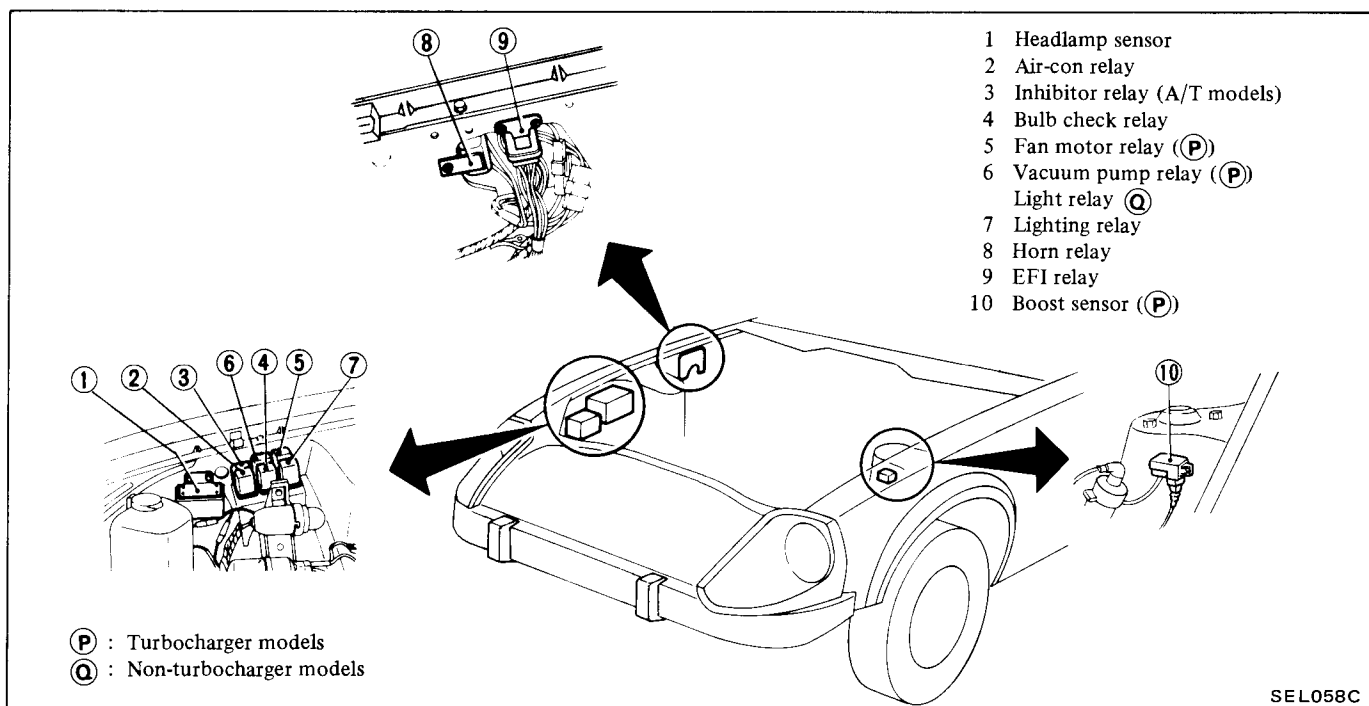


Other malfunctions and faults

Condition	Probable cause	Corrective action
Set speed is cancelled.	<ul style="list-style-type: none"> ● Bent meter cable (excessive meter needle deflection.) ● Faulty controller 	<ul style="list-style-type: none"> ● Check and repair meter cable, or renew cable. ● Renew.
Pulsation of set speed	<ul style="list-style-type: none"> ● Excessive play or binding of A.S.C.D. cable ● Leakage or clogging in vacuum hose ● Binding in actuator ● Faulty servo valve ● Faulty controller 	<ul style="list-style-type: none"> ● Adjust. ● Check and repair piping route, or renew hose. ● Renew actuator. ● Renew servo valve. ● Renew controller.
Excessive setting error	<ul style="list-style-type: none"> ● Excessive play or binding in A.S.C.D. cable ● Leakage or clogging in vacuum hose ● Faulty actuator ● Faulty servo valve ● Faulty controller ● Faulty speed sensor 	<ul style="list-style-type: none"> ● Readjust. ● Check and repair piping route, or renew hose. ● Renew actuator. ● Renew servo valve. ● Renew controller. ● Renew speedometer
Speed drops immediately after setting	<ul style="list-style-type: none"> ● Excessive play in A.S.C.D. cable ● Leakage or clogging in vacuum hose ● Faulty solenoid valve ● Faulty servo valve ● Faulty controller 	<ul style="list-style-type: none"> ● Readjust. ● Check and repair piping route, or renew hose. ● Renew solenoid valve. ● Renew servo valve. ● Renew controller.
Cancel circuit inoperative	<ul style="list-style-type: none"> ● Faulty controller 	<ul style="list-style-type: none"> ● Renew controller.

LOCATION OF ELECTRICAL UNIT

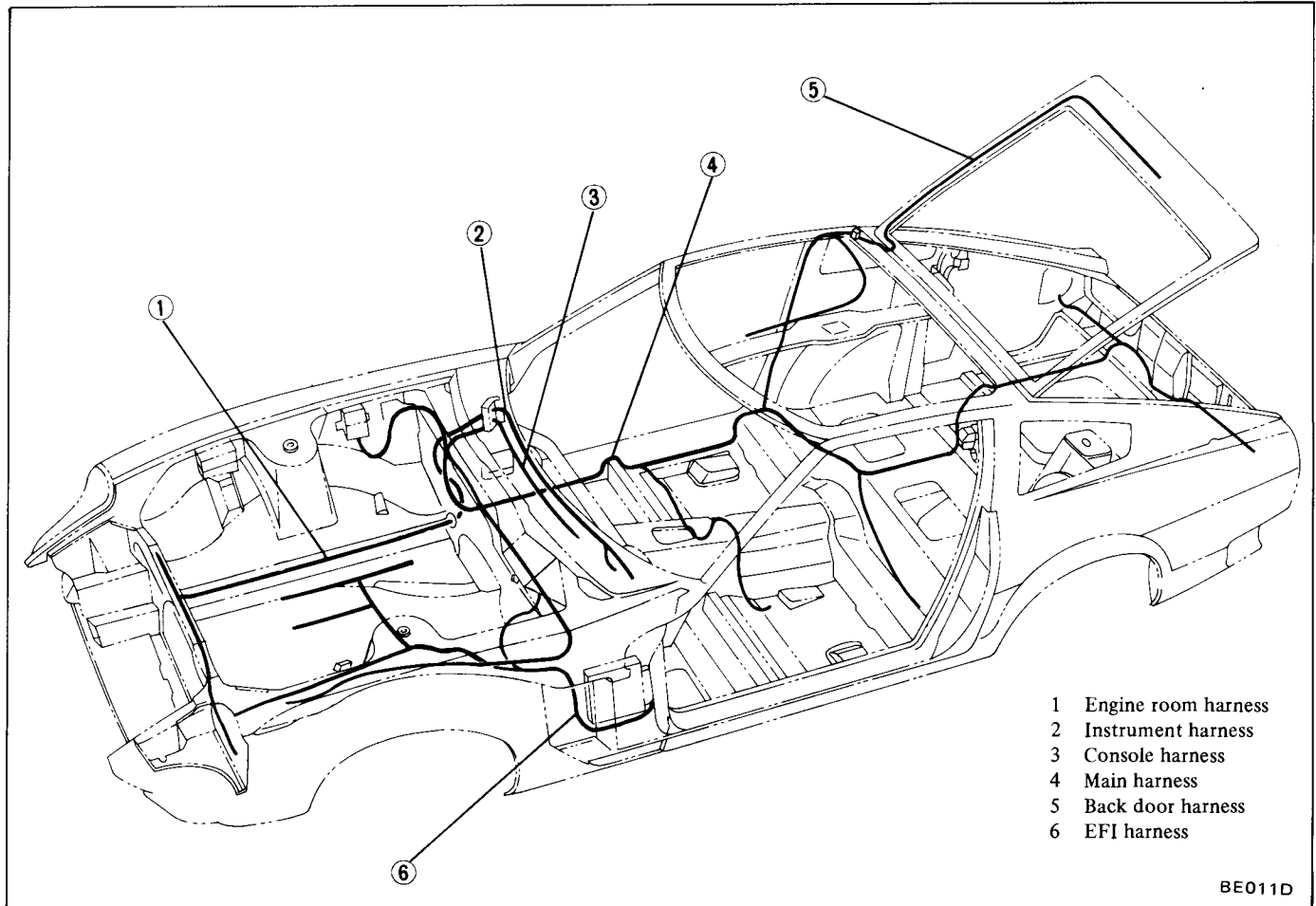
CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.



WIRING

CAUTION: Before starting to work, be sure to turn ignition switch "OFF" and then disconnect battery ground cable.

WIRING

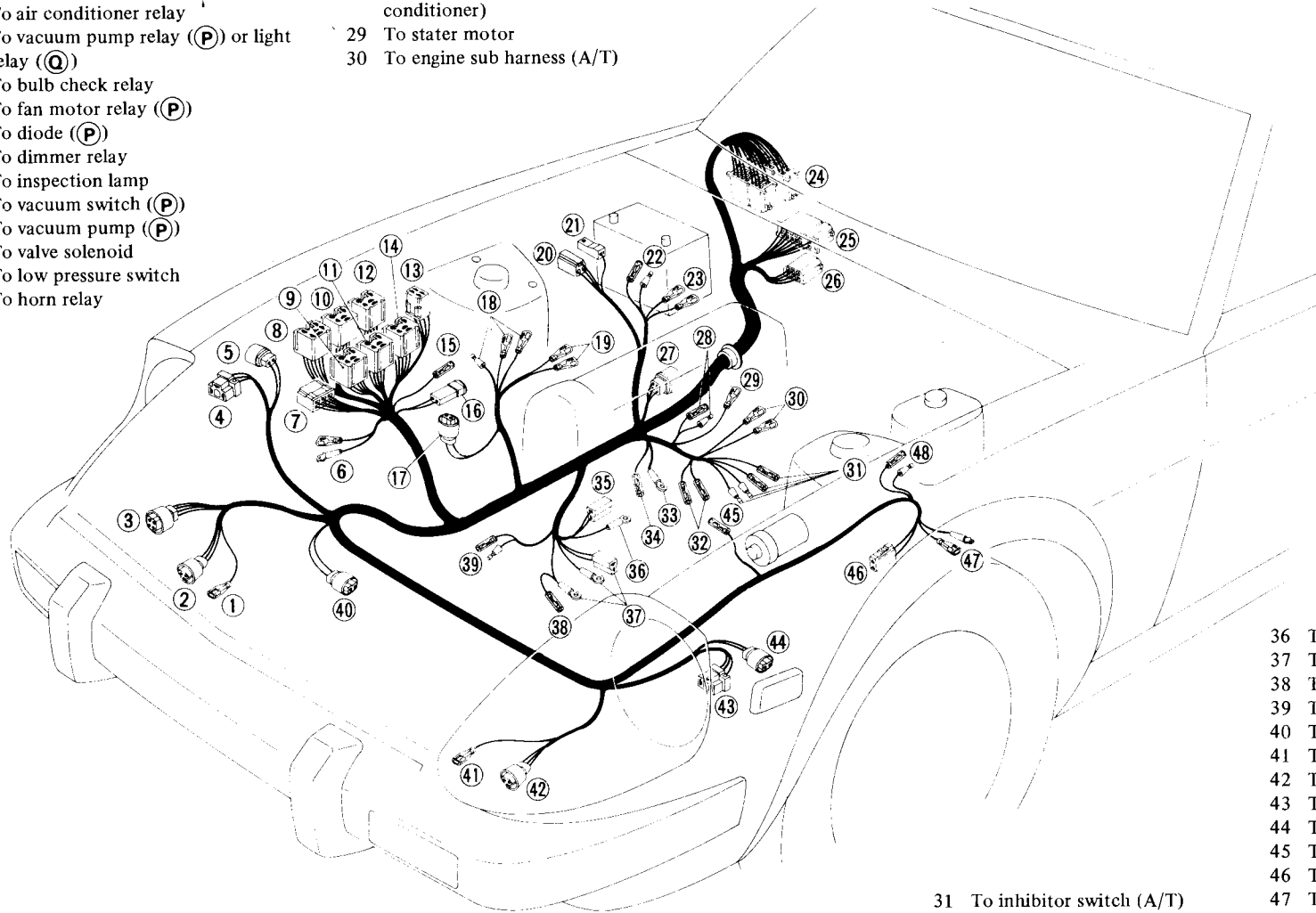


WIRING HARNESS **ENGINE ROOM HARNESS**

EL-126

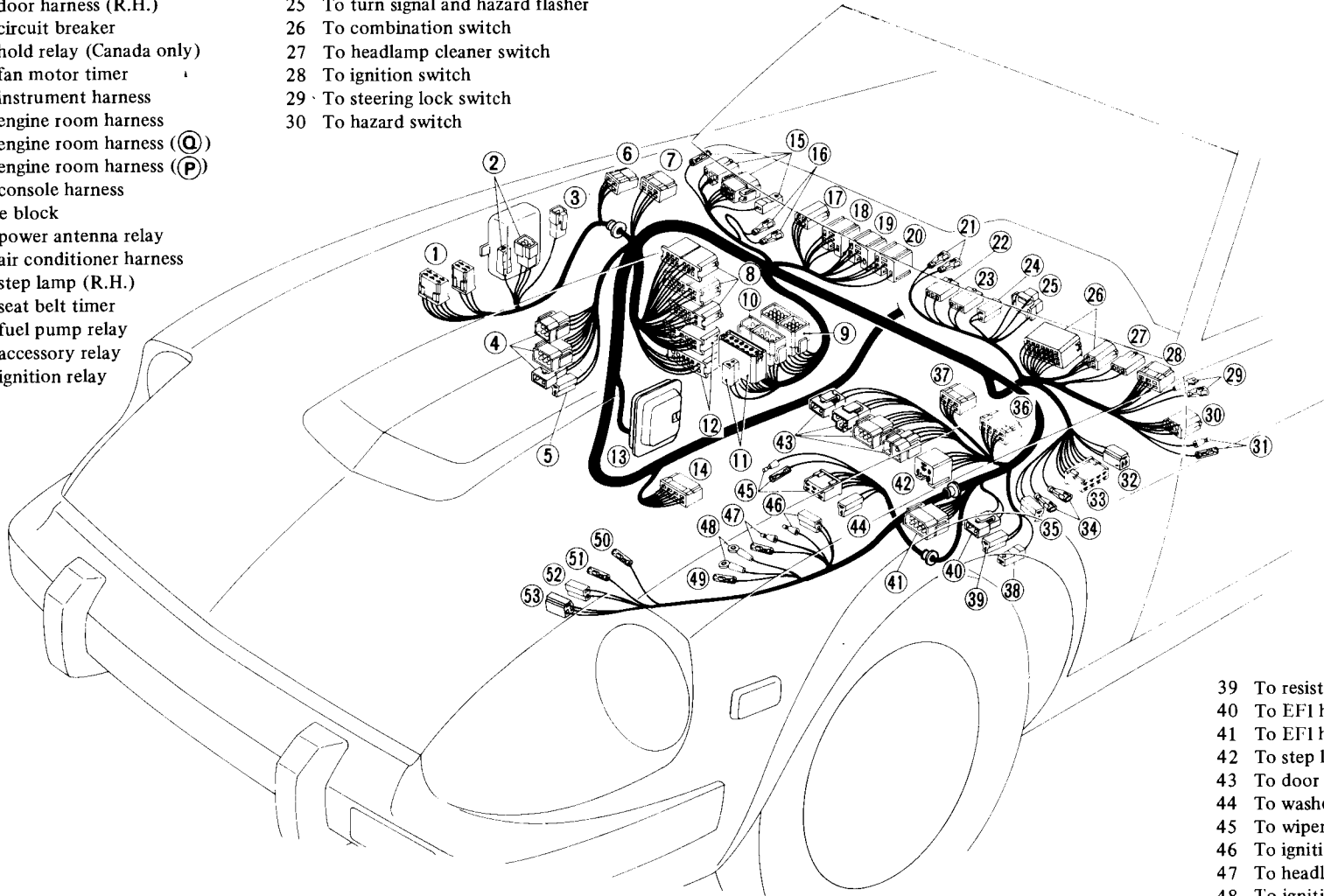
- | | |
|--|---|
| 1 To horn (R.H.) | 21 To main harness |
| 2 To front combination lamp (R.H.) | 22 To servo valve (A.S.C.D.) |
| 3 To ambient switch (For auto temperature control air conditioner) | 23 To solenoid valve (A.S.C.D.) |
| 4 To headlamp (R.H.) | 24 To main harness |
| 5 To side marker lamp (R.H.) | 25 To instrument harness |
| 6 To radiator coolant level switch | 26 To console harness |
| 7 To headlamp sensor | 27 To engine sub harness ((P), M/T) |
| 8 To inhibitor relay (A/T) | 28 To coolant temperature switch (For auto temperature control air conditioner) |
| 9 To air conditioner relay | 29 To stator motor |
| 10 To vacuum pump relay ((P)) or light relay ((Q)) | 30 To engine sub harness (A/T) |

- | |
|-----------------------------|
| 11 To bulb check relay |
| 12 To fan motor relay ((P)) |
| 13 To diode ((P)) |
| 14 To dimmer relay |
| 15 To inspection lamp |
| 16 To vacuum switch ((P)) |
| 17 To vacuum pump ((P)) |
| 18 To valve solenoid |
| 19 To low pressure switch |
| 20 To horn relay |



- | | |
|--------------------------------------|-------------------------------------|
| 31 To inhibitor switch (A/T) | 36 To engine earth |
| 32 To back-up lamp switch ((Q), M/T) | 37 To alternator |
| 33 To body earth | 38 To condenser |
| 34 To oil temperature sensor ((P)) | 39 To auxiliary cooling fan motor |
| 35 To oil pressure switch | 40 To fan motor ((P)) |
| | 41 To horn (L.H.) |
| | 42 To front combination lamp (L.H.) |
| | 43 To headlamp (L.H.) |
| | 44 To side marker lamp (L.H.) |
| | 45 To magnet clutch |
| | 46 To brake fluid level switch |
| | 47 To washer fluid level switch |
| | 48 To rear washer motor |
- (P) : Turbocharger models
 (Q) : Non-turbocharger models

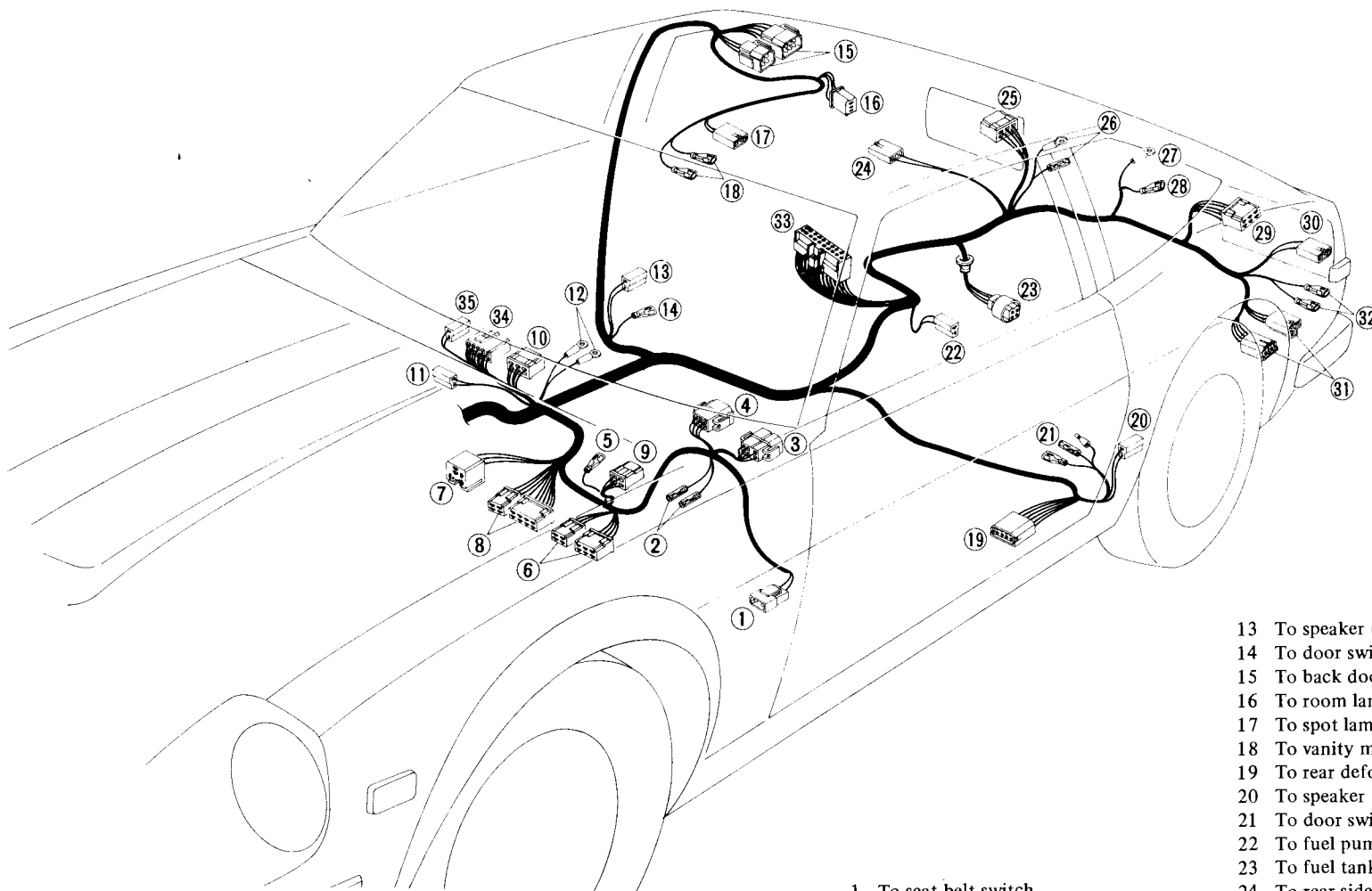
- 1 To EFI harness (6P connector: (P), 4P connector: (Q))
- 2 To fusible link
- 3 To engine room harness
- 4 To door harness (R.H.)
- 5 To circuit breaker
- 6 To hold relay (Canada only)
- 7 To fan motor timer
- 8 To instrument harness
- 9 To engine room harness
- 10 To engine room harness (Q)
- 11 To engine room harness (P)
- 12 To console harness
- 13 Fuse block
- 14 To power antenna relay
- 15 To air conditioner harness
- 16 To step lamp (R.H.)
- 17 To seat belt timer
- 18 To fuel pump relay
- 19 To accessory relay
- 20 To ignition relay
- 21 To stop lamp switch
- 22 To stop switch (A.S.C.D.)
- 23 To clutch switch
- 24 To kick-down switch (A/T)
- 25 To turn signal and hazard flasher
- 26 To combination switch
- 27 To headlamp cleaner switch
- 28 To ignition switch
- 29 To steering lock switch
- 30 To hazard switch



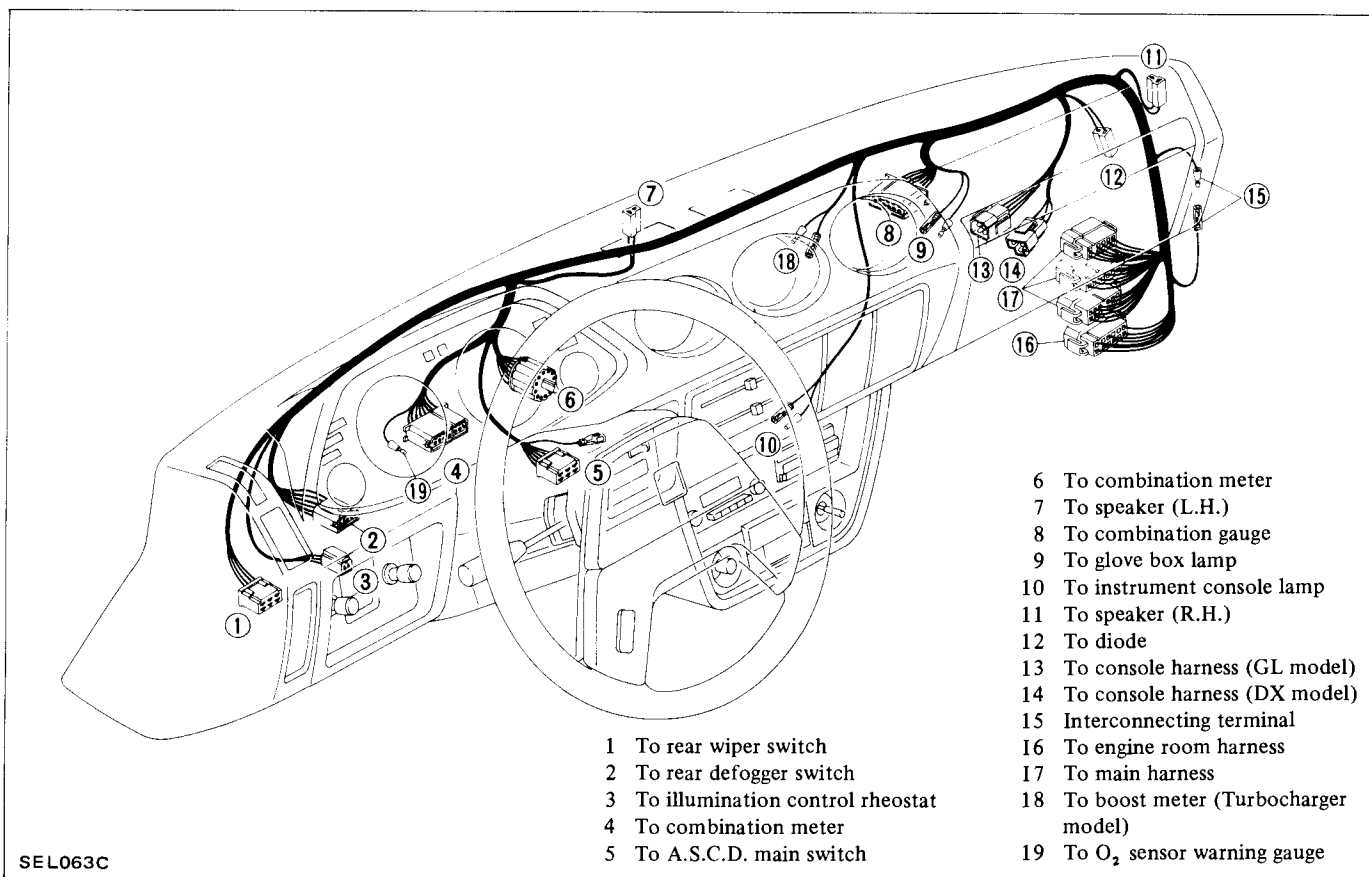
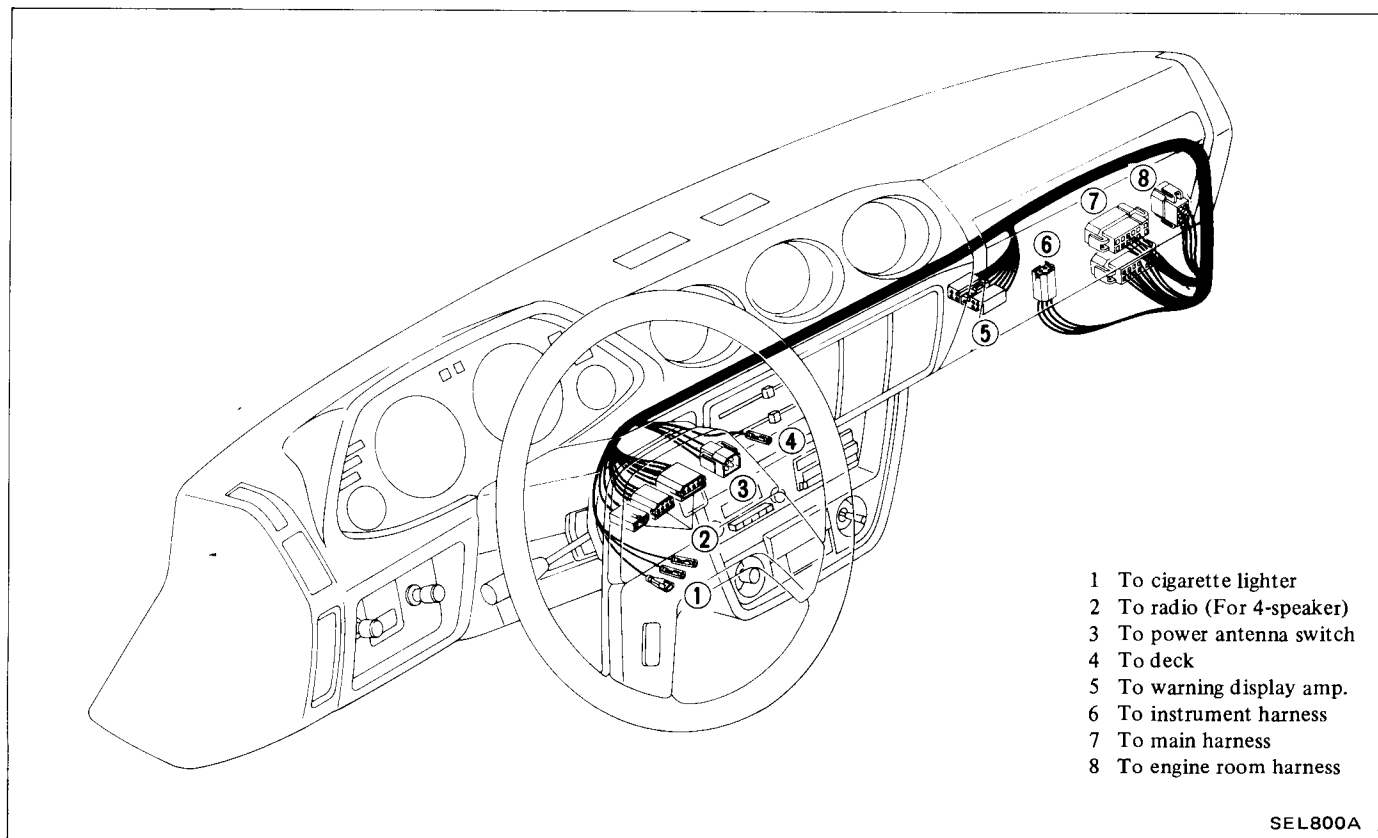
- 31 To key lamp
- 32 To intermittent warning chime
- 33 To intermittent wiper amplifier
- 34 To step lamp (L.H.)
- 35 To altitude switch
- 36 To door lock timer
- 37 To room lamp timer
- 38 To EFI harness

- 39 To resistor
- 40 To EFI harness (Q)
- 41 To EFI harness (P)
- 42 To step lamp relay
- 43 To door harness (L.H.)
- 44 To washer motor
- 45 To wiper motor
- 46 To ignition coil (P)
- 47 To headlamp cleaner
- 48 To ignition coil (Q)
- 49 To condenser
- 50 To water temperature sensor-1 (Q)
- 51 To water temperature sensor-2 (Q)
- 52 To distributor (Q)
- 53 To boost sensor (P)

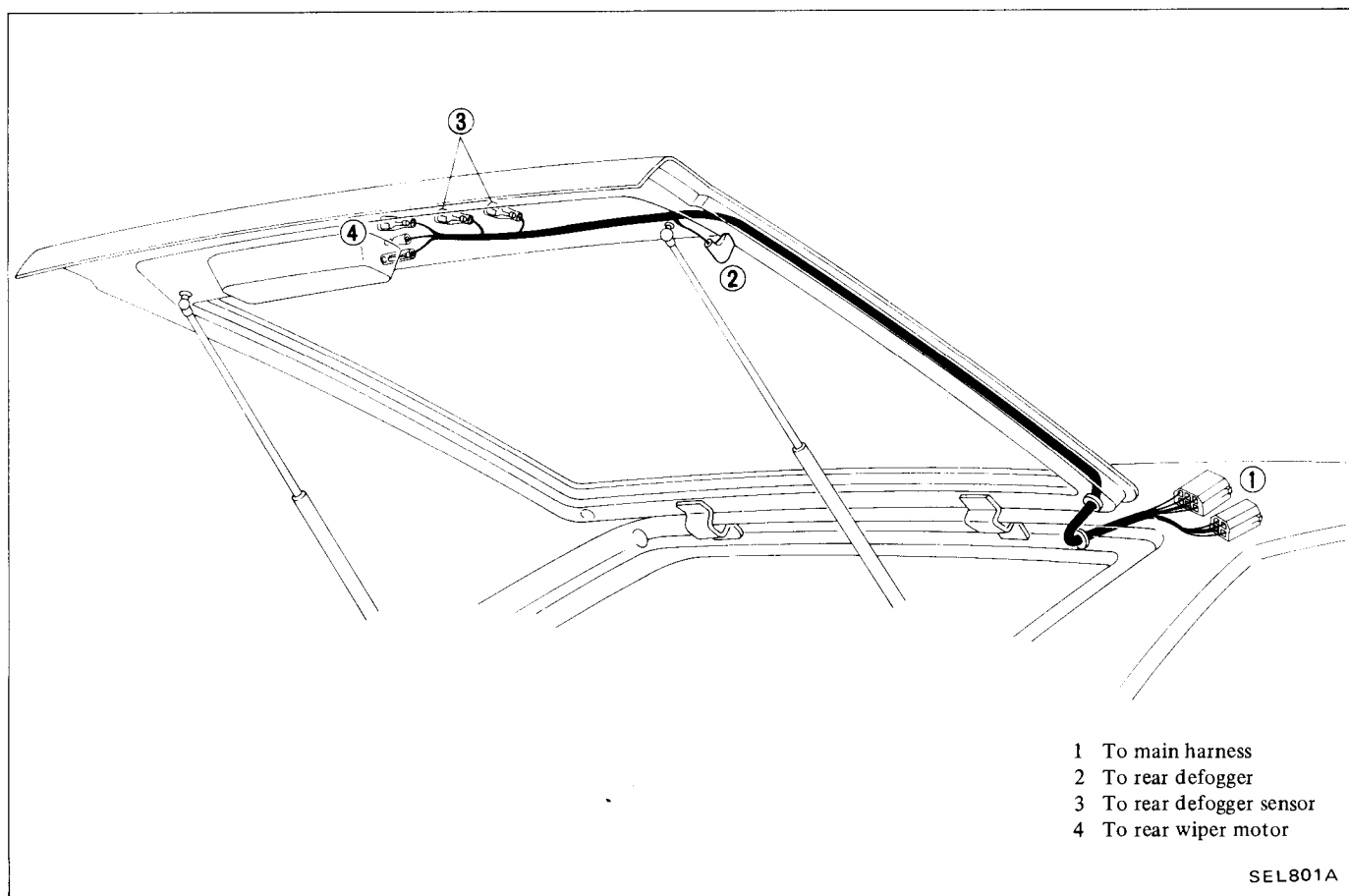
(P) : Turbocharger models
(Q) : Non-turbocharger models



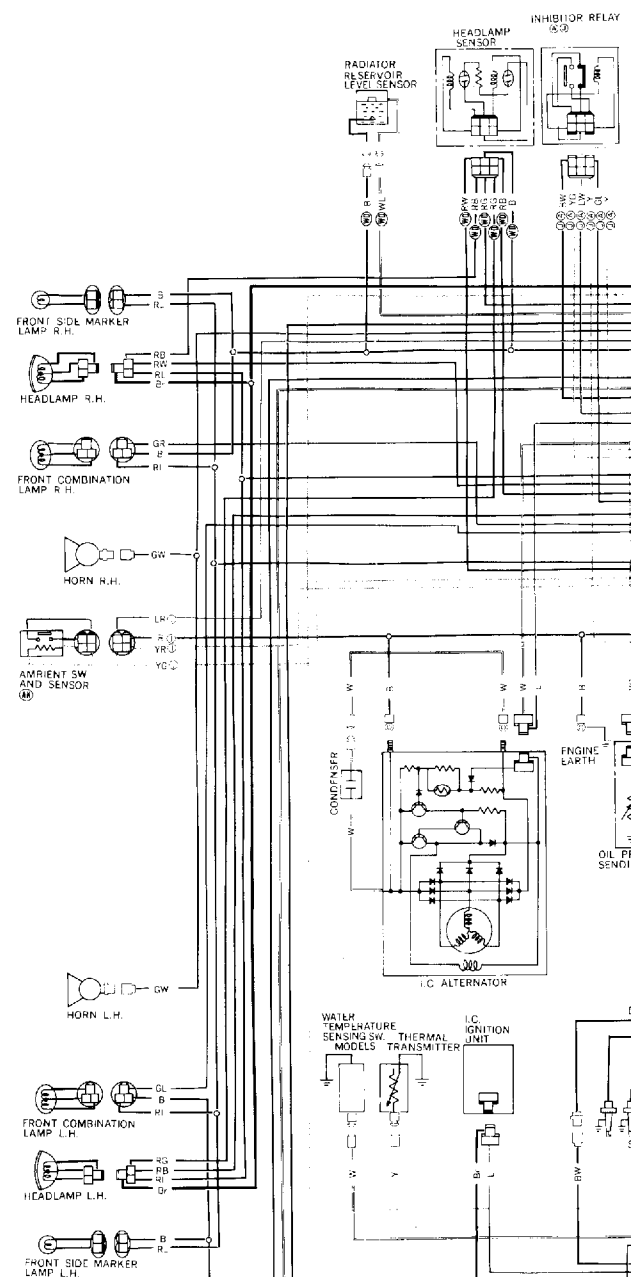
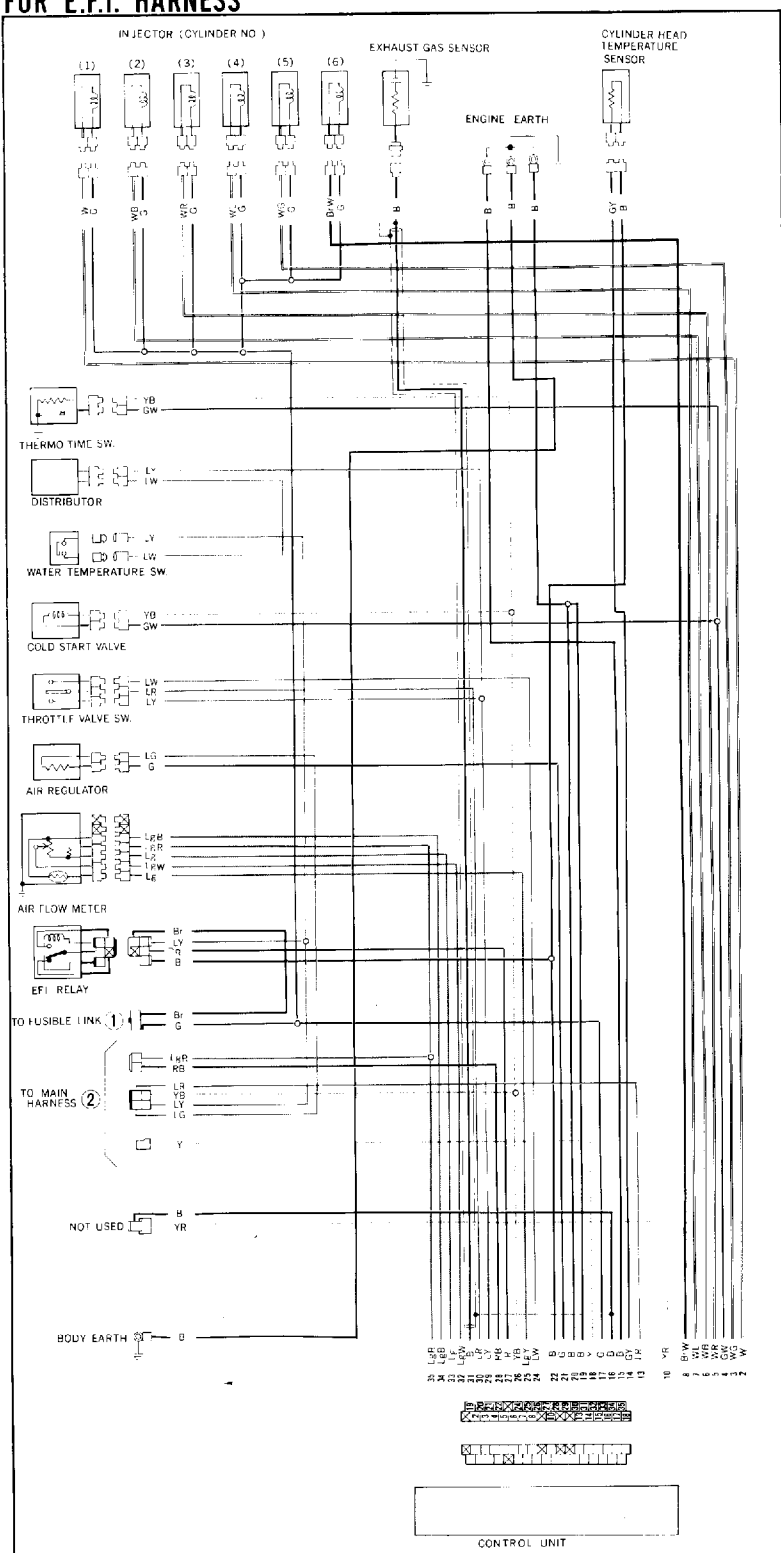
- | | |
|--|--------------------------------------|
| 1 To seat belt switch | 13 To speaker (R.H.) |
| 2 To automatic transmission indicator lamp | 14 To door switch (R.H.) |
| 3 To remote-control mirror switch (L.H.) | 15 To back door sub harness |
| 4 To remote-control mirror switch (R.H.) | 16 To room lamp |
| 5 To parking brake switch | 17 To spot lamp |
| 6 To tail and stop lamp sensor | 18 To vanity mirror lamp |
| 7 To A.S.C.D. relay | 19 To rear defogger controller |
| 8 To A.S.C.D. controller | 20 To speaker (L.H.) |
| 9 To rear defogger relay | 21 To door switch (L.H.) |
| 10 To diode box | 22 To fuel pump sub harness |
| 11 To diode (2+2 seater) | 23 To fuel tank unit gauge |
| 12 To body earth | 24 To rear side marker lamp (R.H.) |
| | 25 To rear combination lamp (R.H.) |
| | 26 To license plate lamp |
| | 27 To body earth |
| | 28 To back door switch |
| | 29 To rear combination lamp (L.H.) |
| | 30 To rear side marker lamp (L.H.) |
| | 31 To power antenna motor |
| | 32 To luggage room lamp (2+2 seater) |
| | 33 To voice warning device |
| | 34 To diode connector |
| | 35 To diode |

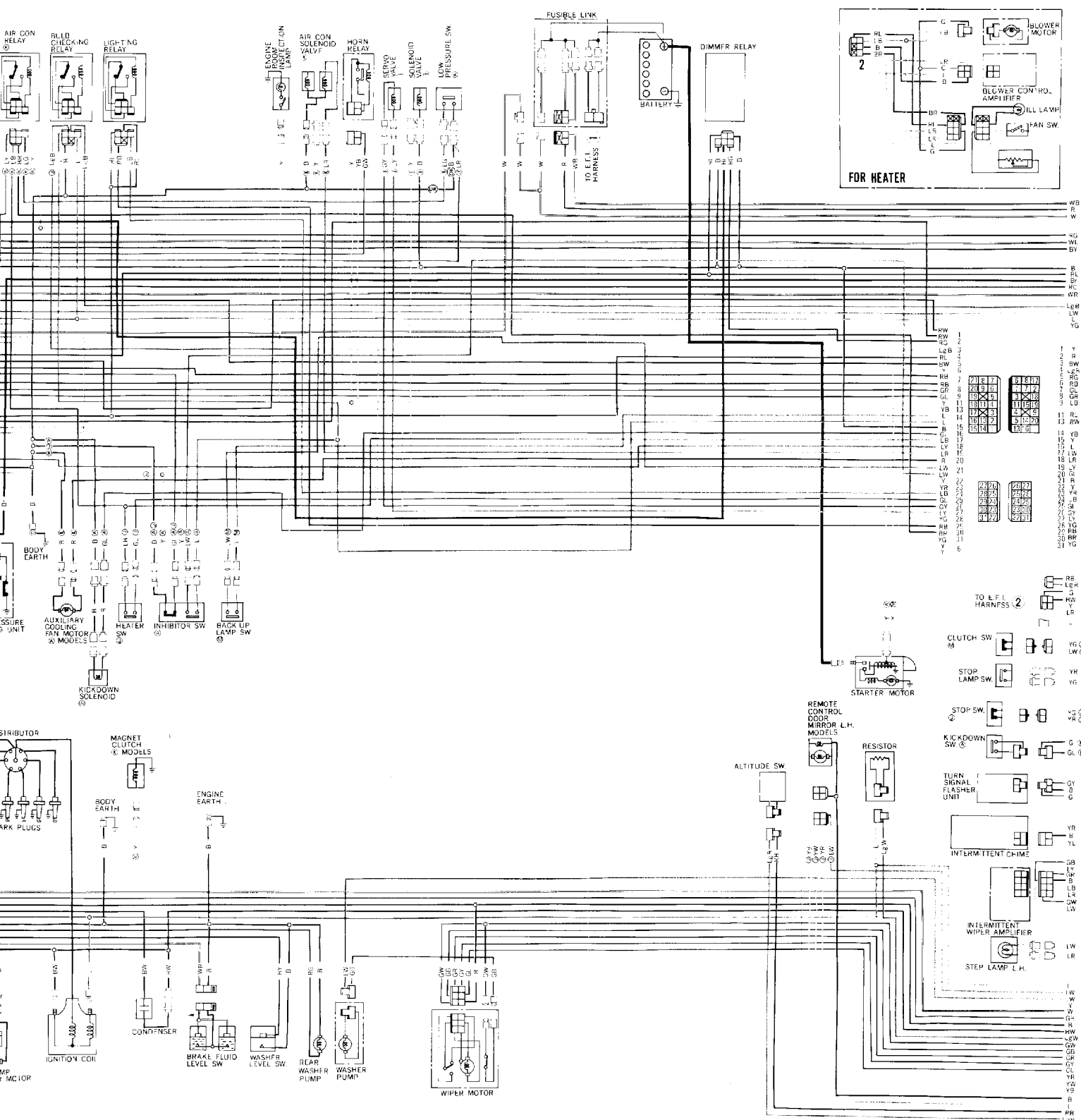
INSTRUMENT HARNESS**CONSOLE HARNESS**

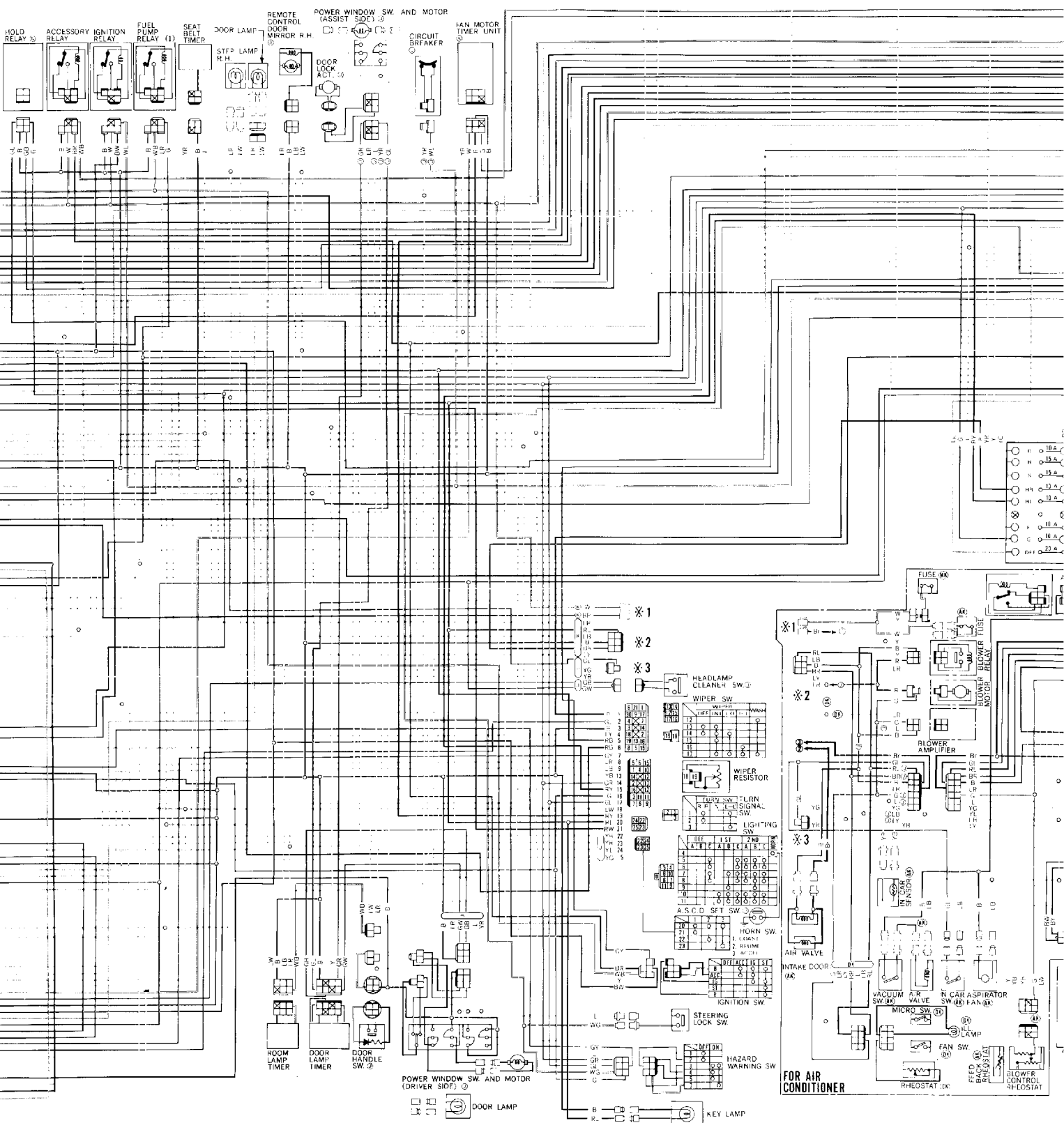
BACK DOOR HARNESS

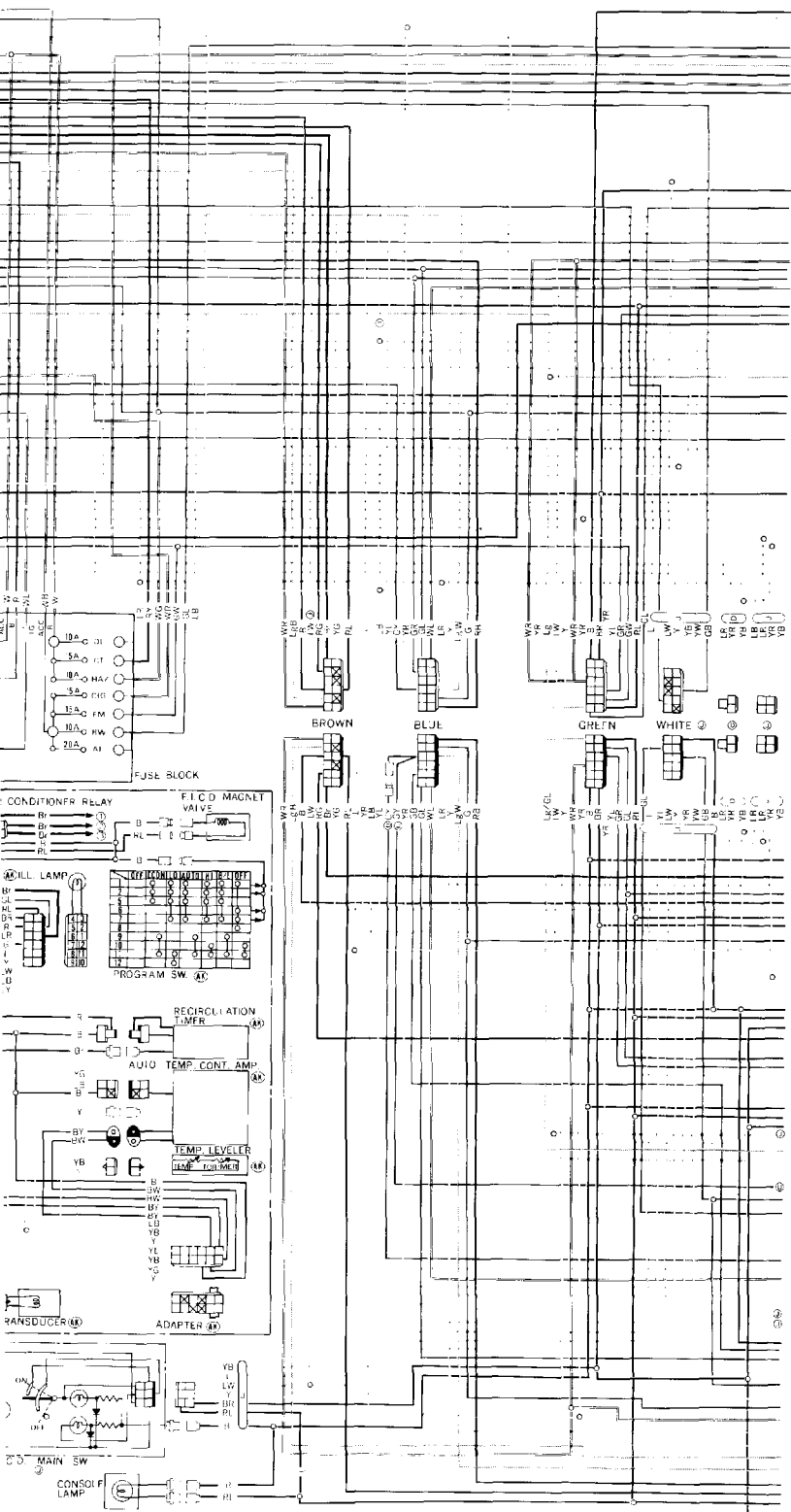


1982 DATSUN 280ZX (NON-TURBO) FOR E.F.I. HARNESS



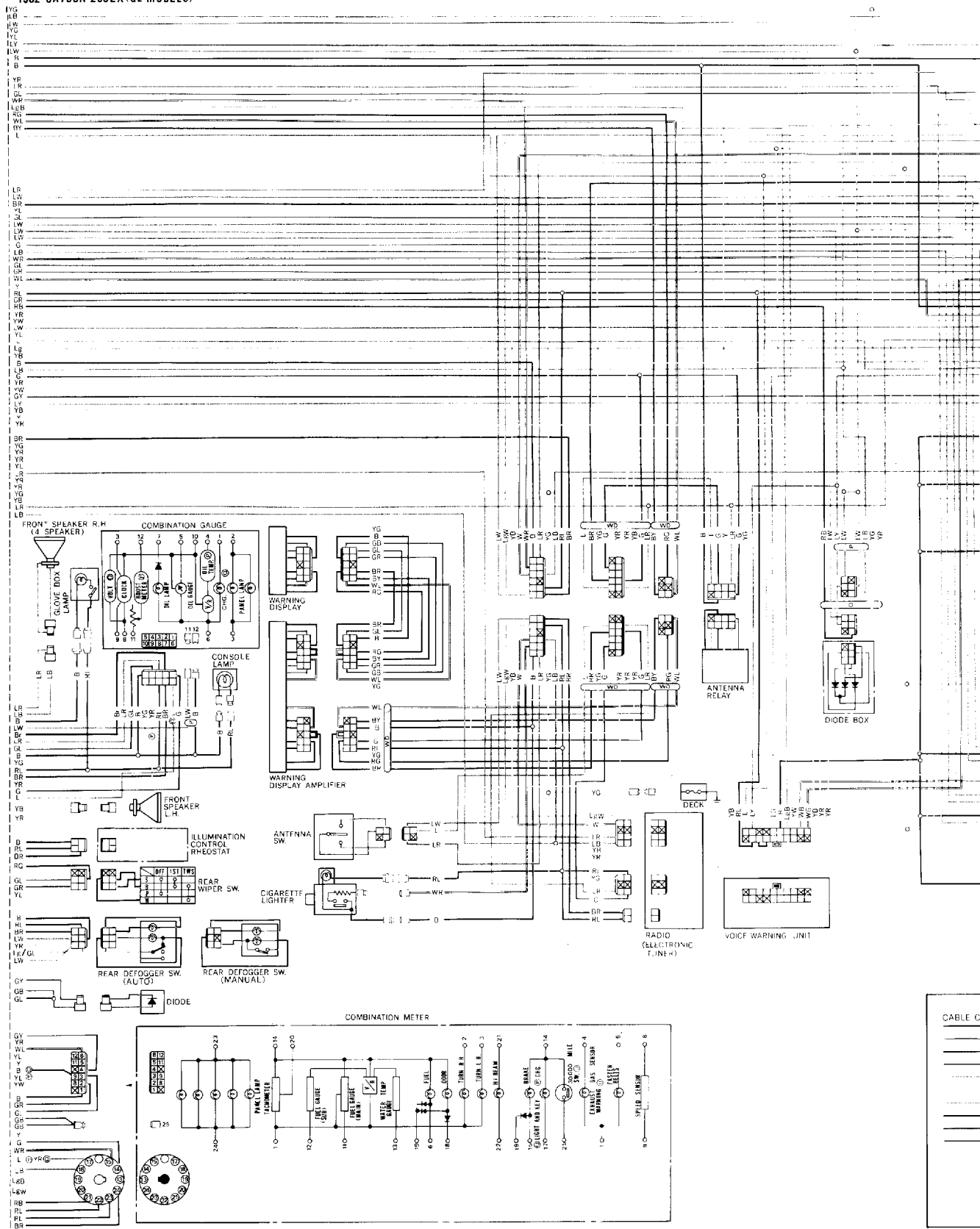


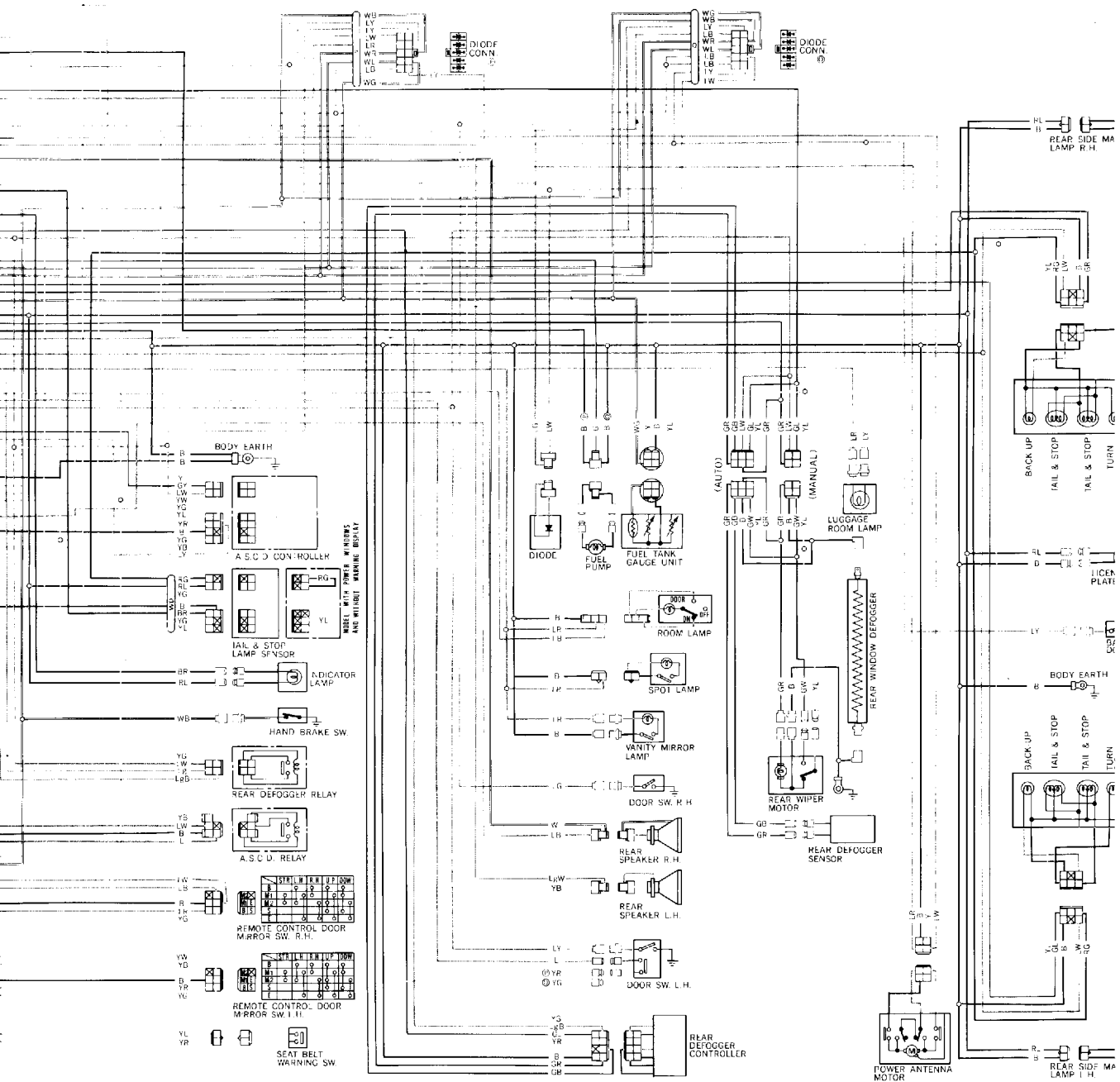




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Colors

B	BLACK
W	WHITE
R	RED
G	GREEN
L	BLUE
Y	YELLOW
Lg	LIGHT GREEN
Br	BROWN
Gr	GRAY
P	PINK

IN THE CASE OF TWO-TONE COLOR CABLE, CABLE COLOR IS INDICATED BY BASE COLOR ONLY AND STRIPE COLOR IS NOT SHOWN.

(Example)

GW — GREEN with WHITE Stripe
LG — BLUE with GREEN Stripe

- ① AUTOMATIC TRANSMISSION MODELS
- ② MANUAL TRANSMISSION MODELS
- ③ 2+2 SEATER MODELS
- ④ 2+2 SEATER MODEL
- ⑤ G1 MODELS
- ⑥ WARNING DISPLAY
- ⑦ AIR CONDITIONER
- ⑧ EXCEPT G1 MODELS
- ⑨ AIR CONDITIONER EQUIPPED MODELS EXCEPT G1
- ⑩ U.S.A. MODELS
- ⑪ CANADA MODELS
- ⑫ AUTO AIR CONDITIONER
- ⑬ MANUAL AIR CONDITIONER
- ⑭ TURBOCHARGER MODELS
- ⑮ NON-TURBOCHARGER MODELS

POSITION

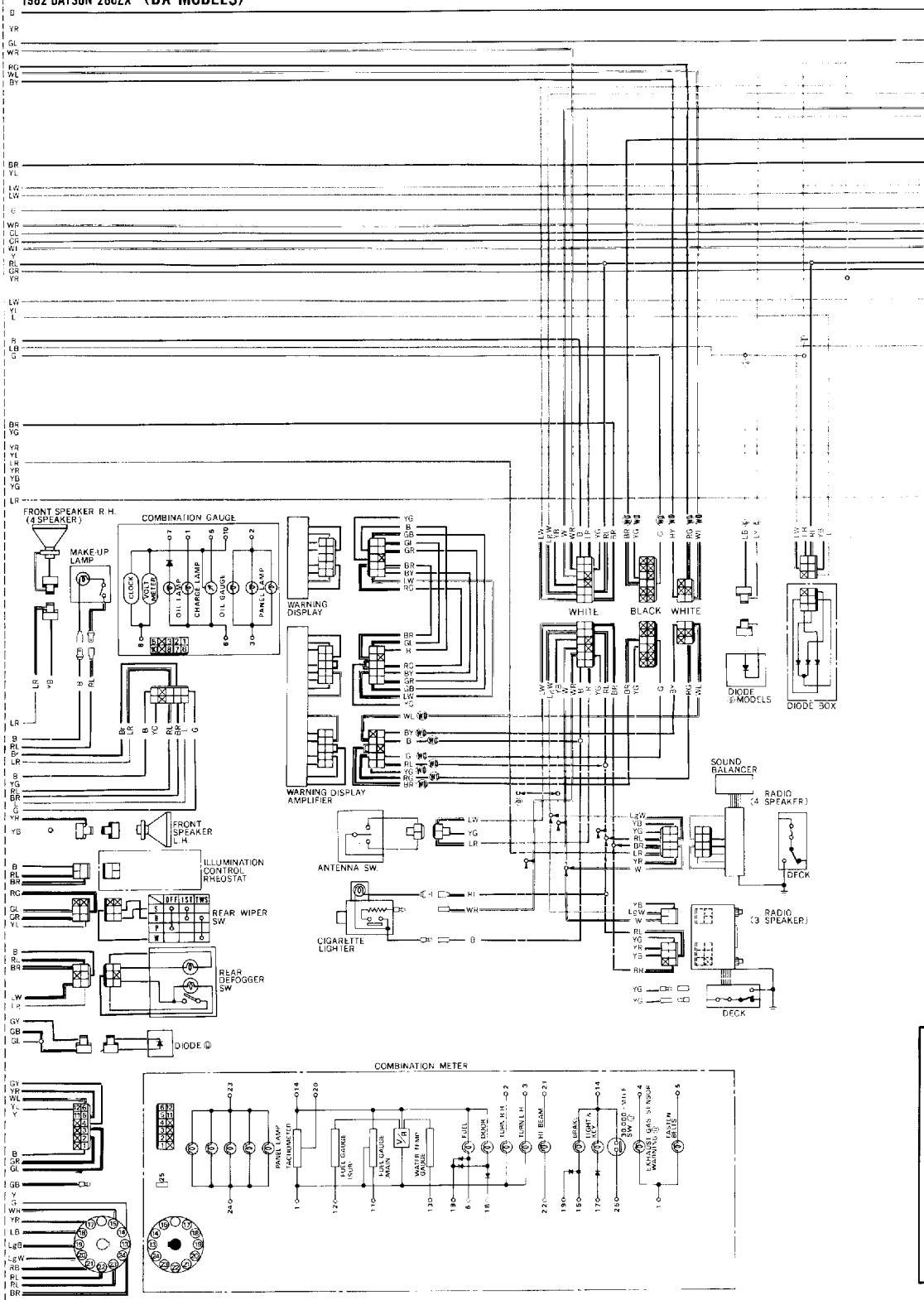
- ① Ignition sw. in lock.
- ② Light sw. and wiper sw. in off.
- ③ Door closed.
- ④ Transmission in neutral (A/T selector lever in parking).
- ⑤ Parking brake pulled.
- ⑥ Driver's seat belt unlocked

MALE NO CONNECT

FEMALE CONNECTION

PIN CONNECTOR NORMALLY OPEN

PLAIN CONNECTOR NORMALLY CLOSED



1982 DATSUN 280ZX (TURBO) FOR E.F.I. HARNESS

